MEZIADIN LANDFILL

2021 Annual Report

Prepared for:
British Columbia Ministry of
Environment & Climate Change Strategy
EnvAuthorizationsReporting@gov.bc.ca

Prepared by:
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Executive Summary

During 2021, 2,039.1 tonnes of municipal solid waste was disposed in the Meziadin landfill. Approximately 132.3 tonnes of materials were diverted from the landfill. Diverted materials include 90.1 tonnes of clean wood, 0.8 tonnes of tires, and stored 41.4 tonnes of metal.

There were two instances of bears breaching the facility fence during 2021 reported to the Conservation Office, as well as a couple of documented failed attempts to access the facility via hole digging under the fence. There was minimal vector activity from birds, including raptor species (bald eagles), and corvid species (crows and ravens).

There were improvements made to the facility fence and solar power unit to bring the Meziadin Landfill into compliance with its OC. The Ministry identified eight non-compliances during their inspection period review on August 5, 2021; seven of which were related to the function and maintenance of the fence. All four groundwater and three surface water sites were sampled and monitored according to their prescribed bi-annual schedule. The compiled data, interpretation, and recommendations from Sperling Hansen Associates will be contained in the *Meziadin Landfill 2021 Annual Environmental Effects Monitoring (EEM) Report.*

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Regional District of
Kitimat-Stikine

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Regional District of
Kitimat-Stikine

1 Introduction

This annual report covers the period from January to December 2021 and has been prepared to fulfill the requirements of Meziadin Landfill Operational Certificate (OC) MR-15681. The Meziadin OC was issued in 2002, and was recently updated in 2022. The OC authorizes the discharge of municipal solid and liquid wastes and outlines thecriteria for environmental and human protection at the landfill.

The 2021 Annual Report summarizes the following topics presented in Table 1.

Table 1: Report Objectives

Waste Tracking Quantity of Waste Received, Recycled and Composted **Wildlife Observations** **Operations** Operational Certificate Authorizations Facility Updates and Maintenance Non-Compliances **Environmental Monitoring**	

Environmental monitoring was conducted in accordance with the OC. The results of the water quality monitoring program, which includes groundwater, surface water, and leachate monitoring, are discussed in the Environmental Effects Monitoring Report by Sperling Hansen Associates and contained in Appendix A of this report.

2 Background

The Meziadin Landfill is owned and operated by the Regional District of Kitimat-Stikine (Regional District or RDKS). It is located approximately 15 km south of Meziadin Junction, accessed from the Stewart-Cassiar Highway.

The Landfill is responsible for the management of municipal solid and liquid waste generated from commercial, residential and industrial sources in the Meziadin area and the Stewart Transfer Station, in accordance with the Regional District Kitimat-Stikine Solid Waste Management Plan (1995). Landfill operations are regulated by the Ministry of Environment and Climate Change Strategy's Operational Certificate MR-15681, issued in August 2002.

The footprint for the entire Meziadin Facility is 12 hectares, which includes a landfill, septage lagoon, and a settling lagoon for collected leachate from the landfill. There is also a designated area for the diversion of metal, clean wood, and tires. Metal is collected by a scrap recycler and tires are collected by the Tire Stewardship of British Columbia. Clean wood is burned on site as outlined in the Operational Certificate.

Figure 1 Location of Meziadin Landfill

3 Waste Disposal

The Meziadin Facility receives waste from residents and businesses, as well as waste generated by industry (such as mining) camps in the area. Industry is required to divert all recyclable and Extended Producer Responsibility materials from waste prior to disposal.

In June 2019, the Meziadin Landfill began receiving waste from the newly constructed Stewart Transfer Station. Waste received from the Stewart Transfer Station is comprised of residential and commercial municipal solid waste generated within the District of Stewart (population of approximately 517).

3.1 Solid Waste Disposal

The annual totals of municipal solid waste, metal, tires, and clean wood received at the Meziadin Landfill from January through to December 2021 are shown in Table 2. Details regarding some of these materials are included below.

Table 2 Refuse and Diverted materials volumes for 2021.

Waste Type	Cubic Metres	Tonnes
Landfilled Waste	**12,498.5**	**2,039.1**
Refuse[1]	12,498.5	2,039.1
Diverted Waste	**1,463**	**3,980.3**
Clean Wood[2]	899	90.1
Metal[3]	488	41.4
Septage[4]	-	3,848
Tires[5]	76	0.8

Refuse

Garbage is defined as discharged materials, substances, or objects, not including Restricted Wastes (metal, organics, and recyclable materials), hazardous or radioactive waste, contaminated soil, smoldering or flammable material, explosive or highly combustible materials, or tires. Garbage is disposed of in the landfill.

In 2021, **2,039.1 tonnes** (12,498.5 cubic meters) of refuse were disposed of in the landfill. Refuse tonnage was converted from cubic meters using the U.S. EPA's *Volume to Weight Conversion Factors* (2016) document. The mixed MSW-Residential, Institutional, Commercial: Uncompacted conversion factor of 1 cubic yard = 275lbs was used to calculate tonnage.

3.2 Diverted Materials

Diverted metals, tires, and large appliances are collected and held at the landfill until collected by the designated Stewardship or metal salvage company. Clean wood is diverted from the landfill and burned, as outlined in the Operation Certificate.

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 burned as prescribed in the Operational Certificate.

In 2021, **90.1 tonnes** (899 cubic meters) of clean wood was segregated as outlined in the Operational Certificate. This volume is a visual estimate based on tracked volume of wood waste. No burning activity took place at Meziadin Facility in 2021. This value is converted from cubic meters to tonnes using the U.S.

[1] Refuse tonnage was converted from cubic meters using the U.S. EPA's *Volume to Weight Conversion Factor* of 1 cubic yard = 275lbs.
[2] This volume is a visual estimate based on tracked volume of wood waste. This value is converted from cubic meters to tonnes using the U.S. EPA's *Volume to Weight Conversion Factors* of 1 cubic yard = 169lbs.
[3] This volume is an estimate of on-site segregated metals. This value is converted from cubic meters to tonnes using the U.S. EPA's Volume to Weight Conversion Factors of 1 cubic yard = 169lbs.
[4] This volume is an estimate based on waste tracking data for the facility.
[5] This volume is an estimate based on waste tracking data for the facility. The volume of tires on site was converted to tonnage by utilizing the U.S. EPA's *Volume to Weight Conversion Factor* of 1 tire = 22.5lbs.

EPA's *Volume to Weight Conversion Factors* (2016) document. The C&D Wood – Clean Dimensional Lumber conversion factor of 1 cubic yard = 169lbs was used to convert to tonnage.

Metal

In 2021, a total of **41.4 tonnes** (488 cubic meters) of metal were collected at the Meziadin Landfill as scrap for recycling. This volume is an estimate of on-site segregated metals. All ozone depleting substances were removedfrom applicable appliances prior to collection by the scrap metal recycler.

Metal tonnages were converted from estimated cubic meters to tonnage using the U.S. EPA's *Volume to Weight Conversion Factors* (2016) document. The C&D Remainder/Composite Metal (avg of metals, without used oil filters) conversion factor of 1 cubic yard = 143lbs was used to find the total tonnage of metals.

Septage

Septage is defined as septic tank pumpage and treated sewage sludge, but does not include other sewage wastes (wastewater, sewage or slurry, including catch basins, oil water separators, shop floor drains).

In 2021, an estimated **3,848 tonnes** of septage was received at the Meziadin Facility.

Tires

In 2021, **0.8 tonnes** (76 individual tires) of tires were collected at the Meziadin Facility for recycling through the Tire Stewardship of BC. This volume is an estimate based on waste tracking data for the facility.

The volume of tires on site was converted from individual tires to tonnage by utilizing the U.S. EPA's *Volume to Weight Conversion Factors* (2016) document. The automotive Scrap Tire: light duty tires (passenger, light truck) conversion factor of one tire = 22.5lbs was used to find total tonnage of tires for 2021.

4 Wildlife Occurrences and Observations

The Meziadin Facility is in an area with bears, wolves, coyotes, several species of birds of prey, and many other species of mammals that may attempt to access the facility. To prevent wildlife from gaining access, the entire facility is fenced, and the active part of the landfill is enclosed in an electric fence. Wolf tracks are frequently seen in the area immediately surrounding the facility fence. Signs of wolves and grizzly bears attempting to burrow under the fence are noted throughout the year. Site Operators deter burrowing by piling rocks at the fence where burrowing has begun. The RDKS is working to develop a long-term solution to wildlife burrowing.

As of November 2018, a Revelstoke Iron Grizzly (RIG) plate is used as an alternative daily cover to prevent vectors from gaining access to the landfill active face. It is positioned each day to cover waste on the landfill active face. Soil from the Regional District borrow area is used as daily and 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.

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 the Meziadin landfill 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).

4.2 Mammals

In May 2021, it was noted by RDKS staff that a grizzly bear cub entered the facility by way of scaling a fence post and in the process, damaged wires. The incident occurred after hours and resulted in damage to the plywood door of the facility garbage container. The bear was not sighted; however, its tracks were found in the facility in addition to the damage to the storage container and fence wires. The Conservation Officer Service was notified of the occurrence.

In October 2021, there were two instances of digging observed along the facility fence with no sign of the facility being accessed. These attempts at breaching the fence were assumed to be initiated by a Grizzly Bear and noted by RDKS staff upon facility inspection. The first occasion was reported to the Conservation Officer Service who informed the RD to continue the practice of filling in these dig locations and monitor the situation with the hopes the bear would move off the facility before snow fall. The second observation was not necessary to report the Conservation Officer (CO) as the Bear had not breached the facility.

In that same month, there was a bear that breached and damaged the facility fence. The facility operator noted there was digging along the fence in addition to damage as well as evidence of tracks within the facility. The CO was notified and asked that the site continue to be monitored and the frequency of these breaches reported.

5 Operations

In August 2021 ENV visited the site to complete a site inspection. The inspection resulted in a list of deficiencies for the site where compliance with the OC was not being met. Works were completed to bring the facility into compliance with the OC. The works completed for 2021 are summarized in Table 3.

Table 3 Works & Projects completed during 2021.

Date and Nature of Work	Details
August 13th, 2021 – Repairs Made to Fence	Fence was repaired in order to bring facility into compliance with prescribed voltage and keep maintained in functional condition.
August 2021 – Solar Panel Box Replacement	The fence experienced ongoing issues with voltage. The site is off grid and relies solar panel set up to produces charge on fence. One unit was replaced to restore full electrical function to fence.

5.1 Non-Compliance Reports

There were several non-compliances identified by the Ministry of the Environment for the Meziadin facility during 2021. These non-compliances are summarized in Table 4.

Table 4 Operational Certificate Non-Compliances

Operational Certificate Non-Compliance Section	Description of Non-Compliance
Section 5.2.3 Leachate Management Requirements, Facultative Lagoon, Seepage Control	Seepage from the facultative lagoon was detected during monitoring conducted for RDKS in 2017 and was identified in the previous inspection record (IR157167). Leak still has not been addressed.
Section 6.14.1 General Requirements, Electric Fencing, Design, Construction and Maintenance	On May 29, 2021, a grizzly bear cub accessed the facility after hours; it climbed the fence post and damaged the fence wires. Bears were not prevented from entering the facility.
Section 6.14.2 General Requirements, Electric Fencing, Fence Type	Along the electric fence there were portions where the bottom strand was more than 10cm from the ground, and a portion of fence that had detached along the Northwest corner of the landfill.
Section 6.14.6 General Requirements, Electric Fencing, Period of Operation	The bottom 3 strands of the electric fence were not energized and the electric fence was not fully operational during the period of April 1 to October 31.

Section 6.14.7 General Requirements, Electric Fencing, Minimum Voltage	The bottom 3 strands of the electric fence were not energized. Review of Staff Facility Inspection Forms found that the bottom strands had not been in compliance with appropriate voltage on several occasions.	
Section 6.14.8 General Requirements, Electric Fencing, Gate(s)	Staff Facility Inspection forms reveal that during the inspection period the gate had been measured at 0 volts on several occasions.	
Section 6.14.9 General Requirements, Electric Fencing, Fence Inspections	The grizzly bear entering the facility was not reported to CO and MOE immediately, as required. Fence inspections were not increased to once daily until proper voltage was restored in response to cases of low voltage being recorded.	
Section 17 Maintenance of Works, Emergency Procedures, and Non-Compliance Reporting	There were no records of notifications to the Director found in the Ministry's electronic filing system for the non-compliances identified in this inspection record during the inspection period.	

6 Environmental Monitoring

Environmental monitoring for the Meziadin Facility was conducted by a Regional District of Kitimat-Stikine Environmental Services Technician, Hannah Shinton, following Ministry of Environment and Climate Change Strategy, 2013 British Columbia Field Sampling Manual. Sperling Hansen Associates has been retained to compile and analyze in-situ monitoring and surface water sampling results. The compiled data, interpretation, and recommendations from Sperling Hansen Associates will be contained in the *Meziadin Landfill 2021 Annual Environmental Effects Monitoring (EEM) Report*.

Ground Water

There are four groundwater monitoring wells and one of them contains a nested well. They are all sampled and monitored twice yearly during the spring and fall months. In-Situ parameters are monitored using a TLC Depth Tape and YSI. Lab parameters are collected in sample bottles and shipped to ALS for analysis.

Surface Water

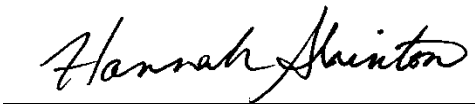
There are three surface water sites; the Treatment Lagoon Outlet, an Upstream point, and Downstream point along surface water that meanders around the facility. They are all sampled and monitored twice yearly during the spring and fall. In-Situ parameters are monitored using a YSI. Lab parameters are collected in sample bottles and shipped to ALS for analysis.

7 Summary

During 2021, 2,039.1 tonnes (12,498.5 cubic meters) of municipal solid waste was disposed in the Meziadin landfill. Approximately 132.3 tonnes of materials were diverted from the landfill. Diverted materials include 90.1 tonnes (899 cubic meters) of clean wood, 0.8 tonnes (76 individual tires) of tires, and stored 41.4 tonnes (488 cubic meters) of metal.

There were two instances of bears breaching the facility fence during 2021. There was minimal vector activity from birds, including raptor species (bald eagles), and corvid species (crows and ravens). There were improvements made to the facility fence and solar power unit to bring the Meziadin Landfill into compliance with its OC. The Ministry identified eight non-compliance during their inspection period review, seven of which were related to the function and maintenance of the fence. All four groundwater and three surface water sites were sampled and monitored according to their prescribed bi-annual schedule. The compiled data, interpretation, and recommendations from Sperling Hansen Associates will be contained in the *Meziadin Landfill 2021 Annual Environmental Effects Monitoring (EEM) Report.*

Document prepared by:



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Appendix A Environmental Effects Monitoring Report

2021 Meziadin Landfill Annual Monitoring Report

PREPARED FOR: REGIONAL DISTRICT OF KITIMAT-STIKINE

PREPARED BY: SPERLING HANSEN ASSOCIATES

June 14, 2022

PRJ22037

SPERLING HANSEN ASSOCIATES

Regional District of Kitimat-Stikine

- Landfill Services
- Land Reclamation
- Corporate Management
- Groundwater Hydrogeology

SPERLING
HANSEN
ASSOCIATES

• Landfill Engineering
• Solid Waste Planning
• Environmental Monitoring
• Landfill Fire Control

June 14, 2022 PRJ22037

Nicole Lavoie
Environmental Services Coordinator
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Suite 300, 4545 Lazelle Avenue
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Dear Ms. Lavoie,

RE: Meziadin Landfill 2021 Annual Monitoring Report - Final

Sperling Hansen Associates (SHA) is pleased to provide you with the Meziadin Landfill 2021 Annual Monitoring Report. This document reports on the water quality trends for surface water and groundwater as well as the monitoring program for 2021.

If you have any questions regarding this report or require any further information, please do not hesitate to contact the undersigned.

Yours truly,

SPERLING HANSEN ASSOCIATES

Carly Wolfe, P.Eng.
Bioresource Engineer

EXECUTIVE SUMMARY

Sperling Hansen Associates (SHA) was retained by the Regional District of Kitimat-Stikine (RDKS) to prepare the 2021 Annual Monitoring Report for the Meziadin Landfill ("Site").

This annual monitoring report provides a synopsis of surface water and groundwater quality at Meziadin Landfill (Site), with a focus on water quality observed in 2021. Bi-annual groundwater and surface water monitoring was conducted at the Site in 2021.

The Site operates as a natural attenuation site. Impacts of contamination to the surrounding environment are mitigated through leachate capture via a leachate collection system to the Site's treatment lagoon as well as natural dilution with precipitation.

The 2021 water quality data suggests that the impacts of contamination to groundwater and downstream surface water appear to be low. However, low levels of ammonia, below applicable standards and guidelines are detected in Site groundwater as well as upstream and downstream surface water locations SW2017-02 and SW2017-01 respectively indicating slight impacts from Site operations.

All groundwater parameters were detected in concentrations below applicable guidelines and standards. Sampling included groundwater monitoring wells MW1A, MW1B, MW2, MW3, and MW4. Trend analysis indicates that groundwater quality is similar in 2021 to the historic data set.

Surface water sampling locations included SW2017-01 (downstream creek), SW2017-02 (upstream surface water), and SW3 (leachate effluent lagoon outlet). Surface water parameter concentrations, although elevated above applicable guidelines at the treatment lagoon outlet at SW3, were below applicable guidelines at the downstream creek sampling location at SW2017-01. Concentrations at SW3 were generally elevated compared to upstream and downstream surface water locations. This is expected given that the sample from this station represents effluent from the leachate lagoon from both the landfilled waste and from the septage disposal facility. Based on results from SW2017-01, Site impacts to downstream surface water appear to be mitigated via natural attenuation.

Trends should continue to be monitored.

The following items are recommended for the Site:

- Effort must be made to maintain consistent diversion of upstream clean surface water from landfill leachate. Note that low levels of ammonia were detected in upgradient surface water station SW2017-02.

- Continuous effort must be made to control turbidity and sediment in surface water flow through the Site via adequate ditch works and the use of mechanisms such as straw bales, check dams etc.
- Wetland construction has been recommended for the Site in the Meziadin Landfill Design, Operations, and Closure Plan (DOCP) (Sperling Hansen Associates, 2022). Wetlands can remove nutrients, provide a polishing effect, and further removing pollutants attached to suspended solids in the leachate. Wetlands also facilitate a large amount of nitrogen uptake from the water, converting the ammonia present in water to nitrogen gas which is transferred to the atmosphere through biological processes taking place in the water. SHA recommends that the wetlands be constructed with guidance and locations per the DOCP.
- Slow but constant flow leaking from the east side of the base of the facultative lagoon was observed in 2017 by SKR Consulting. SHA recommends that the base of the lagoon continue to be assessed by operations annually with repairs conducted promptly.

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APPENDIX

1. INTRODUCTION

Sperling Hansen Associates (SHA) was retained by the Regional District of Kitimat-Stikine (RDKS) to prepare the 2021 Annual Monitoring Report for the Meziadin Landfill (Site). This report details the existing site conditions, reports on the 2021 groundwater & surface water quality monitoring results and provides analysis for the 2021 results in comparison to historical sampling data from 1997 to the present. The Meziadin Landfill (the "Site") was planned by Associated Engineering (AE) in 1998 (Associated Engineering, 1998). The Site is operated by the RDKS under the Operational Certificate MR-15681 (OC). An amendment of the OC to include an Environmental Effects Monitoring Program was included in 2013. The OC is provided in Appendix A.

The landfill receives municipal solid waste. No waste that is defined as hazardous waste in the Hazardous Waste Regulation is accepted at the landfill with the exception of properly handled asbestos. Soil that contains contaminants less than "Hazardous Waste" as defined in the Hazardous Waste Regulation is also permitted.

2. SITE DETAILS

2.1 Location

The Site is located in Block A of District Lots 2458 and 2459, Cassiar Land District, and is approximately 1.1 km northwest of the Highway 37 Nass River Bridge on the "Tintina Main" logging road. The area of the landfill is just under 1 ha and sits on a relatively flat 12 ha area. The Site currently serves a population of approximately 50 dwellings in the Meziadin Junction area and receives solid and liquid waste from the District of Stewart and several remote work camps and mining operations.

The Site location is shown on Figure 2-1 below.

Figure 2-1: Landfill Site Location

2.2 Current Facilities

The landfill is unlined and therefore operates as a natural attenuation site. Potential impacts are further reduced through dilution by precipitation. A leachate collection system drains to a facultative leachate treatment lagoon for mitigation of leachate impacts on the surrounding environment. The facultative leachate treatment lagoon is constructed with a natural liner system. Water from the lagoon discharges through a solid pipe that ultimately discharges through a gravel biofilter to surface water at the north south trending onsite creek on the eastern portion of the Site.

The Site layout is shown on Figure 2-2. A septage area exists on site as per the OC. It is permitted to receive septic tank pumpage, sewage holding tank waste, sewage treatment plant sludge, and wash water and grit from drain sumps at automobile wash facilities and parking lots. The majority of septage received is from work camps in the region.

There is a disposal area on-site for metals, wood, tires, and white goods, as shown below in Photo 2-1.

Project:

Meziadin Landfill
2021 Annual Reporting

Regional District of
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Legend:
- Surface Water Site
- Groundwater Monitoring Well
- Watercourse
- Tenure Lease

Date of Imagery: 2017

DRONEX
Unmanned Aerial Solutions

Title: **Surface and Groundwater Monitoring Locations**

Scale:	Projection:
5,000	NAD 1983 UTM Zone 9N
File: 5360-03-05-06	Date: May 11, 2022
Drawn: N. Lavoie Reviewed: E. Blaney	Figure No **Figure 2-2**

Photo 2-1. Metals, Tires, and Wood Recycling Area (May 5, 2022)

2.2.1 Leachate Treatment System

There is a facultative leachate treatment lagoon at the Meziadin landfill, as shown in Photo 2-2. Effluent from the landfill and the septage area is piped into this lagoon; the lagoon effluent is then discharged through solid pipe into a natural gravel bed biofilter. Effluent is sampled at a manhole adjacent to the lagoon prior to pipe discharge, location SW3. The discharge from SW3 flows into the biofilter which is situated within the Site boundary and upstream of the offsite small creek monitoring location (SW2017-01).

Photo 2-2. Leachate Treatment Lagoon (2017)

3. PHYSICAL SETTING

3.1 Site Topography

Topography is shown in Appendix B. Regionally, the landfill is surrounded from the west, north, and east by ridges approximately 1800 m to 2200 m high (Government of British Columbia, 2022b). Locally, the Site sits on a high point of land that slopes radially outside the Site boundary and is approximately 800 m from the Nass River and 900 m from the Meziadin River. The landfill sits at the watershed boundary between the Meziadin River and Nass River.

3.2 Geological and Hydrogeological Setting

Geology in the area is described as Middle to Upper Jurassic sedimentary rock consisting of sandstone, siltstone, and rare conglomerate (BC Geological Survey, 2022). Surficial geology consists of glacial sediments primarily of sands and gravels that overlay a dense sand/silt/gravel till. The soils are considered to be reasonably tight such that an unlined, natural attenuation site was possible.

The Site contains four monitoring wells along the inner perimeter of the site boundary. Well completion details for onsite wells are shown in the Table below. Borehole logs are included in Appendix C.

Table 1: Well Completion Details

Well ID	Elevation (masl)	Geodetic Water Level (masl) (October 2021)	Screened Lithology	Drilled Depth (mbgs)	Geodetic Screened Interval (masl)
MW1A	317	309.8	Till / Bedrock	8.8	308.2 – 309.7
MW1B	317	315.9	Gravel / Till	5.9	311.1 – 312.6
MW2	324	322.8	Till / Bedrock	6.3	317.7 – 319.2
MW3	338	331.5	Till	9.0	329.0 – 330.5
MW4	333	327.6	Till	9.1	323.9 – 325.4

Note that the water table is shallowest at the southern end of the site and deeper at the northern end of the site. Thus, the landfill was constructed at the north end of the site, where water levels were consistently found to be at least 6 m below the surface.

A perched water table is located at MW1B in the south corner of the landfill site which may extend to the east corner of the landfill site. Groundwater flow is to the south Meziadin and Nass Rivers.

3.3 Groundwater

Given the local geology and natural topography within the vicinity of the Site, regional groundwater is considered to flow to the south. Locally, groundwater flow can be affected by building foundations, recharge areas, drainage, and subsurface utilities. Depending on their depth, underground structures may significantly influence shallow groundwater flow in the vicinity of the Site.

3.4 Surface Water

Stream tributaries exist within 500 m of the Site. Tributaries exist to an unnamed lake to the north, Meziadin River to the southwest, and Nass River to the east & south. However, surface water flows from the Site trending from the northwest to the southeast direction down a gentle incline towards a Nass River tributary south of the Site. A very small creek runs along this path with confluence to the Nass River tributary south of the Site.

4. REGULATORY FRAMEWORK

The regulatory framework for the Site is stipulated in the Site's OC and falls under the jurisdiction of the British Columbia Ministry of Environment & Climate Change Strategy (BC ENV), pursuant to the Environmental Management (EMA) SBC 2003 Chapter 53 current to May 11, 2022.

Concentration limits for the Site follow BC ENV Technical Guidance 15 on Contaminated Sites (BC ENV, 2017b). The analytical results are interpreted using the most suitable water quality criteria. At present, these are:

- The British Columbia Approved Water Quality Guidelines (BCWQG): water quality guideline series no. WQG-20 for Aquatic Life" (BCWQG-AW) for surface water;
- The BC Contaminated Sites Regulation (BC CSR) for Protection of Aquatic Life (BC CSR-AW) for groundwater.

Based on Technical Guidance 15 on Contaminated Sites, the quality of groundwater from the monitoring wells is not required to adhere to the BCWQG as all the wells are more than 10 m from aquatic receiving environments.

Further discussion is provided in the sections below.

4.1 Aquatic Life

BC ENV Protocol 21 (BC ENV, 2017a) provides criteria for determining groundwater uses at a site. Generally, aquatic life water use applies to all groundwater located within 500 metres of an aquatic receiving environment unless it can be demonstrated that the groundwater does not flow to that receiving environment (e.g. groundwater in confined aquifers below shallow ponds or creeks). The BC CSR groundwater standards for the

protection of aquatic life in freshwater (BC CSR-AW) water bodies are considered applicable to groundwater at the Site based on the proximity to several nearby creeks.

As the receiving environment is considered a freshwater aquatic life habit, the BCWQG-AW are considered to apply for surface water.

4.2 Drinking Water

BC ENV Protocol 21 provides criteria for determining groundwater uses at a Site. Drinking water use applies where the groundwater or surface water at or near a site is currently used for drinking water. A search of water wells on the BC Water Resource Atlas revealed that there are no water wells within 500 m of the Site (Government of British Columbia, 2022a). The nearest wells are located approximately 4.5 km to the west and listed for private domestic use. Search details are shown in Appendix D. Based on the available hydrogeological information and the distance to nearby groundwater wells, current drinking water use is not considered to apply for the Site.

The entire area is situated over an unmapped aquifer. None of the underlying saturated geological materials beneath the Landfill are considered an "aquifer" as defined in Protocol 21 (Golder Associates Ltd., 2019). Thus, future drinking water use is not considered applicable to the Site.

5. WATER QUALITY MONITORING

On November 28, 2013, the Environmental Effects Monitoring Program in the Operational Certificate was amended to include bi-annual sampling for surface water and groundwater monitoring. Water quality sampling was conducted by qualified RDKS personnel following the BC Field Sampling Manual Part E (Government of British Columbia, 2013). Table 2 summarizes sampling conducted in 2021. Sampling locations are shown in Figure 3.

Table 2: Sampling Stations

Monitoring Medium	Sampling Station	Required Frequency	Sampled in 2021
Groundwater	MW1A, MW1B, MW2, MW3, MW4	Bi-annual	Yes
Surface Water	SW3 (Effluent treatment lagoon outlet) SW2017-01 (Downstream Creek) SW2017-02 (Upstream Creek)	Bi-annual	Yes*
Surface Water	SW1 (Replaced by SW2017-01) SW2 (Replaced with SW2017-02) SW2107-03 (Utilized during 2017 construction) SW2017-04 (Utilized during 2017 construction) SW2017-05 (Utilized during 2017 construction)	Bi-annual	Not in Use

*SW2017-01 and SW2017-02 not sampled in July sampling event due to low water levels

6. RESULTS

6.1 Groundwater Results

Analytical tables for groundwater are shown in Appendix E. Field data is shown in Appendix I. Laboratory certificates are shown in Appendix J. Per the Site OC, sampling consisted of the following parameters:

Table 3: Groundwater Parameters

Sampling Medium	Sampling Station / Sampling Frequency	Required Parameters
Groundwater	MW1A, MW1B, MW2, MW3, MW4 / Bi-annual	Field Parameters - Well elevation, well depth, groundwater elevation, well water depth, pH, conductivity, temperature Laboratory Parameters - pH, conductivity, temperature, hardness, total dissolved solids, alkalinity, COD, ammonia, total Kjeldahl nitrogen (TKN), nitrate & nitrite, chloride, sulphate, fluoride, and dissolved metals

All required parameters were sampled and analyzed in 2021. Sampling was conducted in July and October.

Parameter concentrations in all wells were below applicable standards.

Trend analysis is provided in Section 7.

The maximum concentrations of typical leachate parameters in groundwater samples collected from the Site in 2021 were as follows:

- **Ammonia** – 0.26 mg/L at MW1B versus the BC CSR standard of 18.5 mg/L (at 7^0C and a pH of 7.3);
- **Chloride** - <2.50 mg/L in all wells versus the BC CSR standard of 1,500 mg/L;
- **Sulphate** – 196 mg/L at MW3 versus the BC CSR standard of 4,290 mg/L (at hardness of 238 mg/L).

6.2 Surface Water Results

Analytical tables for surface water are shown in Appendix F. Field data is shown in Appendix I. Laboratory certificates are shown in Appendix J. Per the Site OC, sampling consisted of the following parameters:

Table 4: Surface Water Parameters

Sampling Medium	Sampling Station / Sampling Frequency	Required Parameters
Surface Water	SW3 (Effluent treatment lagoon outlet) SW2017-01 (Downstream Creek) SW2017-02 (Upstream Creek) / Bi-annual	Field Parameters - pH, conductivity, temperature, and dissolved oxygen Laboratory Parameters - pH, conductivity, temperature, hardness, TSS, alkalinity, BOD, COD, ammonia, total Kjeldahl nitrogen (TKN), nitrate & nitrite, chloride, sulphate, fluoride, and total metals

Sampling was conducted in July and October. July samples at SW2017-01 and SW2017-02 were not collected due to insufficient creek water levels.

All required parameters were sampled and analyzed in 2021. Note that in 2019, BC ENV updated the copper guideline calculation in the BC WQG. The new calculation requires dissolved organic carbon (DOC) analysis. Because DOC was not required as part of the landfill permit, the copper guideline was calculated using the previous method provided by BC ENV prior to the change. The previous copper guideline was calculated using the following equations:

- Acute guideline: (0.094*hardness+2) (µg/L)
- Chronic guideline: When hardness≤50 mg/L; 2. When hardness > 50 mg/L; use the equation: WQG= 0.04 x (mean hardness in mg/L) (µg/L)

All parameter concentrations at the offsite downstream sampling location SW2017-01 were below applicable guidelines.

All Parameter concentrations at the onsite upstream sampling location SW2017-02 were below applicable guidelines with the exception of pH. The Laboratory pH at SW2017-02 was 6.28 versus the BCWQG-AW guideline of 6.5 – 9.0. Note that historically, laboratory pH results at this location have ranged from 6.0 pH units to 6.54 pH units. Historically, field pH results have ranged from 5.42 pH units to 7.13 pH units showing a similar trend of slightly acidic to neutral water quality.

Concentrations of parameters at SW3, the onsite manhole discharge of lagoon treated leachate are compared to BCWQG-AW guidelines for the purpose of determining general leachate quality. Concentrations above applicable guidelines were detected at SW3.

A summary of the water quality at SW3 is presented in Table 5.

Table 5: Maximum Concentrations in Surface Water

Parameter	Maximum Parameter Concentration and Sampling Station	BCAWQ Guideline
TSS	86.9 mg/L at SW3	Change from background of 25 mg/L at any one time for a duration of 24 h in all waters during clear flows or in clear waters
Ammonia	25.7 mg/L at SW3	1.65 mg/L (at pH of 7.2 and temperature of 16°C)
Total Chromium	0.00559 mg/L at SW3	0.001 for Cr VI
Total Iron	5.13 mg/L at SW3	1 mg/L
Total Manganese	8.56 mg/L at SW3	Calculated hardness dependent guideline (Acute ≤ 0.01102 hardness + 0.54, Chronic ≤ 0.0044 hardness + 0.605) 3.1 mg/L Acute, 1.63 Chronic at Hardness of 232 mg/L

Maximum concentrations of other typical leachate parameters at SW3 for 2021 are listed below. Note that these concentrations were detected below applicable parameters:

- **Chloride** – 92.8 mg/L at SW3 versus the BCWQG chronic guideline of 150 mg/L (chronic);
- **Sulphate** – 57.9 mg/L at SW3 versus the BCWQG guideline of 429 mg/L (at hardness of 356 mg/L).

Trend analysis in surface water are provided in Section 7.

7. DISCUSSION

Bi-annual groundwater and surface water monitoring was conducted at the Site in 2021. Duplicates and filed blanks were submitted per the OC.

All groundwater parameters were detected in concentrations below applicable standards in all monitoring wells sampled in 2021.

All surface water parameters were detected in concentrations below applicable guidelines at the downstream offsite surface water station SW2017-01.

The following sections present trend analysis for Site groundwater and surface water quality utilizing indicator parameters in leachate specific to the Site.
Common landfill leachate parameters include, but are not limited to:

- Ammonia, Chloride, pH, Conductivity, Sulphate, Metals.

7.1 Groundwater Quality Discussion

A summary of groundwater characteristics compiled historically from April 1997 to October 2021 is shown in the table below. General trends in these parameters are shown on Figures G-1 through G-5 in Appendix G.

Table 6: Historical Groundwater Range in Concentrations

Parameter	Parameter Concentration Range for Monitoring Wells MW1A, MW1B, MW2, MW3, and MW4	Location of Maximum Concentration / Date of Maximum Concentration
Ammonia	<0.0050 mg/L to 6.92 mg/L (Chart G-1)	MW1A / September 2015
Chloride	<0.050 mg/L to 11.20 mg/L (Chart G-2)	MW1A / April 1997
Conductivity	251 µs/cm to 1020 µs/cm (Chart G-3)	MW1A / January 2006
pH	6.4 to 8.4 (Chart G-4)	MW1A / October 2018
Sulphate	3 mg/L to 288 mg/L (Chart G-5)	MW1A / January 2004

Historically, concentrations of indicator parameters at MW1A have been detected as elevated in comparison to the other monitoring wells. This is observed for ammonia, chloride, pH, conductivity, and sulphate parameters as shown on Figures G-1 through G-5. As described in Section 3, the inferred groundwater flow at the Site is from north to south (i.e. from MW3/MW4, encompassing MW2, and through MW1A).

An average pH of approximately 8.02 is observed in Site groundwater wells MW1A, MW2, MW3, MW4. Generally, the pH at MW1B is slightly lower with an average of 7.20.

Piper plot analysis was conducted to determine groundwater hydrogeochemical facies (Younger, 2007). Piper plots are shown on Figures G-6 through G-10.

Hydrogeochemical facies are summarized in the table below. Concentrations at MW1B, considered a perched aquifer over the underlying aquifer, generally differed from Site groundwater. Dominant cations in the underlying aquifer include Ca/Na. Dominant anions in the shallow aquifer include HCO_3. Piper plots indicate some variability between the perched and underlying aquifers likely due to the influence of freshwater recharge.

Table 7: Groundwater Hydrogeochemical Facies

Location	Predominant Facies	Typical Occurrence of Facie (Younger, 2007)
MW1A	Ca/Na - HCO_3	Shallower portions of regional confined aquifers; waters deduced to have been affected by ion exchange
MW1B (perched)	Ca – HCO_3	Shallow, fresh groundwaters in recharge areas in a wide range of aquifer types
MW2	Ca/Na - HCO_3	Shallower portions of regional confined aquifers; waters deduced to have been affected by ion exchange; freshwater influence
MW3	Ca/Na – HCO_3 (SO_4)	Shallow, fresh groundwaters in recharge areas in a wide range of aquifer types; influence of gypsum-bearing sedimentary aquifers, and groundwaters affected

Location	Predominant Facies	Typical Occurrence of Facie (Younger, 2007)
		by oxidation of pyrite and other sulfide minerals
MW4	Ca/Na – HCO_3 (SO_4)	Shallow, fresh groundwaters in recharge areas in a wide range of aquifer types; influence of gypsum-bearing sedimentary aquifers, and groundwaters affected by oxidation of pyrite and other sulfide minerals

Trend analysis as shown on Figures G-6 to G-10 indicates that groundwater quality is similar in 2021 to the historic data set. Low levels of ammonia were detected in Site groundwater in 2021, and detected historically, indicating slight Site impacts to groundwater quality.

7.2 Surface Water Quality Discussion

Samples were collected at SW2017-01, SW2017-02, and SW3.

A summary of exceedances in surface water are presented in the table below. Note that concentrations of parameters at SW3, the onsite manhole discharge of lagoon treated leachate are compared to BCWQG-AW guidelines for the purpose of determining general leachate quality.

Table 8: Surface Water Parameters Above Applicable Guidelines

Location	Description	Exceedance
SW2017-02	Upstream Surface Water Location	pH**
SW3	Effluent Treatment Lagoon Outlet	TSS, Ammonia, Total Chromium*, Total Iron, Total Manganese
SW2017-01	Downstream Surface Water Location	No Exceedances

"*" Chromium speciation is not required by the Site for analysis. Therefore, SHA adopted the more stringent chromium VI guideline for comparison in analytical tables. Detected chromium concentrations at SW3 are below Cr III guidelines. "**" Historic pH at this location is generally below the BCWQ minimum guideline of 6.5 to 9.0. Generally, pH at SW2017-02 is $6 \leq pH \leq 6.5$.

All parameter concentrations at the offsite downstream sampling location SW2017-01 were below applicable guidelines indicating low impacts of contamination from the Site to the downstream creek.

Concentrations at SW3 were generally elevated compared to upstream and downstream surface water locations. Elevated parameters included TSS, ammonia, total chromium, total iron, and total manganese. This is expected given that the sample from this station represents effluent from the leachate lagoon from both the landfilled waste and from the septage disposal facility. However, based on results from the downstream SW2017-01,

elevated concentrations at SW3 are considered to pose a low impact of contamination to the surrounding environment.

Slightly acidic pH was detected at the onsite upstream sampling location SW2017-02. The pH at the upstream location was detected at 6.28 and below the applicable BCWQ guideline of 6.5-9.0. Historical field and laboratory data suggests that pH at this station ranges from slightly acidic to neutral water quality. Slightly acidic pH's can be caused by surface water flow through natural forest which is observed directly upgradient of the Site. Care must be taken to ensure that upstream surface water flow is separated and diverted from the landfill leachate flow paths.

General surface water trends in ammonia, chloride, conductivity, pH, iron, and manganese parameters are shown on Figures H-1 through H-6 in Appendix H. Low levels of ammonia and chloride were detected at SW2017-01 and SW2017-02 (Figures H-1 and H-2). Trends in conductivity and pH show low impacts to surface water. Trends in total iron and total manganese show fluctuating concentrations likely due to turbidity in samples. Continuous effort must be made to control turbidity and sediment in surface water.

8. CONCLUSIONS AND RECOMMENDATIONS

The Site operates as a natural attenuation site. Impacts of contamination to the surrounding environment are mitigated through leachate capture via a leachate collection system to the Site's treatment lagoon as well as natural dilution with rainwater. The 2021 water quality data suggest that the impacts of contamination to groundwater and downstream surface water appear to be low.

In 2021, all groundwater parameters were detected in concentrations below applicable guidelines and standards. Surface water parameter concentrations, although elevated above applicable guidelines at the treatment lagoon outlet at SW3, were below applicable guidelines at the downstream creek sampling location at SW2017-01. Thus, site impacts appear to be mitigated via natural attenuation.

Generally, low levels of ammonia, below applicable standards and guidelines are detected in Site groundwater as well as upstream and downstream surface water locations SW2017-02 and SW2017-01 respectively indicating slight impacts from Site operations.

Trends should continue to be monitored.

The following items are recommended for the Site:

- Effort must be made to maintain consistent diversion of upstream clean surface water from landfill leachate. Note that low levels of ammonia were detected in upgradient surface water station SW2017-02;

- Continuous effort must be made to control turbidity and sediment in surface water flow through the Site via adequate ditch works and the use of mechanisms such as straw bales, check dams etc.
- Wetland construction has been recommended for the Site in the Meziadin Landfill Design, Operations, and Closure Plan (DOCP) (Sperling Hansen Associates, 2022). Wetlands can remove nutrients, provide a polishing effect, and further removing pollutants attached to suspended solids in the leachate. Wetlands also facilitate a large amount of nitrogen uptake from the water, converting the ammonia present in water to nitrogen gas which is transferred to the atmosphere through biological processes taking place in the water. SHA recommends that the wetlands be constructed with guidance and locations per the DOCP.
- Slow but constant flow leaking from the east side of the base of the facultative lagoon was observed in 2017 by SRK Consulting. SHA recommends that the base of the lagoon continue to be assessed by operations annually with repairs conducted promptly.

9. STATEMENT OF LIMITATIONS

This report has been prepared by Sperling Hansen Associates (SHA) on behalf of the Regional District of Kitimat-Stikine in accordance with generally accepted engineering practices to a level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions in British Columbia, subject to the time limits and financial and physical constraints applicable to the services.

The report, which specifically includes all tables and figures, is based on engineering analysis by SHA staff of data compiled during the course of the project. Except where specifically stated to the contrary, the information on which this study is based has been obtained from external sources. This external information has not been independently verified or otherwise examined by Sperling Hansen Associates to determine its accuracy and completeness. Sperling Hansen Associates has relied in good faith on this information and does not accept responsibility of any deficiency, misstatements or inaccuracies contained in the reports as a result of omissions, misinterpretation and/or fraudulent acts of the persons interviewed or contacted, or errors or omissions in the reviewed documentation.

The report is intended solely for the use of the Regional District of Kitimat-Stikine. Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Sperling Hansen Associates does not accept any responsibility for other uses of the material contained herein nor for damages, if any, suffered by any third party because of decisions made or actions based on this report. Copying of this intellectual property for other purposes is not permitted.

The findings and conclusions of this report are valid only as of the date of this report. The interpretations presented in this report and the conclusions and recommendations that are drawn are based on information that was made available to Sperling Hansen Associates during the course of this project. Should additional new data become available in the future, Sperling Hansen Associates should be requested to re-evaluate the findings of this report and modify the conclusions and recommendations drawn, as required. Please contact the undersigned if you have any questions or concerns.

Yours truly,

SPERLING HANSEN ASSOCIATES

JUNE 14 2022

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
C. G. I. WOLFE
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APPENDICES

APPENDIX A
Operational Certificate

BRITISH COLUMBIA
The Best Place on Earth

DEC - 4 2013

November 28, 2013 File: MR-15681

Roger Tooms
Manager of Works and Services
Regional District of Kitimat-Stikine
300-4545 Lazelle Avenue
Terrace, BC
V8G 4E1

Dear Roger Tooms:

Re: Meziadin Landfill Operational Certificate Amendment – Environmental Effects Monitoring Program

Pursuant to Section 16 of the *Environmental Management Act*, Section 13 (Monitoring Requirements) of MR-15681 is hereby amended as follows:

13. Environmental Effects Monitoring Program

The Permittee shall undertake Environmental Effects Monitoring (EEM) to determine the effects of the landfill on the receiving environment. The Permittee shall submit the results of the monitoring program to the Director as soon as practicable, and no later than June 30 of the following year.

13.1 Surface Water Monitoring

Locations	Parameters	Frequency
Upstream Surface Water – Log Weir (E252829) Downstream Surface Water – Log Weir (E251541) Treatment Lagoon Outlet – Effluent (E245722)	Field Parameters - pH, conductivity, temperature and dissolved oxygen Lab Parameters - pH, conductivity, temperature, hardness, TSS, alkalinity, BOD, COD, ammonia, total Kjeldahl nitrogen (TKN), nitrate + nitrite, chloride, sulphate, fluoride and total + dissolved metals.	Two times per year (spring & fall)

Ministry of Environment Skeena Region
Mailing Address: Bag 5000, 3726 Alfred Ave., Smithers BC V0J 2N0
Location Address: 3726 Alfred Avenue, Smithers BC
Telephone: 250 847-7260
Facsimile: 250 847-7591

Should any contaminants be detected in the surface water samples, additional sampling locations may be added to the program.

13.2 Groundwater Monitoring

A groundwater monitoring program shall be implemented and maintained with the following objectives:

- to help confirm groundwater flow direction and adequate numbers/placement of wells;
- to support future groundwater modeling if determined to be necessary;
- to detect, should they exist, any significant impacts on the environment of leachate in the groundwater.

The Director may specify, from time to time, that the groundwater monitoring program be revised and updated for his/her written approval. The program shall consider the use of existing and if necessary, new groundwater wells.

Locations	Parameters	Frequency
BH97-1A Deep (E251536) or BH97-1B Shallow (E251537) BH97-2 (E251538) BH97-3 (E251539) BH97-4 (E251540)	Field Parameters - Well elevation (m), well depth (m), groundwater elevation (m), well water depth (m), pH, conductivity, temperature Lab Parameters - pH, conductivity, temperature, hardness, total dissolved solids, alkalinity, COD, ammonia, total Kjeldahl nitrogen (TKN), nitrate + nitrite, chloride, sulphate, fluoride, and dissolved metals.	Two times per year (spring & fall)

13.3 Ground and Surface Water Monitoring Procedures

13.3.1 Sampling

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.

A copy of the above manual may be purchased from the Queen's Printer Publications Centre, P.O. Box 9452, Stn. Prov. Gov't. Victoria, British Columbia, V8W 9V7 (1-

800-663-6105 or (250) 387-6409). A copy of the manual is also available for inspection at all Environmental Protection offices.

13.3.2 Analyses

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.

A copy of the above manual may be purchased from the Queen's Printer Publications Centre, P.O. Box 9452, Stn. Prov. Gov't. Victoria, British Columbia, V8W 9V7 (1-800-663-6105 or (250) 387-6409). A copy of the manual is also available for inspection at all Environmental Protection offices.

13.3.3 Quality Assurance/Quality Control (QA/QC)

The operational certificate holder is required to conduct the following Quality Assurance and Control Program to determine the acceptability of data required by this permit and 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 analysed parameter from the analytical laboratory.

b) Collect one duplicate sample during each sampling session from one of the sample locations.

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.

If you have any questions or concerns please contact Eric Pierce at (250) 847-7252 or at eric.pierce@gov.bc.ca

Sincerely,

Eric Pierce
for Director, Environmental Management Act

PROVINCE OF
BRITISH COLUMBIA

Environmental Protection
Box 5000
Smithers
British Columbia V0J 2N0
Telephone: (250) 847-7260
Fax: (250) 847-7591

**MINISTRY OF WATER, LAND
AND AIR PROTECTION**

OPERATIONAL CERTIFICATE
MR-15681

for the

MEZIADAN LANDFILL

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

Regional District of Kitimat-Stikine

Suite 300 – 4545 Lazelle Avenue

Terrace, British Columbia

V8J 4E1

is authorized to store, handle, treat and discharge municipal waste at a sanitary landfill facility located near Meziadan, British Columbia, subject to the terms and conditions listed below. Contravention of any of these conditions is a violation of the *Waste Management Act* and may result in prosecution.

This operational certificate does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works.

Date Issued: AUG 08 2002
Date Amended:
(most recent)

J. Hofweber, P. Eng.
Assistant Regional Waste Manager

1. LOCATION OF LANDFILL PROPERTY

The location of the property where discharges are authorized to occur is Block A of District Lots 2458 and 2459, Cassiar 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 E245720.

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 A.

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 E245760.

2.2.1. Quantity of Discharge

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

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.

Date Issued: AUG 08 2002
Date Amended:
(most recent)

J. Hofweber, P. Eng.
Assistant Regional Waste Manager

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 A.

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 E245721.

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 exfiltration lagoons and related appurtenances located approximately as shown on the attached Site Plan A.

2.4. Leachate

This section applies to the discharge of leachate to a biological filter. The site reference number for this discharge is E245722.

2.4.1. Quantity of Discharge

The maximum authorized rate of discharge is indeterminate. The discharge may occur 24 hours/day, 7 days/week.

2.4.2. Characteristics of the Discharge

The characteristics of the leachate discharge shall be typical of leachate treated by a facultative lagoon with a minimum retention time of 30 days.

2.4.3. Authorized Works

The authorized works are leachate collection and treatment facilities and related appurtenances located approximately as shown on the attached Site Plan A.

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 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 Regional Waste Manager 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 footprint delineating the maximum extent of solid waste disposal allowable at the facility horizontally (in plan view). The engineered 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 (see section 3.5).

3.4. Engineered Excavation and Final Grade Contours

The landfill design shall include preparation of engineered excavation grade 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 (see section 3.5).

3.5. Scaled Drawings

A scaled site plan accurately showing the legal survey, the engineered footprint, and final design contours shall be submitted to the Regional Waste Manager on or before March 31, 2003 in hardcopy and in electronic format (in a standard CAD drawing file format). Additional scaled drawings showing excavation contours and typical cross sectional views of the site shall also be submitted to the Regional Waste Manager on or before March 31, 2003 in hardcopy and in electronic format (in a standard CAD drawing file format).

4. LANDFILL GAS MANAGEMENT

4.1. Lower Explosive Limit

The landfill shall be designed and 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.).

4.2. Gas Venting or Recovery and Management Systems

If the emission of non-methane organic compounds (NMOC's) exceeds 150 tonnes/year, the installation and operation of a landfill gas recovery system is required.

5. LEACHATE MANAGEMENT REQUIREMENTS

5.1. Leachate Containment and Collection

The operational certificate holder shall ensure that leachate is contained and collected, as much as practicable, through the use of a natural soil barrier system.

5.2. Facultative Lagoon

Contained and collected leachate shall be treated in a facultative lagoon subject to the following conditions:

5.2.1. Size

The facultative lagoon shall be sized to provide for winter storage of leachate and to maintain a minimum of 30 days retention time during the remaining seasons.

5.2.2. Location

The facultative lagoon shall be located approximately as shown on the attached site plan.

5.2.3. Seepage Control

Design and construction of the facultative lagoon shall be such that seepage through the berms shall not occur.

