



Regional District of
Kitimat-Stikine

2020 MEZIADIN LANDFILL ANNUAL REPORT

Prepared for:

British Columbia Ministry of
Environment & Climate Change
Strategy
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Meziadin Landfill Overview

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.

In 2020, 15840.9 cubic meters of solid waste were deposited into the landfill. A total of 285 cubic meters of clean wood were diverted, an estimated 122.5 cubic meters of metal were diverted from the landfill to be collected by a scrap recycler, and 6 cubic meters of tires were diverted for collection by the Tire Stewardship Program.

Results of the Meziadin Landfill water quality monitoring program will be discussed in the *Meziadin Landfill 2020 Annual Environmental Effects Monitoring (EEM) Report*, to be prepared by Golder Associates in spring 2021. Once complete, the 2020 EEM report will be appended to this report as Appendix A and will be resubmitted for Ministry review. Figure 1 shows the location of the Meziadin Landfill Facility.



Figure 1 Location of Meziadin Landfill

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1.0 Introduction

This annual report covers the period from January to December 2020 and has been prepared to fulfill the requirements of Meziadin Landfill Operational Certificate MR-15681.

Issued by the Ministry of Environment and Climate Change Strategy in August 2002, and amended in November 2013, the Operational Certificate authorizes the discharge of municipal solid and liquid wastes and outlines the criteria for environmental and human protection at the landfill.

This report meets the requirements in Section (14.2) of the Operational Certificate by providing the following information:

- Total volume of waste discharged to the landfill during 2020;
- Total volume of waste diverted and recycled during 2020;
- Total volume of sewage waste discharged to the septage facility during 2020;
- Occurrences or observations of wildlife attempting to access the facility; and
- The results and evaluation of all the monitoring programs has been undertaken by Golder Associates, and is shown in Appendix A.

2.0 Waste Disposal

The Meziadin Facility receives waste from residents and businesses, as well as waste generated by large industry in the area. Large 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 500).

2.1 Solid Waste

Several wastes are authorized under the Operational Certificate to be disposed of at the Meziadin Landfill. The annual totals of municipal solid waste, metal, tires, and clean wood received at the Meziadin Landfill from January through to December 2020 are shown in Table 1. Details regarding some of these materials are included below.

Table 1: Waste Discharge Volumes for 2020

Material	2020 Volume (cubic meters)	
Waste Discharge		
Garbage	15840.9 ^a	
Diverted		
Metal		122.5 ^b
Tires		6 ^c
Clean Wood		285 ^d
Total		407.5

Note: ^a This value is based on pre-compaction volume (m³) data collected from January to December 2020.

^b This number is a volume estimate for on-site segregated materials.

^c This is an estimate based on tire pile size.

^d This is an estimate of tracked volume.

2.1.1 Garbage

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 2020, 15840.9 cubic meters of garbage were disposed of in the landfill.

2.2 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 2020, an estimated 3670 cubic meters of septage was received at the Meziadin Facility.

The 2020 estimate of septage volume is based on hauler tipping records for the latter half of the year extrapolated to infer volumes for the entire year. This volume is significantly greater than annual septage volumes recorded in previous years. This increase is likely due to improved record keeping in 2020. Previous estimates were based on hauling truck capacity and the number of tipping events recorded by landfill operators. Beginning in July 2020, volume records were collected from all septage haulers for each tipping event, resulting in a more accurate record of tipping events and greater overall volume.

3.0 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.

3.1.1 Metals

In 2020, a total of 122.5 cubic meters of metal were collected at the Meziadin Landfill as scrap for recycling. This volume is an estimate of on-site segregated metals.

3.1.2 Tires

In 2020, 6 cubic meters of tires were collected at the Meziadin Facility for recycling through the Tire Stewardship of BC. This volume is an estimate based on the tire pile size.

3.1.3 Clean Wood Waste

In 2020, 285 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 2020.

4.0 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 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.

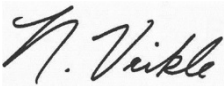
Facility operators are required to inspect the fence line weekly, testing for proper voltage, proper tension on fence stands, overall condition of the fence, and signs of wildlife activity.

In February 2020, RDKS staff noted wolf tracks within the facility. It is believed that wolves were able to use the heavy snow load to climb over the facility fence. On August 2, 2020, operators found a bear within the facility. Operators continue to monitor the electric fence to deter wildlife from entering the facility.

5.0 Environmental Monitoring Report

Environmental monitoring for the Meziadin Facility was conducted by a Regional District of Kitimat-Stikine Environmental Services Technician, Mary Tress, following Ministry of Environment and Climate Change Strategy, 2013 British Columbia Field Sampling Manual. Golder Associates has been retained to compile and analyze in-situ monitoring and surface water sampling results. The compiled data, interpretation, and recommendations from Golder Associates will be contained in the *Meziadin Landfill 2020 Annual Environmental Effects Monitoring (EEM) Report*. Once completed in spring 2021, the 2020 EEM report will be appended to this report and will be resubmitted to the Ministry in June 2021.

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Appendix A: *Meziadin Landfill 2020 Annual Environmental Effects Monitoring (EEM) Report*



REPORT

Meziadin Landfill, Meziadin Junction, BC
2020 Annual Environmental Effects Monitoring Report

Submitted to:

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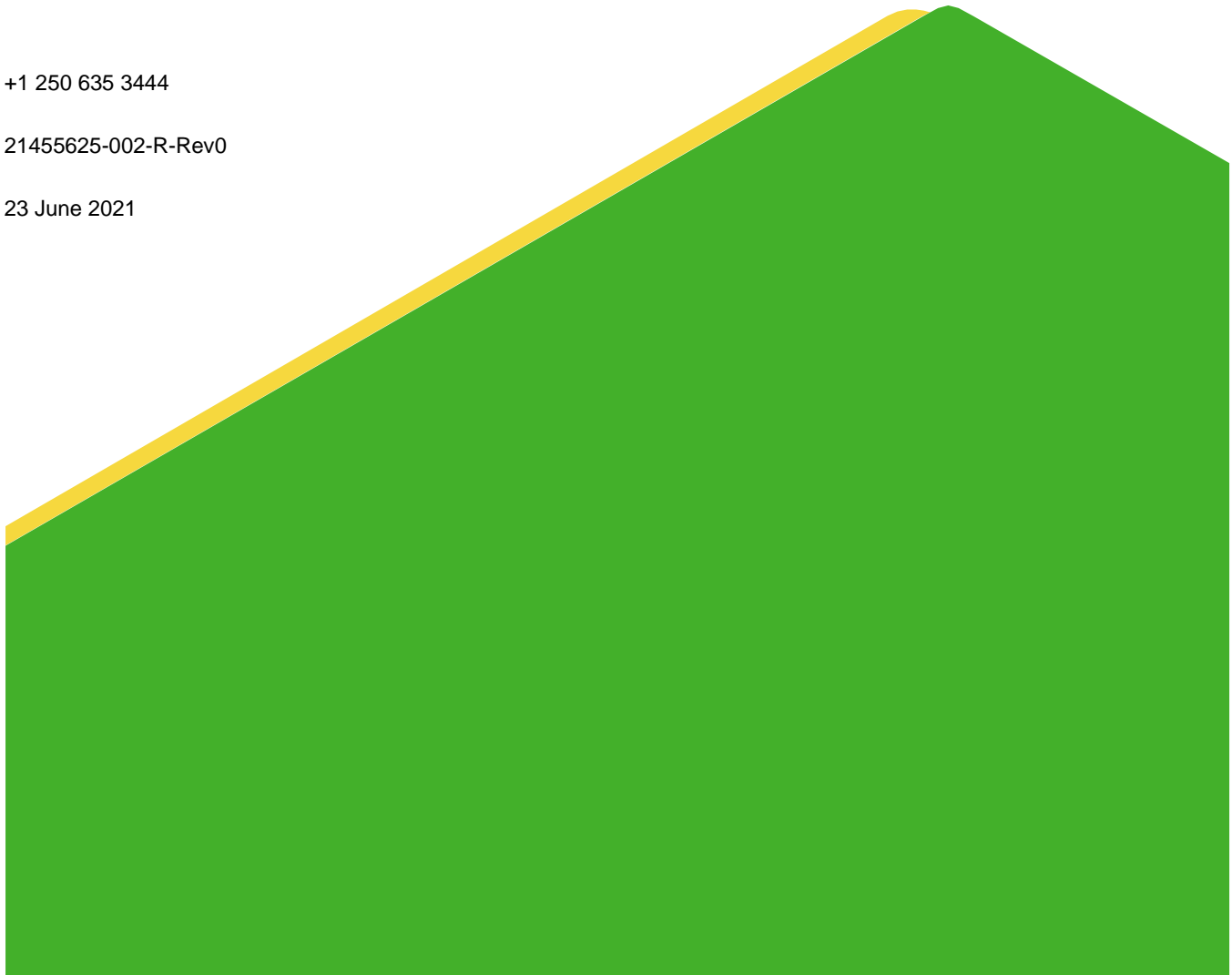
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Distribution List

Regional District of Kitimat-Stikine

Executive Summary

The 2020 monitoring program indicates that the 2020 results follow historic trends and confirm previous findings.

Seasonal variations in groundwater levels were observed in 2020. The hydraulic gradient and groundwater flow direction across the Site appear to be similar to those measured in 1999 (AE 1999). Groundwater is flowing to the south and southeast.

Outlet water from the leachate treatment lagoon exceeds the British Columbia Water Quality Guidelines (BC WQG) for select constituents. However, it appears that leachate is being attenuated and is not impacting surface water and groundwater further downgradient of the Landfill and the treatment lagoon.

Groundwater quality in the till unit which underlies the Landfill shows little to no impact from Landfill leachate and does not exceed applicable regulatory standards, although dissolved iron and manganese concentrations are elevated in shallow groundwater at one downgradient monitoring well location. The elevated dissolved iron and manganese concentrations at this location are considered to be partially caused by other unknown conditions not directly related to Landfill leachate effects.

The exceedances of applicable guidelines and regulations in surface water downgradient of the Landfill appear to be the result of natural processes.

It is recommended that the scope of the current monitoring program be continued in 2021.

Study Limitations

This report was prepared for the exclusive use of the Regional District of Kitimat-Stikine (RDKS). The report, which includes all tables, figures and appendices, is based on current and historical data and information provided by RDKS to Golder Associates Ltd (Golder) in March 2021. The findings, interpretations and conclusions concerning the Site conditions are based solely on the information provided to Golder.

Golder makes no warranty, expressed or implied, and assumes no liability with respect to the use of the information contained in this report at the subject Site, or any other Site, for other than its intended purpose. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Golder accepts no responsibilities for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

The RDKS has the right to submit this report to the BC Ministry of Environment & Climate Change Strategy (ENV) for review and comment. ENV may rely on the information contained in this report solely to carry out such a review.

Golder disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up action and costs, which result from reporting the factual information contained herein.

The services performed as described in this report were conducted in a manner consistent with that level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions, subject to the time limits and financial and physical constraints applicable to the services. The content of this report is based on information provided by the RDKS to Golder in March 2021, our present understanding of the Site conditions, and our professional judgement in light of such information available at the time of this report. This report provides a professional opinion, and therefore no warranty is either expressed, implied or made as to the conclusions, advice and recommendations offered in this report. This report does not provide a legal opinion regarding compliance with applicable laws. With respect to regulatory compliance issues, it should be noted that regulatory statutes and the interpretation of regulatory statutes are subject to change.

Golder accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. The findings and conclusions of this report are valid only as of the date of this report. If new information is discovered during future work, including excavations, borings or other activities or studies, Golder should be requested to re-evaluate the conclusions of this report, and to provide amendments as required.

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Operational Certificate

APPENDIX B

BC Water Well Atlas - Water Well Records

APPENDIX C

Borehole Logs

APPENDIX D

Analytical Results

APPENDIX E

2020 Certificates of Analysis

APPENDIX F

Historic Analytical Results

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by the Regional District of Kitimat-Stikine (RDKS) to prepare the 2020 Annual Environmental Effects Monitoring (EEM) Report for the Meziadin Landfill (the “Site”). The Site is located approximately 9 km southeast of Meziadin Junction, British Columbia, and is accessed from the Stewart-Cassiar Highway. Annual reporting is a requirement of Clause 13 of the Operational Certificate No. MR-15681, dated 8 August 2002, and amended 3 June 2009 and 28 November 2013 (the “OC”). A copy of the Permit including all amendments is provided in APPENDIX A.

1.1 Background

Under the BC Ministry of Environment and Climate Change Strategy (ENV) Operational Certificates and amendments, EEM Programs are required to be completed for the Site. As outlined in the 28 November 2013 ENV letter to the RDKS, the objective of the EEM Program for the Meziadin Landfill is to determine the potential effects of the Landfill on the receiving environment. The scope of work for the EEM Programs is to include:

- **Surface Water Monitoring:** Collection and analysis of three surface water samples from upstream and downstream of the Landfill and from the treatment lagoon outlet, conducted twice annually (spring and fall).
- **Groundwater Monitoring:** Collection and analysis of groundwater samples from five monitoring wells, conducted twice per year (spring and fall).
- **Quality Assurance/Quality Control (QAQC) Program:** The operational certificate holder (RDKS) is required to conduct a QAQC program to determine the acceptability of the data required by the permit.
- **Reporting:** An annual report is to be submitted to BC ENV no later than 30 June of the following year.

1.2 Objective and Scope of Work

The objective of this project was to conduct a desktop analysis of available information to assess the potential impacts of the Landfill on the surrounding environment.

The RDKS completed the surface water monitoring, groundwater sampling and quality assurance and control (QAQC) programs for the 2020 monitoring year. Chemical analysis of surface water and groundwater samples was conducted by ALS Environmental Ltd. The RDKS provided Golder with historic and 2020 data related to sampling and monitoring at the Site. The purpose of this report is to present the following key information to satisfy the requirements presented in the Permit:

- Summary of the regulatory framework and Operational Certificate EEM requirements.
- Methods of field investigations (as provided by RDKS).
- Tabulated surface water and groundwater field parameters and chemistry compared to applicable standards and guidelines.
- Figures showing distribution of key landfill parameters in surface water and groundwater, as well as time series plots for the key landfill parameters.

- Discussion of chemistry and temporal evolution, including both laboratory analyses and field parameters.
- Tabulated depth to groundwater.
- Discussion of the QA/QC program.
- Conclusions and recommendations for the current EEM program.
- Appendices including laboratory certificate of analyses.

1.3 Previous Investigations

Previous studies and annual monitoring reporting have been carried out by Sperling Hansen Associates (SHA). Reporting since 2018 has been conducted by Golder. The most recent annual monitoring report was prepared for the Meziadin Landfill in 2019 (Golder 2020). Prior to the construction of the landfill, a hydrogeological and geotechnical investigation was carried out by Associated Engineering (AE) in 1999.

1.4 Site Description

The Site is located approximately 9 km southeast of Meziadin Junction, British Columbia, west of the Stewart-Cassiar Highway (Figure 1). The Site is situated approximately 800 m west of the Nass River, approximately 900 m east of the Meziadin River and approximately 3 km east of Meziadin Lake. The Site is relatively flat, and the Landfill encompasses an approximate area of 12 hectares.

The Landfill is unlined, thereby relying upon natural attenuation processes to mitigate potential seepage from the Landfill. The Landfill was designed with a leachate collection system that drains to a lined leachate treatment lagoon (Figure 2), intended to reduce the environmental impacts to the surrounding area. A septage receiving facility, located directly south of the Landfill, contains two ponds intended for septic tank contents, sewage holding tank waste, sewage treatment plant sludge, and wash water and grit from drain sumps at automobile wash facilities and parking lots.

The Site is bound by two ridges on the east and west of the Site, assumed to be controlled by underlying bedrock (AE 1999). The local topography gently slopes to the south, directing surface drainage towards the Meziadin River to the south and the Nass River to the southeast (AE 1999). The Site is underlain by sand and gravel ranging in thickness between 1 and 2 metres, which is underlain by dense sand/silt/gravel glacial till ranging in thickness from approximately 2 to 7 metres (AE 1999, McCuaig 2003 and SHA 2018). Groundwater flow follows local topography and generally flows towards the south and southeast, towards the Nass River, similar to surface water.

A search of the BC water well atlas identified the nearest water wells to be located next to Meziadin Lake, approximately 4 km to the west of the Landfill boundary. These two water wells are used for domestic purposes. The well records and locations are presented in APPENDIX B.

There are five monitoring wells at the Site completed in the glacial till unit with the following conditions (Figure 2):

- MW-1A is screened across the till/underlying bedrock contact downgradient of the Landfill.
- MW-1B is screened in an interbed of sand and gravel within the glacial till unit (i.e., bound above and below by glacial till) downgradient of the Landfill.
- MW-2 is screened across the till/underlying bedrock contact downgradient of the Landfill.
- MW-3 is screened in till upgradient of the Landfill.
- MW-4 is screened in till upgradient of the Landfill.

Monitoring well information including depth to bottom, depth of screened interval and location data, is provided in the following section (Table 1, Section 2.1) and on the original borehole logs in APPENDIX C.

The hydraulic conductivity of the till unit is reported to range from 10^{-7} m/s to 10^{-9} m/s (AE 1999). The overlying sand and gravel unit appears to be unsaturated (AE 1999).

2.0 GROUNDWATER AND SURFACE WATER MONITORING METHODOLOGY

2.1 Sampling Locations

Table 1 presents a list of historic and current sampling locations. Groundwater has been monitored from 1996 to 2020. Surface water has been monitored at the Site since 2002. During the 2020 program, five monitoring wells and three surface water locations were sampled. Historically, up to five additional surface water monitoring locations had been sampled. Sampling locations are shown in Figure 2; their locations in relation to the Landfill considering the inferred groundwater flow direction across the Site (described below in Section 3.1) are outlined in Table 1.

Table 1: Sampling Locations with Spatial and Hydrogeologic Information

Location	Sample Type	Easting UTM	Northing UTM	Casing Elevation (approx.) metres relative to local datum ¹	Depth to Bottom (approx.) metres relative to local datum ¹	Ground Elevation (approx.) metres relative to local datum ¹	Screen (Top/Bottom, Stratigraphic Unit) metres below ground surface	Available Sample Period	Location relative to Landfill ²
MW-1A (Deep)	Monitoring Well	488849	6211888	82	72.33	81.13	7.31/8.84, Till/Bedrock	1997 – 2020	Downgradient
MW-1B (Shallow)	Monitoring Well	488849	6211888	82	75.19	81.13	4.42/5.94, Sand and Gravel	1997 – 2020	Downgradient
MW-2	Monitoring Well	489086	6211991	83.63	76.44	82.73	16/21, Till/Bedrock	1997 – 2020	Downgradient
MW-3	Monitoring Well	488900	6212335	90.83	80.94	89.94	25/30, Till	1997 – 2020	Upgradient
MW-4	Monitoring Well	488727	6212206	93.14	83.12	92.19	25/30, Till	1997 – 2020	Upgradient
SW-3	Surface Water	489057	6212019	-	-	-	-	1997 – 2020	Downgradient
SW2017-1*	Surface Water	489242	6211804	-	-	-	-	1997 – 2020	Downgradient
SW2017-2*	Surface Water	488842	6212294	-	-	-	-	1997 – 2020	Upgradient
SW-1	Surface Water	488904	6212309	-	-	-	-	2004 - 2017	Upgradient
SW-2	Surface Water	489143	6212004	-	-	-	-	2003 - 2017	Downgradient
SW2017-3	Surface Water	489008	6211911	-	-	-	-	2017	Downgradient
SW2017-4	Surface Water	489070	6211901	-	-	-	-	2017	Downgradient
SW2017-5	Surface Water	489036	6212056	-	-	-	-	2017	Downgradient

Notes:

(1) Elevations are provided based on local datum of 100 m at a local control point as defined by AE (1999). AE (1999) defined the control point as UTM Easting 5000, Northing 5000. This point is assumed to be approximately 50 meters north of MW-4. No exact location information is available.

(2) Location relative to Landfill considering the inferred groundwater flow direction across the Site (towards the south and southeast).

Bold indicates sampling locations that were sampled in 2020.

Underlined indicates sampling locations that are required two times per year as per the Permit (APPENDIX A).

* Location sampled in October 2020 only, location was dry during June sampling event.

Locations and elevations are approximate.

A description of each surface water sampling location is provided in Table 2 below.

Table 2: Description of Surface Water Sampling Locations

Location	Description
SW-3	<u>Sample location of effluent treatment lagoon outlet water.</u>
SW2017-1	<u>New downstream surface water sampling location proposed as a replacement for SW-2. Location was established in 2017.</u>
SW2017-2	<u>New upstream surface water sampling location proposed as a replacement for SW-1. Location was established in 2017.</u>
SW-1	Former upstream surface water sampling location, which was replaced by SW2017-2 in 2017.
SW-2	Former downstream surface water sampling location, which was replaced by SW2017-1 in 2017.
SW2017-3	Temporary downstream sampling location to monitor construction activities at the Landfill in 2017.
SW2017-4	Temporary downstream sampling location to monitor construction activities at the Landfill in 2017.
SW2017-5	Temporary surface water sampling location of seepage from the toe of the leachate treatment lagoon. Sampled only in 2017 to monitor water quality during construction activities at the Landfill.

Notes:

Bold indicates sampling locations that were sampled in 2020

Underlined indicates sampling locations that are required two times per year as per the Permit (APPENDIX A).

2.2 Groundwater Sampling

The 2020 groundwater monitoring program consisted of groundwater sampling at all five existing monitoring wells. Sampling was conducted twice annually (see Section 2.1) by RDKS field staff, in June (Spring) and October (fall) 2020, following established sampling procedures as laid out in the *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples* (BC ENV 2013). Prior to any sampling activities, field instruments were calibrated to manufacturer specifications in the field. Following this, the depth to groundwater in the monitoring well was measured using a water level probe, and the monitoring well was purged. During purging, a YSI Professional Plus multi-meter was used to measure in-situ water quality parameters (temperature, electrical conductivity, redox potential, dissolved oxygen, and pH). The field parameter data along with analytical results are presented in APPENDIX D. Purging was continued until relatively stable field parameter measurements were obtained and three well volumes were removed, indicating representative formation water was present. Purge water from the monitoring well sampling was collected and disposed of at a suitable location at the Landfill.

The monitoring wells were purged and sampled using dedicated Waterra™ tubing and footvalve with 0.016 m (5/8-inch diameter) polyethylene tubing. Groundwater samples were collected in clean, laboratory-supplied sample bottles. Water samples for dissolved metals were field-filtered using a 0.45 µm in-line filter. As necessary, samples were preserved in the field using chemicals supplied by the laboratory. Standard sampling protocols, as laid out by the *British Columbia Field Sampling Manual* (BC ENV 2013) were followed during groundwater sampling to minimize the possibility of cross-contaminating the monitoring wells and the samples. The groundwater samples were submitted to ALS Environmental Ltd for analysis of the following chemical parameters, as outlined in Table 3, in accordance with requirements of the Permit. Analytical results and laboratory certificates of analysis for 2020 are presented in APPENDIX D and APPENDIX E, respectively. There were no deviations from the Operational Certificate EEM requirements noted during the 2020 groundwater monitoring program.

Table 3: Analytical Parameters for Groundwater Samples in 2020

Parameter	Season	
	Spring (May)	Fall (November)
<u>Dissolved metals including mercury</u>	✓	✓
<u>Dissolved Hardness</u>	✓	✓
<u>Alkalinity</u>	✓	✓
<u>Chloride (Cl)</u>	✓	✓
<u>Fluoride (F)</u>	✓	✓
<u>Sulphate (SO₄)</u>	✓	✓
<u>pH</u>	✓	✓
<u>Conductivity</u>	✓	✓
<u>Total Dissolved Solids (TDS)</u>	✓	✓
<u>Chemical Oxygen Demand (COD)</u>	✓	✓
<u>Ammonia (NH₃), Nitrate (NO₃), Nitrite (NO₂), Total Kjeldahl Nitrogen (TKN)</u>	✓	✓

Notes:

Underlined parameters indicate parameters required, in accordance with Landfill Permit

× indicates parameter was not analysed

✓ indicates parameter was analysed

Temperature was required in accordance with the Landfill Permit; however, Golder assumes that temperature in the Landfill Permit refers to field-measured water temperature at the time of sampling.

2.3 Surface Water Sampling

The surface water monitoring program consisted of water sampling at three locations, as shown in Table 1.

Surface water samples were collected in June and October 2020, alongside the groundwater samples, by RDKS field staff following established sampling procedures as laid out in the *British Columbia Field Sampling Manual for Continuous Monitoring and the Collection of Air, Air-Emission, Water, Wastewater, Soil, Sediment, and Biological Samples* (BC ENV 2013). SW2017-1 and SW2017-2 were not sampled in June 2020 because the locations were dry during the June sampling event.

Prior to any sampling activities, field instruments were calibrated to manufacturer specifications in the field. During sampling, a YSI Professional Plus multi-meter was used to collect measurements of in-situ water quality parameters (temperature, conductivity, redox potential, dissolved oxygen, and pH). The field parameter data along with analytical results are presented in APPENDIX D.

Surface water samples were collected in clean, laboratory-supplied sample bottles. Water samples were collected by submerging bottles in water and directly filling them. Where submersion of bottles was not appropriate due to the need to filter samples, a sealed and disposable syringe was utilized. Water samples for dissolved metals were field-filtered using a 0.45 µm syringe plate filter. As necessary, samples were preserved in the field using chemicals supplied by the laboratory. Standard sampling protocols, as laid out by the *British Columbia Field Sampling Manual* (BC ENV 2013) were followed during surface water sampling to minimize the possibility of cross-contaminating the samples.

The surface samples were submitted to ALS Environmental Ltd for analysis of the following chemical parameters, as outlined in Table 4, in accordance with requirements of the Permit. There were no deviations from the Operational Certificate EEM requirements noted during the 2020 surface water monitoring program.

Table 4: Analytical Parameters for Surface Water Samples in 2020

Parameter	Season	
	Summer (May)	Fall (October)
<u>Dissolved metals including mercury</u>	✓	✓
<u>Dissolved Hardness</u>	✓	✓
<u>Total metals including mercury</u>	✓	✓
<u>Total Hardness</u>	✓	✓
<u>Alkalinity</u>	✓	✓
<u>Chloride (Cl)</u>	✓	✓
<u>Fluoride (F)</u>	✓	✓
<u>Sulphate (SO₄)</u>	✓	✓
<u>pH</u>	✓	✓
<u>Conductivity</u>	✓	✓
<u>Total Suspended Solids (TSS)</u>	✓	✓
<u>Biological Oxygen Demand (BOD)</u>	✓	✓
<u>Chemical Oxygen Demand (COD)</u>	✓	✓
<u>Ammonia (NH₃), Nitrate (NO₃), Nitrite (NO₂), Total Kjeldahl Nitrogen (TKN)</u>	✓	✓

Notes:

Underlined parameters indicate parameters required, in accordance with Landfill Permit

× indicates parameter was not analysed

✓ indicates parameter was analysed

Temperature was required in accordance with the Landfill Permit; however, Golder assumes that temperature in the Landfill Permit refers to field measured temperature at the time of sampling.

2.4 Quality Assurance and Control

To assess and document that the sampling and analytical data are interpretable, meaningful, and reproducible, conformance to the quality assurance / quality control (QA/QC) program laid out in the Landfill Permit was followed. Standard industry field procedures were used in both the collection (field program) and analysis (laboratory) of water samples. The following includes a brief summary of the QA/QC measures implemented by the RDKS field staff during the field program and by Golder during review of the data, as well as the QA/QC measures implemented by the laboratory.

Quality Control (QC) measures used in the collection, preservation and shipment of samples included the following:

- Sampling methods were consistent with established field protocols and provincial/federal requirements (BC ENV 2013).

- Field notes were recorded during all stages of the investigation and are available upon request.
- Sample locations were recorded and marked in the field.
- Samples were stored in coolers and chilled with ice packs during transport to the analytical laboratory.
- Samples were transported to the laboratory using laboratory Chain-of-Custody procedures.
- Nitrile gloves were worn when handling sampling equipment and samples and were changed between samples.
- Dedicated Waterra™ tubing and footvalves were used to purge and sample monitoring wells.
- Dedicated syringes and plate filters were used during surface water sample collection.
- Dedicated filters were used for dissolved metals (including mercury) sample bottles.

The Quality Assurance (QA) measures established for the field program in accordance with the Landfill Permit included:

- Submission of one field blank sample per sampling event. A field blank is a sample of laboratory grade distilled and deionized water that is used to assess potential sources of contamination that may have been introduced to the sample media during sampling (i.e., dusty conditions, sampling error). The field blank consists of the same bottle set and analysis as a regular sample. The blank is filled in the field near the sampling location using laboratory grade deionized and distilled water. The blank is submitted for the same analytical parameters as all other samples.
- Submission of field duplicate samples for approximately 10% of the total sampling locations per sampling event. A field duplicate sample is a second sample of a certain media (e.g., soil, water) from the same location that is submitted to the analytical lab under a separate label such that the laboratory has no prior knowledge of the corresponding sample.
- The relative percent difference (RPD) between field duplicate sample results was used to assess duplicate sample data. The RPD is a measure of the variability between two outcomes from the same procedure or process and is calculated by:

$$RPD (\%) = \left| \left(\frac{x1 - x2}{\text{average } (x1, x2)} \right) \right| \times 100$$

where x1 is the original sample result and x2 is the blind field duplicate result; and

- When the concentration in a sample was less than five times the laboratory reporting limit (LRL), the difference factor (DF) was used to assess duplicate sample data. The DF is also a measure of the variability between two outcomes from the same procedure or process and is calculated by:

$$DF (-) = \left| \left(\frac{x1 - x2}{LRL} \right) \right|$$

where x1 is the original sample result, x2 is the blind field duplicate result and LRL is the laboratory reporting limit.

In 2020, the BC Ministry of Environment and Climate Change Strategy (ENV) updated the British Columbia Laboratory Manual which contains recommended Data Quality Objectives (DQOs) for laboratories duplicate RPDs (BC ENV, 2020). It is recognized that these DQOs are intended for laboratory duplicates and do not include provisions for additional variability in field duplicates; however, these DQOs are considered a conservative screen for assessing the quality of field duplicates. The DQOs applied to this investigation are as follows:

- Water: A RPD of less than 20% was applied for inorganics and 30% for organics.
- For parameters with concentrations less than five times the LRL, the difference factor should be less than two.

In general, an RPD greater than these targets may reflect natural sample variability (which reflects the nature of the contaminant distribution, or variation in the test procedures). In cases where the DQO is greater than the objective, further examination is conducted on a case-by-case basis.

The following criteria were considered acceptable for laboratory QA/QC samples:

- Analytical blanks should have results that are below the detection limits used for the specific analysis.
- Laboratory duplicates should fall within the DQOs set by the laboratory.
- Analytical results for the reference materials or spiked standards should be within the targets specified by the laboratory.

ALS performed the chemical analysis of the groundwater samples for this investigation. ALS has achieved proficiency certification by the Canadian Association for Laboratory Accreditation Inc. (CALA) for the analyses performed. The analytical laboratory also incorporated and reported the results of internal laboratory checks to the RDKS. These were used to assess the reliability, accuracy and reproducibility of the laboratory data. If laboratory QA/QC problems are encountered by the lab, the field samples and internal QA/QC samples are re-analyzed. Copies of the original laboratory certificates of analysis are provided in APPENDIX E.

The results of the QA/QC program are presented in Section 3.4.

Deviations from Landfill Permit Requirements

The 2020 QA/QC program at the Site generally followed the requirements described in the Landfill Permit; however, the following deviations occurred with respect to duplicate and blank samples:

- Field blanks were submitted for analysis of a reduced number of parameters in the June and October sampling events. The blank sample did not include the following parameters:
 - Chloride, Fluoride, Sulphate
 - Nitrate, Nitrite, TKN
 - TDS, TSS
 - COD, BOD
 - Total Metals (June only)

2.5 Regulatory Framework

In British Columbia, environmental matters pertaining to contaminated sites generally fall under the jurisdiction of the Ministry of Environment & Climate Change Strategy (ENV), pursuant to the Environmental Management Act (EMA, SBC 2003, Chapter 53 assented on 23 October 2003, updated on 1 February 2021). The key regulation under the EMA that relates to the assessment and remediation of contaminated sites is the Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 131/2020 and BC Reg. 161/2020, updated on 1 February 2021]).

Drinking Water (Current and Future)

Based on ENV Protocol 21 (BC ENV 2017a), the distance to the nearest water wells, and the available hydrogeological information from previous investigations at the Site (see Section 1.4), there is no current drinking water use at or near the Site, and none of the underlying saturated geological materials beneath the Landfill are considered an “aquifer” as defined in Protocol 21. Therefore, drinking water use is not considered applicable and the Contaminated Sites Regulation (CSR) drinking water (DW) standards are not considered applicable to the Site.

Aquatic Life

The CSR groundwater standards for the protection of aquatic life in freshwater (AW-F) water bodies are considered applicable to the Site based on its proximity to several nearby creeks.

Irrigation and Livestock Watering

The Site and neighbouring properties are not used for agricultural purposes and are not located within the agricultural land reserve (ALR). Irrigation and livestock watering water uses are not considered applicable at the Site.

Other Provincial Groundwater Standards Consideration

Based on Technical Guidance 15 on Contaminated Sites (BC ENV 2017b), the quality of groundwater from the monitoring wells are not required to adhere to the BC Water Quality Guidelines (BC WQG). This is because all the wells are more than 10 m from aquatic receiving environments.

All surface water sample results were compared to BC WQG for the protection of aquatic life in freshwater (AW-F). For reference purposes, they were also compared to CSR AW-F standards. In 2019, 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 method provided by ENV prior to the change.

3.0 GROUNDWATER AND SURFACE WATER RESULTS

Analytical Results are presented in APPENDIX D, Tables D-1 through D-17. Laboratory certificates of analysis for 2020 sampling events are presented in APPENDIX E. Historic analytical results for sampling locations no longer being sampled, as indicated in Section 2.1, Table 1, are presented in APPENDIX F, Tables F-1 through F-10.

3.1 Groundwater Flow

Groundwater level elevations were measured from the top of casing of all monitoring wells. The 2020 groundwater levels fall within or close to the historical ranges, as shown in Table 5. This indicates that the horizontal hydraulic gradient and groundwater flow direction across the Site is consistent with that observed in 1999 (AE 1999), and that groundwater is inferred to be flowing in the south to southeast direction across the Site.

Table 5: Groundwater Elevations

Monitoring Well	Casing Elevation (approximate) metres relative to local datum ¹	Depth to Bottom (approximate) metres relative to local datum ¹	Ground Elevation (approximate) metres relative to local datum ¹	Depth to Water (metres below top of casing) ¹		Water level Elevation (Local Datum) ¹		Historic Water Level Elevation 1997 - 1999 (Local Datum) ²		
				Jun-20	Oct-20	Jun-20	Oct-20	Maximum	Minimum	Average
MW-1A* (Deep)	82.00	72.33	81.13	7.36	8.2	74.64	73.80	75.23	73.37	74.21
MW-1B (Shallow)	82.00	75.19	81.13	2.78	2.82	79.22	79.18	79.82	78.74	79.31
MW-2	83.63	76.44	82.73	2	1.73	81.63	81.90	82.13	80.59	81.74
MW-3	90.83	80.94	89.94	5.68	7.31	85.15	83.52	85.15	83.52	84.41
MW-4	93.14	83.12	92.19	3.44	6.5	89.70	86.64	89.70	86.64	87.70

Notes:

(1) Elevations are provided based on local datum of 100m at a local control point as defined by AE (1999). AE (1999) defined the control point as UTM Easting 5000, Northing 5000. This point is assumed to be approximately 50 meters north of MW-4. No exact location information is available.

(2) Based on data provided in AE (1999)

Seasonal variations of higher fall and lower spring water level measurements were observed at the monitoring wells, with the exception of MW-2 in 2020, where the groundwater level was higher in the fall. Water elevations at MW-1A and -1B indicate a consistently downward hydraulic gradient.

Results for water elevations in 2020 are generally consistent with water elevations obtained in previous sampling events. The spring groundwater elevation of 89.70 m at MW-4 is a new historic maximum. This result may be due to the later than usual spring sampling date, which occurred in June 2020 as opposed to May in previous years.

3.2 Groundwater Quality

Based on the inferred groundwater flow direction, MW-3 and MW-4 represent upgradient groundwater conditions and MW-1A, MW-1B and MW-2 are considered to be downgradient of the Landfill.

Analytical results for all monitoring wells were compared to the CSR standards for Freshwater Aquatic Life. Groundwater concentrations of all parameters were less than the CSR AW-F standards (APPENDIX D, Tables D-1 through D-6).

3.3 Surface Water Quality

Based on Site topography and surface water flow regime described in Section 1.4, surface water sampling location SW2017-2 is considered to be upgradient of the Landfill. SW-3 is located at the outlet of the Leachate Treatment Lagoon located downgradient of the Landfill (Figure 2). The surface water sample at this location represents leachate from the Landfill and treatment lagoon after it was allowed to dilute with incident precipitation and storm water before discharge to ground. SW2017-1 is considered to be downgradient of the Landfill and the Leachate Treatment Lagoon on an unnamed creek to the south of the Site.

The analytical results for the surface water samples are tabulated and compared against the CSR and BC WQG. None of the samples showed parameters concentrations greater than the applicable CSR standards (APPENDIX D, Tables D-8, D-10, and D-12).

A summary of parameters that were greater than the BC WQG are shown in Table 7 and is summarised in APPENDIX D, Tables D-7, D-9, and D-11).

Table 6: Surface Water Exceedances of BC WQG

Parameter/Guideline			DO	Total			Dissolved	
				Alkalinity	Fe	Mn	Al	Fe
BCWQG AW - F (Long-term average)			<u>5 - 8</u>	<u>Min: 20</u>	-	<u>0.631 – 1.87</u>	<u>0.0096 - 0.05</u>	-
BCWQG AW - F (Short-term maximum)				-	1	0.605 – 3.71	0.029- 0.1	0.35
SW-3	Downgradient	June-20	<u>1.7</u>	198	2	<u>7.9</u>	0.043	0.53
SW2017-1	Downgradient		NA	NA	NA	NA	NA	NA
SW2017-2	Upgradient		NA	NA	NA	NA	NA	NA
SW-3	Downgradient	Oct-20	<u>2.7</u>	195	0.36	<u>3.7</u>	0.0071	0.25
SW2017-1	Downgradient		<u>2.4</u>	<u>15</u>	0.29	0.21	<u>0.21</u>	0.12
SW2017-2	Upgradient		<u>4.8</u>	<u>5.9</u>	0.13	0.65	<u>0.33</u>	0.096

Notes:

All concentrations are given in mg/L

BC WQG = BC Water Quality Guidelines

AW – F = Aquatic Life – Freshwater

- = no guideline available

NA = No data available; location not sampled (sample site dry)

Al = Aluminum, Fe = Iron, Mn = Manganese,

Underlined indicates parameter exceeds BC WQG Long Term

Bold and **grey** highlight indicates parameter exceeds BC WQG Maximum

3.4 Results of Quality Assurance/Quality Control Analysis

Field duplicates, which consist of two samples collected from the same sampling location, were collected for groundwater samples in June and October 2020 to assess variability introduced through sampling and handling procedures. The groundwater duplicate samples were collected at monitoring well MW-2 in June and October 2020. Data for the duplicate analyses are presented in APPENDIX D, Table D-12.

The relative percent difference (RPD) and the difference factor (DF) were calculated in APPENDIX D, Table D-12 for groundwater duplicate samples. As stated in Section 2.4, the DQOs applied are:

- RPD less than 20% for inorganics and less than 30% for organics
- parameters with concentrations less than five times the laboratory reporting limit (LRL), a DF less than two

The groundwater duplicate sample at MW-2 in June 2020 indicated the following calculated RPDs above the acceptable limit of 20%:

- Nitrate – 22% RPD (primary sample concentration 0.0894 mg/L, duplicate sample concentration 0.111 mg/L)
- Nitrite – 109% RPD (primary sample concentration 0.0081 mg/L, duplicate sample concentration 0.0024 mg/L)
- Dissolved Tin (Sn) – 70% RPD (primary sample concentration 0.00015 mg/L, duplicate sample concentration 0.00031 mg/L)

The groundwater duplicate sample at MW-3 in October 2020 indicated the following calculated RPDs above the acceptable limit of 20%:

- Total Ammonia – 37% RPD (primary sample concentration 0.0114 mg/L, duplicate sample concentration 0.0166 mg/L)
- Total Kjeldahl Nitrogen – 23% RPD (primary sample concentration 0.185 mg/L, duplicate sample concentration 0.233 mg/L)
- Dissolved Copper – 165% RPD (primary sample concentration 0.00029 mg/L, duplicate sample concentration 0.00298 mg/L)
- Dissolved Iron – 23% RPD (primary sample concentration 0.019 mg/L, duplicate sample concentration 0.024 mg/L)
- Dissolved lead – 74% RPD (primary sample concentration <0.000050 mg/L, duplicate sample concentration 0.000109 mg/L)

The poor RPD results for nitrogen analytes (total ammonia and total kjeldahl nitrogen) in the October 2020 duplicate pair is likely related to holding time exceedances for these parameters. The laboratory certificates of analysis indicates that the holding time was 4 days before they were analysed. The recommended maximum hold time for nitrate and nitrite is 3 days. These hold time exceedances were likely a result of limitations with respect to sample transport time. None of the holding times for the other chemical parameters were exceeded¹. Furthermore, none of the above parameters, including the nitrogen analytes, exceeded the applicable guidelines in any of the groundwater and surface water samples collected in 2020. Therefore, the results are considered satisfactory for the purpose of this report.

¹ pH hold time was 4 days in June and October 2020 and the recommended hold time is to measure pH immediately.

In addition to the field duplicate samples, two field blank samples and two travel blank samples were submitted. One field blank and one travel blank were submitted during each sampling event in June 2020 and in October 2020. None of the parameters exceeded the LRL in these samples, with the exception of TSS in one of the field blanks.

In addition to the field QA/QC samples, internal quality control data provided by ALS was reviewed as a quality assurance of the analytical testing procedures. The laboratory quality control tests consisted of method blanks, replicate samples, and analytical spikes for water analysis, and are provided in the Certificate of Analyses included in APPENDIX E.

All laboratory RPDs were within the acceptable range indicating good reproducibility. The percent recovery for the matrix spike and spiked blank were all within the laboratory's internal QC limits. Similarly, no detections were noted for method blanks, laboratory control samples or standard samples.

The results of the laboratory quality control checks met the laboratory's internal criteria for acceptable results. From the QA/QC information provided, the precision and accuracy of the laboratory data is acceptable.

4.0 DISCUSSION

The data was examined graphically to evaluate spatial and temporal water quality variations and are shown on Figures 3 and 4. The data set considered covers 1997 through 2020.

4.1 Leachate Indicator Parameters

Typical parameters generally indicative of landfill leachate are listed below (Tchobanoglous, Theisen, and Vigil, 1993):

- Biochemical oxygen demand (BOD)
- Total organic carbon (TOC)
- Chemical oxygen demand (COD)
- Total suspended solids (TSS)
- Ammonia nitrogen
- Nitrate
- Phosphorus (total)
- Alkalinity as CaCO_3
- pH
- Total hardness as CaCO_3
- Calcium
- Magnesium
- Potassium
- Sodium
- Chloride
- Sulphate
- Total iron

A subset of these parameters was chosen to evaluate the environmental impact of the Landfill, based on previous work by SHA (2017) and current analysis of the available data. These parameters are listed below:

- Electrical Conductivity (Figure 3-A)
- Chloride (Figure 3-B)
- Sulphate (Figure 3-C)
- Dissolved Iron (Figure 3-D)
- Total Iron (Figure 3-E)
- Dissolved Manganese (Figure 3-F)
- Total Manganese (Figure 3-G)

4.2 Spatial and Temporal Geochemical Distribution

Concentrations for the above-mentioned parameters were plotted for all monitoring wells and surface water sampling locations in June and October 2020 in relation to their distance from the Landfill and leachate treatment lagoon.

Based on the figures, it appears that leachate generated from the Landfill is attenuated quickly once it leaves the leachate treatment lagoon. Surface water leaving the lagoon at SW-3 is characterized by elevated electrical conductivity and concentrations of chloride, sulfate and dissolved manganese in comparison to the upstream sampling location. However, further downstream at SW2017-1, these constituents decline to concentrations that are generally consistent with concentrations at upstream sampling location SW2017-2.

For groundwater, downgradient concentrations of chloride and sulfate at depth (at MW-2 and MW-1A) are generally similar to background groundwater concentrations (at MW-3 and MW-4), while sulphate concentrations in shallow downgradient groundwater at MW-1B are considerably lower than upgradient concentrations.

Concentrations of dissolved iron and manganese at shallow downgradient well MW-1B were greater in June and October 2020 than the upgradient wells, while dissolved iron and manganese in deep downgradient wells MW1A and MW-2 were similar to upgradient concentrations. Electrical conductivity was slightly higher at deep downgradient well MW-1A than upgradient wells, while electrical conductivity was similar or lower at downgradient wells MW-1B and MW-2 than upgradient wells.

The dissolved iron and manganese concentrations at shallow downgradient well MW-1B are similar to or higher than the concentrations in the leachate outlet sample SW-3, higher than upgradient groundwater and surface water, and higher than deeper groundwater at the same location (MW-1A). However, it should be noted that the concentrations do not exceed the applicable regulatory standards (i.e., there are no CSR AW-F standards for manganese).

Time series plots for the following parameters were generated to compare groundwater conditions at all monitoring wells to leachate surface water quality at SW-3:

- Electrical Conductivity (Figure 4-A)
- Chloride (Figure 4-B)
- Dissolved Iron (Figure 4-C)
- Total Iron (Figure 4-D)
- Dissolved Manganese (Figure 4-E)
- Total Manganese (Figure 4-F)

In general, the plots indicate that electrical conductivity remains relatively constant over the monitoring years when concentrations are compared to baseline conditions (1997 results on the plots indicate pre-landfilling conditions). It should be noted that only one set of baseline results, measured in 1997, are available and these may not reflect the full extent of natural variability in baseline conditions. Dissolved iron concentrations (Figure 4-C) in the downgradient shallow groundwater at MW-1B, and to a lesser extent at the deeper groundwater at MW-1A, show a change to higher levels relative to baseline (pre-landfilling) conditions since approximately 2018.

Dissolved manganese concentrations in the shallow downgradient groundwater at MW-1B have mostly remained elevated relative to baseline since landfilling began and have been higher relative to the water quality from the outlet of the treatment lagoon (SW-3) over the initial monitoring years following the start of landfilling and also in recent years. Chloride has remained constant at or below baseline conditions in all monitoring wells. A rise in chloride is apparent between 2002 and 2010 for the leachate lagoon outlet sample SW-3. Since 2013, chloride concentrations have remained relatively constant at that location, fluctuating between 20 and 54 mg/L.

The higher levels of dissolved manganese concentrations (relative to SW-3) since landfilling began, and the increase in dissolved iron since 2018 at MW-1B may be partially attributed to some other unknown condition not directly related to Landfill leachate effects. Water levels in all wells, with the exception of MW-1A and 1B, are typically lower in October than they are in June. The relatively higher water levels in October at the MW-1A/B well pair suggests there could potentially be another water source affecting ground water levels and groundwater quality in the vicinity of this well pair. This is supported by the absence of an increasing trend in landfill leachate indicator parameters, electrical conductivity, and chloride, in the downgradient groundwater.

4.3 Evaluation of Groundwater and Surface Water Quality

The highest parameter concentrations are mostly measured in surface water at SW-3, at the outlet of the leachate treatment lagoon, and appear to be substantially attenuated at the downgradient monitoring locations. SW-3 exceeded the BC WQG for dissolved iron and manganese in 2020. Although downgradient surface water at SW2017-1 exceeded the BC WQG for dissolved aluminum in June and October 2020, these results are not considered to be directly related to Landfill leachate effects. This is because the upgradient background concentrations in surface water (at SW2017-2) also exceeded BC WQG for total and dissolved aluminum in June and October 2020.

Groundwater downgradient of the Landfill appears to show little impact from leachate generated by the Landfill. All parameters were below the applicable regulatory standards (i.e., the CSR AW-F standards).

The overall spatial and temporal analysis indicates that Landfill leachate is attenuated and does not appear to affect downgradient groundwater and surface water. Concentrations downgradient of the Landfill are generally similar to or lower than upgradient background concentrations with the exception of elevated dissolved manganese concentrations at one downgradient well location. These concentrations of dissolved manganese do not exceed the applicable regulatory criteria (i.e., the CSR AW-F standards).

5.0 CONCLUSIONS AND RECOMMENDATIONS

Outlet water from the leachate treatment lagoon exceeds the BC WQG for selected constituents. However, it appears that leachate is being attenuated and is not impacting surface water and groundwater further downgradient of the Landfill and the treatment lagoon. The exceedances of applicable guidelines in surface water downgradient of the Landfill appear to be the result of natural processes. Groundwater quality in the till unit which underlies the Landfill shows little to no impact from Landfill leachate and does not exceed applicable regulatory standards, although dissolved iron and manganese concentrations are elevated in shallow groundwater at one downgradient monitoring well location. The elevated dissolved iron and manganese concentrations at this location are considered to be partially caused by other unknown conditions not directly related to Landfill leachate effects.

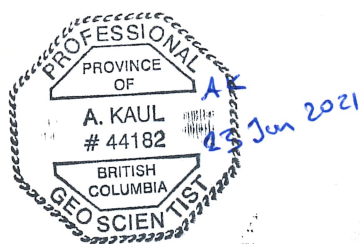
All analytical results obtained in 2020 follow historic trends and confirm previous findings.

It is recommended that the scope of the current monitoring program be continued in 2021.

6.0 CLOSING COMMENTS

We trust that this report provides the information required at this time. If you have any questions, please feel free to contact the undersigned.

Golder Associates Ltd.



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Geochemist

Jillian Sacré, MSc, PGeo
Principal, Senior Hydrogeologist

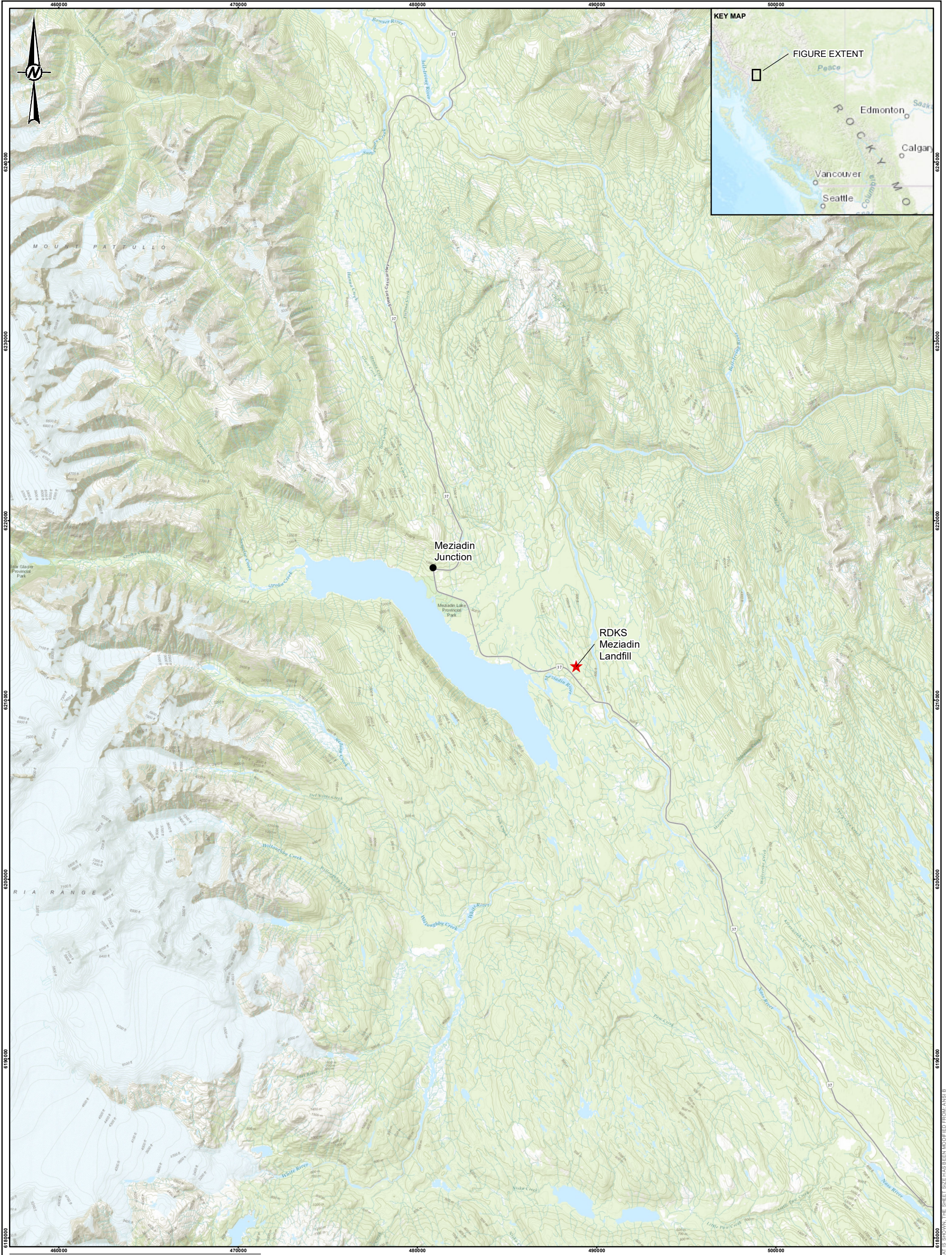
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[https://golderassociates.sharepoint.com/sites/142260/project files/6 deliverables/issued to client_for wp/21455625-002-r-rev0/21455625-002-r-rev0-2020 meziadin 23jun_21.docx](https://golderassociates.sharepoint.com/sites/142260/project%20files/6%20deliverables/issued%20to%20client_for%20wp/21455625-002-r-rev0/21455625-002-r-rev0-2020%20meziadin%2023jun_21.docx)

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- LEGEND**
- ★ SITE LOCATION
 - POINT OF INTEREST

NOT FOR CONSTRUCTION



CLIENT
REGIONAL DISTRICT OF KITIMAT-STIKINE

REFERENCE(S)
1. TOPOGRAPHIC MAP © ESRI AND ITS LICENSORS. USED UNDER LICENSE, ALL RIGHTS RESERVED.
DATUM: NAD 83 PROJECTION: UTM ZONE 9

PROJECT
2020 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD	2021-06-21
DESIGNED	AK
PREPARED	CB
REVIEWED	AK
APPROVED	JS

TITLE
REGIONAL LOCATION MAP

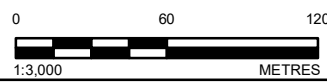
PROJECT NO.	CONTROL	REV.	FIGURE
21455625	3002	0	1



- LEGEND**
- WATERCOURSE
 - TOPOGRAPHIC CONTOUR
 - ➔ GROUNDWATER FLOW DIRECTION
 - GROUNDWATER CONTOURS (MASL)
- SAMPLE LOCATIONS**
- ⊕ MONITORING WELL (GROUND WATER LEVEL MASL)
 - △ SURFACE WATER

CLIENT
REGIONAL DISTRICT OF KITIMAT-STIKINE

NOT FOR CONSTRUCTION



CONSULTANT	YYYY-MM-DD	2021-06-21
	DESIGNED	AK
	PREPARED	CB
	REVIEWED	AK
	APPROVED	JS

REFERENCE(S)

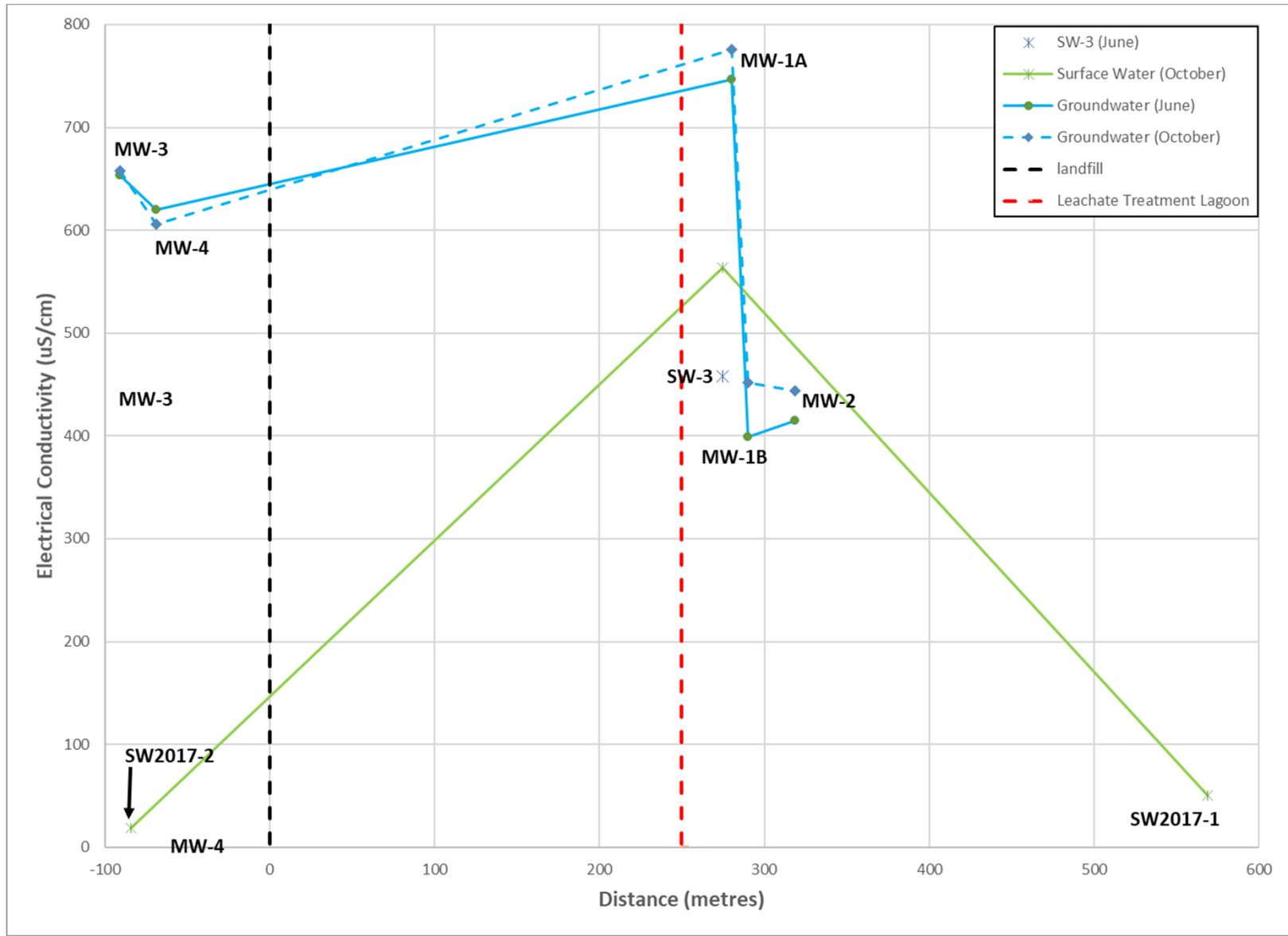
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DATUM: NAD 83 PROJECTION: UTM ZONE 9

PROJECT
2020 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

TITLE	PROJECT NO.	CONTROL	REV.	FIGURE
MONITORING LOCATIONS AND GROUNDWATER FLOW DIRECTION (JUNE 2020)	21455625	3002	0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A4 (210x297mm) TO A3 (297x420mm)



CLIENT
REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT
2020 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD 2021-May-06

PREPARED AK

DESIGN MO

REVIEW AK

APPROVED JS

TITLE

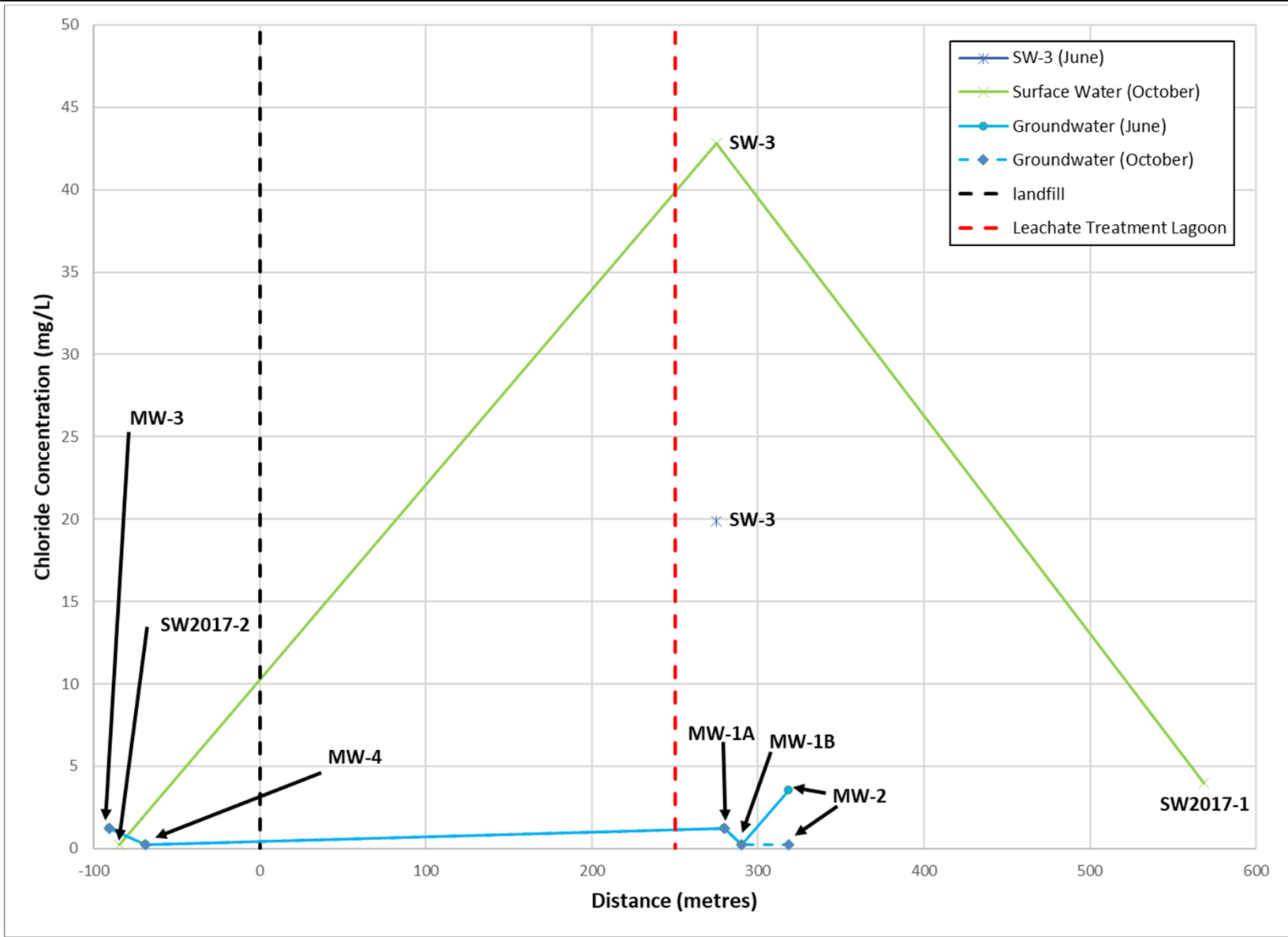
**ELECTRICAL CONDUCTIVITY CONCENTRATIONS
DISTANCE PLOT**

PROJECT No.
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FIGURE
3-A



CLIENT
REGIONAL DISTRICT OF KITIMAT-STIKINE

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2020 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

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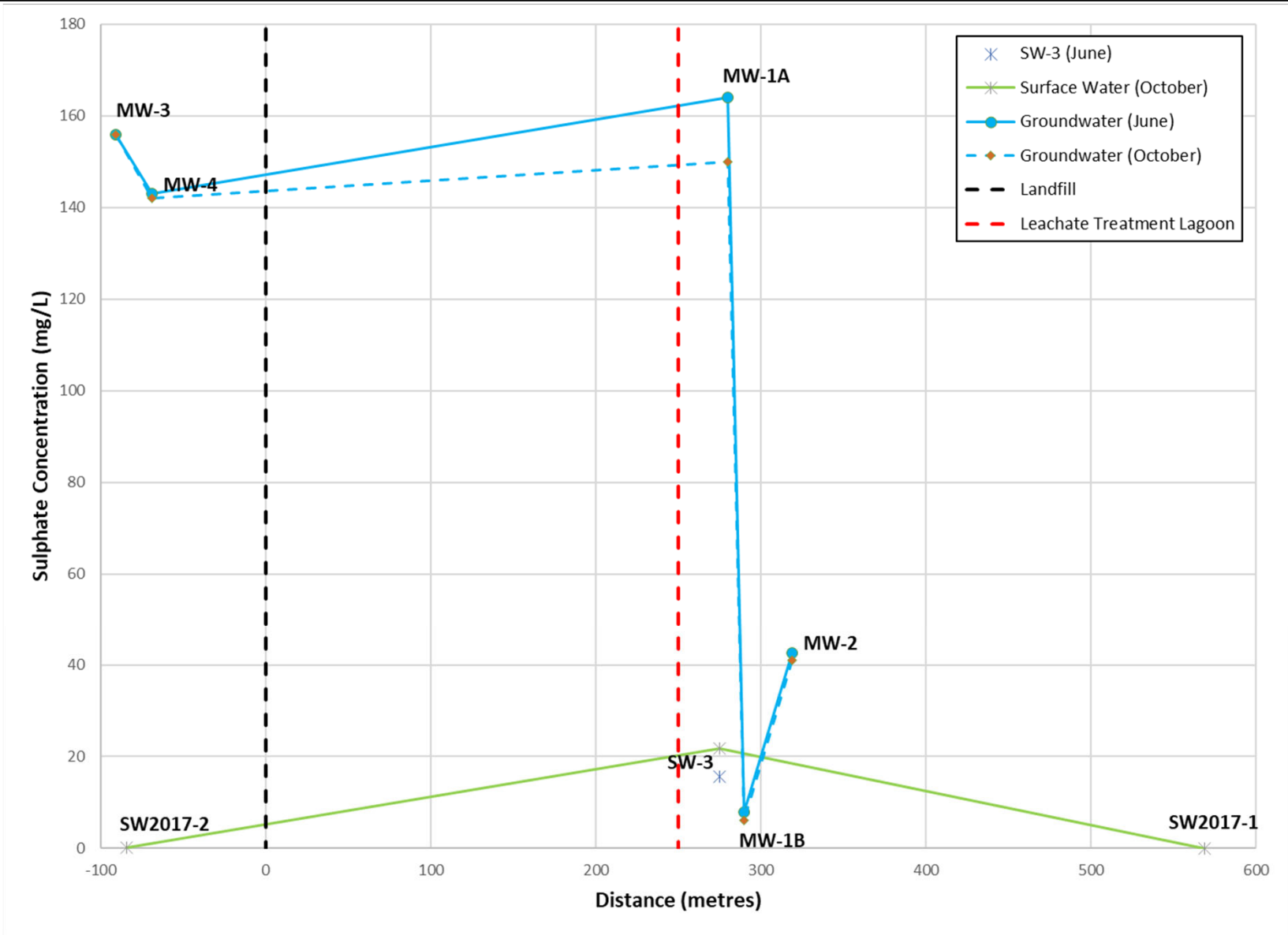
CHLORIDE CONCENTRATIONS DISTANCE PLOT

PROJECT No.
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FIGURE
3-B



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TITLE

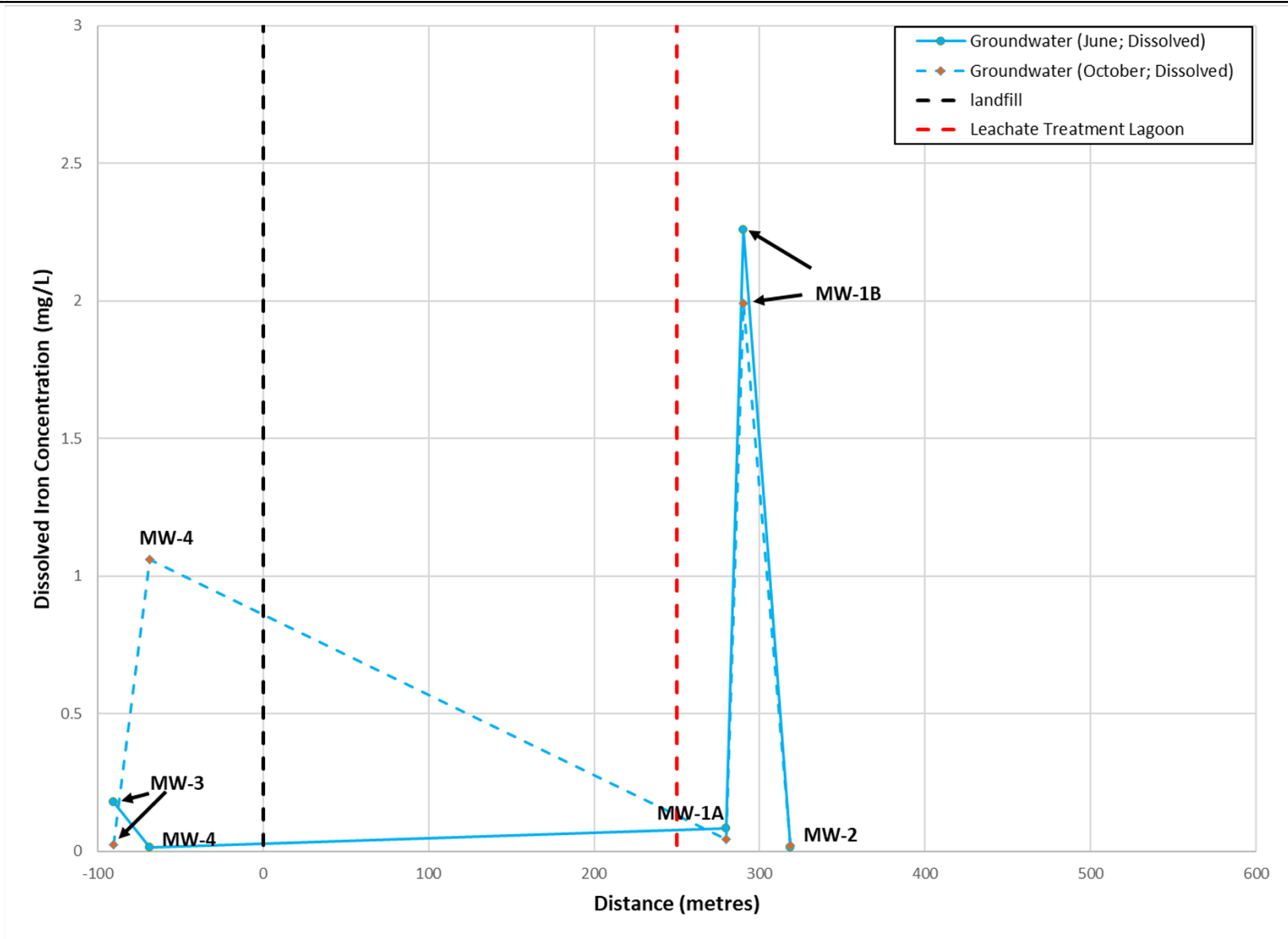
SULPHATE CONCENTRATIONS DISTANCE PLOT

PROJECT No.
21455625

CONTROL
2000

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0

FIGURE
3-C



CLIENT
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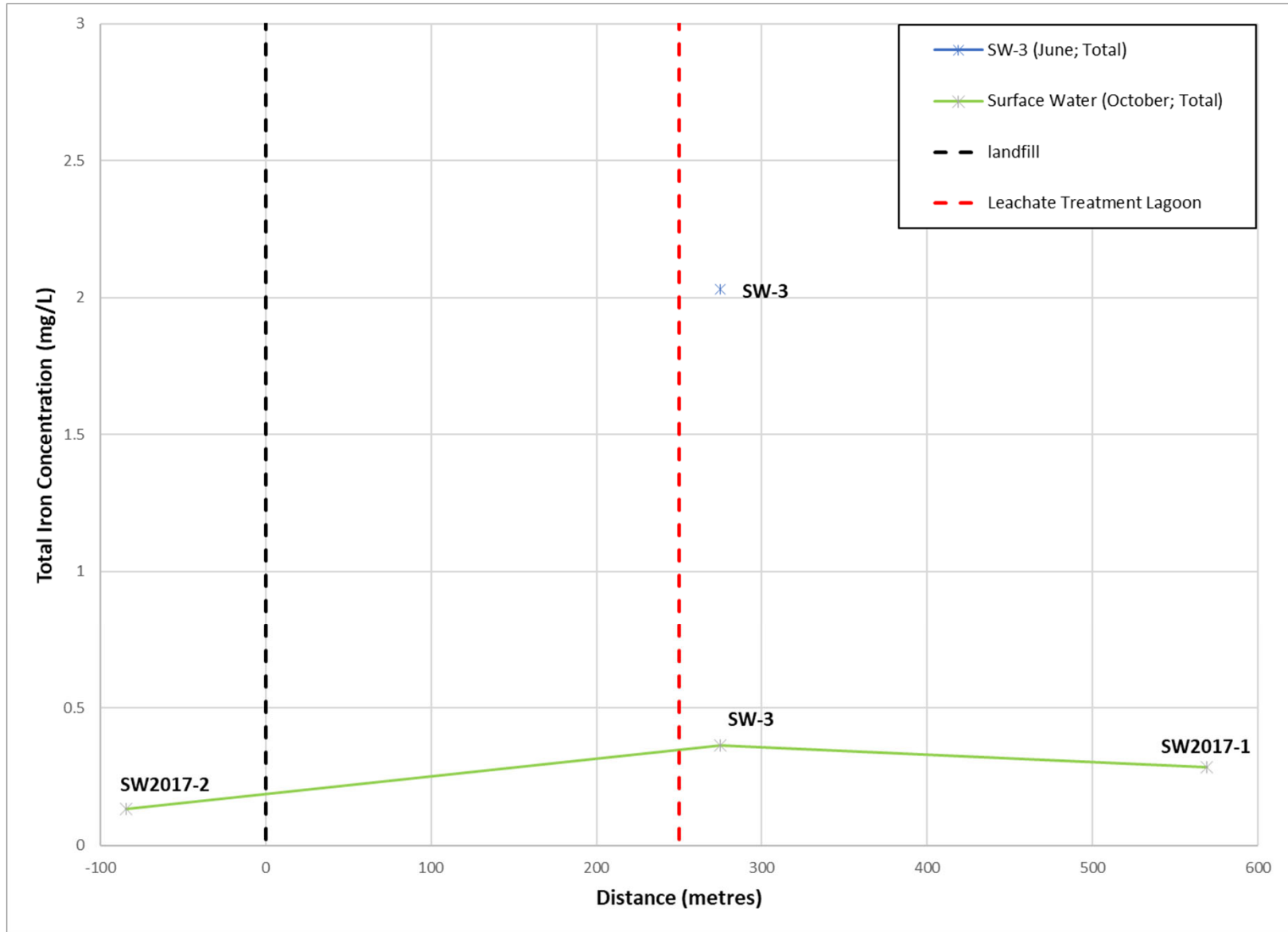
DISSOLVED IRON CONCENTRATIONS DISTANCE PLOT

PROJECT No.
21455625

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FIGURE
3-D



CLIENT
REGIONAL DISTRICT OF KITIMAT-STIKINE

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2020 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

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TOTAL IRON CONCENTRATIONS DISTANCE PLOT



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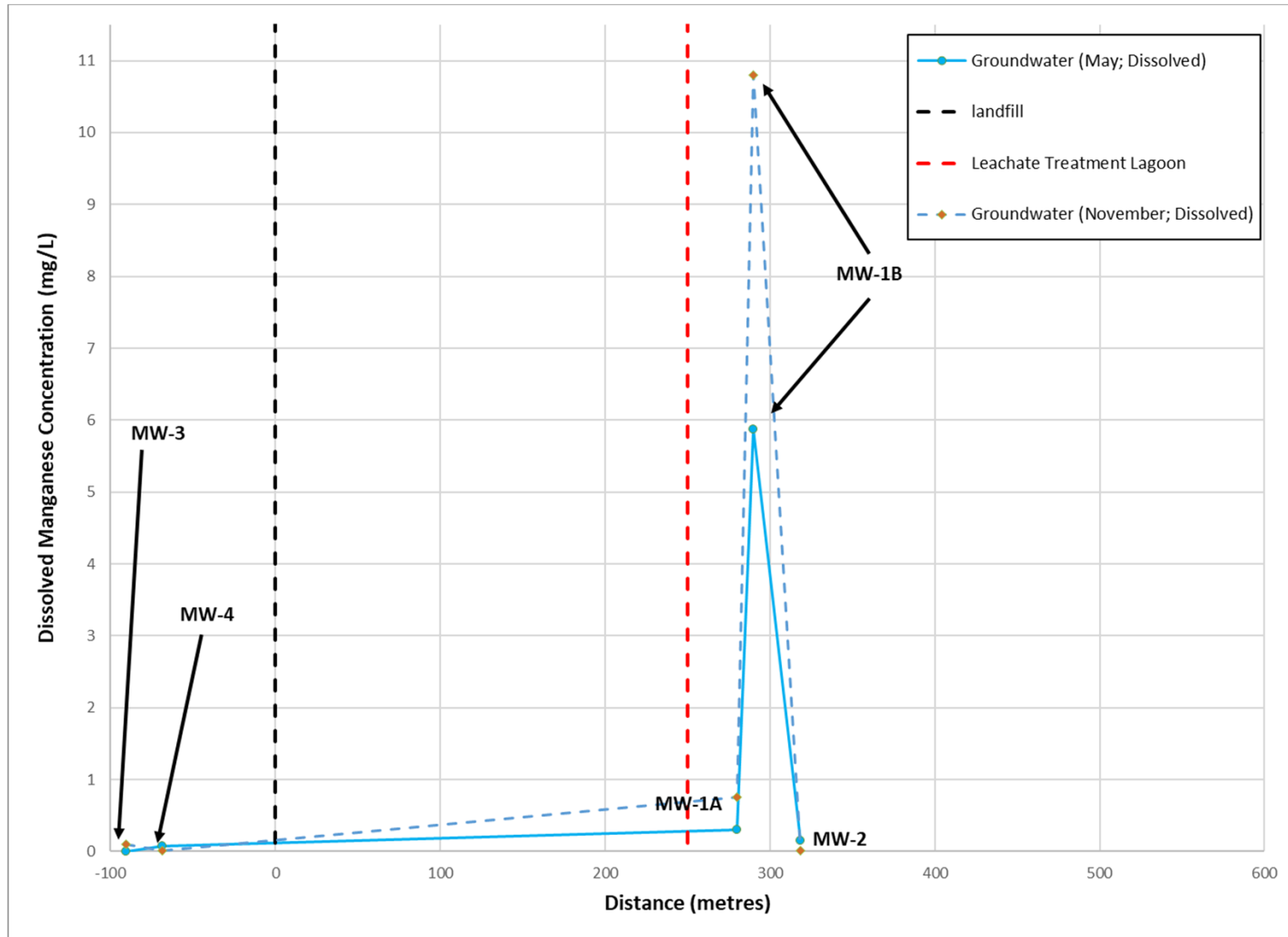
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FIGURE
3-E



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TITLE

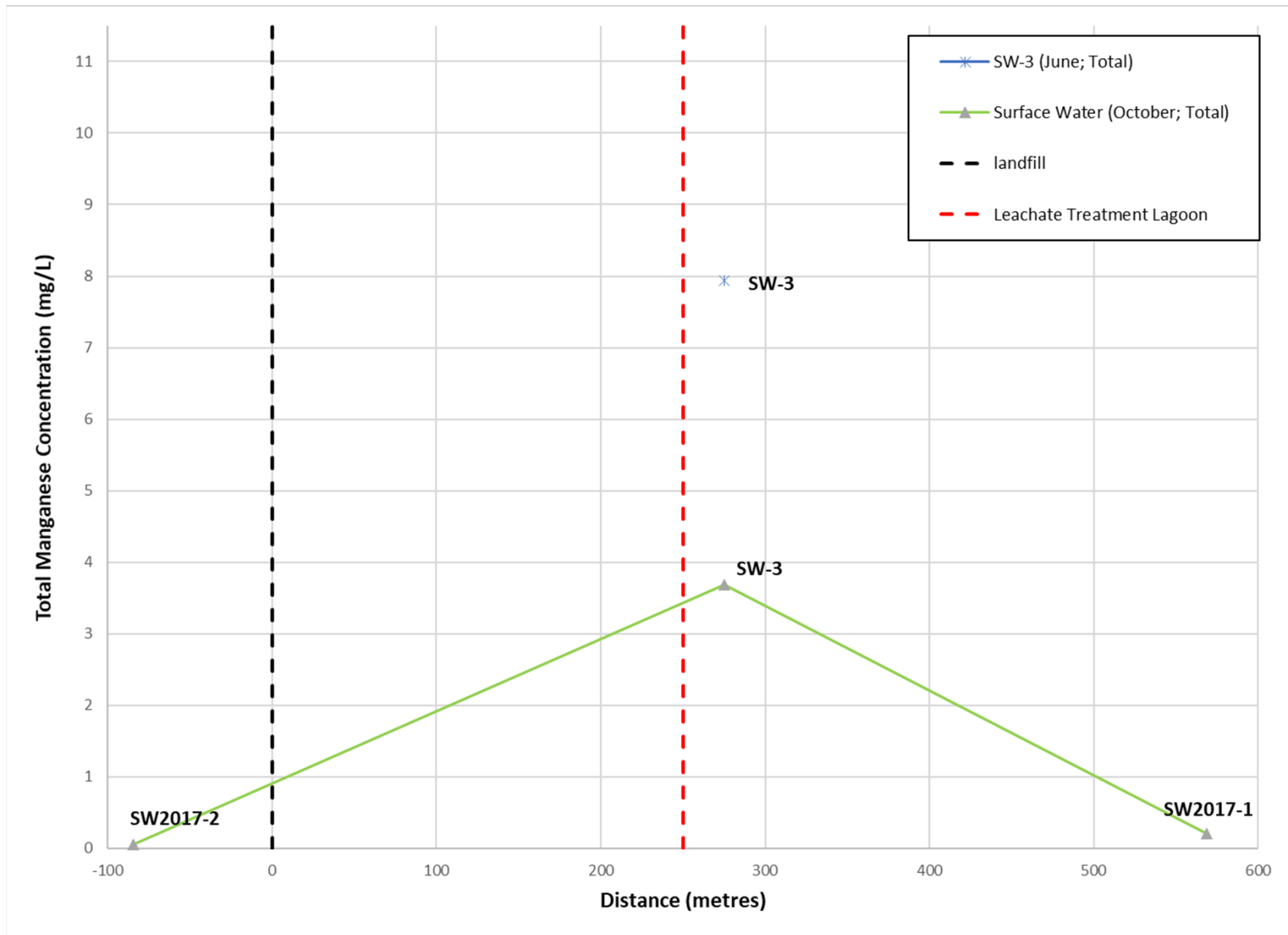
DISSOLVED MANGANESE CONCENTRATIONS DISTANCE PLOT

PROJECT No.
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FIGURE
3-F



CLIENT
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REVIEW AK

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TITLE

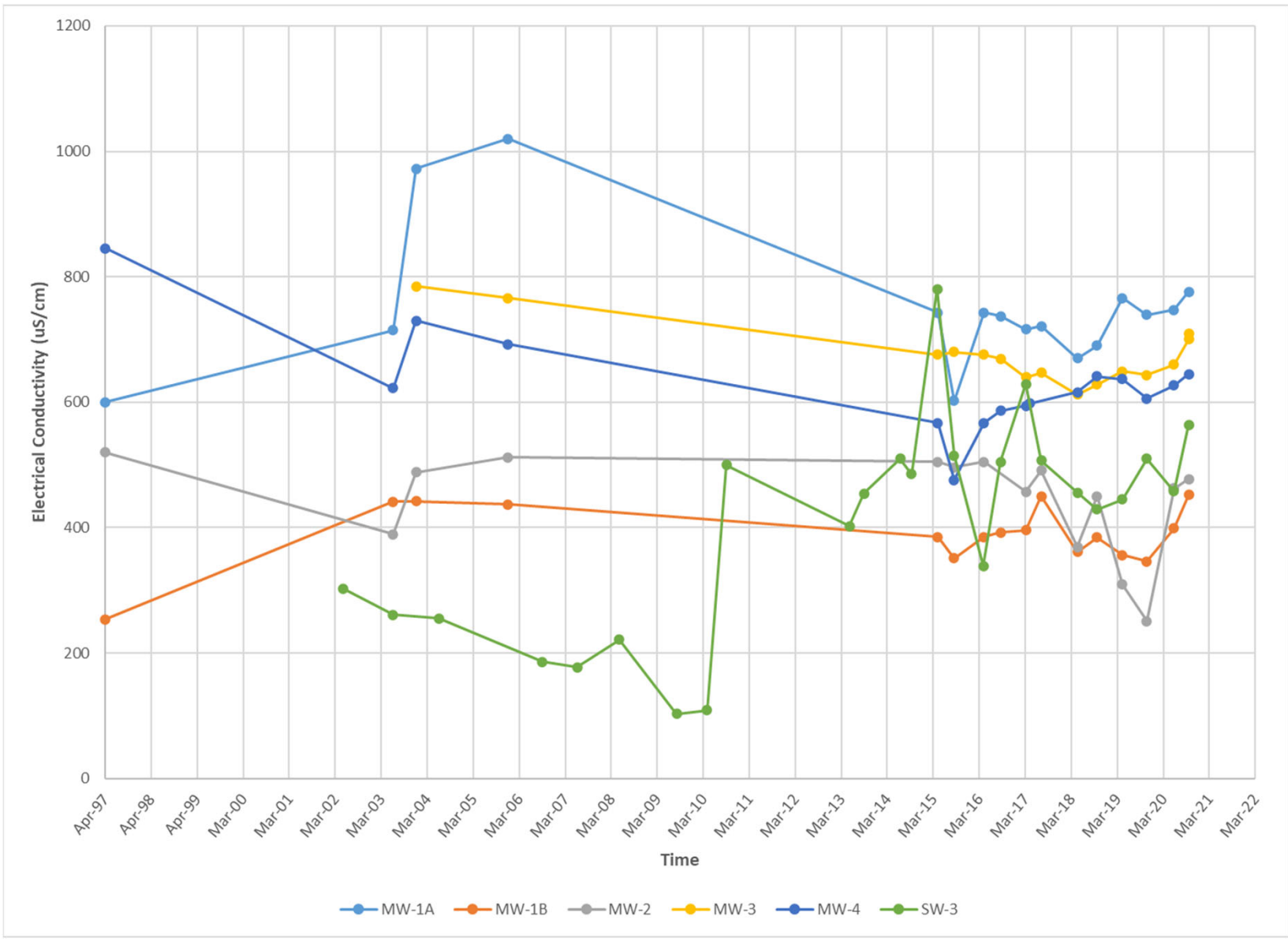
TOTAL MANGANESE CONCENTRATIONS DISTANCE PLOT

PROJECT No.
21455625

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FIGURE
3-G



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2020 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

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REVIEW AK

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TITLE

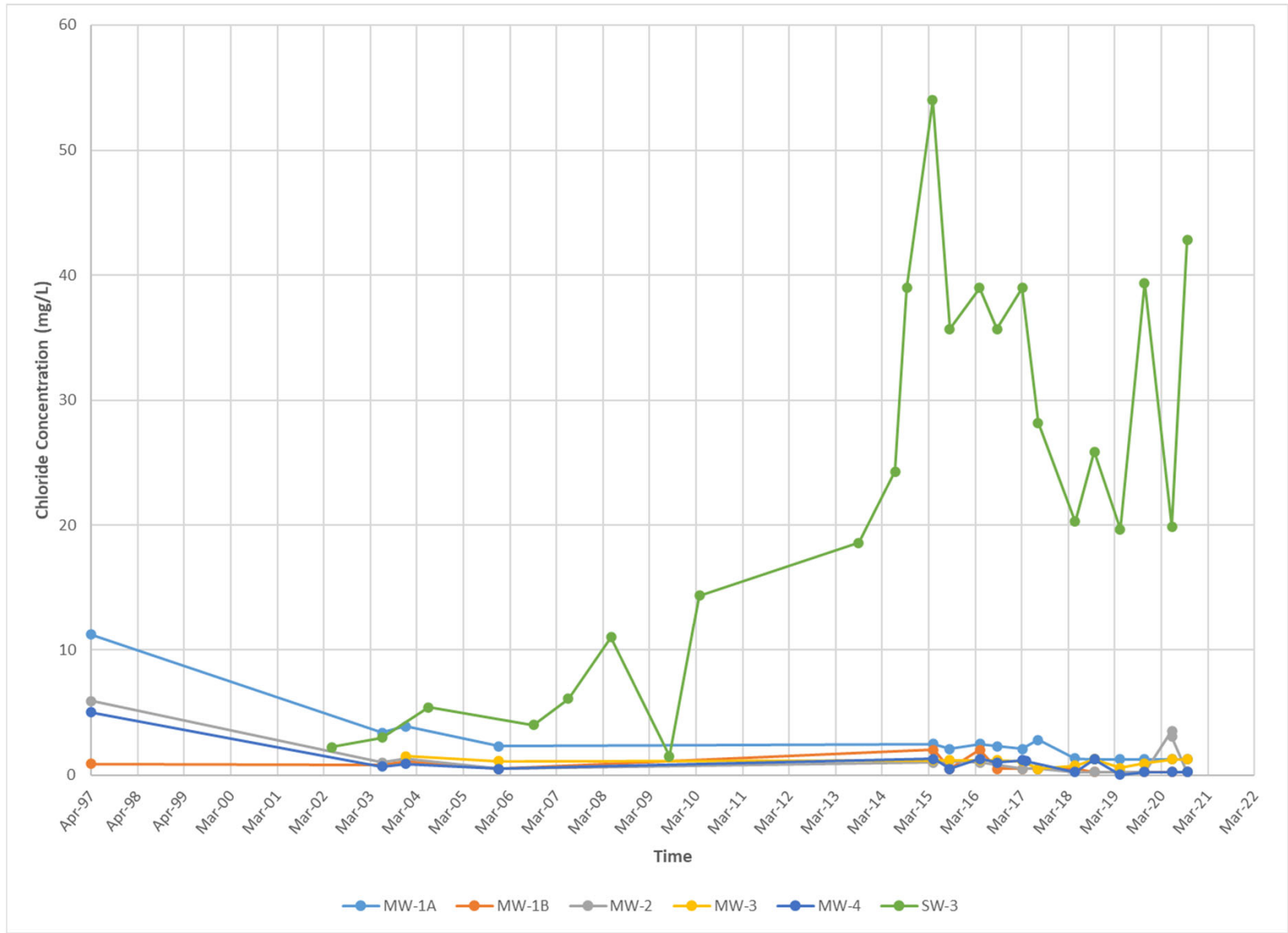
ELECTRICAL CONDUCTIVITY CONCENTRATION TIME SERIES PLOT

PROJECT No.
21455625

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FIGURE
4-A



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REGIONAL DISTRICT OF KITIMAT-STIKINE