5.2.4. Signage and Fencing

The facultative leachate treatment lagoon area shall be clearly identified at the landfill site and shall be fenced with a chainlink or steel woven-wire (e.g., page wire) fence a minimum of 1.2 metres high to keep out children and animals. Signs identifying the nature of the leachate treatment lagoon shall be erected on all sides of the fence such that the lagoon is easily identifiable from any approach. The lettering on the sign shall be such that it is clearly readable by the public when they approach the liquid waste disposal area.

5.2.5. Freeboard

A minimum freeboard of 50 centimetres shall be maintained at all times. The lagoon berms shall be maintained in good working order and the Regional Waste Manager shall be notified immediately of any failure, seepage or overflow.

5.2.6. Sludge Removal and Disposal

Sludge levels shall be monitored and sludge removal conducted as necessary to ensure for the proper functioning of the facultative treatment of leachate. Sludge removed from the leachate treatment lagoon shall not be used for composting. Notwithstanding section 6.2 of this operational certificate, the disposal of sludge from the facultative leachate treatment pond may occur under section 2.1. Leachate sludge deposited at an active face of a designated solid waste disposal area under sections 7 or 8 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.

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, hours of operation, tipping fees (if applicable) and prohibition of special wastes. The lettering on the sign shall be such that it is clearly readable by the public when they approach the entrance of the landfill site.

6.2. Prohibited Wastes

No wastes as defined by the *Special Waste Regulation* shall be received, stored or disposed of at this site except as authorized by the Regional Waste Manager. Lead-acid batteries shall not be landfilled but may be salvaged/recycled provided they are stored, handled and shipped in compliance with the *Special Waste Regulation* and with section 10 of this operational certificate. Tires equal to or less than 43.2 centimetres (17") in rim size and autohulks 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 section 40 of the *Special Waste Regulation* is hereby authorized.

6.4. Contaminated Soil

Soil that contains contaminants in concentrations less than "special waste" as defined by the *Special 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. A Contaminated Soil Relocation Agreement (CSRA) as defined by the *Waste Management Act* is required if the soil contamination exceeds industrial and/or commercial levels and the soil volume being relocated from a specific site exceeds 5 (five) m^3.

6.5. Waste Measurement

The quantity of waste material landfilled at the site shall be measured or estimated by means suitable to the Regional Waste Manager. The results shall be submitted once per year on or before January 31 for the previous year expressed in tonnes/yr and/or m^3/y.

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 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 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 neighboring property shall be reported to the Provincial Emergency Program (phone: 1-800-663-3456) and any local fire authority.

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 Regional Waste Manager. The permission of the Regional Waste Manager 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 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 woodwaste 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 at the landfill site shall be designed, constructed, and maintained such that bears are prevented from penetrating the fence.

6.14.2. Fence Type

Fencing may be either high tensile smooth wire or fence fabric (e.g., mesh-wire, page-wire, chainlink or the like). 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 ± 2 cm, 15 ± 2 cm, 15 ± 2 cm, 20 ± 2 cm, 20 ± 2 cm, 20 ± 2 cm, and 25 ± 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 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 stands 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 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. 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 undertake

Signs of digging or other attempts by bears to penetrate electric fencing shall be recorded in a log book. Any penetrations through electric fencing by bears shall be immediately reported to the Conservation Officer Service.

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. 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.

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. Signs which identify the nature of the waste acceptable at the designated putrescible disposal area shall be erected and maintained. The lettering on the sign shall be such that it is clearly readable by the public when they approach the 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.

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 not exceed 3 metres.

7.6. Waste Cover

Cover shall be applied to refuse as specified below. The operational certificate holder shall maintain a log book to record all dates of cover application.

7.6.1. Active Face Cover

Except as otherwise stated in 7.6.2, the active face does not normally require cover. Based on information concerning environmental or public health concerns related to exposed refuse at the active face, however, the Regional Waste Manager 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 such that no more than 300 m^2 of refuse are exposed at the active face at any time and such that the volume of refuse in the cell

does not exceed 2500 m^3. 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 landfill shall progressively receive final cover during the active life of the landfill (see section 15.4).

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 section 2.1.1). Signs which identify the nature of the waste acceptable at the designated non-putrescible disposal area shall be erected and maintained. The lettering on the sign shall be such that it is clearly readable by the public when they approach the non-putrescible disposal area.

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 not exceed 3 metres.

8.5. Waste Cover

Cover shall be applied to refuse as specified below. The operational certificate holder shall maintain a log book to record all dates of cover application.

8.5.1. Active Face Cover

Except as otherwise stated in 8.5.2, the active face does not normally require cover. Based on information concerning environmental or public health concerns related to exposed refuse at the active face, however, the Regional Waste Manager 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 such that no more than 300 m^2 of refuse are exposed at the active face at any time and such that the volume of refuse in the cell does not exceed 2500 m^3. 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 landfill shall progressively receive final cover during the active life of the landfill (see section 15.4).

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. Signs which identify the nature of the waste acceptable at the designated composting area shall be erected and maintained. The lettering on the sign shall be such that it is clearly readable by the public when they approach the composting area.

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 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 *Production and Use of Compost 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. This area shall be clearly identified at the landfill site. Signs which identify the nature of the materials acceptable at the designated salvage/recycling area shall be erected and maintained. The lettering on the sign shall be such that it is clearly readable by the public when they approach the salvage/recycling area.

10.2. Nature of Wastes

Wastes to be salvaged/recycled may be any items with potential salvage or recycling value such as tires, lead-acid batteries, autohulks, white goods, furniture, used lumber, used goods and the like, 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. Compliance

Salvage/recycling shall comply with the requirements of the *Storage of Recyclable Material Regulation* and any other relevant legislation and any additional requirements contained in this operational certificate.

10.4. Contamination

Contamination of any of the designated salvage/recycling storage piles 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. This area shall be clearly identified at the landfill site. Signs which identify the nature of the waste acceptable at the designated open burning area shall be erected and maintained. The lettering on the sign shall be such that it is clearly readable by the public when they approach the burning area.

11.2. Sources of Wastes

Acceptable sources of selected combustibles include typical residential, commercial and institutional sources but does not include any industrial wood processing facilities (sawmills, pulpmills, re-manufacturing plants, etc.).

11.3. Nature of Wastes

Generally, no waste shall be burned which is unacceptable to the Regional Waste Manager. Acceptable materials include demolition and construction wood wastes, stumps, branches, trees, cardboard, and similar items, but excluding nuisance causing combustibles such as sawdust, rubber, plastics, tars, insulation, etc.

11.4. Authorization of Burning

Each burn event requires separate authorization with respect to adequate dispersion of smoke and prevention of spread of fire as follows:

11.4.1. Adequate Smoke Dispersion

The procedures for gaining authorization to proceed with a burn event with respect to smoke dispersion are outlined in the document "Smoke Dispersion Authorization Procedures for Regulated Burning at Municipal Refuse Facilities in the Skeena Region". Notwithstanding these procedures, burning must not be initiated if the local air flow will cause the smoke to negatively impact a nearby population and/or atmospheric mixing at the site is insufficient to provide rapid dispersion of the smoke.

11.4.2. Prevention of Spread of Fire

Burning shall take place only when approved by the Ministry of Forests and/or Fire Chief of the local municipality who will determine whether it is safe to burn and may specify conditions under which burning may take place.

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 and fed in a manner that ensures smoke emissions are minimized. Measures to minimize smoke shall include, but not necessarily be limited to: stacking of waste in a manner that eliminates dirt; stacking and drying any green or wet wastes until reasonably dry; waiting to burn until wastes are reasonably dry after any significant rainfall; and having satisfactory control of feeding waste into the fire through use of adequate equipment and staff. Burning material at the edge of the burn shall be periodically pushed into the centre of the burn to promote rapid combustion.

11.7. Smoke Reduction if Weather Changes

Wastes must not be added to the open burn pile and burning residue must be extinguished as soon as is practical if: (a) local winds make the dispersion of the smoke inadequate; (b) an inversion forms, trapping smoke near the surface; and/or (c) the Regional Waste Manager imposes an open burning restriction.

J. Hofweber, P. Eng.
Assistant Regional Waste Manager

11.8. Residue of Combustion

After the residue of combustion has cooled to ambient temperature it shall be incorporated into an active face of a designated solid waste disposal area (under section 7 or section 8).

11.9. Documentation

Each open burn event shall be documented on a standardized reporting form (entitled "Skeena Region Municipal Refuse Facility Regulated Open Burning Reporting Form") and submitted to the Regional Waste Manager via fax (1-250-847-7591) within 2 weeks of the completion of each open burn session.

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, holding tanks 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) may function as exfiltration lagoons, decant lagoons (with decant discharged to an authorized liquid waste handling system such as a leachate treatment system) or as part of an organic matter composting system. Construction of any new lagoons shall require the written permission of the Regional Waste Manager. Non-exfiltration 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 clearly identified at the landfill site and shall be fenced with a chainlink or steel woven-wire (e.g., page wire) fence a minimum of 1.2 metres high to keep out children and animals. Signs which identify the nature of the waste acceptable at the designated lagoons shall be erected and maintained at the entrance to the lagoon area. 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. The lettering on the sign shall be such that it is clearly readable by the public when they approach the liquid waste disposal area.

12.4. Freeboard

A minimum freeboard of 50 centimetres shall be maintained at all times. The lagoon berms shall be maintained in good working order and the Regional Waste Manager 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

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

13. MONITORING REQUIREMENTS

The operational certificate holder shall carry out an environmental monitoring program, including reporting of results, as required by the Regional Waste Manager in a separate letter. The monitoring program may include, but not necessarily be limited to, sampling and testing raw and treated leachate, groundwater and surface waters, sampling and testing fish and other organisms, sampling and testing landfill gas, etc.

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. The log book shall be made available for inspection upon request by Ministry staff.

14.2. Reporting

As required by sections 6.5, 11.9 and any requirements of separate letters for monitoring, impact assessment, etc., the operational certificate holder shall submit data, studies and the like to the Regional Waste Manager.

15. CLOSURE REQUIREMENTS

15.1. Notification of Closure

The operational certificate holder shall notify the Regional Waste Manager in writing of intentions to close the landfill site.

15.2. Closure Plan

A Closure Plan shall be submitted to the Regional Waste Manager upon request. 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 by section 4.2);
- 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. 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, 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 Regional Waste Manager. 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 runon/runoff drainage controls, erosion controls, and gas venting controls. The site shall be seeded with a grass/legume mixture suited to the local climate.

15.4. 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 15.3.

16. ENVIRONMENTAL IMPACT

Inspections of the discharge will be carried out by Pollution Prevention personnel as a part of the routine operational certificate inspection procedure. Based on these inspections and any other information available to the Regional Waste Manager 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.

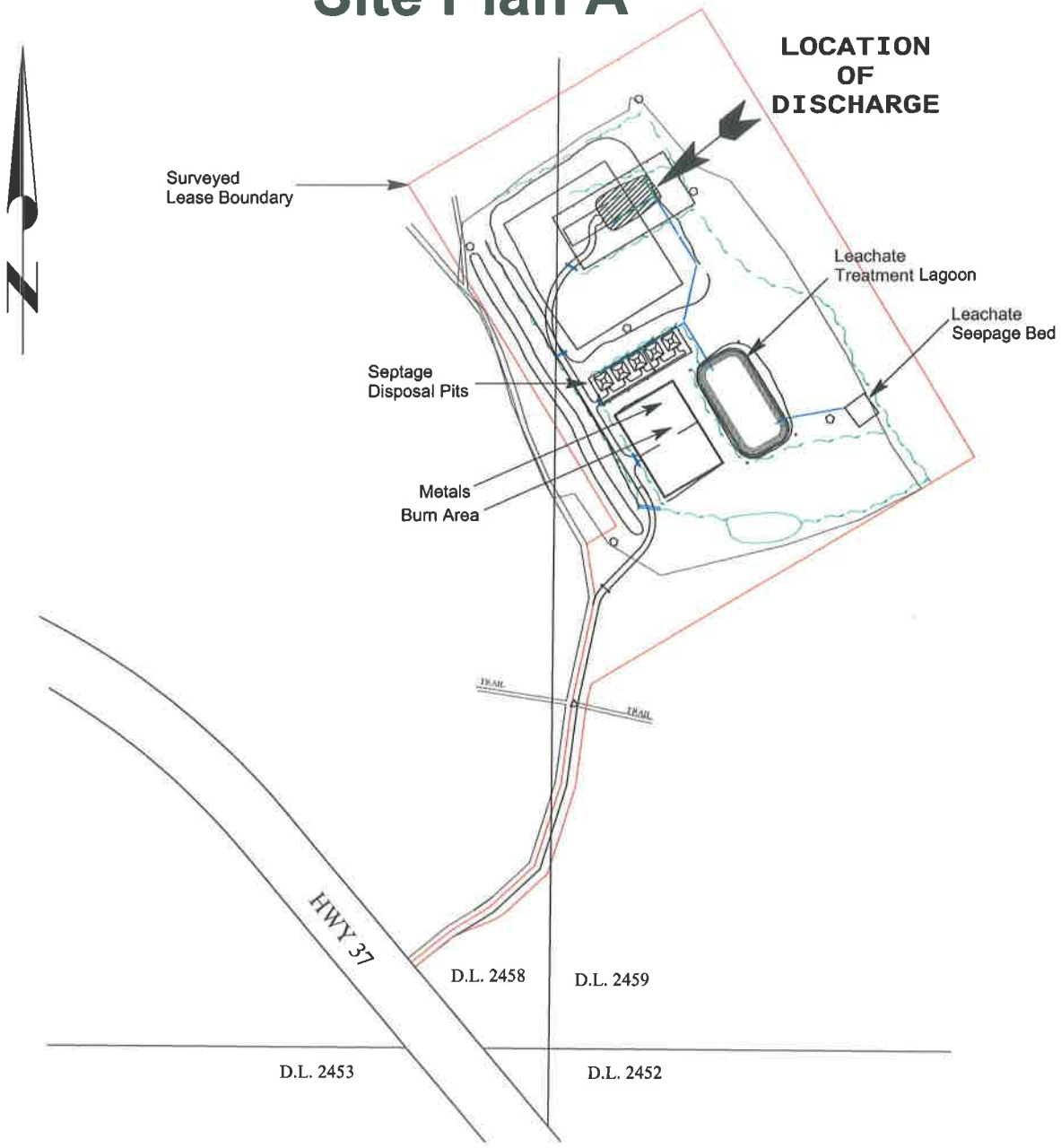
Date Issued: AUG 08 2002
Date Amended:
(most recent)

J. Hofweber, P. Eng.
Assistant Regional Waste Manager

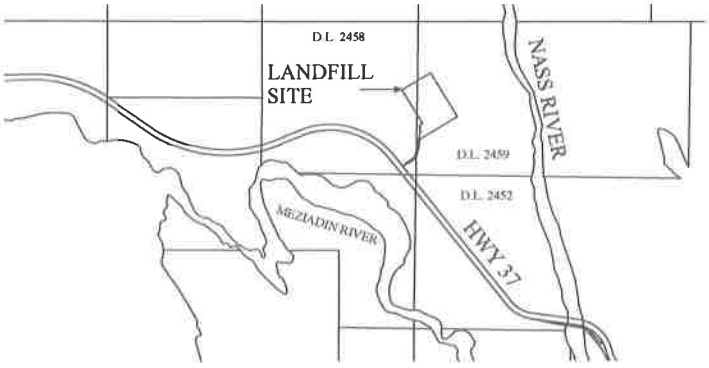
17. MAINTENANCE OF WORKS, EMERGENCY PROCEDURES AND NON-COMPLIANCE REPORTING

The operational certificate holder shall inspect the operation regularly and maintain it in good order. The operational certificate holder shall immediately notify the Regional Waste Manager or designate of any circumstance which prevents continuing operation in the approved manner or results in noncompliance with the requirements of this operational certificate.

Site Plan A



Location Map



Permit No.: MR-15681

Date: AUG 08 2002

Jim Hofweber, P.Eng.
Assistant Regional Waste Manager

APPENDIX B
Topography

BRITISH COLUMBIA

Site Location
iMapBC Mapping

Legend

Contours - (1:20,000)

FCODE

- Contour - Index
- Contour - Index Indefinite
- Contour - Index Depression
- Contour - Index Depression Inde
- Contour - Intermediate
- Contour - Intermediate Indefinite
- Contour - Intermediate Depressi
- Contour - Intermediate Depressi

Contours - Labels (1:20,000

0 0.73 1.5 km

1: 36,112

Copyright/Disclaimer

Datum:	NAD83
Projection:	WGS_1984_Web_Mercator_Auxiliary_Sphere

Key Map of British Columbia

BRITISH COLUMBIA

Site Location
iMapBC Mapping

Legend

Contours - (1:20,000)

FCODE

- Contour - Index
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Contours - Labels (1:20,000

0 0.73 1.5 km

1: 36,112

Copyright/Disclaimer

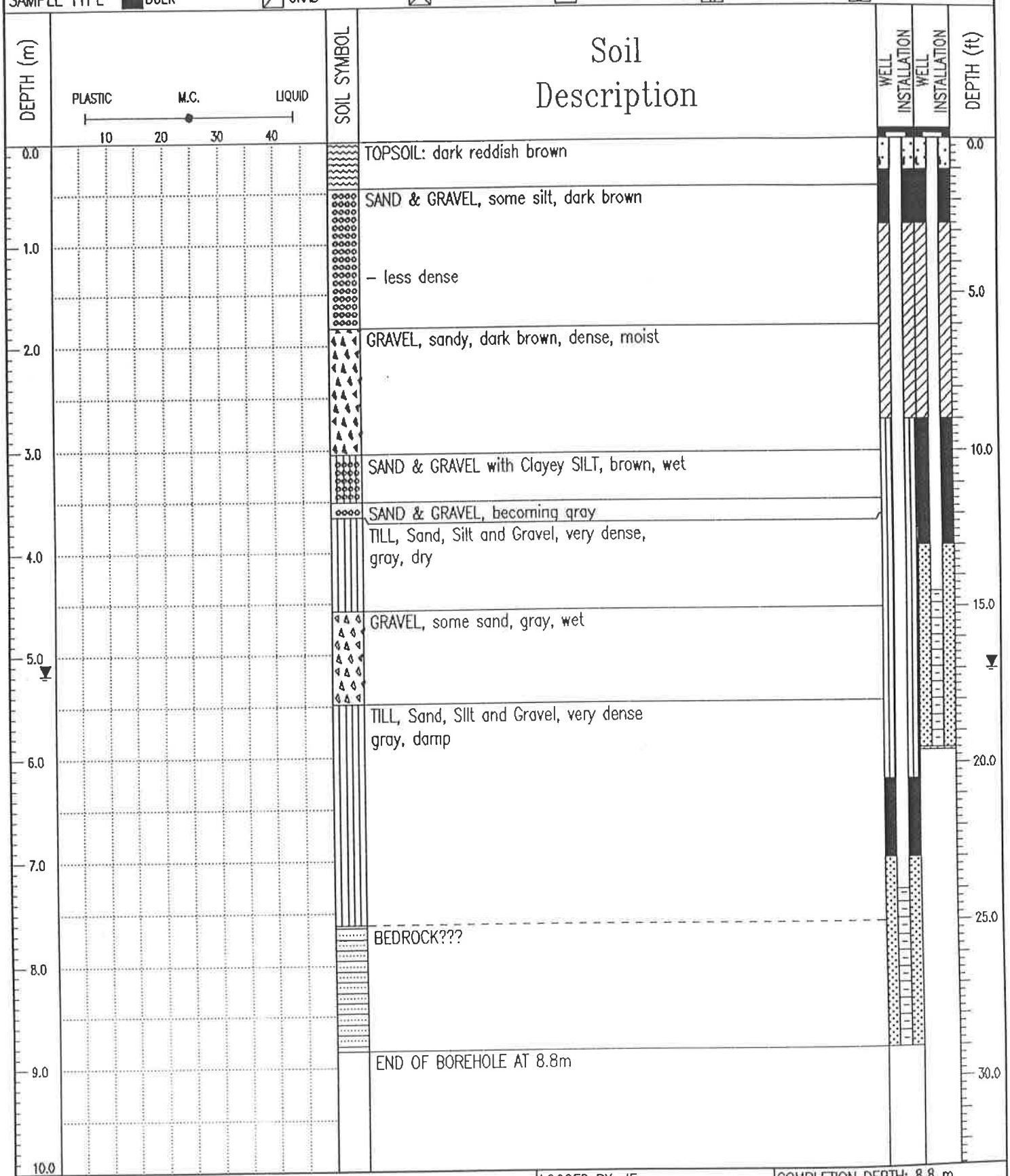
Datum:	NAD83
Projection:	WGS_1984_Web_Mercator_Auxiliary_Sphere

Key Map of British Columbia

APPENDIX C
Borehole Logs

Regional District Kitimat–Stikine	Driller: Double D Drilling Ltd	TEST PIT NO: BH97–1
RDK–S Landfill Siting Program	Method: Air Rotary	PROJECT NO: VE50789
Meziadin Junction – Tintina Main		ELEVATION:

SAMPLE TYPE ■ BULK ▨ GRAB ▩ SPT ▤ A-CASING ▥ SHELBY TUBE ▦ CORE



AGRA Earth & Environmental Limited Burnaby, B.C.	LOGGED BY: JE REVIEWED BY: GB Fig. No:	COMPLETION DEPTH: 8.8 m COMPLETE: 20/01/97 Page 1 of 1

97/02/07 05:26AM

Regional District Kitimat-Stikine	Driller: Double D Drilling Ltd	TEST PIT NO: BH97-2
RDK-S Landfill Siting Program	Method: Air Rotary	PROJECT NO: VE50789
Meziadin Junction – Tintina Main		ELEVATION:

SAMPLE TYPE ■ BULK ▨ GRAB ☒ SPT ▤ A-CASING ▥ SHELBY TUBE ▮ CORE

DEPTH (m) | PLASTIC — M.C. — LIQUID (10 20 30 40) | SOIL SYMBOL | Soil Description | WELL INSTALLATION | DEPTH (ft)

0.0 — TOPSOIL: dark reddish brown

BOULDER

1.0

SAND, some silt, some gravel, brown, damp

2.0

TILL, Sand, Silt and some gravel, dense, dark brown to gray, dry to damp

3.0

4.0

5.0

BEDROCK???

6.0

END OF BOREHOLE AT 6.4m

7.0

8.0

9.0

10.0

0.0 — 5.0 — 10.0 — 15.0 — 20.0 — 25.0 — 30.0

AGRA Earth & Environmental Limited Burnaby, B.C.	LOGGED BY: JE	COMPLETION DEPTH: 6.4 m
	REVIEWED BY: GB	COMPLETE: 20/01/97
	Fig. No:	Page 1 of 1

97/02/07 05:24AM

Regional District Kitimat-Stikine	Driller: Double D Drilling Ltd	TEST PIT NO: BH97-3
RDK-S Landfill Siting Program	Method: Air Rotary	PROJECT NO: VE50789
Meziadin Junction – Tintina Main		ELEVATION:

SAMPLE TYPE ■ BULK ⁄ GRAB ☒ SPT ▤ A-CASING ▥ SHELBY TUBE ▮ CORE

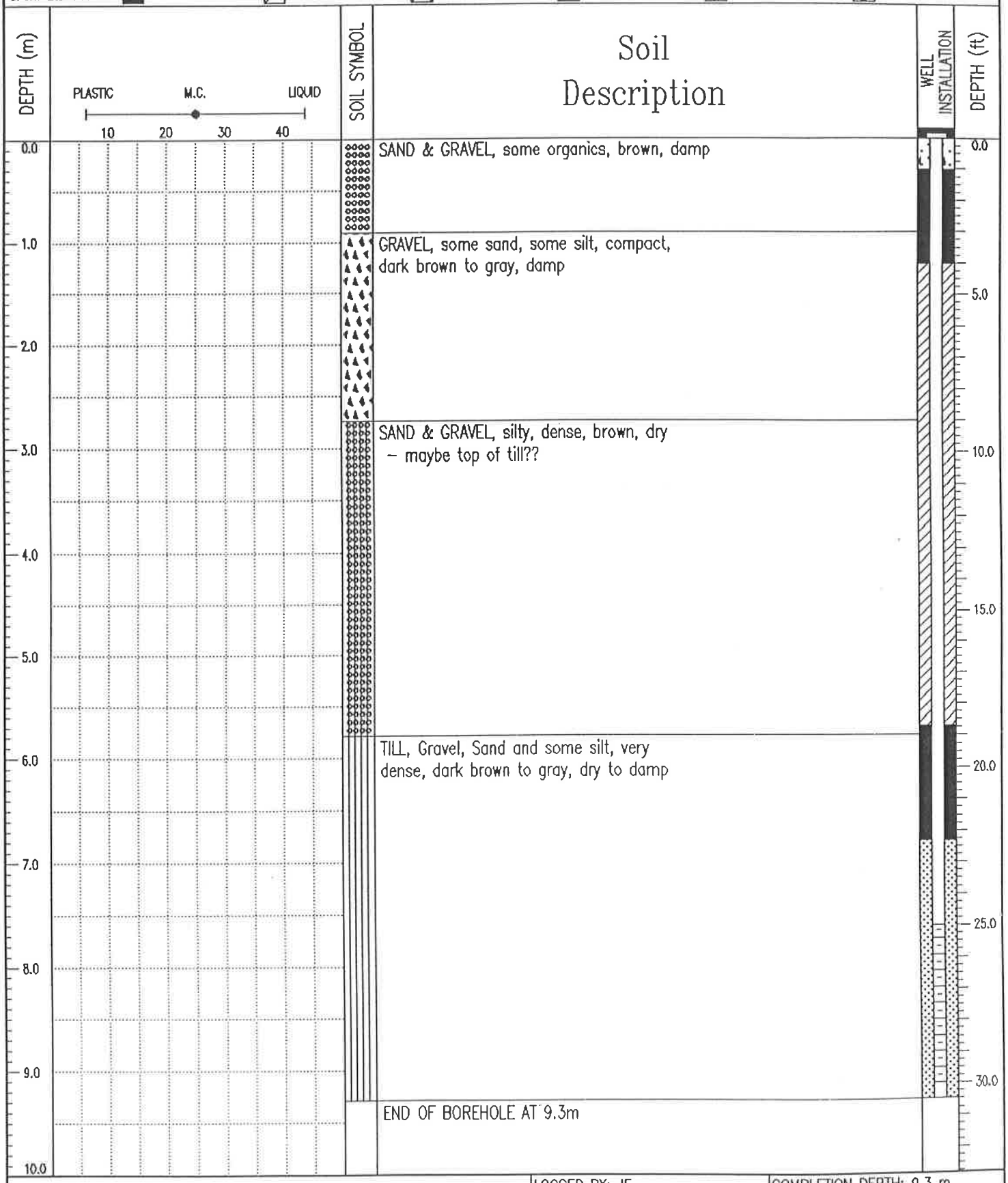
DEPTH (m)	PLASTIC / M.C. / LIQUID (10 20 30 40)	SOIL SYMBOL	Soil Description	WELL INSTALLATION	DEPTH (ft)
0.0			TOPSOIL: dark reddish brown		0.0
1.0					
2.0			SAND & GRAVEL, some organics, brown, damp		5.0
3.0			TILL, Gravel, Sand and some silt, very dense, dark brown to gray, dry to damp		10.0
4.0					
5.0					15.0
6.0					20.0
7.0					
8.0					25.0
9.0					30.0
10.0			END OF BOREHOLE AT 9.3m		

AGRA Earth & Environmental Limited Burnaby, B.C.	LOGGED BY: JE	COMPLETION DEPTH: 9.3 m
	REVIEWED BY: GB	COMPLETE: 21/01/97
	Fig. No:	Page 1 of 1

97/02/07 05:19AM

Regional District Kitimat-Stikine	Driller: Double D Drilling Ltd	TEST PIT NO: BH97-4
RDK-S Landfill Siting Program	Method: Air Rotary	PROJECT NO: VE50789
Meziadin Junction - Tintina Main		ELEVATION:

SAMPLE TYPE: BULK | GRAB | SPT | A-CASING | SHELBY TUBE | CORE



AGRA Earth & Environmental Limited Burnaby, B.C.	LOGGED BY: JE	COMPLETION DEPTH: 9.3 m
	REVIEWED BY: GB	COMPLETE: 21/01/97
	Fig. No:	Page 1 of 1

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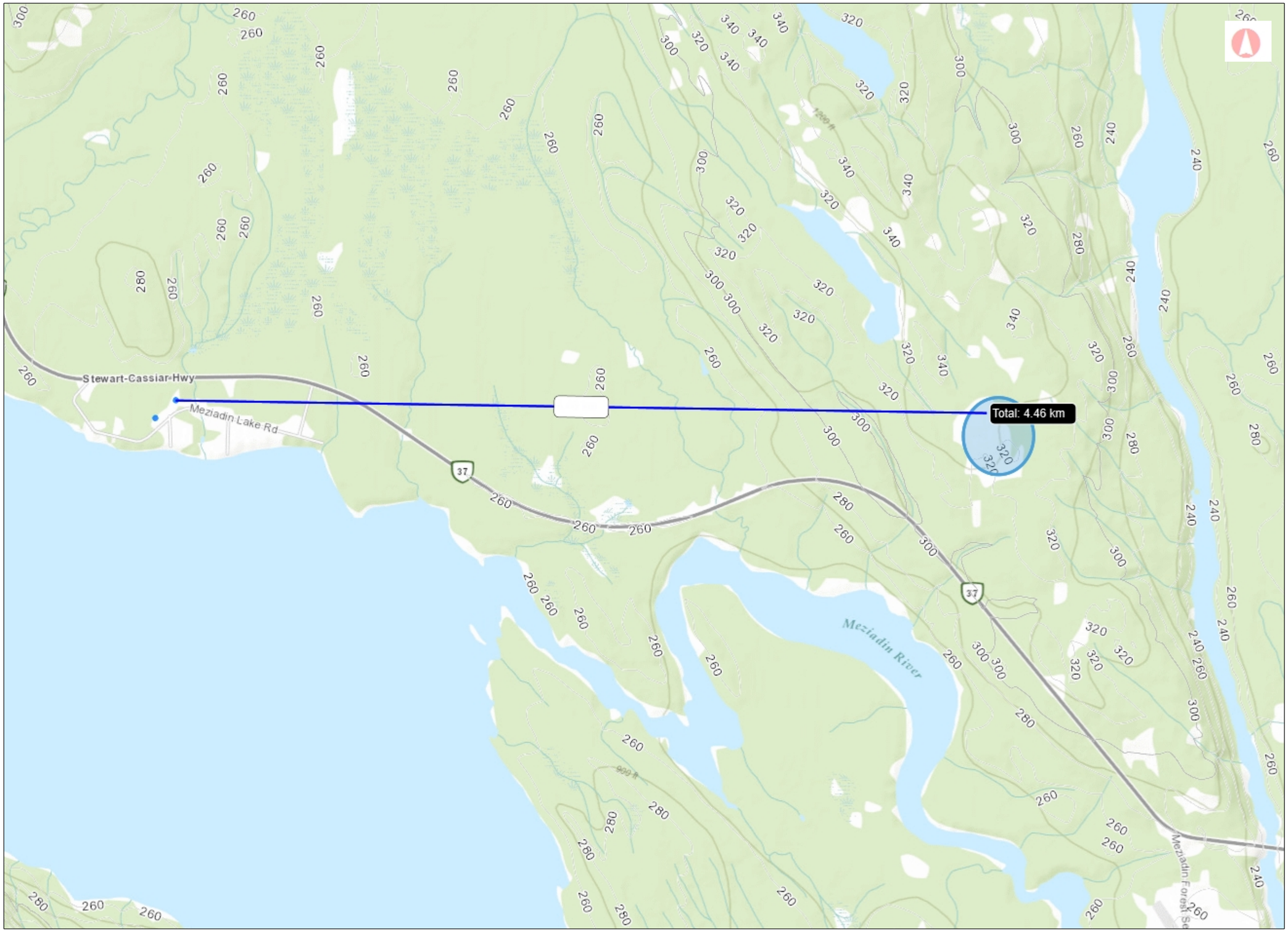
APPENDIX D
BC Water Resource Atlas Search Results



BRITISH COLUMBIA

Water Wells
iMapBC Mapping

Legend

Groundwater Wells - All

ARTESIAN_IND

- Reported Artesian Well
- Well

Contours - (1:20,000)

FCODE

- Contour - Index
- Contour - Index Indefinite
- Contour - Index Depression
- Contour - Index Depression Inde
- Contour - Intermediate
- Contour - Intermediate Indefinite
- Contour - Intermediate Depressi
- Contour - Intermediate Depressi

Contours - Labels (1:20,000

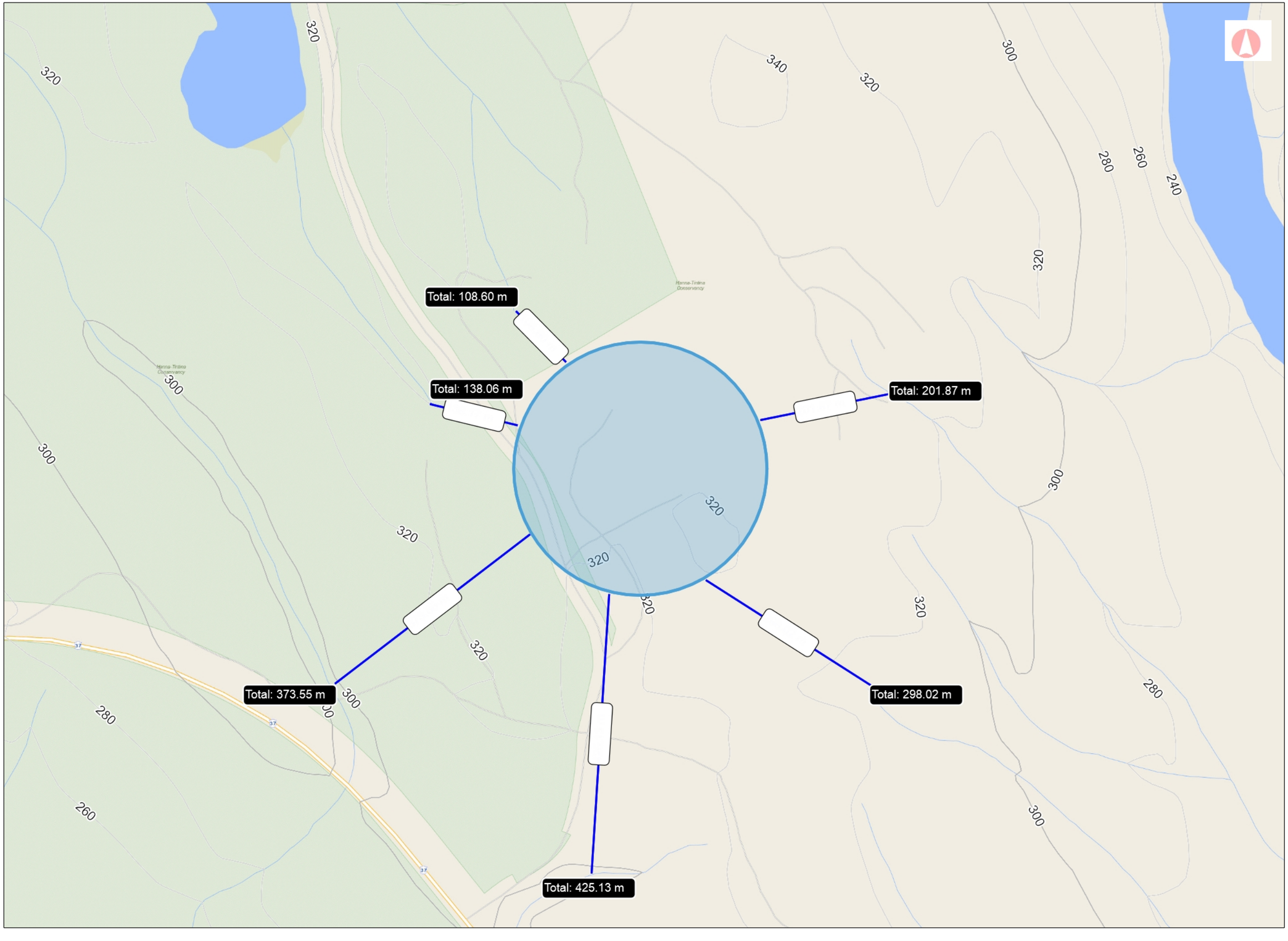
0 0.73 1.5 km

1: 36,112

Copyright/Disclaimer

Datum:	NAD83
Projection:	WGS_1984_Web_Mercator_Auxiliary_Sphere

Key Map of British Columbia



BRITISH COLUMBIA

Surface Water Bodies iMapBC Mapping

Legend

Groundwater Wells - All

ARTESIAN_IND

- Reported Artesian Well
- Well

Contours - Labels (1:20,000

Contours - (1:20,000)

FCODE

- Contour - Index
- Contour - Index Indefinite
- Contour - Index Depression
- Contour - Index Depression Inde
- Contour - Intermediate
- Contour - Intermediate Indefinite
- Contour - Intermediate Depressi
- Contour - Intermediate Depressi

0 0.20 0.4 km

1: 10,000

Copyright/Disclaimer

Datum:	NAD83
Projection:	WGS_1984_Web_Mercator_Auxiliary_Sphere

Key Map of British Columbia

Groundwater Wells and Aquifers

Well Summary

Well Tag Number: 100823
Well Identification Plate Number:
Owner Name: KEN DREY
Intended Water Use: Private Domestic
Artesian Condition: No

Well Status: New
Well Class: Water Supply
Well Subclass: Not Applicable
Aquifer Number:

Observation Well Number:
Observation Well Status:
Environmental Monitoring System (EMS) ID:
Alternative specs submitted: No

Licensing Information

Licensed Status: Unlicensed

Licence Number:

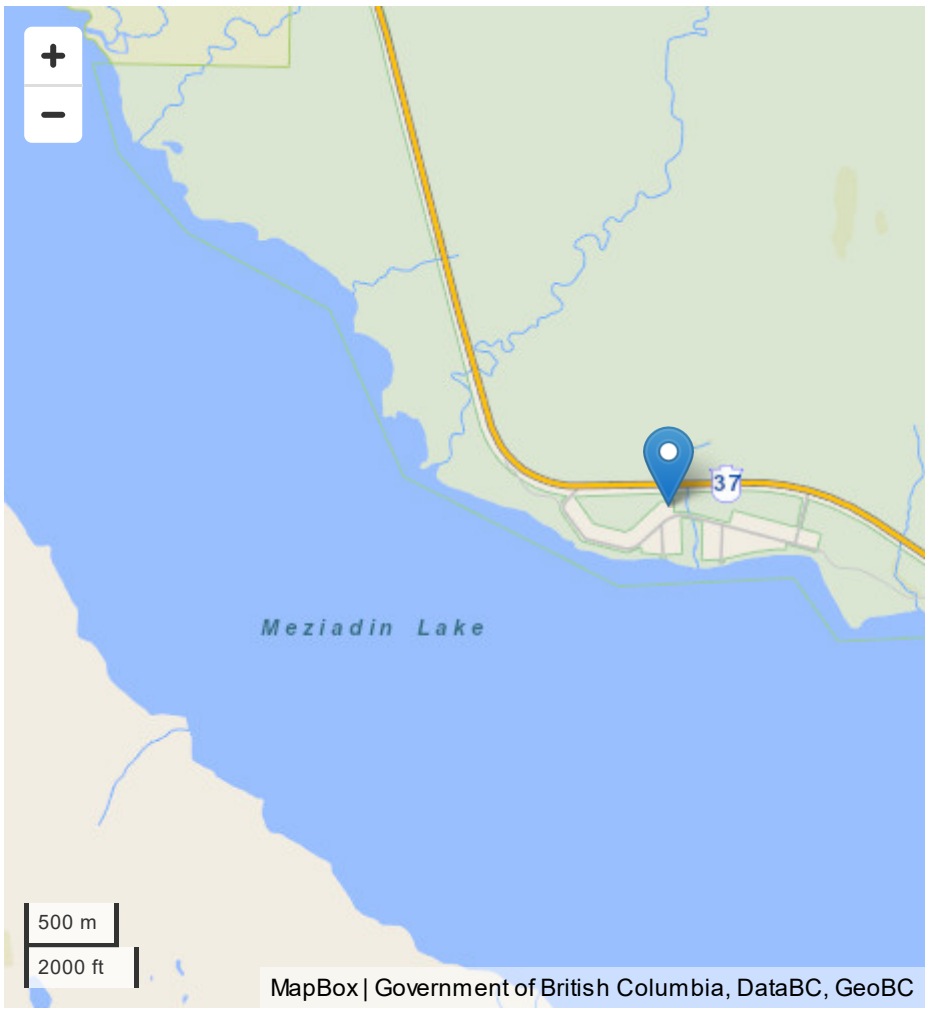
Location Information

Street Address:
Town/City:

Legal Description:

Lot	12
Plan	7577
District Lot	
Block	
Section	
Township	
Range	
Land District	06
Property Identification Description (PID)	007873069

Description of Well Location: SAN-DINERS TRUCKING - TRAILER & SHOP.



Geographic Coordinates - North American Datum of 1983 (NAD 83)
Latitude: 56.055736 **Longitude:** -129.249944
UTM Easting: 484434 **UTM Northing:** 6212311
Zone: 9
Coordinate Acquisition Code: unknown, accuracy based on parcel size) ICF cadastre, poor or no location sketch, arbitrarily located in center of parcel

Well Activity

Activity	Work Start Date	Work End Date	Drilling Company	Date Entered
Legacy record	1987-08-25	1987-08-25	Industrial Drillers	February 26th 2010 at 6:53 AM

Well Work Dates

Start Date of Construction	End Date of Construction	Start Date of Alteration	End Date of Alteration	Start Date of Decommission	End Date of Decommission
1987-08-25	1987-08-25				

Well Completion Data

Total Depth Drilled: 40 ft bgl
Finished Well Depth: 40 ft bgl
Final Casing Stick Up:
Depth to Bedrock: 21 feet bgl
Ground elevation:
Estimated Well Yield:
Well Cap:
Well Disinfected Status: Not Disinfected
Drilling Method: Air Rotary
Method of determining elevation: Unknown
Static Water Level (BTOC):
Artesian Flow:
Artesian Pressure (head):
Artesian Pressure (PSI):
Orientation of Well: VERTICAL

Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
0	21							
21	40					Soft		

Casing Details

From (ft bgl)	To (ft bgl)	Casing Type	Casing Material	Diameter (in)	Wall Thickness (in)	Drive Shoe
There are no records to show						

Surface Seal and Backfill Details

Surface Seal Material:
Surface Seal Installation Method:
Surface Seal Thickness:
Surface Seal Depth:
Backfill Material Above Surface Seal:
Backfill Depth:

Liner Details

Liner Material:
Liner Diameter:
Liner from:
Liner Thickness:
Liner to:

Liner perforations

From (ft bgl)	To (ft bgl)
There are no records to show	

Screen Details

Intake Method:
Type:
Material:
Opening:
Bottom:

Installed Screens

From (ft bgl)	To (ft bgl)	Diameter (in)	Assembly Type	Slot Size
There are no records to show				

Well Development

Developed by: Air lifting
Development Total Duration:

Well Yield

Estimation Method: Air Lifting
Static Water Level Before Test:
Hydrofracturing Performed: No
Estimation Rate: 3 USgpm
Drawdown:
Increase in Yield Due to Hydrofracturing:
Estimation Duration:

Well Decommission Information

Reason for Decommission:
Sealant Material:
Decommission Details:
Method of Decommission:
Backfill Material:

Comments

No comments submitted

Alternative Specs Submitted: Yes

Documents

Loading documents...

Disclaimer

The information provided should not be used as a basis for making financial or any other commitments. The Government of British Columbia accepts no liability for the accuracy, availability, suitability, reliability, usability, completeness or timeliness of the data or graphical depictions rendered from the data.

Groundwater Wells and Aquifers

Well Summary

Well Tag Number: 109966
Well Identification Plate Number: 39304
Owner Name: BRENT OR DEAN SCHMIDT
Intended Water Use: Private Domestic
Artesian Condition: No

Well Status: New
Well Class: Water Supply
Well Subclass: Not Applicable
Aquifer Number:

Observation Well Number:
Observation Well Status:
Environmental Monitoring System (EMS) ID:
Alternative specs submitted: No

Licensing Information

Licensed Status: Unlicensed

Licence Number:

Location Information

Street Address: 110 MEZIADIN CRESENT
Town/City: MEZIADIN LAKE

Legal Description:

Lot	10
Plan	7577
District Lot	2456
Block	
Section	
Township	
Range	
Land District	06
Property Identification Description (PID)	

Description of Well Location: WELL DESCRIPTION NOT PROVIDED

Geographic Coordinates - North American Datum of 1983 (NAD 83)

Latitude: 56.05486 **Longitude:** -129.251753
UTM Easting: 484321 **UTM Northing:** 6212214
Zone: 9
Coordinate Acquisition Code: unknown, accuracy based on parcel size) ICF cadastre, poor or no location sketch, arbitrarily located in center of parcel

Well Activity

Activity	Work Start Date	Work End Date	Drilling Company	Date Entered
Legacy record	2013-09-12	2013-09-25	Double D Drilling	March 10th 2015 at 7:57 AM

Well Work Dates

Start Date of Construction	End Date of Construction	Start Date of Alteration	End Date of Alteration	Start Date of Decommission	End Date of Decommission
2013-09-12	2013-09-25				

Well Completion Data

Total Depth Drilled: 75 ft bgl
Finished Well Depth: 71.5 ft bgl
Final Casing Stick Up: 18 inches
Depth to Bedrock:
Ground elevation:
Estimated Well Yield: 3 USgpm
Well Cap: 6 INCH WTC
Well Disinfected Status: Disinfected
Drilling Method: Air Rotary
Method of determining elevation: Unknown
Static Water Level (BTOC): 19 feet btoc
Artesian Flow:
Artesian Pressure (head):
Artesian Pressure (PSI):
Orientation of Well: VERTICAL

Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
0	15	SILT & FINE SAND			brown	Soft		
15	22	FINE-MEDIUM SAND TRACES OF SILT			grey	Medium	WATER BEARING 18-22FT	
22	24		medium		grey	Medium	DRY	
24	75	MEDIUM HARD			grey			

Casing Details

From (ft bgl)	To (ft bgl)	Casing Type	Casing Material	Diameter (in)	Wall Thickness (in)	Drive Shoe
0	75		Steel	6	0.219	Installed
6.5	61.5		Plastic	4.94		Not Installed

Surface Seal and Backfill Details

Surface Seal Material: Bentonite clay
Surface Seal Installation Method: Poured
Surface Seal Thickness:
Surface Seal Depth: 15 feet
Backfill Material Above Surface Seal:
Backfill Depth:

Liner Details

Liner Material: PVC
Liner Diameter:
Liner from:
Liner Thickness:
Liner to:

Liner perforations

From (ft bgl)	To (ft bgl)
There are no records to show	

Screen Details

Intake Method: Screen
Type: Pipe size
Material: Plastic
Opening: Slotted
Bottom: Other

Installed Screens

From (ft bgl)	To (ft bgl)	Diameter (in)	Assembly Type	Slot Size
6.50	11.50	4.94		
11.50	31.50	4.94		0.02
31.50	51.50	4.94		
51.50	71.50	4.94		

Well Development

Developed by: Pumping
Development Total Duration: 1 hours

Well Yield

Estimation Method: Pumping
Static Water Level Before Test:
Hydrofracturing Performed: No
Estimation Rate: 3 USgpm
Drawdown:
Increase in Yield Due to Hydrofracturing:
Estimation Duration: 1 hours

Well Decommission Information

Reason for Decommission:
Sealant Material:
Decommission Details:
Method of Decommission:
Backfill Material:

Comments

SCREEN TYPE: PVC WELL LINER; SLOT SIZE AT 51.5-71.5FT: ZIP CUT VERTICALS; SCREEN BOTTOM: CAPPED

Alternative Specs Submitted: Yes

Documents

No additional documentation available for this well.

Disclaimer

APPENDIX E
Groundwater Analytical Tables

Table 1. Meziadin Landfill Groundwater Monitoring Results

		BC CSR	MW-1A - E251536																
Analyte	**Units**	**CSR-AW (2)**	1-Apr-97	1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-20	15-Oct-20	19-Jul-21	27-Oct-21
Conductivity	uS/cm	-	600	715	972	1020	743	602	743	737	716	721	670	690	766	739	747	776	779	820
Hardness (Total as CaCO3)	mg/L	-		5580	307	290	158	205	158	168	158	155								
Hardness (Dissolved as CaCO3)	mg/L	-	159	164	332	290		197			-	-					175	180	205.00	202.00
pH	pH	-	7.90	8.10	8.20	8.10	8.10	7.50	8.10	7.90	7.90	7.90		8.39	8.23	8.49	8.2	8.29	8.14	8.34
Total Suspended Solids	mg/L	-		31300																
Total Dissolved Solids	mg/L	-	393	-	658	674	460	330	460	450	450	350	487	452	593	518	547	554	524	518
Alkalinity, Total (as CaCO3)	mg/L	-	198		239	251	260	290	260	250	250	250	241	239	246	244	260	240	229	238
Ammonia, Total (as N)	mg/L	1.3-18.4 (a)			0.03	1.52	1.26	6.92	1.26	1.30	0.08	0.20	0.0827	0.0532	0.9650	0.1030	0.0778	0.0481	0.0188	0.0364
Bromide (Br)	mg/L	-		0.1	0.1	0.1									<0.25	<0.25	<0.250	<0.250		
Chloride (Cl)	mg/L	1500	11.20	3.40	3.90	2.30	2.50	2.10	2.50	2.30	2.10	2.80	1.3300	<2.5	<2.5	<2.5	<2.50	<2.50	<2.50	<2.50
Fluoride (F)	mg/L	2.0-3.0 (e)	0.32					<0.10			0.2	0.19	0.1900	0.1700	0.1500	0.1900	0.150	0.151	0.1480	0.1360
Nitrate (as N)	mg/L	400	0.1		0.107	0.054							0.1380	0.1450	0.0930	0.2390	0.0682	0.0805	0.1350	0.2310
Nitrite (as N)	mg/L	0.2-2.0 (h)	0.01		0.004	0.018							<0.0010	<0.0050	0.0083	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Nitrate + Nitrite (as N)	mg/L	-			0.111	0.072	0.102	0.131	0.102	0.273	-	0.110								
Total Kjeldahl Nitrogen	mg/L	-			3.19	1.4	2.54	10.7	2.54	7.3	1.33	5.43	4.05	0.167	2.21	0.21	0.170	1.19	0.11	0.129
Phosphorus (P)-Total	mg/L	-			15.6	7.99														
Sulfate (SO4)	mg/L	1289-4290	99	135	288	285	144	28	144	135	135	127	135	130	163	160	164	150	188	188
BOD	mg/L	-		6	10															
COD	mg/L	-		28	23	10	142	<20	142	140	35	119	114	<20	127	<20	66	36	<20	35
Dissolved Metals																				
Aluminum (Al)-Dissolved	mg/L	-	0.2	0.0015	0.0015	0.008	0.015	<0.005	0.015	0.007	<0.0050	0.0063	0.0101	0.0091	0.0039	0.0045	0.0063	0.0038	0.0027	0.0060
Antimony (Sb)-Dissolved	mg/L	0.09	0.2	0.000473	0.000473	0.000315	0.0004	<0.0001	0.0004	0.0008	0.00035	0.0005	0.00043	0.00031	0.00025	0.00018	0.00031	0.00029	0.00016	0.00020
Arsenic (As)-Dissolved	mg/L	0.05	0.2	0.001	0.001	0.0014	0.002	<0.0005	0.002	0.0021	0.00064	0.00074	0.0017	0.00089	0.00103	0.0008	0.00128	0.00110	0.00053	0.00051
Barium (Ba)-Dissolved	mg/L	10	0.26	0.176	0.176	0.124	0.068	0.113	0.068	0.295	0.129	0.0531	0.0625	0.0526	0.0738	0.0502	0.0601	0.0557	0.0440	0.0466
Beryllium (Be)-Dissolved	mg/L	0.0015	0.005	0.00002	0.00002	0.00002	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000100	<0.000100	<0.000100	<0.000100
Bismuth (Bi)-Dissolved	mg/L	-	0.1	0.00002	0.00002	0.00002					<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L	12	0.1	0.084	0.084	0.073	0.083	0.023	0.083	0.093	0.085	0.0734	0.067	0.071	0.071	0.079	0.072	0.071	0.074	0.077
Cadmium (Cd)-Dissolved	mg/L	0.0005-0.004	0.01	0.00011	0.00011	0.00007	0.00003	<0.00001	0.00003	0.00005	0.000072	<0.000010	0.000204	0.0000225	0.0000126	0.0000806	<0.0000200	<0.0000200	0.000191	0.0000267
Calcium (Ca)-Dissolved	mg/L	-	47.2	97.5	97.5	85.6	45.6	65.4	45.6	48.3	45.6	44.2	46.6	49.1	52.8	56.8	49.7	52.4	60.4	58.3
Cesium (Cs)-Dissolved	mg/L												<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.01 (e)	0.01	0.0002	0.0002	0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00015	0.00014	<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050
Cobalt (Co)-Dissolved	mg/L	0.04	0.01	0.000834	0.000834	0.00103	0.00067	0.00054	0.00067	0.0008	0.00062	0.00074	0.00064	0.00057	0.00019	0.00056	0.00044	0.00032	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.02-0.09 (d,f)	0.01	0.00069	0.00069	0.00189	0.0018	<0.0002	0.0018	0.0143	0.00801	<0.00040	0.00061	<0.00020	0.00105	0.00054	0.00026	<0.00020	0.00045	0.00304
Iron (Fe)-Dissolved	mg/L	-	0.06	0.005	0.005	0.007	<0.010	0.018	<0.010	<0.010	<0.010	<0.010	0.213	0.367	0.085	0.017	0.084	0.044	<0.010	0.013
Lead (Pb)-Dissolved	mg/L	0.04-0.16 (d,f)	0.05	0.00001	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	<0.000050	<0.000050	0.000063	<0.000050	<0.000050	<0.000050	<0.000050	0.000062
Lithium (Li)-Dissolved	mg/L	-	0.01	0.00392	0.00392	0.00488	0.0078	0.0013	0.0078	0.0031	0.00324	0.0042	0.0037	0.0039	0.0037	0.0041	0.0038	0.0042	0.0038	0.0046
Magnesium (Mg)-Dissolved	mg/L	-	9.94	21.5	21.5	19.2	10.7	8.1	10.7	11.6	10.7	10.8	11.1	11.7	11.8	12.4	12.4	11.9	13.2	13.6
Manganese (Mn)-Dissolved	mg/L	-	0.904	0.521	0.521	0.584	0.792	3.77	0.792	0.948	0.314	0.567	0.542	0.988	0.303	0.757	0.410	0.419	0.0421	0.00179
Mercury (Hg)-Dissolved	mg/L	0.00025		0.00005	0.00005	0.00005	<0.00002	<0.00002	<0.00002		<0.00002	<0.000010	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	10	0.3	0.0118	0.0118	0.0133	0.0254	0.001	0.0254	0.029	0.0253	0.0295	0.0194	0.0156	0.0125	0.0135	0.0137	0.0155	0.0108	0.0112
Nickel (Ni)-Dissolved	mg/L	0.25-1.5 (d,f)	0.02	0.0028	0.0028	0.0024	0.0045	0.0028	0.0045	0.0034	0.00316	0.00477	0.00194	0.00138	0.00079	0.00081	0.00115	0.00104	<0.00050	<0.00050
Phosphorus (P)-Dissolved	mg/L	-	0.3	0.1	0.1	0.1					<0.050	<0.050	<0.050	<0.050	0.05	0.057	0.060	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	3	3.0	3.0	4.0	2.5	2.2	2.5	2.6	2.4	2.2	2.4	2.3	2.5	2.8	2.49	2.54	2.49	2.64
Rubidium (Rb)-Dissolved	mg/L												0.0	0.0	0.0	0.0	0.00029	0.00034	0.00028	0.00033
Selenium (Se)-Dissolved	mg/L	0.02	0.2	0.0004	0.0004	0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.000066	0.00008	0.000143	0.000116	0.000055	0.000156	0.000227	0.000428
Silicon (Si)-Dissolved	mg/L	-									3.7	3.5	3.87	3.79	3.59	3.91	3.79	3.92	3.88	3.84
Silver (Ag)-Dissolved	mg/L	0.0005-0.015 (d)	0.01	0.00002	0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	-	71	96.7	96.7	125.0	98.0	39.0	98.0	91.8	99.2	103.0	99.7	94.6	101.0	101.0	104	108	99.2	104
Strontium (Sr) - Dissolved	mg/L	-	0.241	0.9	0.9	0.9					0.5	0.5	0.5	0.6	0.6	0.7	0.607	0.646	0.712	0.710
Sulfur (S)-Dissolved	mg/L	-		92.0	92.0	98.6					42.3	41.0	45.5	51.3	54.3	53.2	53.7	57.1	67.2	64.8
Tellerium (Te)-Dissolved	mg/L	-		0.1	0.1						<0.00020	<0.00050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L	0.003	0.1	0.000033	0.000033	0.000039	<0.00002	<0.00002	<0.00002	<0.00002	0.000029	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L	-									<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L	-	0.3	0.00001	0.00001	0.00002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	1	0.01	0.003	0.003	0.003	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	0.00051	0.00037	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W)-Dissolved	mg/L												<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L	0.085		0.00389	0.00389	0.00386	0.00361	0.00012	0.00361	0.00285	0.00299	0.00374	0.003	0.00241	0.00273	0.0027	0.00271	0.00292	0.00252	0.00283
Vanadium (V)-Dissolved	mg/L	-	0.03	0.00108	0.00108	0.00059	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	0.00073	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L	0.075-2.4 (d)	0.038	0.0001	0.0001	0.0012	<0.004	<0.004	<0.004	0.017	0.0208	<0.0040	0.0048	<0.0010	0.0034	0.0017	<0.0010	<0.0010	0.0013	0.0018
Zirconium (Zr)-Dissolved	mg/L	-		0.005	0.005	0.005					<0.00010	<0.00010	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020

NOTES

CSR-AW *BC Contaminated Sites Regulation Water Quality Guidelines for Protection of Aquatic Life*

(2) BC Contaminated Sites Regulation (CSR) for protection of aquatic life - 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 - secondary chronic effects from 0.014 mg/L
(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*

Table 1. Meziadin Landfill Groundwater Monitoring Results

		BC CSR	MW-1B - E251537																	
Analyte	**Units**	**CSR-AW (2)**	Apr-97	Jul-03	2004	2006	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-20	15-Oct-20	19-Jul-21	27-Oct-21
Conductivity	uS/cm	-	254	441	442	437	385	351	385	392	396	450	361	384	356	346	399	452	344	362
Hardness (Total as CaCO3)	mg/L	-	116	652	236	200	168	146	168	171	171	208								
Hardness (Dissolved as CaCO3)	mg/L	-		267	260	200		128									183	208	166	172
pH	pH	-	7.90	7.30		7.30	7.60	6.80	7.60	6.80	6.40	6.60		7.24	7.10	7.95	7.34	7.46	6.58	7.30
Total Suspended Solids	mg/L	-		9290																
Total Dissolved Solids	mg/L	-	143		248	260	340	220	340	270	260	220	237	242	343	356	303	388	222	221
Alkalinity, Total (as CaCO3)	mg/L	-	124		240	235	200	180	200	210	210	240	209	213	194	190	230	227	175	182
Ammonia, Total (as N)	mg/L	1.3-18.4 (a)			0.01	0.02	0.08	0.14	0.08	0.21	0.28	0.26	0.27	0.34	0.19	0.13	0.26	0.40	0.01	0.26
Bromide (Br)	mg/L	-		0.1	0.1	0.1									<0.050	<0.050	<0.050	<0.050		
Chloride (Cl)	mg/L	1500	0.90	0.80	1.10	0.50	2.00	<1.0	2.00	<1.0	<1.0	<1.0	0.55	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F)	mg/L	2.0-3.0 (e)	0.22					<0.10			<0.10	<0.10	0.07	0.066	0.066	0.069	0.070	0.069	0.06	0.067
Nitrate (as N)	mg/L	400	0.01		0.002	0.003							0.17	0.0481	0.283	0.268	0.228	0.0153	0.45	0.128
Nitrite (as N)	mg/L	0.2-2.0 (h)	0.01		0.002	0.002							0.0058	0.0012	0.0095	0.0025	0.0037	0.0012	<0.0010	0.0228
Nitrate + Nitrite (as N)	mg/L	-			0.002	0.003	0.360	0.692	0.360	0.297	0.374	0.190								
Total Kjeldahl Nitrogen	mg/L	-			1.66	0.16	1.78	0.72	1.78	4.4	2.48	4.53	1.940	0.505	0.429	1.240	0.473	4.24	0.206	0.494
Phosphorus (P)-Total	mg/L	-			9.51	7.03														
Sulfate (SO4)	mg/L	1289-4290	7	3	3	4	10	6.6	10	4.7	5.8	7	5.740	6.170	7.290	8.720	7.83	6.14	7.680	5.980
BOD	mg/L	-		6	10															
COD	mg/L	-		20	15	24	108	23	108	82	202	194	71.00	25.00	34.00	53.00	80.00	48.00	<20	33.00
Dissolved Metals																				
Aluminum (Al)-Dissolved	mg/L	-	0.2	0.0042	0.0038	0.0036	0.009	<0.005	0.009	0.005	0.0074	0.0075	0.0209	0.118	0.025	0.0197	0.0145	0.0152	0.0044	0.0141
Antimony (Sb)-Dissolved	mg/L	0.09	0.2	0.000885	0.000143	0.000191	0.0002	0.0001	0.0002	0.0005	0.00027	0.00033	<0.00010	0.00011	<0.00020	<0.00010	0.00017	0.00023	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L	0.05	0.2	0.0008	0.0003	0.0003	0.0025	<0.0005	0.0025	0.0044	0.00371	0.00187	0.00129	0.00227	0.00063	0.00129	0.00150	0.00155	0.00019	0.00090
Barium (Ba)-Dissolved	mg/L	10	0.25	0.0869	0.612	0.559	0.329	0.066	0.329	0.672	0.506	0.676	0.403	0.543	0.309	0.496	0.440	0.578	0.101	0.415
Beryllium (Be)-Dissolved	mg/L	0.0015	0.005	0.00002	0.00002	0.00002	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00010	<0.000100	<0.000100	<0.000100	<0.000100
Bismuth (Bi)-Dissolved	mg/L	-	0.1	0.00002	0.00002	0.00002					<0.00010	<0.00010	<0.000050	<0.000050	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L	12	0.1	0.072	0.008	0.008	0.037	0.012	0.037	0.06	0.032	0.0184	<0.010	<0.010	<0.020	<0.010	0.010	<0.010	0.013	0.014
Cadmium (Cd)-Dissolved	mg/L	0.0005-0.004	0.01	0.00011	0.0008	0.0005	0.00019	0.00059	0.00019	0.00022	0.000395	0.000372	0.00007	0.0000567	0.000079	0.0000249	0.0000449	0.000116	0.000149	0.000124
Calcium (Ca)-Dissolved	mg/L	-	34.5	48.1	83.0	63.1	50.6	38.6	50.6	50.4	50.8	62.1	52.2	57.0	46.6	57.4	54.4	62.5	49.9	50.8
Cesium (Cs)-Dissolved	mg/L												0.0	0.0	<0.000020	0.0	0.000011	0.000013	<0.000010	0.000020
Chromium (Cr)-Dissolved	mg/L	0.01 (e)	0.01	0.003	0.0006	0.0002	0.0006	<0.0005	0.0006	0.0005	0.00058	<0.00050	0.00027	0.00043	<0.00020	0.0003	0.00016	0.00021	<0.00050	<0.00050
Cobalt (Co)-Dissolved	mg/L	0.04	0.01	0.0039	0.0139	0.011	0.00338	0.0008	0.00338	0.00775	0.0117	0.0134	0.0117	0.0142	0.00932	0.016	0.00901	0.0148	0.00019	0.0146
Copper (Cu)-Dissolved	mg/L	0.02-0.09 (d,f)	0.01	0.00272	0.0046	0.00354	0.0186	0.0007	0.0186	0.0296	0.0271	0.00226	0.0006	0.00055	0.00065	0.00095	0.00083	0.00069	0.00109	0.00390
Iron (Fe)-Dissolved	mg/L	-	0.1	0.005	0.005	0.005	0.012	0.017	0.012	<0.010	<0.010	0.013	2.16	3.27	0.789	1.99	2.26	1.99	0.099	2.26
Lead (Pb)-Dissolved	mg/L	0.04-0.16 (d,f)	0.05	0.00001	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	0.000084	0.000107	<0.00010	<0.000050	0.000057	<0.000050	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L	-	0.05	0.00321	0.00379	0.00328	0.01	0.0042	0.01	0.0079	0.0061	0.00403	0.0033	0.0035	0.0029	0.0034	0.0034	0.0038	0.0034	0.0036
Magnesium (Mg)-Dissolved	mg/L	-	7.2	10.7	12.8	11.1	10.2	7.7	10.2	10.8	10.6	12.9	10.8	11.4	9.4	10.5	11.3	12.6	9.96	10.9
Manganese (Mn)-Dissolved	mg/L	-	0.94	0.0169	9.81	7.63	2.34	0.703	2.34	5.76	9.41	8.99	7.62	10.5	5.87	10.8	5.86	9.57	0.262	8.58
Mercury (Hg)-Dissolved	mg/L	0.00025			0.00005	0.00005	<0.00002	<0.00002	<0.00002		<0.00002	<0.000010	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	10	0.03	0.031	0.00065	0.00036	0.0004	0.0004	0.0004	0.0008	0.00072	0.00095	0.000337	0.000367	0.00016	0.000313	0.000316	0.000916	0.000081	0.000298
Nickel (Ni)-Dissolved	mg/L	0.25-1.5 (d,f)	0.2	0.0011	0.0305	0.0286	0.0112	0.0024	0.0112	0.0154	0.0182	0.0167	0.0131	0.0154	0.0101	0.0179	0.00908	0.0154	0.00562	0.0156
Phosphorus (P)-Dissolved	mg/L	-	0.3	0.1	0.1	0.1					<0.050	<0.050	<0.050	<0.050	<0.10	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	2.0	3.0	1.0	1.0	0.8	1.0	0.8	0.9	0.8	0.8	0.9	0.8	0.7	0.8	0.711	0.872	0.814	0.883
Rubidium (Rb)-Dissolved	mg/L												0.0	0.0	0.0	0.0	0.00055	0.00066	0.00080	0.00088
Selenium (Se)-Dissolved	mg/L	0.02	0.2	0.02	0.0004	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.000050	<0.000050	<0.000050	0.000054	<0.00010	0.000135	0.000058	0.000088	0.000061	0.000072
Silicon (Si)-Dissolved	mg/L	-									7	7.6	6.94	7.67	6.53	7.6	7.18	7.86	7.36	7.37
Silver (Ag)-Dissolved	mg/L	0.0005-0.015 (d)	0.01	0.00002	0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	-	8.0	110.0	5.0	5.0	8.9	25.9	8.9	9.0	7.9	5.1	7.7	4.7	6.7	4.1	7.08	5.61	10.0	5.72
Strontium (Sr) - Dissolved	mg/L	-	0.3	0.5	0.4	0.4					0.3	0.4	0.3	0.4	0.3	0.4	0.359	0.460	0.299	0.332
Sulfur (S)-Dissolved	mg/L	-		5806.0	0.7	1.1					<3.0	<3.0	2.3	2.0	2.6	1.6	2.85	2.57	2.70	2.05
Tellerium (Te)-Dissolved	mg/L	-		0.1	0.1						<0.00020	<0.00050	<0.00020	<0.00020	<0.00040	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L	0.003	0.1	0.00006	0.000026	0.000019	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	0.000011	<0.000010	<0.000020	0.000023	0.000012	0.000020	<0.000010	0.000026
Thorium (Th)-Dissolved	mg/L	-									<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L	-	0.3	0.00001	0.00001	0.00001	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	0.00038	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	1		0.003	0.003	0.003	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	0.00099	<0.0030	<0.00060	0.0003	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W)-Dissolved	mg/L												<0.00010	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L	0.085		0.000323	0.000208	0.000073	0.00017	0.00023	0.00017	0.00015	0.000121	0.000167	0.00008	0.00005	0.000091	0.000025	0.000106	0.000088	0.000124	0.000048
Vanadium (V)-Dissolved	mg/L	-	<0.3	0.00191	0.00078	0.00047	0.001	<0.001	0.001	<0.001	<0.0010	0.0011	<0.00050	0.00064	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L	0.075-2.4 (d)	0.036	0.0007	0.0046	0.0027	0.013	0.005	0.013	0.071	0.0793	0.0085	0.0049	0.0043	0.0061	0.0073	0.0033	0.0054	0.0053	0.0066
Zirconium (Zr)-Dissolved	mg/L	-		0.005	0.005	0.005					0.00011	<0.00010	0.000193	0.000148	<0.00012	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020

NOTES

CSR-AW *BC Contaminated Sites Regulation Water Qua*

(2) BC Contaminated Sites Regulation (CSR) for protection of aquatic life - 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% chron
(f) Where hardness data was unavailable, 50 mg/L was assumed
(g) Maximum value - secondary chronic effects from 0.014 mg/L
(h) Limit dependent upon chloride concentration
(i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change
** Criteria exceeds detection limit*

Table 1. Meziadin Landfill Groundwater Monitoring Results

		BC CSR	MW-2 - E251538																
Analyte	**Units**	**CSR-AW (2)**	Apr-97	Jul-03	2004	2006	3-May-15	9-Sep-15	3-May-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-20	15-Oct-20	19-Jul-21	27-Oct-21
Conductivity	uS/cm	-	520	389	488	512	505	496	505	457	491	369	450	309	251	462	477	404	430
Hardness (Total as CaCO3)	mg/L	-		265	167	190	151	174	151	139	154								
Hardness (Dissolved as CaCO3)	mg/L	-		149	188	190		168		-	-					114	143	107	128
pH	pH	-	7.90	8.20	8.10	8.20	7.80	8.00	7.80	7.6	7.80		8.36	8.18	8.25	8.22	8.26	7.56	8.22
Total Suspended Solids	mg/L	-		3200															
Total Dissolved Solids	mg/L	-	338		282	290	300	300	300	280	240	233	294	198	146	328	374	258	253
Alkalinity, Total (as CaCO3)	mg/L	-	146		182	188	210	200	210	200	200	166	205	134	114	219	208	173	173
Ammonia, Total (as N)	mg/L	1.3-18.4 (a)		0.01	0.07	0.04	<0.03	<0.03	<0.03	<0.03	0.04	<0.005	0.02	0.03	<0.0050	0.0708	0.62	<0.0050	0.13
Bromide (Br)	mg/L	-		0.1	0.1	0.1								<0.050	<0.050	<0.050	<0.050		
Chloride (Cl)	mg/L	1500	5.90	1.00	1.30	0.50	1.00	1.10	1.00	<1	<1	<0.5	<0.50	<0.50	<0.50	3.55	<0.50	<0.50	<0.50
Fluoride (F)	mg/L	2.0-3.0 (e)	0.19					0.14		0.15	0.15	0.136	0.181	0.117	0.138	0.186	0.191	0.181	0.16
Nitrate (as N)	mg/L	400	0.01		0.004	0.038						0.187	0.0105	0.449	0.383	0.0894	<0.0050	0.205	0.115
Nitrite (as N)	mg/L	0.2-2.0 (h)	0.01		0.002	0.004						0.0011	<0.0010	0.0035	<0.0010	0.0081	<0.0010	0.0012	0.0058
Nitrate + Nitrite (as N)	mg/L	-			0.004	0.042	0.028	0.038	0.028	0.0310	0.015								
Total Kjeldahl Nitrogen	mg/L	-			0.19	0.1	0.14	0.08	0.14	0.109	0.325	0.083	0.082	0.445	0.172	1.61	1.95	0.052	0.21
Phosphorus (P)-Total	mg/L	-			0.923	0.351													
Sulfate (SO4)	mg/L	1289-4290	103	47	77	86	59	66	59	55	50	43	49	33	22	42.5	40.9	43	47
BOD	mg/L	-			10														
COD	mg/L	-		10	10	10	<20	<20	<20	25	<20	<20	<20	<20	<20	45	31	<20	<20
Dissolved Metals																			
Aluminum (Al)-Dissolved	mg/L	-	0.2	0.0047	0.002	0.0043	<0.005	<0.005	<0.005	<0.0050	<0.0050	0.0026	0.0015	0.0191	0.0058	0.0095	0.0050	0.0045	0.0019
Antimony (Sb)-Dissolved	mg/L	0.09	0.2	0.00002	0.000127	0.000096	0.0002	0.0001	0.0002	0.0001	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	0.00012	<0.00010	0.00018	0.00015
Arsenic (As)-Dissolved	mg/L	0.05	0.2	0.0007	0.0006	0.0005	<0.0005	<0.0005	<0.0005	<0.00050	0.0006	0.00027	0.00037	0.00044	0.00026	0.00056	0.00062	0.00052	0.00063
Barium (Ba)-Dissolved	mg/L	10	0.19	0.0812	0.0798	0.0825	0.056	0.059	0.056	0.0927	0.0629	0.0498	0.0527	0.0524	0.0335	0.0537	0.0596	0.0462	0.0568
Beryllium (Be)-Dissolved	mg/L	0.0015	0.005	0.00002	0.00002	0.00002	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000100	<0.000100	<0.000100	<0.000100
Bismuth (Bi)-Dissolved	mg/L	-	0.1	0.00002	0.00002	0.00002				<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L	12	0.1	0.048	0.056	0.053	0.06	0.058	0.06	0.059	0.0589	0.036	0.053	0.046	0.026	0.049	0.058	0.044	0.050
Cadmium (Cd)-Dissolved	mg/L	0.0005-0.004	0.01	0.00044	0.00025	0.00021	0.00017	0.00021	0.00017	0.000494	0.000192	0.000493	0.000157	0.00111	0.00125	0.000247	<0.0000400	0.000129	0.0000240
Calcium (Ca)-Dissolved	mg/L	-	60.2	40.6	52.2	53.9	39.7	46.8	39.7	37.2	40.6	31.3	37.9	34.7	18.2	30.4	38.9	29.4	34.8
Cesium (Cs)-Dissolved	mg/L											<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.01 (e)	0.01	0.0015	0.0002	0.0002	0.0012	<0.0005	0.0012	<0.00050	<0.00050	0.00035	<0.00010	0.00017	0.00016	0.00015	<0.00010	<0.00050	<0.00050
Cobalt (Co)-Dissolved	mg/L	0.04	0.01	0.000311	0.000285	0.00009	<0.00005	<0.00005	<0.00005	0.00014	0.00028	<0.00010	0.0001	0.00015	<0.00010	0.00057	0.00050	<0.00010	0.00014
Copper (Cu)-Dissolved	mg/L	0.02-0.09 (d,f)	0.01	0.0026	0.0014	0.00078	0.0008	0.0005	0.0008	0.00558	<0.00040	0.00092	<0.00020	0.0007	0.00146	0.00194	0.00039	0.00039	0.00140
Iron (Fe)-Dissolved	mg/L	-	0.12	0.005	0.005	0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.021	<0.010	0.011	0.047	<0.010	0.085
Lead (Pb)-Dissolved	mg/L	0.04-0.16 (d,f)	0.05	0.00001	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	<0.000050	<0.000050	<0.000050	<0.000050	0.000147	<0.000050	<0.000050	0.000080
Lithium (Li)-Dissolved	mg/L	-	0.01	0.00158	0.00197	0.0024	0.0035	0.0028	0.0035	0.0023	0.00296	0.002	0.0026	0.0024	0.0015	0.0026	0.0028	0.0023	0.0029
Magnesium (Mg)-Dissolved	mg/L	-	12.6	11.5	13.9	14.0	12.5	12.5	12.5	11.2	12.7	8.7	11.5	10.2	4.8	9.21	11.2	8.06	9.91
Manganese (Mn)-Dissolved	mg/L	-	0.709	0.239	0.258	0.198	0.0011	0.0006	0.0011	0.0517	0.162	0.0108	0.0821	0.144	0.0109	0.344	0.263	0.00684	0.166
Mercury (Hg)-Dissolved	mg/L	0.00025			0.00005	0.00005	<0.00002	<0.00002	<0.00002	<0.00002	<0.000010	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	10	0.03	0.00914	0.00971	0.0114	0.0161	0.015	0.0161	0.0135	0.0175	0.0103	0.0198	0.0182	0.0151	0.0236	0.0208	0.0165	0.0132
Nickel (Ni)-Dissolved	mg/L	0.25-1.5 (d,f)	0.02	0.00113	0.0012	0.00083	0.0003	0.0005	0.0003	0.00084	0.00173	<0.00050	0.00092	0.00117	0.00083	0.00269	0.00091	<0.00050	<0.00050
Phosphorus (P)-Dissolved	mg/L	-	0.3	0.1	0.1	0.1				<0.050	<0.050	<0.050	<0.050	0.063	0.065	0.052	0.075	<0.050	0.070
Potassium (K)-Dissolved	mg/L	-	2.0	2.0	2.0	2.0	2.0	1.8	2.0	1.8	1.8	1.6	1.9	1.9	1.2	2.33	2.15	1.61	1.79
Rubidium (Rb)-Dissolved	mg/L											0.0	0.0	0.0	<0.00020	0.00064	0.00035	<0.00020	0.00024
Selenium (Se)-Dissolved	mg/L	0.02	0.2	0.0029	0.0004	0.0004	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.000088	<0.000050	0.000054	0.000158	0.000135	0.000198	0.000409	0.000084
Silicon (Si)-Dissolved	mg/L	-								4.1	4	4.28	3.95	3.98	4.12	3.80	4.31	4.27	4.26
Silver (Ag)-Dissolved	mg/L	0.0005-0.015 (d)	0.01	0.00002	0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	-	34.0	31.7	39.3	44.7	49.6	44.1	49.6	44.0	49.1	34.0	47.2	46.3	32.0	55.1	53.6	48.5	49.2
Strontium (Sr) - Dissolved	mg/L	-	0.3	0.4	0.5	0.6				0.4	0.5	0.4	0.5	0.4	0.2	0.370	0.504	0.399	0.408
Sulfur (S)-Dissolved	mg/L	-		16.2	24.5	29.5				16.0	18.1	12.9	16.4	14.4	6.7	13.2	16.1	15.3	16.1
Tellerium (Te)-Dissolved	mg/L	-		0.1	0.1					<0.00020	<0.00050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L	0.003	0.1	0.000065	0.00003	0.000022	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L	-								<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L	-	0.03	0.00001	0.00003	0.00001	0.0004	0.0002	0.0004	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	0.00013	0.00015	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	1	0.01	0.003	0.003	0.003	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.00030	<0.00030	0.00092	0.00041	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W)-Dissolved	mg/L											<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L	0.085		0.00166	0.00188	0.00215	0.00252	0.00216	0.00252	0.00181	0.00225	0.00127	0.0019	0.0019	0.00123	0.00224	0.00196	0.00191	0.00180
Vanadium (V)-Dissolved	mg/L	-	0.03	0.00359	0.00133	0.00068	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L	0.075-2.4 (d)	0.037	0.0004	0.0001	0.00001	<0.004	<0.004	<0.004	0.0191	<0.0040	0.0053	<0.0010	0.0053	0.0091	0.0077	<0.0010	0.0025	0.0019
Zirconium (Zr)-Dissolved	mg/L	-		0.005	0.005	0.005				<0.00010	<0.00010	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020

NOTES

CSR-AW — *BC Contaminated Sites Regulation Water Qua*

(2) BC Contaminated Sites Regulation (CSR) for protection of aquatic life - Schedule 3.2
(a) range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 ℃
(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% chron
(f) Where hardness data was unavailable, 50 mg/L was assumed
(g) Maximum value - secondary chronic effects from 0.014 mg/L
(h) Limit dependent upon chloride concentration
(i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change
** Criteria exceeds detection limit*

Table 1. Meziadin Landfill Groundwater Monitoring Results

		BC CSR	MW-3 - E251539																
Analyte	**Units**	**CSR-AW (2)**	Jul-03	2004	2006	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-20	15-Oct-20	19-Jul-21	27-Oct-21
Conductivity	uS/cm	-		785	766	676	680	676	669	640	647	612	628	649	643	660	700	723	761
Hardness (Total as CaCO3)	mg/L	-	473	261	320	199	230	199	194	182	197								
Hardness (Dissolved as CaCO3)	mg/L	-		288	300		218									212	216	238	250
pH	pH	-		8.20	7.90	8.00	8.00	8.00	7.90	7.80	7.70		8.32	8.33	8.41	8.19	8.17	7.98	8.38
Total Suspended Solids	mg/L	-																	
Total Dissolved Solids	mg/L	-		496	520	430	430	430	420	420	320	412	420	398	400	417	450	486	473
Alkalinity, Total (as CaCO3)	mg/L	-		197	201	190	190	190	190	190	180	193	195	193	203	212	192	201	199
Ammonia, Total (as N)	mg/L	1.3-18.4 (a)		0.02	0.02	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.02	0.03	<0.0050	0.06	<0.0050	0.0166	0.03	<0.0050
Bromide (Br)	mg/L	-		0.1	0.1									<0.050	<0.050	<0.250	<0.050		
Chloride (Cl)	mg/L	1500		1.50	1.10	1.20	1.20	1.20	1.20	1.10	<1.0	0.76	<2.5	0.57	0.93	<2.50	<0.50	<2.50	<2.50
Fluoride (F)	mg/L	2.0-3.0 (e)					<0.10			0.1	0.1	0.095	<0.10	0.085	0.087	<0.100	0.080	<0.100	<0.100
Nitrate (as N)	mg/L	400		0.137	0.163							0.121	0.066	0.165	0.306	0.134	0.0357	0.0974	0.182
Nitrite (as N)	mg/L	0.2-2.0 (h)		0.027	0.012							<0.0010	<0.0050	<0.0010	0.0078	<0.0050	<0.0010	0.0051	<0.0050
Nitrate + Nitrite (as N)	mg/L	-		0.164	0.175	0.256	0.270	0.256	0.248	-	0.204								
Total Kjeldahl Nitrogen	mg/L	-		0.14	0.04	0.27	0.12	0.27	0.2	0.224	0.213	0.173	0.098	0.105	0.38	0.059	0.233	0.104	0.089
Phosphorus (P)-Total	mg/L	-		0.434	0.82														
Sulfate (SO4)	mg/L	1289-4290		210	205	161	156	161	112	154	148	148	156	157	151	156	156	196	189
BOD	mg/L	-		10															
COD	mg/L	-		10	10	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	24
Dissolved Metals																			
Aluminum (Al)-Dissolved	mg/L	-		0.0024	0.0044	<0.005	0.012	<0.005	0.007	<0.0050	<0.0050	0.0043	0.0021	0.002	0.0053	0.0967	0.0105	0.0029	0.0050
Antimony (Sb)-Dissolved	mg/L	0.09		0.000122	0.000146	0.0001	<0.0001	0.0001	0.0003	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	0.00010
Arsenic (As)-Dissolved	mg/L	0.05		0.0004	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00024	0.00023	0.00022	0.00021	0.00029	0.00026	0.00023	0.00026
Barium (Ba)-Dissolved	mg/L	10		0.0377	0.0321	0.03	0.025	0.03	0.081	0.0805	0.0286	0.0296	0.0275	0.0288	0.0301	0.0304	0.0331	0.0310	0.0345
Beryllium (Be)-Dissolved	mg/L	0.0015		0.00002	0.00002	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000100	<0.000100	<0.000100	<0.000100
Bismuth (Bi)-Dissolved	mg/L	-		0.00002	0.00002					<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L	12		0.072	0.065	0.07	0.068	0.07	0.085	0.068	0.0711	0.061	0.06	0.062	0.068	0.063	0.065	0.060	0.070
Cadmium (Cd)-Dissolved	mg/L	0.0005-0.004		0.00013	0.00015	0.00025	0.00055	0.00025	0.00039	0.000275	0.000321	0.000106	0.000111	0.000213	0.000668	0.0000950	0.0000216	0.000179	0.0000826
Calcium (Ca)-Dissolved	mg/L	-		86.7	89.7	58.1	65.0	58.1	55.7	53.3	57.1	62.3	53.4	61.8	67.3	62.0	64.0	70.9	73.9
Cesium (Cs)-Dissolved	mg/L											<0.000010	<0.000010	<0.000010	<0.000010	0.000012	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.01 (e)		0.0002	0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	0.00027	<0.00010	<0.00050	<0.00050
Cobalt (Co)-Dissolved	mg/L	0.04		0.000118	0.000113	<0.00005	<0.00005	<0.00005	<0.00005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00027	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.02-0.09 (d,f)		0.00098	0.00018	0.0008	0.0009	0.0008	0.028	0.0111	0.00046	0.00065	0.00034	0.00055	0.00188	0.00118	0.00298	0.00040	0.00159
Iron (Fe)-Dissolved	mg/L	-		0.005	0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017	<0.010	<0.010	0.178	0.024	0.037	<0.010
Lead (Pb)-Dissolved	mg/L	0.04-0.16 (d,f)		0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	<0.000050	<0.000050	<0.000050	<0.000050	0.000180	0.000109	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L	-		0.00428	0.00481	0.0054	0.0048	0.0054	0.0065	0.00433	0.005	0.0045	0.0043	0.0045	0.0048	0.0047	0.0046	0.0045	0.0055
Magnesium (Mg)-Dissolved	mg/L	-		17.3	17.7	13.2	13.6	13.2	13.4	11.8	13.0	12.7	12.5	13.5	13.2	13.9	13.8	14.8	15.9
Manganese (Mn)-Dissolved	mg/L	-		0.218	0.114	0.0041	0.0027	0.0041	0.0424	0.00546	0.0175	0.00868	0.0162	0.00278	0.105	0.0471	0.00916	0.00554	0.00224
Mercury (Hg)-Dissolved	mg/L	0.00025		0.00005	0.00005	<0.00002	<0.00002	<0.00002		<0.00002	<0.000010	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	10		0.00579	0.0058	0.0063	0.0065	0.0063	0.0064	0.00607	0.00667	0.00603	0.00472	0.00596	0.00554	0.00525	0.00546	0.00358	0.00361
Nickel (Ni)-Dissolved	mg/L	0.25-1.5 (d,f)		0.00058	0.00112	0.0002	0.0025	0.0002	0.0003	0.00023	0.00066	0.00052	<0.00050	<0.00050	0.00073	0.00085	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved	mg/L	-		0.1	0.1					<0.050	<0.050	<0.050	<0.050	<0.050	0.065	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-		2.0	2.0	1.8	1.8	1.8	1.9	1.7	1.7	2.0	1.7	1.9	2.2	1.84	1.87	1.92	2.08
Rubidium (Rb)-Dissolved	mg/L											0.0	0.0	0.0	0.0	0.00037	0.00028	0.00026	0.00033
Selenium (Se)-Dissolved	mg/L	0.02		0.0004	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.000298	0.000199	0.000298	0.000179	0.000408	0.000347	0.000600	0.000664
Silicon (Si)-Dissolved	mg/L	-								3.1	3.4	3.35	3.22	3.4	3.42	3.47	3.93	3.63	3.68
Silver (Ag)-Dissolved	mg/L	0.0005-0.015 (d)		0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	-		64.9	69.2	63.3	65.3	63.3	65.0	60.5	66.0	63.5	57.4	65.1	61.4	63.5	66.4	63.4	68.9
Strontium (Sr) - Dissolved	mg/L	-		0.7	0.8					0.5	0.5	0.6	0.6	0.5	0.7	0.610	0.684	0.753	0.723
Sulfur (S)-Dissolved	mg/L	-		71.5	74.8					45.5	48.6	49.3	47.7	50.9	49.7	52.5	63.6	66.2	65.5
Tellerium (Te)-Dissolved	mg/L	-		0.1						<0.00020	<0.00050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L	0.003		0.000022	0.000032	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L	-								<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L	-		0.00001	0.00002	0.0009	0.0004	0.0009	<0.0002	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	1		0.003	0.003	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.00030	<0.00030	<0.00030	0.00051	0.00185	<0.00030	<0.00030	<0.00030
Tungsten (W)-Dissolved	mg/L											<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L	0.085		0.00251	0.00255	0.00175	0.00161	0.00175	0.00144	0.00134	0.00159	0.00148	0.00119	0.00147	0.00139	0.00142	0.00149	0.00156	0.00163
Vanadium (V)-Dissolved	mg/L	-		0.00019	0.00027	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L	0.075-2.4 (d)		0.0001	0.0001	<0.004	0.005	<0.004	0.013	0.0149	<0.0040	0.0015	0.0021	0.0012	0.009	0.0025	0.0017	0.0033	0.0035
Zirconium (Zr)-Dissolved	mg/L	-		0.005	0.005					<0.00010	<0.00010	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020

NOTES

CSR-AW *BC Contaminated Sites Regulation Water Qua*

(2) BC Contaminated Sites Regulation (CSR) for protection of aquatic life - 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% chron
(f) Where hardness data was unavailable, 50 mg/L was assumed
(g) Maximum value - secondary chronic effects from 0.014 mg/L
(h) Limit dependent upon chloride concentration
(i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change
** Criteria exceeds detection limit*

Table 1. Meziadin Landfill Groundwater Monitoring Results

		BC CSR	MW-4 - E251540																	
Analyte	**Units**	**CSR-AW (2)**	Apr-97	Jul-03	2004	2006	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-May-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-20	15-Oct-20	19-Jul-21	27-Oct-21
Conductivity	uS/cm	-	845	622	730	692	567	476	567	586	594	598	616	641	637	606	627	645	705	712
Hardness (Total as CaCO3)	mg/L	-		367	263	320	188	218	188	180	177	186								
Hardness (Dissolved as CaCO3)	mg/L	-	323	227	289	250		199									199	201	234	242
pH	pH	-	7.90	8.10	7.90	8.20	7.90	8.00	7.90	7.9	7.8	7.80		8.33	8.29	8.26	8.16	8.18	7.80	8.26
Total Suspended Solids	mg/L	-		1530		296														
Total Dissolved Solids	mg/L	-	626		454	440	350	290	350	360	370	290	467	422	408	383	445	417	459	450
Alkalinity, Total (as CaCO3)	mg/L	-			216	214	180	190	180	180	180	180	173	191	187	192	196	175	195	193
Ammonia, Total (as N)	mg/L	1.3-18.4 (a)		0.01	0.02	0.05	<0.03	<0.03	<0.03	0.09	0.07	0.07	0.02	0.04	0.01	<0.0050	<0.0050	0.0067	0.01	0.0093
Bromide (Br)	mg/L	-		0.1	0.1	0.1									<0.050	<0.050	<0.050	<0.050		
Chloride (Cl)	mg/L	1500	5.00	0.70	0.90	0.50	1.30	<1.0	1.30	1.00	1.20	1.10	<0.50	<2.5	<0.050	<0.50	<0.50	<0.50	<2.50	0.52
Fluoride (F)	mg/L	2.0-3.0 (e)	0.2					0.11			0.13	0.11	0.109	0.1	0.106	0.107	0.100	0.106	<0.100	0.098
Nitrate (as N)	mg/L	400	0.01		0.037	0.015							0.42	<0.025	0.0819	0.0414	0.0443	0.0266	<0.025	0.130
Nitrite (as N)	mg/L	0.2-2.0 (h)	0.01		0.002	0.002							<0.0010	<0.0050	<0.0010	<0.0010	<0.0010	<0.0010	<0.0050	0.0016
Nitrate + Nitrite (as N)	mg/L	-			0.037	0.017	0.153	0.378	0.153	0.114	0.030	0.092								
Total Kjeldahl Nitrogen	mg/L	-			0.12	0.03	0.14	0.12	0.14	3.76	0.788	0.819	0.678	0.087	0.074	<0.050	<0.050	0.601	<0.050	0.124
Phosphorus (P)-Total	mg/L	-			0.865	0.97														
Sulfate (SO4)	mg/L	1289-4290	274	156	191	148	110	64	110	151	131	122	155	157	151	148	143	142	189	171
BOD	mg/L	-		6	10															
COD	mg/L	-		10	10	10	<20	<20	<20	<20	42	<20	<20	<20	<20	<20	<20	<20	<20	<20
Dissolved Metals																				
Aluminum (Al)-Dissolved	mg/L	-	0.2	0.0039	0.0016	0.0051	<0.005	<0.005	<0.005	<0.005	0.0053	<0.0050	0.0058	0.0013	0.0017	<0.0010	0.0036	0.644	0.0046	0.0012
Antimony (Sb)-Dissolved	mg/L	0.09	0.2	0.00029	0.000178	0.000343	0.0001	0.0001	0.0001	0.0003	0.00027	0.00023	<0.00010	<0.00010	<0.00010	<0.00010	0.00016	0.00025	0.00017	0.00020
Arsenic (As)-Dissolved	mg/L	0.05	0.2	0.0002	0.0003	0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00015	0.00017	0.00015	0.00015	0.00014	0.00060	0.00013	0.00016
Barium (Ba)-Dissolved	mg/L	10	0.21	0.0453	0.0306	0.0394	0.035	0.082	0.035	0.119	0.103	0.0251	0.0252	0.0236	0.0226	0.0217	0.0233	0.0356	0.0226	0.0274
Beryllium (Be)-Dissolved	mg/L	0.0015	0.005	0.00002	0.00002	0.00002	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.000100	<0.000100	<0.000100	<0.000100
Bismuth (Bi)-Dissolved	mg/L	-	0.1	0.00002	0.00002	0.00002					<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L	12	0.1	0.064	0.072	0.058	0.064	0.046	0.064	0.079	0.08	0.0763	0.066	0.069	0.064	0.074	0.066	0.072	0.067	0.078
Cadmium (Cd)-Dissolved	mg/L	0.0005-0.004	0.01	0.00057	0.00027	0.00012	0.00034	0.00013	0.00034	0.00022	0.000056	0.000035	0.0001126	0.0000858	0.000398	0.000032	0.0000933	0.000189	0.000140	0.0000374
Calcium (Ca)-Dissolved	mg/L	-	94.9	65.5	85.0	75.3	52.9	55.6	52.9	50.9	51.7	53.7	66.0	62.8	58.9	66.3	57.3	58.7	70.1	71.3
Cesium (Cs)-Dissolved	mg/L												<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	0.000059	<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L	0.01 (e)	0.01	0.0021	0.0002	0.0002	<0.0005	0.0011	<0.0005	<0.0005	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00158	<0.00050	<0.00050
Cobalt (Co)-Dissolved	mg/L	0.04	0.01	0.000005	0.000123	0.000005	<0.00005	<0.00005	<0.00005	0.00017	0.0003	0.00015	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00105	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L	0.02-0.09 (d,f)	0.01	0.00119	0.00054	0.00058	0.001	0.0006	0.001	0.0126	0.0131	<0.00040	0.00023	0.00039	0.00037	0.00036	0.00025	0.00566	0.00021	0.00312
Iron (Fe)-Dissolved	mg/L	-	0.04	0.005	0.005	0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.04	0.015	<0.010	<0.010	0.015	1.06	<0.010	<0.010
Lead (Pb)-Dissolved	mg/L	0.04-0.16 (d,f)	0.05	0.00001	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00101	<0.000050	0.000127
Lithium (Li)-Dissolved	mg/L	-	0.01	0.00406	0.00547	0.00529	0.0068	0.0026	0.0068	0.0039	0.00466	0.00752	0.0047	0.0047	0.0045	0.0047	0.0044	0.0052	0.0045	0.0055
Magnesium (Mg)-Dissolved	mg/L	-	21.0	15.4	18.6	15.8	13.5	14.7	13.5	12.9	11.7	12.6	13.8	14.3	13.2	13.4	13.7	13.1	14.2	15.6
Manganese (Mn)-Dissolved	mg/L	-	0.203	0.0214	0.137	0.112	0.129	0.002	0.129	0.415	0.509	0.572	0.12	0.235	0.0752	0.00566	0.00675	0.245	0.0142	0.00092
Mercury (Hg)-Dissolved	mg/L	0.00025	0.03		0.00005	0.00005	<0.00002	<0.00002	<0.00002		<0.00002	<0.000010	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000086	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	10	0.03	0.011	0.00941	0.00965	0.0108	0.0104	0.0108	0.0114	0.0136	0.014	0.00801	0.00881	0.00761	0.00856	0.00631	0.00521	0.00507	0.00468
Nickel (Ni)-Dissolved	mg/L	0.25-1.5 (d,f)	0.02	0.00005	0.00062	0.00013	0.0004	0.0009	0.0004	0.0009	0.00181	0.00105	<0.00050	0.00058	<0.00050	<0.00050	<0.00050	0.00345	<0.00050	<0.00050
Phosphorus (P)-Dissolved	mg/L	-	0.3	0.1	0.1	0.1					<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L	-	5.0	3.0	3.0	2.0	2.4	2.2	2.4	2.3	2.3	2.3	2.4	2.2	2.3	2.5	2.28	2.32	2.26	2.50
Rubidium (Rb)-Dissolved	mg/L												0.0	0.0	0.0	0.0	0.00031	0.00056	0.00034	0.00035
Selenium (Se)-Dissolved	mg/L	0.02					<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00028	0.000261	0.000197	0.000269	0.000293	0.000300	0.000313	0.000391
Silicon (Si)-Dissolved	mg/L	-	0.2	0.6	0.0006	0.0006					3.6	3.7	3.85	3.83	3.58	3.85	3.71	6.83	3.88	4.12
Silver (Ag)-Dissolved	mg/L	0.0005-0.015 (d)	0.01	0.00002	0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L	-	74.0	49.9	55.8	58.0	43.5	24.5	43.5	51.2	54.0	57.0	58.4	56.5	56.9	56.5	59.3	57.8	58.0	63.8
Strontium (Sr) - Dissolved	mg/L	-	0.9	0.6	0.8	0.8					0.6	0.6	0.7	0.7	0.6	0.7	0.651	0.691	0.853	0.799
Sulfur (S)-Dissolved	mg/L	-	0.1	43.9	57.0	52.7					40.4	42.4	52.8	54.5	48.8	49.3	48.5	56.7	63.0	63.5
Tellerium (Te)-Dissolved	mg/L	-		0.1	0.1						<0.00020	<0.00050	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L	0.003	0.1	0.000014	0.00001	0.000023	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L	-									<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00017	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L	-	0.03	0.00001	0.00002	0.00001	<0.0002	0.0004	<0.0002	<0.0002	<0.00020	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved	mg/L	1	0.01	0.003	0.003	0.003	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	0.0128	<0.00030	<0.00030
Tungsten (W)-Dissolved	mg/L												<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L	0.085		0.00116	0.00144	0.00145	0.00089	0.00049	0.00089	0.00081	0.000972	0.00102	0.000952	0.000858	0.001	0.000978	0.000938	0.000960	0.000985	0.00106
Vanadium (V)-Dissolved	mg/L	-	0.03	0.00098	0.00026	0.00045	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.00169	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L	0.075-2.4 (d)	0.038	0.0008	0.0001	0.0001	<0.004	0.005	<0.004	0.025	0.0264	<0.0040	0.0016	<0.0010	<0.0010	<0.0010	0.0010	0.0075	<0.0010	0.0022
Zirconium (Zr)-Dissolved	mg/L	-		0.005		0.005					<0.00010	<0.00010	<0.000060	<0.000060	<0.000060	<0.00020	<0.00020	0.00030	0.00075	<0.00020

NOTES

CSR-AW *BC Contaminated Sites Regulation Water Qua*

(2) BC Contaminated Sites Regulation (CSR) for protection of aquatic life - 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% chron
(f) Where hardness data was unavailable, 50 mg/L was assumed
(g) Maximum value - secondary chronic effects from 0.014 mg/L
(h) Limit dependent upon chloride concentration
(i) Change of 25 mg/L from background for a duration of 24 hours during clear flows. Change
** Criteria exceeds detection limit*