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TITLE

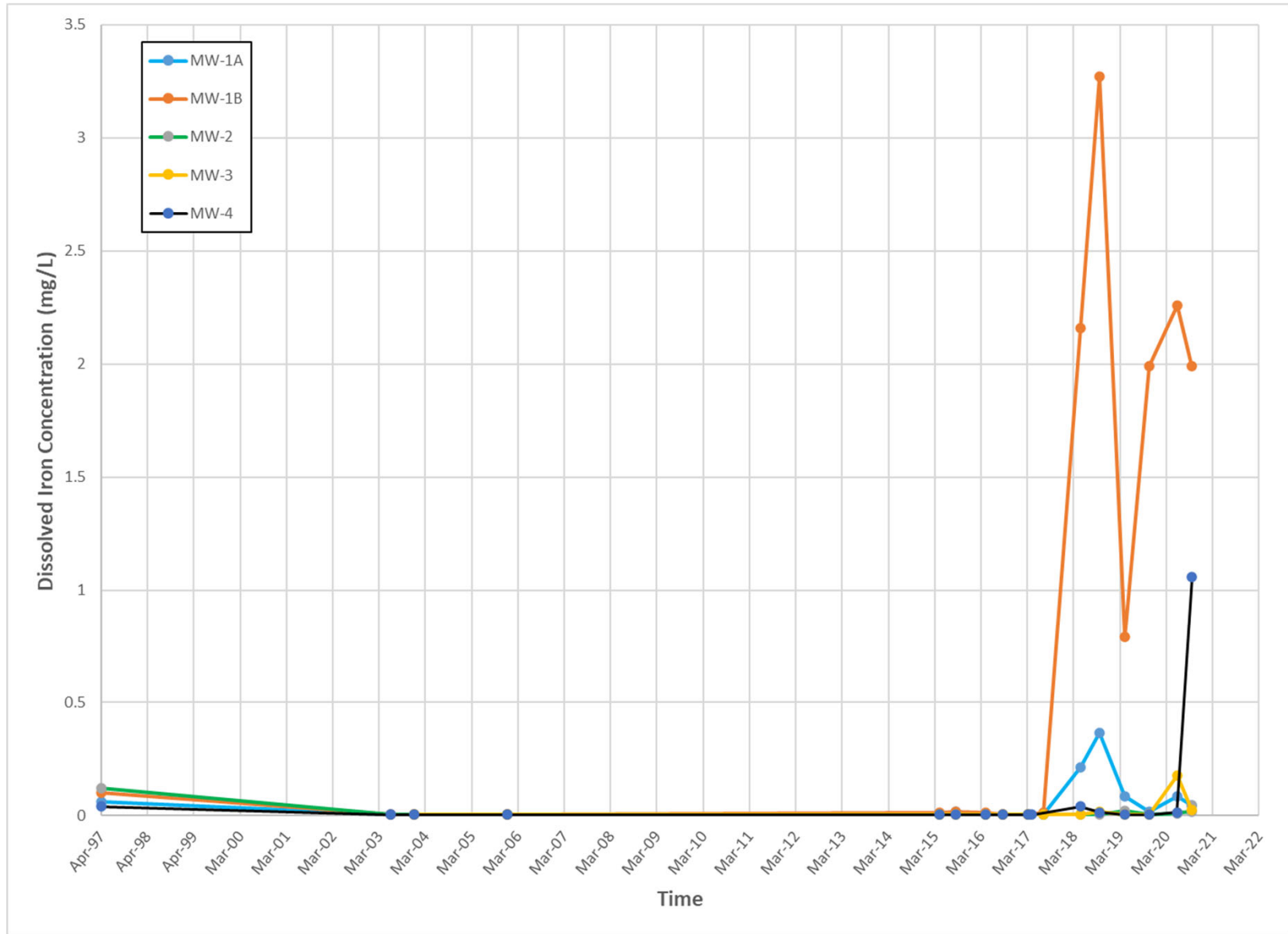
CHLORIDE CONCENTRATION TIME SERIES PLOT

PROJECT No.
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FIGURE
4-B



Notes

IRON CONCENTRATIONS FOR SW-3 ARE TOTAL, ALL MONITORING WELL CONCENTRATIONS ARE DISSOLVED IRON

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2020 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

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REVIEW AK

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TITLE

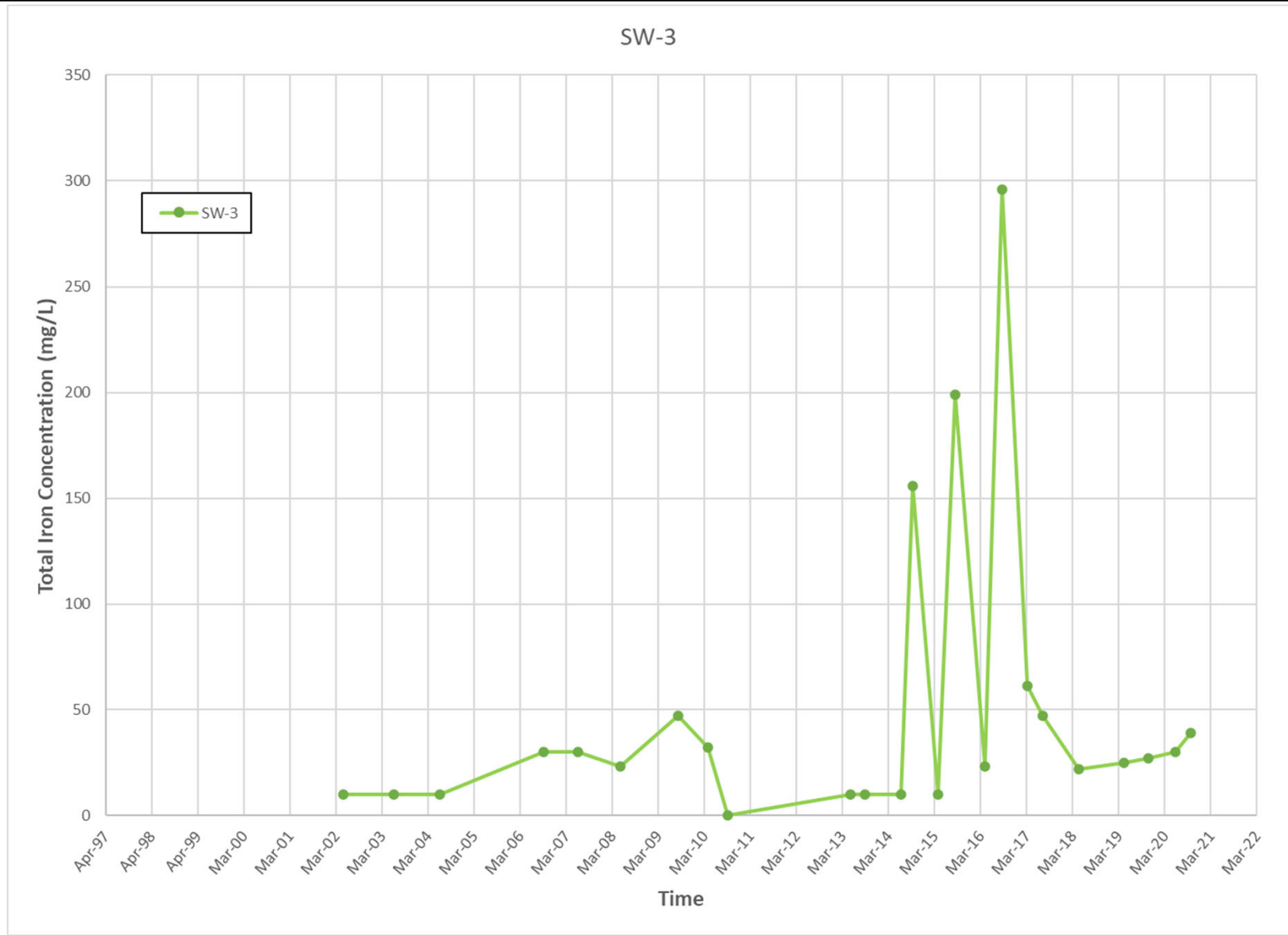
DISSOLVED IRON CONCENTRATION TIME SERIES PLOT

PROJECT No.
21455625

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FIGURE
4-C



Notes

IRON CONCENTRATIONS FOR SW-3 ARE TOTAL, ALL MONITORING WELL CONCENTRATIONS ARE DISSOLVED IRON

CLIENT
REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT
2020 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD 2021-May-06

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DESIGN MO

REVIEW AK

APPROVED JS

TITLE

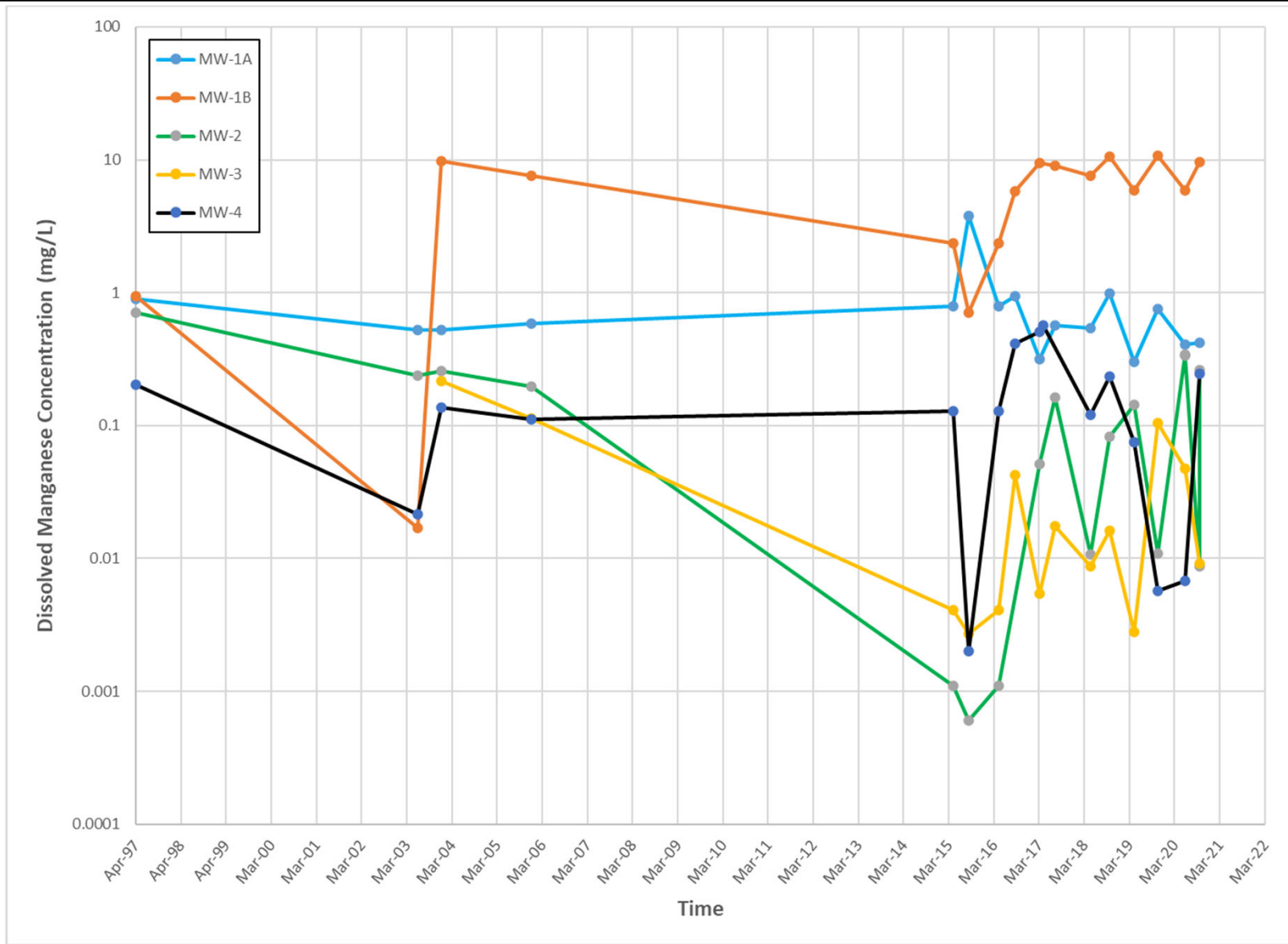
TOTAL IRON CONCENTRATION TIME SERIES PLOT

PROJECT No.
21455625

CONTROL
2000

Rev
0

FIGURE
4-D



Notes

IRON CONCENTRATIONS FOR SW-3 ARE TOTAL, ALL MONITORING WELL CONCENTRATIONS ARE DISSOLVED IRON

CLIENT
REGIONAL DISTRICT OF KITIMAT-STIKINE

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2020 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



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DESIGN MO

REVIEW AK

APPROVED JS

TITLE

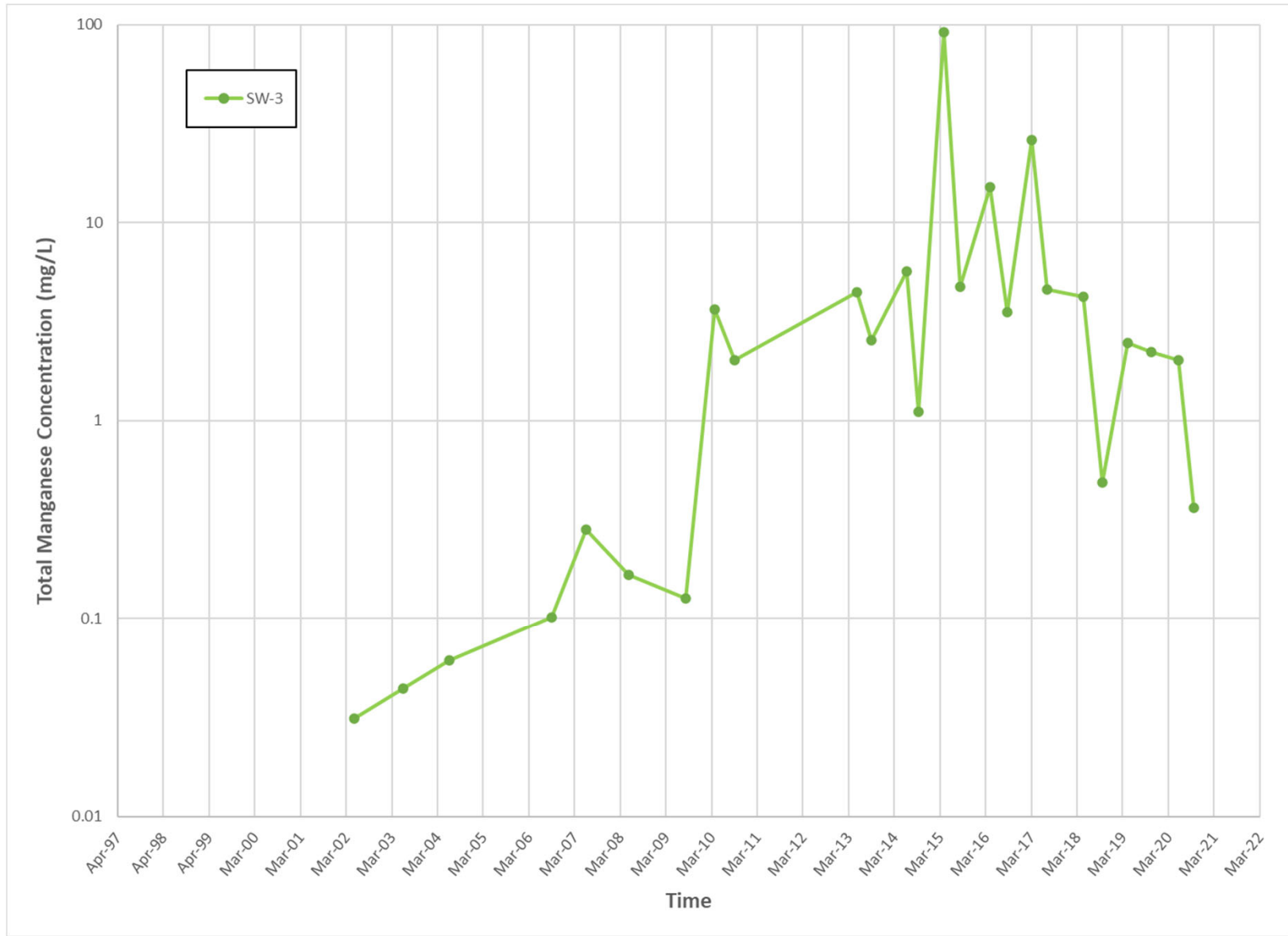
DISSOLVED MANGANESE CONCENTRATION TIME SERIES PLOT

PROJECT No.
21455625

CONTROL
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Rev
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FIGURE
4-E



Notes

IRON CONCENTRATIONS FOR SW-3 ARE TOTAL, ALL MONITORING WELL CONCENTRATIONS ARE DISSOLVED IRON

CLIENT
REGIONAL DISTRICT OF KITIMAT-STIKINE

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2020 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

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TOTAL MANGANESE CONCENTRATION TIME SERIES PLOT

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FIGURE
4-F

APPENDIX A

Operational Certificate



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)
Page: 1 of 22

A handwritten signature in blue ink, appearing to read 'J. Hofweber', written over a horizontal line.

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

OPERATIONAL CERTIFICATE: MR-15681

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.

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 auto hulks shall not be landfilled.

6.3. **Waste Asbestos**

Notwithstanding section 6.2 of this operational certificate, the disposal of waste asbestos under section 2.1 of this operational certificate and in compliance with the requirements of 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) m³.

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 m³/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 undertaken.

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 m² of refuse are exposed at the active face at any time and such that the volume of refuse in the cell

AUG 08 2002



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

does not exceed 2500 m³. 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.

AUG 08 2002

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 m² 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 m³. 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, auto hulks, 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 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)
Page: 21 of 22



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

OPERATIONAL CERTIFICATE: MR-15681

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.

Date Issued: **AUG 08 2002**
Date Amended:
(most recent)
Page: 22 of 22



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

OPERATIONAL CERTIFICATE: MR-15681

Site Plan A



Surveyed Lease Boundary

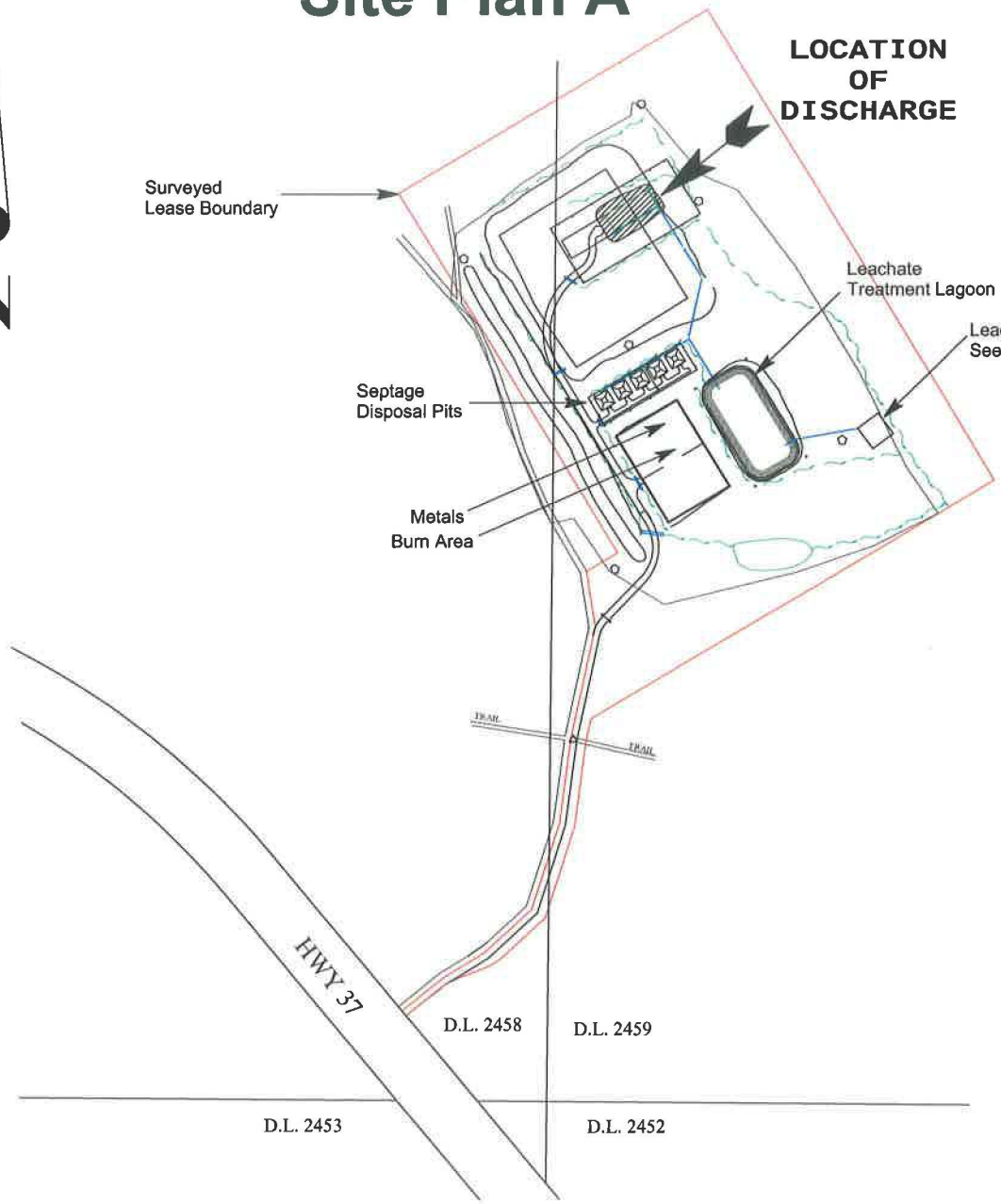
LOCATION OF DISCHARGE

Septage Disposal Pits

Leachate Treatment Lagoon

Leachate Seepage Bed

Metals Burn Area



D.L. 2453

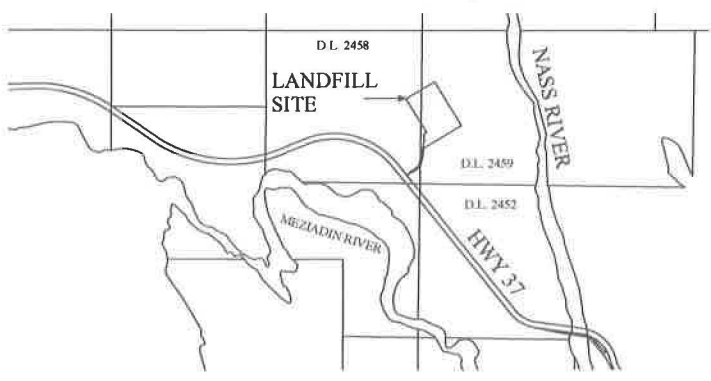
D.L. 2458

D.L. 2459

D.L. 2452

HWY 37

Location Map



Permit No.: MR-15681

Date: **AUG 08 2002**

Jim Hofweber, P.Eng.
Assistant Regional Waste Manager

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

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)	<u>Field Parameters</u> - Well elevation (m), well depth (m), groundwater elevation (m), well water depth (m), pH, conductivity, temperature	Two times per year (spring & fall)
BH97-2 (E251538)	<u>Lab Parameters</u> - pH, conductivity, temperature, hardness, total dissolved solids, alkalinity, COD, ammonia, total Kjeldahl nitrogen (TKN), nitrate + nitrite, chloride, sulphate, fluoride, and dissolved metals.	
BH97-3 (E251539)		
BH97-4 (E251540)		

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.

November 28, 2013

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

Sincerely,

A handwritten signature in blue ink that reads "Eric Pierce". The signature is written in a cursive style with a long horizontal stroke at the end.

Eric Pierce
for Director, Environmental Management Act

ME 2

Refuse ~~STATE~~

~~5300 03 05~~



June 3, 2009

Files: MR-15681

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



Also By Fax: (250) 635-9222

Dear Roger Tooms:

Re: Amendment to Meziadin Landfill Operational Certificate MR-15681

As communicated over the past month, the Ministry of Environment is amending all landfill and transfer station authorizations to reflect new policy prohibiting the burning of painted wood, treated wood, plywood and particle board.

Pursuant to Section 16 of the *Environmental Management Act*, operational certificate MR-15681 is hereby amended as follows:

Section 11.3 "Nature of Wastes"

From: "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".

To: "No waste shall be burned which is unacceptable to the Regional Environmental Protection Manager. Unacceptable materials for open burning include: nuisance-causing combustibles such as painted and treated wood, plywood, particle board, sawdust, yard wastes, mulch, wood chips, stumps, rubber, plastics, tars, insulation, paper, cardboard, etc. Acceptable materials for open burning are as follows: unpainted, untreated demolition and construction wood wastes, pallets, and brush"

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

Administration of this authorization will be carried out by staff from the Skeena Region. Data and reports pertinent to this authorization are to be submitted to the Regional Manager, Environmental Protection, at Ministry of Environment, Regional Operations, Skeena Region, Box 5000, Smithers BC, V0J 2N0.

Should you have any concerns or questions regarding the above, please contact Eric Pierce at (250) 847-7252.

Yours truly,



Mark Love, P. Ag.

For Director, *Environmental Management Act*
Skeena Region

EP/ep

ecc. Ben Van Nostrand, EPO, Omineca Region
Ben Weinstein, Air Quality Meteorologist



Date: **AUG 08 2002**

File: MR-15681

REGISTERED MAIL

Harry Nyce, Chair of the Board of Directors
Board of Directors
Regional District of Kitimat-Stikine
Suite 300 – 4545 Lazelle Avenue
Terrace, BC V8J 4E1

Dear Operational Certificate Holder:

Enclosed is Operational Certificate MR-15681 issued under the provisions of the *Waste Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the operational certificate.

This operational certificate does not authorise entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorised by the owner of such lands or works. The responsibility for obtaining such authority shall rest with the operational certificate holder. This operational certificate is issued pursuant to the provisions of the *Waste Management Act* to ensure compliance with Section 54(3) of that statute, which makes it an offence to discharge waste without authorisation. It is also the responsibility of the operational certificate holder to ensure that all activities conducted under this authorisation are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

This decision may be appealed to the Environmental Appeal Board. Notice of the appeal must (1) be in writing, (2) include the grounds for appeal, (3) be directed by registered mail or personally delivered to the Chair, Environmental Appeal Board, 4th Floor 836 Yates Street, Victoria British Columbia V8V 1X4, (4) be delivered within 30 days from the date notice of the decision is given, and (5) be accompanied by a fee of \$25, payable to the Minister of Finance and Corporate Relations. For further information please contact the Environmental Appeal Board at (250)-387-3464.

Administration of this operational certificate will be carried out by staff from our Regional office located at 3726 Alfred Avenue, British Columbia, V0J 2N0 (telephone 250-847-7260). Plans, data and reports pertinent to the approval are to be submitted to the Regional Waste Manager, at this address.

Yours truly,

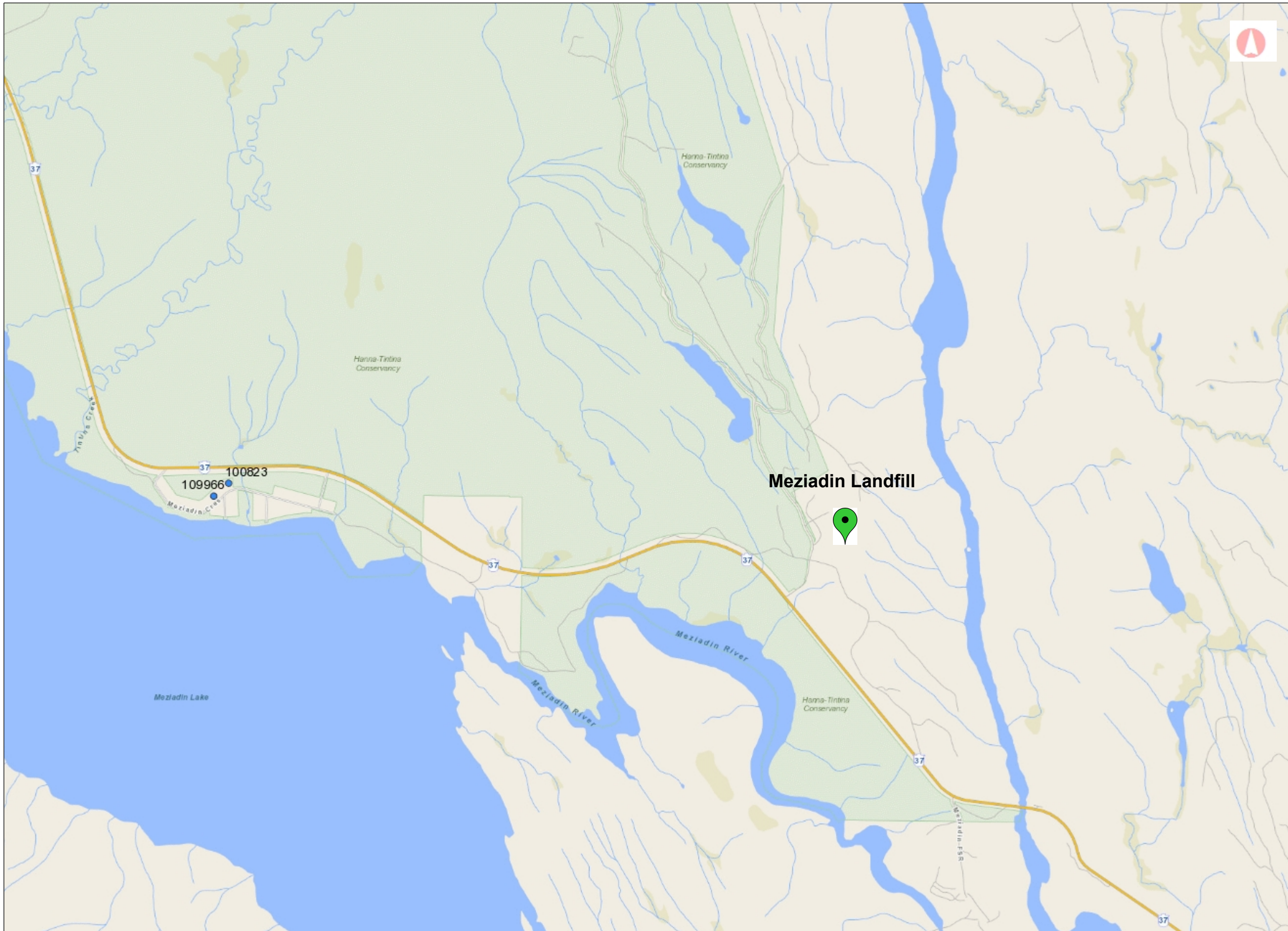
A handwritten signature in blue ink, appearing to read "J. Hofweber".

Jim Hofweber, P.Eng.
Assistant Regional Waste Manager
Skeena Region

Enclosure

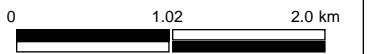
APPENDIX B

**BC Water Well Atlas -
Water Well Records**



Legend

- Water Wells - All



1: 50,000

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Datum: NAD83
 Projection: WGS_1984_Web_Mercator_Auxiliary_Sp here

Key Map of British Columbia





Groundwater Wells and Aquifers

Well Summary

Well Tag Number: 100823
Well Identification Plate Number:
Owner Name: KEN DREY
Licensed Status: Unlicensed

Well Status: New
Well Class: Water Supply
Well Subclass:
Intended Water Use: Private Domestic

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

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)	7873069

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 **Location Accuracy Code:**

Well Activity

Activity Type	Work Start Date	Work End Date	Drilling Company
There are no records to show			

Well Completion Data

Total Depth Drilled: 40.00 feet
Finished Well Depth: 40.00 feet
Final Casing Stick Up:
Depth to Bedrock: 21.00 feet
Ground elevation:

Static Water Level (BTOC):
Estimated Well Yield:
Artesian Flow:
Artesian Pressure:
Method of determining elevation:

Well Cap:
Well Disinfected: No
Drilling Method:
Orientation of Well: vertical

Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
0.00	21.00							

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
21.00	40.00					Soft		

Casing Details

From (ft)	To (ft)	Casing Type	Casing Material	Diameter	Wall Thickness	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 Thickness:		Liner perforations	
Liner Diameter:		Liner to:		From	To
Liner from:				There are no records to show	

Screen Details

Intake Method:		Installed Screens			
Type:		From	To	Internal Diameter	Assembly Type
Material:		There are no records to show			
Opening:					
Bottom:					

Well Development

Developed by: _____ **Development Total Duration:** _____

Well Yield

No well yield data available.

Well Decommission Information

Finished Well Depth: 40.00 feet
Reason for Decommission: _____
Method of Decommission: _____

Sealant Material: _____
Backfill Material: _____
Decommission Details: _____

Comments

No comments submitted

Alternative Specs Submitted: No

Documents

- [WTN 100823 Well Record.pdf](#)

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

Licensed Status: Unlicensed

Well Status: New

Well Class: Water Supply

Well Subclass:

Intended Water Use: Private Domestic

Observation Well Number:

Observation Well Status:

Environmental Monitoring System (EMS) ID:

Aquifer Number:

Alternative specs submitted (if required): No

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

Location Accuracy Code:

Well Activity

Activity Type	Work Start Date	Work End Date	Drilling Company
There are no records to show			

Well Completion Data

Total Depth Drilled: 75.00 feet

Finished Well Depth: 71.50 feet

Final Casing Stick Up: 18.000 inches

Depth to Bedrock:

Ground elevation:

Static Water Level (BTOC): 19.00 feet

Estimated Well Yield: 3.000 USGPM

Artesian Flow:

Artesian Pressure:

Method of determining elevation:

Well Cap: 6 INCH WTC

Well Disinfected: Yes

Drilling Method:

Orientation of Well: vertical

Lithology

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
---------------	-------------	----------	-------------	----------	--------	----------	--------------	-------------------------------------

From (ft bgl)	To (ft bgl)	Raw Data	Description	Moisture	Colour	Hardness	Observations	Water Bearing Flow Estimate (USGPM)
0.00	15.00	SILT & FINE SAND			brown	Soft		
15.00	22.00	FINE-MEDIUM SAND TRACES OF SILT			grey	Medium	WATER BEARING 18-22FT	
22.00	24.00		medium		grey	Medium	DRY	
24.00	75.00	MEDIUM HARD			grey			

Casing Details

From (ft)	To (ft)	Casing Type	Casing Material	Diameter	Wall Thickness	Drive Shoe
0.00	75.00		Steel	6.000	0.219	Yes
6.50	61.50		Plastic	4.940		No

Surface Seal and Backfill Details

Surface Seal Material: Bentonite clay
Surface Seal Installation Method: Poured
Surface Seal Thickness:
Surface Seal Depth:

Backfill Material Above Surface Seal:
Backfill Depth:

Liner Details

Liner Material: PVC
Liner Diameter:
Liner from:

Liner Thickness:
Liner to:

Liner perforations

From	To
There are no records to show	

Screen Details

Intake Method:

Screen

Type: Pipe size

Material: Plastic

Opening: Slotted

Bottom: Other

Installed Screens

From	To	Internal Diameter	Assembly Type	Slot Size
6.50 ft	11.50 ft	4.94		
11.50 ft	31.50 ft	4.94		0.02
31.50 ft	51.50 ft	4.94		
51.50 ft	71.50 ft	4.94		

Well Development

Developed by:

Development Total Duration: 1.00 hours

Well Yield

No well yield data available.

Well Decommission Information

Finished Well Depth: 71.50 feet

Reason for Decommission:

Method of Decommission:

Sealant Material:

Backfill Material:

Decommission Details:

Comments

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

Alternative Specs Submitted: No

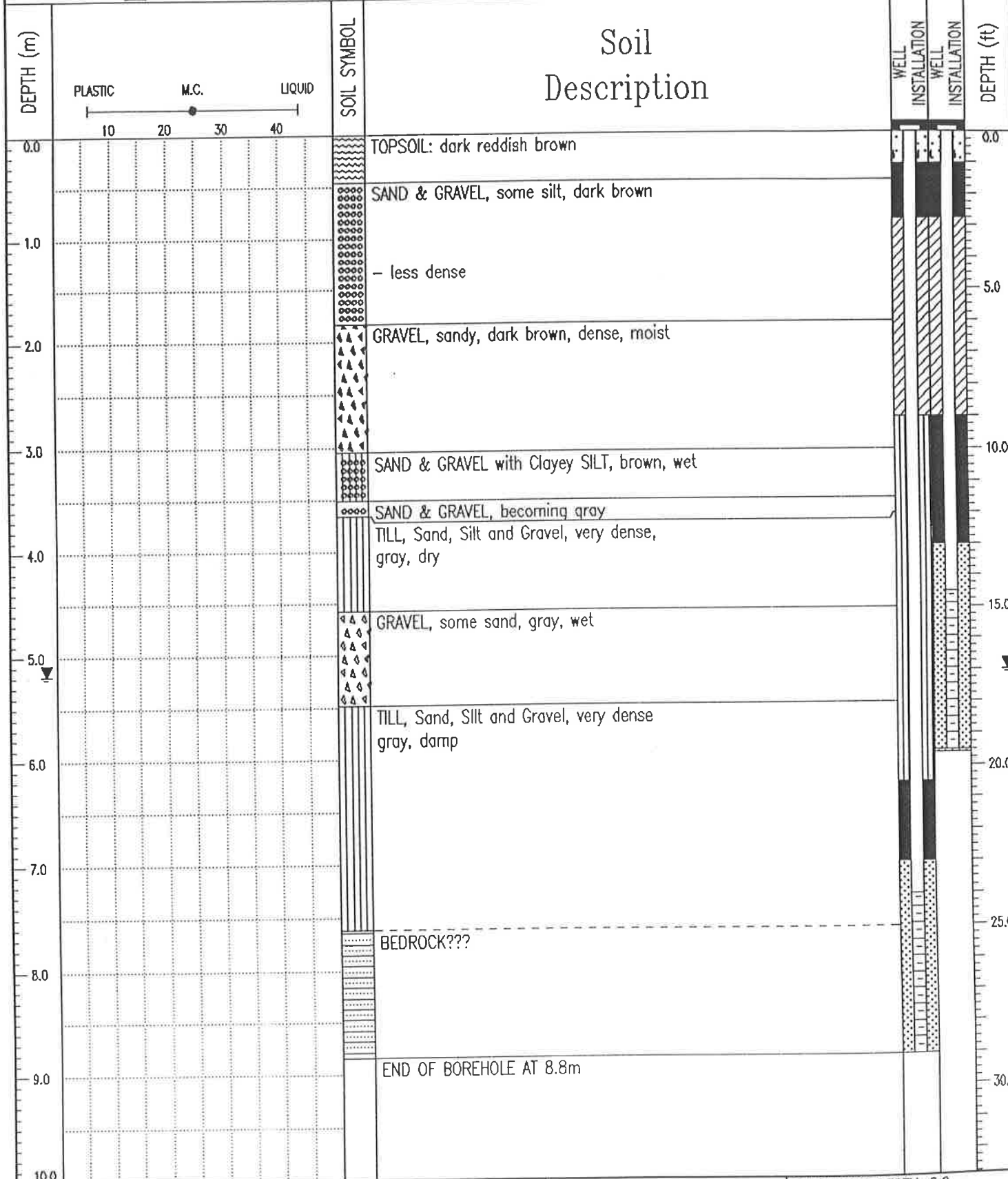
Documents

No additional documentation available for this well.

APPENDIX C

Borehole Logs

SAMPLE TYPE BULK GRAB SPT A-CASING SHELBY TUBE CORE



AGRA Earth & Environmental Limited
Burnaby, B.C.

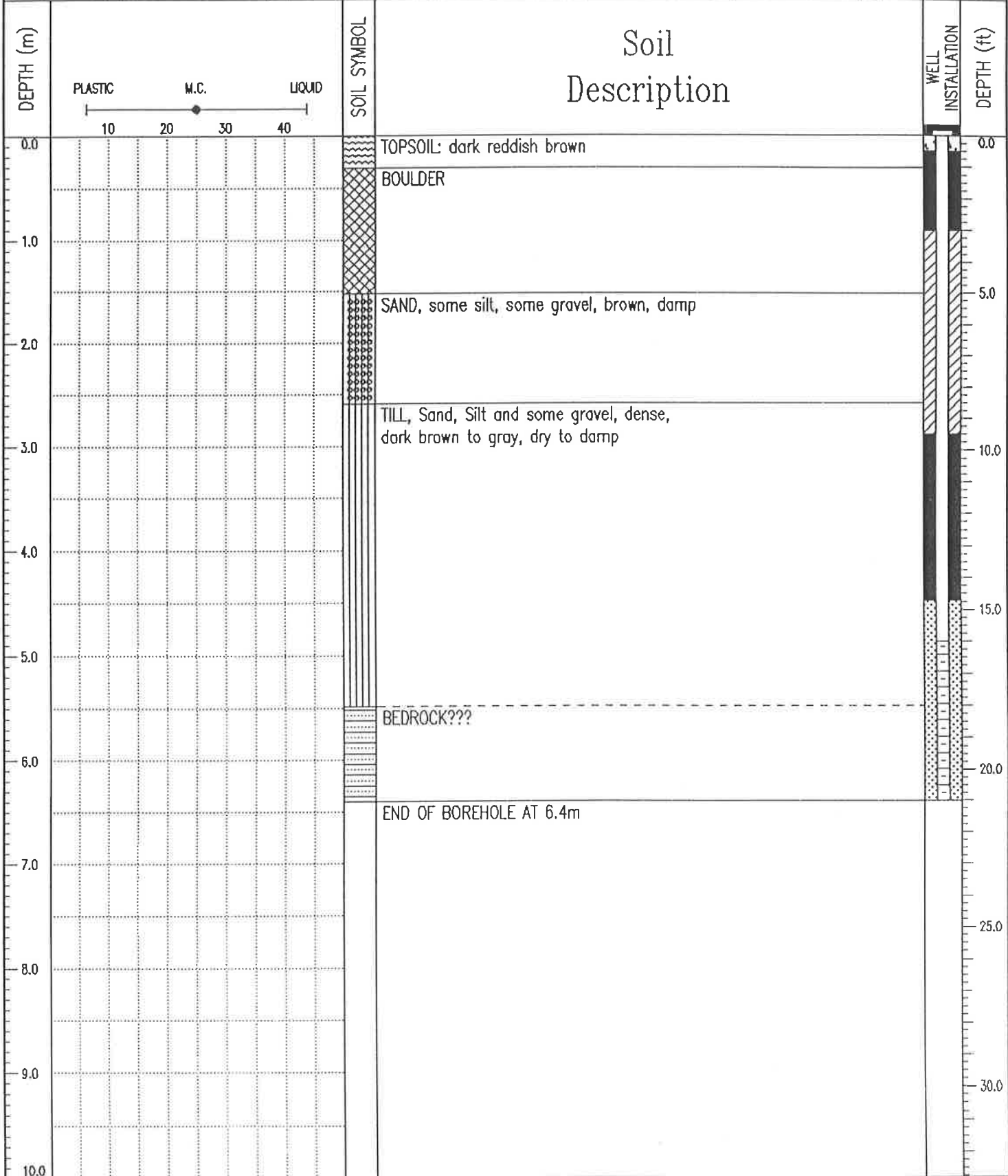
LOGGED BY: JE	COMPLETION DEPTH: 8.8 m
REVIEWED BY: GB	COMPLETE: 20/01/97
Fig. No:	Page 1 of 1

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



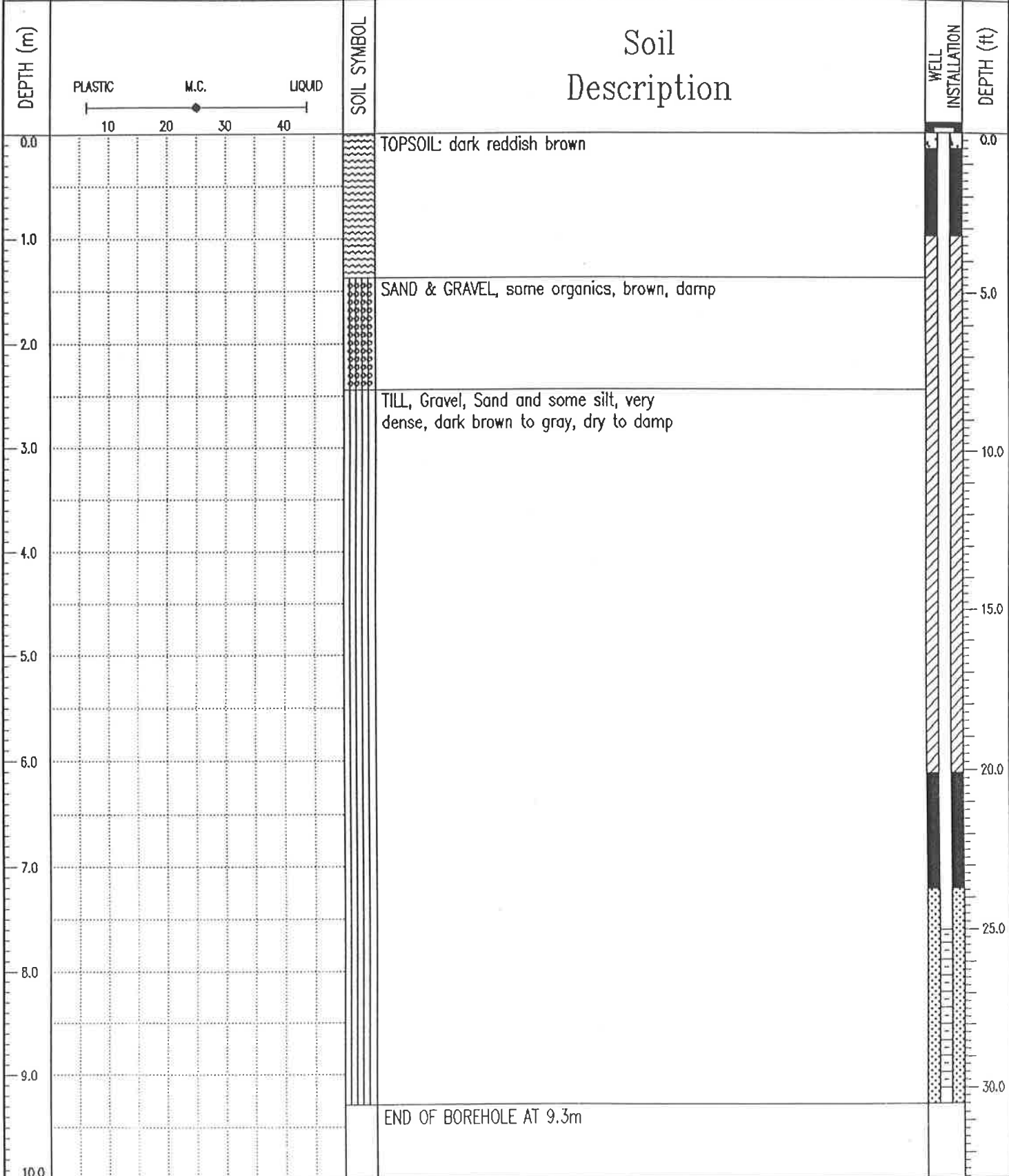
AGRA Earth & Environmental Limited Burnaby, B.C.	LOGGED BY: JE	COMPLETION DEPTH: 6.4 m
	REVIEWED BY: GB	COMPLETE: 20/01/97
	Fig. No:	Page 1 of 1