APPENDIX F
Surface Water Analytical Tables

Table 2. Meziadin Landfill Surface Water Monitoring Results

		BC MoE Guidelines	SW-1																
			Meziadin - Upstream Surface Water Log Weir																
Analyte	**Units**	**Freshwater Aquatic Life (1)**	2004	2006	2007	Jun-08	Sep-09	6-Apr-10	28-Sep-10	1-Jun-13	25-Sep-13	8-Jul-14	7-Oct-14	28-Apr-15	9-Sep-15	28-Apr-16	13-Sep-16	1-Apr-17
Conductivity	uS/cm	-	40	70	49	52.3	28.9	16.2	40.2	71.6	56.2	44.4	31.7	15.3	32.7	20	49.2	19.1
Hardness (Total as CaCO3)	mg/L	-	18.60					9.66	18.92	34.60	19.60	20.5	12.4	6.4	13.3	8.4	20.4	7.99
pH	pH	6.5-9.0	7.3	7.4	7.14	7.2	6.3	6.2	6.1	6.9	6.40	7.10	6.50	6.10	6.00	6.20	6.50	6.1
Total Suspended Solids	mg/L	25 mg/L (backgr. 25-250 mg/l)) (i)	14	<4											4.2	1.6	5.5	7.5
Total Dissolved Solids	mg/L	-	24	40														
Alkalinity, Total (as CaCO3)	mg/L	-	17	23	26	26	13	12	14	38	20	23	9	8	9	10	12	8
Ammonia, Total (as N)	mg/L	0.681-28.7 (a)	0.005	<0.005	ND	ND	ND	ND	ND	0.03	0.03	<0.03	0.05	<0.03	<0.03	<0.03	0.03	0.03
Bromide (Br)	mg/L	-	0.1	<0.1														
Chloride (Cl)	mg/L	150 Chronic, 600 Acute	0.5	<0.5	0.6	1.7	ND	ND		ND	<1	<1	<1	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride (F)	mg/L														<0.10			
Nitrate (as N)	mg/L	32.8	0.002	0.007														
Nitrite (as N)	mg/L	0.06-0.6 (h)	0.002	<0.002														
Nitrate + Nitrite (as N)	mg/L	-	0.002	0.007											0.013	<0.010	0.034	<1.0
Total Kjeldahl Nitrogen	mg/L	-	0.24	0.16	0.38	0.27	0.40	0.14	0.34	0.28	10.70	0.74	0.46	0.19	1.07	0.22	0.53	0.53
Phosphorus (P)-Total	mg/L	-	0.012	0.032														
Sulfate (SO4)	mg/L	128-429 (d)	1.2	8.8	ND	ND	2.0	ND		ND	11.1	0.9	<0.5	<1.0	4.8	<1.0	0.034	<1.0
BOD	mg/L	-	10		ND	ND	ND	ND	ND	ND	<4	<6	<4	<4.0	<4.0	<4.0	<4.0	<4.0
COD	mg/L	-	15	<10	ND	ND	30	14	30	ND	<20	<20	35	22	<20	<20	<20	<20
Total Metals																		
Aluminum (Al)-Total	mg/L		0.176	0.352	0.02	0.037	0.295	0.144	0.421	0.0318	0.182	0.132	0.337	0.159	0.087	0.179	0.116	0.174
Antimony (Sb)-Total	mg/L	0.009	0.000022	0.000041	ND	ND	ND				0.000075	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	0.0002	<0.00010
Arsenic (As)-Total	mg/L	0.005	0.0001	0.0001	ND	0.0002	0.002			0.00031	0.000339	0.00083	0.00028	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050
Barium (Ba)-Total	mg/L	1	0.0113	0.0155	0.011	0.008	0.014	0.01	0.014	0.0239	0.0124	0.0487	0.0172	0.009	0.018	0.011	0.014	0.0075
Beryllium (Be)-Total	mg/L	0.00013	0.00002	0.00002	ND	ND	ND				<0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010
Bismuth (Bi)-Total	mg/L	-	0.00002	<0.00002	ND	ND	ND				-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010
Boron (B)-Total	mg/L	1.2	0.0080	<0.008	ND	ND	ND				<0.05	<0.05	<0.05	0.011	<0.004	0.005	0.011	<0.004
Cadmium (Cd)-Total	mg/L		0.0000100	0.0000300	ND	0.0001500	ND	0.0000100		0.0003480	0.0000180	0.000097	0.000011	0.00002	0.00009	0.00003	0.00004	<0.000010
Calcium (Ca)-Total	mg/L	up to 4, highly sensitive to acid inputs 4 to 8, moderately sensitive over 8 low sensitivity	5.3	8.6	6.6	6.7	4.9	2.7	5.4	10.1	5.3	5.9	3.3	1.8	3.8	2.3	5.4	2.13
Cesium (Cs)-Total	mg/L																	
Chromium (Cr)-Total	mg/L	0.001 (Cr VI), 0.0089 (Cr III) (e)	0.0003	0.0007	ND	ND	ND		0.001		0.00069	<0.001	<0.001	<0.0005	0.0011	0.0005	0.0006	<0.00050
Cobalt (Co)-Total	mg/L	0.11 Acute, 0.004 Chronic	0.000035	0.000118	ND	ND	ND			0.00099	0.000206	0.00617	<0.0005	0.00012	0.00138	0.0002	0.00109	0.00007
Copper (Cu)-Total	mg/L	Hardness-Dependent 0.0032-0.0396 (d,f)	0.00079	0.00156	0.004	0.0059	0.0054	0.0008	0.0025	0.00054	0.00269	0.00152	0.00194	0.0032	0.0023	0.002	0.0028	0.00105
Iron (Fe)-Total	mg/L	1	0.063	0.361	0.048	0.166	0.285	0.093	0.0025	0.324	0.248	1.53	0.25	0.10	0.28	0.16	0.22	0.18
Lead (Pb)-Total	mg/L	0.003-4.17 (d,f)	0.00001	0.00035	ND	ND	0.0003				0.000057	<0.0002	<0.0002	<0.0001	<0.0001	0.0005	<0.0001	<0.00010
Lithium (Li)-Total	mg/L		0.0	0.0	1.6	ND	ND				<0.0005	<0.005	<0.005	0.0003	0.0001	0.0001	0.0002	0.00012
Magnesium (Mg)-Total	mg/L	-	1.29	2.2	1.57	1.61	1.2	0.69	1.3	2.3	1.56	1.42	0.984	0.48	0.93	0.62	1.39	0.646
Manganese (Mn)-Total	mg/L	0.8-3.4 (d,f)	0.0042	0.01	0.04	0.09	0.01	0.03	0.03	1.00	0.07	2.54	0.01	0.04	0.66	0.09	0.72	0.02
Mercury (Hg)-Total	mg/L	0.0001	0.0001	0.0001	ND	0.00001	ND		0.00001		<0.00001	<0.00001	<0.00001	<0.00002	<0.00002			<0.00002
Molybdenum (Mo)-Total	mg/L	46 Acute, 7.6 Chronic	0.0001	0.000	0.0	ND	ND	0.001	0.001		<0.00005	<0.001	<0.001	<0.0001	<0.0001	<0.0001	0.0001	<0.00010
Nickel (Ni)-Total	mg/L	0.025-0.15 (d,f)	0.00118	0.00141	ND	0.001	0.002		0.002	0.0034	0.00243	0.0065	0.0021	0.0011	0.0037	0.0013	0.0029	0.0014
Phosphorus (P)-Total	mg/L	-	0.1	0.1	ND					0.022	0.124	0.1010	0.0380	<0.02	0.14	0.04	0.05	<0.050
Potassium (K)-Total	mg/L	-	1	1	ND	0.2	0.38	0.14	1.59	0.317	1.38	0.154	0.667	0.21	0.79	0.22	0.92	0.27
Rubidium (Rb)-Total	mg/L																	
Selenium (Se)-Total	mg/L	0.002	0.0002	0.0002	ND	ND	ND		0.0002		0.000081	<0.0001	0.00011	0.0011	<0.0005	<0.0005	<0.0005	<0.00050
Silicon (Si) - Total	mg/L	-					3.6				-	-	-	-	1.1	2.1	3	2.1
Silver (Ag)-Total	mg/L	0.0001-0.003 (d)	0.00002	<0.00002	ND	1.8			0.0		<0.000005	<0.00002	<0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050
Sodium (Na)-Total	mg/L	-	1.19	1.69	1.45	ND	0.96	0.69	1.22	1.37	1.24	1.30	1.02	0.63	0.68	0.71	1.34	0.77
Strontium (Sr) - Total	mg/L	-	0.0348	0.0488	0.046	1.92	0.033	0.019	0.033	0.0811	0.0361	0.0456	0.0252	0.012	0.026	0.016	0.036	0.0146
Sulphur (S) - Total	mg/L	-	0.5	3.3	0.4	0.04	ND				<15	<3	<3	<1	<1	<1	3	<3.0
Tellerium (Te)-Total	mg/L	-	0.1			ND	ND							<0.0002	<0.0002	<0.0002	<0.0002	<0.00020
Thallium (Tl)-Total	mg/L	0.0008	0.000002	0.000007	ND	ND	ND				<0.000002	<0.00005	<0.00005	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020
Thorium (Th)-Total	mg/L	-					ND							<0.0001	<0.0001	<0.0001	<0.0001	<0.00010
Tin (Sn)-Total	mg/L	-	0.00002	0.00003	ND	ND	ND				<0.0002	<0.005	<0.005	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020
Titanium (Ti)-Total	mg/L	-	0.003	0.006	ND	ND	ND		0.006		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.0050
Tungsten (W)-Total	mg/L																	
Uranium (U)-Total	mg/L	0.0085	0.0000030	0.0000110	ND	ND	ND				0.0000070	<0.0001	<0.0001	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020
Vanadium (V)-Total	mg/L	-	0.00016	0.00087	ND	ND	ND				0.00092	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.0010
Zinc (Zn)-Total	mg/L	0.033-0.34 (d,f)	0.0007	0.0033	0.01	0.012	0.006	0.03			0.0019	<0.005	<0.005	<0.004	0.008	0.005	0.004	<0.0040
Zirconium (Zr)-Total	mg/L	-	0.005		ND	ND	ND				<0.0001	<0.0005	<0.0005	<0.0001	0.0001	0.0002	<0.0001	0.00017

Table 2. Meziadin Landfill Surface Water Monitoring Results

		BC MoE Guidelines	SW-1															
			Meziadin - Upstream Surface Water Log Weir															
Analyte	**Units**	**Freshwater Aquatic Life (1)**	2004	2006	2007	Jun-08	Sep-09	6-Apr-10	28-Sep-10	1-Jun-13	25-Sep-13	8-Jul-14	7-Oct-14	28-Apr-15	9-Sep-15	28-Apr-16	13-Sep-16	1-Apr-17
Dissolved Metals																		
Aluminum (Al)-Dissolved	mg/L	0.036-0.1 (b,c), 0.1 Acute, 0.05 Chronic at pH >6.5																
Antimony (Sb)-Dissolved	mg/L	-																
Arsenic (As)-Dissolved	mg/L	-																
Barium (Ba)-Dissolved	mg/L	-																
Beryllium (Be)-Dissolved	mg/L	-																
Bismuth (Bi)-Dissolved	mg/L																	
Boron (B)-Dissolved	mg/L	-																
Cadmium (Cd)-Dissolved	mg/L	Hardness-Dependent 0.00004 - 0.00280 (d, f)																
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	0.35																
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 (P)-Dissolved	mg/L																	
Potassium (K)-Dissolved	mg/L	-																
Rubidium (Rb)-Dissolved	mg/L																	
Selenium (Se)-Dissolved	mg/L	-																
Silicon (Si)-Dissolved	mg/L																	
Silver (Ag)-Dissolved	mg/L	-																
Sodium (Na)-Dissolved	mg/L	-																
Strontium (Sr) -Dissolved	mg/L																	
Sulfur (S)- Dissolved	mg/L																	
Tellerium (Te)-Dissolved	mg/L																	
Thallium (Tl)-Dissolved	mg/L	-																
Thorium (Th)-Dissolved	mg/L																	
Tin (Sn)-Dissolved	mg/L	-																
Titanium (Ti)-Dissolved	mg/L	-																
Tungsten (W)-Dissolved	mg/L																	
Uranium (U)-Dissolved	mg/L	-																
Vanadium (V)-Dissolved	mg/L	-																
Zinc (Zn)-Dissolved	mg/L	-																
Zirconium (Zr)-Dissolved	mg/L																	

NOTES

BCWQG-AW	*BC MoE Water Quality Guidelines for Protection of Aquatic Life*

(1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
(2) BC Contaminated Sites Regulation (CSR) for protection of aquatic life - Schedule 6
(3) All criteria limits for Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (Dissolved)
(a) range based on max pH 8.5 to min pH 6.5 at temperature of 6.0 ℃
(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 only. Current guidleine requires DOC data.
(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 - secondary chronic effects from 0.014 mg/L
(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

Table 2. Meziadin Landfill Surface Water Monitoring Results

		BC MoE Guidelines	SW-2														
			Creek Downstream - Surface Water														
Analyte	**Units**	**Freshwater Aquatic Life (1)**	2003	2004	2006	2007	Jun-08	6-Apr-10	28-Sep-10	8-Jul-14	7-Oct-14	28-Apr-15	9-Sep-15	28-Apr-16	1-Apr-17	1-May-17	1-Aug-17
Conductivity	uS/cm	-	169	170	133	99	242	20.6	102	314	125	116	216	116	236	370	320
Hardness (Total as CaCO3)	mg/L	-	107.0	65.9	59.0					121.0	48.9	43.2	89.1	45.7	79.7	133.0	116.0
pH	pH	6.5-9.0	7.5	7.6	7.2	7.14	6.7	5.8	5.9	7.50	6.90	6.80	6.50	6.70	6.9	7.2	6.4
Total Suspended Solids	mg/L	25 mg/L (backgr. 25-250 mg/l)) (i)	212	4	4								18	83	7.7	53	93
Total Dissolved Solids	mg/L	-		118	88												
Alkalinity, Total (as CaCO3)	mg/L	-		51	28	48	110	8	20	138	37	44	56	46	100	140	60
Ammonia, Total (as N)	mg/L	0.681-28.7 (a)	0.064	0.005	0.007	ND	ND	ND	ND	1.02	0.03	0.57	0.11	0.26	1.36	1.31	0.76
Bromide (Br)	mg/L	-	0.1	0.1	0.1												
Chloride (Cl)	mg/L	150 Chronic, 600 Acute	1.2	3.1	3.9	0.5	8.5	1	4.1	12.3	8.2	6.5	19	6.7	12.8	25.5	12.7
Fluoride (F)	mg/L												<0.10				
Nitrate (as N)	mg/L	32.8		0.009	0.048												
Nitrite (as N)	mg/L	0.06-0.6 (h)		0.002	0.002												
Nitrate + Nitrite (as N)	mg/L	-		0.009	0.048								0.4	0.141	0.084	-	0.162
Total Kjeldahl Nitrogen	mg/L	-		0.25	0.34	0.48	0.43	0.85	0.58	1.90	0.53	1.11	1.00	1.52	1.83	3.45	1.99
Phosphorus (P)-Total	mg/L	-		0.006	0.015												
Sulfate (SO4)	mg/L	128-429 (d)	16.6	25.5	23.9	6.0	18.3	3.1	19.6	9.1	10.8	2.3	16.0	3.5	1.3	2.0	69.3
BOD	mg/L	-	7	10		ND	ND		ND	<6	<4	<4.0	<4.0	<4.0	<4.0	17	7.6
COD	mg/L	-	44	11	10	32	ND	55	35	83	28	24	28	23	34	76	80
Total Metals																	
Aluminum (Al)-Total	mg/L		1.500	0.028	0.067	0.080	0.028	0.395	0.099	0.136	0.0520	0.091	0.092	0.082	0.0237	0.0129	0.0937
Antimony (Sb)-Total	mg/L	0.009	0.000166	0.000042	0.000043	ND	ND			<0.0005	<0.0005	<0.0001	0.0002	<0.0001	<0.00010	0.00013	<0.00020
Arsenic (As)-Total	mg/L	0.005	0.00120	0.00020	0.00030	ND	0.00020	0.00030		0.00128	0.00016	<0.0005	0.0005	<0.0005	<0.00050	0.00071	0.00144
Barium (Ba)-Total	mg/L	1	0.385	0.016	0.027	0.040	0.016	0.016	0.030	0.147	0.0255	0.026	0.061	0.04	0.0488	0.176	0.127
Beryllium (Be)-Total	mg/L	0.00013	0.00007	0.00002	0.00002	ND	ND			<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	0.00004	0.00006	0.00002	ND	ND			-	-	-	-	-	<0.00010	<0.00010	<0.00010
Boron (B)-Total	mg/L	1.2	0.008	0.027	0.016	0.019	ND			0.152	<0.05	0.046	0.155	0.055	0.1	0.2	0.6
Cadmium (Cd)-Total	mg/L		0.000260	0.000030	0.000230	ND	0.000170	0.001140	0.000040	0.000126	0.000053	0.00002	0.00015	0.00006	0.000017	0.000025	0.000146
Calcium (Ca)-Total	mg/L	up to 4, highly sensitive to acid inputs 4 to 8, moderately sensitive over 8 low sensitivity	31.9	19.3	17.7	14.8	32.5	2.8	11.4	37.3	13.7	13.2	27.5	13.3	23.5	40.2	39.6
Cesium (Cs)-Total	mg/L																
Chromium (Cr)-Total	mg/L	0.001 (Cr VI), 0.0089 (Cr III) (e)	0.0017	0.0002	0.0002	ND	ND	0.001		<0.001	<0.001	<0.0005	0.0009	<0.0005	<0.00050	<0.00050	0.00058
Cobalt (Co)-Total	mg/L	0.11 Acute, 0.004 Chronic	0.03570	0.00015	0.00015	ND	ND	0.00200		0.00277	<0.0005	0.00039	0.00085	0.0007	0.00105	0.00216	0.00396
Copper (Cu)-Total	mg/L	Hardness-Dependent 0.0032-0.0396 (d,f)	0.39400	0.00026	0.00115	0.00110	0.00260	0.00360	0.00210	0.00148	0.00109	0.0011	0.0019	0.0018	0.00055	0.0013	0.00265
Iron (Fe)-Total	mg/L	1	20.50	0.06	0.07	0.40	0.59	3.13	0.07	6.63	0.09	0.34	0.91	0.92	0.25	1.22	4.26
Lead (Pb)-Total	mg/L	0.003-4.17 (d,f)	0.00012	0.00001	0.00012	ND	ND	0.00020		0.00031	<0.0002	<0.0001	<0.0001	0.0001	<0.00010	<0.00010	<0.00020
Lithium (Li)-Total	mg/L		0.00015	0.00011	0.00007	3.38	ND			<0.005	<0.005	0.0004	<0.0001	0.0002	0.00032	0.00075	0.00014
Magnesium (Mg)-Total	mg/L	-	6.64	4.29	4.15	0.76	7.51	0.88	2.85	6.73	3.53	2.46	4.92	3.02	5.07	7.95	7.78
Manganese (Mn)-Total	mg/L	0.8-3.4 (d,f)	37.30	0.11	0.12	ND	2.38	0.53	0.09	3.53	0.07	1.90	0.67	2.51	6.54	8.08	8.5
Mercury (Hg)-Total	mg/L	0.0001		0.00005	0.00005	ND	0.00001			<0.00001	<0.00001	<0.00002	<0.00002		<0.00002	0.00037	<0.000010
Molybdenum (Mo)-Total	mg/L	46 Acute, 7.6 Chronic	0.00005	0.00005	0.00008	ND	ND			<0.001	<0.001	<0.0001	0.0002	<0.0001	0.00032		0.00041
Nickel (Ni)-Total	mg/L	0.025-0.15 (d,f)	0.0130	0.0009	0.0013	ND	0.0010	0.0020	0.0010	0.0032	0.0016	0.0012	0.0028	0.0016	0.00258	0.00382	0.00405
Phosphorus (P)-Total	mg/L	-	0.8000	0.1000	0.1000	ND									<0.050	0.241	0.309
Potassium (K)-Total	mg/L	-	1.000	1.000	1.000	ND	0.100	0.390	1.000	0.416	0.810	1.19	0.92	1.01	2.2	4.63	2.87
Rubidium (Rb)-Total	mg/L																
Selenium (Se)-Total	mg/L	0.002		0.00020	0.00020	ND	ND	0.00010		0.00011	<0.0001	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050
Silicon (Si) - Total	mg/L	-													2.2	3	5.1
Silver (Ag)-Total	mg/L	0.0001-0.003 (d)	0.00005	0.00002	0.00002	ND	1.12	0.000011	0.000008	<0.00002	<0.00002	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	3.0	3.1	3.9	2.1	ND	1.2	2.3	10.8	3.73	4.89	9.74	4.79	9.18	17.2	13.6
Strontium (Sr) - Total	mg/L	-	0.162	0.089	0.086	0.078	4.240	0.017	0.066	0.216	0.0813	0.077	0.146	0.089	0.154	0.256	0.258
Sulphur (S) - Total	mg/L	-	7.5	8	9.7	1.2	0.145		7	<3	<3	<1	5	1	<3.0	<3.0	26.8
Tellerium (Te)-Total	mg/L	-	0.05	0.05		ND	6					<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00050
Thallium (Tl)-Total	mg/L	0.0008	0.000002	0.000002	0.000002	ND	ND			<0.00005	<0.00005	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.000020
Thorium (Th)-Total	mg/L	-										<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	0.00005	0.00001	0.00002	ND	ND			<0.005	<0.005	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00020
Titanium (Ti)-Total	mg/L	-	0.021	0.003	0.003	ND	ND			<0.005	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.0050
Tungsten (W)-Total	mg/L																
Uranium (U)-Total	mg/L	0.0085	0.000118	0.000005	0.000108	ND	ND			<0.0001	<0.0001	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.000020
Vanadium (V)-Total	mg/L	-	0.00199	0.00006	0.00016	ND	ND			<0.005	<0.005	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.033-0.34 (d,f)	0.0226	0.0002	0.0061	ND	0.0180	0.0150	0.0060	0.0060	<0.005	<0.004	0.007	0.005	<0.0040	<0.0040	0.0138
Zirconium (Zr)-Total	mg/L	-	0.012	0.005		ND	ND			<0.0005	<0.0005	0.0001	0.0001	0.0001	<0.00010	<0.00010	<0.00010

Table 2. Meziadin Landfill Surface Water Monitoring Results

		BC MoE Guidelines	SW-2														
			Creek Downstream - Surface Water														
Analyte	**Units**	**Freshwater Aquatic Life (1)**	2003	2004	2006	2007	Jun-08	6-Apr-10	28-Sep-10	8-Jul-14	7-Oct-14	28-Apr-15	9-Sep-15	28-Apr-16	1-Apr-17	1-May-17	1-Aug-17
Dissolved Metals																	
Aluminum (Al)-Dissolved	mg/L	0.036-0.1 (b,c), 0.1 Acute, 0.05 Chronic at pH >6.5															
Antimony (Sb)-Dissolved	mg/L	-															
Arsenic (As)-Dissolved	mg/L	-															
Barium (Ba)-Dissolved	mg/L	-															
Beryllium (Be)-Dissolved	mg/L	-															
Bismuth (Bi)-Dissolved	mg/L																
Boron (B)-Dissolved	mg/L	-															
Cadmium (Cd)-Dissolved	mg/L	Hardness-Dependent 0.00004 - 0.00280 (d, f)															
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	0.35															
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 (P)-Dissolved	mg/L																
Potassium (K)-Dissolved	mg/L	-															
Rubidium (Rb)-Dissolved	mg/L																
Selenium (Se)-Dissolved	mg/L	-															
Silicon (Si)-Dissolved	mg/L																
Silver (Ag)-Dissolved	mg/L	-															
Sodium (Na)-Dissolved	mg/L	-															
Strontium (Sr) -Dissolved	mg/L																
Sulfur (S)- Dissolved	mg/L																
Tellerium (Te)-Dissolved	mg/L																
Thallium (Tl)-Dissolved	mg/L	-															
Thorium (Th)-Dissolved	mg/L																
Tin (Sn)-Dissolved	mg/L	-															
Titanium (Ti)-Dissolved	mg/L	-															
Tungsten (W)-Dissolved	mg/L																
Uranium (U)-Dissolved	mg/L	-															
Vanadium (V)-Dissolved	mg/L	-															
Zinc (Zn)-Dissolved	mg/L	-															
Zirconium (Zr)-Dissolved	mg/L																

NOTES

BCWQG-AW	*BC MoE Water Quality Guidelines for Protection of Aquatic Life*

(1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
(2) BC Contaminated Sites Regulation (CSR) for protection of aquatic life - Schedule 6
(3) All criteria limits for Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (I
(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 only. Current guidleine requires DOC data.
(e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sam
(f) Where hardness data was unavailable, 50 mg/L was assumed
(g) Maximum value - secondary chronic effects from 0.014 mg/L
(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 back
** Criteria exceeds detection limit*
MAC = Maximum Acceptable Concentration
AO = Aesthetic Objective

Table 2. Meziadin Landfill Surface Water Monitoring Results

		BC MoE Guidelines	SW-3 - E245722																								
			Meziadin - Treatment Lagoon Outlet Effluent																								
Analyte	**Units**	**Freshwater Aquatic Life (1)**	Jun-02	Jul-03	Jul-04	Oct-06	Jul-07	Jun-08	Sep-09	26-Apr-10	28-Sep-10	Jun-13	25-Sep-13	8-Jul-14	7-Oct-14	28-Apr-15	9-Sep-15	28-Apr-16	13-Sep-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-20	15-Oct-20	19-Jul-21	27-Oct-21
Conductivity	uS/cm	-	303	261	255	186	177	221	103	109	500	402	454	510	485	780	515	339	505	629	507	456	429	445	510	458	564	616	1370
Hardness (Total as CaCO3)	mg/L	-		134.0	111.0	85.0				161.1	250.5	183.0	175.0	197.0	177.0	288.0	201.0	164.0	179.0	207.0	204.0	207.0	157.0	172.0	169.0	179.0	190.0	232.0	356.0
pH	pH	6.5-9.0	8.37	6	7.9	7.9	7.66	7.5	6.5	6.8	6.7	6.9	7.00	7.70	7.70	7.00	7.20	7.00	7.40	6.7	7	-	8.2	7.7	7.7	7.32	8.06	7.2	7.72
Total Suspended Solids	mg/L	25 mg/L (backgr. 25-250 mg/l)) (i)		4	4	4											9.6	280	8.9	280	31	20.5	<3.0	7.5	16.8	11.4	6.8	13	86.9
Total Dissolved Solids	mg/L	-			142	102																-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	-			81	62	74	96	32	173	230	208	205	237	193	320	220	180	220	240	230	215	192	198	189	198	195	272	509
Ammonia, Total (as N)	mg/L	0.681-28.7 (a)	0.03	0.005	0.005	0.007	0.19	0.14	ND	4.1	0.49	1.5	2.6	1.81	0.32	8.53	1.73	0.15	2.15	5.45	1.1	1.65	2.84	1.74	3.09	1.15	2.13	6.46	25.7
Bromide (Br)	mg/L	-		0.1	0.1	0.1																-	0.077	0.052	0.092	<0.050	0.086	-	<0.250
Chloride (Cl)	mg/L	150 Chronic, 600 Acute	2.24	3	5.4	4	6.1	11	1.5	14.4			18.6	24.3	39	54	35.7	39	35.7	39	28.2	20.3	25.9	19.7	39.4	19.9	42.8	28.8	92.8
Fluoride (F)	mg/L																<0.10					0.069	0.113	0.075	0.065	0.069	0.037	0.112	<0.100
Nitrate (as N)	mg/L	32.8			0.002	0.002																<0.0050	0.0956	0.0157	0.0053	<0.0050	<0.0050	<0.0050	<0.0250
Nitrite (as N)	mg/L	0.06-0.6 (h)			0.002	0.002																<0.0010	0.0114	<0.0010	<0.0010	<0.0010	<0.0010	0.0071	<0.0050
Nitrate + Nitrite (as N)	mg/L	-			0.002	0.002											<0.010	0.066	0.044	5.45	1.1	<0.0051	0.107	0.0157	0.0053	-	-	-	-
Total Kjeldahl Nitrogen	mg/L	-	0.2		0.4	0.2	0.8	0.6	0.5	0.1	0.9	1.8	2.9	0.3	0.5	2.0	2.8	1.7	7.4	11.8	1.6	3.5	3.3	2.7	3.8	1.73	3.1	7.4	30.3
Phosphorus (P)-Total	mg/L	-			0.045	0.012																-	-	-	-	-	-	-	-
Sulfate (SO4)	mg/L	128-429 (d)	60.0	50.4	37.1	24.0	17.0	13.5	15.8	3290			6.0	5.7	<0.5	11.0	1.7	11.8	1.2	17.9	2.4	-	8.7	18.6	19.2	15.7	21.8	15.5	57.9
BOD	mg/L	-	6	6	10		10	4.1	ND	13	ND	4.6	11	<6	<4	66	<4.0	64	<8.0	>130	<5.0	9.9	<2.0	6.6	7.6	6.8	5.6	9.9	79.3
COD	mg/L	-	30	10	10	10	30	30	23	47	32	ND	<20	<20	<20	156	<20	199	23	296	61	47	22	25	27	30	39	52	243
Total Metals																													
Aluminum (Al)-Total	mg/L		0.03	0.0114	0.0103	0.0325	0.02	0.011	0.067	0.073	0.019	0.0163	0.0159	0.0884	0.0134	0.917	0.01	1.49	0.007	1.16	0.018	0.0595	0.0129	0.048	0.199	0.350	0.0392	0.232	0.377
Antimony (Sb)-Total	mg/L	0.009	0.05	0.00007	0.000073	0.00005	0.001	ND	ND				0.000068	<0.0005	<0.0005	0.002	<0.0001	0.0008	0.0003	0.00063	<0.00020	0.00017	0.00014	<0.00020	0.00017	<0.00010	0.0002	0.00017	0.00099
Arsenic (As)-Total	mg/L	0.005	0.05	0.0003	0.0007	0.0003	0.001	0.0005	0.0002	0.0008	0.0015	0.00116	0.00132	0.00193	0.00088	0.0135	0.0028	0.0025	0.0026	0.00305	0.00219	0.00141	0.00082	0.00127	0.00104	0.00104	0.0013	0.00086	0.00460
Barium (Ba)-Total	mg/L	1	0.04	0.0167	0.025	0.00794	0.019	0.029	0.023	0.135	0.139	0.249	0.177	0.169	0.0709	0.741	0.155	0.281	0.144	0.607	0.138	0.196	0.1	0.128	0.128	0.139	0.108	0.116	0.200
Beryllium (Be)-Total	mg/L	0.00013	0.0002	0.00002	0.00002	0.00002	0.0020	ND	ND				<0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00010	<0.000100	<0.000100	<0.000100	<0.000200
Bismuth (Bi)-Total	mg/L	-	0.1	0.00002	0.00003	0.00002	0.1	ND	ND	0.1										<0.00010	<0.00010	<0.000050	<0.000050	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000100
Boron (B)-Total	mg/L	1.2	0.03	0.034	0.056	0.054	0.054	0.082	ND	0.00027	0.06	0.089	0.117	0.116	0.165	0.317	0.184	0.25	0.22	0.32	0.218	0.155	0.2	0.124	0.226	0.150	0.296	0.232	0.939
Cadmium (Cd)-Total	mg/L		0.002	0.00002	0.00001	0.0001	0.0080	0.0001	0.0001		0.0004	0.0000120	0.0000150	0.000021	0.000024	0.00022	0.00002	0.00024	0.00001	0.00014	0.000012	0.0000127	<0.0000050	0.000019	0.0000707	0.0000097	0.0000222	0.0000419	0.0000240
Calcium (Ca)-Total	mg/L	up to 4, highly sensitive to acid inputs 4 to 8, moderately sensitive over 8 low sensitivity	46.8	41.2	32.8	23.8	22.6	28.6	14.2	50.6	79.8	58.2	56.6	62.4	53.9	91.2	63.8	45.6	59.1	69.6	61.9	59.7	52.2	55.1	50.8	61.0	54.0	72.0	109
Cesium (Cs)-Total	mg/L																					0.0	0.0	<0.000020	0.0	<0.000010	0.0	0.000031	0.000150
Chromium (Cr)-Total	mg/L	0.001 (Cr VI), 0.0089 (Cr III) (e)	0.005	0.001	0.0002	0.0002	0.0050	ND	ND				<0.0005	<0.001	<0.001	0.0122	0.001	0.005	<0.0005	0.00544	<0.00050	0.001	0.00019	0.00055	0.00085	0.00060	0.00043	0.00090	0.00559
Cobalt (Co)-Total	mg/L	0.11 Acute, 0.004 Chronic	0.005	0.000208	0.000202	0.000137	0.005	0.0008	ND	0.0026	0.0016	0.00099	0.000767	0.00120	0.00097	0.0063	0.00062	0.0036	0.00044	0.00559	0.00072	0.00122	0.00024	0.00099	0.00075	0.00062	0.00033	0.00081	0.00140
Copper (Cu)-Total	mg/L	Hardness-Dependent 0.0032-0.0396 (d,f)	0.005	0.00111	0.00057	0.00035	0.0009	0.001	0.0017	0.0017	0.0018	0.00032	0.00053	0.00175	0.0105	0.0082	0.0003	0.0098	0.0004	0.00696	<0.00040	<0.00050	<0.00050	<0.0010	0.00108	0.00088	<0.00050	0.00126	0.00303
Iron (Fe)-Total	mg/L	1	0.03	0.04	0.06	0.10	0.28	0.17	0.13	3.65	2.02	4.46	2.55	5.69	1.11	91.60	4.73	15.10	3.54	26.30	4.59	4.21	0.49	2.46	2.22	2.03	0.36	1.48	5.13
Lead (Pb)-Total	mg/L	0.003-4.17 (d,f)	0.030	0.00001	0.00001	0.00005	0.005	ND	ND	0.0			<0.00005	<0.0002	0.00022	0.0006	<0.0001	0.0013	<0.0001	0.00094	<0.00020	0.000336	0.000063	<0.00010	0.000221	0.000104	<0.000050	0.000160	0.000228
Lithium (Li)-Total	mg/L			0.00064	0.00068	0.00082		ND	ND				0.00109	<0.005	<0.005	0.0039	0.0011	0.0036	0.0013	0.00306	0.00132	0.0015	<0.0010	<0.0020	0.002	<0.0010	0.0029	0.0035	0.0198
Magnesium (Mg)-Total	mg/L	-	8.2	7.6	7.1	6.6	4.3	4.8	3.5	8.4	12.4	9.1	8.06	10.0	10.4	14.6	9.98	10.8	10.4	12.7	11.8	10.9	7.58	10.2	10.3	10.1	13.5	12.6	20.5
Manganese (Mn)-Total	mg/L	0.8-3.4 (d,f)	0.4	0.1	0.1	0.2	0.8	1.8	0.2	6.73	7.43	7.96	5.90	9.32	1.95	12.40	8.76	5.64	8.28	10.30	8.56	7.91	3.58	5.86	5.02	7.94	3.68	8.56	7.17
Mercury (Hg)-Total	mg/L	0.0001	0.000050		0.000050	0.000050	0.000010	0.000020	ND		0.000010		<0.00001	<0.00001	<0.00001	<0.00002	<0.00002			<0.00002	<0.000010	0.000005	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000076
Molybdenum (Mo)-Total	mg/L	46 Acute, 7.6 Chronic	0.005	0.00071	0.00078	0.00035	0.005	ND	ND		0.001		0.000865	0.0011	<0.001	0.0016	0.0014	0.0006	0.0008	0.00156	0.00083	0.00083	0.00234	0.0007	0.00024	0.000363	0.000256	0.000185	0.000413
Nickel (Ni)-Total	mg/L	0.025-0.15 (d,f)	0.008	0.00076	0.00136	0.00081	0.008	0.002	0.004	0	0.004	0.0021	0.00216	0.0031	0.0038	0.0167	0.0024	0.0102	0.0025	0.0131	0.00239	0.00317	0.00278	0.0028	0.00328	0.00208	0.00293	0.00297	0.00840
Phosphorus (P)-Total	mg/L	-	0.1	0.1	0.1	0.1	0.1					0.327								0.762	0.216	0.405	0.056	0.21	0.069	0.166	0.052	0.682	1.20
Potassium (K)-Total	mg/L	-	1	2	2	1	2	1.67	0.54	3.28	1.31	1.33	2.77	1.77	4.25	9.79	3.27	5.17	3.81	8.03	2.44	3.85	4.04	3.51	6.22	1.96	9.57	7.45	32.8
Rubidium (Rb)-Total	mg/L																					0.00164	0.00192	0.0015	0.00303	0.00076	0.00419	0.00427	0.0183
Selenium (Se)-Total	mg/L	0.002	0.03	0.0002	0.0002	0.0002	0.001	0.0002	ND	0.0001	0.0003		0.000065	<0.0001	<0.0001	0.0018	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00009	0.00008	<0.00010	0.000095	0.000059	0.000058	0.000066	0.000119
Silicon (Si) - Total	mg/L	-							3.3											5.2	4.6	3.27	3.58	2.49	1.95	3.51	1.33	4.65	4.28
Silver (Ag)-Total	mg/L	0.0001-0.003 (d)	0.0010000	0.0000200	0.0000200	0.0000200	0.0000100	0.3660000			0.0000060		0.0000050	<0.00002	<0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	0.000081
Sodium (Na)-Total	mg/L	-	4.26	4.77	5.78	4.86	7.9	ND	2.14	8.21	6.56	8.48	12.5	12.8	20.4	34.2	23	21.7	25.6	29.8	20.6	18.2	20.2	16	27	16.8	32.8	26.4	82.6
Strontium (Sr) - Total	mg/L	-	0.223	0.174	0.167	0.129	0.116	5.44	0.077	0.265	0.419	0.327	0.324	0.332	0.335	0.563	0.348	0.314	0.38	0.428	0.353	0.378	0.367	0.31	0.284	0.344	0.352	0.398	0.627
Sulphur (S) - Total	mg/L	-	20.5	16.5	12.9	8.6	5.0	0.1	ND	7.0	11.0		<15	<3	<3	3	<1	4	<1	3.8	<3.0	3.12	2.72	6.8	6.95	3.91	8.43	4.47	11.3
Tellerium (Te)-Total	mg/L	-	0.1	0.1	0.1			4.0	ND							<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00050	<0.00020	<0.00020	<0.00040	<0.00020	<0.00020	<0.00020	0.00022	<0.00040
Thallium (Tl)-Total	mg/L	0.0008	0.0300	0.00001	0.000002	0.000002	0.0001	ND	ND				<0.000002	<0.00005	<0.00005	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.000010	<0.000010	<0.000020	<0.000010	<0.000010	<0.000010	<0.000010	<0.000020
Thorium (Th)-Total	mg/L	-							ND							0.0002	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020
Tin (Sn)-Total	mg/L	-	0.0200	0.00002	0.00001	0.00003	0.0200	ND	ND				<0.0002	<0.005	<0.005	0.0006	0.0003	0.0002	<0.0002	<0.00020	<0.00020	0.00011	0.0004	<0.00020	<0.00010	0.00012	<0.00010	<0.00010	<0.00020
Titanium (Ti)-Total	mg/L	-	0.0030	0.0030	0.0030	0.0030	0.0030	ND	ND				<0.005	<0.005	<0.005	0.013	<0.005	0.018	<0.005	0.0223	<0.0050	0.00064	0.00032	<0.00090	<0.0027	0.00173	<0.00030	0.00271	0.00650
Tungsten (W)-Total	mg/L																					<0.00010	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020
Uranium (U)-Total	mg/L	0.0085		0.0000490	0.0000280	0.0000090	0.0001000	ND	ND				0.0000310	<0.0001	<0.0001	0.0001	0.00002	0.00004	<0.00002	0.000049	0.000023	0.000034	0.000044	0.000029	0.000023	0.000017	<0.000010	0.000012	0.000022
Vanadium (V)-Total	mg/L	-	0.0050	0.0002	0.0001	0.0001	0.0050	ND	ND				<0.0005	<0.005	<0.005	0.004	<0.001	0.004	<0.001	0.0038	<0.0010	<0.00050	<0.00050	<0.0010	0.00064	0.00052	<0.00050	0.00074	0.00130
Zinc (Zn)-Total	mg/L	0.033-0.34 (d,f)	0.011	0.0009	0.0005	0.0006	0.005	0.009	0.006	0.028	0.005		0.0013	0.0076	0.0223	0.061	<0.004	0.056	<0.004	0.0496	0.0045	0.0049	0.0034	<0.0060	0.0055	0.0098	0.0035	0.0180	0.0105
Zirconium (Zr)-Total	mg/L	-	0.0	0.005	0.005		0.005	ND	ND				<0.0001	<0.0005	<0.0005	0.0008	0.0001	0.0004	<0.0001	0.00051	<0.00010	<0.000060	<0.000060	<0.00012	<0.00020	<0.00020	<0.00020	<0.00020	<0.00040

Table 2. Meziadin Landfill Surface Water Monitoring Results

		BC MoE Guidelines	SW-3 - E245722																													
			Meziadin - Treatment Lagoon Outlet Effluent																													
Analyte	**Units**	**Freshwater Aquatic Life (1)**	Jun-02	Jul-03	Jul-04	Oct-06	Jul-07	Jun-08	Sep-09	26-Apr-10	28-Sep-10	Jun-13	25-Sep-13	8-Jul-14	7-Oct-14	28-Apr-15	9-Sep-15	28-Apr-16	13-Sep-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-20	15-Oct-20	19-Jul-21	27-Oct-21
Dissolved Metals																																
Aluminum (Al)-Dissolved	mg/L	0.036-0.1 (b,c), 0.1 Acute, 0.05 Chronic at pH >6.5																				0.0083	0.0097	0.0083	0.0115	0.0428	0.0071	0.0200	0.0708
Antimony (Sb)-Dissolved	mg/L	-																				0.00013	0.00013	<0.00020	0.00017	<0.00010	0.00015	<0.00020	0.00074
Arsenic (As)-Dissolved	mg/L	-																				0.00129	0.00061	0.00124	0.00084	0.00096	0.0012	0.00065	0.00442
Barium (Ba)-Dissolved	mg/L	-																				0.162	0.0968	0.112	0.115	0.146	0.108	0.109	0.177
Beryllium (Be)-Dissolved	mg/L	-																				<0.00010	<0.00010	<0.00020	<0.00010	<0.000100	<0.000100	<0.000200	<0.000100
Bismuth (Bi)-Dissolved	mg/L																					<0.000050	<0.000050	<0.00010	<0.000050	<0.000050	<0.000050	<0.000100	<0.000050
Boron (B)-Dissolved	mg/L	-																				0.146	0.186	0.116	0.215	0.132	0.274	0.229	0.805
Cadmium (Cd)-Dissolved	mg/L	Hardness-Dependent 0.00004 - 0.00280 (d, f)																				0.0000066	0.0000602	0.000012	0.0000086	<0.0000050	<0.0000050	<0.0000100	<0.0000050
Calcium (Ca)-Dissolved	mg/L	-																				63.7	50.1	52.6	48.8	54.3	54.8	69.4	109
Cesium (Cs)-Dissolved	mg/L																					0.000011	0.000026	<0.000020	0.000013	<0.000010	0.00001	0.000024	0.000149
Chromium (Cr)-Dissolved	mg/L	-																				0.00088	0.00011	0.00032	0.00027	0.00028	0.00038	<0.00100	0.00408
Cobalt (Co)-Dissolved	mg/L	-																				0.00121	0.00022	0.0009	0.00061	0.00032	0.0003	0.00033	0.00065
Copper (Cu)-Dissolved	mg/L	-																				<0.00020	0.0014	<0.00040	0.00037	<0.00020	0.00026	<0.00040	0.00026
Iron (Fe)-Dissolved	mg/L	0.35																				4.04	0.029	1.65	1.87	0.525	0.248	0.324	0.155
Lead (Pb)-Dissolved	mg/L	-																				<0.000050	<0.000050	<0.00010	<0.000050	<0.000050	<0.000050	<0.000100	<0.000050
Lithium (Li)-Dissolved	mg/L	-																				0.0014	<0.0010	<0.0020	0.0018	0.0011	0.0027	0.0034	0.0181
Magnesium (Mg)-Dissolved	mg/L	-																				11.6	7.83	9.9	11.4	10.5	13.2	12.0	21.2
Manganese (Mn)-Dissolved	mg/L	-																				8.2	3.38	5.5	5.15	7.60	3.89	8.56	7.50
Mercury (Hg)-Dissolved	mg/L	-																				<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L	-																				0.000766	0.0022	0.00063	0.00021	0.000252	0.000218	0.000106	0.000121
Nickel (Ni)-Dissolved	mg/L	-																				0.00307	0.00267	0.0027	0.0027	0.00132	0.00286	0.00211	0.00616
Phosphorus (P)-Dissolved	mg/L																					0.098	<0.050	<0.10	<0.050	0.100	<0.050	0.561	0.690
Potassium (K)-Dissolved	mg/L	-																				4.05	4.03	3.4	6.77	2.03	10	7.18	36.0
Rubidium (Rb)-Dissolved	mg/L																					0.00167	0.00197	0.00154	0.00318	0.00069	0.00434	0.00368	0.0201
Selenium (Se)-Dissolved	mg/L	-																				0.00121	0.000076	<0.00010	0.000698	0.00777	0.00171	0.00176	0.00665
Silicon (Si)-Dissolved	mg/L																					3.16	3.45	2.45	1.73	3.42	1.27	4.27	4.08
Silver (Ag)-Dissolved	mg/L	-																				<0.000010	<0.000010	<0.000020	<0.000010	<0.000010	<0.000010	<0.000020	<0.000010
Sodium (Na)-Dissolved	mg/L	-																				18.8	20.3	16.5	27.7	16.6	33.8	24.3	81.6
Strontium (Sr) -Dissolved	mg/L																					0.362	0.35	0.263	0.316	0.318	0.349	0.420	0.646
Sulfur (S)- Dissolved	mg/L																					3.4	3.25	6.6	9.78	32.8	10	14.8	63.9
Tellerium (Te)-Dissolved	mg/L																					<0.00020	<0.00020	<0.00040	<0.00020	<0.00020	<0.00020	<0.00040	<0.00020
Thallium (Tl)-Dissolved	mg/L	-																				<0.000010	<0.000010	<0.000020	<0.000010	<0.000010	<0.000010	<0.000020	<0.000010
Thorium (Th)-Dissolved	mg/L																					<0.00010	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00020	<0.00010
Tin (Sn)-Dissolved	mg/L	-																				<0.00010	<0.00010	<0.00020	0.00011	<0.00010	<0.00010	<0.00020	<0.00010
Titanium (Ti)-Dissolved	mg/L	-																				<0.00030	<0.00030	<0.00060	0.00035	<0.00030	<0.00030	<0.00060	0.00151
Tungsten (W)-Dissolved	mg/L																					<0.00010	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00020	<0.00010
Uranium (U)-Dissolved	mg/L	-																				0.000031	0.000041	0.000027	0.000019	0.000013	<0.000010	<0.000020	0.000021
Vanadium (V)-Dissolved	mg/L	-																				<0.00050	<0.00050	<0.0010	<0.00050	<0.00050	<0.00050	<0.00100	0.00066
Zinc (Zn)-Dissolved	mg/L	-																				0.0013	0.0031	0.0023	0.0011	0.0012	0.0013	0.0035	0.0014
Zirconium (Zr)-Dissolved	mg/L																					<0.000060	<0.000060	<0.00012	<0.00020	<0.00020	<0.00020	<0.00040	0.00026

NOTES

BCWQG-AW — *BC MoE Water Quality Guidelines for Protection of Aquatic Life*

(1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
(2) BC Contaminated Sites Regulation (CSR) for protection of aquatic life - Schedule 6
(3) All criteria limits for Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (l
(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 only. Current guidleine requires DOC data.
(e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sam
(f) Where hardness data was unavailable, 50 mg/L was assumed
(g) Maximum value - secondary chronic effects from 0.014 mg/L
(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 back
** Criteria exceeds detection limit*
MAC = Maximum Acceptable Concentration
AO = Aesthetic Objective

Table 2. Meziadin Landfill Surface Water Monitoring Results

		BC MoE Guidelines	SW2017-01 - E251541									SW2017-02 - E252829									SW2017-03		SW2017-04		SW2017-05	
			New Downstream Surface location									New Upstream Surface location									Downstream Surface from metal storage – located at the end of the receiving drainage ditch		Downstream Surface at the end of the lagoon, downstream of SW2017-03 – downstream from metal storage		Surface seepage from toe of lagoon	
Analyte	**Units**	**Freshwater Aquatic Life (1)**	1-May-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-20	15-Oct-20	19-Jul-21	27-Oct-21	1-May-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-20	15-Oct-20	19-Jul-21	27-Oct-21	1-May-17	1-Aug-17	1-May-17	1-Aug-17	1-May-17	1-Aug-17
Conductivity	uS/cm	-	32.3	22.1		25.4			50.8		66.4	15.8	12.7		12.9			19.1		17.1	88.1	204	103	108	546	726
Hardness (Total as CaCO3)	mg/L	-	11.6	10.8		11.3			20.5		21.2	8.93	5.9		5.4			8.18		6.96	29.3	54.5	31.2	39.5	278	296
pH	pH	6.5-9.0	6.5	-		6.75			7.18		7.19	6			6.3			6.54		6.28	6.9	6.8	6.6	7.1	7.1	6.3
Total Suspended Solids	mg/L	25 mg/L (backgr. 25-250 mg/l)) (i)	<1	<3.0		<3.0			3.6		<3.0	61	38.3		3.7			12		<3.0	3.7	3.8	8.2	11	56	30
Total Dissolved Solids	mg/L	-																								
Alkalinity, Total (as CaCO3)	mg/L	-	12	8.7		8.7			15.2		15.9	6	4.8		4.2			5.9		3.6	36	52	39	38	230	320
Ammonia, Total (as N)	mg/L	0.681-28.7 (a)	<0.03	0.0075		0.0095			0.0221		0.033	<0.03	0.0069		0.0077			0.0080		<0.0050	<0.03	<0.03	<0.03	<0.03	0.08	0.82
Bromide (Br)	mg/L	-	-	-		<0.050			<0.050		<0.050		-		<0.050			<0.050		<0.050						
Chloride (Cl)	mg/L	150 Chronic, 600 Acute	2.1	<0.50		0.67			3.95		4.89	<1.0	<0.50		<0.50			<0.50		<0.50	3.4	9.9	3.5	2.2	12.2	35.1
Fluoride (F)	mg/L	-	-	0.021		0.02			<0.020		<0.20		0.02		0.02			<0.020		<0.020						
Nitrate (as N)	mg/L	32.8	-	0.0615		0.055			0.0727				<0.0050		<0.0050			<0.0050		<0.0050						
Nitrite (as N)	mg/L	0.06-0.6 (h)	-	<0.0010		<0.0010			<0.0010		0.0029		<0.0010		<0.0010			<0.0010		<0.0010						
Nitrate + Nitrite (as N)	mg/L	-	-	0.0615		0.055						-	<0.0051		<0.0051			-		-	-	0.0162	-	0.013	-	0.0546
Total Kjeldahl Nitrogen	mg/L	-	0.403	0.432		0.389			0.549		0.542	0.353	0.269		0.236			0.402		0.328	0.348	0.838	0.394	0.676	1.29	1.79
Phosphorus (P)-Total	mg/L	-							<0.050																	
Sulfate (SO4)	mg/L	128-429 (d)	<1			1.0			<0.30		3.3	<1.0			0.4			<0.30		0.9	6.0	26.9	6.8	10.9	34.1	7.9
BOD	mg/L	-	<5	<2.0		<2.0			<2.0		<2.0	<5.0	<2.0		<2.0			<2.0		<2.0	<5.0	-	<5.0	5.7	11	6.5
COD	mg/L	-	24	26		28			47		44	26	21		<20			46		37	<20	45	22	32	49	37
Total Metals																										
Aluminum (Al)-Total	mg/L		0.176	0.196		0.189			0.293		0.205	1.13	0.679		0.331			0.348		0.399	0.362	0.0437	0.317	0.0173	0.051	0.0187
Antimony (Sb)-Total	mg/L	0.009	<0.00010	<0.00010		<0.00010			<0.00010		<0.00010	<0.00010	<0.00010		<0.00010			<0.00010		<0.00010	0.0001	<0.00020	<0.00010	<0.00020	<0.00010	<0.00020
Arsenic (As)-Total	mg/L	0.005	<0.00050	0.00015		0.00012			0.00021		0.00016	<0.00050	0.00021		0.00012			0.00016		0.00020	0.00061	0.00076	0.00064	0.00074	0.00124	0.00099
Barium (Ba)-Total	mg/L	1	0.0096	0.00949		0.00878			0.0184		0.0114	0.0164	0.0158		0.00894			0.0108		0.0125	0.0114	0.0217	0.0122	<0.0050	0.0978	0.129
Beryllium (Be)-Total	mg/L	0.00013	<0.00010	<0.00010		<0.00010			<0.000100		<0.000100	<0.00010	<0.00010		<0.00010			<0.000100		<0.000100	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth (Bi)-Total	mg/L	-	<0.00010	<0.000050		<0.000050			<0.000050		<0.000050	<0.00010	<0.000050		<0.000050			<0.000050		<0.000050	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Boron (B)-Total	mg/L	1.2	0.017	<0.010		<0.010			<0.010		0.031	0.005	<0.010		<0.010			<0.010		<0.010	0.043	0.103	0.046	0.0612	0.059	0.172
Cadmium (Cd)-Total	mg/L		0.0000110	0.0000118		0.0000584			0.0000371		0.0000128	0.0000270	0.0000328		0.0000179			0.0000266		0.0000798	0.0000170	0.0005950	0.0000300	0.0000280	0.0000300	0.0000700
Calcium (Ca)-Total	mg/L	up to 4, highly sensitive to acid inputs 4 to 8, moderately sensitive over 8 low sensitivity	3.5	3.1		3.1			5.80		6.08	2.1	1.6		1.4			2.20		1.87	8.7	14.5	9.4	11.3	80.4	86.4
Cesium (Cs)-Total	mg/L			<0.000010		<0.000010			<0.000010		<0.000010		0.0		<0.000010			<0.000010		<0.000010						
Chromium (Cr)-Total	mg/L	0.001 (Cr VI), 0.0089 (Cr III) (e)	<0.00050	0.0004		0.0004			0.00056		<0.00050	0.003	0.001		0.001			0.00060		0.00060	0.0013	0.0008	0.0012	<0.00050	<0.00050	0.0007
Cobalt (Co)-Total	mg/L	0.11 Acute, 0.004 Chronic	<0.00010	<0.00010		<0.00010			0.00053		<0.00010	0.00042	0.00048		<0.00010			0.00019		0.00058	0.00104	0.00242	0.00108	0.00021	0.00129	0.00291
Copper (Cu)-Total	mg/L	Hardness-Dependent 0.0032-0.0396 (d,f)	0.00087	0.00073		0.00086			0.00078		0.00078	0.00263	0.00188		0.00112			0.00104		0.00152	0.00179	0.00393	0.00175	0.00145	0.0011	0.00056
Iron (Fe)-Total	mg/L	1	0.06	0.08		0.06			0.285		0.08	1.13	0.41		0.13			0.133		0.236	1.54	3.50	1.56	0.64	5.20	2.41
Lead (Pb)-Total	mg/L	0.003-4.17 (d,f)	<0.00010	<0.000050		<0.000050			0.000085		<0.000050	0.0002	0.0002		<0.000050			<0.000050		0.000064	0.0002	<0.00020	0.0002	<0.00020	<0.00010	<0.00020
Lithium (Li)-Total	mg/L		<0.00010	<0.0010		<0.0010			<0.0010		<0.0010	0.00075	<0.0010		<0.0010			<0.0010		<0.0010	0.0004	0.00017	0.00042	0.00014	0.00037	0.0003
Magnesium (Mg)-Total	mg/L	-	0.972	0.803		0.795			1.46		1.45	0.919	0.618		0.485			0.652		0.556	2.19	5.27	2.34	2.7	18.7	19.5
Manganese (Mn)-Total	mg/L	0.8-3.4 (d,f)	0.00178	0.0145		0.00515			0.207		0.00792	0.0423	0.0634		0.00691			0.0578		0.206	1.68	2.41	1.89	0.257	7.8	29
Mercury (Hg)-Total	mg/L	0.0001		0.0000068		0.0000085			<0.0000050		<0.0000050		0.0000103		0.00001			<0.0000050		<0.0000050		0.00001		0.000016		<0.000010
Molybdenum (Mo)-Total	mg/L	46 Acute, 7.6 Chronic	<0.00010	<0.000050		<0.000050			<0.000050		<0.000050	<0.00010	<0.000050		<0.000050			<0.000050		<0.000050	<0.00010	0.00015	<0.00010	0.00012	0.00172	0.0024
Nickel (Ni)-Total	mg/L	0.025-0.15 (d,f)	0.0013	0.00107		0.00106			0.00230		0.00133	0.00434	0.00218		0.00133			0.00194		0.00174	0.00304	0.00782	0.00315	0.00098	0.00186	0.00353
Phosphorus (P)-Total	mg/L	-	<0.050	<0.050		<0.050			<0.050		<0.050	<0.050	0.056		<0.050			<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	0.09	0.108
Potassium (K)-Total	mg/L	-	0.34	0.194		0.215			0.517		1.18	0.29	0.24		0.179			0.235		0.093	1.1	4.16	1.17	1.22	0.75	1.44
Rubidium (Rb)-Total	mg/L			<0.00020		<0.00020			0.00043		0.00051		0.00042		0.00022			0.00033		<0.00020						
Selenium (Se)-Total	mg/L	0.002	<0.00050	0.00006		0.000066			0.000085		0.000084	<0.00050	0.000084		0.000115			0.000102		0.000108	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Silicon (Si) - Total	mg/L	-	1.6	2.04		1.93			3.27		2.82	3.7	3.04		2.37			3.21		2.99	3.3	4.0	3.2	<1.0	2.6	2.8
Silver (Ag)-Total	mg/L	0.0001-0.003 (d)	<0.000050	<0.000010		<0.000010			<0.000010		<0.000010	<0.000050	0.0000150		<0.000010			0.000011		0.000011	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Sodium (Na)-Total	mg/L	-	2.25	1.34		1.27			2.90		4.41	0.85	0.816		0.705			0.881		0.891	6.19	18.2	6.88	6.39	9.49	26.3
Strontium (Sr) - Total	mg/L	-	0.0226	0.021		0.0202			0.0383		0.0388	0.0125	0.013		0.00988			0.0154		0.0129	0.042	0.0816	0.0461	0.0585	0.395	0.451
Sulphur (S) - Total	mg/L	-	<3.0	<0.50		0.5			<0.50		1.16	<3.0	<0.50		<0.50			<0.50		<0.50	<3.0	10.4	<3.0	4.4	12.1	<3.0
Tellerium (Te)-Total	mg/L	-	<0.00020	<0.00020		<0.00020			<0.00020		<0.00020	<0.00020	<0.00020		<0.00020			<0.00020		<0.00020	<0.00020	<0.00050	<0.00020	<0.00050	<0.00020	<0.00050
Thallium (Tl)-Total	mg/L	0.0008	<0.000020	<0.000010		<0.000010			<0.000010		<0.000010	<0.000020	<0.000010		<0.000010			<0.000010		<0.000010	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020	0.0
Thorium (Th)-Total	mg/L	-	<0.00010	<0.00010		<0.00010			<0.00010		<0.00010	<0.00010	<0.00010		<0.00010			<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	-	<0.00020	<0.00010		<0.00010			<0.00010		<0.00010	<0.00020	<0.00010		<0.00010			<0.00010		<0.00010	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Titanium (Ti)-Total	mg/L	-	<0.0050	0.0		0.0			0.00180		0.00097	0.0192	0.0058		0.0026			0.00164		0.00217	0.0077	<0.0050	0.0083	<0.0050	<0.0050	<0.0050
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	0.0085	<0.000020	<0.000010		<0.000010			<0.000010		<0.000010	0.0000230	0.0000150		<0.000010			<0.000010		<0.000010	<0.000020	<0.000020	<0.000020	<0.000020	0.0001050	0.0001040
Vanadium (V)-Total	mg/L	-	<0.0010	<0.00050		<0.00050			0.00051		<0.00050	0.0020	0.0008		<0.00050			<0.00050		<0.00050	0.0011	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Zinc (Zn)-Total	mg/L	0.033-0.34 (d,f)	<0.0040	<0.0030		<0.0030			<0.0030		<0.0030	<0.0040	<0.0030		<0.0030			<0.0030		0.0035	<0.0040	0.0384	<0.0040	<0.0040	<0.0040	0.0071
Zirconium (Zr)-Total	mg/L	-	0.0002	0.0002		0.0002			0.00024		0.00025	0.0005	0.0003		0.0003			0.00034		0.00037	0.0005	0.0002	0.0003	<0.00010	0.0002	0.0002

Table 2. Meziadin Landfill Surface Water Monitoring Results

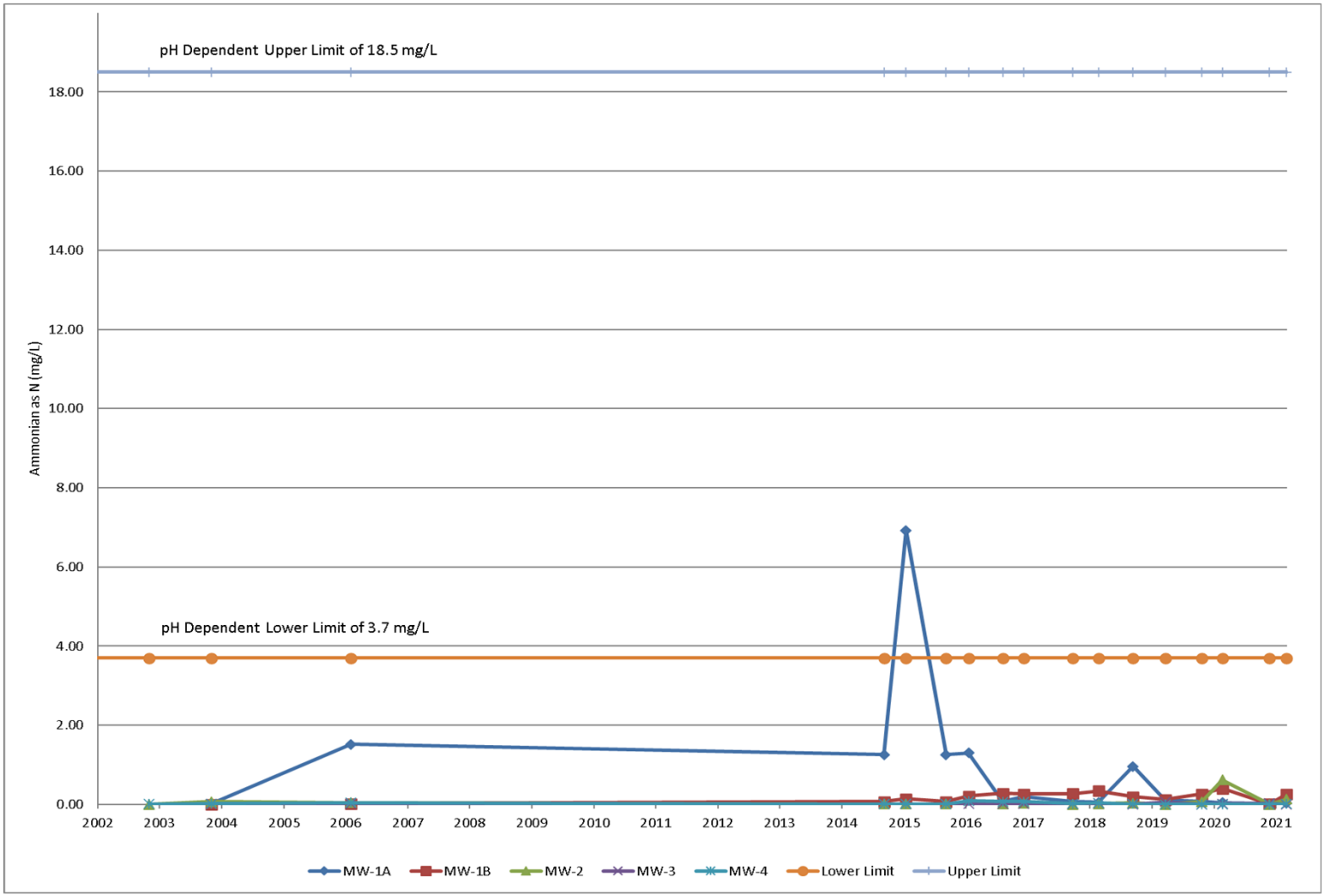
		BC MoE Guidelines	SW2017-01 - E251541									SW2017-02 - E252829									SW2017-03		SW2017-04		SW2017-05	
			New Downstream Surface location									New Upstream Surface location									Downstream Surface from metal storage – located at the end of the receiving drainage ditch		Downstream Surface at the end of the lagoon, downstream of SW2017-03 – downstream from metal storage		Surface seepage from toe of lagoon	
Analyte	**Units**	**Freshwater Aquatic Life (1)**	1-May-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-20	15-Oct-20	19-Jul-21	27-Oct-21	1-May-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-20	15-Oct-20	19-Jul-21	27-Oct-21	1-May-17	1-Aug-17	1-May-17	1-Aug-17	1-May-17	1-Aug-17
Dissolved Metals																										
Aluminum (Al)-Dissolved	mg/L	0.036-0.1 (b,c), 0.1 Acute, 0.05 Chronic at pH >6.5		0.187		0.203			0.207		0.194		0.263		0.267			0.330		0.334						
Antimony (Sb)-Dissolved	mg/L	-		<0.00010		<0.00010			<0.00010		<0.00010		<0.00010		<0.00010			<0.00010		<0.00010						
Arsenic (As)-Dissolved	mg/L	-		0.00014		0.00012			0.00017		0.00015		0.00011		0.00012			0.00019		0.00018						
Barium (Ba)-Dissolved	mg/L	-		0.00928		0.00939			0.0149		0.0113		0.0097		0.00844			0.0104		0.0100						
Beryllium (Be)-Dissolved	mg/L	-		<0.00010		<0.00010			<0.000100		<0.000100		<0.00010		<0.00010			<0.000100		<0.000100						
Bismuth (Bi)-Dissolved	mg/L			<0.000050		<0.000050			<0.000050		<0.000050		<0.000050		<0.000050			<0.000050		<0.000050						
Boron (B)-Dissolved	mg/L	-		<0.010		<0.010			<0.010		0.027		<0.010		<0.010			<0.010		<0.010						
Cadmium (Cd)-Dissolved	mg/L	Hardness-Dependent 0.00004 - 0.00280 (d, f)		0.0000066		0.0000474			0.0000115		0.0000142		0.000014		0.0000115			0.0000262		0.0000273						
Calcium (Ca)-Dissolved	mg/L	-		3		3.19			5.63		5.77		1.5		1.42			2.10		1.74						
Cesium (Cs)-Dissolved	mg/L			<0.000010		<0.000010			<0.000010		<0.000010		<0.000010		<0.000010			<0.000010		<0.000010						
Chromium (Cr)-Dissolved	mg/L	-		0.00039		0.00036			0.00047		<0.00050		0.00047		0.00042			0.00063		0.00053						
Cobalt (Co)-Dissolved	mg/L	-		<0.00010		<0.00010			<0.00010		<0.00010		<0.00010		<0.00010			0.00016		<0.00010						
Copper (Cu)-Dissolved	mg/L	-		0.00067		0.00089			0.00064		0.00134		0.00109		0.00102			0.00106		0.00118						
Iron (Fe)-Dissolved	mg/L	0.35		0.067		0.059			0.120		0.074		0.071		0.061			0.096		0.114						
Lead (Pb)-Dissolved	mg/L	-		<0.000050		<0.000050			<0.000050		<0.000050		<0.000050		<0.000050			<0.000050		<0.000050						
Lithium (Li)-Dissolved	mg/L	-		<0.0010		<0.0010			<0.0010		<0.0010		<0.0010		<0.0010			<0.0010		<0.0010						
Magnesium (Mg)-Dissolved	mg/L	-		0.803		0.804			1.48		1.47		0.518		0.441			0.647		0.556						
Manganese (Mn)-Dissolved	mg/L	-		0.00258		0.00244			0.00390		0.00191		0.0115		0.00275			0.0560		0.0126						
Mercury (Hg)-Dissolved	mg/L	-		<0.0000050		<0.0000050			<0.0000050		0.0000063		0.0000054		0.0000076			<0.0000050		0.0000089						
Molybdenum (Mo)-Dissolved	mg/L	-		<0.000050		<0.000050			<0.000050		<0.000050		<0.000050		<0.000050			<0.000050		<0.000050						
Nickel (Ni)-Dissolved	mg/L	-		0.0011		0.00113			0.00196		0.00138		0.00116		0.00109			0.00186		0.00158						
Phosphorus (P)-Dissolved	mg/L			<0.050		<0.050			<0.050		<0.050		<0.050		<0.050			<0.050		<0.050						
Potassium (K)-Dissolved	mg/L	-		0.198		0.23			0.515		1.19		0.224		0.175			0.223		0.061						
Rubidium (Rb)-Dissolved	mg/L			<0.00020		<0.00020			0.00037		0.00055		<0.00020		<0.00020			0.00033		<0.00020						
Selenium (Se)-Dissolved	mg/L	-		0.000063		0.00008			0.000072		0.000074		0.000063		0.000102			0.000128		0.000109						
Silicon (Si)-Dissolved	mg/L			1.89		1.89			3.43		2.72		2.57		2.19			3.31		2.84						
Silver (Ag)-Dissolved	mg/L	-		<0.000010		<0.000010			<0.000010		<0.000010		<0.000010		<0.000010			0.000012		<0.000010						
Sodium (Na)-Dissolved	mg/L	-		1.25		1.38			2.97		4.42		0.788		0.754			0.942		0.888						
Strontium (Sr) -Dissolved	mg/L			0.0207		0.0187			0.0355		0.0361		0.011		0.00851			0.0143		0.0135						
Sulfur (S)- Dissolved	mg/L			<0.50		<0.50			<0.50		1.14		<0.50		<0.50			<0.50		<0.50						
Tellerium (Te)-Dissolved	mg/L			<0.00020		<0.00020			<0.00020		<0.00020		<0.00020		<0.00020			<0.00020		<0.00020						
Thallium (Tl)-Dissolved	mg/L	-		<0.000010		<0.000010			<0.000010		<0.000010		<0.000010		<0.000010			<0.000010		<0.000010						
Thorium (Th)-Dissolved	mg/L			<0.00010		<0.00010			<0.00010		<0.00010		<0.00010		<0.00010			<0.00010		<0.00010						
Tin (Sn)-Dissolved	mg/L	-		<0.00010		<0.00010			<0.00010		<0.00010		<0.00010		<0.00010			<0.00010		<0.00010						
Titanium (Ti)-Dissolved	mg/L	-		0.00072		0.00079			0.00128		0.00087		0.00125		0.00114			0.00149		0.00139						
Tungsten (W)-Dissolved	mg/L			<0.00010		<0.00010			<0.00010		<0.00010		<0.00010		<0.00010			<0.00010		<0.00010						
Uranium (U)-Dissolved	mg/L	-		<0.000010		<0.000010			<0.000010		<0.000010		<0.000010		<0.000010			<0.000010		<0.000010						
Vanadium (V)-Dissolved	mg/L	-		<0.00050		<0.00050			<0.00050		<0.00050		<0.00050		<0.00050			<0.00050		<0.00050						
Zinc (Zn)-Dissolved	mg/L	-		<0.0010		<0.0010			0.0012		0.0012		0.001		<0.0010			0.0019		0.0020						
Zirconium (Zr)-Dissolved	mg/L			0.000216		0.000252			0.00038		0.00025		0.000261		0.000309			0.00043		0.00037						

NOTES

BCWQG-AW	*BC MoE Water Quality Guidelines for Protection of Aquatic Life*

(1) BC MoE Approved and Working Water Quality Guidelines, last updated March 2018
(2) BC Contaminated Sites Regulation (CSR) for protection of aquatic life - Schedule 6
(3) All criteria limits for Drinking Quality Guidelines based on Total Metal Concentration except Aluminum (1
(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 only. Current guidleine requires DOC data.
(e) Limit for chromium(VI) - data reported by lab as total chromium - limit assumes 100% chromium VI in sam
(f) Where hardness data was unavailable, 50 mg/L was assumed
(g) Maximum value - secondary chronic effects from 0.014 mg/L
(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 back
** Criteria exceeds detection limit*
MAC = Maximum Acceptable Concentration
AO = Aesthetic Objective

APPENDIX G
Trends in Groundwater



Sperling Hansen Associates

Regional District of Kitimat-Stikine

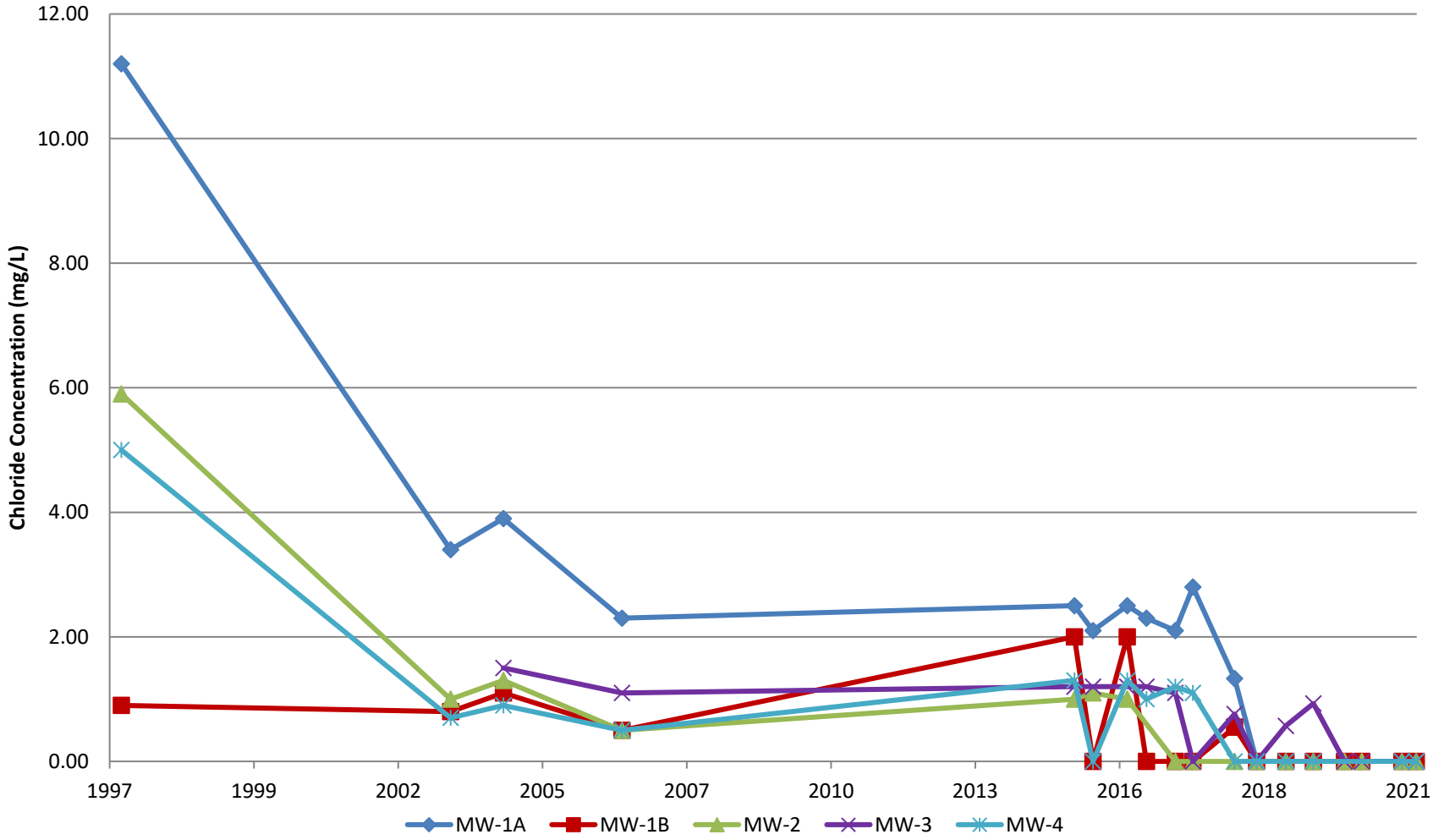
PROJECT:

Meziadin Annual Monitoring Report

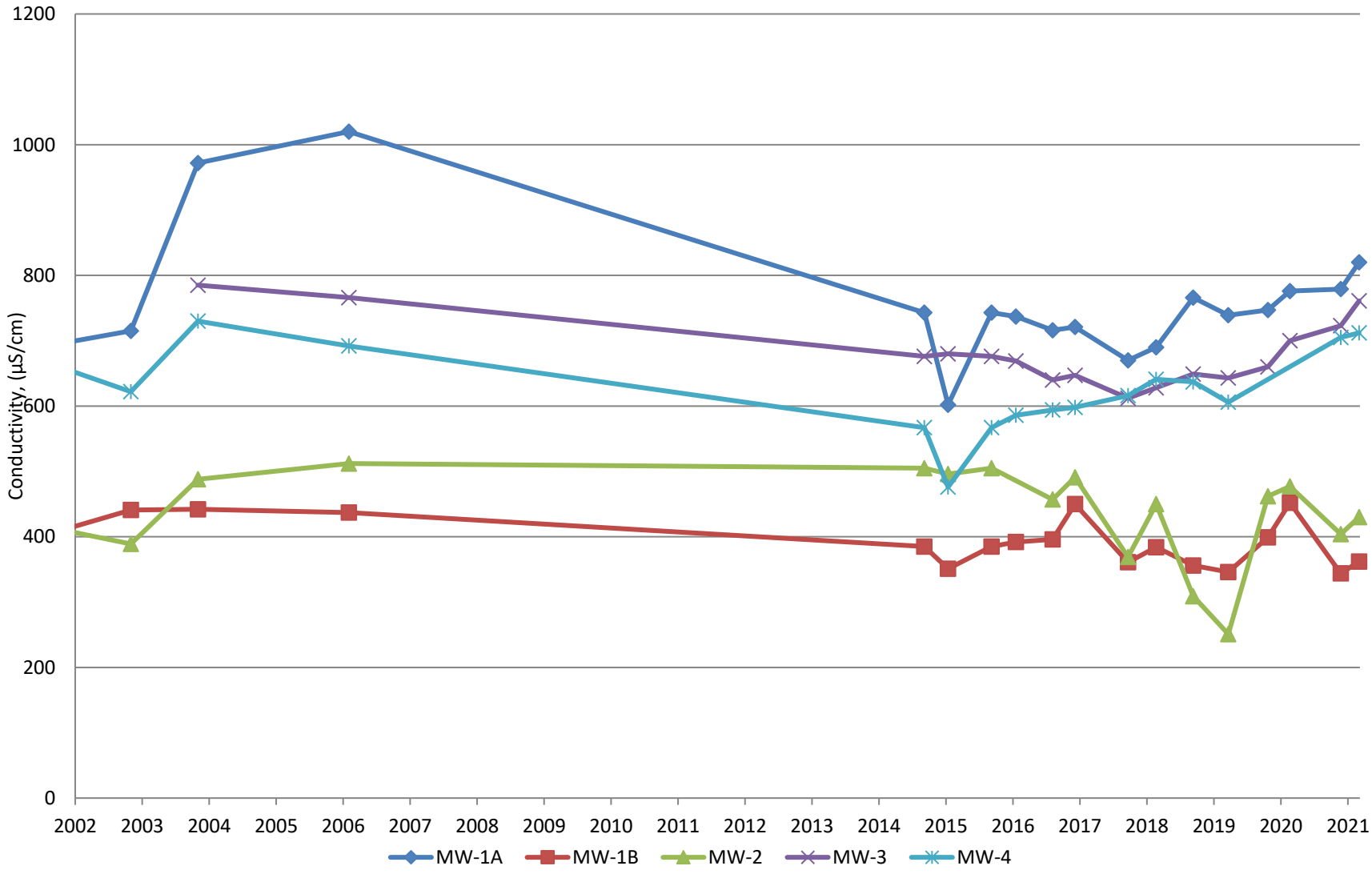
TITLE:

Groundwater Ammonia

SCALE:	DATE:	PROJECT NO:
N/A	2022/03/31 yyyy/mm/dd	PRJ22037
DESIGNED	AM	DRAWING NO:
DRAWN	AM	**Figure G-1**
CHECKED	IB	



Sperling Hansen Associates	Regional District of Kitimat-Stikine	PROJECT: **Meziadin Annual Monitoring Report**	TITLE: **Groundwater Chloride Concentrations**	SCALE: N/A; DATE: 2022/03/31 yyyy/mm/dd; PROJECT NO: PRJ22037; DESIGNED AM; DRAWN AM; CHECKED IB; DRAWING NO: **Figure G-2**



Sperling Hansen Associates

Regional District of Kitimat-Stikine

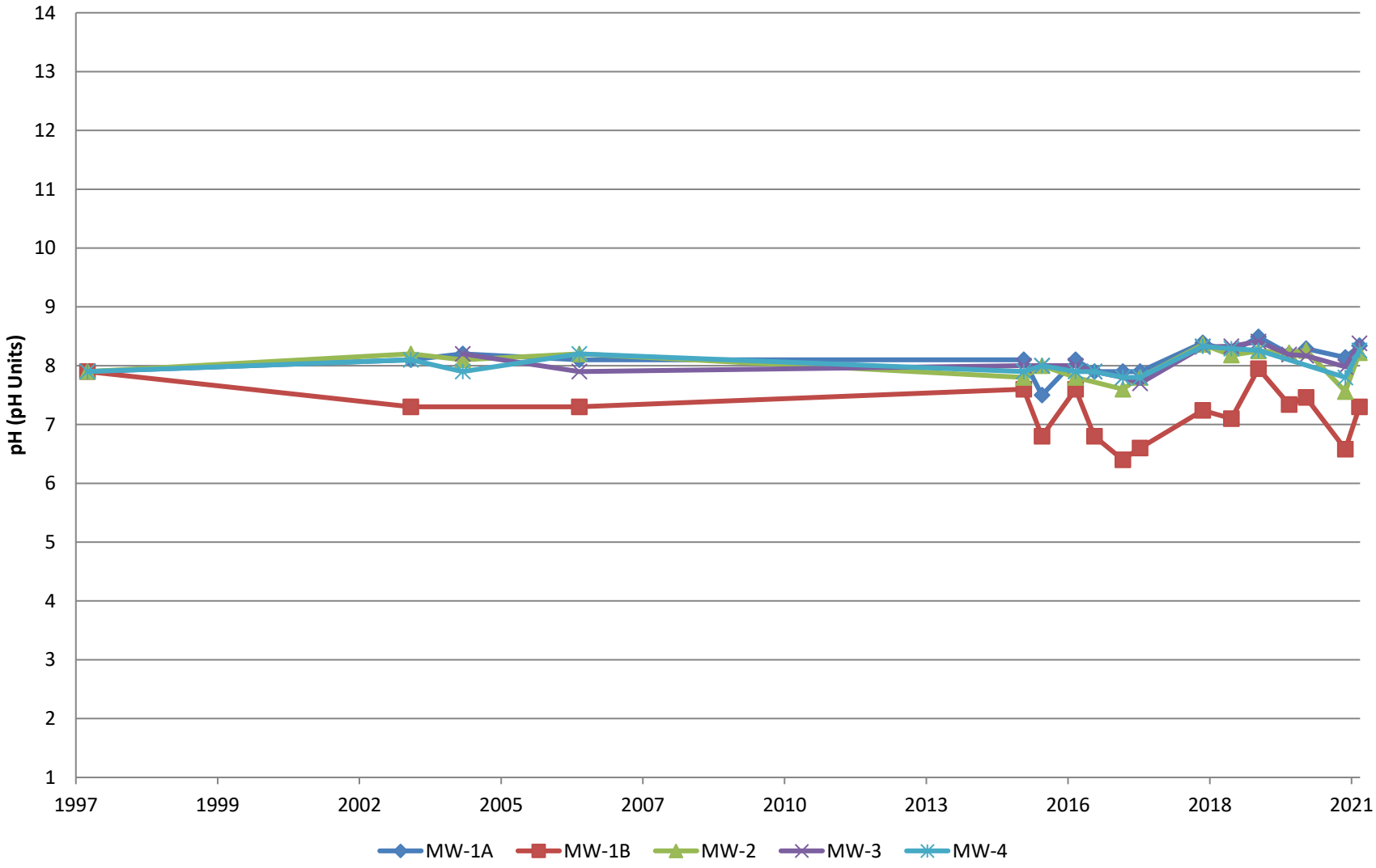
PROJECT:

Meziadin Annual Monitoring Report

TITLE:

Groundwater Conductivity

SCALE:	DATE:	PROJECT NO:
N/A	2022/03/31 (yyyy/mm/dd)	PRJ22037
DESIGNED	AM	DRAWING NO:
DRAWN	AM	**Figure G-3**
CHECKED	IB	



Sperling Hansen Associates

Regional District of Kitimat-Stikine

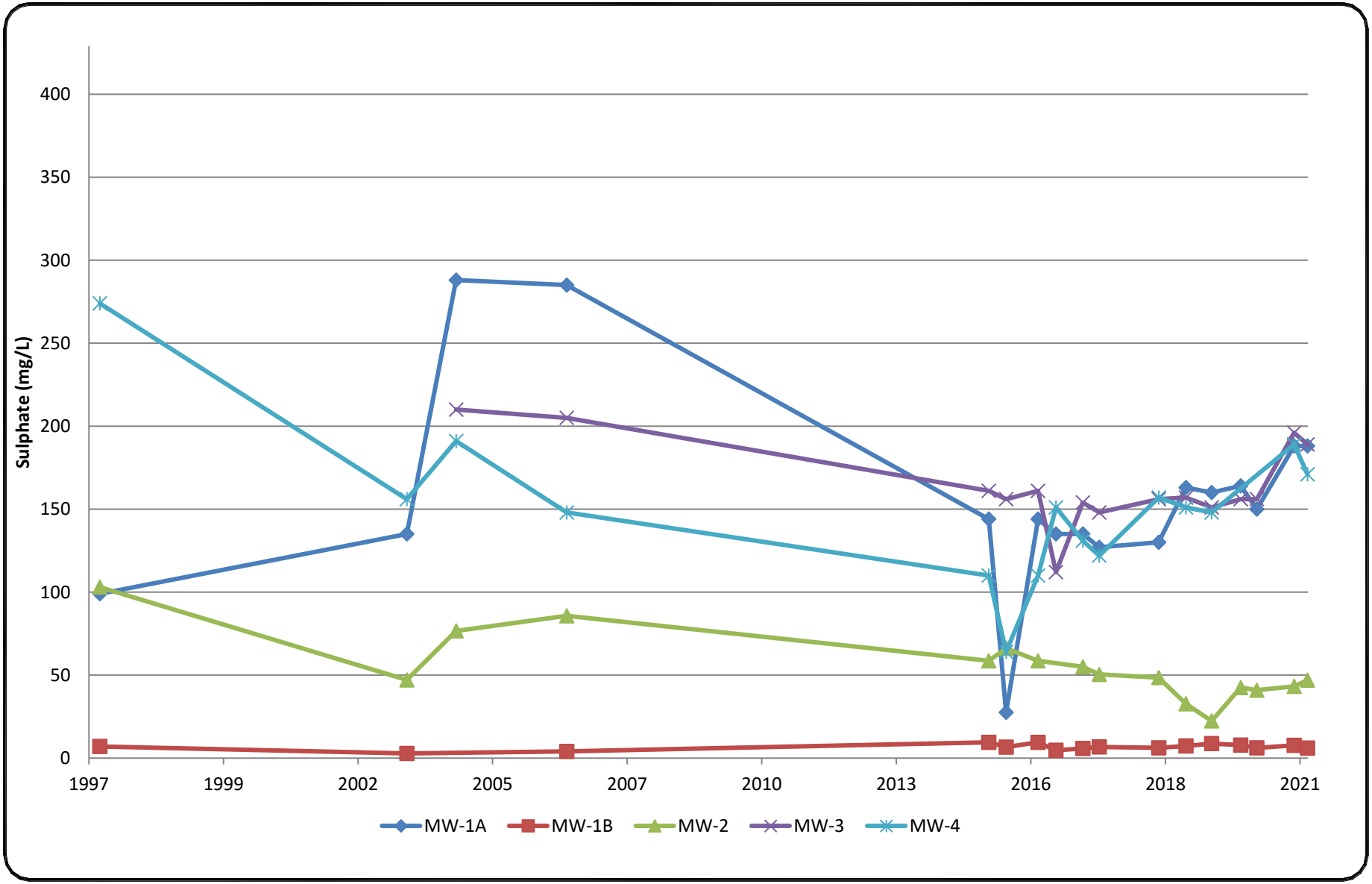
PROJECT:

Meziadin Annual Monitoring Report

TITLE:

Groundwater pH

SCALE:	DATE:	PROJECT NO:
N/A	2022/03/31 yyyy/mm/dd	PRJ22037
DESIGNED	AM	DRAWING NO:
DRAWN	AM	**Figure G-4**
CHECKED	IB	



Sperling Hansen Associates

Regional District of Kitimat-Stikine

PROJECT:
Meziadin Annual Monitoring Report

TITLE:
Groundwater Sulphate

SCALE:	DATE:	PROJECT NO:
N/A	2022/03/31 yyyy/mm/dd	PRJ22037
DESIGNED	AM	DRAWING NO:
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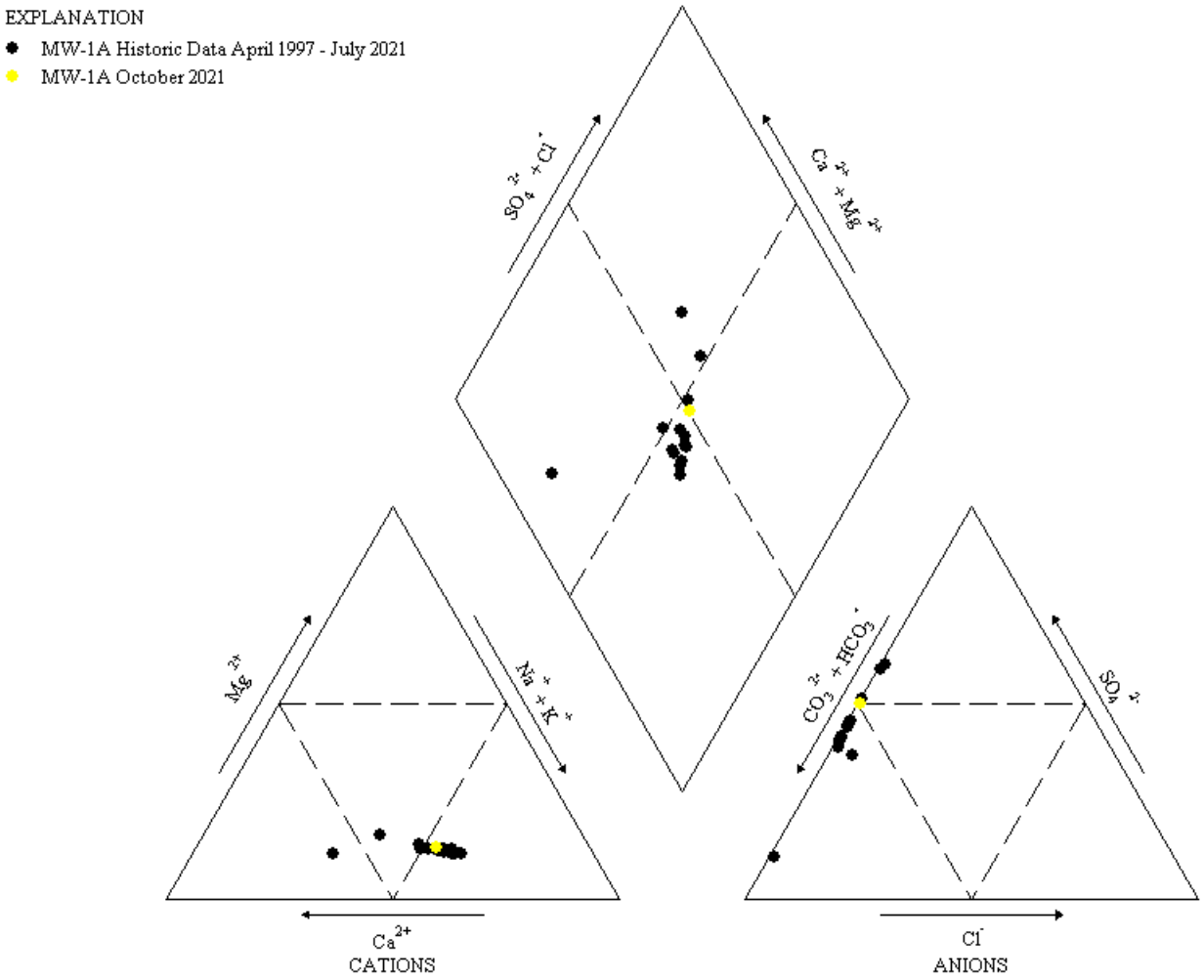
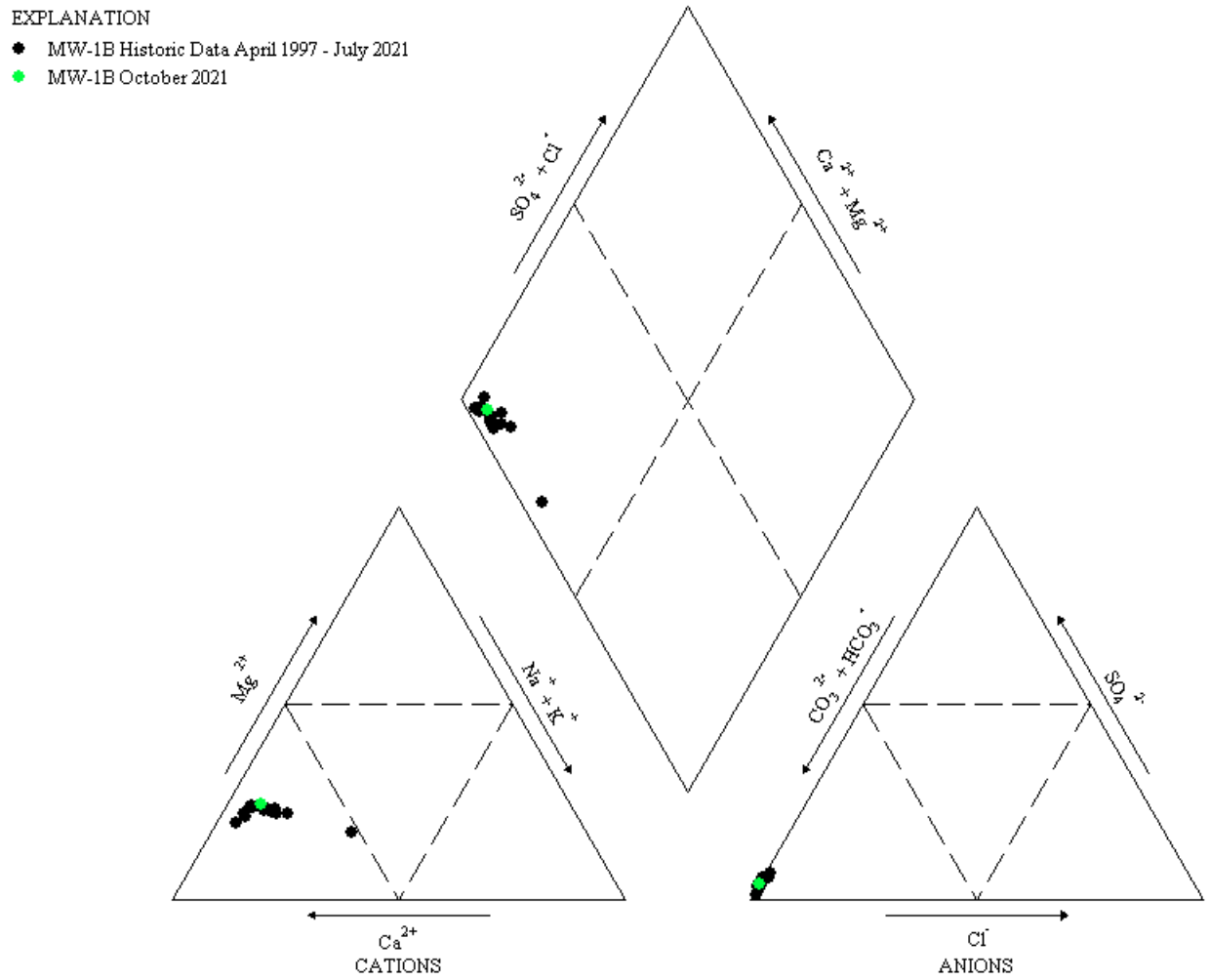
CHECKED	IB	



SPERLING HANSEN ASSOCIATES	Regional District of Kitimat-Stikine	PROJECT: **Meziadin Annual Monitoring Report**	TITLE: **Groundwater Piper Plot – MW1A**

SCALE: N/A	DATE: 2022/03/31 yyyy/mm/dd		PROJECT NO: **PRJ22037**
DESIGNED	AM	DRAWING NO: **Figure G-6**	
DRAWN	AM		
CHECKED	IB		



SPERLING HANSEN ASSOCIATES	Regional District of Kitimat-Stikine	PROJECT: **Meziadin Annual Monitoring Report**	TITLE: **Groundwater Piper Plot – MW1B**

SCALE: N/A	DATE: 2022/03/31 yyyy/mm/dd	PROJECT NO: **PRJ22037**	
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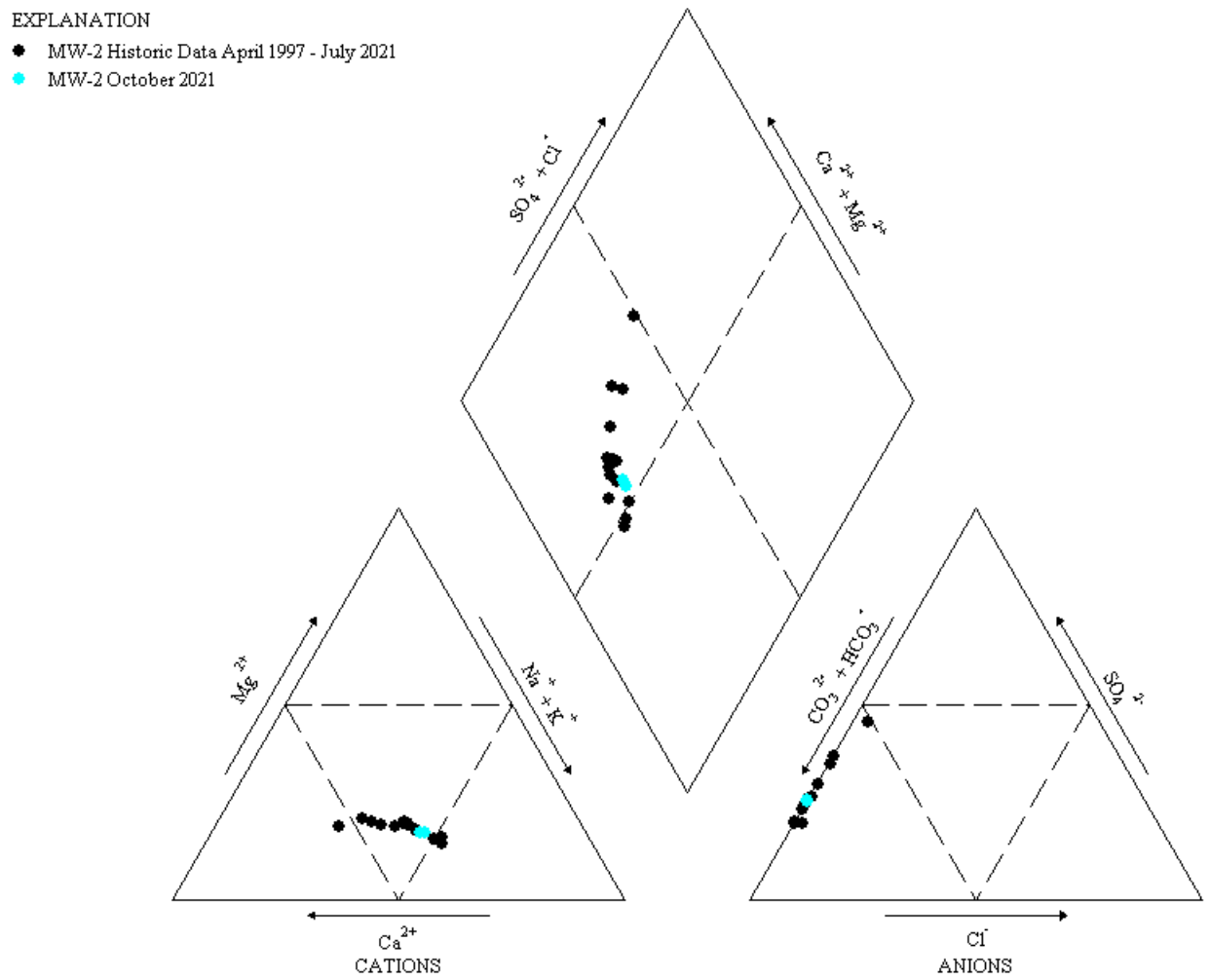
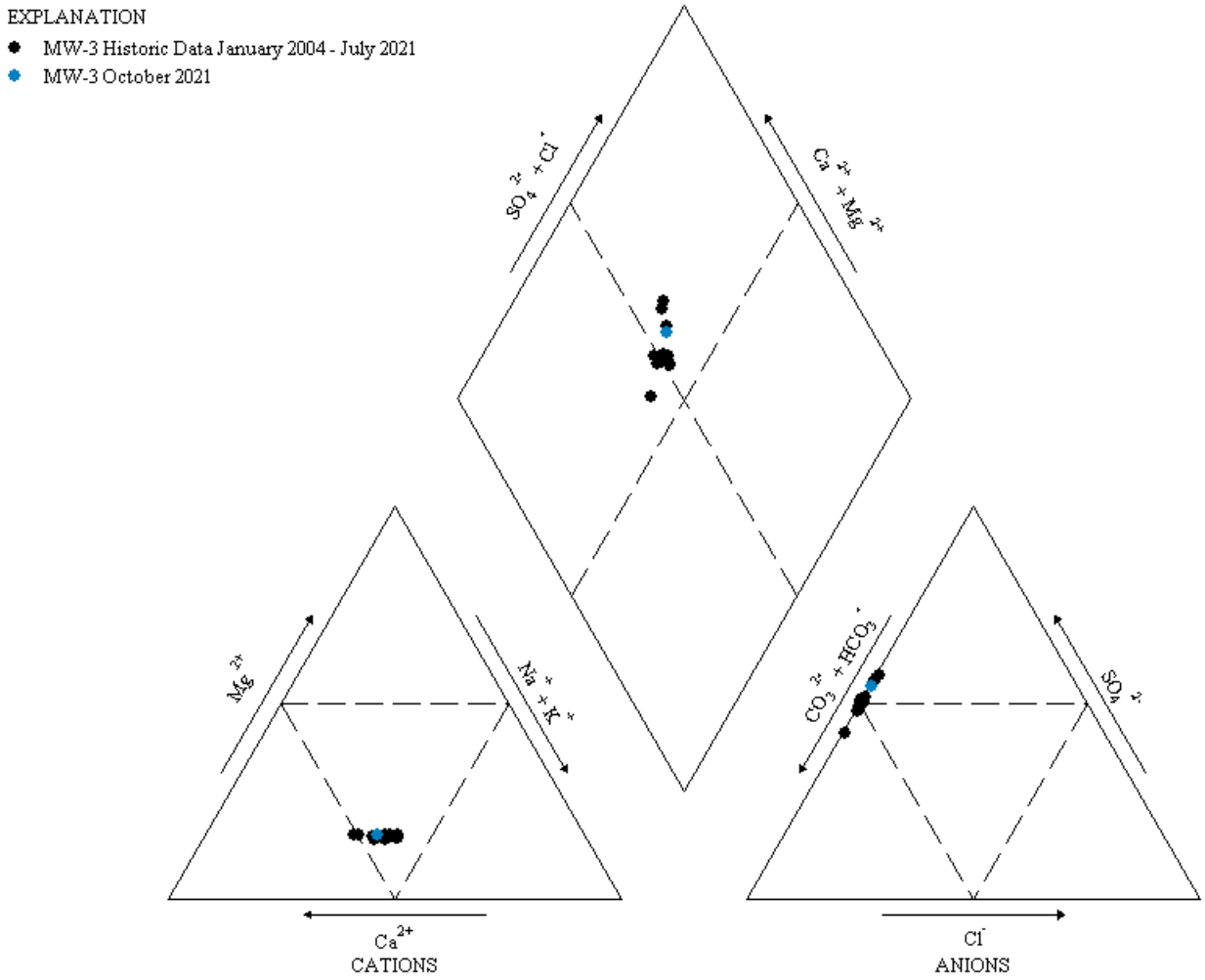
DRAWN	AM		
CHECKED	IB		