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

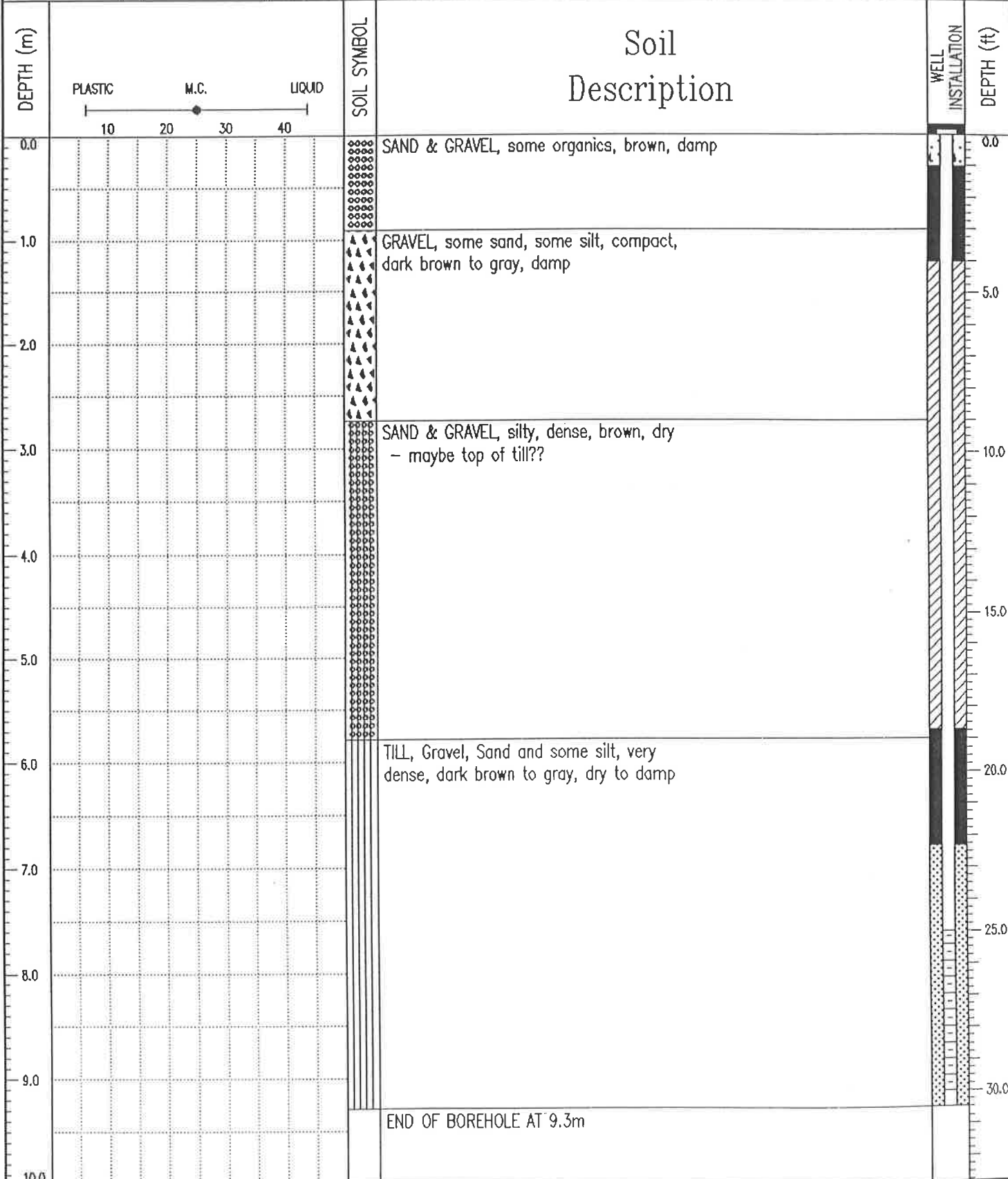
Meziadin Junction - Tintina Main ELEVATION:

SAMPLE TYPE BULK GRAB SPT A-CASING SHELBY TUBE CORE



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

SAMPLE TYPE BULK GRAB SPT A-CASING SHELBY TUBE CORE



APPENDIX D

Analytical Results

**Table D-1: Groundwater Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Parameter	CSR Aquatic Life Standard, Freshwater (AW-F)	Unit	Meziadin Landfill															
			MW-1A															
			1997-04-01 MW-1A	2003-07-01 MW-1A	2004-01-01 MW-1A	2006-01-01 MW-1A	2015-05-03 MW-1A	2015-09-09 MW-1A	2016-05-03 MW-1A	2016-09-13 MW-1A	2017-04-01 MW-1A	2017-08-01 MW-1A	2018-05-17 MW-1A	2018-10-17 MW-1A	2019-05-07 MW-1A	2019-11-14 MW-1A	2020-06-17 MW1A	2020-10-15 MW1A
Location																		
Monitoring Well																		
Sample Date																		
Sample Name																		
QAQC																		
Lab ID																		
Field Measured																		
Depth to Water		m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
pH		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Conductivity		µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Specific conductivity		µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Temperature		°C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Dissolved oxygen		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Redox potential		mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Conventional Parameters																		
pH		-	7.9	8.1	8.2	8.1	8.1	7.5	8.1	7.9	7.9	7.9	-	8.39	8.23	8.49	8.2	8.29
Specific conductivity		µS/cm	600	715	972	1020	743	602	743	737	716	721	670	690	766	739	747	776
Hardness, as CaCO3		mg/L	159	164	332	290	-	197	-	-	-	-	-	-	-	-	175	180
Hardness, as CaCO3 (Total)		mg/L	-	5580	307	290	158	205	158	168	158	155	162	171	180	193	-	-
Total alkalinity, as CaCO3		mg/L	198	-	239	251	260	290	260	250	250	250	241	239	246	244	260	240
Total suspended solids		mg/L	-	31300	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Major Ions																		
Bromide		mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-	< 0.25	< 0.25	< 0.250	< 0.250
Calcium		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
Chloride	1500	mg/L	11.2	3.4	3.9	2.3	2.5	2.1	2.5	2.3	2.1	2.8	1.33	< 2.5	< 2.5	< 2.5	< 2.50	< 2.50
Fluoride	3	mg/L	0.32	-	-	-	-	< 0.10	-	-	0.2	0.19	0.19	0.17	0.15	0.19	0.15	0.151
Magnesium		mg/L	9.94	21.5	21.5	19.2	10.7	8.11	10.7	11.6	10.7	10.8	11.1	11.7	11.8	12.4	12.4	11.9
Potassium		mg/L	3	3	3	4	2.52	2.23	2.52	2.55	2.37	2.24	2.43	2.31	2.46	2.83	2.49	2.54
Sodium		mg/L	71	96.7	96.7	125	98	39	98	91.8	99.2	103	99.7	94.6	101	101	104	108
Sulphate	3090 - 4290	mg/L	99	135	288	285	144	27.5	144	135	135	127	135	130	163	160	164	150
Nutrients																		
Nitrite	0.2 - 2	mg-N/L	0.01	-	0.004	0.018	-	-	-	-	-	-	< 0.0010	< 0.0050	0.0083	< 0.0050	< 0.0050	< 0.0050
Nitrate + nitrite	400	mg-N/L	-	-	0.111	0.072	0.102	0.131	0.102	0.273	-	0.11	0.138	0.145	0.101	0.239	-	-
Total ammonia	1.31 - 18.5	mg-N/L	-	-	0.032	1.52	1.26	6.92	1.26	1.3	0.08	0.2	0.0827	0.0532	0.965	0.103	0.0778	0.0481
Total Kjeldahl nitrogen		mg-N/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	0.17	1.19
Total phosphorus		mg-P/L	-	36.9	15.6	7.99	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved phosphorus		mg-P/L	0.3	0.1	0.1	0.1	-	-	-	-	< 0.050	< 0.050	< 0.050	< 0.050	0.05	0.057	0.06	< 0.050
Biochemical oxygen demand		mg/L	-	6	10	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical oxygen demand		mg/L	-	28	23	10	142	< 20	142	140	35	119	114	< 20	127	< 20	66	36
Total Metals																		
Aluminum		µg/L	-	671000	39.9	27200	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	50	µg/L	-	182	1.1	10.7	-	-	-	-	-	-	-	-	-	-	-	-
Barium	10000	µg/L	-	7720	172	303	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	1.5	µg/L	-	18.7	0.02	1.8	-	-	-	-	-	-	-	-	-	-	-	-
Bismuth		µg/L	-	0.02	0.02	0.02	-	-	-	-	-	-	-	-	-	-	-	-
Boron	12000	µg/L	-	213	90	81	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	3.5 - 4	µg/L	-	22.9	0.12	1.82	-	-	-	-	-	-	-	-	-	-	-	-
Calcium		µg/L	-	837000	89800	136000	-	66100	-	-	-	-	-	-	-	-	-	-
Chromium	10	µg/L	-	2490	0.2	80.5	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	40	µg/L	-	722	0.882	85.3	-	-	-	-	-	-	-	-	-	-	-	-
Copper	70 - 90	µg/L	-	21400	1.07	158	-	-	-	-	-	-	-	-	-	-	-	-
Iron		µg/L	-	1700	228	23100	-	-	-	-	-	-	-	-	-	-	-	-
Lead	60 - 160	µg/L	-	324	0.07	23.7	-	-	-	-	-	-	-	-	-	-	-	-
Lithium		µg/L	-	893	4.06	38	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	10000	µg/L	-	50.2	12.1	13.9	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	1100 - 1500	µg/L	-	3520	3.04	193	-	-	-	-	-	-	-	-	-	-	-	-
Potassium		µg/L	-	78000	3000	6000	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	20	µg/L	-	20	0.7	0.3	-	-	-	-	-	-	-	-	-	-	-	-
Silver	15	µg/L	-	7.93	0.02	0.05	-	-	-	-	-	-	-	-	-	-	-	-
Sodium		µg/L	-	176000	92300	124000	-	-	-	-	-	-	-	-	-	-	-	-
Sulphur		µg/L	-	109000	99000	92700	-	-	-	-	-	-	-	-	-	-	-	-
Tellurium		µg/L	-	500	50	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin		µg/L	-	0.01	0.01	0.13	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	1000	µg/L	-	3	3	3	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	85	µg/L	-	3.86	3.86	4.2	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium		µg/L	-	1.19	1.19	73.9	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	900 - 2400	µg/L	-	0.1	0.1	321	-	-	-	-	-	-	-	-	-	-	-	-
Zirconium		µg/L	-	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-

**Table D-1: Groundwater Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Parameter	CSR Aquatic Life Standard, Freshwater (AW-F)	Unit	Meziadin Landfill															
			MW-1A															
			1997-04-01	2003-07-01	2004-01-01	2006-01-01	2015-05-03	2015-09-09	2016-05-03	2016-09-13	2017-04-01	2017-08-01	2018-05-17	2018-10-17	2019-05-07	2019-11-14	2020-06-17	2020-10-15
			Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name
			MW-1A_1997-04-01_N	MW-1A_2003-07-01_N	MW-1A_2004-01-01_N	MW-1A_2006-01-01_N	MW-1A_2015-05-03_03_N	MW-1A_2015-09-09_09_N	MW-1A_2016-05-03_03_N	MW-1A_2016-09-13_13_N	MW-1A_2017-04-01_01_N	MW-1A_2017-08-01_01_N	L2097663-1	L2183746-1	L2269973-1	L2383402-1	VA20A8675-001	VA20B8400-001
Dissolved Metals																		
Aluminum		µg/L	200	1.5	1.5	8	15	< 5	15	7	< 5.0	6.3	10.1	9.1	3.9	4.5	6.3	3.8
Antimony	90	µg/L	200	0.473	0.473	0.315	0.4	< 0.1	0.4	0.8	0.35	0.5	0.43	0.31	0.25	0.18	0.31	0.29
Arsenic	50	µg/L	200	1	1	1.4	2	< 0.5	2	2.1	0.64	0.74	1.7	0.89	1.03	0.8	1.28	1.1
Barium	10000	µg/L	260	176	176	124	68	113	68	295	129	53.1	62.5	52.6	73.8	50.2	60.1	55.7
Beryllium	1.5	µg/L	5	0.02	0.02	0.02	< 0.1	< 0.1	< 0.1	< 0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.100	< 0.100
Bismuth		µg/L	100	0.02	0.02	0.02	-	-	-	-	< 0.10	< 0.10	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Boron	12000	µg/L	100	84	84	73	83	23	83	93	85	73.4	67	71	71	79	72	71
Cadmium	3.5 - 4	µg/L	10	0.11	0.11	0.07	0.03	< 0.01	0.03	0.05	0.072	< 0.010	0.204	0.0225	0.0126	0.0806	< 0.0200	< 0.0200
Cesium		µg/L	-	-	-	-	-	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Chromium	10	µg/L	10	0.2	0.2	0.2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	0.15	0.14	< 0.10	< 0.10	< 0.10	< 0.10
Cobalt	40	µg/L	10	0.834	0.834	1.03	0.67	0.54	0.67	0.8	0.62	0.74	0.64	0.57	0.19	0.56	0.44	0.32
Copper	70 - 90	µg/L	10	0.69	0.69	1.89	1.8	< 0.2	1.8	14.3	8.01	< 0.40	0.61	< 0.20	1.05	0.54	0.26	< 0.20
Iron		µg/L	60	5	5	7	< 10	18	< 10	< 10	< 10	< 10	213	367	85	17	84	44
Lead	60 - 160	µg/L	50	0.01	0.01	0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.10	< 0.20	< 0.050	< 0.050	0.063	< 0.050	< 0.050	< 0.050
Lithium		µg/L	10	3.92	3.92	4.88	7.8	1.3	7.8	3.1	3.24	4.2	3.7	3.9	3.7	4.1	3.8	4.2
Manganese		µg/L	904	521	521	584	792	3770	792	948	314	567	542	988	303	757	410	419
Mercury	0.25	µg/L	-	0.05	0.05	0.05	< 0.02	< 0.02	< 0.02	-	< 0.02	< 0.010	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Molybdenum	10000	µg/L	300	11.8	11.8	13.3	25.4	1	25.4	29	25.3	29.5	19.4	15.6	12.5	13.5	13.7	15.5
Nickel	1100 - 1500	µg/L	20	2.8	2.8	2.4	4.5	2.8	4.5	3.4	3.16	4.77	1.94	1.38	0.79	0.81	1.15	1.04
Rubidium		µg/L	-	-	-	-	-	-	-	-	-	-	0.37	0.32	0.27	0.42	0.29	0.34
Selenium	20	µg/L	200	0.4	0.4	0.3	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	0.066	0.08	0.143	0.116	0.055	0.156
Silicon		µg/L	-	-	-	-	-	-	-	-	3700	3500	3870	3790	3590	3910	3790	3920
Silver	15	µg/L	10	0.02	0.02	0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.050	< 0.050	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Strontium		µg/L	241	883	883	850	-	-	-	-	515	505	542	614	594	686	607	646
Sulphur		µg/L	-	92000	92000	98600	-	-	-	-	42300	41000	45500	51300	54300	53200	53700	57100
Tellurium		µg/L	-	50	50	-	-	-	-	-	< 0.20	< 0.50	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Thallium	3	µg/L	100	0.033	0.033	0.039	< 0.02	< 0.02	< 0.02	< 0.02	0.029	< 0.020	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Thorium		µg/L	-	-	-	-	-	-	-	-	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Tin		µg/L	300	0.01	0.01	0.02	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Titanium	1000	µg/L	10	3	3	3	< 5	< 5	< 5	< 5	< 5.0	< 5.0	0.51	0.37	< 0.30	< 0.30	< 0.30	< 0.30
Tungsten		µg/L	-	-	-	-	-	-	-	-	-	-	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Uranium	85	µg/L	-	3.89	3.89	3.86	3.61	0.12	3.61	2.85	2.99	3.74	3	2.41	2.73	2.7	2.71	2.92
Vanadium		µg/L	30	1.08	1.08	0.59	< 1	< 1	< 1	< 1	< 1.0	< 1.0	0.73	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Zinc	900 - 2400	µg/L	38	0.1	0.1	1.2	< 4	< 4	< 4	17	20.8	< 4.0	4.8	< 1.0	3.4	1.7	< 1.0	< 1.0
Zirconium		µg/L	-	5	5	5	-	-	-	-	< 0.10	< 0.10	< 0.060	< 0.060	< 0.060	< 0.20	< 0.20	< 0.20

NOTES
 Italics indicate that the laboratory detection limit exceeds the applicable standard.
 Standards shown are from the BC Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 131/2020 and BC Reg. 161/2020, updated to 1 February 2021])
^a = pH dependent; ^b = hardness dependent, ^c = chloride dependent
^d = most conservative standards applied for chromium (between Cr(III) and Cr(VI))
 QAQC = quality assurance/quality control; FD = field duplicate;
 FDA = field duplicate available

**Table D-2: Groundwater Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Parameter	CSR Aquatic Life Standard, Freshwater (AW-F)	Unit	Meziadin Landfill MW-1B																		
			1997-04-01 MW-1B	2003-07-01 MW-1B	2004-01-01 MW-1B	2006-01-01 MW-1B	2015-05-03 MW-1B	2015-09-09 MW-1B	2016-05-03 MW-1B	2016-09-13 MW-1B	2017-04-01 MW-1B	2017-08-01 MW-1B	2018-05-17 MW-1B	2018-10-17 MW-1B	2019-05-07 MW-1B	2019-11-14 DUP	2019-11-14 MW-1B	2020-06-17 MW-1B	2020-10-15 MW-1B		
QAQC			N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N			
Lab ID			MW-1B_1997-04-01_N	MW-1B_2003-07-01_N	MW-1B_2004-01-01_N	MW-1B_2006-01-01_N	MW-1B_2015-05-03_N	MW-1B_2015-09-09_N	MW-1B_2016-05-03_N	MW-1B_2016-09-13_N	MW-1B_2017-04-01_N	MW-1B_2017-08-01_N	L2097663-2	L2183746-2	L2269973-2	L2383402-7	L2383402-2	VA20A8675-002	VA20B8400-002		
Field Measured																					
Depth to Water		m	-	-	-	-	-	-	-	-	-	-	-	-	2.62	3.26	2.5	-	2.18	2.78	2.82
pH		-	-	-	-	-	-	-	-	-	-	-	-	-	5.86	7.13	6.38	-	7.18	6.2	6.31
Conductivity		µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	264.9	232.2	244.1	-	220.8	2.9	278.9
Specific conductivity		µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.9	424.5
Temperature		°C	-	-	-	-	-	-	-	-	-	-	-	-	7.5	7.1	4.5	-	7.2	5.8	6.9
Dissolved oxygen		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	2.9	7.9	2.4	-	7.2	4.5	3.2
Redox potential		mV	-	-	-	-	-	-	-	-	-	-	-	-	270.1	402.7	371.4	-	283.7	197.8	178.3
Conventional Parameters																					
pH		-	7.9	7.3	-	7.3	7.6	6.8	7.6	6.8	6.4	6.6	-	7.24	7.1	7.61	7.95	7.34	7.46		
Specific conductivity		µS/cm	254	441	442	437	385	351	385	392	396	450	361	384	356	364	346	399	452		
Hardness, as CaCO3		mg/L	-	267	260	200	-	128	-	-	-	-	-	-	-	-	-	183	208		
Hardness, as CaCO3 (Total)		mg/L	116	652	236	200	168	146	168	171	171	208	175	189	155	186	187	-	-		
Total alkalinity, as CaCO3		mg/L	124	-	240	235	200	180	200	210	210	240	209	213	194	208	190	230	227		
Total suspended solids		mg/L	-	9290	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Major Ions																					
Bromide		mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050		
Calcium		mg/L	34.5	48.1	83	63.1	50.6	38.6	50.6	50.4	50.8	62.1	52.2	57	46.6	56.6	57.4	54.4	62.5		
Chloride	1500	mg/L	0.9	0.8	1.1	0.5	2	< 1.0	2	< 1.0	< 1.0	< 1.0	0.55	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		
Fluoride	3	mg/L	0.22	-	-	-	-	< 0.10	-	-	< 0.10	< 0.10	0.07	0.066	0.066	0.074	0.069	0.07	0.069		
Magnesium		mg/L	7.18	10.7	12.8	11.1	10.2	7.67	10.2	10.8	10.6	12.9	10.8	11.4	9.41	10.9	10.5	11.3	12.6		
Potassium		mg/L	2	3	1	1	0.81	1.01	0.81	0.9	0.83	0.81	0.898	0.787	0.65	0.779	0.767	0.711	0.872		
Sodium		mg/L	8	110	4.98	5.04	8.87	25.9	8.87	9.03	7.85	5.12	7.74	4.67	6.69	4.18	4.13	7.08	5.61		
Sulphate	3090 - 4290	mg/L	7	2.8	2.6	4	9.5	6.6	9.5	4.7	5.8	6.7	5.74	6.17	7.29	5.42	8.72	7.83	6.14		
Nutrients																					
Nitrite	0.2	mg-N/L	0.01	-	0.002	0.002	-	-	-	-	-	-	0.0058	0.0012	0.0095	< 0.0010	0.0025	0.0037	0.0012		
Nitrate + nitrite	400	mg-N/L	-	-	0.002	0.003	0.36	0.692	0.36	0.297	0.374	0.19	0.176	0.0492	0.293	0.0219	0.27	-	-		
Total ammonia	1.31 - 18.5	mg-N/L	-	-	0.005	0.02	0.076	0.14	0.076	0.21	0.28	0.26	0.269	0.34	0.193	0.123	0.127	0.26	0.401		
Total Kjeldahl nitrogen		mg-N/L	-	-	1.66	0.16	1.78	0.72	1.78	4.4	2.48	4.53	1.94	0.505	0.429	0.298	1.24	0.473	4.24		
Total phosphorus		mg-P/L	-	6.5	9.51	7.03	-	-	-	-	-	-	-	-	-	-	-	-	-		
Dissolved phosphorus		mg-P/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		
Biochemical oxygen demand		mg/L	-	6	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Chemical oxygen demand		mg/L	-	20	15	24	108	23	108	82	202	194	71	25	34	35	53	80	48		
Total Metals																					
Aluminum		µg/L	-	18600	37.1	8460	-	-	-	-	-	-	-	-	-	-	-	-	-		
Arsenic	50	µg/L	-	4.7	0.3	3.9	-	-	-	-	-	-	-	-	-	-	-	-	-		
Barium	10000	µg/L	-	1430	593	1530	-	-	-	-	-	-	-	-	-	-	-	-	-		
Beryllium	1.5	µg/L	-	2.11	0.02	1.37	-	-	-	-	-	-	-	-	-	-	-	-	-		
Bismuth		µg/L	-	0.02	0.02	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-		
Boron	12000	µg/L	-	33	8	8	-	-	-	-	-	-	-	-	-	-	-	-	-		
Cadmium	3.5 - 4	µg/L	-	2.55	0.79	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-		
Calcium		µg/L	-	102000	75300	84000	-	44500	-	-	-	-	-	-	-	-	-	-	-		
Chromium	10	µg/L	-	50.6	0.4	11.2	-	-	-	-	-	-	-	-	-	-	-	-	-		
Cobalt	40	µg/L	-	74.9	14.1	47.2	-	-	-	-	-	-	-	-	-	-	-	-	-		
Copper	90	µg/L	-	210	5.05	163	-	-	-	-	-	-	-	-	-	-	-	-	-		
Iron		µg/L	-	289000	144	55200	-	-	-	-	-	-	-	-	-	-	-	-	-		
Lead	110	µg/L	-	27.1	0.04	25.2	-	-	-	-	-	-	-	-	-	-	-	-	-		
Lithium		µg/L	-	29.1	3.81	16.6	-	-	-	-	-	-	-	-	-	-	-	-	-		
Manganese		µg/L	-	12600	9940	12300	-	-	-	-	-	-	-	-	-	-	-	-	-		
Molybdenum	10000	µg/L	-	2.48	0.62	0.52	-	-	-	-	-	-	-	-	-	-	-	-	-		
Nickel	1500	µg/L	-	169	30.8	99.5	-	-	-	-	-	-	-	-	-	-	-	-	-		
Potassium		µg/L	-	8000	1000	1000	-	-	-	-	-	-	-	-	-	-	-	-	-		
Selenium	20	µg/L	-	2.3	0.3	0.7	-	-	-	-	-	-	-	-	-	-	-	-	-		
Silver	15	µg/L	-	0.06	0.02	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-		
Sodium		µg/L	-	7490	4550	5330	-	-	-	-	-	-	-	-	-	-	-	-	-		
Sulphur		µg/L	-	8900	700	1400	-	-	-	-	-	-	-	-	-	-	-	-	-		
Tellurium		µg/L	-	50	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Tin		µg/L	-	0.03	0.01	0.03	-	-	-	-	-	-	-	-	-	-	-	-	-		
Titanium	1000	µg/L	-	2.07	3	6	-	-	-	-	-	-	-	-	-	-	-	-	-		
Uranium	85	µg/L	-	16.2	0.207	0.616	-	-	-	-	-	-	-	-	-	-	-	-	-		
Vanadium		µg/L	-	1840	0.89	29.9	-	-	-	-	-	-	-	-	-	-	-	-	-		
Zinc	1650	µg/L	-	4580	5.1	152	-	-	-	-	-	-	-	-	-	-	-	-	-		
Zirconium		µg/L	-	50	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-		

**Table D-2: Groundwater Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Parameter	CSR Aquatic Life Standard, Freshwater (AW-F)	Unit	Meziadin Landfill MW-1B																
			1997-04-01 MW-1B N MW-1B_1997-04-01_N	2003-07-01 MW-1B N MW-1B_2003-07-01_N	2004-01-01 MW-1B N MW-1B_2004-01-01_N	2006-01-01 MW-1B N MW-1B_2006-01-01_N	2015-05-03 MW-1B N MW-1B_2015-05-03_N	2015-09-09 MW-1B N MW-1B_2015-09-09_N	2016-05-03 MW-1B N MW-1B_2016-05-03_N	2016-09-13 MW-1B N MW-1B_2016-09-13_N	2017-04-01 MW-1B N MW-1B_2017-04-01_N	2017-08-01 MW-1B N MW-1B_2017-08-01_N	2018-05-17 MW-1B N L2097663-2	2018-10-17 MW-1B N L2183746-2	2019-05-07 MW-1B N L2269973-2	2019-11-14 DUP FD L2383402-7	2019-11-14 MW-1B N L2383402-2	2020-06-17 MW1B N VA20A8675-002	2020-10-15 MW1B N VA20B8400-002
Dissolved Metals																			
Aluminum		µg/L	200	4.2	3.8	3.6	9	< 5	9	5	7.4	7.5	20.9	118	25	17.3	19.7	14.5	15.2
Antimony	90	µg/L	200	0.885	0.143	0.191	0.2	0.1	0.2	0.5	0.27	0.33	< 0.10	0.11	< 0.20	< 0.10	< 0.10	0.17	0.23
Arsenic	50	µg/L	200	0.8	0.3	0.3	2.5	< 0.5	2.5	4.4	3.71	1.87	1.29	2.27	0.63	1.17	1.29	1.5	1.55
Barium	10000	µg/L	250	86.9	612	559	329	66	329	672	506	676	403	543	309	511	496	440	578
Beryllium	1.5	µg/L	5	0.02	0.02	0.02	< 0.1	< 0.1	< 0.1	< 0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.20	< 0.10	< 0.10	< 0.100	< 0.100
Bismuth		µg/L	100	0.02	0.02	0.02	-	-	-	-	< 0.10	< 0.10	< 0.050	< 0.050	< 0.10	< 0.050	< 0.050	< 0.050	< 0.050
Boron	12000	µg/L	100	72	8	8	37	12	37	60	32	18.4	< 10	< 10	< 20	< 10	< 10	10	< 10
Cadmium	2.5 - 4	µg/L	10	0.11	0.8	0.5	0.19	0.59	0.19	0.22	0.395	0.372	0.07	0.0567	0.079	0.0188	0.0249	0.0449	0.116
Cesium		µg/L	-	-	-	-	-	-	-	-	-	-	0.011	0.018	< 0.020	0.017	0.015	0.011	0.013
Chromium	10	µg/L	10	3	0.6	0.2	0.6	< 0.5	0.6	0.5	0.58	< 0.50	0.27	0.43	< 0.20	0.27	0.3	0.16	0.21
Cobalt	40	µg/L	10	3.9	13.9	11	3.38	0.8	3.38	7.75	11.7	13.4	11.7	14.2	9.32	16.3	16	9.01	14.8
Copper	50 - 90	µg/L	10	2.72	4.6	3.54	18.6	0.7	18.6	29.6	27.1	2.26	0.6	0.55	0.65	0.26	0.95	0.83	0.69
Iron		µg/L	100	5	5	5	12	17	12	< 10	< 10	13	2160	3270	789	1940	1990	2260	1990
Lead	60 - 110	µg/L	50	0.01	0.01	0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.10	< 0.20	0.084	0.107	< 0.10	< 0.050	< 0.050	0.057	< 0.050
Lithium		µg/L	50	3.21	3.79	3.28	10	4.2	10	7.9	6.1	4.03	3.3	3.5	2.9	3.4	3.4	3.4	3.8
Manganese		µg/L	940	16.9	9810	7630	2340	703	2340	5760	9410	8990	7620	10500	5870	10800	10800	5860	9570
Mercury	0.25	µg/L	-	-	0.05	0.05	< 0.02	< 0.02	< 0.02	-	< 0.02	< 0.010	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Molybdenum	10000	µg/L	30	31	0.65	0.36	0.4	0.4	0.4	0.8	0.72	0.95	0.337	0.367	0.16	0.306	0.313	0.316	0.916
Nickel	650 - 1500	µg/L	200	1.1	30.5	28.6	11.2	2.4	11.2	15.4	18.2	16.7	13.1	15.4	10.1	18.5	17.9	9.08	15.4
Rubidium		µg/L	-	-	-	-	-	-	-	-	-	-	0.53	0.71	0.56	0.84	0.74	0.55	0.66
Selenium	20	µg/L	200	20	0.4	0.6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	< 0.050	0.054	< 0.10	< 0.050	0.135	0.058	0.088
Silicon		µg/L	-	-	-	-	-	-	-	-	7000	7600	6940	7670	6530	7560	7600	7180	7860
Silver	15	µg/L	10	0.02	0.02	0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.050	< 0.050	< 0.010	< 0.010	< 0.020	< 0.010	< 0.010	< 0.010	< 0.010
Strontium		µg/L	260	473	425	365	-	-	-	-	342	400	338	380	276	373	366	359	460
Sulphur		µg/L	-	5806000	700	1100	-	-	-	-	< 3000	< 3000	2320	1960	2600	1400	1630	2850	2570
Tellurium		µg/L	-	50	50	-	-	-	-	-	< 0.20	< 0.50	< 0.20	< 0.20	< 0.40	< 0.20	< 0.20	< 0.20	< 0.20
Thallium	3	µg/L	100	0.06	0.026	0.019	< 0.02	< 0.02	< 0.02	< 0.02	< 0.020	< 0.020	0.011	< 0.010	< 0.020	0.026	0.023	0.012	0.02
Thorium		µg/L	-	-	-	-	-	-	-	-	< 0.10	< 0.10	< 0.10	< 0.10	< 0.20	< 0.10	< 0.10	< 0.10	< 0.10
Tin		µg/L	300	0.01	0.01	0.01	< 0.2	< 0.2	< 0.2	< 0.2	< 0.20	< 0.20	0.38	< 0.10	< 0.20	< 0.10	< 0.10	< 0.10	< 0.10
Titanium	1000	µg/L	-	3	3	3	< 5	< 5	< 5	< 5	< 5.0	< 5.0	0.99	< 3.0	< 0.60	< 0.30	0.3	< 0.30	< 0.30
Tungsten		µg/L	-	-	-	-	-	-	-	-	-	-	< 0.10	< 0.10	< 0.20	< 0.10	< 0.10	< 0.10	< 0.10
Uranium	85	µg/L	-	0.323	0.208	0.073	0.17	0.23	0.17	0.15	0.121	0.167	0.08	0.05	0.091	0.024	0.025	0.106	0.088
Vanadium		µg/L	< 300	1.91	0.78	0.47	1	< 1	1	< 1	< 1.0	1.1	< 0.50	0.64	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50
Zinc	900 - 1650	µg/L	36	0.7	4.6	2.7	13	5	13	71	79.3	8.5	4.9	4.3	6.1	5.7	7.3	3.3	5.4
Zirconium		µg/L	-	5	5	5	-	-	-	-	0.11	< 0.10	0.193	0.148	< 0.12	< 0.20	< 0.20	< 0.20	< 0.20

NOTES
 Italics indicate that the laboratory detection limit exceeds the applicable standard.
 Standards shown are from the BC Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 131/2020 and BC Reg. 161/2020, updated to 1 February 2021])

^a = pH dependent; ^b = hardness dependent; ^c = chloride dependent

^d = most conservative standards applied for chromium (between Cr(III) and Cr(VI))

QAQC = quality assurance/quality control; FD = field duplicate;

FDA = field duplicate available

**Table D-3: Groundwater Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Parameter	CSR Aquatic Life Standard, Freshwater (AW, E)	Unit	Meziadin Landfill																	
			MW-2																	
			1997-04-01	2003-07-01	2004-01-01	2006-01-01	2015-05-03	2015-09-09	2016-05-03	2017-04-01	2017-08-01	2018-05-17	2018-10-17	2018-10-17	2019-05-07	2019-05-07	2019-11-14	2020-06-17	2020-06-17	2020-10-15
			MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	DUP	MW-2	DUP	MW-2	MW-2	MW2	DUP
Sample Date	Sample Name	QAQC	Lab ID	Lab ID	Lab ID	Lab ID	Lab ID	Lab ID	Lab ID	Lab ID	Lab ID	Lab ID	Lab ID	Lab ID	Lab ID	Lab ID	Lab ID	Lab ID	Lab ID	
			MW-2_1997-04-01_N	MW-2_2003-07-01_N	MW-2_2004-01-01_N	MW-2_2006-01-01_N	MW-2_2015-05-03_N	MW-2_2015-09-09_N	MW-2_2016-05-03_N	MW-2_2017-04-01_N	MW-2_2017-08-01_N	L2097663-3	L2183746-7	L2183746-3	L2269973-7	L2269973-3	L2383402-3	VA20A8675-003	VA20A8675-006	VA20B8400-003
Field Measured																				
Depth to Water		m	-	-	-	-	-	-	-	-	-	1.52	-	3.04	-	1.5	1.56	2	-	1.73
pH			-	-	-	-	-	-	-	-	-	7.2	-	7.65	-	7.35	7.6	7.71	-	7.22
Conductivity		µS/cm	-	-	-	-	-	-	-	-	-	309.8	-	248.9	-	234.9	99.3	325	-	300
Specific conductivity		µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	415	-	444.1
Temperature		°C	-	-	-	-	-	-	-	-	-	6.9	-	6.9	-	4.6	4.6	8.1	-	8.8
Dissolved oxygen		mg/L	-	-	-	-	-	-	-	-	-	13.3	-	6.4	-	6.5	7.7	8.2	-	6.5
Redox potential		mV	-	-	-	-	-	-	-	-	-	406.5	-	404.6	-	410.7	314.3	297.4	-	263.2
Conventional Parameters																				
pH		-	7.9	8.2	8.1	8.2	7.8	8	7.8	7.6	7.8	-	8.37	8.36	8.3	8.18	8.25	8.22	8.18	8.26
Specific conductivity		µS/cm	520	389	488	512	505	496	505	457	491	369	458	450	414	309	251	462	462	477
Hardness, as CaCO3		mg/L	149	188	188	190	-	168	-	-	-	-	-	-	-	-	114	116	143	-
Hardness, as CaCO3 (Total)		mg/L	-	265	167	190	151	174	151	139	154	114	145	142	131	129	65.4	-	-	-
Total alkalinity, as CaCO3		mg/L	146	-	182	188	210	200	210	200	200	166	208	205	186	134	114	219	226	208
Total dissolved solids		mg/L	338	-	282	290	300	300	300	280	240	233	284	294	306	198	146	328	310	374
Total suspended solids		mg/L	-	3200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Major Ions																				
Bromide		mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Calcium		mg/L	60.2	40.6	52.2	53.9	39.7	46.8	39.7	37.2	40.6	31.3	38.9	37.9	35.4	34.7	18.2	30.4	31.2	38.9
Chloride	1500	mg/L	5.9	1	1.3	0.5	1	1.1	1	< 1	< 1	< 0.5	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	3.55	3.08	< 0.50
Fluoride	2 - 3	mg/L	0.19	-	-	-	-	0.14	-	0.15	0.15	0.136	0.183	0.181	0.165	0.117	0.138	0.186	0.175	0.191
Magnesium		mg/L	12.6	11.5	13.9	14	12.5	12.5	12.5	11.2	12.7	8.68	11.6	11.5	10.3	10.2	4.84	9.21	9.26	11.2
Potassium		mg/L	2	2	2	2	1.97	1.83	1.97	1.82	1.82	1.63	1.9	1.91	1.82	1.85	1.23	2.33	2.33	2.15
Sodium		mg/L	34	31.7	39.3	44.7	49.6	44.1	49.6	44	49.1	34	47.6	47.2	47	46.3	32	55.1	55.6	53.6
Sulphate	1280 - 4290	mg/L	103	47.1	76.6	85.7	58.6	66.2	58.6	55	50.4	42.7	48.5	48.5	44.1	32.7	22.4	42.5	40.9	40.9
Nutrients																				
Nitrate	400	mg-N/L	0.01	-	0.004	0.038	-	-	-	-	-	0.187	0.0085	0.0105	0.163	0.449	0.383	0.0894	0.111	< 0.0050
Nitrite	0.2 - 0.6	mg-N/L	0.01	-	0.002	0.004	-	-	-	-	-	0.0011	< 0.0010	< 0.0010	< 0.0010	0.0035	< 0.0010	0.0081	0.0024	< 0.0010
Nitrate + nitrite	400	mg-N/L	-	-	0.004	0.042	0.028	0.038	0.028	0.031	0.0149	0.188	0.0085	0.0105	0.163	0.453	0.383	-	-	-
Total ammonia	1.31 - 18.5	mg-N/L	-	0.005	0.068	0.043	< 0.03	< 0.03	< 0.03	< 0.03	0.04	< 0.005	0.0158	0.0216	0.034	0.0336	< 0.0050	0.0708	0.0712	0.62
Total Kjeldahl nitrogen		mg-N/L	-	-	0.19	0.1	0.14	0.08	0.14	0.109	0.325	0.083	0.06	0.082	0.552	0.445	0.172	1.61	1.54	1.95
Total phosphorus		mg-P/L	-	1.4	0.923	0.351	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved phosphorus		mg-P/L	0.3	0.1	0.1	0.1	-	-	-	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	0.061	0.063	0.065	0.052	0.054	0.075
Biochemical oxygen demand		mg/L	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical oxygen demand		mg/L	-	10	10	10	< 20	< 20	< 20	25	< 20	< 20	< 20	< 20	32	< 20	< 20	45	38	31
Total Metals																				
Aluminum		µg/L	-	7590	185	1990	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	90	µg/L	-	0.254	0.147	0.145	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	50	µg/L	-	2.5	0.6	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	10000	µg/L	-	277	87.2	120	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	1.5	µg/L	-	0.57	0.02	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bismuth		µg/L	-	0.03	0.04	0.02	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron	12000	µg/L	-	57	65	51	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	2.5 - 3.5	µg/L	-	3.39	0.3	0.76	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium		µg/L	-	53500	46600	56400	-	48600	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	10	µg/L	-	22.2	0.5	5.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	40	µg/L	-	18.6	0.597	4.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	60 - 80	µg/L	-	87.9	3.37	18.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron		µg/L	-	66600	181	3940	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	60	µg/L	-	10.5	0.18	2.62	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lithium		µg/L	-	12.2	2.2	4.98	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium		µg/L	-	31800	12400	15500	-	12700	-	-	-	-	-	-	-	-	-	-	-	-
Manganese		µg/L	-	1260	275	640	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	0.25	µg/L	-	-	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	10000	µg/L	-	9.51	9.4	10.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	1100 - 1500	µg/L	-	54.2	2.12	12.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium		µg/L	-	5000	2000	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	20	µg/L	-	4.3	0.4	0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	15	µg/L	-	0.06	0.02	0.04	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium		µg/L	-	30300	34200	44800	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium		µg/L	-	451	551	586	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphur		µg/L	-	16200	25400	29800	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tellurium		µg/L	-	50	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	3	µg/L	-	0.231	0.036	0.056	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin		µg/L	-	0.04	0.04	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	1000	µg/L	-	262	3	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	85	µg/L	-	1.92	1.98	2.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium		µg/L	-	29.9	1.93	6.72	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	900	µg/L	-	107	1.4	20.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zirconium		µg/L	-	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

**Table D-3: Groundwater Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Parameter	CSR Aquatic Life Standard, Freshwater (AW, F)	Unit	Meziadin Landfill																	
			MW-2																	
			1997-04-01	2003-07-01	2004-01-01	2006-01-01	2015-05-03	2015-09-09	2016-05-03	2017-04-01	2017-08-01	2018-05-17	2018-10-17	2018-10-17	2019-05-07	2019-05-07	2019-11-14	2020-06-17	2020-06-17	2020-10-15
Sample Date	Sample Name	QAQC	Lab ID	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	
Dissolved Metals																				
Aluminum		µg/L	200	4.7	2	4.3	< 5	< 5	< 5	< 5.0	< 5.0	2.6	1.7	1.5	13.8	19.1	5.8	9.5	11.3	5
Antimony	90	µg/L	200	0.02	0.127	0.096	0.2	0.1	0.2	0.1	< 0.20	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.12	0.12	< 0.10
Arsenic	50	µg/L	200	0.7	0.6	0.5	< 0.5	< 0.5	< 0.5	< 0.50	0.6	0.27	0.43	0.37	0.47	0.44	0.26	0.56	0.53	0.62
Barium	10000	µg/L	190	81.2	79.8	82.5	56	59	56	62.9	49.8	51.2	52.7	50.6	52.4	33.5	53.7	53.7	53.7	59.6
Beryllium	1.5	µg/L	5	0.02	0.02	0.02	< 0.1	< 0.1	< 0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.100	< 0.100	< 0.100
Bismuth		µg/L	100	0.02	0.02	0.02	-	-	-	< 0.10	< 0.10	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Boron	12000	µg/L	100	48	56	53	60	58	60	59	58.9	36	55	53	48	46	26	49	49	58
Cadmium	0.5 - 4	µg/L	10	0.44	0.25	0.21	0.17	0.21	0.17	0.494	0.192	0.493	0.171	0.157	0.756	1.11	1.25	0.247	0.256	< 0.0400
Cesium		µg/L	-	-	-	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Chromium	10	µg/L	10	1.5	0.2	0.2	1.2	< 0.5	1.2	< 0.50	< 0.50	0.35	< 0.10	< 0.10	< 0.10	0.17	0.16	0.15	0.16	< 0.10
Cobalt	40	µg/L	10	0.311	0.285	0.09	< 0.05	< 0.05	< 0.05	0.14	0.28	< 0.10	< 0.10	0.1	0.12	0.15	< 0.10	0.57	0.54	0.5
Copper	20 - 90	µg/L	10	2.6	1.4	0.78	0.8	0.5	0.8	5.58	< 0.40	0.92	< 0.20	< 0.20	0.62	0.7	1.46	1.94	1.88	0.39
Iron		µg/L	120	5	5	5	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	16	21	< 10	11	15	47
Lead	40 - 110	µg/L	50	0.01	0.01	0.01	< 0.1	< 0.1	< 0.1	< 0.10	< 0.20	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	0.147	0.127	< 0.050
Lithium		µg/L	10	1.58	1.97	2.4	3.5	2.8	3.5	2.3	2.96	2	2.7	2.6	2.5	2.4	1.5	2.6	2.8	2.8
Manganese		µg/L	709	239	258	198	1.1	0.6	1.1	51.7	162	10.8	76.3	82.1	130	144	10.9	344	336	263
Mercury	0.25	µg/L	-	-	0.05	0.05	< 0.02	< 0.02	< 0.02	< 0.02	< 0.010	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050
Molybdenum	10000	µg/L	30	9.14	9.71	11.4	16.1	15	16.1	13.5	17.5	10.3	19.7	19.8	19.5	18.2	15.1	23.6	23.4	20.8
Nickel	250 - 1500	µg/L	20	1.13	1.2	0.83	0.3	0.5	0.3	0.84	1.73	< 0.50	0.82	0.92	0.96	1.17	0.83	2.69	2.65	0.91
Rubidium		µg/L	-	-	-	-	-	-	-	-	-	0.25	0.23	0.22	0.24	0.23	< 0.20	0.64	0.56	0.35
Selenium	20	µg/L	200	2.9	0.4	0.4	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	0.088	< 0.050	< 0.050	0.069	0.054	0.158	0.135	0.144	0.198
Silicon		µg/L	-	-	-	-	-	-	-	4100	4000	4280	3960	3950	3980	4120	3800	3740	4310	
Silver	0.5 - 15	µg/L	10	0.02	0.02	0.02	< 0.05	< 0.05	< 0.05	< 0.050	< 0.050	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Strontium		µg/L	282	393	534	578	-	-	-	441	487	360	492	498	377	360	204	370	368	504
Sulphur		µg/L	-	16200	24500	29500	-	-	-	16000	18100	12900	15900	16400	14400	14400	6650	13200	12500	16100
Tellurium		µg/L	-	50	50	-	-	-	-	< 0.20	< 0.50	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Thallium	3	µg/L	100	0.065	0.03	0.022	< 0.02	< 0.02	< 0.02	< 0.020	< 0.020	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Thorium		µg/L	-	-	-	-	-	-	-	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Tin		µg/L	30	0.01	0.03	0.01	0.4	0.2	0.4	< 0.20	< 0.20	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.13	0.15	0.31	< 0.10
Titanium	1000	µg/L	10	3	3	3	< 5	< 5	< 5	< 5.0	< 5.0	< 0.30	< 0.30	< 0.30	0.6	0.92	0.41	< 0.30	0.32	< 0.30
Tungsten		µg/L	-	-	-	-	-	-	-	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Uranium	85	µg/L	-	1.66	1.88	2.15	2.52	2.16	2.52	1.81	2.25	1.27	1.97	1.9	2.04	1.9	1.23	2.24	2.15	1.96
Vanadium		µg/L	30	3.59	1.33	0.68	< 1	< 1	< 1	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Zinc	75 - 1650	µg/L	37	0.4	0.1	0.01	< 4	< 4	< 4	19.1	< 4.0	5.3	1.1	< 1.0	2.5	5.3	9.1	7.7	7.6	< 1.0
Zirconium		µg/L	-	5	5	5	-	-	-	< 0.10	< 0.10	< 0.060	< 0.060	< 0.060	0.067	< 0.060	< 0.20	< 0.20	< 0.20	< 0.20

NOTES
 Italics indicate that the laboratory detection limit exceeds the applicable Standards shown are from the BC Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 131/2020 and BC Reg. 161/2020, updated to 1 February 2021])
 a = pH dependent, b = hardness dependent, c = chloride dependent
 d = most conservative standards applied for chromium (between Cr(III) and QAQC = quality assurance/quality control; FD = field duplicate;

**Table D-4: Groundwater Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Parameter	Location Monitoring Well	Sample Date	Meziadin Landfill															
			MW-3															
			2003-07-01	2004-01-01	2006-01-01	2015-05-03	2015-09-09	2016-05-03	2016-09-13	2017-04-01	2017-08-01	2018-05-17	2018-10-17	2019-05-07	2019-11-14	2020-06-17	2020-10-15	2020-10-15
Sample Name	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	DUP	MW3		
QAQC	N	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	FDA		
Lab ID	MW-3_2003-07-01_N	MW-3_2004-01-01-N	MW-3_2006-01-01-N	MW-3_2015-05-03_N	MW-3_2015-09-09_N	MW-3_2016-05-03_N	MW-3_2016-09-13_N	MW-3_2017-04-01-N	MW-3_2017-08-01-N	L2097663-4	L2183746-4	L2269973-4	L2383402-4	VA20A8675-004	VA20B8400-007	VA20B8400-004		
Unit	CSR Aquatic Life Standard, Freshwater (AW-F)																	
Field Measured																		
Depth to Water	m	-	-	-	-	-	-	-	-	-	-	6.1	6.94	5.9	6.58	5.68	-	7.31
pH	-	-	-	-	-	-	-	-	-	-	-	7.19	7.5	7.59	7.54	7.53	-	7.31
Conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	421.7	391.7	402	406.1	450.6	-	427.1
Specific conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	653.1	-	657.7
Temperature	°C	-	-	-	-	-	-	-	-	-	-	6.6	6.1	5.3	6.7	5.6	-	5.9
Dissolved oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	11.2	7.6	5.6	4	6.4	-	4.6
Redox potential	mV	-	-	-	-	-	-	-	-	-	-	433.8	412.3	450.2	381.3	291.5	-	206.7
Conventional Parameters																		
pH	-	-	8.2	7.9	8	8	8	7.9	7.8	7.7	-	8.32	8.33	8.41	8.19	8.15	8.17	
Specific conductivity	µS/cm	-	785	766	676	680	676	669	640	647	612	628	649	643	660	709	700	
Hardness, as CaCO3	mg/L	-	288	300	-	218	-	-	-	-	-	-	-	-	212	220	216	
Hardness, as CaCO3 (Total)	mg/L	473	261	320	199	230	199	194	182	197	208	185	210	223	-	-	-	
Total alkalinity, as CaCO3	mg/L	-	197	201	190	190	190	190	190	180	193	195	193	203	212	193	192	
Total dissolved solids	mg/L	-	496	520	430	430	430	420	420	320	412	420	398	400	417	442	450	
WQTC03-Major Ions																		
Bromide	mg/L	-	0.1	0.1	-	-	-	-	-	-	-	-	-	< 0.050	< 0.050	< 0.250	< 0.050	< 0.050
Calcium	mg/L	-	86.7	89.7	58.1	65	58.1	55.7	53.3	57.1	62.3	53.4	61.8	67.3	62	65.2	64	
Chloride	mg/L	1500	1.5	1.1	1.2	1.2	1.2	1.2	1.1	< 1.0	0.76	< 2.5	0.57	0.93	< 2.50	< 0.50	< 0.50	
Fluoride	mg/L	3	-	-	-	< 0.10	-	-	0.1	0.1	0.095	< 0.10	0.085	0.087	< 0.100	0.078	0.08	
Magnesium	mg/L	-	17.3	17.7	13.2	13.6	13.2	13.4	11.8	13	12.7	12.5	13.5	13.2	13.9	13.9	13.8	
Potassium	mg/L	-	2	2	1.84	1.76	1.84	1.92	1.73	1.69	1.95	1.71	1.9	2.19	1.84	1.91	1.87	
Sodium	mg/L	-	64.9	69.2	63.3	65.3	63.3	65	60.5	66	63.5	57.4	65.1	61.4	63.5	67.9	66.4	
Sulphate	mg/L	4290	210	205	161	156	161	112	154	148	148	156	157	151	156	156	156	
Nutrients																		
Nitrate	mg-N/L	400	0.137	0.163	-	-	-	-	-	-	0.121	0.066	0.165	0.306	0.134	0.0365	0.0357	
Nitrite	mg-N/L	0.2 - 0.4	0.027	0.012	-	-	-	-	-	-	< 0.0010	< 0.0050	< 0.0010	0.0078	< 0.0050	< 0.0010	< 0.0010	
Nitrate + nitrite	mg-N/L	400	0.164	0.175	0.256	0.27	0.256	0.248	-	0.204	0.121	< 0.0710	0.165	0.314	-	-	-	
Total ammonia	mg-N/L	1.31 - 18.5	0.02	0.024	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	0.0164	0.026	< 0.0050	0.063	< 0.0050	0.0114	0.0166	
Total Kjeldahl nitrogen	mg-N/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	0.185	0.233	
Total phosphorus	mg-P/L	3.2	0.434	0.82	-	-	-	-	-	-	-	-	-	-	-	-	-	
Dissolved phosphorus	mg-P/L	-	0.1	0.1	-	-	-	-	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	0.065	< 0.050	< 0.050	< 0.050	
Biochemical oxygen demand	mg/L	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Chemical oxygen demand	mg/L	-	10	10	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	< 20	
Total Metals																		
Aluminum	µg/L	90	12600	43.6	6150	-	-	-	-	-	-	-	-	-	-	-	-	
Antimony	µg/L	50	0.221	0.127	0.328	-	-	-	-	-	-	-	-	-	-	-	-	
Arsenic	µg/L	10000	7.1	0.5	2.7	-	-	-	-	-	-	-	-	-	-	-	-	
Barium	µg/L	1.5	203	41.3	135	-	-	-	-	-	-	-	-	-	-	-	-	
Beryllium	µg/L	-	1.14	0.02	0.27	-	-	-	-	-	-	-	-	-	-	-	-	
Bismuth	µg/L	-	0.02	0.02	0.14	-	-	-	-	-	-	-	-	-	-	-	-	
Boron	µg/L	12000	75	72	65	-	-	-	-	-	-	-	-	-	-	-	-	
Cadmium	µg/L	4	10.6	0.14	0.81	-	-	-	-	-	-	-	-	-	-	-	-	
Calcium	µg/L	-	106000	78800	93500	-	69300	-	-	-	-	-	-	-	-	-	-	
Chromium	µg/L	-	35.3	0.2	16.3	-	-	-	-	-	-	-	-	-	-	-	-	
Cobalt	µg/L	40	31	0.207	9.6	-	-	-	-	-	-	-	-	-	-	-	-	
Copper	µg/L	90	150	0.92	21	-	-	-	-	-	-	-	-	-	-	-	-	
Iron	µg/L	-	129000	60	10000	-	-	-	-	-	-	-	-	-	-	-	-	
Lead	µg/L	110 - 160	21.8	0.1	4.85	-	-	-	-	-	-	-	-	-	-	-	-	
Lithium	µg/L	-	20.1	4.44	11.3	-	-	-	-	-	-	-	-	-	-	-	-	
Magnesium	µg/L	-	50700	15600	20900	-	13800	-	-	-	-	-	-	-	-	-	-	
Manganese	µg/L	-	2210	225	817	-	-	-	-	-	-	-	-	-	-	-	-	
Mercury	µg/L	0.25	-	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	
Molybdenum	µg/L	10000	2.17	5.74	6.32	-	-	-	-	-	-	-	-	-	-	-	-	
Nickel	µg/L	1500	86.6	0.74	27.2	-	-	-	-	-	-	-	-	-	-	-	-	
Potassium	µg/L	-	6000	2000	3000	-	-	-	-	-	-	-	-	-	-	-	-	
Selenium	µg/L	20	0.2	0.4	1.8	-	-	-	-	-	-	-	-	-	-	-	-	
Silver	µg/L	15	0.04	0.02	0.13	-	-	-	-	-	-	-	-	-	-	-	-	
Sodium	µg/L	-	60200	58900	68000	-	-	-	-	-	-	-	-	-	-	-	-	
Strontium	µg/L	-	646	720	784	-	-	-	-	-	-	-	-	-	-	-	-	
Sulphur	µg/L	-	59300	74700	73200	-	-	-	-	-	-	-	-	-	-	-	-	
Tellurium	µg/L	-	50	50	-	-	-	-	-	-	-	-	-	-	-	-	-	
Thallium	µg/L	3	0.335	0.023	0.097	-	-	-	-	-	-	-	-	-	-	-	-	
Tin	µg/L	-	0.38	0.01	0.23	-	-	-	-	-	-	-	-	-	-	-	-	
Titanium	µg/L	1000	498	3	5	-	-	-	-	-	-	-	-	-	-	-	-	
Uranium	µg/L	85	3.51	2.52	2.43	-	-	-	-	-	-	-	-	-	-	-	-	
Vanadium	µg/L	-	46.3	0.31	18.7	-	-	-	-	-	-	-	-	-	-	-	-	
Zinc	µg/L	1650 - 3150	202	0.1	44.6	-	-	-	-	-	-	-	-	-	-	-	-	
Zirconium	µg/L	-	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-	

**Table D-4: Groundwater Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Parameter	CSR Aquatic Life Standard, Freshwater (AW-E)	Unit	Location Monitoring Well	Meziadin Landfill MW-3																
			Sample Date	2003-07-01	2004-01-01	2006-01-01	2015-05-03	2015-09-09	2016-05-03	2016-09-13	2017-04-01	2017-08-01	2018-05-17	2018-10-17	2019-05-07	2019-11-14	2020-06-17	2020-10-15	2020-10-15	
			Sample Name	MW-3 N	MW-3 N	MW-3 N	MW-3 N	MW-3 N	MW-3 N	MW-3 N	MW-3 N	MW-3 N	MW-3 N	MW-3 N	MW-3 N	MW-3 N	MW-3 N	MW-3 N	DUP FD	MW-3 FDA
			Lab ID	MW-3_2003-07-01_N	MW-3_2004-01-01_N	MW-3_2006-01-01_N	MW-3_2015-05-03_N	MW-3_2015-09-09_N	MW-3_2016-05-03_N	MW-3_2016-09-13_N	MW-3_2017-04-01_N	MW-3_2017-08-01_N	L2097663-4	L2183746-4	L2269973-4	L2383402-4	VA20A8675-004	VA20B8400-007	VA20B8400-004	
Dissolved Metals																				
Aluminum		µg/L	-	2.4	4.4	< 5	12	< 5	7	< 5.0	< 5.0	4.3	2.1	2	5.3	96.7	10.4	10.5		
Antimony	90	µg/L	-	0.122	0.146	0.1	< 0.1	0.1	0.3	< 0.10	< 0.20	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Arsenic	50	µg/L	-	0.4	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	0.24	0.23	0.22	0.21	0.29	0.23	0.26		
Barium	10000	µg/L	-	37.7	32.1	30	25	30	81	80.5	28.6	29.6	27.5	28.8	30.1	30.4	30.2	33.1		
Beryllium	1.5	µg/L	-	0.02	0.02	< 0.1	< 0.1	< 0.1	< 0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.100	< 0.100	< 0.100		
Bismuth		µg/L	-	0.02	0.02	-	-	-	-	< 0.10	< 0.10	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050		
Boron	12000	µg/L	-	72	65	70	68	70	85	68	71.1	61	60	62	68	63	66	65		
Cadmium	3.5 - 4	µg/L	-	0.13	0.15	0.25	0.55	0.25	0.39	0.275	0.321	0.106	0.111	0.213	0.668	0.095	0.0225	0.0216		
Cesium		µg/L	-	-	-	-	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	0.012	< 0.010	< 0.010		
Chromium	10	µg/L	-	0.2	0.2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	< 0.10	< 0.10	< 0.10	< 0.10	0.27	< 0.10	< 0.10		
Cobalt	40	µg/L	-	0.118	0.113	< 0.05	< 0.05	< 0.05	< 0.05	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.27	< 0.10	< 0.10		
Copper	80 - 90	µg/L	-	0.98	0.18	0.8	0.9	0.8	28	11.1	0.46	0.65	0.34	0.55	1.88	1.18	0.29	2.98		
Iron		µg/L	-	5	5	< 10	< 10	< 10	< 10	< 10	< 10	< 10	17	< 10	< 10	178	19	24		
Lead	60 - 160	µg/L	-	0.01	0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.10	< 0.20	< 0.050	< 0.050	< 0.050	< 0.050	0.18	< 0.050	0.109		
Lithium		µg/L	-	4.28	4.81	5.4	4.8	5.4	6.5	4.33	5	4.5	4.3	4.5	4.8	4.7	4.6	4.6		
Manganese		µg/L	-	218	114	4.1	2.7	4.1	42.4	5.46	17.5	8.68	16.2	2.78	105	47.1	8.74	9.16		
Mercury	0.25	µg/L	-	0.05	0.05	< 0.02	< 0.02	< 0.02	-	< 0.02	< 0.010	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050		
Molybdenum	10000	µg/L	-	5.79	5.8	6.3	6.5	6.3	6.4	6.07	6.67	6.03	4.72	5.96	5.54	5.25	5.33	5.46		
Nickel	1500	µg/L	-	0.58	1.12	0.2	2.5	0.2	0.3	0.23	0.66	0.52	< 0.50	< 0.50	0.73	0.85	< 0.50	< 0.50		
Rubidium		µg/L	-	-	-	-	-	-	-	-	-	0.32	0.26	0.31	0.48	0.37	0.29	0.28		
Selenium	20	µg/L	-	0.4	0.6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	0.298	0.199	0.298	0.179	0.408	0.415	0.347		
Silicon		µg/L	-	-	-	-	-	-	-	3100	3400	3350	3220	3400	3420	3470	3800	3930		
Silver	15	µg/L	-	0.02	0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.050	< 0.050	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010		
Strontium		µg/L	-	732	774	-	-	-	-	516	543	598	567	542	659	610	661	684		
Sulphur		µg/L	-	71500	74800	-	-	-	-	45500	48600	49300	47700	50900	49700	52500	62400	63600		
Tellurium		µg/L	-	50	-	-	-	-	-	< 0.20	< 0.50	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20		
Thallium	3	µg/L	-	0.022	0.032	< 0.02	< 0.02	< 0.02	< 0.02	< 0.020	< 0.020	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010		
Thorium		µg/L	-	-	-	-	-	-	-	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Tin		µg/L	-	0.01	0.02	0.9	0.4	0.9	< 0.2	< 0.20	< 0.20	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Titanium	1000	µg/L	-	3	3	< 5	< 5	< 5	< 5	< 5.0	< 5.0	< 0.30	< 0.30	< 0.30	0.51	1.85	< 0.30	< 0.30		
Tungsten		µg/L	-	-	-	-	-	-	-	-	-	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10		
Uranium	85	µg/L	-	2.51	2.55	1.75	1.61	1.75	1.44	1.34	1.59	1.48	1.19	1.47	1.39	1.42	1.47	1.49		
Vanadium		µg/L	-	0.19	0.27	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50		
Zinc	900 - 2400	µg/L	-	0.1	0.1	< 4	5	< 4	13	14.9	< 4.0	1.5	2.1	1.2	9	2.5	< 1.0	1.7		
Zirconium		µg/L	-	5	5	-	-	-	-	< 0.10	< 0.10	< 0.060	< 0.060	< 0.060	< 0.20	< 0.20	< 0.20	< 0.20		

NOTES
 Italics indicate that the laboratory detection limit exceeds the applicable standard.
 Standards shown are from the BC Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 131/2020 and BC Reg. 161/2020, updated to 1 February 2021])

^a = pH dependent; ^b = hardness dependent; ^c = chloride dependent
^d = most conservative standards applied for chromium (between Cr(III) and Cr(VI))
 QAQC = quality assurance/quality control; FD = field duplicate;
 FDA = field duplicate available

**Table D-5: Groundwater Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Parameter	CSR Aquatic Life Standard, Freshwater (AW-F)	Unit	Meziadin Landfill															
			MW-4															
			1997-04-01	2003-07-01	2004-01-01	2006-01-01	2015-05-03	2015-09-09	2016-05-03	2016-09-13	2017-04-01	2017-05-01	2018-05-17	2018-10-17	2019-05-07	2019-11-14	2020-06-17	2020-10-15
Sample Name	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	MW4	MW4		
QAQC	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
Lab ID	MW-4_1997-04-01_N	MW-4_2003-07-01_N	MW-4_2004-01-01_N	MW-4_2006-01-01_N	MW-4_2015-05-03_N	MW-4_2015-09-09_N	MW-4_2016-05-03_N	MW-4_2016-09-13_N	MW-4_2017-04-01_N	MW-4_2017-05-01_N	L2097663-5	L2183746-5	L2269973-5	L2383402-5	VA20A8675-005	VA20B8400-005		
Ungrouped Analytes																		
Depth to Water		m	-	-	-	-	-	-	-	-	-	6	5.91	5	5.81	3.44	6.5	
WQTC01-Field Measured																		
pH		-	-	-	-	-	-	-	-	-	-	7.32	6.97	6.4	6.8	7.56	7.43	
Conductivity		µS/cm	-	-	-	-	-	-	-	-	-	430.8	428.7	409	410.7	412.7	395.5	
Specific conductivity		µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	620.3	605.7	-	
Temperature		°C	-	-	-	-	-	-	-	-	-	8.1	7.4	5.2	6.7	5.9	6.4	
Dissolved oxygen		mg/L	-	-	-	-	-	-	-	-	-	13.6	6.3	7.2	2.1	3.9	4.9	
Redox potential		mV	-	-	-	-	-	-	-	-	-	307.6	412.7	459	475.6	161	218.7	
WQTC02-Conventional Parameters																		
pH		-	7.9	8.1	7.9	8.2	7.9	8	7.9	7.8	7.8	-	8.33	8.29	8.26	8.16	8.18	
Specific conductivity		µS/cm	845	622	730	692	567	476	567	586	594	598	616	641	637	606	627	645
Hardness, as CaCO3		mg/L	323	227	289	250	-	199	-	-	-	-	-	-	-	199	201	
Hardness, as CaCO3 (Total)		mg/L	-	367	263	320	188	218	188	180	177	186	222	216	202	221	-	
Total alkalinity, as CaCO3		mg/L	-	-	216	214	180	190	180	180	180	173	191	187	192	196	175	
Total dissolved solids		mg/L	626	-	454	440	350	290	350	360	370	290	467	422	408	383	445	417
Total suspended solids		mg/L	-	1530	-	296	-	-	-	-	-	-	-	-	-	-	-	
WQTC03-Major Ions																		
Bromide		mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-	< 0.050	< 0.050	< 0.050	< 0.050
Calcium		mg/L	94.9	65.5	85	75.3	52.9	55.6	52.9	50.9	51.7	53.7	66	62.8	58.9	66.3	57.3	58.7
Chloride	1500	mg/L	5	0.7	0.9	0.5	1.3	< 1.0	1.3	1	1.2	1.1	< 0.50	< 2.5	< 0.050	< 0.50	< 0.50	< 0.50
Fluoride	3	mg/L	0.2	-	-	-	-	0.11	-	-	0.13	0.11	0.109	0.1	0.106	0.107	0.100	0.106
Magnesium		mg/L	21	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
Potassium		mg/L	5	3	3	2	2.38	2.2	2.38	2.26	2.31	2.27	2.41	2.24	2.28	2.53	2.28	2.32
Sodium		mg/L	74	49.9	55.8	58	43.5	24.5	43.5	51.2	54	57	58.4	56.5	56.9	56.5	59.3	57.8
Sulphate	3090 - 4290	mg/L	274	156	191	148	110	64	110	151	131	122	155	157	151	148	143	142
WQTC04-Nutrients and Chlorophyll a																		
Nitrate	400	mg-N/L	0.01	-	0.037	0.015	-	-	-	-	-	-	0.42	< 0.025	0.0819	0.0414	0.0443	0.0266
Nitrite	0.2 - 0.6	mg-N/L	0.01	-	0.002	0.002	-	-	-	-	-	-	< 0.0010	< 0.0050	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nitrate + nitrite	400	mg-N/L	-	-	0.037	0.017	0.153	0.378	0.153	0.114	0.03	0.0919	0.42	< 0.030	0.0819	0.0414	-	-
Total ammonia	1.31 - 18.5	mg-N/L	-	0.007	0.021	0.046	< 0.03	< 0.03	< 0.03	0.09	0.07	0.07	0.021	0.0412	0.012	< 0.0050	< 0.0050	0.0067
Total Kjeldahl nitrogen		mg-N/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
Total phosphorus		mg-P/L	-	1.8	0.865	0.97	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved phosphorus		mg-P/L	0.3	0.1	0.1	0.1	-	-	-	-	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	
Biochemical oxygen demand		mg/L	-	6	10	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical oxygen demand		mg/L	-	10	10	10	< 20	< 20	< 20	< 20	42	< 20	< 20	< 20	< 20	< 20	< 20	< 20
WQTC06-Total Metals																		
Aluminum		µg/L	-	10000	56.9	4010	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	90	µg/L	-	0.332	0.181	0.566	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	50	µg/L	-	4.8	0.3	3.2	-	-	-	-	-	-	-	-	-	-	-	-
Barium	10000	µg/L	-	219	32.8	157	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	1.5	µg/L	-	1	0.02	0.78	-	-	-	-	-	-	-	-	-	-	-	-
Bismuth		µg/L	-	0.02	0.02	0.02	-	-	-	-	-	-	-	-	-	-	-	-
Boron	12000	µg/L	-	77	78	71	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	4	µg/L	-	8.38	0.28	1.45	-	-	-	-	-	-	-	-	-	-	-	-
Calcium		µg/L	-	83800	77400	94800	-	62100	-	-	-	-	-	-	-	-	-	-
Chromium	10	µg/L	-	31.4	0.2	6.8	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	40	µg/L	-	23.3	0.216	17.5	-	-	-	-	-	-	-	-	-	-	-	-
Copper	90	µg/L	-	60.7	0.87	47.2	-	-	-	-	-	-	-	-	-	-	-	-
Iron		µg/L	-	74400	76	10300	-	-	-	-	-	-	-	-	-	-	-	-
Lead	110	µg/L	-	25.4	0.12	15.1	-	-	-	-	-	-	-	-	-	-	-	-
Lithium		µg/L	-	16.6	5.36	11.9	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium		µg/L	-	38300	17000	20100	-	15200	-	-	-	-	-	-	-	-	-	-
Manganese		µg/L	-	2890	142	2470	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	0.25	µg/L	-	-	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	10000	µg/L	-	11.8	9.34	10.6	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	1500	µg/L	-	67.2	1.18	31.8	-	-	-	-	-	-	-	-	-	-	-	-
Potassium		µg/L	-	6000	2000	3000	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	20	µg/L	-	0.7	0.3	0.8	-	-	-	-	-	-	-	-	-	-	-	-
Silver	15	µg/L	-	0.06	0.02	0.04	-	-	-	-	-	-	-	-	-	-	-	-
Sodium		µg/L	-	48900	52000	58500	-	-	-	-	-	-	-	-	-	-	-	-
Strontium		µg/L	-	686	796	840	-	-	-	-	-	-	-	-	-	-	-	-
Sulphur		µg/L	-	42300	60700	52400	-	-	-	-	-	-	-	-	-	-	-	-
Tellurium		µg/L	-	50	50	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	3	µg/L	-	0.065	0.01	0.054	-	-	-	-	-	-	-	-	-	-	-	-
Tin		µg/L	-	0.17	0.03	0.09	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	1000	µg/L	-	299	3	3	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	85	µg/L	-	1.42	1.41	1.63	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium		µg/L	-	28.2	0.37	10.6	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	1650	µg/L	-	143	0.7	83.7	-	-	-	-	-	-	-	-	-	-	-	-
Zirconium		µg/L	-	5	5	-	-	-	-	-	-	-	-	-	-	-	-	-

**Table D-5: Groundwater Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Parameter	CSR Aquatic Life Standard, Freshwater (AW-F)	Unit	Meziadin Landfill																
			MW-4																
			Location Monitoring Well	1997-04-01	2003-07-01	2004-01-01	2006-01-01	2015-05-03	2015-09-09	2016-05-03	2016-09-13	2017-04-01	2017-05-01	2018-05-17	2018-10-17	2019-05-07	2019-11-14	2020-06-17	2020-10-15
			Sample Date	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	MW4	MW4
			QAQC	N	N	N	N	N	N	N	N	N	N	N	N	N	N		
			Lab ID	MW-4_1997-04-01_N	MW-4_2003-07-01_N	MW-4_2004-01-01_N	MW-4_2006-01-01_N	MW-4_2015-05-03_N	MW-4_2015-09-09_N	MW-4_2016-05-03_N	MW-4_2016-09-13_N	MW-4_2017-04-01_N	MW-4_2017-05-01_N	L2097663-5	L2183746-5	L2269973-5	L2383402-5	VA20A8675-005	VA20B8400-005
WQTC07-Dissolved Metals																			
Aluminum		µg/L		200	3.9	1.6	5.1	< 5	< 5	< 5	< 5	5.3	< 5.0	5.8	1.3	1.7	< 1.0	3.6	644
Antimony	90	µg/L		200	0.29	0.178	0.343	0.1	0.1	0.1	0.3	0.27	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.16	0.25
Arsenic	50	µg/L		200	0.2	0.3	0.3	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	0.15	0.17	0.15	0.15	0.14	0.60
Barium	10000	µg/L		210	45.3	30.6	39.4	35	82	35	119	103	25.1	25.2	23.6	22.6	21.7	23.3	35.6
Beryllium	1.5	µg/L		5	0.02	0.02	0.02	< 0.1	< 0.1	< 0.1	< 0.1	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.100	< 0.100
Bismuth		µg/L		100	0.02	0.02	0.02	-	-	-	-	< 0.10	< 0.10	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050
Boron	12000	µg/L		100	64	72	58	64	46	64	79	80	76.3	66	69	64	74	66	72
Cadmium	3.5 - 4	µg/L		10	0.57	0.27	0.12	0.34	0.13	0.34	0.22	0.056	0.035	0.126	0.0858	0.398	0.032	0.0933	0.189
Cesium		µg/L		-	-	-	-	-	-	-	-	-	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	0.059
Chromium	10	µg/L		10	2.1	0.2	0.2	< 0.5	1.1	< 0.5	< 0.5	< 0.50	< 0.50	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	1.58
Cobalt	40	µg/L		10	0.005	0.123	0.005	< 0.05	< 0.05	< 0.05	0.17	0.3	0.15	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	1.05
Copper	80 - 90	µg/L		10	1.19	0.54	0.58	1	0.6	1	12.6	13.1	< 0.40	0.23	0.39	0.37	0.36	0.25	5.66
Iron		µg/L		40	5	5	5	< 10	< 10	< 10	< 10	< 10	< 10	40	15	< 10	< 10	15	1060
Lead	60 - 160	µg/L		50	0.01	0.01	0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.10	< 0.20	< 0.050	< 0.050	< 0.050	< 0.050	< 0.050	1.01
Lithium		µg/L		10	4.06	5.47	5.29	6.8	2.6	6.8	3.9	4.66	7.52	4.7	4.7	4.5	4.7	4.4	5.2
Manganese		µg/L		203	21.4	137	112	129	2	129	415	509	572	120	235	75.2	5.66	6.75	245
Mercury	0.25	µg/L		30	-	0.05	0.05	< 0.02	< 0.02	< 0.02	-	< 0.02	< 0.010	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	0.0086
Molybdenum	10000	µg/L		30	11	9.41	9.65	10.8	10.4	10.8	11.4	13.6	14	8.01	8.81	7.61	8.56	6.31	5.21
Nickel	1100 - 1500	µg/L		20	0.05	0.62	0.13	0.4	0.9	0.4	0.9	1.81	1.05	< 0.50	0.58	< 0.50	< 0.50	< 0.50	3.45
Rubidium		µg/L		-	-	-	-	-	-	-	-	-	-	0.43	0.33	0.43	0.39	0.31	0.56
Selenium	20	µg/L		-	-	-	-	< 0.5	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	0.28	0.261	0.197	0.269	0.293	0.300
Silicon		µg/L		200	600	0.6	0.6	-	-	-	-	3600	3700	3850	3830	3580	3850	3710	6830
Silver	15	µg/L		10	0.02	0.02	0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.050	< 0.050	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Strontium		µg/L		925	599	790	757	-	-	-	-	556	584	709	733	603	738	651	691
Sulphur		µg/L		100	43900	57000	52700	-	-	-	-	40400	42400	52800	54500	48800	49300	48500	56700
Tellurium		µg/L		-	50	50	-	-	-	-	-	< 0.20	< 0.50	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Thallium	3	µg/L		100	0.014	0.01	0.023	< 0.02	< 0.02	< 0.02	< 0.02	< 0.020	< 0.020	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010
Thorium		µg/L		-	-	-	-	-	-	-	-	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	0.17
Tin		µg/L		30	0.01	0.02	0.01	< 0.2	0.4	< 0.2	< 0.2	< 0.20	< 0.20	< 0.10	< 0.10	< 0.10	< 0.10	0.10	< 0.10
Titanium	1000	µg/L		10	3	3	3	< 5	< 5	< 5	< 5	< 5.0	< 5.0	< 0.30	< 0.30	< 0.30	< 0.30	< 0.30	12.8
Tungsten		µg/L		-	-	-	-	-	-	-	-	-	-	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Uranium	85	µg/L		-	1.16	1.44	1.45	0.89	0.49	0.89	0.81	0.972	1.02	0.952	0.858	1	0.978	0.938	0.960
Vanadium		µg/L		30	0.98	0.26	0.45	< 1	< 1	< 1	< 1	< 1.0	< 1.0	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	1.69
Zinc	900 - 2400	µg/L		38	0.8	0.1	0.1	< 4	5	< 4	25	26.4	< 4.0	1.6	< 1.0	< 1.0	< 1.0	1.0	7.5
Zirconium		µg/L		-	5	-	5	-	-	-	-	< 0.10	< 0.10	< 0.060	< 0.060	< 0.060	< 0.20	< 0.20	0.30

NOTES
 Italics indicate that the laboratory detection limit exceeds the applicable standard.
 Standards shown are from the BC Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 131/2020 and BC Reg. 161/2020, updated to 1 February 2021])
^a = pH dependent; ^b = hardness dependent; ^c = chloride dependent
^d = most conservative standards applied for chromium (between Cr(III) and Cr(VI))
 QAQC = quality assurance/quality control; FD = field duplicate;
 FDA = field duplicate available

**Table D-6: Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Parameter	CSR Aquatic Life Standard, Freshwater (AW-F)	Unit	Meziadin Landfill																									
			SW-3																									
			2002-06-01	2003-07-01	2004-07-01	2006-10-01	2007-07-01	2008-06-01	2009-09-01	2010-04-26	2010-09-28	2013-06-01	2013-09-25	2014-07-08	2014-10-07	2015-04-28	2015-09-09	2016-04-28	2016-09-13	2017-04-01	2017-08-01	2018-05-17	2018-10-17	2019-05-07	2019-11-14	2020-06-17	2020-10-15	
			Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name	Sample Name
Field Measured			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
pH		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Conductivity	µS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Temperature	°C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Dissolved oxygen	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Redox potential	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Conventional Parameters			8.37	6	7.9	7.9	7.66	7.5	6.5	6.8	6.7	6.9	7	7.2	7	7.4	6.7	7	6.7	7	-	8.2	7.7	7.7	8.06			
pH	-	-	303	261	255	186	177	221	103	109	500	402	454	510	485	780	515	339	505	629	507	456	429	445	564			
Specific conductivity	µS/cm	-	-	132	118	85	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Hardness, as CaCO3	mg/L	-	-	134	111	85	-	-	-	-	161	251	183	175	197	177	288	201	164	179	207	204	207	157	191			
Hardness, as CaCO3 (Total)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total alkalinity, as CaCO3	mg/L	-	-	-	80.9	61.7	74	96	32	173	230	208	205	237	193	320	220	180	220	240	230	215	192	198	195			
Total dissolved solids	mg/L	-	-	-	142	102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total suspended solids	mg/L	-	4	4	4	4	-	-	-	-	-	-	-	-	-	-	9.6	280	8.9	280	31	20.5	< 3.0	7.5	6.8			
Major Ions			-	0.1	0.1	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Bromide	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Calcium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Chloride	mg/L	1500	2.24	3	5.4	4	6.1	1.5	14.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Fluoride	mg/L	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Magnesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Potassium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Sodium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Sulphate	mg/L	1280 - 4290	60	50.4	37.1	24	17	13.5	15.8	3290	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Nutrients			-	-	0.002	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Nitrate	mg-N/L	400	-	-	0.002	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Nitrite	mg-N/L	0.6 - 2	-	-	0.002	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Nitrate + nitrite	mg-N/L	400	-	-	0.002	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Total ammonia	mg-N/L	1.31 - 18.5	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	0.15	2.15	5.45	1.1	1.65	2.84	1.74	3.09	1.15	2.13		
Total Kjeldahl nitrogen	mg-N/L	-	0.2	-	0.43	0.21	0.82	0.59	0.49	0.11	0.86	1.81	2.94	0.315	0.463	2	2.8	1.69	7.37	11.8	1.57	3.51	3.29	2.71	3.83	1.73	3.06	
Total phosphorus	mg-P/L	-	0.1	0.1	0.045	0.012	0.1	-	-	-	-	0.327	-	-	-	-	-	-	-	-	0.762	0.216	0.405	0.056	0.21	0.069	0.166	0.052
Dissolved phosphorus	mg-P/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Biochemical oxygen demand	mg/L	-	6	6	10	-	10	4.1	ND	13	ND	4.6	11	< 4	66	< 4.0	64	< 8.0	> 130	< 5.0	9.9	< 2.0	6.6	7.6	6.8	5.6		
Chemical oxygen demand	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	
Total Metals			30	11.4	10.3	32.5	20	11	67	73	19	16.3	15.9	88.4	13.4	917	10	1490	7	1160	18	59.5	12.9	48	199	350	39.2	
Aluminum	µg/L	90	50	0.07	0.073	0.05	1	ND	ND	-	-	-	0.068	< 0.5	< 0.5	2	< 0.1	0.8	0.3	0.63	< 0.20	0.17	0.14	< 0.20	0.17	< 0.10	0.2	
Antimony	µg/L	50	50	0.3	0.7	0.3	1	0.5	0.2	0.8	1.5	1.16	1.32	1.93	0.88	13.5	2.8	2.5	2.6	3.05	2.19	1.41	0.82	1.27	1.04	1.04	1.3	
Arsenic	µg/L	50	40	16.7	25	7.94	19	29	23	135	139	249	177	169	70.9	741	155	281	144	607	138	196	100	128	128	139	108	
Barium	µg/L	10000	0.2	0.02	0.02	0.02	2	ND	ND	-	-	-	< 0.01	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	
Beryllium	µg/L	1.5	50	0.02	0.03	0.02	50	ND	ND	131	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Bismuth	µg/L	12000	30	34	56	54	54	82	ND	0.27	60	89	117	116	165	317	184	250	220	320	218	155	200	124	226	150	296	
Boron	µg/L	0.5 - 4	2	0.02	0.01	0.1	8	0.06	0.08	-	0.4	0.012	0.015	0.021	0.024	0.22	0.02	0.24	0.01	0.14	0.012	< 0.0050	0.019	0.0707	0.0097	0.0222		
Cadmium	µg/L	-	48800	41200	32800	23800	22600	28600	14200	50600	79800	58200	56600	62400	53900	91200	63800	45600	59100	69500	61900	59700	52200	55100	50800	61000	54000	
Calcium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cesium	µg/L	-	5	0.5	0.2	0.2	5	ND	ND	-	-	-	< 0.5	< 1	< 1	12.2	1	5	< 0.5	5.44	< 0.50	1	0.19	0.55	0.85	0.6	0.43	
Chromium	µg/L	10	5	0.208	0.202	0.137	5	0.8	ND	2.6	1.6	0.99	0.767	1.2	0.97	6.3	0.62	3.6	0.44	5.59	0.72	1.22	0.24	0.99	0.75	0.62	0.33	
Cobalt	µg/L	40	5	1.11	0.57	0.35	0.9	1	1.7	1.7	1.8	0.32	0.53	1.75	10.5	8.2	0.3	9.8	0.4	6.96	< 0.40	< 0.50	< 0.50	< 1.0	1.08	0.88	< 0.50	
Copper	µg/L	20 - 90	31	44	61	101	283	166	127	3650	2020	4460	2550	5690	1110	91600	4730	15100	3540	26300	4590	4210	486	2460	2220	2030	364	
Iron	µg/L	40 - 110	30	0.01	0.01	0.05	5	ND	ND	0.2	-	-	< 0.05	< 0.2	0.22	0.6	< 0.1	1.3	< 0.1	0.94	< 0.20	0.336	0.063	< 0.10	0.221	0.104	< 0.050	
Lead	µg/L	-	-	0.64	0.68	0.82	-	ND	ND	-	-	-	1.09	< 5	< 5	3.9	1.1	3.6	1.3	3.06	1.32	1.5	< 1.0	< 2.0	2	< 1.0	2.9	
Lithium	µg/L	-	8210	7600	7110	6610	4270	4800	3500	8400	12400	9070	8060	10000	10400	14600	9980	10800	10400	12700	11800	10900	7580	10200	10300	10100	13500	
Magnesium	µg/L	-	402	139	134	160	790	1820	196	6730	7430	7960	5900	9320	1950	12400	8760	5640	8280	10300	8560	7910	3580	5860	5020	7940	3680	
Manganese	µg/L	0.25	0.05	-	0.05	0.05	0.01	0.02	ND	-	0.01	-	< 0.01	< 0.1	< 0.1	< 0.02	< 0.02	-	-	< 0.02	< 0.010	0.005	< 0.0050	< 0.0050	< 0.0050	< 0.0050	< 0.0050	
Mercury	µg/L	10000	5	0.71	0.78	0.35	5	ND	ND	-	1	-	0.865	1.1	< 1	1.6	1.4	0.6	0.8	1.56	0.83	0.83	2.34	0.07	0.24	0.363	0.256	
Molybdenum	µg/L	250 - 1500	8	0.76	1.36	0.81	8	2	4	0	4	2.1	2.16	3.1	3.8	16.7	2.4	10.2	2.5	13.1	2.39	3.17	2.78	2.8	3.28	2.08	2.93	
Nickel	µg/L	-	1000	2000	2000	1000	2000	1670	540	3280	1310	1330	2770	1770	4250	9790	3270	5170	3810	8030	2440	3850	4040	3510	6220	1960	9570	
Potassium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Rubidium	µg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	µg/L	20	30	0.2	0.2	0.2	1	0.2	ND	0.1	0.3	-	0.065	< 0.1	< 0.1	1.8	< 0.5	< 0.5	< 0.5	< 0.50	< 0.50	0.09	0.08</					

Table D-7: Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Table with columns for Location Monitoring Location Sample ID, Laboratory ID, Sample Date QAQC, Unit, BC WQG Aquatic Life - Freshwater (Chronic - Long-term average), BC WQG Aquatic Life - Freshwater (Short-term maximum), and 28 SW-3 samples. Rows include Field Measured (pH, Temperature, Dissolved oxygen, etc.), Conventional Parameters (Hardness, Alkalinity, etc.), Nutrients (Nitrate, Ammonia, etc.), Major Ions (Bromide, Calcium, etc.), and Total Metals (Aluminum, Arsenic, etc.).

**Table D-7: Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Location Monitoring Location Sample ID Laboratory ID Sample Date QAQC	Unit	BC WQG Aquatic Life - Freshwater (Chronic - Long- term average)	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Meziadin Landfill																						Lagoon Outlet	Lagoon Outlet	LAGOON OUTLET	LAGOON OUTLET				
				SW-3																													
				SW-3 3_M_2002-06-01 N	SW-3_2003-07-01 N	SW-3_2004-07-01 N	SW-3_2006-10-01 N	SW-3_2007-07-01 N	SW-3_2008-06-01 N	SW-3_2009-09-01 N	SW-3_2010-04-26 N	SW-3_2010-09-28 N	SW-3_2013-06-01 N	SW-3_2013-09-25 N	SW-3_2014-07-08 N	SW-3_2014-10-07 N	SW-3_2015-04-28 N	SW-3_2015-09-09 N	SW-3_2016-04-28 N	SW-3_2016-09-13 N	SW-3_2017-04-01 N	SW-3_2017-08-01 N	SW-3_2018-05-17	SW-3_2018-10-17	2019-05-07					2019-11-14	2020-06-17	2020-10-15	
Dissolved Metals																																	
Aluminum	mg/L	0.020 - 0.050 ^(a)	0.047 - 0.10 ^(a)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0083	0.0097	0.0083	0.012	0.043	0.0071	
Antimony	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00013	0.00013	<0.0002	0.00017	<0.0001	0.00015
Arsenic	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0013	0.00061	0.0012	0.00084	0.00096	0.0012
Barium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.16	0.097	0.11	0.12	0.15	0.11
Beryllium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001
Bismuth	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00005	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005
Boron	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.15	0.19	0.12	0.22	0.13	0.27
Cadmium	mg/L	0.00019 - 0.00046 ^(b)	0.00050 - 0.0017 ^(b)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000066	0.00060	0.00012	0.000086	<0.00005	<0.00005
Cesium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000011	0.00026	<0.00002	0.000013	<0.00001	0.00010
Chromium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00088	0.00011	0.00032	0.00027	0.00028	0.00038
Cobalt	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0012	0.00022	0.00090	0.00061	0.00032	0.00030
Copper	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	0.0014	<0.0004	0.00037	<0.0002	0.00026
Iron	mg/L	-	0.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	0.029	1.7	1.9	0.53	0.25
Lead	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00005	<0.00005	<0.0001	<0.00005	<0.00005	<0.00005
Lithium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0014	<0.001	<0.002	0.0018	0.0011	0.0027
Manganese	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.2	3.4	5.5	5.2	7.6	3.9
Mercury	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005	<0.000005
Molybdenum	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00077	0.0022	0.00063	0.00021	0.00025	0.00022
Nickel	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0031	0.0027	0.0027	0.0027	0.0013	0.0029
Rubidium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0017	0.0020	0.0015	0.0032	0.00069	0.0043
Selenium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0012	0.00076	<0.0001	0.00070	0.0078	0.0017
Silicon	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2	3.5	2.5	1.7	3.4	1.3
Silver	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00001	<0.00001	<0.00002	<0.00001	<0.00001	<0.00001
Strontium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.36	0.35	0.26	0.32	0.32	0.35
Sulphur	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	3.3	6.6	9.8	33	10
Tellurium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0002	<0.0002	<0.0004	<0.0002	<0.0002	<0.0002
Thallium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00001	<0.00001	<0.00002	<0.00001	<0.00001	<0.00001
Thorium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001
Tin	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0002	0.00011	<0.0001	<0.0001
Titanium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0003	<0.0003	<0.0006	0.00035	<0.0003	<0.0003
Tungsten	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0002	<0.0001	<0.0001	<0.0001
Uranium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000031	0.000041	0.000027	0.000019	0.000013	<0.00001
Vanadium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0005	<0.0005	<0.001	<0.0005	<0.0005	<0.0005
Zinc	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0013	0.0031	0.0023	0.0011	0.0012	0.0013
Zirconium	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00006	<0.00006	<0.00012	<0.0002	<0.0002	<0.0002

NOTES
 BCWQG AWF Long-term: BC Water Quality Guidelines for Freshwater Aquatic Life - Chronic
 BCWQG AWF Short-term: BC Water Quality Guidelines for Freshwater Aquatic Life - Short-term Maximum
 Italics indicate that the laboratory detection limit exceeds the applicable standard.
 British Columbia Approved and Working (or interim) Water Quality Guidelines (BC WQG), updated from time to time, for the protection of
 H = standard is hardness dependent; pH = standard is pH dependent; Cl = standard is chloride dependent; T = standard varies with
 V = Standard is valence dependent VI refers to chromium VI and III refers to chromium III; Ca = standard is calcium dependent
 * = for ammonia guideline, an average temperature of 10 degrees Celsius and a pH of 7.5 was chosen where no data was available
 MAC = Maximum Acceptable Concentration
 AO = Aesthetic Objective
 QAQC = Quality Assurance and Control; FDA = Field Duplicate Available; FD = Field Duplicate
^(a) = guideline is a minimum value, unless the background concentration or value is lower.
^(b) = guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (21 to 801 mg/L). The guideline is
^(c) = for some samples, water hardness was greater than 250 mg/L. At this hardness, no BC ENV water quality guideline has been established for sulphate;
^(d) = guideline is chloride dependent. The guideline range shown is based on the chloride concentration range observed in the dataset (0.1110 to 206.0000
^(e) = the ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.13 mg-N/L) is based on the
^(f) = the ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.69 mg-N/L) is based on the
^(g) = guideline is for chromium VI.
^(h) = Since 2019, the total copper guideline is calculated using a biolignat model. The model calculation is based on dissolved organic carbon and hardness. Because dissolved organic carbon was not collected and analyzed in 2020, the 2019 guideline calculation based on hardness only was utilized.