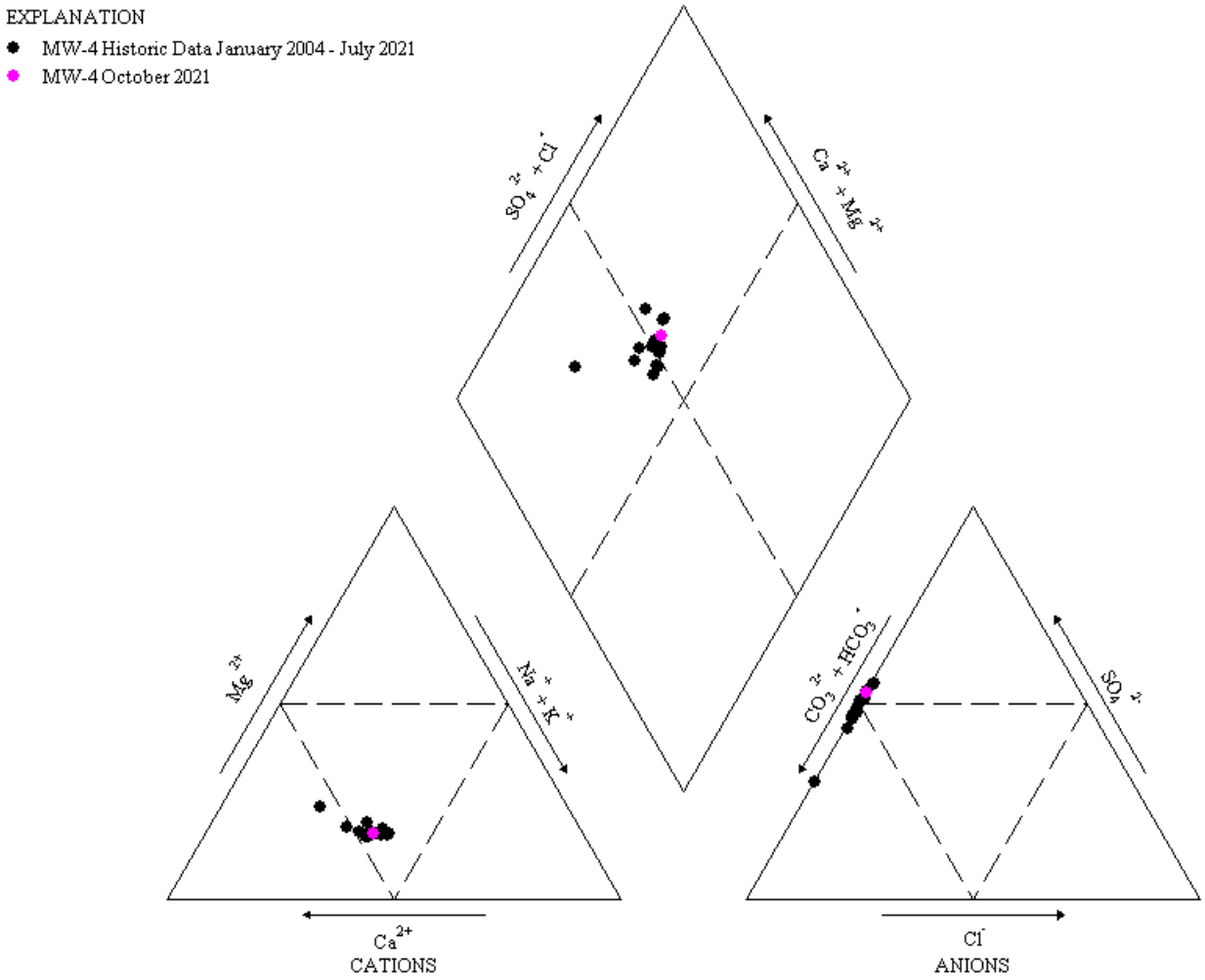


SPERLING HANSEN ASSOCIATES	Regional District of Kitimat-Stikine	PROJECT: **Meziadin Annual Monitoring Report**	TITLE: **Groundwater Piper Plot – MW2**	SCALE: N/A DATE: **2022/03/31** yyyy/mm/dd PROJECT NO: **PRJ22037** DESIGNED AM DRAWN AM CHECKED IB DRAWING NO: **Figure G-8**



SPERLING HANSEN ASSOCIATES	Regional District of Kitimat-Stikine	PROJECT: **Meziadin Annual Monitoring Report**	TITLE: **Groundwater Piper Plot – MW3**

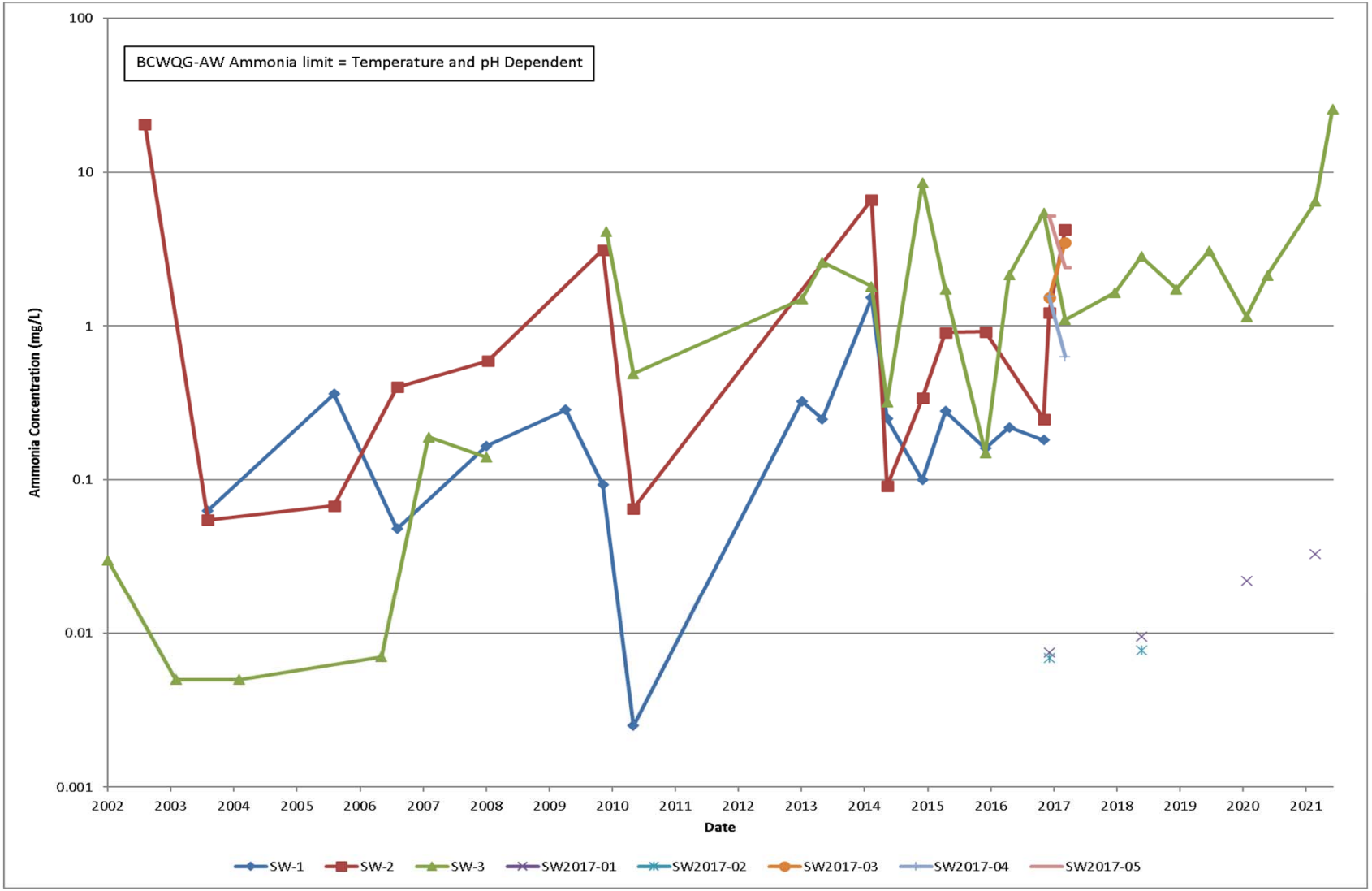
SCALE: N/A	DATE: 2022/03/31 yyyy/mm/dd		PROJECT NO: **PRJ22037**
DESIGNED	AM	DRAWING NO: **Figure G-9**	
DRAWN	AM		
CHECKED	IB		



SPERLING HANSEN ASSOCIATES	Regional District of Kitimat-Stikine	PROJECT: **Meziadin Annual Monitoring Report**	TITLE: **Groundwater Piper Plot – MW4**

SCALE:	DATE:	PROJECT NO:
N/A	**2022/03/31** yyyy/mm/dd	**PRJ22037**
DESIGNED: AM	DRAWING NO:	
DRAWN: AM	**Figure G-10**	
CHECKED: IB		

APPENDIX H
Trends in Surface Water



Sperling Hansen Associates	Regional District of Kitimat-Stikine	PROJECT: Meziadin Annual Monitoring Report	TITLE: Surface Water Ammonia	SCALE: N/A	DATE: 2022/03/31 (yyyy/mm/dd)
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				DRAWN: AM	
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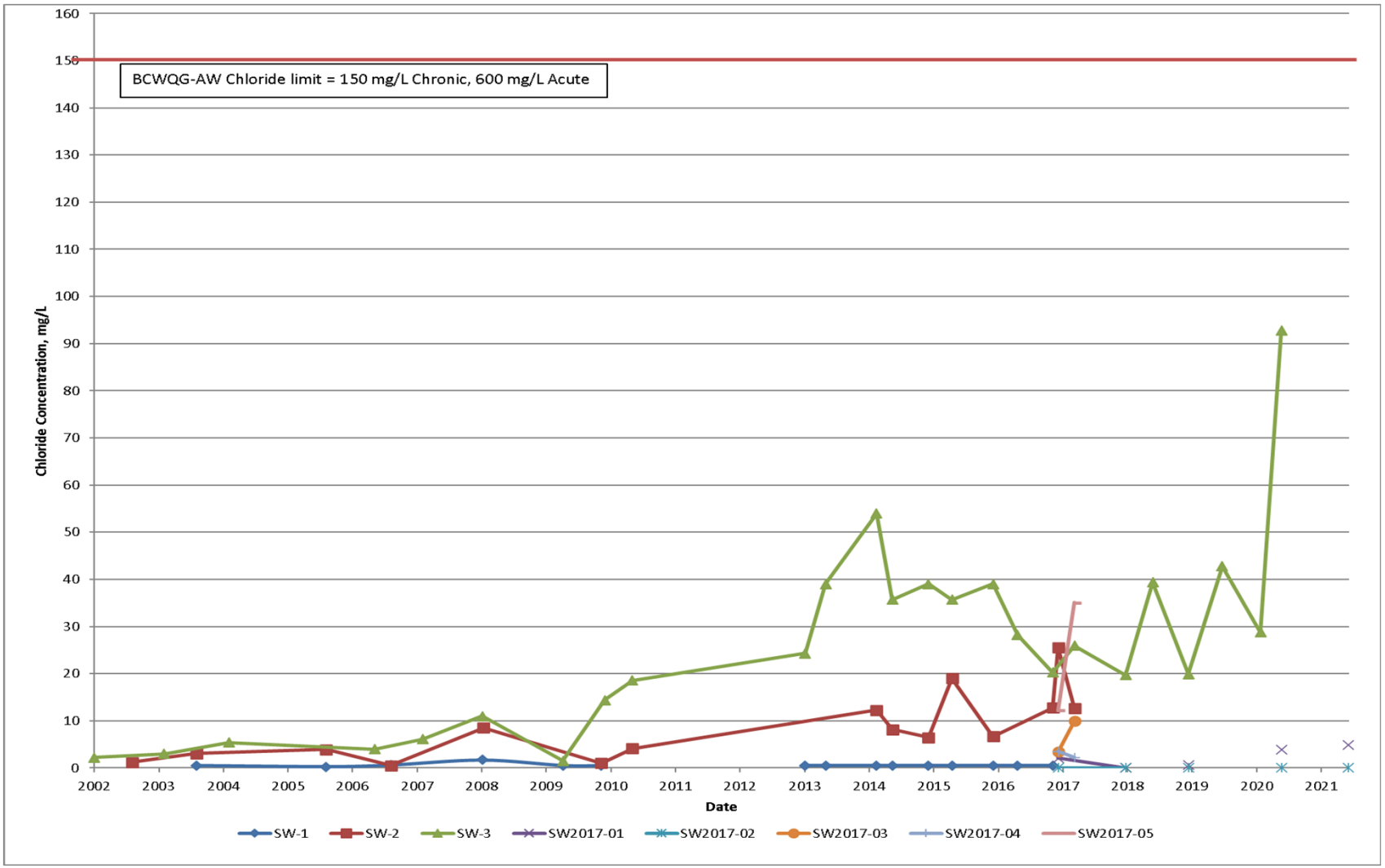

Sperling Hansen Associates	Regional District of Kitimat-Stikine	PROJECT: Meziadin Annual Monitoring Report	TITLE: Surface Water Chloride	SCALE: N/A	DATE: 2022/03/31 (yyyy/mm/dd)
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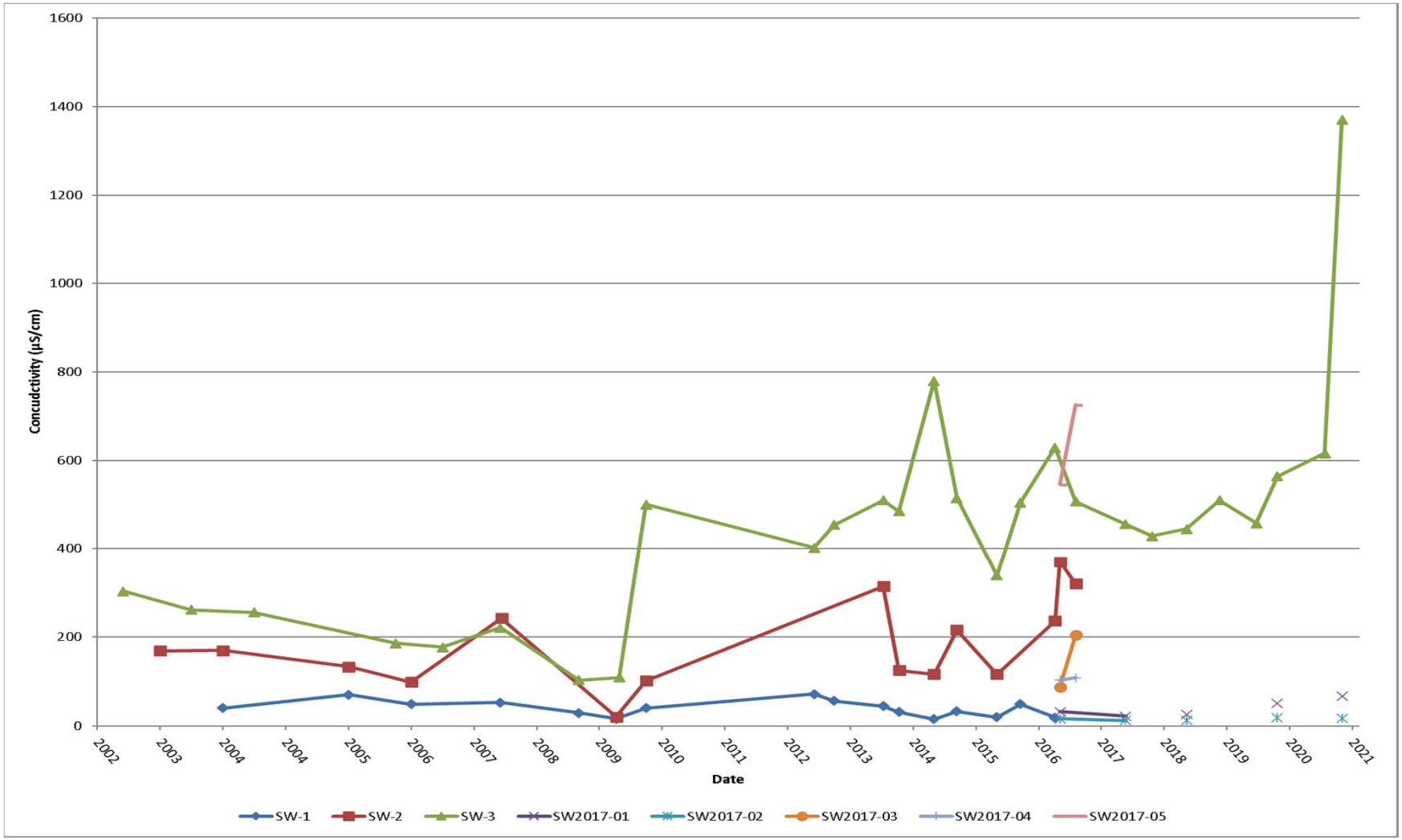

Sperling Hansen Associates	Regional District of Kitimat-Stikine	PROJECT: Meziadin Annual Monitoring Report	TITLE: Surface Water Conductivity	SCALE: N/A	DATE: 2022/03/31 yyyy/mm/dd
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				DESIGNED AM	DRAWING NO: Figure H-3
				DRAWN AM	
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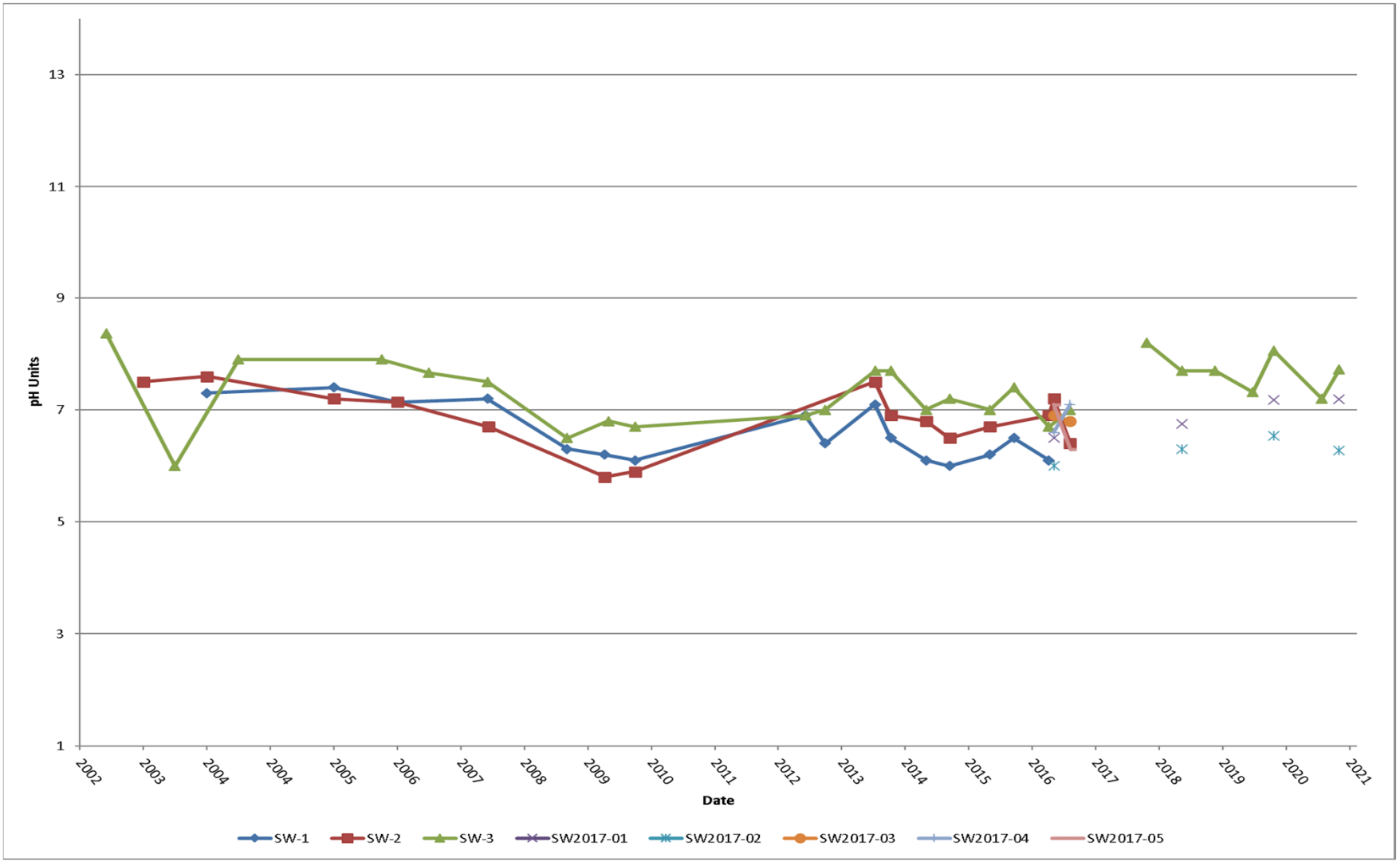

Sperling Hansen Associates	Regional District of Kitimat-Stikine	PROJECT: Meziadin Annual Monitoring Report	TITLE: Surface Water pH	SCALE: N/A	DATE: 2022/03/31 yyyy/mm/dd
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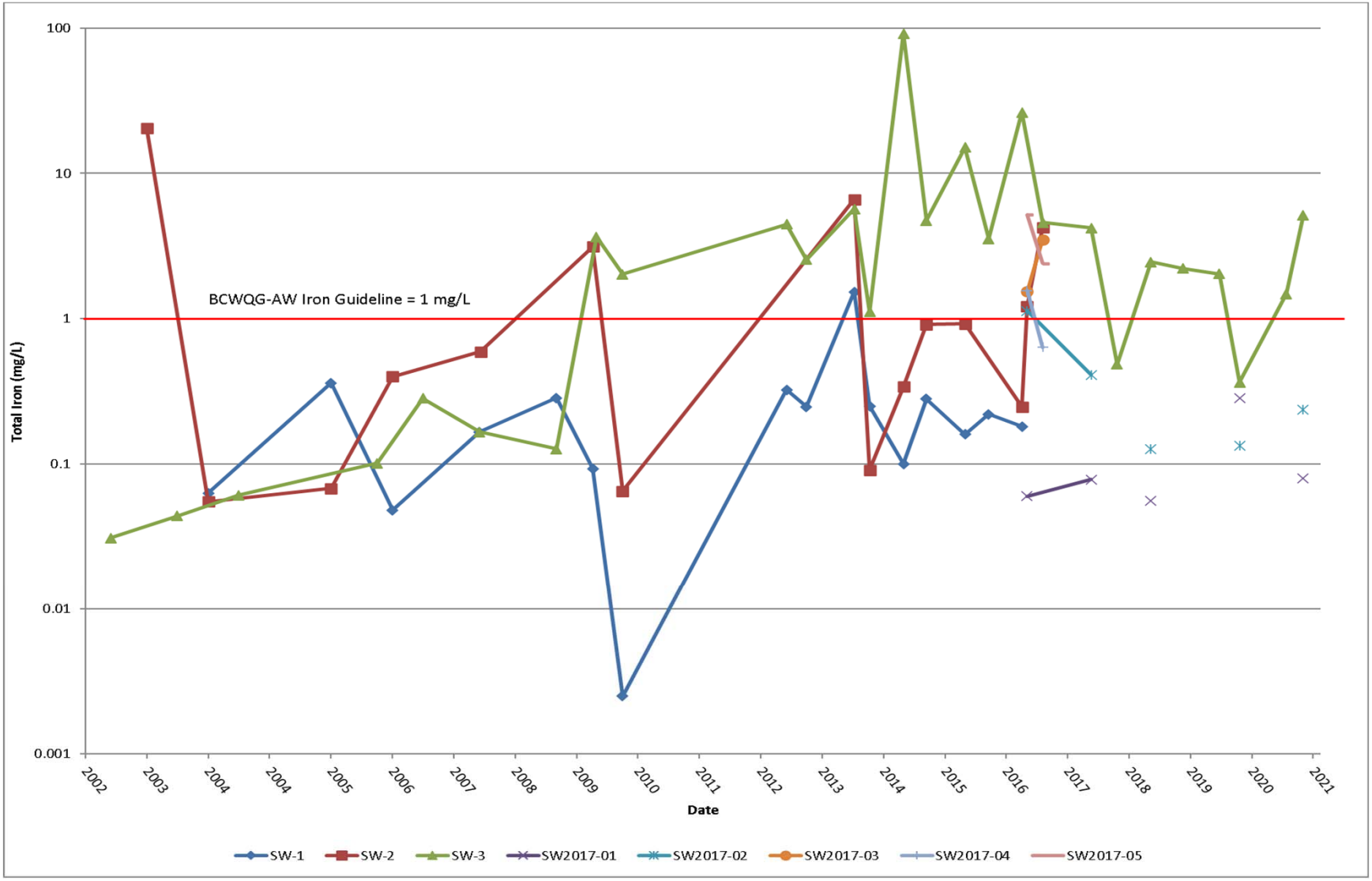

Sperling Hansen Associates	Regional District of Kitimat-Stikine	PROJECT: Meziadin Annual Monitoring Report	TITLE: Surface Water Iron	SCALE: N/A	DATE: 2022/03/31 (yyyy/mm/dd)
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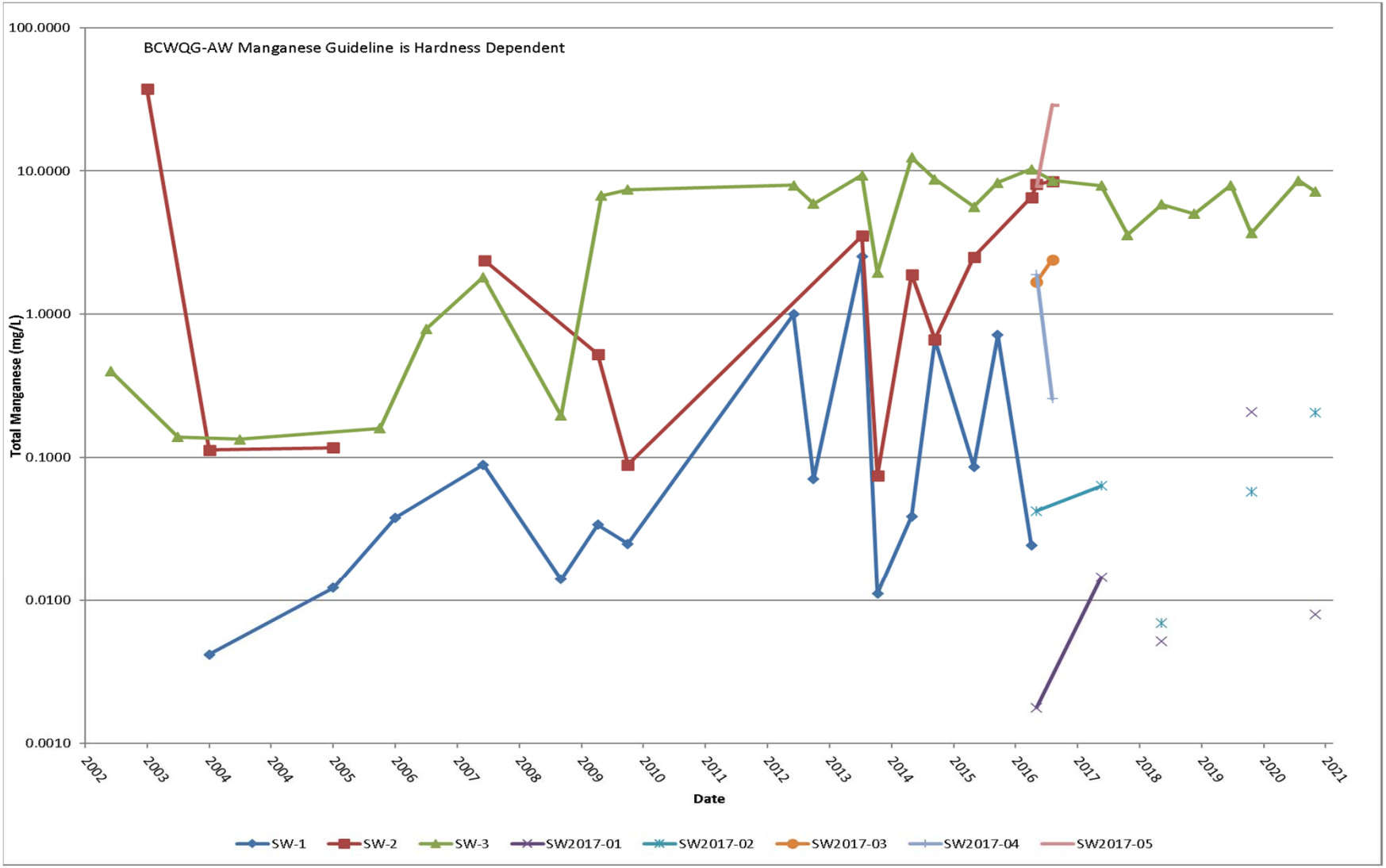

Sperling Hansen Associates	Regional District of Kitimat-Stikine	PROJECT: Meziadin Annual Monitoring Report	TITLE: Surface Water Manganese	SCALE: N/A	DATE: 2022/03/31 (yyyy/mm/dd)
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				DESIGNED: AM	DRAWING NO: Figure H-6
				DRAWN: AM	
				CHECKED: IB	

APPENDIX I
Field Monitoring Data

2021 Meziadin Landfill Annual Monitoring Program
FIELD DATA
Regional District of Kitimat-Stikine

Location			Meziadin Landfill																
Monitoring Well			BH97-1A / E251536																
Sample ID			MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A
Sample Date	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	1-Apr-97	1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-2020	15-Oct-20	19-Jul-21	27-Oct-2021
Sample Time																	15:05	10:45	15:02	10:36
Laboratory ID			-	-	-	-	-	-	-	-	-	-	L2097663-1	L2183746-1	L2269973	L2383402-1	VA20A8675-001	VA20B8400-001	VA21B5004-001	VA21C4129-001
Analyte																	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water
QAQC			-	-	-	-	-	-	-	-	-	-	-	-	-	-			HS	HS
Field Observations																				
Elevation	-	m	-	-	-	-	-	-	-	-	-	-	-	-	-	-		317	-	-
Depth to Water	-	m	-	-	-	-	-	-	-	-	-	-	6.77	8.63	8	7.79	7.36	8.2	8.45	8.43
Depth to Bottom	-	m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.74	9.9	9.9	9.98
pH	-	-	-	-	-	-	-	-	-	-	-	-	7.42	7.83	7.22	7.45	7.55	7.59	9.22	7.95
Temperature	-	°C	-	-	-	-	-	-	-	-	-	-	7.9	6.7	6.5	6.9	6.2	6.5	6.4	7.1
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	-	469.3	452.2	505	461.8	587	476.1	605	511
SPC	-	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	655	727.3	764	777
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	-	3.1	8.5	4.9	8.4	7.2	3.7	9.3	9.6
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	-	255.4	402.4	406.2	257.2	172.5	224.2	219.9	277.8

2021 Meziadin Landfill Annual Monitoring Program
FIELD DATA
Regional District of Kitimat-Stikine

Location			Meziadin Landfill																
Monitoring Well			BH97-1B / E251537																
Sample ID	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B
Sample Date			1-Apr-97	1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-2020	15-Oct-20	19-Jul-2021	27-Oct-2021
Sample Time																	15:15	11:15	15:25	10:55
Laboratory ID			-	-	-	-	-	-	-	-	-	-	L2097663-2	L2183746-2	L2269973	L2383402-2	VA20A8675-002	VA20B8400-002	VA21B5004-002	VA21C4129-002
Analyte																	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water
QAQC			-	-	-	-	-	-	-	-	-	-	-	-	-	-	MT		HS	HS
Field Observations																				
Elevation	-	m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	317	-	-
Depth to Water	-	m	-	-	-	-	-	-	-	-	-	-	2.62	3.26	2.5	2.18	2.78	2.82	3.2	2.26
Depth to Bottom	-	m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.05	7.84	7.05	7.04
pH	-	-	-	-	-	-	-	-	-	-	-	-	5.86	7.13	6.38	7.18	6.2	6.31	8.03	6.31
Temperature	-	°C	-	-	-	-	-	-	-	-	-	-	7.5	7.1	4.5	7.2	5.8	6.9	7.1	7.1
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	-	264.9	232.2	244.1	220.8	2.9	278.9	252.7	239.4
SPC	-	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.9	424.5	348.7	363.7
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	-	2.9	7.9	2.4	7.2	4.5	3.2	4.4	3.6
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	-	270.1	402.7	371.4	283.7	197.8	178.3	236.7	273

2021 Meziadin Landfill Annual Monitoring Program
FIELD DATA
Regional District of Kitimat-Stikine

Location			Meziadin Landfill																	
Monitoring Well			BH97-2 / E251538																	
Sample ID	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	RPD
Sample Date			1-Apr-97	1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-2020	15-Oct-20	19-Jul-2021	27-Oct-2021	27-Oct-2021	-
Sample Time																11:30	14:20	17:27	11:43	12:00	-
Laboratory ID			-	-	-	-	-	-	-	-	-	L2097663-3	L2183746-3	L2269973	L2383402-3	VA20A8675-003	VA20B8400-003	VA21B5004-003	VA21C4129-003	VA21C4129-007	-
Analyte																Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	DUP	-
QAQC			-	-	-	-	-	-	-	-	-	-	-	JC	-			HS	HS	HS	-
Field Observations																					
Elevation	-	m	-	-	-	-	-	-	-	-	-	-	-	-	-		324	-	-	-	-
Depth to Water	-	m	-	-	-	-	-	-	-	-	-	1.52	3.04	1.5	1.56	2	1.73	2.6	2	-	-
Depth to Bottom	-	m	-	-	-	-	-	-	-	-	-	-	-	-	-	5.42	7.07	7.08	7.11	-	-
pH	-	-	-	-	-	-	-	-	-	-	-	7.2	7.65	7.35	7.6	7.71	7.22	8.76	7.68	-	-
Temperature	-	°C	-	-	-	-	-	-	-	-	-	6.9	6.9	4.6	4.6	8.1	8.8	6.3	7.5	-	-
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	309.8	248.9	234.9	99.3	325	300	345.9	272.1	-	-
SPC	-	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	415	444.1	459.2	408.9	-	-
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	13.3	6.4	6.5	7.7	8.2	6.5	1.6	2	-	-
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	406.5	404.6	410.7	314.3	297.4	263.2	175.4	154.3	-	-

2021 Meziadin Landfill Annual Monitoring Program
FIELD DATA
Regional District of Kitimat-Stikine

Location			Meziadin Landfill																	
Monitoring Well			BH97-3 / E251539																	
Sample ID	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW3
Sample Date			1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18	**7-May-19**	14-Nov-19	17-Jun-2020 12:40	15-Oct-20 12:15	15-Oct-20 12:15	15-Oct-20 12:15	19-Jul-2021 13:00	27-Oct-2021 09:17
Laboratory ID			-	-	-	-	-	-	-	-	-	L2097663-4	L2183746-4	L2269973	L2383402-4	VA20A8675-004	VA20B8400-004	DUP	RPD Calculation	VA21B5004-004	VA21C4129-004
Analyte																Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water		Sub-Matrix: Water	Sub-Matrix: Water
QAQC			-	-	-	-	-	-	-	-	-	-	-	JC	-					HS	HS
Field Observations																					
Elevation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	338	338	0.00	-	-
Depth to Water	-	m	-	-	-	-	-	-	-	-	-	6.1	6.94	5.9	6.58	5.68	7.31	7.31	0.00	6.51	7.10
Depth to bottom	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.45	9.61	9.61	0.00	7.98	9.61
pH	-	-	-	-	-	-	-	-	-	-	-	7.19	7.5	7.59	7.54	7.53	7.31	7.31	0.00	9.12	8.09
Temperature	-	°C	-	-	-	-	-	-	-	-	-	6.6	6.1	5.3	6.7	5.6	5.9	5.9	0.00	5.50	6.40
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	421.7	391.7	402	406.1	450.6	427.1	427.1	0.00	552.0	452.10
SPC	-	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	653.1	657.7	657.7	0.00	720.0	700.50
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	11.2	7.6	5.6	4.0	6.4	4.6	4.6	0.00	11.1	12.70
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	433.8	412.3	450.2	381.3	291.5	206.7	206.7	0.00	227.3	267.90

2021 Meziadin Landfill Annual Monitoring Program
FIELD DATA
Regional District of Kitimat-Stikine

Location			Meziadin Landfill																		
Monitoring Well			BH97-4 / E251540																		
Sample ID	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	RPD	MW4
Sample Date			1-Apr-97	1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-May-17	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-2020	15-Oct-20	19-Jul-2021	19-Jul-2021	-	27-Oct-2021
Sample Time																	14:45	9:45	14:20	12:00	-	10:00
Laboratory ID			-	-	-	-	-	-	-	-	-	-	L2097663-5	L2183746-5	L2269973	L2383402-5	VA20A8675-005	VA20B8400-005	VA21B5004-005	VA21B5004-006	-	VA21C4129-005
Analyte																	Sub-Matrix: Water	Sub-Matrix: Water	Sub-Matrix: Water	DUP	-	Sub-Matrix: Water
QAQC			-	-	-	-	-	-	-	-	-	-	-	-					HS	HS	-	HS
Field Observations																						
Elevation	-	m	-	-	-	-	-	-	-	-	-	-	-	-	-	-		333	-	-	-	-
Depth to Water	-	m	-	-	-	-	-	-	-	-	-	-	6	5.91	5	5.81	3.44	6.5	5.6	-	-	6.33
Depth to Bottom	-	m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.44	9.6	8.24	-	-	10.02
pH	-	-	-	-	-	-	-	-	-	-	-	-	7.32	6.97	6.4	6.8	7.56	7.43	8.94	-	-	7.53
Temperature	-	°C	-	-	-	-	-	-	-	-	-	-	8.1	7.4	5.2	6.7	5.9	6.4	5.7	-	-	5.5
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	-	430.8	428.7	409	410.7	412.7	395.5	696	-	-	440.3
SPC	-	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	620.3	605.7	706	-	-	680.3
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	-	13.6	6.3	7.2	2.1	3.9	4.9	1.8	-	-	12.3
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	-	307.6	412.7	459	475.6	161	218.7	227.3	-	-	272

2021 Meziadin Landfill Annual Monitoring Program
FIELD DATA
Regional District of Kitimat-Stikine

Location	Meziadin - Treatment Lagoon Outlet Effluent							
Site Name	SW-3 / E245722							
Sample ID	**SW-3**	**SW-3**	**SW-3**	**SW-3**	**SW-3**	**SW-3**	**SW-3**	**SW-3**
Laboratory ID	L2097662-3	L2183745-1	L2269974-3	L2383403-1	VA20A8676-001	VA20B8397-003	VA21B5002-001	VA21C4128-003
Sample Date	17-May-18	17-Oct-18	7-May-19	14-Nov-19	17-Jun-20	15-Oct-20	19-Jul-2021	27-Oct-2021
QAQC	-	-						
Field Observations								
pH	6.61	7.45	6.62	-	6.71	6.62	8.22	7.04
Temperature	7.4	9.4	6.2	-	10.3	8	16.2	7.1
Conductivity	345	316.6	290.8	-	322	347.7	534	831
Water level	-	-	-	-	-	-	-	-
Dissolved Oxygen	4.7	5.5	4.2	-	1.7	2.7	1.8	4.3
Oxidation Reduction Potential	203.1	408.8	420.7	-	-37.2	210	-108.6	143.7

2021 Meziadin Landfill Annual Monitoring Program
FIELD DATA
Regional District of Kitimat-Stikine

Location	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	Downstream Location								
Site Name			SW2017-1 / E251541								
Sample ID			SW2017-1	SW2017-1	SW2017-1	SW2017-1	SW2017-1	SW2017-01 DS	SW2017-1	SW2017-1	SW2017-1
Laboratory ID			-	L2097662-1		L2269974					VA21C4128-001
Sample Date			1-May-17	17-May-18	17-Oct-18	7-May-19	14-No-19	17-Jun-20	15-Oct-20	19-Jul-21	27-Oct-2021
QAQC			-	-	No Sample Collected	-	No Sample Collected	Creek dry (MT)		Creek Dry HS	-
Field Observations											
pH	-	-	-	5.83	-	7.32	-	-	7.71	-	7.44
Temperature	-	°C	-	10.1	-	8.8	-	-	4.4	-	4.7
Conductivity	-	uS/cm	-	17.5	-	20.1	-	-	30.5	-	45.5
Water level	-	m	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	-	mg/L	-	10.5	-	9.1	-	-	4.8	-	8.9
Oxidation Reduction Potential	-	mV	-	400.1	-	400.8	-	-	248.1	-	178.6

2021 Meziadin Landfill Annual Monitoring Program
FIELD DATA
Regional District of Kitimat-Stikine

Location			Upstream surface location							
Site Name			SW2017-2 / E252829							
Sample ID	CSR Aquatic Life		SW2017-2	SW2017-2	SW2017-02	SW2017-02	SW2017-02	SW2017-2	SW2017-2	SW2017-2
Laboratory ID	Standard,	Units	-	L2097662-2	L2269974					VA21C4128-002
Sample Date	Freshwater (AW-F)		1-May-17	17-May-18	7-May-19	14-Nov-19	17-Jun-20	15-Oct-20	19-Jul-21	27-Oct-2021
QAQC			-	-	-	No sample collected	dry (MT)		Creek Dry (HS)	-
Field Observations										
pH	-	-	-	5.42	5.73	-	-	6.7	-	7.13
Temperature	-	°C	-	8	5.3	-	-	6	-	5.1
Conductivity	-	uS/cm	-	160	8.7	-	-	15.2	-	31.7
Water level	-	m	-	-	-	-	-	-	-	-
Dissolved Oxygen	-	mg/L	-	13.4	8.1	-	-	2.4	-	6.4
Oxidation Reduction Potential	-	mV	-	444.6	449.9	-	-	230.5	-	255

APPENDIX J
Laboratory Certificates

CERTIFICATE OF ANALYSIS

Work Order	: **VA21C4129**	Page	: 1 of 6
Client	: **Regional District of Kitimat-Stikine**	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 BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Meziadin Landfill Groundwater	Date Samples Received	: 28-Oct-2021 21:45
PO	: ----	Date Analysis Commenced	: 30-Oct-2021
C-O-C number	: ----	Issue Date	: 16-Nov-2021 17:12
Sampler	: Hannah Shinton		
Site	:		
Quote number	: Q62338		
No. of samples received	: 8		
No. of samples analysed	: 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 Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Jay Jang	Lab Assistant	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Saron Kim	Analyst	Metals, Burnaby, British Columbia

General Comments

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

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

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

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

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

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

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
HTD	*Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW1A	MW1B	MW2	MW3	MW4
					Client sampling date / time	27-Oct-2021 10:36	27-Oct-2021 10:55	27-Oct-2021 11:43	27-Oct-2021 09:17	27-Oct-2021 10:00
						VA21C4129-001	VA21C4129-002	VA21C4129-003	VA21C4129-004	VA21C4129-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		238	182	173	199	193
conductivity	----	E100	2.0	µS/cm		820	362	430	761	712
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		202	172	128	250	242
pH	----	E108	0.10	pH units		8.34	7.30	8.22	8.38	8.26
solids, total dissolved [TDS]	----	E162	10	mg/L		518	221	253	473	450
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0364	0.264	0.131	<0.0050	0.0093
chloride	16887-00-6	E235.Cl	0.50	mg/L		<2.50 DLDS	<0.50	<0.50	<2.50 DLDS	0.52
fluoride	16984-48-8	E235.F	0.020	mg/L		0.136	0.067	0.160	<0.100 DLDS	0.098
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.129	0.494	0.210	0.089	0.124
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.231	0.128	0.115	0.182	0.130
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS, HTD	0.0228	0.0058	<0.0050 DLDS	0.0016
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		188	5.98	46.9	189	171
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0060	0.0141	0.0019	0.0050	0.0012
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00020	<0.00010	0.00015	0.00010	0.00020
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00051	0.00090	0.00063	0.00026	0.00016
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0466	0.415	0.0568	0.0345	0.0274
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		0.077	0.014	0.050	0.070	0.078
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000267	0.000124	0.0000240	0.0000826	0.0000374
calcium, dissolved	7440-70-2	E421	0.050	mg/L		58.3	50.8	34.8	73.9	71.3
cesium, dissolved	7440-46-2	E421	0.000010	mg/L		<0.000010	0.000020	<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
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	0.0146	0.00014	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00304	0.00390	0.00140	0.00159	0.00312
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.013	2.26	0.085	<0.010	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		0.000062	<0.000050	0.000080	<0.000050	0.000127
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0046	0.0036	0.0029	0.0055	0.0055

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW1A	MW1B	MW2	MW3	MW4
					Client sampling date / time	27-Oct-2021 10:36	27-Oct-2021 10:55	27-Oct-2021 11:43	27-Oct-2021 09:17	27-Oct-2021 10:00
						VA21C4129-001	VA21C4129-002	VA21C4129-003	VA21C4129-004	VA21C4129-005
						Result	Result	Result	Result	Result
Dissolved Metals										
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		13.6	10.9	9.91	15.9	15.6
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00179	8.58	0.166	0.00224	0.00092
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		0.0112	0.000298	0.0132	0.00361	0.00468
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	0.0156	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	0.070	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.050	mg/L		2.64	0.883	1.79	2.08	2.50
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		0.00033	0.00088	0.00024	0.00033	0.00035
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000428	0.000072	0.000084	0.000664	0.000391
silicon, dissolved	7440-21-3	E421	0.050	mg/L		3.84	7.37	4.26	3.68	4.12
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	17341-25-2	E421	0.050	mg/L		104	5.72	49.2	68.9	63.8
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.710	0.332	0.408	0.723	0.799
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		64.8	2.05	16.1	65.5	63.5
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	0.000026	<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	<0.00010
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00283	0.000048	0.00180	0.00163	0.00106
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		0.0018	0.0066	0.0019	0.0035	0.0022
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field
Aggregate Organics										
chemical oxygen demand [COD]	----	E559	20	mg/L		35	33	<20	24	<20

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: Field Blank	DUP	Travel Blank	----	----
					Client sampling date / time: 27-Oct-2021 12:30	27-Oct-2021 12:00	27-Oct-2021	----	----
					VA21C4129-006	VA21C4129-007	VA21C4129-008	--------	--------
					Result	Result	Result	----	----
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	<1.0	205	<1.0	----	----
conductivity	----	E100	2.0	µS/cm	<2.0	491	<2.0	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L	----	123	----	----	----
pH	----	E108	0.10	pH units	5.40	8.30	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	----	283	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	0.131	<0.0050	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L	----	<0.50	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	----	0.167	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	----	0.238	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	----	0.0456	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	----	0.0028	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	----	54.7	----	----	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	----	0.0020	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	----	0.00016	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	----	0.00062	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L	----	0.0564	----	----	----
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	----	0.049	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	----	0.0000234	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L	----	33.2	----	----	----
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	----	0.00013	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L	----	0.00056	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L	----	0.077	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L	----	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	----	0.0029	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	----	9.68	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: Field Blank	DUP	Travel Blank	----	----
					Client sampling date / time: 27-Oct-2021 12:30	27-Oct-2021 12:00	27-Oct-2021	----	----
					VA21C4129-006	VA21C4129-007	VA21C4129-008	--------	--------
					Result	Result	Result	----	----
Dissolved Metals									
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	----	0.151	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	----	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	----	0.0132	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	----	<0.00050	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	----	0.073	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	----	1.80	----	----	----
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	----	0.00023	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L	----	0.000106	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L	----	4.36	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L	----	<0.000010	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L	----	49.6	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	----	0.400	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	----	16.0	----	----	----
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	----	<0.00020	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	----	<0.000010	----	----	----
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	----	0.00178	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	----	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	----	0.0013	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	----	<0.00020	----	----	----
dissolved mercury filtration location	----	EP509	-	-	----	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-	----	Field	----	----	----
Aggregate Organics									
chemical oxygen demand [COD]	----	E559	20	mg/L	----	<20	----	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA21C4129**	Page	: 1 of 17
Client	: **Regional District of Kitimat-Stikine**	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	: Meziadin Landfill Groundwater	Date Samples Received	: 28-Oct-2021 21:45
PO	: ----	Issue Date	: 16-Nov-2021 17:12
C-O-C number	: ----		
Sampler	: Hannah Shinton		
Site	:		
Quote number	: Q62338		
No. of samples received	: 8		
No. of samples analysed	: 8		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Physical Tests	QC-MRG2-3336450 01	----	alkalinity, total (as CaCO3)	----	E290	1.8 mg/L [B]	1.5 mg/L	Blank result exceeds permitted value