**Table D-8: Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Parameter	CSR Aquatic Life Standard, Freshwater (AW-F)	Unit	Meziadin Landfill SW2017-1			
			2017-05-01 SW2017-1 N SW2017-1_2017-05-01_N	2018-05-17 SW2017-1 N L2097662-1	2019-05-07 SW2017-01 N L2269974-1	2020-10-15 SW2017-01 DS N VA20B8397-001
Field Measured						
pH	-	-	-	5.83	5.73	7.71
Conductivity	-	µS/cm	-	17.5	8.7	30.5
Temperature	-	°C	-	10.1	5.3	4.4
Dissolved oxygen	-	mg/L	-	10.5	8.1	4.8
Redox potential	-	mV	-	400.1	449.9	248.1
Conventional Parameters						
pH	-	-	6.5	-	6.31	7.18
Specific conductivity	-	µS/cm	32.3	22.1	12.9	50.8
Hardness, as CaCO3	-	mg/L	-	-	-	20.2
Hardness, as CaCO3 (Total)	-	mg/L	11.6	10.8	5.37	20.5
Total alkalinity, as CaCO3	-	mg/L	12	8.7	4.2	15.2
Total suspended solids	-	mg/L	< 1	< 3.0	3.7	3.6
Major Ions						
Bromide	-	mg/L	-	-	< 0.050	< 0.050
Calcium	-	mg/L	-	3	1.42	5.63
Chloride	1500	mg/L	2.1	< 0.50	< 0.50	3.95
Fluoride	2	mg/L	-	0.021	0.02	< 0.020
Magnesium	-	mg/L	-	0.803	0.441	1.48
Potassium	-	mg/L	-	0.198	0.175	0.515
Sodium	-	mg/L	-	1.25	0.754	2.97
Sulphate	1280	mg/L	< 1	-	0.42	< 0.30
Nutrients						
Nitrate	400	mg-N/L	-	0.0615	< 0.0050	0.0727
Nitrite	0.2 - 0.6	mg-N/L	-	< 0.0010	< 0.0010	< 0.0010
Nitrate + nitrite	400	mg-N/L	-	0.0615	< 0.0051	-
Total ammonia	1.31 - 18.4	mg-N/L	< 0.03	0.0075	0.0077	0.0221
Total Kjeldahl nitrogen	-	mg-N/L	0.403	0.432	0.236	0.549
Total phosphorus	-	mg-P/L	< 0.050	< 0.050	< 0.050	< 0.050
Dissolved phosphorus	-	mg-P/L	-	< 0.050	< 0.050	< 0.050
Biochemical oxygen demand	-	mg/L	< 5	< 2.0	< 2.0	< 2.0
Chemical oxygen demand	-	mg/L	24	26	< 20	47
Total Metals						
Aluminum	-	µg/L	176	196	331	293
Antimony	90	µg/L	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	50	µg/L	< 0.50	0.15	0.12	0.21
Barium	10000	µg/L	9.6	9.49	8.94	18.4
Beryllium	1.5	µg/L	< 0.10	< 0.10	< 0.10	< 0.100
Bismuth	-	µg/L	< 0.10	< 0.050	< 0.050	< 0.050
Boron	12000	µg/L	17	< 10	< 10	< 10
Cadmium	0.5	µg/L	0.011	0.0118	0.0179	0.0371
Calcium	-	µg/L	3520	3080	1410	5800
Cesium	-	µg/L	-	< 0.010	< 0.010	< 0.010
Chromium	10	µg/L	< 0.50	0.43	0.63	0.56
Cobalt	40	µg/L	< 0.10	< 0.10	< 0.10	0.53
Copper	20	µg/L	0.87	0.73	1.12	0.78
Iron	-	µg/L	60	78	127	285
Lead	40	µg/L	< 0.10	< 0.050	< 0.050	0.085
Lithium	-	µg/L	< 0.10	< 1.0	< 1.0	< 1.0
Magnesium	-	µg/L	972	803	485	1460
Manganese	-	µg/L	1.78	14.5	6.91	207
Mercury	0.25	µg/L	-	0.0068	0.01	< 0.0050
Molybdenum	10000	µg/L	< 0.10	< 0.050	< 0.050	< 0.050
Nickel	250	µg/L	1.3	1.07	1.33	2.3
Potassium	-	µg/L	340	194	179	517
Rubidium	-	µg/L	-	< 0.20	0.22	0.43
Selenium	20	µg/L	< 0.50	0.06	0.115	0.085
Silicon	-	µg/L	1600	2040	2370	3270
Silver	0.5	µg/L	< 0.050	< 0.010	< 0.010	< 0.010
Sodium	-	µg/L	2250	1340	705	2900
Strontium	-	µg/L	22.6	21	9.88	38.3
Sulphur	-	µg/L	< 3000	< 500	< 500	< 500
Tellurium	-	µg/L	< 0.20	< 0.20	< 0.20	< 0.20
Thallium	3	µg/L	< 0.020	< 0.010	< 0.010	< 0.010
Thorium	-	µg/L	< 0.10	< 0.10	< 0.10	< 0.10
Tin	-	µg/L	< 0.20	< 0.10	< 0.10	< 0.10
Titanium	1000	µg/L	< 5.0	0.77	2.64	1.8
Tungsten	-	µg/L	-	< 0.10	< 0.10	< 0.10
Uranium	85	µg/L	< 0.020	< 0.010	< 0.010	< 0.010
Vanadium	-	µg/L	< 1.0	< 0.50	< 0.50	0.51
Zinc	75	µg/L	< 4.0	< 3.0	< 3.0	< 3.0
Zirconium	-	µg/L	0.2	0.21	0.337	0.24
Dissolved Metals						
Aluminum	-	µg/L	-	187	267	207
Antimony	90	µg/L	-	< 0.10	< 0.10	< 0.10
Arsenic	50	µg/L	-	0.14	0.12	0.17
Barium	10000	µg/L	-	9.28	8.44	14.9
Beryllium	1.5	µg/L	-	< 0.10	< 0.10	< 0.100
Bismuth	-	µg/L	-	< 0.050	< 0.050	< 0.050
Boron	12000	µg/L	-	< 10	< 10	< 10
Cadmium	0.5	µg/L	-	0.0066	0.0115	0.0115
Cesium	-	µg/L	-	< 0.010	< 0.010	< 0.010
Chromium	10	µg/L	-	0.39	0.42	0.47
Cobalt	40	µg/L	-	< 0.10	< 0.10	< 0.10
Copper	20	µg/L	-	0.67	1.02	0.64
Iron	-	µg/L	-	67	61	120
Lead	40	µg/L	-	< 0.050	< 0.050	< 0.050
Lithium	-	µg/L	-	< 1.0	< 1.0	< 1.0
Manganese	-	µg/L	-	2.58	2.75	3.9
Mercury	0.25	µg/L	-	< 0.0050	0.0076	< 0.0050
Molybdenum	10000	µg/L	-	< 0.050	< 0.050	< 0.050
Nickel	250	µg/L	-	1.1	1.09	1.96
Rubidium	-	µg/L	-	< 0.20	< 0.20	0.37
Selenium	20	µg/L	-	0.063	0.102	0.072
Silicon	-	µg/L	-	1890	2190	3430
Silver	0.5	µg/L	-	< 0.010	< 0.010	< 0.010
Strontium	-	µg/L	-	20.7	8.51	35.5
Sulphur	-	µg/L	-	< 500	< 500	< 500
Tellurium	-	µg/L	-	< 0.20	< 0.20	< 0.20
Thallium	3	µg/L	-	< 0.010	< 0.010	< 0.010
Thorium	-	µg/L	-	< 0.10	< 0.10	< 0.10
Tin	-	µg/L	-	< 0.10	< 0.10	< 0.10
Titanium	1000	µg/L	-	0.72	1.14	1.28
Tungsten	-	µg/L	-	< 0.10	< 0.10	< 0.10
Uranium	85	µg/L	-	< 0.010	< 0.010	< 0.010
Vanadium	-	µg/L	-	< 0.50	< 0.50	< 0.50
Zinc	75	µg/L	-	< 1.0	< 1.0	1.2
Zirconium	-	µg/L	-	0.216	0.309	0.38

NOTES
 Italics indicate that the laboratory detection limit exceeds the applicable standard.
 Standards shown are from the BC Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 131/2020 and BC Reg. 161/2020, updated to 1 February 2021])
 a = pH dependent; b = hardness dependent, c = chloride dependent
 d = most conservative standards applied for chromium (between Cr(III) and Cr(VI))
 QAQC = quality assurance/quality control; FD = field duplicate; FDA = field duplicate available

**Table D-9: Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Monitoring Location Sample ID Laboratory ID Sample Date QAQC	Location	Unit	BC WQG Aquatic Life - Freshwater (Chronic - Long- term average)	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Meziadin Landfill			
					SW2017-1			
					SW2017-1	SW2017-1	SW2017-01	SW2017-01 DS
					SW2017-1_2017-05-01_N	L2097662-1	L2269974-1	VA20B8397-001
Field Measured								
pH	-	6.5 - 9.0	6.5 - 9.0	-	5.8	5.7	7.7	
Temperature	°C	-	-	-	10	5.3	4.4	
Dissolved oxygen	mg/L	8.0	5.0	-	11	8.1	4.8	
Conductivity	µS/cm	-	-	-	18	8.7	31	
Redox potential	mV	-	-	-	400	450	248	
Conventional Parameters								
pH	-	6.5 - 9.0	6.5 - 9.0	6.5	-	6.3	7.2	
Specific conductivity	µS/cm	-	-	32.3	22.1	12.9	50.8	
Hardness, as CaCO ₃	mg/L	-	-	-	-	-	20	
Total alkalinity, as CaCO ₃	mg/L	20 ^(a)	-	12	8.7	4.2	15	
Total suspended solids	mg/L	-	-	<1.0	<3.0	3.7	3.6	
Hardness, as CaCO ₃ (Total)	mg/L	-	-	12	11	5.4	21	
Major Ions								
Bromide	mg/L	-	-	-	-	<0.05	<0.05	
Calcium	mg/L	-	-	-	3.0	1.4	5.6	
Chloride	mg/L	150	600	2.1	<0.5	<0.5	4.0	
Fluoride	mg/L	-	0.40 - 0.69 ^(b)	-	0.021	0.020	<0.02	
Magnesium	mg/L	-	-	-	0.80	0.44	1.5	
Potassium	mg/L	-	-	-	0.20	0.18	0.52	
Sodium	mg/L	-	-	-	1.3	0.75	3.0	
Sulphate	mg/L	128 ^(b)	-	<1.0	-	0.42	<0.3	
Nutrients								
Nitrate	mg-N/L	3.0	33	-	0.062	<0.005	0.073	
Nitrite	mg-N/L	0.020 - 0.040 ^(c)	0.060 - 0.12 ^(c)	-	<0.001	<0.001	<0.001	
Nitrate + nitrite	mg-N/L	-	-	-	0.062	<0.0051	-	
Total ammonia	mg-N/L	1.8 - 2.0 ^(d)	10 - 27 ^(e)	<0.03	0.0075	0.0077	0.022	
Total Kjeldahl nitrogen	mg-N/L	-	-	0.40	0.43	0.24	0.55	
Total nitrogen (calculated)	mg-N/L	-	-	-	0.49	0.24	-	
Total phosphorus	mg-P/L	-	-	<0.05	<0.05	<0.05	<0.05	
Dissolved phosphorus	mg-P/L	-	-	-	<0.05	<0.05	<0.05	
Biochemical oxygen demand	mg/L	-	-	<5.0	<2.0	<2.0	<2.0	
Chemical oxygen demand	mg/L	-	-	24	26	<20	47	
Total Metals								
Aluminum	mg/L	-	-	0.18	0.20	0.33	0.29	
Antimony	mg/L	0.0090	-	<0.0001	<0.0001	<0.0001	<0.0001	
Arsenic	mg/L	-	0.0050	<0.0005	0.00015	0.00012	0.00021	
Barium	mg/L	1.0	-	0.0096	0.0095	0.0089	0.018	
Beryllium	mg/L	0.00013	-	<0.0001	<0.0001	<0.0001	<0.0001	
Bismuth	mg/L	-	-	<0.0001	<0.00005	<0.00005	<0.00005	
Boron	mg/L	1.2	-	0.017	<0.01	<0.01	<0.01	
Cadmium	mg/L	-	-	0.000011	0.000012	0.000018	0.000037	
Calcium	mg/L	-	-	3.5	3.1	1.4	5.8	
Cesium	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	
Chromium	mg/L	0.0010 ^(f)	-	<0.0005	0.00043	0.00063	0.00056	
Cobalt	mg/L	0.0040	0.11	<0.0001	<0.0001	<0.0001	0.00053	
Copper	mg/L	see note (h)	see note (h)	0.00087	0.00073	0.0011	0.00078	
Iron	mg/L	-	1.0	0.060	0.078	0.13	0.29	
Lead	mg/L	0.0037 ^(b)	0.0030 - 0.011 ^(b)	<0.0001	<0.00005	<0.00005	0.000085	
Lithium	mg/L	-	-	<0.0001	<0.001	<0.001	<0.001	
Magnesium	mg/L	-	-	0.97	0.80	0.49	1.5	
Manganese	mg/L	0.8 - 1.9	-	0.0018	0.015	0.0069	0.21	
Mercury	mg/L	0.000010	-	-	0.0000068	0.000010	<0.000005	
Molybdenum	mg/L	1.0	2.0	<0.0001	<0.00005	<0.00005	<0.00005	
Nickel	mg/L	0.025 ^(b)	-	0.0013	0.0011	0.0013	0.0023	
Potassium	mg/L	-	-	0.34	0.19	0.18	0.52	
Rubidium	mg/L	-	-	-	<0.0002	0.00022	0.00043	
Selenium	mg/L	0.0020	-	<0.0005	0.000060	0.00012	0.000085	
Silicon	mg/L	-	-	1.6	2.0	2.4	3.3	
Silver	mg/L	0.000050 ^(b)	0.00010 ^(b)	<0.00005	<0.00001	<0.00001	<0.00001	
Sodium	mg/L	-	-	2.3	1.3	0.71	2.9	
Strontium	mg/L	-	-	0.023	0.021	0.0099	0.038	
Sulphur	mg/L	-	-	<3.0	<0.5	<0.5	<0.5	
Tellurium	mg/L	-	-	<0.0002	<0.0002	<0.0002	<0.0002	
Thallium	mg/L	0.00080	-	<0.0002	<0.0001	<0.0001	<0.0001	
Thorium	mg/L	-	-	<0.0001	<0.0001	<0.0001	<0.0001	
Tin	mg/L	-	-	<0.0002	<0.0001	<0.0001	<0.0001	
Titanium	mg/L	-	-	<0.005	0.00077	0.0026	0.0018	
Tungsten	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	
Uranium	mg/L	0.0085	-	<0.00002	<0.00001	<0.00001	<0.00001	
Vanadium	mg/L	-	-	<0.001	<0.0005	<0.0005	0.00051	
Zinc	mg/L	0.0075	0.033	<0.004	<0.003	<0.003	<0.003	
Zirconium	mg/L	-	-	0.00020	0.00021	0.00034	0.00024	
Dissolved Metals								
Aluminum	mg/L	0.014 - 0.050 ⁽ⁱ⁾	0.036 - 0.10 ⁽ⁱ⁾	-	0.19	0.27	0.21	
Antimony	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	
Arsenic	mg/L	-	-	-	0.00014	0.00012	0.00017	
Barium	mg/L	-	-	-	0.0093	0.0084	0.015	
Beryllium	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	
Boron	mg/L	-	-	-	<0.01	<0.01	<0.01	
Cadmium	mg/L	0.000025 - 0.000065 ^(b)	0.000038 - 0.00011 ^(b)	-	0.000066	0.000012	0.000012	
Cesium	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	
Chromium	mg/L	-	-	-	0.00039	0.00042	0.00047	
Cobalt	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	
Copper	mg/L	-	-	-	0.00067	0.0010	0.00064	
Iron	mg/L	-	0.35	-	0.067	0.061	0.12	
Lead	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	
Lithium	mg/L	-	-	-	<0.001	<0.001	<0.001	
Manganese	mg/L	-	-	-	0.0026	0.0028	0.0039	
Mercury	mg/L	-	-	-	<0.000005	0.0000076	<0.000005	
Molybdenum	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	
Nickel	mg/L	-	-	-	0.0011	0.0011	0.0020	
Rubidium	mg/L	-	-	-	<0.0002	<0.0002	0.00037	
Selenium	mg/L	-	-	-	0.00063	0.00010	0.000072	
Silicon	mg/L	-	-	-	1.9	2.2	3.4	
Silver	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	
Strontium	mg/L	-	-	-	0.021	0.0085	0.036	
Sulphur	mg/L	-	-	-	<0.5	<0.5	<0.5	
Tellurium	mg/L	-	-	-	<0.0002	<0.0002	<0.0002	
Thallium	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	
Thorium	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	
Titanium	mg/L	-	-	-	0.00072	0.0011	0.0013	
Tungsten	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	
Uranium	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	
Vanadium	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	
Zinc	mg/L	-	-	-	<0.001	<0.001	0.0012	
Zirconium	mg/L	-	-	-	0.00022	0.00031	0.00038	

NOTES
 BCWQG AWF Long-term BC Water Quality Guidelines for Freshwater Aquatic Life - Chronic Long-term Average
 BCWQG AWF Short-term BC Water Quality Guidelines for Freshwater Aquatic Life - Short-term Maximum
 Italics indicate that the laboratory detection limit exceeds the applicable standard.
 British Columbia Approved and Working (or interim) Water Quality Guidelines (BC WQG), updated from time to time, for the protection of freshwater aquatic life (AWF-F).
 H = standard is hardness dependent; pH = standard is pH dependent; Cl = standard is chloride dependent; T = standard varies with temperature
 V = Standard is valence dependent VI refers to chromium VI and III refers to chromium III; Ca = standard is calcium dependent
 * = for ammonia guideline, an average temperature of 10 degrees Celsius and a pH of 7.5 was chosen where no data was available
 MAC = Maximum Acceptable Concentration
 AO = Aesthetic Objective
 QAQC = Quality Assurance and Control; FDA = Field Duplicate Available; FD = Field Duplicate
^(a) = guideline is a minimum value, unless the background concentration or value is lower.
^(b) = guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (21 to 801 mg/L). The guideline is calculated based on the individual hardness value for each sample.
^(c) = for some samples, water hardness was greater than 250 mg/L. At this hardness, no BC ENV water quality guideline has been established for sulphate; however, the observed data were screened against the guideline for very hard water (i.e., 429 mg/L) for comparative purposes.
^(d) = guideline is chloride dependent. The guideline range shown is based on the chloride concentration range observed in the dataset (0.1110 to 206.0000 mg/L). The guideline is calculated based on the individual chloride concentration in each sample.
^(e) = the ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.13 mg-N/L) is based on the combination of field pH (10.2) and water temperature (13.3°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample.
^(f) = the ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.69 mg-N/L) is based on the combination of field pH (10.2) and water temperature (13.3°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample.
^(g) = guideline is for chromium VI.
^(h) = Since 2019, the total copper guideline is calculated using a bioligand model. The model calculation is based on dissolved organic carbon and hardness. Because dissolved organic carbon was not collected and analyzed in 2020, the 2019 guideline calculation based on hardness only was utilized.

**Table D-10: Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Parameter	CSR Aquatic Life Standard, Freshwater (AW-F)	Unit	Meziadin Landfill				
			Location Site Name	Sample Date	Sample Name	QAQC	Lab ID
			2017-05-01	2018-05-17	2018-05-17	2019-05-07	2020-10-15
			SW2017-2	DUP	SW2017-2	SW2017-02	SW2017-02 US
			N	FD	N	N	N
			SW2017-2_2017-05-01_N	L2097662-4	L2097662-2	L2269974-2	VA20B8397-002
Field Measured							
pH		-	-	-	5.42	7.32	6.7
Conductivity		µS/cm	-	-	160	20.1	15.2
Temperature		°C	-	-	8	8.8	6
Dissolved oxygen		mg/L	-	-	13.4	9.1	2.4
Redox potential		mV	-	-	444.6	400.8	230.5
Conventional Parameters							
pH		-	6	-	-	6.75	6.54
Specific conductivity		µS/cm	15.8	12.3	12.7	25.4	19.1
Hardness, as CaCO3		mg/L	-	-	-	-	7.92
Hardness, as CaCO3 (Total)		mg/L	8.93	6.05	5.87	11.3	8.18
Total alkalinity, as CaCO3		mg/L	6	4.7	4.8	8.7	5.9
Total suspended solids		mg/L	61	137	38.3	< 3.0	12
Major Ions							
Bromide		mg/L	-	-	-	< 0.050	< 0.050
Calcium		mg/L	-	1.54	1.5	3.19	2.1
Chloride	1500	mg/L	< 1.0	< 0.50	< 0.50	0.67	< 0.50
Fluoride	2	mg/L	-	0.023	0.02	0.02	< 0.020
Magnesium		mg/L	-	0.535	0.518	0.804	0.647
Potassium		mg/L	-	0.245	0.224	0.23	0.223
Sodium		mg/L	-	0.809	0.788	1.38	0.942
Sulphate	1280	mg/L	< 1.0	-	-	0.99	< 0.30
Nutrients							
Nitrate	400	mg-N/L	-	< 0.0050	< 0.0050	0.055	< 0.0050
Nitrite	0.2	mg-N/L	-	< 0.0010	< 0.0010	< 0.0010	< 0.0010
Nitrate + nitrite	400	mg-N/L	-	< 0.0051	< 0.0051	0.055	-
Total ammonia	1.31 - 18.5	mg-N/L	< 0.03	0.0055	0.0069	0.0095	0.008
Total Kjeldahl nitrogen		mg-N/L	0.353	0.304	0.269	0.389	0.402
Total phosphorus		mg-P/L	< 0.050	0.105	0.056	< 0.050	< 0.050
Dissolved phosphorus		mg-P/L	-	< 0.050	< 0.050	< 0.050	< 0.050
Biochemical oxygen demand		mg/L	< 5.0	< 2.0	< 2.0	< 2.0	< 2.0
Chemical oxygen demand		mg/L	26	22	21	28	46
Total Metals							
Aluminum		µg/L	1130	1800	679	189	348
Antimony	90	µg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	50	µg/L	< 0.50	0.37	0.21	0.12	0.16
Barium	10000	µg/L	16.4	26.8	15.8	8.78	10.8
Beryllium	1.5	µg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.100
Bismuth		µg/L	< 0.10	< 0.050	< 0.050	< 0.050	< 0.050
Boron	12000	µg/L	5	< 10	< 10	< 10	< 10
Cadmium	0.5	µg/L	0.027	0.0642	0.0328	0.0584	0.0266
Calcium		µg/L	2060	1720	1610	3070	2200
Cesium		µg/L	-	0.092	0.02	< 0.010	< 0.010
Chromium	10	µg/L	2.79	3.59	1.13	0.35	0.6
Cobalt	40	µg/L	0.42	0.76	0.48	< 0.10	0.19
Copper	20	µg/L	2.63	3.53	1.88	0.86	1.04
Iron		µg/L	1130	1690	411	56	133
Lead	40	µg/L	0.18	0.347	0.154	< 0.050	< 0.050
Lithium		µg/L	0.75	1.3	< 1.0	< 1.0	< 1.0
Magnesium		µg/L	919	1010	618	< 795	652
Manganese		µg/L	42.3	115	63.4	5.15	57.8
Mercury	0.25	µg/L	-	0.0151	0.0103	0.0085	< 0.0050
Molybdenum	10000	µg/L	< 0.10	0.071	< 0.050	< 0.050	< 0.050
Nickel	250	µg/L	4.34	5.48	2.18	1.06	1.94
Potassium		µg/L	290	322	240	215	235
Rubidium		µg/L	-	1.11	0.42	< 0.20	0.33
Selenium	20	µg/L	< 0.50	0.152	0.084	0.066	0.102
Silicon		µg/L	3700	4290	3040	1930	3210
Silver	0.5	µg/L	< 0.050	0.037	0.015	< 0.010	0.011
Sodium		µg/L	850	862	816	1270	881
Strontium		µg/L	12.5	14.6	13	20.2	15.4
Sulphur		µg/L	< 3000	< 500	< 500	530	< 500
Tellurium		µg/L	< 0.20	< 0.20	< 0.20	< 0.20	< 0.20
Thallium	3	µg/L	< 0.020	0.012	< 0.010	< 0.010	< 0.010
Thorium		µg/L	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Tin		µg/L	< 0.20	< 0.10	< 0.10	< 0.10	< 0.10
Titanium	1000	µg/L	19.2	23.9	5.84	0.79	1.64
Tungsten		µg/L	-	< 0.10	< 0.10	< 0.10	< 0.10
Uranium	85	µg/L	0.023	0.029	0.015	< 0.010	< 0.010
Vanadium		µg/L	2	3.08	0.84	< 0.50	< 0.50
Zinc	75	µg/L	< 4.0	6.1	< 3.0	< 3.0	< 3.0
Zirconium		µg/L	0.45	0.348	0.287	0.21	0.34

**Table D-10: Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Parameter	CSR Aquatic Life Standard, Freshwater (AW-F)	Unit	Meziadin Landfill				
			Location Site Name	Sample Date	Sample Name	QAQC	Lab ID
			2017-05-01	2018-05-17	2018-05-17	2019-05-07	2020-10-15
			SW2017-2	DUP	SW2017-2	SW2017-02	SW2017-02 US
			N	FD	N	N	N
			SW2017-2_2017-05-01_N	L2097662-4	L2097662-2	L2269974-2	VA20B8397-002
Dissolved Metals							
Aluminum		µg/L	-	274	263	203	330
Antimony	90	µg/L	-	< 0.10	< 0.10	< 0.10	< 0.10
Arsenic	50	µg/L	-	0.12	0.11	0.12	0.19
Barium	10000	µg/L	-	9.6	9.7	9.39	10.4
Beryllium	1.5	µg/L	-	< 0.10	< 0.10	< 0.10	< 0.100
Bismuth		µg/L	-	< 0.050	< 0.050	< 0.050	< 0.050
Boron	12000	µg/L	-	< 10	< 10	< 10	< 10
Cadmium	0.5	µg/L	-	0.0139	0.014	0.0474	0.0262
Cesium		µg/L	-	< 0.010	< 0.010	< 0.010	< 0.010
Chromium	10	µg/L	-	0.42	0.47	0.36	0.63
Cobalt	40	µg/L	-	< 0.10	< 0.10	< 0.10	0.16
Copper	20	µg/L	-	1.09	1.09	0.89	1.06
Iron		µg/L	-	68	71	59	96
Lead	40	µg/L	-	< 0.050	< 0.050	< 0.050	< 0.050
Lithium		µg/L	-	< 1.0	< 1.0	< 1.0	< 1.0
Manganese		µg/L	-	12.5	11.5	2.44	56
Mercury	0.25	µg/L	-	0.0052	0.0054	< 0.0050	< 0.0050
Molybdenum	10000	µg/L	-	< 0.050	< 0.050	< 0.050	< 0.050
Nickel	250	µg/L	-	1.1	1.16	1.13	1.86
Rubidium		µg/L	-	0.2	< 0.20	< 0.20	0.33
Selenium	20	µg/L	-	0.113	0.063	0.08	0.128
Silicon		µg/L	-	2490	2570	1890	3310
Silver	0.5	µg/L	-	< 0.010	< 0.010	< 0.010	0.012
Strontium		µg/L	-	11.3	11	18.7	14.3
Sulphur		µg/L	-	< 500	< 500	< 500	< 500
Tellurium		µg/L	-	< 0.20	< 0.20	< 0.20	< 0.20
Thallium	3	µg/L	-	< 0.010	< 0.010	< 0.010	< 0.010
Thorium		µg/L	-	< 0.10	< 0.10	< 0.10	< 0.10
Tin		µg/L	-	< 0.10	< 0.10	< 0.10	< 0.10
Titanium	1000	µg/L	-	1.33	1.25	0.79	1.49
Tungsten		µg/L	-	< 0.10	< 0.10	< 0.10	< 0.10
Uranium	85	µg/L	-	< 0.010	< 0.010	< 0.010	< 0.010
Vanadium		µg/L	-	< 0.50	< 0.50	< 0.50	< 0.50
Zinc	75	µg/L	-	< 1.0	1	< 1.0	1.9
Zirconium		µg/L	-	0.296	0.261	0.252	0.43

NOTES

Italics indicate that the laboratory detection limit exceeds the applicable standard.

Standards shown are from the BC Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 131/2020 and BC Reg. 161/2020, updated to 1 February 2021])

^a = pH dependent; ^b = hardness dependent, ^c = chloride dependent

^d = most conservative standards applied for chromium (between Cr(III) and Cr(VI))

QAQC = quality assurance/quality control; FD = field duplicate; FDA = field duplicate available

**Table D-11: Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Field Measured	Unit	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Meziadin Landfill				
				SW2017-2 2017-05-01	DUP 2018-05-17	SW2017-2 2018-05-17	SW2017-02 2019-05-07	SW2017-02 US 2020-10-15
Field Measured								
pH	-	6.5 - 9.0	6.5 - 9.0	-	-	5.4	7.3	6.7
Temperature	°C	-	-	-	-	8.0	8.8	6.0
Dissolved oxygen	mg/L	8.0	5.0	-	-	13	9.1	2.4
Conductivity	µS/cm	-	-	-	-	160	20	15
Redox potential	mV	-	-	-	-	445	401	231
Conventional Parameters								
pH	-	6.5 - 9.0	6.5 - 9.0	6	-	-	6.8	6.5
Specific conductivity	µS/cm	-	-	16	12	13	25	19
Hardness, as CaCO ₃	mg/L	-	-	-	-	-	-	7.9
Total alkalinity, as CaCO ₃	mg/L	20 ^(a)	-	6	4.7	4.8	8.7	5.9
Total suspended solids	mg/L	-	-	61	137	38	<3.0	12
Hardness, as CaCO ₃ (Total)	mg/L	-	-	8.9	6.1	5.9	11	8.2
Major Ions								
Bromide	mg/L	-	-	-	-	-	<0.05	<0.05
Calcium	mg/L	-	-	-	1.5	1.5	3.2	2.1
Chloride	mg/L	150	600	<1.0	<0.5	<0.5	0.67	<0.5
Fluoride	mg/L	-	0.40 ^(b)	-	0.023	0.020	0.020	<0.02
Magnesium	mg/L	-	-	-	0.54	0.52	0.80	0.65
Potassium	mg/L	-	-	-	0.25	0.22	0.23	0.22
Sodium	mg/L	-	-	-	0.81	0.79	1.4	0.94
Sulphate	mg/L	128 ^(b)	-	<1.0	-	-	0.99	<0.3
Nutrients								
Nitrate	mg-N/L	3.0	33	-	<0.005	<0.005	0.055	<0.005
Nitrite	mg-N/L	0.020 ^(c)	0.060 ^(c)	-	<0.001	<0.001	<0.001	<0.001
Nitrate + nitrite	mg-N/L	-	-	-	<0.0051	<0.0051	0.055	-
Total ammonia	mg-N/L	1.9 - 1.9 ^(d)	16 - 26 ^(e)	<0.03	0.0055	0.0069	0.0095	0.0080
Total Kjeldahl nitrogen	mg-N/L	-	-	0.35	0.30	0.27	0.39	0.40
Total nitrogen (calculated)	mg-N/L	-	-	-	0.30	0.27	0.44	-
Total phosphorus	mg-P/L	-	-	<0.05	0.11	0.056	<0.05	<0.05
Dissolved phosphorus	mg-P/L	-	-	-	<0.05	<0.05	<0.05	<0.05
Biochemical oxygen demand	mg/L	-	-	<5.0	<2.0	<2.0	<2.0	<2.0
Chemical oxygen demand	mg/L	-	-	26	22	21	28	46
Total Metals								
Aluminum	mg/L	-	-	1.1	1.8	0.68	0.19	0.35
Antimony	mg/L	0.0090	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	mg/L	-	0.0050	<0.0005	0.00037	0.00021	0.00012	0.00016
Barium	mg/L	1.0	-	0.016	0.027	0.016	0.0088	0.011
Beryllium	mg/L	0.00013	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth	mg/L	-	-	<0.0001	<0.00005	<0.00005	<0.00005	<0.00005
Boron	mg/L	1.2	-	0.0050	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	-	-	0.000027	0.000064	0.000033	0.000058	0.000027
Calcium	mg/L	-	-	2.1	1.7	1.6	3.1	2.2
Cesium	mg/L	-	-	-	0.000092	0.000020	<0.00001	<0.00001
Chromium	mg/L	0.0010 ^(f)	-	0.0028	0.0036	0.0011	0.00039	0.00060
Cobalt	mg/L	0.0040	0.11	0.00042	0.00076	0.00048	<0.0001	0.00019
Copper	mg/L	see note (h)	see note (h)	0.0026	0.0035	0.0019	0.00086	0.0010
Iron	mg/L	-	1.0	1.1	1.7	0.41	0.056	0.13
Lead	mg/L	-	0.0030 ^(b)	0.00018	0.00035	0.00015	<0.00005	<0.00005
Lithium	mg/L	-	-	0.00075	0.0013	<0.001	<0.001	<0.001
Magnesium	mg/L	-	-	0.92	1.0	0.62	0.80	0.65
Manganese	mg/L	0.8 - 1.9	-	0.042	0.12	0.063	0.0052	0.058
Mercury	mg/L	0.000010	-	-	0.000015	0.00001	0.0000085	<0.000005
Molybdenum	mg/L	1.0	2.0	<0.0001	0.000071	<0.00005	<0.00005	<0.00005
Nickel	mg/L	0.025 ^(b)	-	0.0043	0.0055	0.0022	0.0011	0.0019
Potassium	mg/L	-	-	0.29	0.32	0.24	0.22	0.24
Rubidium	mg/L	-	-	-	0.0011	0.00042	<0.0002	0.00033
Selenium	mg/L	0.0020	-	<0.0005	0.00015	0.000084	0.000066	0.00010
Silicon	mg/L	-	-	3.7	4.3	3.0	1.9	3.2
Silver	mg/L	0.000050 ^(b)	0.00010 ^(b)	<0.00005	0.000037	0.000015	<0.00001	0.000011
Sodium	mg/L	-	-	0.85	0.86	0.82	1.3	0.88
Strontium	mg/L	-	-	0.013	0.015	0.013	0.020	0.015
Sulphur	mg/L	-	-	<3.0	<0.5	<0.5	0.53	<0.5
Tellurium	mg/L	-	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Thallium	mg/L	0.00080	-	<0.00002	0.000012	<0.00001	<0.00001	<0.00001
Thorium	mg/L	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	-	-	<0.0002	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	mg/L	-	-	0.019	0.024	0.0058	0.00079	0.0016
Tungsten	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001
Uranium	mg/L	0.0085	-	0.000023	0.000029	0.000015	<0.00001	<0.00001
Vanadium	mg/L	-	-	0.0020	0.0031	0.00084	<0.0005	<0.0005
Zinc	mg/L	0.0075	0.033	<0.004	0.0061	<0.003	<0.003	<0.003
Zirconium	mg/L	-	-	0.00045	0.00035	0.00029	0.00021	0.00034
Dissolved Metals								
Aluminum	mg/L	0.0096 - 0.050 ⁽ⁱ⁾	0.029 - 0.10 ⁽ⁱ⁾	-	0.27	0.26	0.2	0.33
Antimony	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001
Arsenic	mg/L	-	-	-	0.00012	0.00011	0.00012	0.00019
Barium	mg/L	-	-	-	0.0096	0.0097	0.0094	0.010
Beryllium	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001
Bismuth	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005
Boron	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01
Cadmium	mg/L	0.000033 ^(b)	0.000043 ^(b)	-	0.000014	0.000014	0.000047	0.000026
Cesium	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001
Chromium	mg/L	-	-	-	0.00042	0.00047	0.00036	0.00063
Cobalt	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	0.00016
Copper	mg/L	-	-	-	0.0011	0.0011	0.00089	0.0011
Iron	mg/L	-	0.35	-	0.068	0.071	0.059	0.096
Lead	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005
Lithium	mg/L	-	-	-	<0.001	<0.001	<0.001	<0.001
Manganese	mg/L	-	-	-	0.013	0.012	0.0024	0.056
Mercury	mg/L	-	-	-	0.0000052	0.0000054	<0.000005	<0.000005
Molybdenum	mg/L	-	-	-	<0.00005	<0.00005	<0.00005	<0.00005
Nickel	mg/L	-	-	-	0.0011	0.0012	0.0011	0.0019
Rubidium	mg/L	-	-	-	0.00020	<0.0002	<0.0002	0.00033
Selenium	mg/L	-	-	-	0.00011	0.000063	0.000080	0.00013
Silicon	mg/L	-	-	-	2.5	2.6	1.9	3.3
Silver	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	0.000012
Strontium	mg/L	-	-	-	0.011	0.011	0.019	0.014
Sulphur	mg/L	-	-	-	<0.5	<0.5	<0.5	<0.5
Tellurium	mg/L	-	-	-	<0.0002	<0.0002	<0.0002	<0.0002
Thallium	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001
Thorium	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001
Tin	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001
Titanium	mg/L	-	-	-	0.0013	0.0013	0.00079	0.0015
Tungsten	mg/L	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001
Uranium	mg/L	-	-	-	<0.00001	<0.00001	<0.00001	<0.00001
Vanadium	mg/L	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005
Zinc	mg/L	-	-	-	<0.001	0.0010	<0.001	0.0019
Zirconium	mg/L	-	-	-	0.00030	0.00026	0.00025	0.00043

NOTES
 BCWQG AWF Long-term BC Water Quality Guidelines for Freshwater Aquatic Life - Chronic Long-term
 BCWQG AWF Short-term BC Water Quality Guidelines for Freshwater Aquatic Life - Short-term
 Italics indicate that the laboratory detection limit exceeds the applicable standard.
 British Columbia Approved and Working (or interim) Water Quality Guidelines (BC WQG), updated from time to time, for the protection of freshwater
 H = standard is hardness dependent; pH = standard is pH dependent; Cl = standard is chloride dependent; T = standard varies with temperature
 V = Standard is valence dependent VI refers to chromium VI and III refers to chromium III; Ca = standard is calcium dependent
 * = for ammonia guideline, an average temperature of 10 degrees Celsius and a pH of 7.5 was chosen where no data was available
 MAC = Maximum Acceptable Concentration
 AO = Aesthetic Objective
 QAQC = Quality Assurance and Control; FDA = Field Duplicate Available; FD = Field Duplicate
^(a) = guideline is a minimum value, unless the background concentration or value is lower.
^(b) = guideline is hardness dependent. The guideline range shown is based on the hardness range observed in the dataset (21 to 801 mg/L). The guideline is calculated based on the individual hardness value for each sample.
^(c) = for some samples, water hardness was greater than 250 mg/L. At this hardness, no BC ENV water quality guideline has been established for sulphate; however, the observed data were screened against the guideline for very hard water (i.e., 429 mg/L) for comparative purposes.
^(d) = guideline is chloride dependent. The guideline range shown is based on the chloride concentration range observed in the dataset (0.1110 to 206.0000 mg/L). The guideline is calculated based on the individual chloride concentration in each sample.
^(e) = the ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.13 mg-N/L) is based on the combination of field pH (10.2) and water temperature (13.3°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample.
^(f) = the ammonia guideline is pH and temperature dependent. The guideline that results in the minimum ammonia guideline (0.69 mg-N/L) is based on the combination of field pH (10.2) and water temperature (13.3°C). Guidelines calculated with temperature and pH values falling outside the defined range (i.e., pH 6.0 to 10.0 and temperature 0°C to 30°C) should be used with caution, as the WQG does not necessarily accurately reflect toxic effects at the low and high pH and temperature extremes. The guideline is calculated based on the individual field pH and temperature measurements for each sample.
^(g) = guideline is for chromium VI.
^(h) = Since 2019, the total copper guideline is calculated using a bioinorganic model. The model calculation is based on dissolved organic carbon and hardness. Because dissolved organic carbon was not collected and analyzed in 2020, the 2019 guideline calculation based on hardness only was utilized.

Table D-12: QAQC Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Sample Location	Units	MW-2 DUP 6/17/2020 WG	MW-2 MW2 6/17/2020 WG	Mean	RPD (%)	DF (unitless)
Conventional Parameters						
Hardness, as CaCO3	mg/L	116	114	115	2	n/c
pH	pH units	8.18	8.22	8.2	0	n/c
Specific conductivity	uS/cm	462	462	462	0	n/c
Total alkalinity, as CaCO3	mg/L	226	219	222.5	3	n/c
Total dissolved solids	mg/L	310	328	319	6	n/c
Major Ions						
Bromide	mg/L	< 0.050	< 0.050	NC	n/c	0
Calcium	mg/L	31.2	30.4	30.8	3	n/c
Chloride	mg/L	3.08	3.55	3.315	14	n/c
Fluoride	mg/L	0.175	0.186	0.1805	6	n/c
Magnesium	mg/L	9.26	9.21	9.235	1	n/c
Potassium	mg/L	2.33	2.33	2.33	0	n/c
Sodium	mg/L	55.6	55.1	55.35	1	n/c
Sulphate	mg/L	40.9	42.5	41.7	4	n/c
Nutrients						
Chemical oxygen demand	mg/L	38	45	41.5	17	n/c
Dissolved phosphorus	mg/L	0.054	0.052	0.053	n/c	0.04
Nitrate	mg/L	0.111	0.0894	0.1002	22	n/c
Nitrite	mg/L	0.0024	0.0081	0.00525	109	n/c
Total ammonia	mg/L	0.0712	0.0708	0.071	1	n/c
Total Kjeldahl nitrogen	mg/L	1.54	1.61	1.575	4	n/c
Total phosphorus	mg/L	-	-	-	-	-
Dissolved Metals						
Aluminum	mg/L	0.0113	0.0095	0.0104	17	n/c
Antimony	mg/L	0.00012	0.00012	0.00012	n/c	0
Arsenic	mg/L	0.00053	0.00056	0.000545	6	n/c
Barium	mg/L	0.0537	0.0537	0.0537	0	n/c
Beryllium	mg/L	< 0.000100	< 0.000100	NC	n/c	0
Bismuth	mg/L	< 0.000050	< 0.000050	NC	n/c	0
Boron	mg/L	0.049	0.049	0.049	0	n/c
Cadmium	mg/L	0.000256	0.000247	0.0002515	4	n/c
Cesium	mg/L	< 0.000010	< 0.000010	NC	n/c	0
Chromium	mg/L	0.00016	0.00015	0.000155	n/c	0.1
Cobalt	mg/L	0.00054	0.00057	0.000555	5	n/c
Copper	mg/L	0.00188	0.00194	0.00191	3	n/c
Iron	mg/L	0.015	0.011	0.013	n/c	0.4
Lead	mg/L	0.000127	0.000147	0.000137	15	n/c
Lithium	mg/L	0.0028	0.0026	0.0027	7	n/c
Manganese	mg/L	0.336	0.344	0.34	2	n/c
Mercury	mg/L	< 0.0000050	< 0.0000050	NC	n/c	0
Molybdenum	mg/L	0.0234	0.0236	0.0235	1	n/c
Nickel	mg/L	0.00265	0.00269	0.00267	1	n/c
Rubidium	mg/L	0.00056	0.00064	0.0006	13	n/c
Selenium	mg/L	0.000144	0.000135	0.0001395	6	n/c
Silicon	mg/L	3.74	3.8	3.77	2	n/c
Silver	mg/L	< 0.000010	< 0.000010	NC	n/c	0
Strontium	mg/L	0.368	0.37	0.369	1	n/c
Sulphur	mg/L	12.5	13.2	12.85	5	n/c
Tellurium	mg/L	< 0.00020	< 0.00020	NC	n/c	0
Thallium	mg/L	< 0.000010	< 0.000010	NC	n/c	0
Thorium	mg/L	< 0.00010	< 0.00010	NC	n/c	0
Tin	mg/L	0.00031	0.00015	0.00023	70	n/c
Titanium	mg/L	0.00032	< 0.00030	0.00032	n/c	0.07
Tungsten	mg/L	< 0.00010	< 0.00010	NC	n/c	0
Uranium	mg/L	0.00215	0.00224	0.002195	4	n/c
Vanadium	mg/L	< 0.00050	< 0.00050	NC	n/c	0
Zinc	mg/L	0.0076	0.0077	0.00765	1	n/c
Zirconium	mg/L	< 0.00020	< 0.00020	NC	n/c	0

Notes:
 QA/QC = quality assurance/quality control; FDA = field duplicate available; FD = field duplicate
 Laboratory Reporting Limit indicates the minimum concentration that could be measured by laboratory instrumentation for a specific sample.
 Mean indicates the mean or average value calculated of a field duplicate pair (the FDA and the FD).
 Relative Percent Difference (RPD) is calculated when the mean value is greater than five times the laboratory reporting limit.
 Difference Factor (DF) is calculated when the mean value is less than five times the laboratory reporting limit.
 NC = not calculated; NA = Not Applicable
20% Indicates the parameter analyzed exceeds Golder's internal QA/QC targets.