Result Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 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 Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid)										
DUP	E559	27-Oct-2021	----	----	----		09-Nov-2021	28 days	13 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid)										
MW1A	E559	27-Oct-2021	----	----	----		09-Nov-2021	28 days	13 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid)										
MW1B	E559	27-Oct-2021	----	----	----		09-Nov-2021	28 days	13 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid)										
MW2	E559	27-Oct-2021	----	----	----		09-Nov-2021	28 days	13 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid)										
MW3	E559	27-Oct-2021	----	----	----		09-Nov-2021	28 days	13 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid)										
MW4	E559	27-Oct-2021	----	----	----		09-Nov-2021	28 days	13 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
Travel Blank	E298	27-Oct-2021	09-Nov-2021	----	----		09-Nov-2021	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 Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) DUP	E298	27-Oct-2021	09-Nov-2021	----	----		09-Nov-2021	28 days	14 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) Field Blank	E298	27-Oct-2021	09-Nov-2021	----	----		09-Nov-2021	28 days	14 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW1A	E298	27-Oct-2021	09-Nov-2021	----	----		09-Nov-2021	28 days	14 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW1B	E298	27-Oct-2021	09-Nov-2021	----	----		09-Nov-2021	28 days	14 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW2	E298	27-Oct-2021	09-Nov-2021	----	----		09-Nov-2021	28 days	14 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW3	E298	27-Oct-2021	09-Nov-2021	----	----		09-Nov-2021	28 days	14 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW4	E298	27-Oct-2021	09-Nov-2021	----	----		09-Nov-2021	28 days	14 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE DUP	E235.Cl	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE MW1A	E235.Cl	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC										
HDPE MW1B	E235.Cl	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE MW2	E235.Cl	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE MW3	E235.Cl	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE MW4	E235.Cl	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE DUP	E235.F	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW1A	E235.F	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW1B	E235.F	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW2	E235.F	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW3	E235.F	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW4	E235.F	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP	E235.NO3-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW1A	E235.NO3-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW1B	E235.NO3-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW2	E235.NO3-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW3	E235.NO3-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW4	E235.NO3-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP	E235.NO2-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW1A	E235.NO2-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW1B	E235.NO2-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW2	E235.NO2-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW3	E235.NO2-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW4	E235.NO2-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE DUP	E235.SO4	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW1A	E235.SO4	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW1B	E235.SO4	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW2	E235.SO4	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW3	E235.SO4	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
MW4	E235.SO4	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
DUP	E318	27-Oct-2021	09-Nov-2021	----	----		16-Nov-2021	28 days	20 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
MW1A	E318	27-Oct-2021	09-Nov-2021	----	----		16-Nov-2021	28 days	20 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
MW1B	E318	27-Oct-2021	09-Nov-2021	----	----		16-Nov-2021	28 days	20 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
MW2	E318	27-Oct-2021	09-Nov-2021	----	----		16-Nov-2021	28 days	20 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
MW3	E318	27-Oct-2021	09-Nov-2021	----	----		16-Nov-2021	28 days	20 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
MW4	E318	27-Oct-2021	09-Nov-2021	----	----		16-Nov-2021	28 days	20 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
DUP	E509	27-Oct-2021	06-Nov-2021	----	----		06-Nov-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW1A	E509	27-Oct-2021	06-Nov-2021	----	----		06-Nov-2021	28 days	10 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW1B	E509	27-Oct-2021	06-Nov-2021	----	----		06-Nov-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW2	E509	27-Oct-2021	06-Nov-2021	----	----		06-Nov-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW3	E509	27-Oct-2021	06-Nov-2021	----	----		06-Nov-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
MW4	E509	27-Oct-2021	06-Nov-2021	----	----		06-Nov-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
DUP	E421	27-Oct-2021	05-Nov-2021	----	----		06-Nov-2021	180 days	10 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
MW1A	E421	27-Oct-2021	05-Nov-2021	----	----		06-Nov-2021	180 days	10 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
MW1B	E421	27-Oct-2021	05-Nov-2021	----	----		06-Nov-2021	180 days	10 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
MW2	E421	27-Oct-2021	05-Nov-2021	----	----		06-Nov-2021	180 days	10 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
MW3	E421	27-Oct-2021	05-Nov-2021	----	----		06-Nov-2021	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 Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW4	E421	27-Oct-2021	05-Nov-2021	----	----		06-Nov-2021	180 days	10 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DUP	E290	27-Oct-2021	----	----	----		30-Oct-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE Field Blank	E290	27-Oct-2021	----	----	----		30-Oct-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW1A	E290	27-Oct-2021	----	----	----		30-Oct-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW1B	E290	27-Oct-2021	----	----	----		30-Oct-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW2	E290	27-Oct-2021	----	----	----		30-Oct-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW3	E290	27-Oct-2021	----	----	----		30-Oct-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW4	E290	27-Oct-2021	----	----	----		30-Oct-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE Travel Blank	E290	27-Oct-2021	----	----	----		30-Oct-2021	14 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE DUP	E100	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE Field Blank	E100	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE MW1A	E100	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE MW1B	E100	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE MW2	E100	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE MW3	E100	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE MW4	E100	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE Travel Blank	E100	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Physical Tests : pH by Meter										
HDPE Field Blank	E108	27-Oct-2021	----	----	----		30-Oct-2021	0.25 hrs	67 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE DUP	E108	27-Oct-2021	----	----	----		30-Oct-2021	0.25 hrs	68 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW2	E108	27-Oct-2021	----	----	----		30-Oct-2021	0.25 hrs	68 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW1A	E108	27-Oct-2021	----	----	----		30-Oct-2021	0.25 hrs	69 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW1B	E108	27-Oct-2021	----	----	----		30-Oct-2021	0.25 hrs	69 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW4	E108	27-Oct-2021	----	----	----		30-Oct-2021	0.25 hrs	70 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW3	E108	27-Oct-2021	----	----	----		30-Oct-2021	0.25 hrs	71 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE DUP	E162	27-Oct-2021	----	----	----		03-Nov-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE MW1A	E162	27-Oct-2021	----	----	----		03-Nov-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE MW1B	E162	27-Oct-2021	----	----	----		03-Nov-2021	7 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TDS by Gravimetry										
HDPE MW2	E162	27-Oct-2021	----	----	----		03-Nov-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE MW3	E162	27-Oct-2021	----	----	----		03-Nov-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE MW4	E162	27-Oct-2021	----	----	----		03-Nov-2021	7 days	7 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	333645	1	11	9.0	5.0	✓
Ammonia by Fluorescence	E298	340922	1	17	5.8	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	341605	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	333641	1	9	11.1	5.0	✓
Conductivity in Water	E100	333646	1	11	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	339483	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	338399	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	333640	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	333638	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	333639	1	12	8.3	5.0	✓
pH by Meter	E108	333644	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	333643	1	9	11.1	5.0	✓
TDS by Gravimetry	E162	336384	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	340919	1	6	16.6	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	333645	1	11	9.0	5.0	✓
Ammonia by Fluorescence	E298	340922	1	17	5.8	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	341605	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	333641	1	9	11.1	5.0	✓
Conductivity in Water	E100	333646	1	11	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	339483	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	338399	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	333640	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	333638	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	333639	1	12	8.3	5.0	✓
pH by Meter	E108	333644	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	333643	1	9	11.1	5.0	✓
TDS by Gravimetry	E162	336384	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	340919	1	6	16.6	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	333645	1	11	9.0	5.0	✓
Ammonia by Fluorescence	E298	340922	1	17	5.8	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	341605	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	333641	1	9	11.1	5.0	✓
Conductivity in Water	E100	333646	1	11	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	339483	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	338399	1	20	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Fluoride in Water by IC	E235.F	333640	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	333638	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	333639	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	333643	1	9	11.1	5.0	✓
TDS by Gravimetry	E162	336384	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	340919	1	6	16.6	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	340922	1	17	5.8	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	341605	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	333641	1	9	11.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	339483	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	338399	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	333640	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	333638	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	333639	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	333643	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	340919	1	6	16.6	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.
TDS by Gravimetry	E162 Vancouver - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
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).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
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.
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	E559 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
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 using block digestion with Copper Sulfate Digestion Reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	: **VA21C4129**	Page	: 1 of 10
Client	: Regional District of Kitimat-Stikine	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	: Meziadin Landfill Groundwater	Date Samples Received	: 28-Oct-2021 21:45
PO	: ----	Date Analysis Commenced	: 30-Oct-2021
C-O-C number	: ----	Issue Date	: 16-Nov-2021 17:12
Sampler	: Hannah Shinton		
Site	:		
Quote number	: Q62338		
No. of samples received	: 8		
No. of samples analysed	: 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 Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Jay Jang	Lab Assistant	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Saron Kim	Analyst	Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 333644)											
VA21C4128-001	Anonymous	pH	----	E108	0.10	pH units	7.19	7.15	0.558%	4%	----
Physical Tests (QC Lot: 333645)											
VA21C4128-001	Anonymous	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	15.9	15.4	3.19%	20%	----
Physical Tests (QC Lot: 333646)											
VA21C4128-001	Anonymous	conductivity	----	E100	2.0	µS/cm	66.4	68.1	2.53%	10%	----
Physical Tests (QC Lot: 336384)											
FJ2101220-001	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	1440	1480	2.98%	20%	----
Anions and Nutrients (QC Lot: 333638)											
VA21C4128-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.539	0.545	1.17%	20%	----
Anions and Nutrients (QC Lot: 333639)											
VA21C4128-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0029	0.0029	0.000001	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 333640)											
VA21C4128-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 333641)											
VA21C4128-001	Anonymous	chloride	16887-00-6	E235.Cl	0.50	mg/L	4.89	4.90	0.002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 333643)											
VA21C4128-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	3.26	3.26	0.0708%	20%	----
Anions and Nutrients (QC Lot: 340919)											
VA21C4129-001	MW1A	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.129	0.150	0.020	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 340922)											
VA21C4104-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0068	0.0070	0.0002	Diff <2x LOR	----
Dissolved Metals (QC Lot: 338399)											
VA21C4080-003	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	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 338399) - continued											
VA21C4080-003	Anonymous	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	0.000177	0.000178	0.0000005	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	----
		sodium, dissolved	17341-25-2	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	0.000010	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	<0.000010	<0.000010	0	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 339483)											
VA21C4126-004	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Aggregate Organics (QC Lot: 341605)											
VA21C4129-001	MW1A	chemical oxygen demand [COD]	----	E559	20	mg/L	35	42	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: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 333645)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	# 1.8	B
Physical Tests (QCLot: 333646)						
conductivity	----	E100	1	µS/cm	1.2	----
Physical Tests (QCLot: 336384)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 333638)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 333639)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 333640)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 333641)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 333643)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 340919)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 340922)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 338399)						
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	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 338399) - continued						
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
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	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
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	----
Dissolved Metals (QCLot: 339483)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Aggregate Organics (QCLot: 341605)						
chemical oxygen demand [COD]	----	E559	20	mg/L	<20	----

Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 333644)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 333645)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	98.5	85.0	115	----
Physical Tests (QCLot: 333646)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	107	90.0	110	----
Physical Tests (QCLot: 336384)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	100	85.0	115	----
Anions and Nutrients (QCLot: 333638)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 333639)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 333640)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	99.8	90.0	110	----
Anions and Nutrients (QCLot: 333641)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 333643)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 340919)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	93.2	75.0	125	----
Anions and Nutrients (QCLot: 340922)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	98.7	85.0	115	----
Dissolved Metals (QCLot: 338399)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	101	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	99.2	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	101	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	97.6	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	90.5	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	100	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	99.3	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Dissolved Metals (QCLot: 338399) - continued									
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	94.8	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	98.4	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	97.1	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	98.0	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	95.7	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	98.2	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	96.7	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	99.9	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	98.1	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	95.0	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	101	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	99.9	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	96.7	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	90.0	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	96.0	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	90.6	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	100	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	101	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	91.0	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	97.4	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	102	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	94.9	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	97.2	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	97.0	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	95.8	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	104	80.0	120	----
Aggregate Organics (QCLot: 341605)									
chemical oxygen demand [COD]	----	E559	20	mg/L	100 mg/L	109	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
Anions and Nutrients (QCLot: 333638)										
VA21C4128-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.40 mg/L	2.5 mg/L	96.0	75.0	125	----
Anions and Nutrients (QCLot: 333639)										
VA21C4128-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.466 mg/L	0.5 mg/L	93.2	75.0	125	----
Anions and Nutrients (QCLot: 333640)										
VA21C4128-002	Anonymous	fluoride	16984-48-8	E235.F	0.931 mg/L	1 mg/L	93.1	75.0	125	----
Anions and Nutrients (QCLot: 333641)										
VA21C4128-002	Anonymous	chloride	16887-00-6	E235.Cl	95.3 mg/L	100 mg/L	95.3	75.0	125	----
Anions and Nutrients (QCLot: 333643)										
VA21C4128-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	98.3 mg/L	100 mg/L	98.3	75.0	125	----
Anions and Nutrients (QCLot: 340919)										
VA21C4129-002	MW1B	Kjeldahl nitrogen, total [TKN]	----	E318	2.42 mg/L	2.5 mg/L	96.6	70.0	130	----
Anions and Nutrients (QCLot: 340922)										
VA21C4104-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0969 mg/L	0.1 mg/L	96.9	75.0	125	----
Dissolved Metals (QCLot: 338399)										
VA21C4080-004	Anonymous	aluminum, dissolved	7429-90-5	E421	0.192 mg/L	0.2 mg/L	96.0	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0387 mg/L	0.04 mg/L	96.7	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00905 mg/L	0.01 mg/L	90.5	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.092 mg/L	0.1 mg/L	91.8	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00382 mg/L	0.004 mg/L	95.5	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	0.00947 mg/L	0.01 mg/L	94.7	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0187 mg/L	0.02 mg/L	93.3	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0180 mg/L	0.02 mg/L	89.8	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.89 mg/L	2 mg/L	94.4	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0188 mg/L	0.02 mg/L	93.8	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
Dissolved Metals (QCLot: 338399) - continued										
VA21C4080-004	Anonymous	lithium, dissolved	7439-93-2	E421	0.0976 mg/L	0.1 mg/L	97.6	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	0.0362 mg/L	0.04 mg/L	90.6	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.5 mg/L	10 mg/L	105	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.91 mg/L	4 mg/L	97.7	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0189 mg/L	0.02 mg/L	94.4	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0413 mg/L	0.04 mg/L	103	70.0	130	----
		silicon, dissolved	7440-21-3	E421	8.60 mg/L	10 mg/L	86.0	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00381 mg/L	0.004 mg/L	95.2	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	20.4 mg/L	20 mg/L	102	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0401 mg/L	0.04 mg/L	100	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00374 mg/L	0.004 mg/L	93.6	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0195 mg/L	0.02 mg/L	97.4	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0390 mg/L	0.04 mg/L	97.5	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00368 mg/L	0.004 mg/L	92.0	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0964 mg/L	0.1 mg/L	96.4	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.365 mg/L	0.4 mg/L	91.3	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0390 mg/L	0.04 mg/L	97.5	70.0	130	----
Dissolved Metals (QCLot: 339483)										
VA21C4126-005	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000991 mg/L	0.0001 mg/L	99.1	70.0	130	----
Aggregate Organics (QCLot: 341605)										
VA21C4129-002	MW1B	chemical oxygen demand [COD]	----	E559	110 mg/L	100 mg/L	110	75.0	125	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Regional District of Kitimat-Stikine
Contact:	Hannah Shinton
Phone:	250-641-4141
	Company address below will appear on the final report
Street:	4545 Lazelle Avenue
City/Province:	Terrace/BC
Postal Code:	V8G4E1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	Regional District of Kitimat-Stikine
Contact:	Nicki Veikle

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	eblaney@rdks.bc.ca
Email 2	hshinton@rdks.bc.ca
Email 3	

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	anne-maries@rdks.bc.ca
Email 2	nveikle@rdks.bc.ca

Project Information	
ALS Account # / Quote #:	
Job #:	Meziadin Landfill Groundwater
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler: H.Shinton

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)
- 4 day [P4-20%] ☐
- 3 day [P3-25%] ☐
- 2 day [P2-50%] ☐

EMERGENCY
- 1 Business day [E1 - 100%] ☐
- Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Co	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	conductivity	hardness	total dissolved solids	alkalinity	ammonia	total kjeldahl nitrogen	nitrate + nitrite	chloride	sulphate	fluoride	dissolved metals	COD	pH	temperature	SAMPLES ON HOLD	Sample is hazardous (please provide further detail	NUMBER OF CONTAINERS
									P	P				F/P		P					
	MW1A	27-Oct-21	10:36	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	MW1B	27-Oct-21	10:55	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	MW2	27-Oct-21	11:43	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	MW3	27-Oct-21	9:17	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	MW4	27-Oct-21	10:00	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	Field Blank	27-Oct-21	12:30	Water	R	R		R	R								R				
	DUP	27-Oct-21	12:00	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	Travel Blank	27-Oct-21	-	Water	R			R	R												

Environmental Division
Vancouver
Work Order Reference
VA21C4129

Telephone : +1 604 253 4188

Tel # ___ Carbouys Air SFX

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)
Are samples for human consumption/ use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
9.6						6	

SHIPMENT RELEASE (client use)		
Released by: Hannah Shinton	Date: October 28th, 2021	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by: Chris	Date: 28 Oct 21	Time: 1450

FINAL SHIPMENT RECEPTION (lab use only)		
Received by: PD	Date: OCT 28 2021	Time: 21:45

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA21B5004**	Page	: 1 of 6
Client	: **Regional District of Kitimat-Stikine**	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 BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Meziadin Landfill Groundwater	Date Samples Received	: 21-Jul-2021 21:00
PO	: ----	Date Analysis Commenced	: 22-Jul-2021
C-O-C number	: ----	Issue Date	: 29-Jul-2021 17:18
Sampler	: HS		
Site	:		
Quote number	: Q62338		
No. of samples received	: 7		
No. of samples analysed	: 7		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Ruby Pham	Lab Assistant	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
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

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW1A (BH97-1A)	MW1B (BH97-1B)	MW2 (BH97-2)	MW3 (BH97-3)	MW4 (BH97-4)
					Client sampling date / time	19-Jul-2021 15:02	19-Jul-2021 15:25	19-Jul-2021 17:27	19-Jul-2021 13:00	19-Jul-2021 14:20
						VA21B5004-001	VA21B5004-002	VA21B5004-003	VA21B5004-004	VA21B5004-005
						Result	Result	Result	Result	Result
Physical Tests										
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		229	175	173	201	195
conductivity	----	E100	2.0	µS/cm		779	344	404	723	705
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		205	166	107	238	234
pH	----	E108	0.10	pH units		8.14	6.58	7.56	7.98	7.80
solids, total dissolved [TDS]	----	E162	10	mg/L		524	222	258	486	459
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0188	0.0083	<0.0050	0.0292	0.0062
chloride	16887-00-6	E235.Cl	0.50	mg/L		<2.50 DLDS	<0.50	<0.50	<2.50 DLDS	<2.50 DLDS
fluoride	16984-48-8	E235.F	0.020	mg/L		0.148	0.060	0.181	<0.100 DLDS	<0.100 DLDS
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.110	0.206	0.052	0.104	<0.050
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.135	0.450	0.205	0.0974	<0.0250 DLDS
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	<0.0010	0.0012	0.0051	<0.0050 DLDS
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		188	7.68	43.2	196	189
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0027	0.0044	0.0045	0.0029	0.0046
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00016	<0.00010	0.00018	0.00010	0.00017
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00053	0.00019	0.00052	0.00023	0.00013
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0440	0.101	0.0462	0.0310	0.0226
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		0.074	0.013	0.044	0.060	0.067
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.000191	0.000149	0.000129	0.000179	0.000140
calcium, dissolved	7440-70-2	E421	0.050	mg/L		60.4	49.9	29.4	70.9	70.1
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
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	0.00019	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00045	0.00109	0.00039	0.00040	0.00021
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	0.099	<0.010	0.037	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0038	0.0034	0.0023	0.0045	0.0045
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		13.2	9.96	8.06	14.8	14.2

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	MW1A (BH97-1A)	MW1B (BH97-1B)	MW2 (BH97-2)	MW3 (BH97-3)	MW4 (BH97-4)
					Client sampling date / time	19-Jul-2021 15:02	19-Jul-2021 15:25	19-Jul-2021 17:27	19-Jul-2021 13:00	19-Jul-2021 14:20
						VA21B5004-001	VA21B5004-002	VA21B5004-003	VA21B5004-004	VA21B5004-005
						Result	Result	Result	Result	Result
Dissolved Metals										
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0421	0.262	0.00684	0.00554	0.0142
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		0.0108	0.000081	0.0165	0.00358	0.00507
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	0.00562	<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		2.49	0.814	1.61	1.92	2.26
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		0.00028	0.00080	<0.00020	0.00026	0.00034
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000227	0.000061	0.000409	0.000600	0.000313
silicon, dissolved	7440-21-3	E421	0.050	mg/L		3.88	7.36	4.27	3.63	3.88
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	17341-25-2	E421	0.050	mg/L		99.2	10.0	48.5	63.4	58.0
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.712	0.299	0.399	0.753	0.853
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		67.2	2.70	15.3	66.2	63.0
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	<0.00010
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00252	0.000124	0.00191	0.00156	0.000985
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		0.0013	0.0053	0.0025	0.0033	<0.0010
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	0.00075
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field
Aggregate Organics										
chemical oxygen demand [COD]	----	E559	20	mg/L		<20	<20	<20	<20	<20

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	Travel Blank	----	----	----
					Client sampling date / time	19-Jul-2021 12:00	19-Jul-2021	----	----	----
						VA21B5004-006	VA21B5004-007	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		192	1.8	----	----	----
conductivity	----	E100	2.0	µS/cm		715	<2.0	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		243	----	----	----	----
pH	----	E108	0.10	pH units		7.80	----	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L		464	----	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0051	<0.0050	----	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L		<2.50 DLDS	----	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L		<0.100 DLDS	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.056	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0313	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		189	----	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0016	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00018	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00012	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0237	----	----	----	----
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		0.070	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000995	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		72.9	----	----	----	----
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		0.0046	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		14.8	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00744	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	DUP	Travel Blank	----	----	----
					Client sampling date / time	19-Jul-2021 12:00	19-Jul-2021	----	----	----
						VA21B5004-006	VA21B5004-007	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00482	----	----	----	----
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		2.40	----	----	----	----
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		0.00034	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000361	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.04	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	----	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		60.1	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.853	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		64.4	----	----	----	----
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L		<0.00020	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----
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		0.00102	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	----	----	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----
Aggregate Organics										
chemical oxygen demand [COD]	----	E559	20	mg/L		24	----	----	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA21B5004**	Page	: 1 of 15
Client	: **Regional District of Kitimat-Stikine**	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	: Meziadin Landfill Groundwater	Date Samples Received	: 21-Jul-2021 21:00
PO	: ----	Issue Date	: 29-Jul-2021 17:18
C-O-C number	: ----		
Sampler	: HS		
Site	:		
Quote number	: Q62338		
No. of samples received	: 7		
No. of samples analysed	: 7		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 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 Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) DUP	E559	19-Jul-2021	----	----	----		27-Jul-2021	28 days	8 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) MW1A (BH97-1A)	E559	19-Jul-2021	----	----	----		27-Jul-2021	28 days	8 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) MW1B (BH97-1B)	E559	19-Jul-2021	----	----	----		27-Jul-2021	28 days	8 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) MW2 (BH97-2)	E559	19-Jul-2021	----	----	----		27-Jul-2021	28 days	8 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) MW3 (BH97-3)	E559	19-Jul-2021	----	----	----		27-Jul-2021	28 days	8 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) MW4 (BH97-4)	E559	19-Jul-2021	----	----	----		27-Jul-2021	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW2 (BH97-2)	E298	19-Jul-2021	28-Jul-2021	----	----		28-Jul-2021	28 days	8 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) DUP	E298	19-Jul-2021	28-Jul-2021	----	----		28-Jul-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW1A (BH97-1A)	E298	19-Jul-2021	28-Jul-2021	----	----		28-Jul-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW1B (BH97-1B)	E298	19-Jul-2021	28-Jul-2021	----	----		28-Jul-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW3 (BH97-3)	E298	19-Jul-2021	28-Jul-2021	----	----		28-Jul-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) MW4 (BH97-4)	E298	19-Jul-2021	28-Jul-2021	----	----		28-Jul-2021	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) Travel Blank	E298	19-Jul-2021	28-Jul-2021	----	----		28-Jul-2021	28 days	9 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE DUP	E235.Cl	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE MW1A (BH97-1A)	E235.Cl	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE MW1B (BH97-1B)	E235.Cl	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC										
HDPE MW2 (BH97-2)	E235.Cl	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE MW3 (BH97-3)	E235.Cl	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE MW4 (BH97-4)	E235.Cl	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE DUP	E235.F	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW1A (BH97-1A)	E235.F	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW1B (BH97-1B)	E235.F	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW2 (BH97-2)	E235.F	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW3 (BH97-3)	E235.F	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE MW4 (BH97-4)	E235.F	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DUP	E235.NO3-L	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW1A (BH97-1A)	E235.NO3-L	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW1B (BH97-1B)	E235.NO3-L	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW2 (BH97-2)	E235.NO3-L	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW3 (BH97-3)	E235.NO3-L	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE MW4 (BH97-4)	E235.NO3-L	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DUP	E235.NO2-L	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW1A (BH97-1A)	E235.NO2-L	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW1B (BH97-1B)	E235.NO2-L	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW2 (BH97-2)	E235.NO2-L	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW3 (BH97-3)	E235.NO2-L	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE MW4 (BH97-4)	E235.NO2-L	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE DUP	E235.SO4	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW1A (BH97-1A)	E235.SO4	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW1B (BH97-1B)	E235.SO4	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW2 (BH97-2)	E235.SO4	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW3 (BH97-3)	E235.SO4	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE MW4 (BH97-4)	E235.SO4	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) DUP	E318	19-Jul-2021	28-Jul-2021	----	----		29-Jul-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) MW1A (BH97-1A)	E318	19-Jul-2021	28-Jul-2021	----	----		29-Jul-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) MW1B (BH97-1B)	E318	19-Jul-2021	28-Jul-2021	----	----		29-Jul-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) MW3 (BH97-3)	E318	19-Jul-2021	28-Jul-2021	----	----		29-Jul-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) MW4 (BH97-4)	E318	19-Jul-2021	28-Jul-2021	----	----		29-Jul-2021	28 days	10 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) MW2 (BH97-2)	E318	19-Jul-2021	28-Jul-2021	----	----		29-Jul-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) DUP	E509	19-Jul-2021	25-Jul-2021	----	----		25-Jul-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW1A (BH97-1A)	E509	19-Jul-2021	25-Jul-2021	----	----		25-Jul-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW1B (BH97-1B)	E509	19-Jul-2021	25-Jul-2021	----	----		25-Jul-2021	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW2 (BH97-2)	E509	19-Jul-2021	25-Jul-2021	----	----		25-Jul-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW3 (BH97-3)	E509	19-Jul-2021	25-Jul-2021	----	----		25-Jul-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) MW4 (BH97-4)	E509	19-Jul-2021	25-Jul-2021	----	----		25-Jul-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW1A (BH97-1A)	E421	19-Jul-2021	23-Jul-2021	----	----		23-Jul-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW1B (BH97-1B)	E421	19-Jul-2021	23-Jul-2021	----	----		23-Jul-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) DUP	E421	19-Jul-2021	26-Jul-2021	----	----		26-Jul-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW2 (BH97-2)	E421	19-Jul-2021	26-Jul-2021	----	----		26-Jul-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW3 (BH97-3)	E421	19-Jul-2021	26-Jul-2021	----	----		26-Jul-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) MW4 (BH97-4)	E421	19-Jul-2021	26-Jul-2021	----	----		26-Jul-2021	180 days	7 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE DUP	E290	19-Jul-2021	----	----	----		22-Jul-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW1A (BH97-1A)	E290	19-Jul-2021	----	----	----		22-Jul-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW1B (BH97-1B)	E290	19-Jul-2021	----	----	----		22-Jul-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW2 (BH97-2)	E290	19-Jul-2021	----	----	----		22-Jul-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW3 (BH97-3)	E290	19-Jul-2021	----	----	----		22-Jul-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE MW4 (BH97-4)	E290	19-Jul-2021	----	----	----		22-Jul-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE Travel Blank	E290	19-Jul-2021	----	----	----		22-Jul-2021	14 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE DUP	E100	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE MW1A (BH97-1A)	E100	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE MW1B (BH97-1B)	E100	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE MW2 (BH97-2)	E100	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE MW3 (BH97-3)	E100	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE MW4 (BH97-4)	E100	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE Travel Blank	E100	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Physical Tests : pH by Meter										
HDPE MW2 (BH97-2)	E108	19-Jul-2021	----	----	----		22-Jul-2021	0.25 hrs	66 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW1A (BH97-1A)	E108	19-Jul-2021	----	----	----		22-Jul-2021	0.25 hrs	68 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW1B (BH97-1B)	E108	19-Jul-2021	----	----	----		22-Jul-2021	0.25 hrs	68 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE MW4 (BH97-4)	E108	19-Jul-2021	----	----	----		22-Jul-2021	0.25 hrs	69 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE MW3 (BH97-3)	E108	19-Jul-2021	----	----	----		22-Jul-2021	0.25 hrs	70 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DUP	E108	19-Jul-2021	----	----	----		22-Jul-2021	0.25 hrs	71 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE DUP	E162	19-Jul-2021	----	----	----		26-Jul-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE MW1A (BH97-1A)	E162	19-Jul-2021	----	----	----		26-Jul-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE MW1B (BH97-1B)	E162	19-Jul-2021	----	----	----		26-Jul-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE MW2 (BH97-2)	E162	19-Jul-2021	----	----	----		26-Jul-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE MW3 (BH97-3)	E162	19-Jul-2021	----	----	----		26-Jul-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE MW4 (BH97-4)	E162	19-Jul-2021	----	----	----		26-Jul-2021	7 days	7 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	249057	1	15	6.6	5.0	✓
Ammonia by Fluorescence	E298	253318	1	18	5.5	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	252456	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	249095	1	14	7.1	5.0	✓
Conductivity in Water	E100	249056	1	14	7.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	251524	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	250248	2	40	5.0	5.0	✓
Fluoride in Water by IC	E235.F	249094	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	249092	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	249093	1	12	8.3	5.0	✓
pH by Meter	E108	249055	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	249091	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	251886	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	253317	1	14	7.1	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	249057	1	15	6.6	5.0	✓
Ammonia by Fluorescence	E298	253318	1	18	5.5	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	252456	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	249095	1	14	7.1	5.0	✓
Conductivity in Water	E100	249056	1	14	7.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	251524	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	250248	2	40	5.0	5.0	✓
Fluoride in Water by IC	E235.F	249094	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	249092	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	249093	1	12	8.3	5.0	✓
pH by Meter	E108	249055	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	249091	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	251886	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	253317	1	14	7.1	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	249057	1	15	6.6	5.0	✓
Ammonia by Fluorescence	E298	253318	1	18	5.5	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	252456	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	249095	1	14	7.1	5.0	✓
Conductivity in Water	E100	249056	1	14	7.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	251524	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	250248	2	40	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Fluoride in Water by IC	E235.F	249094	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	249092	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	249093	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	249091	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	251886	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	253317	1	14	7.1	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	253318	1	18	5.5	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	252456	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	249095	1	14	7.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	251524	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	250248	2	40	5.0	5.0	✓
Fluoride in Water by IC	E235.F	249094	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	249092	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	249093	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	249091	1	14	7.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	253317	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.
TDS by Gravimetry	E162 Vancouver - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
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).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
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.
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	E559 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
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 using block digestion with Copper Sulfate Digestion Reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	: **VA21B5004**	Page	: 1 of 17
Client	: Regional District of Kitimat-Stikine	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	: Meziadin Landfill Groundwater	Date Samples Received	: 21-Jul-2021 21:00
PO	: ----	Date Analysis Commenced	: 22-Jul-2021
C-O-C number	: ----	Issue Date	: 29-Jul-2021 17:18
Sampler	: HS		
Site	:		
Quote number	: Q62338		
No. of samples received	: 7		
No. of samples analysed	: 7		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Ruby Pham	Lab Assistant	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 249055)											
VA21B5000-001	Anonymous	pH	----	E108	0.10	pH units	8.37	8.36	0.120%	4%	----
Physical Tests (QC Lot: 249056)											
VA21B5000-001	Anonymous	conductivity	----	E100	2.0	µS/cm	670	670	0.00%	10%	----
Physical Tests (QC Lot: 249057)											
VA21B5000-001	Anonymous	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	272	271	0.221%	20%	----
Physical Tests (QC Lot: 251886)											
VA21B4918-001	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	652	637	2.40%	20%	----
Anions and Nutrients (QC Lot: 249091)											
VA21B5000-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	1.62	1.63	0.007	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 249092)											
VA21B5000-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	0.0372	0.0351	0.0020	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 249093)											
VA21B5000-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 249094)											
VA21B5000-001	Anonymous	fluoride	16984-48-8	E235.F	0.100	mg/L	0.103	0.102	0.0006	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 249095)											
VA21B5000-001	Anonymous	chloride	16887-00-6	E235.Cl	2.50	mg/L	61.6	61.8	0.274%	20%	----
Anions and Nutrients (QC Lot: 253317)											
KS2102323-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	4.88	4.81	1.57%	20%	----
Anions and Nutrients (QC Lot: 253318)											
KS2102323-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0250	mg/L	2.93	2.92	0.308%	20%	----
Dissolved Metals (QC Lot: 250248)											
VA21B4914-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0020	mg/L	0.325	0.322	0.813%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00020	mg/L	0.00541	0.00535	1.05%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000040	mg/L	<0.000040	<0.000040	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.020	mg/L	0.107	0.108	0.002	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000100	mg/L	0.000860	0.000826	4.03%	20%	----
		calcium, dissolved	7440-70-2	E421	0.100	mg/L	423	430	1.73%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 250248) - continued											
VA21B4914-001	Anonymous	cesium, dissolved	7440-46-2	E421	0.000020	mg/L	0.000194	0.000204	0.000010	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00020	mg/L	0.00046	0.00045	0.000007	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00040	mg/L	0.00377	0.00370	0.00007	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0020	mg/L	0.0494	0.0490	0.771%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0100	mg/L	38.0	37.1	2.23%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00020	mg/L	0.252	0.248	1.69%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000100	mg/L	0.000163	0.000199	0.000036	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	0.904	0.877	0.026	Diff <2x LOR	----
		rubidium, dissolved	7440-17-7	E421	0.00040	mg/L	0.00087	0.00093	0.00006	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.000100	mg/L	0.000237	0.000236	0.0000008	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.100	mg/L	1.41	1.45	2.58%	20%	----
		silver, dissolved	7440-22-4	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.100	mg/L	7.10	6.80	4.31%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00040	mg/L	2.00	2.05	2.60%	20%	----
		sulfur, dissolved	7704-34-9	E421	1.00	mg/L	446	445	0.0966%	20%	----
		tellurium, dissolved	13494-80-9	E421	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000020	mg/L	0.000054	0.000052	0.000001	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000020	mg/L	0.000023	0.000020	0.000003	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0020	mg/L	0.0237	0.0224	5.64%	20%	----
		zirconium, dissolved	7440-67-7	E421	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 251524)											
FJ2100577-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 251778)											
VA21B4901-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0309	0.0333	7.37%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.0208	0.0205	1.26%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 251778) - continued											
VA21B4901-001	Anonymous	arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00082	0.00080	0.00001	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0313	0.0317	1.32%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.045	0.045	0.00005	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000100	mg/L	<0.0000100	<0.0000100	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	76.2	78.6	3.12%	20%	----
		cesium, dissolved	7440-46-2	E421	0.000010	mg/L	0.000089	0.000085	0.000003	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	0.00055	0.00055	0.000004	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00023	0.00025	0.00002	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00029	0.00032	0.00004	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	0.0125	0.0124	0.638%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	24.2	25.5	5.22%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0592	0.0605	2.27%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00532	0.00523	1.57%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	0.064	0.080	0.016	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	9.98	9.94	0.454%	20%	----
		rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00522	0.00492	5.97%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.0117	0.0112	4.46%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.80	2.74	2.37%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	57.7	58.5	1.50%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	2.10	2.10	0.281%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	80.1	79.2	1.11%	20%	----
		tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	0.00023	<0.00020	0.00003	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000029	0.000027	0.000002	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	0.000963	0.00100	3.84%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 251778) - continued											
VA21B4901-001	Anonymous	zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0022	0.0022	0.00002	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Aggregate Organics (QC Lot: 252456)											
VA21B4863-001	Anonymous	chemical oxygen demand [COD]	----	E559	80	mg/L	4470	4560	1.87%	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
Physical Tests (QCLot: 249056)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 249057)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 251886)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 249091)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 249092)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 249093)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 249094)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 249095)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 253317)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 253318)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Dissolved Metals (QCLot: 250248)						
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	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 250248) - continued						
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
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	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
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	----
Dissolved Metals (QCLot: 251524)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 251778)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 251778) - continued						
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
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	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
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	----
Aggregate Organics (QCLot: 252456)						
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				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 249055)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 249056)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 249057)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	98.9	85.0	115	----
Physical Tests (QCLot: 251886)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	100	85.0	115	----
Anions and Nutrients (QCLot: 249091)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	105	90.0	110	----
Anions and Nutrients (QCLot: 249092)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	105	90.0	110	----
Anions and Nutrients (QCLot: 249093)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 249094)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	106	90.0	110	----
Anions and Nutrients (QCLot: 249095)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 253317)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 253318)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	99.2	85.0	115	----
Dissolved Metals (QCLot: 250248)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	92.9	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	102	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	92.1	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	93.3	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	94.7	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	87.5	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	91.0	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	96.3	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	97.3	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	97.7	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 250248) - continued									
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	92.1	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	93.4	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	92.0	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	94.8	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	93.6	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	92.2	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	91.8	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	90.8	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	98.2	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	91.7	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	100	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	94.1	80.0	120	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	101	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	105	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	95.6	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	99.6	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	97.4	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	96.2	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	86.1	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	104	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	90.7	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	82.8	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	94.2	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	87.6	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	89.3	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	91.4	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	93.2	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	93.5	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	96.1	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	100	80.0	120	----
Dissolved Metals (QCLot: 251778)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	98.0	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	108	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	93.5	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	95.5	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	95.8	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	106	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 251778) - continued									
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	87.4	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	97.0	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	100.0	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	98.5	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	96.9	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	99.9	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	107	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	93.6	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	96.4	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	106	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	95.1	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	98.5	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	101	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	94.5	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	103	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	98.5	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	105	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	90.6	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	100	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	94.4	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	96.8	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	86.9	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	97.4	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	110	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	99.7	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	93.3	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	103	80.0	120	----
Aggregate Organics (QCLot: 252456)									
chemical oxygen demand [COD]	----	E559	20	mg/L	100 mg/L	103	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
Anions and Nutrients (QCLot: 249091)										
VA21B5000-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	548 mg/L	500 mg/L	110	75.0	125	----
Anions and Nutrients (QCLot: 249092)										
VA21B5000-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	13.8 mg/L	12.5 mg/L	110	75.0	125	----
Anions and Nutrients (QCLot: 249093)										
VA21B5000-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	2.69 mg/L	2.5 mg/L	108	75.0	125	----
Anions and Nutrients (QCLot: 249094)										
VA21B5000-002	Anonymous	fluoride	16984-48-8	E235.F	5.60 mg/L	5 mg/L	112	75.0	125	----
Anions and Nutrients (QCLot: 249095)										
VA21B5000-002	Anonymous	chloride	16887-00-6	E235.Cl	549 mg/L	500 mg/L	110	75.0	125	----
Anions and Nutrients (QCLot: 253317)										
VA21B5004-001	MW1A (BH97-1A)	Kjeldahl nitrogen, total [TKN]	----	E318	2.69 mg/L	2.5 mg/L	108	70.0	130	----
Anions and Nutrients (QCLot: 253318)										
VA21B5004-001	MW1A (BH97-1A)	ammonia, total (as N)	7664-41-7	E298	0.105 mg/L	0.1 mg/L	105	75.0	125	----
Dissolved Metals (QCLot: 250248)										
VA21B4914-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.397 mg/L	0.4 mg/L	99.2	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0395 mg/L	0.04 mg/L	98.7	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0399 mg/L	0.04 mg/L	99.8	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0393 mg/L	0.04 mg/L	98.3	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0798 mg/L	0.08 mg/L	99.7	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.0162 mg/L	0.02 mg/L	81.2	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.181 mg/L	0.2 mg/L	90.7	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00800 mg/L	0.008 mg/L	100.0	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	8 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E421	0.0199 mg/L	0.02 mg/L	99.5	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0787 mg/L	0.08 mg/L	98.4	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0393 mg/L	0.04 mg/L	98.4	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0375 mg/L	0.04 mg/L	93.6	70.0	130	----
		iron, dissolved	7439-89-6	E421	3.91 mg/L	4 mg/L	97.8	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0377 mg/L	0.04 mg/L	94.3	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 250248) - continued										
VA21B4914-002	Anonymous	lithium, dissolved	7439-93-2	E421	0.194 mg/L	0.2 mg/L	96.9	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.04 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0396 mg/L	0.04 mg/L	99.1	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0769 mg/L	0.08 mg/L	96.1	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	20.9 mg/L	20 mg/L	105	70.0	130	----
		potassium, dissolved	7440-09-7	E421	8.17 mg/L	8 mg/L	102	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0428 mg/L	0.04 mg/L	107	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0927 mg/L	0.08 mg/L	116	70.0	130	----
		silicon, dissolved	7440-21-3	E421	19.5 mg/L	20 mg/L	97.3	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00770 mg/L	0.008 mg/L	96.3	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	40 mg/L	ND	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0800 mg/L	0.08 mg/L	100	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00719 mg/L	0.008 mg/L	89.9	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0420 mg/L	0.04 mg/L	105	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0391 mg/L	0.04 mg/L	97.6	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0805 mg/L	0.08 mg/L	101	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	0.0388 mg/L	0.04 mg/L	96.9	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00768 mg/L	0.008 mg/L	95.9	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.204 mg/L	0.2 mg/L	102	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.783 mg/L	0.8 mg/L	97.9	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0849 mg/L	0.08 mg/L	106	70.0	130	----
Dissolved Metals (QCLot: 251524)										
FJ2100577-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.000102 mg/L	0.0001 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 251778)										
VA21B4906-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.186 mg/L	0.2 mg/L	92.8	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0212 mg/L	0.02 mg/L	106	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0192 mg/L	0.02 mg/L	96.1	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0394 mg/L	0.04 mg/L	98.5	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00789 mg/L	0.01 mg/L	78.9	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.094 mg/L	0.1 mg/L	94.0	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00393 mg/L	0.004 mg/L	98.2	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 251778) - continued										
VA21B4906-001	Anonymous	cesium, dissolved	7440-46-2	E421	0.0102 mg/L	0.01 mg/L	102	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0375 mg/L	0.04 mg/L	93.8	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0185 mg/L	0.02 mg/L	92.6	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0180 mg/L	0.02 mg/L	90.3	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.86 mg/L	2 mg/L	92.9	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0192 mg/L	0.02 mg/L	96.0	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0214 mg/L	0.02 mg/L	107	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0354 mg/L	0.04 mg/L	88.5	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	11.0 mg/L	10 mg/L	110	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.83 mg/L	4 mg/L	95.7	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0194 mg/L	0.02 mg/L	96.8	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0443 mg/L	0.04 mg/L	111	70.0	130	----
		silicon, dissolved	7440-21-3	E421	8.86 mg/L	10 mg/L	88.6	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00311 mg/L	0.004 mg/L	77.7	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	19.3 mg/L	20 mg/L	96.5	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0426 mg/L	0.04 mg/L	106	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00372 mg/L	0.004 mg/L	93.0	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0213 mg/L	0.02 mg/L	106	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0196 mg/L	0.02 mg/L	98.3	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0372 mg/L	0.04 mg/L	93.0	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	0.0191 mg/L	0.02 mg/L	95.7	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00411 mg/L	0.004 mg/L	103	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0970 mg/L	0.1 mg/L	97.0	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.367 mg/L	0.4 mg/L	91.8	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0446 mg/L	0.04 mg/L	112	70.0	130	----
Aggregate Organics (QCLot: 252456)										
VA21B4999-001	Anonymous	chemical oxygen demand [COD]	----	E559	ND mg/L	100 mg/L	ND	75.0	125	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Regional District of Kitimat-Stikine
Contact:	Hannah Shinton
Phone:	250-641-4141
	Company address below will appear on the final report
Street:	4545 Lazelle Avenue
City/Province:	Terrace/BC
Postal Code:	V8G4E1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	Regional District of Kitimat-Stikine
Contact:	Nicki Veikle

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	hshinton@rdks.bc.ca
Email 2	nveikle@rdks.bc.ca
Email 3	eblaney@rdks.bc.ca
Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	anne-maries@rdks.bc.ca
Email 2	nveikle@rdks.bc.ca

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days): 4 day [P4-20%] ☐ | 3 day [P3-25%] ☐ | 2 day [P2-50%] ☐

EMERGENCY: 1 Business day [E1 - 100%] ☐ | Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	Meziadin Landfill Groundwater	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): | **ALS Contact:** | **Sampler:** H.Shinton

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	conductivity	hardness	total dissolved solids	alkalinity	ammonia	total kjeldahl nitrogen	nitrate + nitrite	chloride	sulphate	fluoride	dissolved metals	COD	pH	temperature		SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
									P	P					F/P	P						
	MW1A (BH97-1A)	19-Jul-21	15:02	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R				
	MW1B (BH97-1B)	19-Jul-21	15:25	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R				
	MW2 (BH97-2)	19-Jul-21	17:27	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R				
	MW3 (BH97-3)	19-Jul-21	13:00	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R				
	MW4 (BH97-4)	19-Jul-21	14:20	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R				
	DUP	19-Jul-21	12:00	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R				
	Travel Blank	19-Jul-21	--	Water	R			R	R													

Environmental Division Vancouver
Work Order Reference
VA21B5004

Telephone : +1 604 253 4188

Drinking Water (DW) Samples[1] (client us... | ...dd on report by clicking on the drop-down list below ...tronic COC only)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human consumption/ use? ☐ YES ☑ NO

Water Quality Guidelines (MAY, 2015)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐

Ice Packs ☑ | Ice Cubes ☐ | Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
4.2				0			

SHIPMENT RELEASE (cli... | **INITIAL SHIPMENT RECEPTION (lab use only)** | **FINAL SHIPMENT RECEPTION (lab use only)**

Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
Hannah Shinton	July 21st, 2021		Chris	21 July 21	1210		JUL 21 2021	9

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA21C4128**	Page	: 1 of 6
Client	: **Regional District of Kitimat-Stikine**	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 BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Meziadin Landfill Surface Water	Date Samples Received	: 28-Oct-2021 21:45
PO	: ----	Date Analysis Commenced	: 30-Oct-2021
C-O-C number	: ----	Issue Date	: 19-Nov-2021 13:20
Sampler	: H. Shinton		
Site	:		
Quote number	: Q62338		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Cindy Tang	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Saron Kim	Analyst	Metals, Burnaby, British Columbia

General Comments

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

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

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

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

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

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

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
DTS	*Dissolved Sulfur concentration exceeds total. Negative bias on Total Sulfur suspected due to presence of volatile sulfur species lost during digestion.*
DTSE	*Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed.*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SW2017-01 DS	SW2017-02 US	Lagoon Outlet	----	----
					Client sampling date / time	27-Oct-2021 12:08	27-Oct-2021 09:32	27-Oct-2021 11:19	----	----
						VA21C4128-001	VA21C4128-002	VA21C4128-003	--------	--------
						Result	Result	Result	----	----
Physical Tests										
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		15.9	3.6 RRV	509	----	----
conductivity	----	E100	2.0	µS/cm		66.4	17.1	1370	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		20.5	6.63	359	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		21.2	6.96	356	----	----
pH	----	E108	0.10	pH units		7.19	6.28	7.72	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		<3.0	<3.0	86.9	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0330	<0.0050	25.7	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	<0.250 DLDS	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L		4.89	<0.50	92.8	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L		<0.020	<0.020	<0.100 DLDS	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.542	0.328	30.3	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.539	<0.0050	<0.0250 DLDS	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0029	<0.0010	<0.0050 DLDS	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		3.26	0.91	57.9	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.205	0.399	0.377	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	0.00099	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00016	0.00020	0.00460	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0114	0.0125	0.200	----	----
beryllium, total	7440-41-7	E420	0.000100	mg/L		<0.000100	<0.000100	<0.000200 DLA	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000100 DLA	----	----
boron, total	7440-42-8	E420	0.010	mg/L		0.031	<0.010	0.939	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000128	0.0000798	0.0000240	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		6.08	1.87	109	----	----
cesium, total	7440-46-2	E420	0.000010	mg/L		<0.000010	<0.000010	0.000150	----	----
chromium, total	7440-47-3	E420	0.00050	mg/L		<0.00050	0.00060	0.00559	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	0.00058	0.00140	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		0.00078	0.00152	0.00303	----	----
iron, total	7439-89-6	E420	0.010	mg/L		0.080	0.236	5.13	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SW2017-01 DS	SW2017-02 US	Lagoon Outlet	----	----
					Client sampling date / time	27-Oct-2021 12:08	27-Oct-2021 09:32	27-Oct-2021 11:19	----	----
						VA21C4128-001	VA21C4128-002	VA21C4128-003	--------	--------
						Result	Result	Result	----	----
Total Metals										
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	0.000064	0.000228	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	<0.0010	0.0198	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		1.45	0.556	20.5	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00792	0.206	7.17	----	----
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	0.0000076	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		<0.000050	<0.000050	0.000413	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00133	0.00174	0.00840	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	1.20	----	----
potassium, total	7440-09-7	E420	0.050	mg/L		1.18	0.093	32.8	----	----
rubidium, total	7440-17-7	E420	0.00020	mg/L		0.00051	<0.00020	0.0183	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000084	0.000108	0.000119	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		2.82	2.99	4.28	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	0.000011	0.000081	----	----
sodium, total	17341-25-2	E420	0.050	mg/L		4.41	0.891	82.6	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.0388	0.0129	0.627	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		1.16	<0.50	11.3	----	----
tellurium, total	13494-80-9	E420	0.00020	mg/L		<0.00020	<0.00020	<0.00040 DLA	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000020 DLA	----	----
thorium, total	7440-29-1	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00020 DLA	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00020 DLA	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00097	0.00217	0.00650	----	----
tungsten, total	7440-33-7	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00020 DLA	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		<0.000010	<0.000010	0.000022	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	0.00130	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	0.0035	0.0105	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L		0.00025	0.00037	<0.00040 DLA	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.194	0.334	0.0708	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	0.00074	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00015	0.00018	0.00442	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0113	0.0100	0.177	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SW2017-01 DS	SW2017-02 US	Lagoon Outlet	----	----
					Client sampling date / time	27-Oct-2021 12:08	27-Oct-2021 09:32	27-Oct-2021 11:19	----	----
						VA21C4128-001	VA21C4128-002	VA21C4128-003	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
beryllium, dissolved	7440-41-7	E421	0.000100	mg/L		<0.000100	<0.000100	<0.000100	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.027	<0.010	0.805	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000142	0.0000273	<0.0000050	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		5.77	1.74	109	----	----
cesium, dissolved	7440-46-2	E421	0.000010	mg/L		<0.000010	<0.000010	0.000149	----	----
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00050	0.00053	0.00408	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	0.00065	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00134	0.00118	0.00026	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.074	0.114	0.155	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	<0.0010	0.0181	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		1.47	0.556	21.2	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00191	0.0126	7.50	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		0.0000063	0.0000089	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		<0.000050	<0.000050	0.000121	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00138	0.00158	0.00616	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	0.690	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		1.19	0.061	36.0	----	----
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		0.00055	<0.00020	0.0201	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000074	0.000109	0.00665 DTSE	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.72	2.84	4.08	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		4.42	0.888	81.6	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.0361	0.0135	0.646	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		1.14	<0.50	63.9 DTS	----	----
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
thorium, dissolved	7440-29-1	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		0.00087	0.00139	0.00151	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	SW2017-01 DS	SW2017-02 US	Lagoon Outlet	----	----
					Client sampling date / time	27-Oct-2021 12:08	27-Oct-2021 09:32	27-Oct-2021 11:19	----	----
						VA21C4128-001	VA21C4128-002	VA21C4128-003	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		<0.000010	<0.000010	0.000021	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	0.00066	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0012	0.0020	0.0014	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		0.00025	0.00037	0.00026	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----
Aggregate Organics										
biochemical oxygen demand [BOD]	----	E550	2.0	mg/L		<2.0	<2.0	79.3	----	----
chemical oxygen demand [COD]	----	E559	20	mg/L		44	37	243	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA21C4128**	Page	: 1 of 14
Client	: **Regional District of Kitimat-Stikine**	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	: Meziadin Landfill Surface Water	Date Samples Received	: 28-Oct-2021 21:45
PO	: ----	Issue Date	: 19-Nov-2021 13:20
C-O-C number	: ----		
Sampler	: H. Shinton		
Site	:		
Quote number	: Q62338		
No. of samples received	: 3		
No. of samples analysed	: 3		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Summary of Outliers

Outliers : Quality Control Samples

- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Physical Tests	QC-MRG2-3336450 01	----	alkalinity, total (as CaCO3)	----	E290	1.8 mg/L [B]	1.5 mg/L	Blank result exceeds permitted value

Result Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Analysis Holding Time Compliance

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times, which are selected to meet known provincial and /or federal requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by organizations such as CCME, US EPA, APHA Standard Methods, ASTM, or Environment Canada (where available). Dates and holding times reported below represent the first dates of extraction or analysis. If subsequent tests or dilutions exceeded holding times, qualifiers are added (refer to COA).