Sample Location	Units	MW-3 DUP 10/15/2020 WG	MW-3 MW3 10/15/2020 WG	Mean	RPD (%)	DF (unitless)
Conventional Parameters						
Hardness, as CaCO3	mg/L	220	216	218	2	n/c
pH	pH units	8.15	8.17	8.16	0	n/c
Specific conductivity	uS/cm	709	700	704.5	1	n/c
Total alkalinity, as CaCO3	mg/L	193	192	192.5	1	n/c
Total dissolved solids	mg/L	442	450	446	2	n/c
Major Ions						
Bromide	mg/L	< 0.050	< 0.050	NC	n/c	0
Calcium	mg/L	65.2	64	64.6	2	n/c
Chloride	mg/L	< 0.50	< 0.50	NC	n/c	0
Fluoride	mg/L	0.078	0.08	0.079	3	n/c
Magnesium	mg/L	13.9	13.8	13.85	1	n/c
Potassium	mg/L	1.91	1.87	1.89	2	n/c
Sodium	mg/L	67.9	66.4	67.15	2	n/c
Sulphate	mg/L	156	156	156	0	n/c
Nutrients and Chlorophyll a						
Chemical oxygen demand	mg/L	< 20	< 20	NC	n/c	0
Dissolved phosphorus	mg/L	< 0.050	< 0.050	NC	n/c	0
Nitrate	mg/L	0.0365	0.0357	0.0361	2	n/c
Nitrite	mg/L	< 0.0010	< 0.0010	NC	n/c	0
Total ammonia	mg/L	0.0114	0.0166	0.0140	37	n/c
Total Kjeldahl nitrogen	mg/L	0.185	0.233	0.209	23	n/c
Total phosphorus	mg/L	-	-	-	-	-
Dissolved Metals						
Aluminum	mg/L	0.0104	0.0105	0.01045	1	n/c
Antimony	mg/L	< 0.00010	< 0.00010	NC	n/c	0
Arsenic	mg/L	0.00023	0.00026	0.000245	12	n/c
Barium	mg/L	0.0302	0.0331	0.03165	9	n/c
Beryllium	mg/L	< 0.000100	< 0.000100	NC	n/c	0
Bismuth	mg/L	< 0.000050	< 0.000050	NC	n/c	0
Boron	mg/L	0.066	0.065	0.0655	2	n/c
Cadmium	mg/L	0.000225	0.000216	2.205E-05	4	n/c
Cesium	mg/L	< 0.000010	< 0.000010	NC	n/c	0
Chromium	mg/L	< 0.00010	< 0.00010	NC	n/c	0
Cobalt	mg/L	< 0.00010	< 0.00010	NC	n/c	0
Copper	mg/L	0.00029	0.00298	0.001635	165	n/c
Iron	mg/L	0.019	0.024	0.0215	23	n/c
Lead	mg/L	< 0.000050	0.000109	0.000109	74	n/c
Lithium	mg/L	0.0046	0.0046	0.0046	0	n/c
Manganese	mg/L	0.00874	0.00916	0.00895	5	n/c
Mercury	mg/L	< 0.0000050	< 0.0000050	NC	n/c	0
Molybdenum	mg/L	0.00533	0.00546	0.005395	2	n/c
Nickel	mg/L	< 0.00050	< 0.00050	NC	n/c	0
Rubidium	mg/L	0.00029	0.00028	0.000285	n/c	0.05
Selenium	mg/L	0.000415	0.000347	0.000381	18	n/c
Silicon	mg/L	3.8	3.93	3.865	3	n/c
Silver	mg/L	< 0.000010	< 0.000010	NC	n/c	0
Strontium	mg/L	0.661	0.684	0.6725	3	n/c
Sulphur	mg/L	62.4	63.6	63	2	n/c
Tellurium	mg/L	< 0.00020	< 0.00020	NC	n/c	0
Thallium	mg/L	< 0.000010	< 0.000010	NC	n/c	0
Thorium	mg/L	< 0.00010	< 0.00010	NC	n/c	0
Tin	mg/L	< 0.00010	< 0.00010	NC	n/c	0
Titanium	mg/L	< 0.00030	< 0.00030	NC	n/c	0
Tungsten	mg/L	< 0.00010	< 0.00010	NC	n/c	0
Uranium	mg/L	0.00147	0.00149	0.00148	1	n/c
Vanadium	mg/L	< 0.00050	< 0.00050	NC	n/c	0
Zinc	mg/L	< 0.0010	0.0017	0.0017	n/c	0.70
Zirconium	mg/L	< 0.00020	< 0.00020	NC	n/c	0

FB FIELD BLANK 10/15/2020	FB FIELD BLANK 6/17/2020	TB TRAVEL BLANK 10/15/2020	TB TRAVEL BLANK 6/17/2020
-	-	-	-
< 0.60	< 0.60	< 0.60	-
5.47	5.31	-	-
< 2.0	< 2.0	< 2.0	< 2.0
< 1.0	< 1.0	< 1.0	< 1.0
-	-	-	-
-	-	-	-
< 0.050	< 0.050	< 0.050	-
-	-	-	-
-	-	-	-
< 0.0050	< 0.0050	< 0.0050	-
< 0.050	< 0.050	< 0.050	-
< 0.050	< 0.050	< 0.050	-
-	-	-	-
-	-	-	-
< 0.050	< 0.050	< 0.050	-
-	-	-	-
< 0.0050	< 0.0050	< 0.0050	< 0.0050
-	-	-	-
-	< 0.050	-	-
< 0.0010	< 0.0010	< 0.0010	-
< 0.00010	< 0.00010	< 0.00010	-
< 0.00010	< 0.00010	< 0.00010	-
< 0.00010	< 0.00010	< 0.00010	-
< 0.000100	< 0.000100	< 0.000100	-
< 0.000050	< 0.000050	< 0.000050	-
< 0.010	< 0.010	< 0.010	-
< 0.0000050	< 0.0000050	< 0.0000050	-
< 0.000010	< 0.000010	< 0.000010	-
< 0.00010	< 0.00010	< 0.00010	-
< 0.00010	< 0.00010	< 0.00010	-
< 0.00020	< 0.00020	< 0.00020	-
< 0.010	< 0.010	< 0.010	-
< 0.000050	< 0.000050	< 0.000050	-
< 0.0010	< 0.0010	< 0.0010	-
< 0.00010	< 0.00010	< 0.00010	-
< 0.0000050	< 0.0000050	< 0.0000050	-
< 0.000050	< 0.000050	< 0.000050	-
< 0.00050	< 0.00050	< 0.00050	-
< 0.00020	< 0.00020	< 0.00020	-
< 0.000050	< 0.000050	< 0.000050	-
< 0.050	< 0.050	< 0.050	-
< 0.000010	< 0.000010	< 0.000010	-
< 0.00020	< 0.00020	< 0.00020	-
< 0.50	< 0.50	< 0.50	-
< 0.00020	< 0.00020	< 0.00020	-
< 0.000010	< 0.000010	< 0.000010	-
< 0.00010	< 0.00010	< 0.00010	-
< 0.00010	< 0.00010	< 0.00010	-
< 0.00030	< 0.00030	< 0.00030	-
< 0.00010	< 0.00010	< 0.00010	-
< 0.000010	< 0.000010	< 0.000010	-
< 0.00050	< 0.00050	< 0.00050	-
< 0.0010	< 0.0010	< 0.0010	-
< 0.00020	< 0.00020	< 0.00020	-

APPENDIX E

2020 Certificates of Analysis



CERTIFICATE OF ANALYSIS

Work Order : **VA20A8675**
Client : **Regional District of Kitimat-Stikine**
Contact : **Mary Tress**
Address : **# 300 - 4545 Lazelle Avenue**
Terrace BC Canada V8G 4E1
Telephone : **----**
Project : **Meziadin Landfill Groundwater**
PO : **----**
C-O-C number : **----**
Sampler : **Mary Tress**
Site :
Quote number : **Q62338**
No. of samples received : **7**
No. of samples analysed : **7**

Page : **1 of 6**
Laboratory : **Vancouver - Environmental**
Account Manager : **Amber Springer**
Address : **8081 Lougheed Highway**
Burnaby BC Canada V5A 1W9
Telephone : **+1 604 253 4188**
Date Samples Received : **18-Jun-2020 19:10**
Date Analysis Commenced : **20-Jun-2020**
Issue Date : **30-Jun-2020 18:05**

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Muneeb Alam	Analyst	Metals, Burnaby, British Columbia
Woochan Song	Lab Assistant	Metals, Burnaby, British Columbia



General Comments

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

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

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

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

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

<i>Unit</i>	<i>Description</i>
-	No 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.

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

Qualifiers

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



Analytical Results

Sub-Matrix: Water

Client sample ID

(Matrix: Water)

					MW1A	MW1B	MW2	MW3	MW4
Client sampling date / time					17-Jun-2020 15:05	17-Jun-2020 15:15	17-Jun-2020 11:30	17-Jun-2020 12:40	17-Jun-2020 14:45
Analyte	CAS Number	Method	LOR	Unit	VA20A8675-001	VA20A8675-002	VA20A8675-003	VA20A8675-004	VA20A8675-005
					Result	Result	Result	Result	Result
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	260	230	219	212	196
conductivity	----	E100	2.0	µS/cm	747	399	462	660	627
pH	----	E108	0.10	pH units	8.20	7.34	8.22	8.19	8.16
solids, total dissolved [TDS]	----	E162	10	mg/L	547	303	328	417	445
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L	175	183	114	212	199
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0778	0.260	0.0708	<0.0050	<0.0050
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.250 ^{DLDS}	<0.050	<0.050	<0.250 ^{DLDS}	<0.050
chloride	16887-00-6	E235.Cl	0.50	mg/L	<2.50 ^{DLDS}	<0.50	3.55	<2.50 ^{DLDS}	<0.50
fluoride	16984-48-8	E235.F	0.020	mg/L	0.150	0.070	0.186	<0.100 ^{DLDS}	0.100
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.170	0.473	1.61	0.059	<0.050
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0682	0.228	0.0894	0.134	0.0443
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0050 ^{DLDS}	0.0037	0.0081	<0.0050 ^{DLDS}	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	164	7.83	42.5	156	143
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0063	0.0145	0.0095	0.0967	0.0036
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00031	0.00017	0.00012	<0.00010	0.00016
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00128	0.00150	0.00056	0.00029	0.00014
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0601	0.440	0.0537	0.0304	0.0233
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	0.072	0.010	0.049	0.063	0.066
cadmium, dissolved	7440-43-9	E421	0.000050	mg/L	<0.0000200 ^{DLM}	0.0000449	0.000247	0.0000950	0.0000933
calcium, dissolved	7440-70-2	E421	0.050	mg/L	49.7	54.4	30.4	62.0	57.3
cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	0.000011	<0.000010	0.000012	<0.000010
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	0.00016	0.00015	0.00027	<0.00010
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00044	0.00901	0.00057	0.00027	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00026	0.00083	0.00194	0.00118	0.00025
iron, dissolved	7439-89-6	E421	0.010	mg/L	0.084	2.26	0.011	0.178	0.015
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	0.000057	0.000147	0.000180	<0.000050



Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	MW1A	MW1B	MW2	MW3	MW4
Client sampling date / time					17-Jun-2020 15:05	17-Jun-2020 15:15	17-Jun-2020 11:30	17-Jun-2020 12:40	17-Jun-2020 14:45	
Analyte	CAS Number	Method	LOR	Unit	VA20A8675-001	VA20A8675-002	VA20A8675-003	VA20A8675-004	VA20A8675-005	
					Result	Result	Result	Result	Result	
Dissolved Metals										
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0038	0.0034	0.0026	0.0047	0.0044	
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	12.4	11.3	9.21	13.9	13.7	
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.410	5.86	0.344	0.0471	0.00675	
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	0.0137	0.000316	0.0236	0.00525	0.00631	
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00115	0.00908	0.00269	0.00085	<0.00050	
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	0.060	<0.050	0.052	<0.050	<0.050	
potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.49	0.711	2.33	1.84	2.28	
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00029	0.00055	0.00064	0.00037	0.00031	
selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000055	0.000058	0.000135	0.000408	0.000293	
silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.79	7.18	3.80	3.47	3.71	
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	
sodium, dissolved	7440-23-5	E421	0.050	mg/L	104	7.08	55.1	63.5	59.3	
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.607	0.359	0.370	0.610	0.651	
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	53.7	2.85	13.2	52.5	48.5	
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	0.000012	<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	0.00015	<0.00010	0.00010	
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	<0.00030	0.00185	<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	0.00271	0.000106	0.00224	0.00142	0.000938	
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	0.0033	0.0077	0.0025	0.0010	
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	Field	
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	Field	
Aggregate Organics										
chemical oxygen demand [COD]	----	E559	20	mg/L	66	80	45	<20	<20	

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



Analytical Results

Sub-Matrix: Water					Client sample ID	DUP	Travel Blank	----	----	----
(Matrix: Water)					Client sampling date / time	17-Jun-2020 12:00	[17-Jun-2020]	---	---	---
Analyte	CAS Number	Method	LOR	Unit	VA20A8675-006	VA20A8675-007	-----	-----	-----	
					Result	Result	---	---	---	
Physical Tests										
alkalinity, total (as CaCO3)	---	E290	1.0	mg/L	226	<1.0	---	---	---	
conductivity	---	E100	2.0	µS/cm	462	<2.0	---	---	---	
pH	---	E108	0.10	pH units	8.18	---	---	---	---	
solids, total dissolved [TDS]	---	E162	10	mg/L	310	---	---	---	---	
hardness (as CaCO3), dissolved	---	EC100	0.60	mg/L	116	---	---	---	---	
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0712	<0.0050	---	---	---	
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	---	---	---	---	
chloride	16887-00-6	E235.Cl	0.50	mg/L	3.08	---	---	---	---	
fluoride	16984-48-8	E235.F	0.020	mg/L	0.175	---	---	---	---	
Kjeldahl nitrogen, total [TKN]	---	E318	0.050	mg/L	1.54	---	---	---	---	
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.111	---	---	---	---	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0024	---	---	---	---	
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	40.9	---	---	---	---	
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0113	---	---	---	---	
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00012	---	---	---	---	
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00053	---	---	---	---	
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0537	---	---	---	---	
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	0.000256	---	---	---	---	
calcium, dissolved	7440-70-2	E421	0.050	mg/L	31.2	---	---	---	---	
cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	---	---	---	---	
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00016	---	---	---	---	
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00054	---	---	---	---	
copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00188	---	---	---	---	
iron, dissolved	7439-89-6	E421	0.010	mg/L	0.015	---	---	---	---	
lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000127	---	---	---	---	
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0028	---	---	---	---	



Analytical Results

Sub-Matrix: Water					Client sample ID	DUP	Travel Blank	----	----	----
(Matrix: Water)					Client sampling date / time	17-Jun-2020 12:00	[17-Jun-2020]	---	---	---
Analyte	CAS Number	Method	LOR	Unit	VA20A8675-006	VA20A8675-007	-----	-----	-----	
					Result	Result	---	---	---	
Dissolved Metals										
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	9.26	----	----	----	----	
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.336	----	----	----	----	
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	----	----	----	----	
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.0234	----	----	----	----	
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00265	----	----	----	----	
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	0.054	----	----	----	----	
potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.33	----	----	----	----	
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00056	----	----	----	----	
selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000144	----	----	----	----	
silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.74	----	----	----	----	
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	----	----	----	----	
sodium, dissolved	7440-23-5	E421	0.050	mg/L	55.6	----	----	----	----	
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.368	----	----	----	----	
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	12.5	----	----	----	----	
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	0.00031	----	----	----	----	
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	0.00032	----	----	----	----	
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	----	----	----	----	
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00215	----	----	----	----	
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	----	----	----	----	
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0076	----	----	----	----	
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	38	----	----	----	----	

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



CERTIFICATE OF ANALYSIS

Work Order : VA20A8676
Client : Regional District of Kitimat-Stikine
Contact : Mary Tress
Address : # 300 - 4545 Lazelle Avenue
Terrace BC Canada V8G 4E1
Telephone : ----
Project : Meziadin Landfill Surface Water
PO : ----
C-O-C number : ----
Sampler : Mary Tress
Site :
Quote number : Q62338
No. of samples received : 2
No. of samples analysed : 2

Page : 1 of 6
Laboratory : Vancouver - Environmental
Account Manager : Amber Springer
Address : 8081 Lougheed Highway
Burnaby BC Canada V5A 1W9
Telephone : +1 604 253 4188
Date Samples Received : 18-Jun-2020 19:10
Date Analysis Commenced : 20-Jun-2020
Issue Date : 30-Jun-2020 18:03

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
Bruna Botti	Analyst	Inorganics - Water Quality, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Clarie Tejano		Metals, Burnaby, British Columbia
Kevin Duarte	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Muneeb Alam	Analyst	Metals, Burnaby, British Columbia
Woochan Song	Lab Assistant	Metals, Burnaby, British Columbia



General Comments

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

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

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

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

<i>Unit</i>	<i>Description</i>
-	No 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.

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

Qualifiers

<i>Qualifier</i>	<i>Description</i>
DTS	<i>Dissolved Sulfur concentration exceeds total. Negative bias on Total Sulfur suspected due to presence of volatile sulfur species lost during digestion.</i>
DTSE	<i>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.</i>



Analytical Results

Sub-Matrix: Water
 (Matrix: Water)

Client sample ID

					Lagoon Outlet	Field Blank	----	----	----
					17-Jun-2020 14:15	17-Jun-2020 12:00	----	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20A8676-001	VA20A8676-002	-----	-----	-----
					Result	Result	----	----	----
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	198	----	----	----	----
conductivity	----	E100	2.0	µS/cm	458	<2.0	----	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L	194	<0.60	----	----	----
pH	----	E108	0.10	pH units	7.32	5.31	----	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L	11.4	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L	179	<0.60	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	1.15	<0.0050	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	----	----	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L	19.9	----	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	0.069	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	1.73	----	----	----	----
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	<0.0010	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	15.7	----	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.350	<0.0030	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00104	<0.00010	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.139	<0.00010	----	----	----
beryllium, total	7440-41-7	E420	0.000100	mg/L	<0.000100	<0.000100	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L	0.150	<0.010	----	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000097	<0.0000050	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	61.0	<0.050	----	----	----
cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000010	<0.000010	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00060	<0.00010	----	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00062	<0.00010	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L	0.00088	<0.00050	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L	2.03	<0.010	----	----	----



Analytical Results

Sub-Matrix: Water					Client sample ID	Lagoon Outlet	Field Blank	----	----	----
(Matrix: Water)										
Client sampling date / time					17-Jun-2020 14:15	17-Jun-2020 12:00	---	---	---	---
Analyte	CAS Number	Method	LOR	Unit	VA20A8676-001	VA20A8676-002	-----	-----	-----	-----
					Result	Result	---	---	---	---
Total Metals										
lead, total	7439-92-1	E420	0.000050	mg/L	0.000104	<0.000050	----	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0010	<0.0010	----	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	10.1	<0.0050	----	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	7.94	<0.00010	----	----	----	----
mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	----	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000363	<0.000050	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00208	<0.00050	----	----	----	----
phosphorus, total	7723-14-0	E420	0.050	mg/L	0.166	<0.050	----	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	1.96	<0.050	----	----	----	----
rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00076	<0.00020	----	----	----	----
selenium, total	7782-49-2	E420	0.000050	mg/L	0.000059	<0.000050	----	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L	3.51	<0.10	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	----	----	----	----
sodium, total	7440-23-5	E420	0.050	mg/L	16.8	<0.050	----	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L	0.344	<0.00020	----	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	3.91	<0.50	----	----	----	----
tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	----	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	----	----	----	----
thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	----	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	0.00012	<0.00010	----	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	0.00173	<0.00030	----	----	----	----
tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00010	<0.00010	----	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.000017	<0.000010	----	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00052	<0.00050	----	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	0.0098	<0.0030	----	----	----	----
zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	----	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0428	<0.0010	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00096	<0.00010	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.146	<0.00010	----	----	----	----



Analytical Results

Sub-Matrix: Water					Client sample ID	Lagoon Outlet	Field Blank	----	----	----
(Matrix: Water)										
Client sampling date / time					17-Jun-2020 14:15	17-Jun-2020 12:00	---	---	---	---
Analyte	CAS Number	Method	LOR	Unit	VA20A8676-001	VA20A8676-002	-----	-----	-----	-----
					Result	Result	---	---	---	---
Dissolved Metals										
beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	---	---	---	---
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	---	---	---	---
boron, dissolved	7440-42-8	E421	0.010	mg/L	0.132	<0.010	---	---	---	---
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	<0.0000050	---	---	---	---
calcium, dissolved	7440-70-2	E421	0.050	mg/L	54.3	<0.050	---	---	---	---
cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	---	---	---	---
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00028	<0.00010	---	---	---	---
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00032	<0.00010	---	---	---	---
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	---	---	---	---
iron, dissolved	7439-89-6	E421	0.010	mg/L	0.525	<0.010	---	---	---	---
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	---	---	---	---
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0011	<0.0010	---	---	---	---
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	10.5	<0.0050	---	---	---	---
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	7.60	<0.00010	---	---	---	---
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	---	---	---	---
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000252	<0.000050	---	---	---	---
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00132	<0.00050	---	---	---	---
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	0.100	<0.050	---	---	---	---
potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.03	<0.050	---	---	---	---
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00069	<0.00020	---	---	---	---
selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.00777 ^{DTSE}	<0.000050	---	---	---	---
silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.42	<0.050	---	---	---	---
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	---	---	---	---
sodium, dissolved	7440-23-5	E421	0.050	mg/L	16.6	<0.050	---	---	---	---
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.318	<0.00020	---	---	---	---
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	32.8 ^{DTS}	<0.50	---	---	---	---
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	---	---	---	---
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	---	---	---	---
thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00010	---	---	---	---
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	---	---	---	---
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	---	---	---	---



Analytical Results

Sub-Matrix: Water

(Matrix: Water)

					Client sample ID	Lagoon Outlet	Field Blank	----	----	----
					Client sampling date / time	17-Jun-2020 14:15	17-Jun-2020 12:00	---	---	---
Analyte	CAS Number	Method	LOR	Unit	VA20A8676-001	VA20A8676-002	-----	-----	-----	
					Result	Result	---	---	---	
Dissolved Metals										
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	<0.00010	----	----	----	
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000013	<0.000010	----	----	----	
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	----	----	----	
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0012	<0.0010	----	----	----	
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	----	----	----	
dissolved mercury filtration location	----	EP509	-	-	Field	Field	----	----	----	
dissolved metals filtration location	----	EP421	-	-	Field	Field	----	----	----	
Aggregate Organics										
biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	6.8	----	----	----	----	
chemical oxygen demand [COD]	----	E559	20	mg/L	30	----	----	----	----	

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



CERTIFICATE OF ANALYSIS

Work Order : VA20B8400
Client : Regional District of Kitimat-Stikine
Contact : Mary Tress
Address : # 300 - 4545 Lazelle Avenue
Terrace BC Canada V8G 4E1
Telephone : ----
Project : Meziadin Landfill Groundwater
PO : ----
C-O-C number : ----
Sampler : Mary Tress
Site :
Quote number : Q62338
No. of samples received : 8
No. of samples analysed : 8

Page : 1 of 6
Laboratory : Vancouver - Environmental
Account Manager : Amber Springer
Address : 8081 Lougheed Highway
Burnaby BC Canada V5A 1W9
Telephone : +1 604 253 4188
Date Samples Received : 16-Oct-2020 20:15
Date Analysis Commenced : 17-Oct-2020
Issue Date : 28-Oct-2020 16:20

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.

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- Analytical Results

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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
Amy Lazure	Lab Assistant	Inorganics, Calgary, Alberta
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Katarzyna Glinka		Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia



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

<i>Unit</i>	<i>Description</i>
-	No 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.

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

Qualifiers

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



Analytical Results

Sub-Matrix: Water					Client sample ID				
(Matrix: Water)					MW1A	MW1B	MW2	MW3	MW4
Client sampling date / time					15-Oct-2020 10:45	15-Oct-2020 11:15	15-Oct-2020 14:20	15-Oct-2020 12:15	15-Oct-2020 09:45
Analyte	CAS Number	Method	LOR	Unit	VA20B8400-001	VA20B8400-002	VA20B8400-003	VA20B8400-004	VA20B8400-005
					Result	Result	Result	Result	Result
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	240	227	208	192	175
conductivity	----	E100	2.0	µS/cm	776	452	477	700	645
pH	----	E108	0.10	pH units	8.29	7.46	8.26	8.17	8.18
solids, total dissolved [TDS]	----	E162	10	mg/L	554	388	374	450	417
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L	180	208	143	216	201
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0481	0.401	0.620	0.0166	0.0067
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.250 ^{DLS}	<0.050	<0.050	<0.050	<0.050
chloride	16887-00-6	E235.Cl	0.50	mg/L	<2.50 ^{DLS}	<0.50	<0.50	<0.50	<0.50
fluoride	16984-48-8	E235.F	0.020	mg/L	0.151	0.069	0.191	0.080	0.106
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	1.19	4.24	1.95	0.233	0.601
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0805	0.0153	<0.0050	0.0357	0.0266
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0050 ^{DLS}	0.0012	<0.0010	<0.0010	<0.0010
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	150	6.14	40.9	156	142
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0038	0.0152	0.0050	0.0105	0.644
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00029	0.00023	<0.00010	<0.00010	0.00025
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00110	0.00155	0.00062	0.00026	0.00060
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0557	0.578	0.0596	0.0331	0.0356
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	0.071	<0.010	0.058	0.065	0.072
cadmium, dissolved	7440-43-9	E421	0.000050	mg/L	<0.0000200 ^{DLM}	0.000116	<0.0000400 ^{DLM}	0.0000216	0.000189
calcium, dissolved	7440-70-2	E421	0.050	mg/L	52.4	62.5	38.9	64.0	58.7
cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	0.000013	<0.000010	<0.000010	0.000059
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	0.00021	<0.00010	<0.00010	0.00158
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00032	0.0148	0.00050	<0.00010	0.00105
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	0.00069	0.00039	0.00298	0.00566
iron, dissolved	7439-89-6	E421	0.010	mg/L	0.044	1.99	0.047	0.024	1.06
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	0.000109	0.00101



Analytical Results

Sub-Matrix: Water					Client sample ID				
(Matrix: Water)					MW1A	MW1B	MW2	MW3	MW4
Client sampling date / time					15-Oct-2020 10:45	15-Oct-2020 11:15	15-Oct-2020 14:20	15-Oct-2020 12:15	15-Oct-2020 09:45
Analyte	CAS Number	Method	LOR	Unit	VA20B8400-001	VA20B8400-002	VA20B8400-003	VA20B8400-004	VA20B8400-005
					Result	Result	Result	Result	Result
Dissolved Metals									
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0042	0.0038	0.0028	0.0046	0.0052
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	11.9	12.6	11.2	13.8	13.1
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.419	9.57	0.263	0.00916	0.245
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	0.0000086
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.0155	0.000916	0.0208	0.00546	0.00521
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00104	0.0154	0.00091	<0.00050	0.00345
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0.075	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.54	0.872	2.15	1.87	2.32
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00034	0.00066	0.00035	0.00028	0.00056
selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000156	0.000088	0.000198	0.000347	0.000300
silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.92	7.86	4.31	3.93	6.83
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	108	5.61	53.6	66.4	57.8
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.646	0.460	0.504	0.684	0.691
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	57.1	2.57	16.1	63.6	56.7
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	0.000020	<0.000010	<0.000010	<0.000010
thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.00017
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	0.0128
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	0.00292	0.000088	0.00196	0.00149	0.000960
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.00169
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	0.0054	<0.0010	0.0017	0.0075
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	<0.00020	<0.00020	0.00030
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	36	48	31	<20	<20

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



Analytical Results

Sub-Matrix: Water					Client sample ID	Field Blank	DUP	Travel Blank	----	----
(Matrix: Water)					Client sampling date / time	15-Oct-2020 13:55	15-Oct-2020 12:00	15-Oct-2020	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20B8400-006	VA20B8400-007	VA20B8400-008	-----	-----	
					Result	Result	Result	---	---	
Physical Tests										
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	<1.0	193	<1.0	----	----	
conductivity	----	E100	2.0	µS/cm	<2.0	709	<2.0	----	----	
pH	----	E108	0.10	pH units	5.47	8.15	----	----	----	
solids, total dissolved [TDS]	----	E162	10	mg/L	----	442	----	----	----	
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L	<0.60	220	<0.60	----	----	
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	0.0114	<0.0050	----	----	
bromide	24959-67-9	E235.Br-L	0.050	mg/L	----	<0.050	----	----	----	
chloride	16887-00-6	E235.Cl	0.50	mg/L	----	<0.50	----	----	----	
fluoride	16984-48-8	E235.F	0.020	mg/L	----	0.078	----	----	----	
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	----	0.185	----	----	----	
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	----	0.0365	----	----	----	
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	----	<0.0010	----	----	----	
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	----	156	----	----	----	
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	0.0104	<0.0010	----	----	
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----	
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	0.00023	<0.00010	----	----	
barium, dissolved	7440-39-3	E421	0.00010	mg/L	<0.00010	0.0302	<0.00010	----	----	
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	<0.010	0.066	<0.010	----	----	
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	0.0000225	<0.0000050	----	----	
calcium, dissolved	7440-70-2	E421	0.050	mg/L	<0.050	65.2	<0.050	----	----	
cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	----	----	
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----	
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----	
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	0.00029	<0.00020	----	----	
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	0.019	<0.010	----	----	
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	0.0046	<0.0010	----	----	



Analytical Results

Sub-Matrix: Water					Client sample ID	Field Blank	DUP	Travel Blank	----	----
(Matrix: Water)					Client sampling date / time	15-Oct-2020 13:55	15-Oct-2020 12:00	15-Oct-2020	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20B8400-006	VA20B8400-007	VA20B8400-008	-----	-----	
					Result	Result	Result	---	---	
Dissolved Metals										
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	<0.0050	13.9	<0.0050	----	----	
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	<0.00010	0.00874	<0.00010	----	----	
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	----	----	
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	<0.000050	0.00533	<0.000050	----	----	
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----	
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	<0.050	----	----	
potassium, dissolved	7440-09-7	E421	0.050	mg/L	<0.050	1.91	<0.050	----	----	
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	<0.00020	0.00029	<0.00020	----	----	
selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	0.000415	<0.000050	----	----	
silicon, dissolved	7440-21-3	E421	0.050	mg/L	<0.050	3.80	<0.050	----	----	
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	<0.050	67.9	<0.050	----	----	
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	<0.00020	0.661	<0.00020	----	----	
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	<0.50	62.4	<0.50	----	----	
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	<0.00030	<0.00030	<0.00030	----	----	
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	0.00147	<0.000010	----	----	
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----	
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	<0.0010	----	----	
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	<0.00020	----	----	
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Laboratory	----	----	
dissolved metals filtration location	----	EP421	-	-	Field	Field	Laboratory	----	----	
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	: VA20B8400	Page	: 1 of 19
Client	: Regional District of Kitimat-Stikine	Laboratory	: Vancouver - Environmental
Contact	: Mary Tress	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	: 16-Oct-2020 20:15
PO	: ----	Issue Date	: 28-Oct-2020 16:20
C-O-C number	: ----		
Sampler	: Mary Tress		
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 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.

RIGHT SOLUTIONS | RIGHT PARTNER



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 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) DUP	E559	15-Oct-2020	----	----	----		21-Oct-2020	28 days	5 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) MW1A	E559	15-Oct-2020	----	----	----		21-Oct-2020	28 days	5 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) MW1B	E559	15-Oct-2020	----	----	----		21-Oct-2020	28 days	5 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) MW2	E559	15-Oct-2020	----	----	----		21-Oct-2020	28 days	5 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) MW3	E559	15-Oct-2020	----	----	----		21-Oct-2020	28 days	5 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) MW4	E559	15-Oct-2020	----	----	----		21-Oct-2020	28 days	6 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) DUP	E298	15-Oct-2020	----	----	----		26-Oct-2020	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		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Anions and Nutrients : Ammonia by Fluorescence											
Amber glass total (sulfuric acid) Field Blank	E298	15-Oct-2020	----	----	----		26-Oct-2020	28 days	10 days	✔	
Anions and Nutrients : Ammonia by Fluorescence											
Amber glass total (sulfuric acid) MW2	E298	15-Oct-2020	----	----	----		26-Oct-2020	28 days	10 days	✔	
Anions and Nutrients : Ammonia by Fluorescence											
Amber glass total (sulfuric acid) MW3	E298	15-Oct-2020	----	----	----		26-Oct-2020	28 days	10 days	✔	
Anions and Nutrients : Ammonia by Fluorescence											
Amber glass total (sulfuric acid) MW1A	E298	15-Oct-2020	----	----	----		26-Oct-2020	28 days	11 days	✔	
Anions and Nutrients : Ammonia by Fluorescence											
Amber glass total (sulfuric acid) MW1B	E298	15-Oct-2020	----	----	----		26-Oct-2020	28 days	11 days	✔	
Anions and Nutrients : Ammonia by Fluorescence											
Amber glass total (sulfuric acid) MW4	E298	15-Oct-2020	----	----	----		26-Oct-2020	28 days	11 days	✔	
Anions and Nutrients : Ammonia by Fluorescence											
Amber glass total (sulfuric acid) Travel Blank	E298	15-Oct-2020	----	----	----		26-Oct-2020	28 days	11 days	✔	
Anions and Nutrients : Bromide in Water by IC (Low Level)											
HDPE DUP	E235.Br-L	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Bromide in Water by IC (Low Level)											
HDPE MW1A	E235.Br-L	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Anions and Nutrients : Bromide in Water by IC (Low Level)											
HDPE MW1B	E235.Br-L	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Bromide in Water by IC (Low Level)											
HDPE MW2	E235.Br-L	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Bromide in Water by IC (Low Level)											
HDPE MW3	E235.Br-L	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Bromide in Water by IC (Low Level)											
HDPE MW4	E235.Br-L	15-Oct-2020	----	----	----		18-Oct-2020	28 days	3 days	✔	
Anions and Nutrients : Chloride in Water by IC											
HDPE DUP	E235.Cl	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Chloride in Water by IC											
HDPE MW1A	E235.Cl	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Chloride in Water by IC											
HDPE MW1B	E235.Cl	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Chloride in Water by IC											
HDPE MW2	E235.Cl	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Chloride in Water by IC											
HDPE MW3	E235.Cl	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Anions and Nutrients : Chloride in Water by IC											
HDPE MW4	E235.Cl	15-Oct-2020	----	----	----		18-Oct-2020	28 days	3 days	✔	
Anions and Nutrients : Fluoride in Water by IC											
HDPE DUP	E235.F	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Fluoride in Water by IC											
HDPE MW1A	E235.F	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Fluoride in Water by IC											
HDPE MW1B	E235.F	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Fluoride in Water by IC											
HDPE MW2	E235.F	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Fluoride in Water by IC											
HDPE MW3	E235.F	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Fluoride in Water by IC											
HDPE MW4	E235.F	15-Oct-2020	----	----	----		18-Oct-2020	28 days	3 days	✔	
Anions and Nutrients : Nitrate in Water by IC (Low Level)											
HDPE DUP	E235.NO3-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	
Anions and Nutrients : Nitrate in Water by IC (Low Level)											
HDPE MW1A	E235.NO3-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Anions and Nutrients : Nitrate in Water by IC (Low Level)											
HDPE MW1B	E235.NO3-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	
Anions and Nutrients : Nitrate in Water by IC (Low Level)											
HDPE MW2	E235.NO3-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	
Anions and Nutrients : Nitrate in Water by IC (Low Level)											
HDPE MW3	E235.NO3-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	
Anions and Nutrients : Nitrate in Water by IC (Low Level)											
HDPE MW4	E235.NO3-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	3 days	✔	
Anions and Nutrients : Nitrite in Water by IC (Low Level)											
HDPE DUP	E235.NO2-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	
Anions and Nutrients : Nitrite in Water by IC (Low Level)											
HDPE MW1A	E235.NO2-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	
Anions and Nutrients : Nitrite in Water by IC (Low Level)											
HDPE MW1B	E235.NO2-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	
Anions and Nutrients : Nitrite in Water by IC (Low Level)											
HDPE MW2	E235.NO2-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	
Anions and Nutrients : Nitrite in Water by IC (Low Level)											
HDPE MW3	E235.NO2-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	



Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Anions and Nutrients : Nitrite in Water by IC (Low Level)											
HDPE MW4	E235.NO2-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	3 days	✓	
Anions and Nutrients : Sulfate in Water by IC											
HDPE DUP	E235.SO4	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✓	
Anions and Nutrients : Sulfate in Water by IC											
HDPE MW1A	E235.SO4	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✓	
Anions and Nutrients : Sulfate in Water by IC											
HDPE MW1B	E235.SO4	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✓	
Anions and Nutrients : Sulfate in Water by IC											
HDPE MW2	E235.SO4	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✓	
Anions and Nutrients : Sulfate in Water by IC											
HDPE MW3	E235.SO4	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✓	
Anions and Nutrients : Sulfate in Water by IC											
HDPE MW4	E235.SO4	15-Oct-2020	----	----	----		18-Oct-2020	28 days	3 days	✓	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)											
Amber glass total (sulfuric acid) MW2	E318	15-Oct-2020	26-Oct-2020	28 days	10 days	✓	27-Oct-2020	17 days	1 days	✓	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)											
Amber glass total (sulfuric acid) DUP	E318	15-Oct-2020	26-Oct-2020	28 days	11 days	✓	27-Oct-2020	16 days	1 days	✓	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)											
Amber glass total (sulfuric acid) MW1A	E318	15-Oct-2020	26-Oct-2020	28 days	11 days	✔	27-Oct-2020	16 days	1 days	✔	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)											
Amber glass total (sulfuric acid) MW1B	E318	15-Oct-2020	26-Oct-2020	28 days	11 days	✔	27-Oct-2020	16 days	1 days	✔	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)											
Amber glass total (sulfuric acid) MW3	E318	15-Oct-2020	26-Oct-2020	28 days	11 days	✔	27-Oct-2020	16 days	1 days	✔	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)											
Amber glass total (sulfuric acid) MW4	E318	15-Oct-2020	26-Oct-2020	28 days	11 days	✔	27-Oct-2020	16 days	1 days	✔	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)											
HDPE dissolved (nitric acid) DUP	E421.Cr-L	15-Oct-2020	22-Oct-2020	180 days	6 days	✔	24-Oct-2020	173 days	1 days	✔	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)											
HDPE dissolved (nitric acid) Field Blank	E421.Cr-L	15-Oct-2020	22-Oct-2020	180 days	6 days	✔	24-Oct-2020	173 days	1 days	✔	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)											
HDPE dissolved (nitric acid) MW1A	E421.Cr-L	15-Oct-2020	22-Oct-2020	180 days	6 days	✔	24-Oct-2020	173 days	1 days	✔	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)											
HDPE dissolved (nitric acid) MW1B	E421.Cr-L	15-Oct-2020	22-Oct-2020	180 days	6 days	✔	24-Oct-2020	173 days	1 days	✔	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)											
HDPE dissolved (nitric acid) MW2	E421.Cr-L	15-Oct-2020	22-Oct-2020	180 days	6 days	✔	24-Oct-2020	173 days	1 days	✔	



Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)											
HDPE dissolved (nitric acid) MW3	E421.Cr-L	15-Oct-2020	22-Oct-2020	180 days	6 days	✓	24-Oct-2020	173 days	1 days	✓	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)											
HDPE dissolved (nitric acid) MW4	E421.Cr-L	15-Oct-2020	22-Oct-2020	180 days	6 days	✓	24-Oct-2020	173 days	1 days	✓	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)											
HDPE dissolved (nitric acid) Travel Blank	E421.Cr-L	15-Oct-2020	22-Oct-2020	180 days	7 days	✓	23-Oct-2020	172 days	1 days	✓	
Dissolved Metals : Dissolved Mercury in Water by CVAAS											
Glass vial dissolved (hydrochloric acid) DUP	E509	15-Oct-2020	26-Oct-2020	28 days	11 days	✓	26-Oct-2020	16 days	0 days	✓	
Dissolved Metals : Dissolved Mercury in Water by CVAAS											
Glass vial dissolved (hydrochloric acid) Field Blank	E509	15-Oct-2020	26-Oct-2020	28 days	11 days	✓	26-Oct-2020	16 days	0 days	✓	
Dissolved Metals : Dissolved Mercury in Water by CVAAS											
Glass vial dissolved (hydrochloric acid) MW1A	E509	15-Oct-2020	26-Oct-2020	28 days	11 days	✓	26-Oct-2020	16 days	0 days	✓	
Dissolved Metals : Dissolved Mercury in Water by CVAAS											
Glass vial dissolved (hydrochloric acid) MW1B	E509	15-Oct-2020	26-Oct-2020	28 days	11 days	✓	26-Oct-2020	16 days	0 days	✓	
Dissolved Metals : Dissolved Mercury in Water by CVAAS											
Glass vial dissolved (hydrochloric acid) MW2	E509	15-Oct-2020	26-Oct-2020	28 days	11 days	✓	26-Oct-2020	16 days	0 days	✓	
Dissolved Metals : Dissolved Mercury in Water by CVAAS											
Glass vial dissolved (hydrochloric acid) MW3	E509	15-Oct-2020	26-Oct-2020	28 days	11 days	✓	26-Oct-2020	16 days	0 days	✓	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Dissolved Metals : Dissolved Mercury in Water by CVAAS											
Glass vial dissolved (hydrochloric acid) MW4	E509	15-Oct-2020	26-Oct-2020	28 days	11 days	✔	26-Oct-2020	16 days	0 days	✔	
Dissolved Metals : Dissolved Mercury in Water by CVAAS											
Glass vial dissolved (hydrochloric acid) Travel Blank	E509	15-Oct-2020	20-Oct-2020	28 days	4 days	✔	20-Oct-2020	23 days	0 days	✔	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) DUP	E421	15-Oct-2020	22-Oct-2020	180 days	6 days	✔	24-Oct-2020	173 days	1 days	✔	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) Field Blank	E421	15-Oct-2020	22-Oct-2020	180 days	6 days	✔	24-Oct-2020	173 days	1 days	✔	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) MW1A	E421	15-Oct-2020	22-Oct-2020	180 days	6 days	✔	24-Oct-2020	173 days	1 days	✔	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) MW1B	E421	15-Oct-2020	22-Oct-2020	180 days	6 days	✔	24-Oct-2020	173 days	1 days	✔	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) MW2	E421	15-Oct-2020	22-Oct-2020	180 days	6 days	✔	24-Oct-2020	173 days	1 days	✔	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) MW3	E421	15-Oct-2020	22-Oct-2020	180 days	6 days	✔	24-Oct-2020	173 days	1 days	✔	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) MW4	E421	15-Oct-2020	22-Oct-2020	180 days	6 days	✔	24-Oct-2020	173 days	1 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) Travel Blank	E421	15-Oct-2020	22-Oct-2020	180 days	7 days	✔	23-Oct-2020	172 days	1 days	✔	
Physical Tests : Alkalinity Species by Titration											
HDPE Field Blank	E290	15-Oct-2020	----	----	----		19-Oct-2020	14 days	3 days	✔	
Physical Tests : Alkalinity Species by Titration											
HDPE MW2	E290	15-Oct-2020	----	----	----		19-Oct-2020	14 days	3 days	✔	
Physical Tests : Alkalinity Species by Titration											
HDPE DUP	E290	15-Oct-2020	----	----	----		19-Oct-2020	14 days	4 days	✔	
Physical Tests : Alkalinity Species by Titration											
HDPE MW1A	E290	15-Oct-2020	----	----	----		19-Oct-2020	14 days	4 days	✔	
Physical Tests : Alkalinity Species by Titration											
HDPE MW1B	E290	15-Oct-2020	----	----	----		19-Oct-2020	14 days	4 days	✔	
Physical Tests : Alkalinity Species by Titration											
HDPE MW3	E290	15-Oct-2020	----	----	----		19-Oct-2020	14 days	4 days	✔	
Physical Tests : Alkalinity Species by Titration											
HDPE MW4	E290	15-Oct-2020	----	----	----		19-Oct-2020	14 days	4 days	✔	
Physical Tests : Alkalinity Species by Titration											
HDPE Travel Blank	E290	15-Oct-2020	----	----	----		19-Oct-2020	14 days	4 days	✔	



Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Physical Tests : Conductivity in Water											
HDPE Field Blank	E100	15-Oct-2020	----	----	----		19-Oct-2020	28 days	3 days		✓
Physical Tests : Conductivity in Water											
HDPE MW2	E100	15-Oct-2020	----	----	----		19-Oct-2020	28 days	3 days		✓
Physical Tests : Conductivity in Water											
HDPE DUP	E100	15-Oct-2020	----	----	----		19-Oct-2020	28 days	4 days		✓
Physical Tests : Conductivity in Water											
HDPE MW1A	E100	15-Oct-2020	----	----	----		19-Oct-2020	28 days	4 days		✓
Physical Tests : Conductivity in Water											
HDPE MW1B	E100	15-Oct-2020	----	----	----		19-Oct-2020	28 days	4 days		✓
Physical Tests : Conductivity in Water											
HDPE MW3	E100	15-Oct-2020	----	----	----		19-Oct-2020	28 days	4 days		✓
Physical Tests : Conductivity in Water											
HDPE MW4	E100	15-Oct-2020	----	----	----		19-Oct-2020	28 days	4 days		✓
Physical Tests : Conductivity in Water											
HDPE Travel Blank	E100	15-Oct-2020	----	----	----		19-Oct-2020	28 days	4 days		✓
Physical Tests : pH by Meter											
HDPE Field Blank	E108	15-Oct-2020	----	----	----		19-Oct-2020	0.25 hrs	94 hrs		* EHTR-FM



Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Physical Tests : pH by Meter											
HDPE MW2	E108	15-Oct-2020	----	----	----		19-Oct-2020	0.25 hrs	94 hrs	*	EHTR-FM
Physical Tests : pH by Meter											
HDPE DUP	E108	15-Oct-2020	----	----	----		19-Oct-2020	0.25 hrs	96 hrs	*	EHTR-FM
Physical Tests : pH by Meter											
HDPE MW3	E108	15-Oct-2020	----	----	----		19-Oct-2020	0.25 hrs	96 hrs	*	EHTR-FM
Physical Tests : pH by Meter											
HDPE MW1B	E108	15-Oct-2020	----	----	----		19-Oct-2020	0.25 hrs	97 hrs	*	EHTR-FM
Physical Tests : pH by Meter											
HDPE MW1A	E108	15-Oct-2020	----	----	----		19-Oct-2020	0.25 hrs	98 hrs	*	EHTR-FM
Physical Tests : pH by Meter											
HDPE MW4	E108	15-Oct-2020	----	----	----		19-Oct-2020	0.25 hrs	99 hrs	*	EHTR-FM
Physical Tests : TDS by Gravimetry											
HDPE DUP	E162	15-Oct-2020	----	----	----		20-Oct-2020	7 days	5 days	✓	
Physical Tests : TDS by Gravimetry											
HDPE MW1A	E162	15-Oct-2020	----	----	----		20-Oct-2020	7 days	5 days	✓	
Physical Tests : TDS by Gravimetry											
HDPE MW1B	E162	15-Oct-2020	----	----	----		20-Oct-2020	7 days	5 days	✓	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Physical Tests : TDS by Gravimetry										
HDPE MW2	E162	15-Oct-2020	----	----	----		20-Oct-2020	7 days	5 days	✔
Physical Tests : TDS by Gravimetry										
HDPE MW3	E162	15-Oct-2020	----	----	----		20-Oct-2020	7 days	5 days	✔
Physical Tests : TDS by Gravimetry										
HDPE MW4	E162	15-Oct-2020	----	----	----		20-Oct-2020	7 days	5 days	✔

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended
 Rec. HT: ALS recommended hold time (see units).