If samples are identified below as having been analyzed or extracted outside of recommended holding times, measurement uncertainties may be increased, and this should be taken into consideration when interpreting results.

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 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 Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD HT 3d]										
Lagoon Outlet	E550	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD HT 3d]										
SW2017-01 DS	E550	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD HT 3d]										
SW2017-02 US	E550	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid)										
Lagoon Outlet	E559	27-Oct-2021	----	----	----		08-Nov-2021	28 days	12 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid)										
SW2017-01 DS	E559	27-Oct-2021	----	----	----		08-Nov-2021	28 days	12 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid)										
SW2017-02 US	E559	27-Oct-2021	----	----	----		08-Nov-2021	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
Lagoon Outlet	E298	27-Oct-2021	07-Nov-2021	----	----		08-Nov-2021	28 days	12 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) SW2017-01 DS	E298	27-Oct-2021	07-Nov-2021	----	----		08-Nov-2021	28 days	12 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) SW2017-02 US	E298	27-Oct-2021	07-Nov-2021	----	----		08-Nov-2021	28 days	12 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE Lagoon Outlet	E235.Br-L	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE SW2017-01 DS	E235.Br-L	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE SW2017-02 US	E235.Br-L	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE Lagoon Outlet	E235.Cl	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE SW2017-01 DS	E235.Cl	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE SW2017-02 US	E235.Cl	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE Lagoon Outlet	E235.F	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
SW2017-01 DS	E235.F	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
SW2017-02 US	E235.F	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
Lagoon Outlet	E235.NO3-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
SW2017-01 DS	E235.NO3-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
SW2017-02 US	E235.NO3-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
Lagoon Outlet	E235.NO2-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
SW2017-01 DS	E235.NO2-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
SW2017-02 US	E235.NO2-L	27-Oct-2021	----	----	----		30-Oct-2021	3 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
Lagoon Outlet	E235.SO4	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
SW2017-01 DS	E235.SO4	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
SW2017-02 US	E235.SO4	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
Lagoon Outlet	E318	27-Oct-2021	07-Nov-2021	----	----		12-Nov-2021	28 days	16 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
SW2017-01 DS	E318	27-Oct-2021	07-Nov-2021	----	----		12-Nov-2021	28 days	16 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
SW2017-02 US	E318	27-Oct-2021	07-Nov-2021	----	----		12-Nov-2021	28 days	16 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
Lagoon Outlet	E509	27-Oct-2021	06-Nov-2021	----	----		06-Nov-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
SW2017-01 DS	E509	27-Oct-2021	06-Nov-2021	----	----		06-Nov-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
SW2017-02 US	E509	27-Oct-2021	06-Nov-2021	----	----		06-Nov-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
Lagoon Outlet	E421	27-Oct-2021	05-Nov-2021	----	----		05-Nov-2021	180 days	9 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SW2017-01 DS	E421	27-Oct-2021	05-Nov-2021	----	----		05-Nov-2021	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SW2017-02 US	E421	27-Oct-2021	05-Nov-2021	----	----		05-Nov-2021	180 days	9 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE Lagoon Outlet	E290	27-Oct-2021	----	----	----		30-Oct-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SW2017-01 DS	E290	27-Oct-2021	----	----	----		30-Oct-2021	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE SW2017-02 US	E290	27-Oct-2021	----	----	----		30-Oct-2021	14 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE Lagoon Outlet	E100	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE SW2017-01 DS	E100	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE SW2017-02 US	E100	27-Oct-2021	----	----	----		30-Oct-2021	28 days	3 days	✓
Physical Tests : pH by Meter										
HDPE SW2017-01 DS	E108	27-Oct-2021	----	----	----		30-Oct-2021	0.25 hrs	68 hrs	× EHTR-FM

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE Lagoon Outlet	E108	27-Oct-2021	----	----	----		30-Oct-2021	0.25 hrs	69 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE SW2017-02 US	E108	27-Oct-2021	----	----	----		30-Oct-2021	0.25 hrs	70 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE SW2017-01 DS	E160-H	27-Oct-2021	----	----	----		01-Nov-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE Lagoon Outlet	E160-H	27-Oct-2021	----	----	----		01-Nov-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry										
HDPE SW2017-02 US	E160-H	27-Oct-2021	----	----	----		01-Nov-2021	7 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) Lagoon Outlet	E508	27-Oct-2021	----	----	----		09-Nov-2021	28 days	13 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) SW2017-01 DS	E508	27-Oct-2021	----	----	----		09-Nov-2021	28 days	13 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) SW2017-02 US	E508	27-Oct-2021	----	----	----		09-Nov-2021	28 days	13 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) Lagoon Outlet	E420	27-Oct-2021	----	----	----		09-Nov-2021	180 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 Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
SW2017-01 DS	E420	27-Oct-2021	----	----	----		09-Nov-2021	180 days	13 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
SW2017-02 US	E420	27-Oct-2021	----	----	----		09-Nov-2021	180 days	13 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	333645	1	11	9.0	5.0	✓
Ammonia by Fluorescence	E298	339890	1	20	5.0	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	333699	1	17	5.8	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	333642	1	3	33.3	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	340597	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	333641	1	9	11.1	5.0	✓
Conductivity in Water	E100	333646	1	11	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	339483	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	338416	1	19	5.2	5.0	✓
Fluoride in Water by IC	E235.F	333640	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	333638	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	333639	1	12	8.3	5.0	✓
pH by Meter	E108	333644	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	333643	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	339888	1	15	6.6	5.0	✓
Total Mercury in Water by CVAAS	E508	340909	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	340911	1	20	5.0	5.0	✓
TSS by Gravimetry	E160-H	335296	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	333645	1	11	9.0	5.0	✓
Ammonia by Fluorescence	E298	339890	1	20	5.0	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	333699	1	17	5.8	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	333642	1	3	33.3	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	340597	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	333641	1	9	11.1	5.0	✓
Conductivity in Water	E100	333646	1	11	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	339483	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	338416	1	19	5.2	5.0	✓
Fluoride in Water by IC	E235.F	333640	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	333638	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	333639	1	12	8.3	5.0	✓
pH by Meter	E108	333644	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	333643	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	339888	1	15	6.6	5.0	✓
Total Mercury in Water by CVAAS	E508	340909	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	340911	1	20	5.0	5.0	✓
TSS by Gravimetry	E160-H	335296	1	20	5.0	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB)							
Alkalinity Species by Titration	E290	333645	1	11	9.0	5.0	✓
Ammonia by Fluorescence	E298	339890	1	20	5.0	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	333699	1	17	5.8	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	333642	1	3	33.3	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	340597	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	333641	1	9	11.1	5.0	✓
Conductivity in Water	E100	333646	1	11	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	339483	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	338416	1	19	5.2	5.0	✓
Fluoride in Water by IC	E235.F	333640	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	333638	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	333639	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	333643	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	339888	1	15	6.6	5.0	✓
Total Mercury in Water by CVAAS	E508	340909	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	340911	1	20	5.0	5.0	✓
TSS by Gravimetry	E160-H	335296	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	339890	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	333642	1	3	33.3	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	340597	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	333641	1	9	11.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	339483	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	338416	1	19	5.2	5.0	✓
Fluoride in Water by IC	E235.F	333640	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	333638	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	333639	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	333643	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	339888	1	15	6.6	5.0	✓
Total Mercury in Water by CVAAS	E508	340909	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	340911	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
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.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
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.
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	E559 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 $CaCO_3$ equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), from total Ca/Mg” is calculated from the sum of total Calcium and Magnesium concentrations, expressed in $CaCO_3$ 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 using block digestion with Copper Sulfate Digestion Reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	: **VA21C4128**	Page	: 1 of 18
Client	: Regional District of Kitimat-Stikine	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	: Meziadin Landfill Surface Water	Date Samples Received	: 28-Oct-2021 21:45
PO	: ----	Date Analysis Commenced	: 30-Oct-2021
C-O-C number	: ----	Issue Date	: 19-Nov-2021 13:20
Sampler	: H. Shinton		
Site	:		
Quote number	: Q62338		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Laboratory Department*
Cindy Tang	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
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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.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 333644)											
VA21C4128-001	SW2017-01 DS	pH	----	E108	0.10	pH units	7.19	7.15	0.558%	4%	----
Physical Tests (QC Lot: 333645)											
VA21C4128-001	SW2017-01 DS	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	15.9	15.4	3.19%	20%	----
Physical Tests (QC Lot: 333646)											
VA21C4128-001	SW2017-01 DS	conductivity	----	E100	2.0	µS/cm	66.4	68.1	2.53%	10%	----
Physical Tests (QC Lot: 335296)											
KS2103525-001	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 333638)											
VA21C4128-001	SW2017-01 DS	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.539	0.545	1.17%	20%	----
Anions and Nutrients (QC Lot: 333639)											
VA21C4128-001	SW2017-01 DS	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0029	0.0029	0.000001	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 333640)											
VA21C4128-001	SW2017-01 DS	fluoride	16984-48-8	E235.F	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 333641)											
VA21C4128-001	SW2017-01 DS	chloride	16887-00-6	E235.Cl	0.50	mg/L	4.89	4.90	0.002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 333642)											
VA21C4128-001	SW2017-01 DS	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 333643)											
VA21C4128-001	SW2017-01 DS	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	3.26	3.26	0.0708%	20%	----
Anions and Nutrients (QC Lot: 339888)											
VA21C3737-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.936	0.926	1.07%	20%	----
Anions and Nutrients (QC Lot: 339890)											
VA21C3737-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0940	0.0907	3.52%	20%	----
Total Metals (QC Lot: 340909)											
CG2105487-014	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 340911)											
VA21C4169-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.314	0.323	2.93%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.0159	0.0158	0.536%	20%	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.0245	0.0251	2.28%	20%	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.144	0.147	1.91%	20%	----
		beryllium, total	7440-41-7	E420	0.000100	mg/L	0.0167	0.0170	1.88%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 340911) - continued											
VA21C4169-001	Anonymous	bismuth, total	7440-69-9	E420	0.000050	mg/L	0.0118	0.0120	1.60%	20%	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.013	0.012	0.001	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0837	0.0852	1.73%	20%	----
		calcium, total	7440-70-2	E420	0.050	mg/L	13.4	13.5	1.26%	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	0.155	0.160	3.07%	20%	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.126	0.127	0.664%	20%	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.189	0.193	2.17%	20%	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.345	0.338	2.17%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.332	0.336	1.35%	20%	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0146	0.0149	2.14%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	3.38	3.56	5.17%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.190	0.192	1.43%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.210	0.210	0.418%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.269	0.272	1.43%	20%	----
		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	0.651	0.680	4.40%	20%	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	0.0151	0.0154	1.41%	20%	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.0214	0.0216	0.864%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	0.20	0.21	0.002	Diff <2x LOR	----
		silver, total	7440-22-4	E420	0.000010	mg/L	0.0144	0.0143	1.08%	20%	----
		sodium, total	17341-25-2	E420	0.050	mg/L	5.70	5.86	2.88%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.273	0.270	1.32%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	3.87	3.68	0.19	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	0.0172	0.0175	1.66%	20%	----
		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	0.0188	0.0190	1.38%	20%	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.110	0.112	2.07%	20%	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	0.00809	0.00816	0.961%	20%	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.0220	0.0226	2.74%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.137	0.139	1.47%	20%	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.258	0.265	2.73%	20%	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 338416)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 338416) - continued											
FJ2101213-001	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	0.00037	0.00038	0.000001	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	0.0363	0.0369	1.64%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.022	0.023	0.0006	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000150	mg/L	<0.0000150	<0.0000100	0.0000050	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	27.0	27.4	1.55%	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	0.00050	0.00051	0.000007	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	0.0178	0.0177	0.569%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	32.0	31.7	0.688%	20%	----
		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	0.00736	0.00744	0.986%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.19	1.17	2.13%	20%	----
		rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00059	0.00059	0.000002	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.0290	0.0299	3.07%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	0.641	0.686	6.88%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	0.972	0.969	0.275%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0713	0.0705	1.07%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	23.4	24.4	3.92%	20%	----
		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	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 338416) - continued											
FJ2101213-001	Anonymous	uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00154	0.00150	2.64%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 339483)											
VA21C4126-004	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Aggregate Organics (QC Lot: 333699)											
VA21C4045-008	Anonymous	biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	<2.0	<2.0	0.0%	30%	----
Aggregate Organics (QC Lot: 340597)											
VA21C4121-001	Anonymous	chemical oxygen demand [COD]	----	E559	20	mg/L	130	137	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: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 333645)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	# 1.8	B
Physical Tests (QCLot: 333646)						
conductivity	----	E100	1	µS/cm	1.2	----
Physical Tests (QCLot: 335296)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 333638)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 333639)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 333640)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 333641)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 333642)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 333643)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 339888)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 339890)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Total Metals (QCLot: 340909)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 340911)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 340911) - continued						
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	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
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	----
Dissolved Metals (QCLot: 338416)						
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	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 338416) - continued						
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	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
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	----
Dissolved Metals (QCLot: 339483)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Aggregate Organics (QCLot: 333699)						
biochemical oxygen demand [BOD]	----	E550	2	mg/L	<2.0	----
Aggregate Organics (QCLot: 340597)						
chemical oxygen demand [COD]	----	E559	20	mg/L	<20	----

Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Laboratory Control Sample (LCS) Report

A Laboratory Control Sample (LCS) is an analyte-free matrix that has been fortified (spiked) with test analytes at known concentration and processed in an identical manner to test samples. LCS results are expressed as percent recovery, and are used to monitor and control test method accuracy and precision, independent of test sample matrix.

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 333644)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 333645)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	98.5	85.0	115	----
Physical Tests (QCLot: 333646)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	107	90.0	110	----
Physical Tests (QCLot: 335296)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	87.8	85.0	115	----
Anions and Nutrients (QCLot: 333638)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 333639)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 333640)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	99.8	90.0	110	----
Anions and Nutrients (QCLot: 333641)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 333642)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	101	85.0	115	----
Anions and Nutrients (QCLot: 333643)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 339888)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	98.5	75.0	125	----
Anions and Nutrients (QCLot: 339890)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	102	85.0	115	----
Total Metals (QCLot: 340909)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	100	80.0	120	----
Total Metals (QCLot: 340911)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	102	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	103	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	103	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	106	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	101	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 340911) - continued									
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	89.8	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	100	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	100	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	99.9	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	105	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	105	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	103	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	102	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	97.9	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	106	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	99.0	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	106	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	94.6	80.0	120	----
sodium, total	17341-25-2	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	100	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	96.4	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	99.3	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	102	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	99.6	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	101	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	102	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	97.4	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	101	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	103	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	100	80.0	120	----
Dissolved Metals (QCLot: 338416)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	99.6	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	100	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	97.3	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 338416) - continued									
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	91.8	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	96.4	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	87.4	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	98.9	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	93.5	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	108	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	98.0	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	96.1	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	102	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	99.1	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	91.1	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	97.7	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	97.9	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	97.5	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	96.4	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	101	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	99.5	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	94.8	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	91.2	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	103	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	108	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	96.8	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	101	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	95.6	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	101	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	98.0	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	97.5	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	101	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	110	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	100	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	100	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	98.9	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	104	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Aggregate Organics (QCLot: 333699)									
biochemical oxygen demand [BOD]	----	E550	2	mg/L	198 mg/L	104	85.0	115	----
Aggregate Organics (QCLot: 340597)									
chemical oxygen demand [COD]	----	E559	20	mg/L	100 mg/L	108	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
Anions and Nutrients (QCLot: 333638)										
VA21C4128-002	SW2017-02 US	nitrate (as N)	14797-55-8	E235.NO3-L	2.40 mg/L	2.5 mg/L	96.0	75.0	125	----
Anions and Nutrients (QCLot: 333639)										
VA21C4128-002	SW2017-02 US	nitrite (as N)	14797-65-0	E235.NO2-L	0.466 mg/L	0.5 mg/L	93.2	75.0	125	----
Anions and Nutrients (QCLot: 333640)										
VA21C4128-002	SW2017-02 US	fluoride	16984-48-8	E235.F	0.931 mg/L	1 mg/L	93.1	75.0	125	----
Anions and Nutrients (QCLot: 333641)										
VA21C4128-002	SW2017-02 US	chloride	16887-00-6	E235.Cl	95.3 mg/L	100 mg/L	95.3	75.0	125	----
Anions and Nutrients (QCLot: 333642)										
VA21C4128-002	SW2017-02 US	bromide	24959-67-9	E235.Br-L	0.470 mg/L	0.5 mg/L	93.9	75.0	125	----
Anions and Nutrients (QCLot: 333643)										
VA21C4128-002	SW2017-02 US	sulfate (as SO4)	14808-79-8	E235.SO4	98.3 mg/L	100 mg/L	98.3	75.0	125	----
Anions and Nutrients (QCLot: 339888)										
VA21C3737-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.51 mg/L	2.5 mg/L	100	70.0	130	----
Anions and Nutrients (QCLot: 339890)										
VA21C3737-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.104 mg/L	0.1 mg/L	104	75.0	125	----
Total Metals (QCLot: 340909)										
CG2105487-015	Anonymous	mercury, total	7439-97-6	E508	0.000100 mg/L	0.0001 mg/L	100	70.0	130	----
Total Metals (QCLot: 340911)										
VA21C4169-002	Anonymous	aluminum, total	7429-90-5	E420	0.186 mg/L	0.2 mg/L	92.9	70.0	130	----
		antimony, total	7440-36-0	E420	0.0187 mg/L	0.02 mg/L	93.7	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0184 mg/L	0.02 mg/L	91.8	70.0	130	----
		barium, total	7440-39-3	E420	0.0183 mg/L	0.02 mg/L	91.4	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0382 mg/L	0.04 mg/L	95.5	70.0	130	----
		bismuth, total	7440-69-9	E420	ND mg/L	0.01 mg/L	ND	70.0	130	----
		boron, total	7440-42-8	E420	0.092 mg/L	0.1 mg/L	91.7	70.0	130	----
		cadmium, total	7440-43-9	E420	ND mg/L	0.004 mg/L	ND	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	0.00981 mg/L	0.01 mg/L	98.1	70.0	130	----
		chromium, total	7440-47-3	E420	0.0372 mg/L	0.04 mg/L	93.0	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 340911) - continued										
VA21C4169-002	Anonymous	cobalt, total	7440-48-4	E420	0.0187 mg/L	0.02 mg/L	93.4	70.0	130	----
		copper, total	7440-50-8	E420	0.0190 mg/L	0.02 mg/L	95.2	70.0	130	----
		iron, total	7439-89-6	E420	1.89 mg/L	2 mg/L	94.5	70.0	130	----
		lead, total	7439-92-1	E420	0.0192 mg/L	0.02 mg/L	95.9	70.0	130	----
		lithium, total	7439-93-2	E420	0.0963 mg/L	0.1 mg/L	96.3	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	0.0185 mg/L	0.02 mg/L	92.4	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0190 mg/L	0.02 mg/L	95.0	70.0	130	----
		nickel, total	7440-02-0	E420	0.0382 mg/L	0.04 mg/L	95.4	70.0	130	----
		phosphorus, total	7723-14-0	E420	9.35 mg/L	10 mg/L	93.5	70.0	130	----
		potassium, total	7440-09-7	E420	3.87 mg/L	4 mg/L	96.8	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0188 mg/L	0.02 mg/L	94.3	70.0	130	----
		selenium, total	7782-49-2	E420	0.0377 mg/L	0.04 mg/L	94.4	70.0	130	----
		silicon, total	7440-21-3	E420	8.77 mg/L	10 mg/L	87.7	70.0	130	----
		silver, total	7440-22-4	E420	ND mg/L	0.004 mg/L	ND	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	19.0 mg/L	20 mg/L	95.2	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0390 mg/L	0.04 mg/L	97.4	70.0	130	----
		thallium, total	7440-28-0	E420	ND mg/L	0.004 mg/L	ND	70.0	130	----
		thorium, total	7440-29-1	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		tin, total	7440-31-5	E420	0.0191 mg/L	0.02 mg/L	95.7	70.0	130	----
		titanium, total	7440-32-6	E420	0.0377 mg/L	0.04 mg/L	94.3	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0184 mg/L	0.02 mg/L	91.9	70.0	130	----
		uranium, total	7440-61-1	E420	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0961 mg/L	0.1 mg/L	96.1	70.0	130	----
		zinc, total	7440-66-6	E420	0.384 mg/L	0.4 mg/L	95.9	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0393 mg/L	0.04 mg/L	98.2	70.0	130	----
Dissolved Metals (QCLot: 338416)										
FJ2101213-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.195 mg/L	0.2 mg/L	97.7	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0205 mg/L	0.02 mg/L	103	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0207 mg/L	0.02 mg/L	104	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0369 mg/L	0.04 mg/L	92.4	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00907 mg/L	0.01 mg/L	90.7	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.084 mg/L	0.1 mg/L	84.1	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 338416) - continued										
FJ2101213-002	Anonymous	cadmium, dissolved	7440-43-9	E421	0.00412 mg/L	0.004 mg/L	103	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E421	0.0108 mg/L	0.01 mg/L	108	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0415 mg/L	0.04 mg/L	104	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0196 mg/L	0.02 mg/L	98.0	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0186 mg/L	0.02 mg/L	92.8	70.0	130	----
		iron, dissolved	7439-89-6	E421	2.03 mg/L	2 mg/L	102	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0190 mg/L	0.02 mg/L	95.1	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0916 mg/L	0.1 mg/L	91.6	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0195 mg/L	0.02 mg/L	97.4	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0396 mg/L	0.04 mg/L	98.9	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.5 mg/L	10 mg/L	105	70.0	130	----
		potassium, dissolved	7440-09-7	E421	4.09 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	0.0445 mg/L	0.04 mg/L	111	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.26 mg/L	10 mg/L	92.6	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00396 mg/L	0.004 mg/L	99.1	70.0	130	----
		sodium, dissolved	17341-25-2	E421	1.86 mg/L	2 mg/L	92.8	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	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00370 mg/L	0.004 mg/L	92.6	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0406 mg/L	0.04 mg/L	101	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00418 mg/L	0.004 mg/L	104	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.104 mg/L	0.1 mg/L	104	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.406 mg/L	0.4 mg/L	102	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 339483)										
VA21C4126-005	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000991 mg/L	0.0001 mg/L	99.1	70.0	130	----
Aggregate Organics (QCLot: 340597)										
VA21C4121-002	Anonymous	chemical oxygen demand [COD]	----	E559	ND mg/L	100 mg/L	ND	75.0	125	----

ALS Environmental

www.alsglobal.com

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 of

Report To	Contact and company name below will appear on the final report
Company:	Regional District of Kitimat-Stikine
Contact:	Hannah Shinton
Phone:	250-641-4141
	Company address below will appear on the final report
Street:	4545 Lazelle Avenue
City/Province:	Terrace/BC
Postal Code:	V8G4E1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	Regional District of Kitimat-Stikine
Contact:	Nicki Veikle

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	eblaney@rdks.bc.ca
Email 2	hshinton@rdks.bc.ca
Email 3	nveikle@rdks.bc.ca
Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	anne-maries@rdks.bc.ca
Email 2	nveikle@rdks.bc.ca

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	Meziadin Landfill Surface Water	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):	4128	ALS Contact:	Sampler: H.Shinton

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days):
- 4 day [P4-20%] ☐
- 3 day [P3-25%] ☐
- 2 day [P2-50%] ☐

EMERGENCY:
- 1 Business day [E1 - 100%] ☐
- Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals (P)	Dissolved Metals (F/P)	Temperature	Hardness	TSS	Alkalinity	BOD	COD (P)	Ammonia (P)	Total Kjeldahl Nitrogen (P)	Nitrate and Nitrite	Chloride	Sulphate	Fluoride	pH, Conductivity	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
	SW2017-01 DS	27-Oct-21	12:08	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R			6
	SW2017-02 US	27-Oct-21	9:32	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R			6
	Lagoon Outlet	27-Oct-21	11:19	Effluent	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R			6

Environmental Division
Vancouver
Work Order Reference
VA21C4128

Telephone : +1 604 253 4188

Terrace Shipping
#1 Coolers
#___ Carbouys
Ground ☐
Air ☒
SFX ☐

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)
Are samples for human consumption/ use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
9.7						8	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Hannah Shinton	Date: October 28th, 2021	Time:	Received by: Chris	Date: 28Oct21	Time: 1150	Received by: PD	Date: OCT 28 2021	Time: 21:45

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA21B5002**	Page	: 1 of 6
Client	: **Regional District of Kitimat-Stikine**	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 BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Meziadin Landfill Surface Water	Date Samples Received	: 21-Jul-2021 21:00
PO	: ----	Date Analysis Commenced	: 22-Jul-2021
C-O-C number	: ----	Issue Date	: 30-Jul-2021 09:22
Sampler	: HS		
Site	:		
Quote number	: Q62338		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruby Pham	Lab Assistant	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
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

Qualifier	*Description*
DLA	*Detection Limit adjusted for required dilution.*
DTS	*Dissolved Sulfur concentration exceeds total. Negative bias on Total Sulfur suspected due to presence of volatile sulfur species lost during digestion.*
DTSE	*Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	Lagoon Outlet	----	----	----	----
					Client sampling date / time	19-Jul-2021 04:20	----	----	----	----
						VA21B5002-001	--------	--------	--------	--------
						Result	----	----	----	----
Physical Tests										
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		272	----	----	----	----
conductivity	----	E100	2.0	µS/cm		616	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		223	----	----	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		232	----	----	----	----
pH	----	E108	0.10	pH units		7.20	----	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L		13.0	----	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		6.46	----	----	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L		28.8	----	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.112	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		7.36	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0071	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		15.5	----	----	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.232	----	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00017	----	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00086	----	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.116	----	----	----	----
beryllium, total	7440-41-7	E420	0.000100	mg/L		<0.000100	----	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	----	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L		0.232	----	----	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000419	----	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		72.0	----	----	----	----
cesium, total	7440-46-2	E420	0.000010	mg/L		0.000031	----	----	----	----
chromium, total	7440-47-3	E420	0.00050	mg/L		0.00090	----	----	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00081	----	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		0.00126	----	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L		1.48	----	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		0.000160	----	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0035	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	Lagoon Outlet	----	----	----	----
					Client sampling date / time	19-Jul-2021 04:20	----	----	----	----
						VA21B5002-001	--------	--------	--------	--------
						Result	----	----	----	----
Total Metals										
magnesium, total	7439-95-4	E420	0.0050	mg/L		12.6	----	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		8.56	----	----	----	----
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000185	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00297	----	----	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L		0.682	----	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L		7.45	----	----	----	----
rubidium, total	7440-17-7	E420	0.00020	mg/L		0.00427	----	----	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000066	----	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		4.65	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	----	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L		26.4	----	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.398	----	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		4.47	----	----	----	----
tellurium, total	13494-80-9	E420	0.00020	mg/L		0.00022	----	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	----	----	----	----
thorium, total	7440-29-1	E420	0.00010	mg/L		<0.00010	----	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	----	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00271	----	----	----	----
tungsten, total	7440-33-7	E420	0.00010	mg/L		<0.00010	----	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000012	----	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00074	----	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0180	----	----	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	----	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0200	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00020 DLA	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00065	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.109	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.000100	mg/L		<0.000200 DLA	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000100 DLA	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.229	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	Lagoon Outlet	----	----	----	----
					Client sampling date / time	19-Jul-2021 04:20	----	----	----	----
						VA21B5002-001	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000100 DLA	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		69.4	----	----	----	----
cesium, dissolved	7440-46-2	E421	0.000010	mg/L		0.000024	----	----	----	----
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00100 DLA	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		0.00033	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00040 DLA	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.324	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000100 DLA	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0034	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		12.0	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		8.56	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000106	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00211	----	----	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		0.561	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		7.18	----	----	----	----
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		0.00368	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.00176 DTSE	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.27	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000020 DLA	----	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		24.3	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.420	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		14.8 DTS	----	----	----	----
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L		<0.00040 DLA	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000020 DLA	----	----	----	----
thorium, dissolved	7440-29-1	E421	0.00010	mg/L		<0.00020 DLA	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00020 DLA	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00060 DLA	----	----	----	----
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L		<0.00020 DLA	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		<0.000020 DLA	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00100 DLA	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0035	----	----	----	----

Analytical Results

Sub-Matrix: **Water** (Matrix: **Water**)					Client sample ID	**Lagoon Outlet**	----	----	----	----
					Client sampling date / time	19-Jul-2021 04:20	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*		**VA21B5002-001**	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00040 DLA	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----
Aggregate Organics										
biochemical oxygen demand [BOD]	----	E550	2.0	mg/L		9.9	----	----	----	----
chemical oxygen demand [COD]	----	E559	20	mg/L		52	----	----	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA21B5002**	Page	: 1 of 9
Client	: **Regional District of Kitimat-Stikine**	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	: Meziadin Landfill Surface Water	Date Samples Received	: 21-Jul-2021 21:00
PO	: ----	Issue Date	: 30-Jul-2021 09:22
C-O-C number	: ----		
Sampler	: HS		
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.

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 Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD HT 3d]										
Lagoon Outlet	E550	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid)										
Lagoon Outlet	E559	19-Jul-2021	----	----	----		27-Jul-2021	28 days	8 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
Lagoon Outlet	E298	19-Jul-2021	27-Jul-2021	----	----		28-Jul-2021	28 days	10 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
Lagoon Outlet	E235.Cl	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
Lagoon Outlet	E235.F	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
Lagoon Outlet	E235.NO3-L	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
Lagoon Outlet	E235.NO2-L	19-Jul-2021	----	----	----		22-Jul-2021	3 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
Lagoon Outlet	E235.SO4	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
Lagoon Outlet	E318	19-Jul-2021	27-Jul-2021	----	----		29-Jul-2021	28 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
Lagoon Outlet	E509	19-Jul-2021	25-Jul-2021	----	----		25-Jul-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
Lagoon Outlet	E421	19-Jul-2021	26-Jul-2021	----	----		26-Jul-2021	180 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
Lagoon Outlet	E290	19-Jul-2021	----	----	----		22-Jul-2021	14 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE										
Lagoon Outlet	E100	19-Jul-2021	----	----	----		22-Jul-2021	28 days	3 days	✓
Physical Tests : pH by Meter										
HDPE										
Lagoon Outlet	E108	19-Jul-2021	----	----	----		22-Jul-2021	0.25 hrs	79 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE										
Lagoon Outlet	E160-H	19-Jul-2021	----	----	----		26-Jul-2021	7 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid)										
Lagoon Outlet	E508	19-Jul-2021	----	----	----		25-Jul-2021	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
Lagoon Outlet	E420	19-Jul-2021	----	----	----		28-Jul-2021	180 days	10 days	✓

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended

Rec. HT: ALS recommended hold time (see units).

Quality Control Parameter Frequency Compliance

The following report summarizes the frequency of laboratory QC samples analyzed within the analytical batches (QC lots) in which the submitted samples were processed. The actual frequency should be greater than or equal to the expected frequency.

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	249057	1	15	6.6	5.0	✓
Ammonia by Fluorescence	E298	253168	1	20	5.0	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	249294	1	11	9.0	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	252456	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	249095	1	14	7.1	5.0	✓
Conductivity in Water	E100	249056	1	14	7.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	251524	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	251778	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	249094	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	249092	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	249093	1	12	8.3	5.0	✓
pH by Meter	E108	249055	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	249091	1	14	7.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	253169	1	8	12.5	5.0	✓
Total Mercury in Water by CVAAS	E508	251604	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	253286	1	20	5.0	5.0	✓
TSS by Gravimetry	E160-H	251653	1	12	8.3	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	249057	1	15	6.6	5.0	✓
Ammonia by Fluorescence	E298	253168	1	20	5.0	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	249294	1	11	9.0	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	252456	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	249095	1	14	7.1	5.0	✓
Conductivity in Water	E100	249056	1	14	7.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	251524	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	251778	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	249094	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	249092	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	249093	1	12	8.3	5.0	✓
pH by Meter	E108	249055	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	249091	1	14	7.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	253169	1	8	12.5	5.0	✓
Total Mercury in Water by CVAAS	E508	251604	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	253286	1	20	5.0	5.0	✓
TSS by Gravimetry	E160-H	251653	1	12	8.3	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	249057	1	15	6.6	5.0	✓

Matrix: **Water**

Evaluation: × = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Ammonia by Fluorescence	E298	253168	1	20	5.0	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	249294	1	11	9.0	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	252456	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	249095	1	14	7.1	5.0	✓
Conductivity in Water	E100	249056	1	14	7.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	251524	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	251778	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	249094	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	249092	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	249093	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	249091	1	14	7.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	253169	1	8	12.5	5.0	✓
Total Mercury in Water by CVAAS	E508	251604	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	253286	1	20	5.0	5.0	✓
TSS by Gravimetry	E160-H	251653	1	12	8.3	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	253168	1	20	5.0	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	252456	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	249095	1	14	7.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	251524	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	251778	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	249094	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	249092	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	249093	1	12	8.3	5.0	✓
Sulfate in Water by IC	E235.SO4	249091	1	14	7.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	253169	1	8	12.5	5.0	✓
Total Mercury in Water by CVAAS	E508	251604	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	253286	1	20	5.0	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160-H Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Chloride in Water by IC	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).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
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.
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	E559 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.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), from total Ca/Mg” is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions

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 using block digestion with Copper Sulfate Digestion Reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **VA21B5002**	Page	: 1 of 18
Client	: Regional District of Kitimat-Stikine	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	: Meziadin Landfill Surface Water	Date Samples Received	: 21-Jul-2021 21:00
PO	: ----	Date Analysis Commenced	: 22-Jul-2021
C-O-C number	: ----	Issue Date	: 30-Jul-2021 09:22
Sampler	: HS		
Site	:		
Quote number	: Q62338		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruby Pham	Lab Assistant	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Services number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percentage Difference
# = Indicates a QC result that did not meet the ALS DQO.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 249055)											
VA21B5000-001	Anonymous	pH	----	E108	0.10	pH units	8.37	8.36	0.120%	4%	----
Physical Tests (QC Lot: 249056)											
VA21B5000-001	Anonymous	conductivity	----	E100	2.0	µS/cm	670	670	0.00%	10%	----
Physical Tests (QC Lot: 249057)											
VA21B5000-001	Anonymous	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	272	271	0.221%	20%	----
Physical Tests (QC Lot: 251653)											
VA21B4883-013	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	4.3	<3.0	1.3	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 249091)											
VA21B5000-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	1.62	1.63	0.007	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 249092)											
VA21B5000-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	0.0372	0.0351	0.0020	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 249093)											
VA21B5000-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 249094)											
VA21B5000-001	Anonymous	fluoride	16984-48-8	E235.F	0.100	mg/L	0.103	0.102	0.0006	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 249095)											
VA21B5000-001	Anonymous	chloride	16887-00-6	E235.Cl	2.50	mg/L	61.6	61.8	0.274%	20%	----
Anions and Nutrients (QC Lot: 253168)											
VA21B4971-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0537	0.0541	0.744%	20%	----
Anions and Nutrients (QC Lot: 253169)											
VA21B4999-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	2.34	2.33	0.198%	20%	----
Total Metals (QC Lot: 251604)											
VA21B4971-006	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 253286)											
VA21B5001-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0858	0.0856	0.255%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00089	0.00090	0.000007	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0184	0.0184	0.143%	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	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 253286) - continued											
VA21B5001-001	Anonymous	cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000160	0.0000164	0.0000005	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	14.4	14.4	0.496%	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	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00025	0.00026	0.00001	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	0.613	0.612	0.125%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000074	0.000074	0.0000003	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	2.69	2.61	3.22%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0584	0.0574	1.79%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00075	0.00073	0.00002	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	0.136	0.134	0.002	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	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	0.58	0.60	0.02	Diff <2x LOR	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	18.0	17.6	2.44%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.0955	0.0998	4.37%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	0.00024	0.00004	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	0.00120	mg/L	<0.00120	0.00078	0.00042	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	<0.000010	<0.000010	0	Diff <2x LOR	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0069	0.0063	0.0006	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 251524)											
FJ2100577-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 251778)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 251778) - continued											
VA21B4901-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0309	0.0333	7.37%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.0208	0.0205	1.26%	20%	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00082	0.00080	0.00001	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0313	0.0317	1.32%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.045	0.045	0.00005	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000100	mg/L	<0.0000100	<0.0000100	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	76.2	78.6	3.12%	20%	----
		cesium, dissolved	7440-46-2	E421	0.000010	mg/L	0.000089	0.000085	0.000003	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	0.00055	0.00055	0.000004	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00023	0.00025	0.00002	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00029	0.00032	0.00004	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	0.0125	0.0124	0.638%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	24.2	25.5	5.22%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0592	0.0605	2.27%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00532	0.00523	1.57%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	0.064	0.080	0.016	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	9.98	9.94	0.454%	20%	----
		rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00522	0.00492	5.97%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.0117	0.0112	4.46%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.80	2.74	2.37%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	57.7	58.5	1.50%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	2.10	2.10	0.281%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	80.1	79.2	1.11%	20%	----
		tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	0.00023	<0.00020	0.00003	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000029	0.000027	0.000002	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	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 251778) - continued											
VA21B4901-001	Anonymous	uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000963	0.00100	3.84%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0022	0.0022	0.00002	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Aggregate Organics (QC Lot: 249294)											
FJ2100583-001	Anonymous	biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	<2.0	<2.0	0.0%	30%	----
Aggregate Organics (QC Lot: 252456)											
VA21B4863-001	Anonymous	chemical oxygen demand [COD]	----	E559	80	mg/L	4470	4560	1.87%	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
Physical Tests (QCLot: 249056)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 249057)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 251653)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 249091)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 249092)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 249093)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 249094)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 249095)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 253168)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 253169)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Total Metals (QCLot: 251604)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 253286)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 253286) - continued						
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	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
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	----
Dissolved Metals (QCLot: 251524)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 251778)						
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	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 251778) - continued						
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	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
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	----
Aggregate Organics (QCLot: 249294)						
biochemical oxygen demand [BOD]	----	E550	2	mg/L	<2.0	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Aggregate Organics (QCLot: 252456)						
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				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 249055)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 249056)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 249057)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	98.9	85.0	115	----
Physical Tests (QCLot: 251653)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	97.2	85.0	115	----
Anions and Nutrients (QCLot: 249091)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	105	90.0	110	----
Anions and Nutrients (QCLot: 249092)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	105	90.0	110	----
Anions and Nutrients (QCLot: 249093)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 249094)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	106	90.0	110	----
Anions and Nutrients (QCLot: 249095)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 253168)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	101	85.0	115	----
Anions and Nutrients (QCLot: 253169)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	101	75.0	125	----
Total Metals (QCLot: 251604)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	102	80.0	120	----
Total Metals (QCLot: 253286)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	100	80.0	120	----
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	99.9	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	99.6	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	90.6	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	94.8	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	96.9	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 253286) - continued									
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	101	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	97.5	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	99.3	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	98.5	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	93.4	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	92.3	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	98.4	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	97.3	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	104	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	95.7	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	98.6	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	108	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	103	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	101	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	97.2	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	101	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	99.7	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	90.5	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	105	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	102	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	97.2	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	93.1	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	96.2	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	95.7	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	99.6	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	97.2	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	94.9	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	100	80.0	120	----
Dissolved Metals (QCLot: 251778)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	98.0	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	108	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	93.5	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	95.5	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Dissolved Metals (QCLot: 251778) - continued									
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	95.8	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	106	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	87.4	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	97.0	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	100.0	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	98.5	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	96.9	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	99.9	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	107	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	93.6	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	96.4	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	106	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	95.1	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	98.5	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	101	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	94.5	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	103	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	98.5	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	105	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	90.6	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	100	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	94.4	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	96.8	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	86.9	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	97.4	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	110	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	99.7	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	93.3	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	103	80.0	120	----
Aggregate Organics (QCLot: 249294)									
biochemical oxygen demand [BOD]	----	E550	2	mg/L	198 mg/L	107	85.0	115	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Aggregate Organics (QCLot: 252456)									
chemical oxygen demand [COD]	----	E559	20	mg/L	100 mg/L	103	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
Anions and Nutrients (QCLot: 249091)										
VA21B5000-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	548 mg/L	500 mg/L	110	75.0	125	----
Anions and Nutrients (QCLot: 249092)										
VA21B5000-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	13.8 mg/L	12.5 mg/L	110	75.0	125	----
Anions and Nutrients (QCLot: 249093)										
VA21B5000-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	2.69 mg/L	2.5 mg/L	108	75.0	125	----
Anions and Nutrients (QCLot: 249094)										
VA21B5000-002	Anonymous	fluoride	16984-48-8	E235.F	5.60 mg/L	5 mg/L	112	75.0	125	----
Anions and Nutrients (QCLot: 249095)										
VA21B5000-002	Anonymous	chloride	16887-00-6	E235.Cl	549 mg/L	500 mg/L	110	75.0	125	----
Anions and Nutrients (QCLot: 253168)										
VA21B4971-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.111 mg/L	0.1 mg/L	111	75.0	125	----
Anions and Nutrients (QCLot: 253169)										
VA21B4999-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.66 mg/L	2.5 mg/L	106	70.0	130	----
Total Metals (QCLot: 251604)										
VA21B4971-007	Anonymous	mercury, total	7439-97-6	E508	0.0000963 mg/L	0.0001 mg/L	96.3	70.0	130	----
Total Metals (QCLot: 253286)										
VA21B5001-002	Anonymous	aluminum, total	7429-90-5	E420	0.196 mg/L	0.2 mg/L	98.3	70.0	130	----
		antimony, total	7440-36-0	E420	0.0196 mg/L	0.02 mg/L	97.8	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0199 mg/L	0.02 mg/L	99.7	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	0.0387 mg/L	0.04 mg/L	96.7	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00909 mg/L	0.01 mg/L	90.9	70.0	130	----
		boron, total	7440-42-8	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00374 mg/L	0.004 mg/L	93.6	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	0.0384 mg/L	0.04 mg/L	96.1	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0187 mg/L	0.02 mg/L	93.6	70.0	130	----
		copper, total	7440-50-8	E420	0.0182 mg/L	0.02 mg/L	91.0	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 253286) - continued										
VA21B5001-002	Anonymous	iron, total	7439-89-6	E420	1.86 mg/L	2 mg/L	93.1	70.0	130	----
		lead, total	7439-92-1	E420	0.0184 mg/L	0.02 mg/L	92.0	70.0	130	----
		lithium, total	7439-93-2	E420	0.101 mg/L	0.1 mg/L	101	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	0.0194 mg/L	0.02 mg/L	97.2	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		nickel, total	7440-02-0	E420	0.0362 mg/L	0.04 mg/L	90.4	70.0	130	----
		phosphorus, total	7723-14-0	E420	10.3 mg/L	10 mg/L	103	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	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		selenium, total	7782-49-2	E420	0.0411 mg/L	0.04 mg/L	103	70.0	130	----
		silicon, total	7440-21-3	E420	8.96 mg/L	10 mg/L	89.6	70.0	130	----
		silver, total	7440-22-4	E420	0.00382 mg/L	0.004 mg/L	95.6	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	20.9 mg/L	20 mg/L	104	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0391 mg/L	0.04 mg/L	97.7	70.0	130	----
		thallium, total	7440-28-0	E420	0.00357 mg/L	0.004 mg/L	89.2	70.0	130	----
		thorium, total	7440-29-1	E420	0.0207 mg/L	0.02 mg/L	104	70.0	130	----
		tin, total	7440-31-5	E420	0.0193 mg/L	0.02 mg/L	96.7	70.0	130	----
		titanium, total	7440-32-6	E420	0.0396 mg/L	0.04 mg/L	99.1	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0194 mg/L	0.02 mg/L	96.9	70.0	130	----
		uranium, total	7440-61-1	E420	0.00384 mg/L	0.004 mg/L	96.0	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0990 mg/L	0.1 mg/L	99.0	70.0	130	----
		zinc, total	7440-66-6	E420	0.382 mg/L	0.4 mg/L	95.6	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0399 mg/L	0.04 mg/L	99.8	70.0	130	----
Dissolved Metals (QCLot: 251524)										
FJ2100577-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.000102 mg/L	0.0001 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 251778)										
VA21B4906-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.186 mg/L	0.2 mg/L	92.8	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0212 mg/L	0.02 mg/L	106	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0192 mg/L	0.02 mg/L	96.1	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0394 mg/L	0.04 mg/L	98.5	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00789 mg/L	0.01 mg/L	78.9	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.094 mg/L	0.1 mg/L	94.0	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 251778) - continued										
VA21B4906-001	Anonymous	cadmium, dissolved	7440-43-9	E421	0.00393 mg/L	0.004 mg/L	98.2	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E421	0.0102 mg/L	0.01 mg/L	102	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0375 mg/L	0.04 mg/L	93.8	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0185 mg/L	0.02 mg/L	92.6	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0180 mg/L	0.02 mg/L	90.3	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.86 mg/L	2 mg/L	92.9	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0192 mg/L	0.02 mg/L	96.0	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0214 mg/L	0.02 mg/L	107	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0354 mg/L	0.04 mg/L	88.5	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	11.0 mg/L	10 mg/L	110	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.83 mg/L	4 mg/L	95.7	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0194 mg/L	0.02 mg/L	96.8	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0443 mg/L	0.04 mg/L	111	70.0	130	----
		silicon, dissolved	7440-21-3	E421	8.86 mg/L	10 mg/L	88.6	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00311 mg/L	0.004 mg/L	77.7	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	19.3 mg/L	20 mg/L	96.5	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0426 mg/L	0.04 mg/L	106	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00372 mg/L	0.004 mg/L	93.0	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0213 mg/L	0.02 mg/L	106	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0196 mg/L	0.02 mg/L	98.3	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0372 mg/L	0.04 mg/L	93.0	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	0.0191 mg/L	0.02 mg/L	95.7	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00411 mg/L	0.004 mg/L	103	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0970 mg/L	0.1 mg/L	97.0	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.367 mg/L	0.4 mg/L	91.8	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0446 mg/L	0.04 mg/L	112	70.0	130	----
Aggregate Organics (QCLot: 252456)										
VA21B4999-001	Anonymous	chemical oxygen demand [COD]	----	E559	ND mg/L	100 mg/L	ND	75.0	125	----

ALS Environmental

www.alsglobal.com

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 of

Report To	Contact and company name below will appear on the final report
Company:	Regional District of Kitimat-Stikine
Contact:	Hannah Shinton
Phone:	250-641-4141
	Company address below will appear on the final report
Street:	4545 Lazelle Avenue
City/Province:	Terrace/BC
Postal Code:	V8G4E1
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☑ YES ☐ NO
Company:	Regional District of Kitimat-Stikine
Contact:	Nicki Veikle

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☑ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	hshinton@rdks.bc.ca
Email 2	nveikle@rdks.bc.ca
Email 3	eblaney@rdks.bc.ca

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	anne-maries@rdks:bc.ca
Email 2	nveikle@rdks.bc.ca

Project Information	
ALS Account # / Quote #:	
Job #:	Meziadin Landfill Surface Water
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)		
AFE/Cost Center:		PO#
Major/Minor Code:		Routing Code:
Requisitioner:		
Location:		

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler: H.Shinton

Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days):
- 4 day [P4-20%] ☐
- 3 day [P3-25%] ☐
- 2 day [P2-50%] ☐

EMERGENCY:
- 1 Business day [E1 - 100%] ☐
- Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service level selected, you will be contacted.

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Total Metals	Dissolved Metals	Temperature	Hardness	TSS	Alkalinity	BOD	COD	Ammonia	Total Kjeldahl Nitrogen	Nitrate and Nitrite	Chloride	Sulphate	Fluoride	pH, Conductivity	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
					P	F/P						P	P	P								
	Lagoon Outlet	19-Jul-21	4:20	Effluent	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R			6

Terrace Shipping
#1 Coolers Ground ☐
Carbouys Air ☑

Environmental Division
Vancouver
Work Order Reference
VA21B5002

Telephone : +1 604 253 4188

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on re... (electronic CO... only) ...own list below
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)
Are samples for human consumption/ use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
3.8				4			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Hannah Shinton	Date: July 21st 2021	Time:	Received by: Chris	Date: 21 July 21	Time: 1210	Received by:	Date: JUL 21 2021	Time: 4

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a **Regulated Drinking Water (DW) System**, please submit using an **Authorized DW COC form**.