Quality Control Parameter Frequency Compliance

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

Matrix: **Water** Evaluation: * = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
Analytical Methods							
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	104354	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	108290	1	9	11.1	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	104358	1	17	5.8	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	105917	1	6	16.6	5.0	✓
Chloride in Water by IC	E235.Cl	104357	1	17	5.8	5.0	✓
Conductivity in Water	E100	104355	1	19	5.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	106429	2	8	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	105197	3	32	9.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	106428	2	24	8.3	5.0	✓
Fluoride in Water by IC	E235.F	104356	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	104359	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	104360	1	17	5.8	5.0	✓
pH by Meter	E108	104353	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	104361	1	17	5.8	5.0	✓
TDS by Gravimetry	E162	105490	1	17	5.8	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	108343	1	11	9.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	104354	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	108290	1	9	11.1	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	104358	1	17	5.8	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	105917	1	6	16.6	5.0	✓
Chloride in Water by IC	E235.Cl	104357	1	17	5.8	5.0	✓
Conductivity in Water	E100	104355	1	19	5.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	106429	2	8	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	105197	3	32	9.3	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	106428	2	24	8.3	5.0	✓
Fluoride in Water by IC	E235.F	104356	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	104359	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	104360	1	17	5.8	5.0	✓
pH by Meter	E108	104353	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	104361	1	17	5.8	5.0	✓
TDS by Gravimetry	E162	105490	1	17	5.8	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	108343	1	11	9.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	104354	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	108290	1	9	11.1	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	104358	1	17	5.8	5.0	✓



Matrix: **Water**

Evaluation: ✖ = QC frequency outside specification; ✔ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
<i>Analytical Methods</i>							
Method Blanks (MB) - Continued							
Chemical Oxygen Demand by Colourimetry	E559	105917	1	6	16.6	5.0	✔
Chloride in Water by IC	E235.Cl	104357	1	17	5.8	5.0	✔
Conductivity in Water	E100	104355	1	19	5.2	5.0	✔
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	106429	2	8	25.0	5.0	✔
Dissolved Mercury in Water by CVAAS	E509	105197	3	32	9.3	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	106428	2	24	8.3	5.0	✔
Fluoride in Water by IC	E235.F	104356	1	17	5.8	5.0	✔
Nitrate in Water by IC (Low Level)	E235.NO3-L	104359	1	17	5.8	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	104360	1	17	5.8	5.0	✔
Sulfate in Water by IC	E235.SO4	104361	1	17	5.8	5.0	✔
TDS by Gravimetry	E162	105490	1	17	5.8	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	108343	1	11	9.0	5.0	✔
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	108290	1	9	11.1	5.0	✔
Bromide in Water by IC (Low Level)	E235.Br-L	104358	1	17	5.8	5.0	✔
Chemical Oxygen Demand by Colourimetry	E559	105917	1	6	16.6	5.0	✔
Chloride in Water by IC	E235.Cl	104357	1	17	5.8	5.0	✔
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	106429	1	8	12.5	5.0	✔
Dissolved Mercury in Water by CVAAS	E509	105197	3	32	9.3	5.0	✔
Dissolved Metals in Water by CRC ICPMS	E421	106428	2	24	8.3	5.0	✔
Fluoride in Water by IC	E235.F	104356	1	17	5.8	5.0	✔
Nitrate in Water by IC (Low Level)	E235.NO3-L	104359	1	17	5.8	5.0	✔
Nitrite in Water by IC (Low Level)	E235.NO2-L	104360	1	17	5.8	5.0	✔
Sulfate in Water by IC	E235.SO4	104361	1	17	5.8	5.0	✔
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	108343	1	11	9.0	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.
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.
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 Calgary - 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.
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 Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
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 Calgary - Environmental	Water	APHA 5220 D (mod)	Samples are analyzed using the closed reflux colourimetric method.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO ₃), 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.
Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
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 HNO ₃ .
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 : VA20B8400

Page : 1 of 18

Client : Regional District of Kitimat-Stikine
Contact : Mary Tress
Address : # 300 - 4545 Lazelle Avenue
Terrace BC Canada V8G 4E1
Telephone : ----
Project : Meziadin Landfill Groundwater
PO : ----
C-O-C number : ----
Sampler : Mary Tress
Site :
Quote number : Q62338
No. of samples received : 8
No. of samples analysed : 8

Laboratory : Vancouver - Environmental
Account Manager : Amber Springer
Address : 8081 Lougheed Highway
Burnaby, British Columbia Canada V5A 1W9
Telephone : +1 604 253 4188
Date Samples Received : 16-Oct-2020 20:15
Date Analysis Commenced : 17-Oct-2020
Issue Date : 28-Oct-2020 16:20

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.

Table with 3 columns: Signatories, Position, Laboratory Department. Lists names like Amy Lazure, Angela Ren, Angelo Salandanan, Bruna Botti, Dee Lee, Katarzyna Glinka, Kim Jensen, Lindsay Gung, Monica Ko, Robin Weeks, and Shaneel Dayal with their respective roles and departments.

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Work Order : VA20B8400
Client : Regional District of Kitimat-Stikine
Project : Meziadin Landfill Groundwater



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: 104353)											
VA20B8399-003	Anonymous	pH	----	E108	0.10	pH units	7.92	7.94	0.252%	4%	----
Physical Tests (QC Lot: 104354)											
VA20B8399-003	Anonymous	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	53.4	53.0	0.752%	20%	----
Physical Tests (QC Lot: 104355)											
VA20B8399-003	Anonymous	conductivity	----	E100	2.0	µS/cm	221	222	0.451%	10%	----
Physical Tests (QC Lot: 105490)											
VA20B8400-001	MW1A	solids, total dissolved [TDS]	----	E162	20	mg/L	554	589	6.13%	20%	----
Anions and Nutrients (QC Lot: 104356)											
VA20B8399-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.313	0.313	0.0894%	20%	----
Anions and Nutrients (QC Lot: 104357)											
VA20B8399-001	Anonymous	chloride	16887-00-6	E235.Cl	0.50	mg/L	2.35	2.34	0.008	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 104358)											
VA20B8399-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 104359)											
VA20B8399-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.373	0.371	0.531%	20%	----
Anions and Nutrients (QC Lot: 104360)											
VA20B8399-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0013	<0.0010	0.0003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 104361)											
VA20B8399-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	24.3	24.3	0.135%	20%	----
Anions and Nutrients (QC Lot: 108290)											
VA20B8400-008	Travel Blank	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 108343)											
VA20B8375-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	1.37	1.34	2.12%	20%	----
Dissolved Metals (QC Lot: 105197)											
VA20B8400-008	Travel Blank	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 106428)											
VA20B8400-001	MW1A	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0038	0.0040	0.0002	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00029	0.00029	0.0000009	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00110	0.00110	0.367%	20%	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0557	0.0563	1.15%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	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: 106428) - continued											
VA20B8400-001	MW1A	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	0.071	0.072	0.0009	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000200	mg/L	<0.0000200	<0.0000200	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	52.4	51.8	1.15%	20%	----
		cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00032	0.00034	0.00002	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	0.044	0.041	0.003	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	0.0042	0.0042	0.00002	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	11.9	12.3	3.05%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.419	0.426	1.50%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.0155	0.0154	0.0175%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00104	0.00107	0.00003	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	2.54	2.59	1.94%	20%	----
		rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00034	0.00026	0.00007	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000156	0.000088	0.000068	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.92	3.91	0.163%	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	108	110	1.28%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.646	0.643	0.473%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	57.1	55.8	2.45%	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	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00292	0.00290	0.555%	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	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----

Dissolved Metals (QC Lot: 106429)

VA20B8400-001	MW1A	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
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Dissolved Metals (QC Lot: 106957)



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: 106957) - continued											
VA20B8400-008	Travel Blank	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	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		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	----

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 Work Order : VA20B8400
 Client : Regional District of Kitimat-Stikine
 Project : Meziadin Landfill Groundwater



Sub-Matrix: Water					<i>Laboratory Duplicate (DUP) Report</i>						
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>LOR</i>	<i>Unit</i>	<i>Original Result</i>	<i>Duplicate Result</i>	<i>RPD(%) or Difference</i>	<i>Duplicate Limits</i>	<i>Qualifier</i>
Dissolved Metals (QC Lot: 106957) - continued											
VA20B8400-008	Travel Blank	zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 106958)											
VA20B8400-008	Travel Blank	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 108479)											
VA20B8287-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 108480)											
VA20B8400-002	MW1B	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Aggregate Organics (QC Lot: 105917)											
VA20B8400-001	MW1A	chemical oxygen demand [COD]	----	E559	20	mg/L	36	41	5	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: 104354)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 104355)						
conductivity	----	E100	1	µS/cm	1.2	----
Physical Tests (QCLot: 105490)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 104356)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 104357)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 104358)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 104359)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 104360)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 104361)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 108290)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 108343)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Dissolved Metals (QCLot: 105197)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 106428)						
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	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 106428) - continued						
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	<0.000010	---
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: 106429)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	---
Dissolved Metals (QCLot: 106957)						
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	---



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 106957) - continued						
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	---
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: 106958)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	---



Sub-Matrix: **Water**

<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>LOR</i>	<i>Unit</i>	<i>Result</i>	<i>Qualifier</i>
Dissolved Metals (QCLot: 108479)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 108480)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Aggregate Organics (QCLot: 105917)						
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 Concentration	Recovery (%) LCS	Recovery Limits (%)		Qualifier
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 104353)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 104354)									
alkalinity, total (as CaCO ₃)	----	E290	1	mg/L	500 mg/L	97.0	85.0	115	----
Physical Tests (QCLot: 104355)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	104	90.0	110	----
Physical Tests (QCLot: 105490)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	95.3	85.0	115	----
Anions and Nutrients (QCLot: 104356)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	99.8	90.0	110	----
Anions and Nutrients (QCLot: 104357)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 104358)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	93.0	85.0	115	----
Anions and Nutrients (QCLot: 104359)									
nitrate (as N)	14797-55-8	E235.NO ₃ -L	0.005	mg/L	2.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 104360)									
nitrite (as N)	14797-65-0	E235.NO ₂ -L	0.001	mg/L	0.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 104361)									
sulfate (as SO ₄)	14808-79-8	E235.SO ₄	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 108290)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.1 mg/L	101	85.0	115	----
Anions and Nutrients (QCLot: 108343)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	103	75.0	125	----
Dissolved Metals (QCLot: 105197)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	95.0	80.0	120	----
Dissolved Metals (QCLot: 106428)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	108	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	89.8	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	94.2	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	96.8	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	99.6	80.0	120	----



Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
Dissolved Metals (QCLot: 106428) - continued									
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	93.1	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	104	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	98.0	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	103	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	100	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	102	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	102	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	100	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	99.6	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	96.7	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	99.2	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	101	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	99.5	80.0	120	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	94.7	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	93.5	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	99.4	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	101	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	104	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	103	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	94.4	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	100	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	90.2	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	92.3	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	88.2	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	89.5	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	99.3	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	102	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	91.6	80.0	120	----
Dissolved Metals (QCLot: 106429)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	98.5	80.0	120	----
Dissolved Metals (QCLot: 106957)									
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	88.3	80.0	120	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
Dissolved Metals (QCLot: 106957) - continued									
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	93.0	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	103	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	96.5	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	90.0	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	94.4	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	100	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	98.4	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	98.1	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	95.1	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	99.1	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	98.3	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	98.4	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	93.7	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	98.2	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	103	70.0	130	----
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	99.7	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	98.0	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	102	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	102	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	99.9	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	94.1	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	108	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	97.3	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	95.6	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	86.6	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	87.8	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	91.5	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	101	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	99.3	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	108	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	92.6	80.0	120	----

Dissolved Metals (QCLot: 106958)

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 Work Order : VA20B8400
 Client : Regional District of Kitimat-Stikine
 Project : Meziadin Landfill Groundwater



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 106958) - continued									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	97.4	80.0	120	----
Dissolved Metals (QCLot: 108479)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	99.8	80.0	120	----
Dissolved Metals (QCLot: 108480)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	97.8	80.0	120	----
Aggregate Organics (QCLot: 105917)									
chemical oxygen demand [COD]	----	E559	20	mg/L	500 mg/L	97.7	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: 104356)										
VA20B8399-002	Anonymous	fluoride	16984-48-8	E235.F	1.02 mg/L	1 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 104357)										
VA20B8399-002	Anonymous	chloride	16887-00-6	E235.Cl	101 mg/L	100 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 104358)										
VA20B8399-002	Anonymous	bromide	24959-67-9	E235.Br-L	0.437 mg/L	0.5 mg/L	87.4	75.0	125	----
Anions and Nutrients (QCLot: 104359)										
VA20B8399-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.52 mg/L	2.5 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 104360)										
VA20B8399-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.499 mg/L	0.5 mg/L	99.8	75.0	125	----
Anions and Nutrients (QCLot: 104361)										
VA20B8399-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	99.5 mg/L	100 mg/L	99.5	75.0	125	----
Anions and Nutrients (QCLot: 108290)										
VA20B8400-008	Travel Blank	ammonia, total (as N)	7664-41-7	E298	0.100 mg/L	0.1 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 108343)										
VA20B8375-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	ND mg/L	0.5 mg/L	ND	70.0	130	----
Dissolved Metals (QCLot: 105197)										
VA20B8417-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000920 mg/L	0.0001 mg/L	92.0	70.0	130	----
Dissolved Metals (QCLot: 106428)										
VA20B8400-002	MW1B	aluminum, dissolved	7429-90-5	E421	0.203 mg/L	0.2 mg/L	101	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0199 mg/L	0.02 mg/L	99.5	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0201 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	0.0388 mg/L	0.04 mg/L	97.1	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00883 mg/L	0.01 mg/L	88.3	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.086 mg/L	0.1 mg/L	86.0	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00404 mg/L	0.004 mg/L	101	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	0.0106 mg/L	0.01 mg/L	106	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0185 mg/L	0.02 mg/L	92.5	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: 106428) - continued										
VA20B8400-002	MW1B	copper, dissolved	7440-50-8	E421	0.0189 mg/L	0.02 mg/L	94.6	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.87 mg/L	2 mg/L	93.6	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0190 mg/L	0.02 mg/L	95.2	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0984 mg/L	0.1 mg/L	98.4	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	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0371 mg/L	0.04 mg/L	92.7	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.6 mg/L	10 mg/L	106	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.82 mg/L	4 mg/L	95.5	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0186 mg/L	0.02 mg/L	93.1	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0419 mg/L	0.04 mg/L	105	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.36 mg/L	10 mg/L	93.6	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00405 mg/L	0.004 mg/L	101	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	21.2 mg/L	20 mg/L	106	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0410 mg/L	0.04 mg/L	102	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00369 mg/L	0.004 mg/L	92.2	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0187 mg/L	0.02 mg/L	93.6	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0199 mg/L	0.02 mg/L	99.5	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	0.0189 mg/L	0.02 mg/L	94.5	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00390 mg/L	0.004 mg/L	97.6	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.399 mg/L	0.4 mg/L	99.8	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0429 mg/L	0.04 mg/L	107	70.0	130	----
Dissolved Metals (QCLot: 106429)										
VA20B8400-002	MW1B	chromium, dissolved	7440-47-3	E421.Cr-L	0.0392 mg/L	0.04 mg/L	98.1	70.0	130	----
Dissolved Metals (QCLot: 106957)										
VA20B8375-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.208 mg/L	0.2 mg/L	104	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0189 mg/L	0.02 mg/L	94.6	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0237 mg/L	0.02 mg/L	119	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	0.0402 mg/L	0.04 mg/L	100	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00812 mg/L	0.01 mg/L	81.2	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: 106957) - continued										
VA20B8375-002	Anonymous	boron, dissolved	7440-42-8	E421	0.088 mg/L	0.1 mg/L	87.9	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00360 mg/L	0.004 mg/L	90.1	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	----
		cobalt, dissolved	7440-48-4	E421	0.0193 mg/L	0.02 mg/L	96.4	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0184 mg/L	0.02 mg/L	91.8	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.92 mg/L	2 mg/L	95.9	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0178 mg/L	0.02 mg/L	89.1	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0885 mg/L	0.1 mg/L	88.5	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	0.0200 mg/L	0.02 mg/L	99.8	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0373 mg/L	0.04 mg/L	93.2	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	12.3 mg/L	10 mg/L	123	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.89 mg/L	4 mg/L	97.2	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0193 mg/L	0.02 mg/L	96.4	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0812 mg/L	0.08 mg/L	102	70.0	130	----
		silicon, dissolved	7440-21-3	E421	10.0 mg/L	10 mg/L	100	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00605 mg/L	0.008 mg/L	75.6	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	22.1 mg/L	20 mg/L	110	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0442 mg/L	0.04 mg/L	110	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00345 mg/L	0.004 mg/L	86.2	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0203 mg/L	0.02 mg/L	101	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0189 mg/L	0.02 mg/L	94.6	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0395 mg/L	0.04 mg/L	98.8	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	0.0196 mg/L	0.02 mg/L	98.1	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00383 mg/L	0.004 mg/L	95.8	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.105 mg/L	0.1 mg/L	105	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.392 mg/L	0.4 mg/L	98.0	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0410 mg/L	0.04 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 108479)										
VA20B8287-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000978 mg/L	0.0001 mg/L	97.8	70.0	130	----
Dissolved Metals (QCLot: 108480)										
VA20B8400-003	MW2	mercury, dissolved	7439-97-6	E509	0.0000996 mg/L	0.0001 mg/L	99.6	70.0	130	----

Page : 18 of 18
 Work Order : VA20B8400
 Client : Regional District of Kitimat-Stikine
 Project : Meziadin Landfill Groundwater



Sub-Matrix: **Water**

					<i>Matrix Spike (MS) Report</i>					
					<i>Spike</i>		<i>Recovery (%)</i>	<i>Recovery Limits (%)</i>		
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>Concentration</i>	<i>Target</i>	<i>MS</i>	<i>Low</i>	<i>High</i>	<i>Qualifier</i>
Aggregate Organics (QCLot: 105917)										
VA20B8400-002	MW1B	chemical oxygen demand [COD]	----	E559	141 mg/L	139.5 mg/L	101	75.0	125	----



Chain of Custody (COC) / Analytical Request Form

COC Number: 17 -

Affix ALS barcode label here (lab use only)

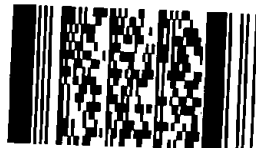
Page of

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

Report To Contact and company name below will appear on the final report		Report Format / Distribution			Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)																		
Company:	Regional District of Kitimat-Stikine	Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL)			Regular [R] <input checked="" type="checkbox"/> Standard TAT if received by 3 pm - business days - no surcharges apply																		
Contact:	Mary Tress	Quality Control (QC) Report with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			PRIORITY (Business Days)	4 day [P4-20%] <input type="checkbox"/>				EMERGENCY	1 Business day [E1 - 100%] <input type="checkbox"/>												
Phone:	250-641-4141	<input checked="" type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked				3 day [P3-25%] <input type="checkbox"/>					Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] <input type="checkbox"/>												
Company address below will appear on the final report		Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			- Date and Time Required for all E&P TATs:																		
Street:	4545 Lazelle Avenue	Email 1 or Fax eblaney@rdks.bc.ca			For tests that can not be performed according to the service level selected, you will be contacted.																		
City/Province:	Terrace/BC	Email 2 mtress@rdks.bc.ca, mhaley@rdks.bc.ca			Analysis Request																		
Postal Code:	V8G4E1	Email 3 sprouse@rdks.bc.ca; mglover@rdks.bc.ca			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																		
Invoice To		Invoice Distribution																					
Same as Report To <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX																					
Copy of Invoice with Report <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		Email 1 or Fax anne-maries@rdks.bc.ca																					
Company:	Regional District of Kitimat-Stikine	Email 2 mhaley@rdks.bc.ca																					
Contact:	Mary Tress																						
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: Mary Tress																			
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
MW1A				15 Oct 20	16:45	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
MW1B					11:15	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
MW2					14:20	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
MW3					12:15	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
MW4					09:45	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
Field Blank					13:55	Water	R	R		R							R		R				
DUP					12:00	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
Travel Blank						Water	R			R	R						R						
Drinking Water (DW) Samples¹ (client use)		Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)			SAMPLE CONDITION AS RECEIVED (lab use only)																		
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)			Frozen <input type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>																		
Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO					Ice Packs <input checked="" type="checkbox"/> Ice Cubes <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>																		
					Cooling Initiated <input type="checkbox"/>																		
					INITIAL COOLER TEMPERATURES °C						FINAL COOLER TEMPERATURES °C												
					3.8						8												
SHIPMENT RELEASE (client use)				INITIAL SHIPMENT RECEPTION (lab use only)				FINAL SHIPMENT RECEPTION (lab use only)															
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:									
Mary Tress	16 Oct 2020	1:10	Chris	16 Oct 2020	13:10	Tress	OCT 16 2020	8:15															

Environmental Division
Vancouver
Work Order Reference
VA20B8400



Telephone : +1 604 253 4188



CERTIFICATE OF ANALYSIS

Work Order : **VA20B8397**
Client : **Regional District of Kitimat-Stikine**
Contact : **Mary Tress**
Address : **# 300 - 4545 Lazelle Avenue**
Terrace BC Canada V8G 4E1
Telephone : **----**
Project : **Meziadin Landfill Surface Water**
PO : **----**
C-O-C number : **----**
Sampler : **Mary Tress**
Site : **:**
Quote number : **Q62338**
No. of samples received : **3**
No. of samples analysed : **3**

Page : **1 of 6**
Laboratory : **Vancouver - Environmental**
Account Manager : **Amber Springer**
Address : **8081 Lougheed Highway**
Burnaby BC Canada V5A 1W9
Telephone : **+1 604 253 4188**
Date Samples Received : **16-Oct-2020 20:15**
Date Analysis Commenced : **18-Oct-2020**
Issue Date : **27-Oct-2020 16:25**

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Amy Lazure	Lab Assistant	Inorganics, Calgary, Alberta
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Anthony Calero		Metals, Calgary, Alberta
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Katarzyna Glinka		Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Ruth Morrison		Inorganics, Calgary, Alberta



General Comments

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

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

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

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

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

<i>Unit</i>	<i>Description</i>
-	No 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.

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

Qualifiers

<i>Qualifier</i>	<i>Description</i>
DTSE	<i>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.</i>



Analytical Results

Sub-Matrix: Water

Client sample ID

(Matrix: Water)

					SW2017-01 DS	SW2017-02 US	Lagoon Outlet	----	----
Client sampling date / time					15-Oct-2020 14:50	15-Oct-2020 13:10	15-Oct-2020 15:40	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20B8397-001	VA20B8397-002	VA20B8397-003	-----	-----
					Result	Result	Result	----	----
Physical Tests									
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	15.2	5.9	195	----	----
conductivity	----	E100	2.0	µS/cm	50.8	19.1	564	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L	20.5	8.18	190	----	----
pH	----	E108	0.10	pH units	7.18	6.54	8.06	----	----
solids, total suspended [TSS]	----	E160-H	3.0	mg/L	3.6	12.0	6.8	----	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L	20.2	7.92	191	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0221	0.0080	2.13	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0.086	----	----
chloride	16887-00-6	E235.Cl	0.50	mg/L	3.95	<0.50	42.8	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	<0.020	<0.020	0.037	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.549	0.402	3.06	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0727	<0.0050	<0.0050	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	<0.0010	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	<0.30	<0.30	21.8	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.293	0.348	0.0392	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0.00020	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00021	0.00016	0.00130	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0184	0.0108	0.108	----	----
beryllium, total	7440-41-7	E420	0.000100	mg/L	<0.000100	<0.000100	<0.000100	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----
boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0.296	----	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000371	0.0000266	0.0000222	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	5.80	2.20	54.0	----	----
cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000010	<0.000010	0.000013	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00056	0.00060	0.00043	----	----
cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00053	0.00019	0.00033	----	----
copper, total	7440-50-8	E420	0.00050	mg/L	0.00078	0.00104	<0.00050	----	----
iron, total	7439-89-6	E420	0.010	mg/L	0.285	0.133	0.364	----	----



Analytical Results

Sub-Matrix: Water					Client sample ID	SW2017-01 DS	SW2017-02 US	Lagoon Outlet	----	----
(Matrix: Water)										
Client sampling date / time					15-Oct-2020 14:50	15-Oct-2020 13:10	15-Oct-2020 15:40	----	----	
Analyte	CAS Number	Method	LOR	Unit	VA20B8397-001	VA20B8397-002	VA20B8397-003	-----	-----	
					Result	Result	Result	---	---	
Total Metals										
lead, total	7439-92-1	E420	0.000050	mg/L	0.000085	<0.000050	<0.000050	----	----	
lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0010	<0.0010	0.0029	----	----	
magnesium, total	7439-95-4	E420	0.0050	mg/L	1.46	0.652	13.5	----	----	
manganese, total	7439-96-5	E420	0.00010	mg/L	0.207	0.0578	3.68	----	----	
mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	----	----	
molybdenum, total	7439-98-7	E420	0.000050	mg/L	<0.000050	<0.000050	0.000256	----	----	
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00230	0.00194	0.00293	----	----	
phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0.052	----	----	
potassium, total	7440-09-7	E420	0.050	mg/L	0.517	0.235	9.57	----	----	
rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00043	0.00033	0.00419	----	----	
selenium, total	7782-49-2	E420	0.000050	mg/L	0.000085	0.000102	0.000058	----	----	
silicon, total	7440-21-3	E420	0.10	mg/L	3.27	3.21	1.33	----	----	
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	0.000011	<0.000010	----	----	
sodium, total	17341-25-2	E420	0.050	mg/L	2.90	0.881	32.8	----	----	
strontium, total	7440-24-6	E420	0.00020	mg/L	0.0383	0.0154	0.352	----	----	
sulfur, total	7704-34-9	E420	0.50	mg/L	<0.50	<0.50	8.43	----	----	
tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	<0.00020	----	----	
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	<0.000010	----	----	
thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----	
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----	
titanium, total	7440-32-6	E420	0.00030	mg/L	0.00180	0.00164	<0.00030	----	----	
tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----	
uranium, total	7440-61-1	E420	0.000010	mg/L	<0.000010	<0.000010	<0.000010	----	----	
vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00051	<0.00050	<0.00050	----	----	
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0.0035	----	----	
zirconium, total	7440-67-7	E420	0.00020	mg/L	0.00024	0.00034	<0.00020	----	----	
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.207	0.330	0.0071	----	----	
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0.00015	----	----	
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00017	0.00019	0.00120	----	----	
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0149	0.0104	0.108	----	----	



Analytical Results

Sub-Matrix: Water					Client sample ID	SW2017-01 DS	SW2017-02 US	Lagoon Outlet	----	----
(Matrix: Water)					Client sampling date / time	15-Oct-2020 14:50	15-Oct-2020 13:10	15-Oct-2020 15:40	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20B8397-001	VA20B8397-002	VA20B8397-003	-----	-----	
					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	<0.010	<0.010	0.274	----	----	
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000115	0.0000262	<0.0000050	----	----	
calcium, dissolved	7440-70-2	E421	0.050	mg/L	5.63	2.10	54.8	----	----	
cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	0.000010	----	----	
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00047	0.00063	0.00038	----	----	
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	0.00016	0.00030	----	----	
copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00064	0.00106	0.00026	----	----	
iron, dissolved	7439-89-6	E421	0.010	mg/L	0.120	0.096	0.248	----	----	
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	0.0027	----	----	
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	1.48	0.647	13.2	----	----	
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00390	0.0560	3.89	----	----	
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	----	----	
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	<0.000050	<0.000050	0.000218	----	----	
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00196	0.00186	0.00286	----	----	
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	<0.050	----	----	
potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.515	0.223	10.0	----	----	
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00037	0.00033	0.00434	----	----	
selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000072	0.000128	0.00171 ^{DTSE}	----	----	
silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.43	3.31	1.27	----	----	
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	0.000012	<0.000010	----	----	
sodium, dissolved	17341-25-2	E421	0.050	mg/L	2.97	0.942	33.8	----	----	
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0355	0.0143	0.349	----	----	
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	<0.50	<0.50	10.0	----	----	
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	0.00128	0.00149	<0.00030	----	----	



Analytical Results

Sub-Matrix: Water

Client sample ID

(Matrix: Water)

					SW2017-01 DS	SW2017-02 US	Lagoon Outlet	----	----
					15-Oct-2020 14:50	15-Oct-2020 13:10	15-Oct-2020 15:40	----	----
Analyte	CAS Number	Method	LOR	Unit	VA20B8397-001	VA20B8397-002	VA20B8397-003	-----	-----
					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	<0.000010	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0012	0.0019	0.0013	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	0.00038	0.00043	<0.00020	----	----
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	5.6	----	----
chemical oxygen demand [COD]	----	E559	20	mg/L	47	46	39	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: VA20B8397	Page	: 1 of 15
Client	: Regional District of Kitimat-Stikine	Laboratory	: Vancouver - Environmental
Contact	: Mary Tress	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	: 16-Oct-2020 20:15
PO	: ----	Issue Date	: 27-Oct-2020 16:25
C-O-C number	: ----		
Sampler	: Mary Tress		
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 Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Laboratory Control Sample (LCS) Recoveries								
Dissolved Metals	QC-MRG2-1063040 02	----	lithium, dissolved	7439-93-2	E421	121 % ^{MES}	80.0-120%	Recovery greater than upper control limit
Dissolved Metals	QC-MRG2-1063040 02	----	sulfur, dissolved	7704-34-9	E421	79.1 % ^{MES}	80.0-120%	Recovery less than lower control limit

Result Qualifiers

Qualifier	Description
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).



Analysis Holding Time Compliance

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

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

Where actual sampling date is not provided on the chain of custody, the date of receipt with time at 15:00 is used for calculation purposes.

Where only the sample date without time is provided on the chain of custody, the sampling date at 15:00 is used for calculation purposes.

Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval
				Rec	Actual			Rec	Actual	
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD] Lagoon Outlet	E550	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✓
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD] SW2017-01 DS	E550	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✓
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD] SW2017-02 US	E550	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) Lagoon Outlet	E559	15-Oct-2020	----	----	----		21-Oct-2020	28 days	5 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) SW2017-01 DS	E559	15-Oct-2020	----	----	----		21-Oct-2020	28 days	5 days	✓
Aggregate Organics : Chemical Oxygen Demand by Colourimetry										
Amber glass total (sulfuric acid) SW2017-02 US	E559	15-Oct-2020	----	----	----		21-Oct-2020	28 days	5 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) Lagoon Outlet	E298	15-Oct-2020	----	----	----		26-Oct-2020	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		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Anions and Nutrients : Ammonia by Fluorescence											
Amber glass total (sulfuric acid) SW2017-01 DS	E298	15-Oct-2020	----	----	----		26-Oct-2020	28 days	10 days	✔	
Anions and Nutrients : Ammonia by Fluorescence											
Amber glass total (sulfuric acid) SW2017-02 US	E298	15-Oct-2020	----	----	----		26-Oct-2020	28 days	10 days	✔	
Anions and Nutrients : Bromide in Water by IC (Low Level)											
HDPE Lagoon Outlet	E235.Br-L	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Bromide in Water by IC (Low Level)											
HDPE SW2017-01 DS	E235.Br-L	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Bromide in Water by IC (Low Level)											
HDPE SW2017-02 US	E235.Br-L	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Chloride in Water by IC											
HDPE Lagoon Outlet	E235.Cl	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Chloride in Water by IC											
HDPE SW2017-01 DS	E235.Cl	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Chloride in Water by IC											
HDPE SW2017-02 US	E235.Cl	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Fluoride in Water by IC											
HDPE Lagoon Outlet	E235.F	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Anions and Nutrients : Fluoride in Water by IC											
HDPE SW2017-01 DS	E235.F	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Fluoride in Water by IC											
HDPE SW2017-02 US	E235.F	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Nitrate in Water by IC (Low Level)											
HDPE Lagoon Outlet	E235.NO3-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	
Anions and Nutrients : Nitrate in Water by IC (Low Level)											
HDPE SW2017-01 DS	E235.NO3-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	
Anions and Nutrients : Nitrate in Water by IC (Low Level)											
HDPE SW2017-02 US	E235.NO3-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	
Anions and Nutrients : Nitrite in Water by IC (Low Level)											
HDPE Lagoon Outlet	E235.NO2-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	
Anions and Nutrients : Nitrite in Water by IC (Low Level)											
HDPE SW2017-01 DS	E235.NO2-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	
Anions and Nutrients : Nitrite in Water by IC (Low Level)											
HDPE SW2017-02 US	E235.NO2-L	15-Oct-2020	----	----	----		18-Oct-2020	3 days	2 days	✔	
Anions and Nutrients : Sulfate in Water by IC											
HDPE Lagoon Outlet	E235.SO4	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	



Matrix: **Water** Evaluation: ✖ = Holding time exceedance ; ✔ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Anions and Nutrients : Sulfate in Water by IC											
HDPE SW2017-01 DS	E235.SO4	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Sulfate in Water by IC											
HDPE SW2017-02 US	E235.SO4	15-Oct-2020	----	----	----		18-Oct-2020	28 days	2 days	✔	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)											
Amber glass total (sulfuric acid) Lagoon Outlet	E318	15-Oct-2020	23-Oct-2020	28 days	7 days	✔	23-Oct-2020	20 days	0 days	✔	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)											
Amber glass total (sulfuric acid) SW2017-01 DS	E318	15-Oct-2020	23-Oct-2020	28 days	7 days	✔	23-Oct-2020	20 days	0 days	✔	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)											
Amber glass total (sulfuric acid) SW2017-02 US	E318	15-Oct-2020	23-Oct-2020	28 days	7 days	✔	23-Oct-2020	20 days	0 days	✔	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)											
HDPE dissolved (nitric acid) Lagoon Outlet	E421.Cr-L	15-Oct-2020	21-Oct-2020	180 days	6 days	✔	22-Oct-2020	173 days	0 days	✔	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)											
HDPE dissolved (nitric acid) SW2017-01 DS	E421.Cr-L	15-Oct-2020	21-Oct-2020	180 days	6 days	✔	22-Oct-2020	173 days	0 days	✔	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)											
HDPE dissolved (nitric acid) SW2017-02 US	E421.Cr-L	15-Oct-2020	21-Oct-2020	180 days	6 days	✔	22-Oct-2020	173 days	0 days	✔	
Dissolved Metals : Dissolved Mercury in Water by CVAAS											
Glass vial dissolved (hydrochloric acid) Lagoon Outlet	E509	15-Oct-2020	21-Oct-2020	28 days	5 days	✔	21-Oct-2020	22 days	0 days	✔	



Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Dissolved Metals : Dissolved Mercury in Water by CVAAS											
Glass vial dissolved (hydrochloric acid) SW2017-01 DS	E509	15-Oct-2020	21-Oct-2020	28 days	5 days	✓	21-Oct-2020	22 days	0 days	✓	
Dissolved Metals : Dissolved Mercury in Water by CVAAS											
Glass vial dissolved (hydrochloric acid) SW2017-02 US	E509	15-Oct-2020	21-Oct-2020	28 days	5 days	✓	21-Oct-2020	22 days	0 days	✓	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) Lagoon Outlet	E421	15-Oct-2020	21-Oct-2020	180 days	6 days	✓	22-Oct-2020	173 days	0 days	✓	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) SW2017-01 DS	E421	15-Oct-2020	21-Oct-2020	180 days	6 days	✓	22-Oct-2020	173 days	0 days	✓	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS											
HDPE dissolved (nitric acid) SW2017-02 US	E421	15-Oct-2020	21-Oct-2020	180 days	6 days	✓	22-Oct-2020	173 days	0 days	✓	
Physical Tests : Alkalinity Species by Titration											
HDPE Lagoon Outlet	E290	15-Oct-2020	----	----	----		19-Oct-2020	14 days	3 days	✓	
Physical Tests : Alkalinity Species by Titration											
HDPE SW2017-01 DS	E290	15-Oct-2020	----	----	----		19-Oct-2020	14 days	3 days	✓	
Physical Tests : Alkalinity Species by Titration											
HDPE SW2017-02 US	E290	15-Oct-2020	----	----	----		19-Oct-2020	14 days	3 days	✓	
Physical Tests : Conductivity in Water											
HDPE Lagoon Outlet	E100	15-Oct-2020	----	----	----		19-Oct-2020	28 days	3 days	✓	



Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Physical Tests : Conductivity in Water											
HDPE SW2017-01 DS	E100	15-Oct-2020	----	----	----		19-Oct-2020	28 days	3 days	✓	
Physical Tests : Conductivity in Water											
HDPE SW2017-02 US	E100	15-Oct-2020	----	----	----		19-Oct-2020	28 days	3 days	✓	
Physical Tests : pH by Meter											
HDPE Lagoon Outlet	E108	15-Oct-2020	----	----	----		19-Oct-2020	0.25 hrs	93 hrs	* EHTR-FM	
Physical Tests : pH by Meter											
HDPE SW2017-01 DS	E108	15-Oct-2020	----	----	----		19-Oct-2020	0.25 hrs	94 hrs	* EHTR-FM	
Physical Tests : pH by Meter											
HDPE SW2017-02 US	E108	15-Oct-2020	----	----	----		19-Oct-2020	0.25 hrs	95 hrs	* EHTR-FM	
Physical Tests : TSS by Gravimetry											
HDPE Lagoon Outlet	E160-H	15-Oct-2020	----	----	----		20-Oct-2020	7 days	4 days	✓	
Physical Tests : TSS by Gravimetry											
HDPE SW2017-01 DS	E160-H	15-Oct-2020	----	----	----		20-Oct-2020	7 days	4 days	✓	
Physical Tests : TSS by Gravimetry											
HDPE SW2017-02 US	E160-H	15-Oct-2020	----	----	----		20-Oct-2020	7 days	4 days	✓	
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)											
HDPE total (nitric acid) Lagoon Outlet	E420.Cr-L	15-Oct-2020	----	----	----		24-Oct-2020	180 days	8 days	✓	



Matrix: **Water** Evaluation: * = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis				
			Preparation Date	Holding Times		Eval	Analysis Date	Holding Times		Eval	
				Rec	Actual			Rec	Actual		
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)											
HDPE total (nitric acid) SW2017-01 DS	E420.Cr-L	15-Oct-2020	----	----	----		24-Oct-2020	180 days	8 days	✓	
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)											
HDPE total (nitric acid) SW2017-02 US	E420.Cr-L	15-Oct-2020	----	----	----		24-Oct-2020	180 days	8 days	✓	
Total Metals : Total Mercury in Water by CVAAS											
Glass vial total (hydrochloric acid) Lagoon Outlet	E508	15-Oct-2020	----	----	----		21-Oct-2020	28 days	5 days	✓	
Total Metals : Total Mercury in Water by CVAAS											
Glass vial total (hydrochloric acid) SW2017-01 DS	E508	15-Oct-2020	----	----	----		21-Oct-2020	28 days	5 days	✓	
Total Metals : Total Mercury in Water by CVAAS											
Glass vial total (hydrochloric acid) SW2017-02 US	E508	15-Oct-2020	----	----	----		21-Oct-2020	28 days	5 days	✓	
Total Metals : Total Metals in Water by CRC ICPMS											
HDPE total (nitric acid) Lagoon Outlet	E420	15-Oct-2020	----	----	----		24-Oct-2020	180 days	8 days	✓	
Total Metals : Total Metals in Water by CRC ICPMS											
HDPE total (nitric acid) SW2017-01 DS	E420	15-Oct-2020	----	----	----		24-Oct-2020	180 days	8 days	✓	
Total Metals : Total Metals in Water by CRC ICPMS											
HDPE total (nitric acid) SW2017-02 US	E420	15-Oct-2020	----	----	----		24-Oct-2020	180 days	8 days	✓	

Legend & Qualifier Definitions

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended
 Rec. HT: ALS recommended hold time (see units).



Quality Control Parameter Frequency Compliance

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

Matrix: **Water** Evaluation: * = QC frequency outside specification; ✓ = QC frequency within specification.

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
Analytical Methods							
Laboratory Duplicates (DUP)							
Alkalinity Species by Titration	E290	104434	1	8	12.5	5.0	✓
Ammonia by Fluorescence	E298	108289	2	29	6.9	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	104589	1	16	6.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	104440	1	8	12.5	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	105916	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	104439	1	8	12.5	5.0	✓
Conductivity in Water	E100	104435	1	7	14.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	106305	1	3	33.3	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	105932	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	106304	1	17	5.8	5.0	✓
Fluoride in Water by IC	E235.F	104438	1	8	12.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	104441	1	9	11.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	104442	1	8	12.5	5.0	✓
pH by Meter	E108	104433	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	104443	1	8	12.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	106221	1	6	16.6	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	107094	1	20	5.0	5.0	✓
Total Mercury in Water by CVAAS	E508	105937	1	8	12.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	106220	1	18	5.5	5.0	✓
TSS by Gravimetry	E160-H	105307	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Alkalinity Species by Titration	E290	104434	1	8	12.5	5.0	✓
Ammonia by Fluorescence	E298	108289	2	29	6.9	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	104589	1	16	6.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	104440	1	8	12.5	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	105916	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	104439	1	8	12.5	5.0	✓
Conductivity in Water	E100	104435	1	7	14.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	106305	1	3	33.3	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	105932	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	106304	1	17	5.8	5.0	✓
Fluoride in Water by IC	E235.F	104438	1	8	12.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	104441	1	9	11.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	104442	1	8	12.5	5.0	✓
pH by Meter	E108	104433	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	104443	1	8	12.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	106221	1	6	16.6	5.0	✓



Matrix: **Water**

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

Quality Control Sample Type	Method	QC Lot #	Count		Frequency (%)		Evaluation
			QC	Regular	Actual	Expected	
Analytical Methods							
Laboratory Control Samples (LCS) - Continued							
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	107094	1	20	5.0	5.0	✓
Total Mercury in Water by CVAAS	E508	105937	1	8	12.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	106220	1	18	5.5	5.0	✓
TSS by Gravimetry	E160-H	105307	1	20	5.0	5.0	✓
Method Blanks (MB)							
Alkalinity Species by Titration	E290	104434	1	8	12.5	5.0	✓
Ammonia by Fluorescence	E298	108289	2	29	6.9	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	104589	1	16	6.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	104440	1	8	12.5	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	105916	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	104439	1	8	12.5	5.0	✓
Conductivity in Water	E100	104435	1	7	14.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	106305	1	3	33.3	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	105932	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	106304	1	17	5.8	5.0	✓
Fluoride in Water by IC	E235.F	104438	1	8	12.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	104441	1	9	11.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	104442	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	104443	1	8	12.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	106221	1	6	16.6	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	107094	1	20	5.0	5.0	✓
Total Mercury in Water by CVAAS	E508	105937	1	8	12.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	106220	1	18	5.5	5.0	✓
TSS by Gravimetry	E160-H	105307	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	108289	2	29	6.9	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	104440	1	8	12.5	5.0	✓
Chemical Oxygen Demand by Colourimetry	E559	105916	1	20	5.0	5.0	✓
Chloride in Water by IC	E235.Cl	104439	1	8	12.5	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	106305	1	3	33.3	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	105932	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	106304	1	17	5.8	5.0	✓
Fluoride in Water by IC	E235.F	104438	1	8	12.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	104441	1	9	11.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	104442	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	104443	1	8	12.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	106221	1	6	16.6	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	107094	1	20	5.0	5.0	✓
Total Mercury in Water by CVAAS	E508	105937	1	8	12.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	106220	1	18	5.5	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 Calgary - 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 Calgary - 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.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
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 Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAAS	E508 Calgary - 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 Calgary - 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 Calgary - Environmental	Water	APHA 5220 D (mod)	Samples are analyzed using the closed reflux colourimetric method.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO ₃), 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.



<i>Analytical Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO ₃), 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.
<i>Preparation Methods</i>	<i>Method / Lab</i>	<i>Matrix</i>	<i>Method Reference</i>	<i>Method Descriptions</i>
Digestion for TKN in water	EP318 Calgary - 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 HNO ₃ .
Dissolved Mercury Water Filtration	EP509 Calgary - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order : **VA20B8397**

Page : 1 of 18

Client : Regional District of Kitimat-Stikine
Contact : Mary Tress
Address : # 300 - 4545 Lazelle Avenue
 Terrace BC Canada V8G 4E1
Telephone : ----
Project : Meziadin Landfill Surface Water
PO : ----
C-O-C number : ----
Sampler : Mary Tress
Site :
Quote number : Q62338
No. of samples received : 3
No. of samples analysed : 3

Laboratory : Vancouver - Environmental
Account Manager : Amber Springer
Address : 8081 Lougheed Highway
 Burnaby, British Columbia Canada V5A 1W9
Telephone : +1 604 253 4188
Date Samples Received : 16-Oct-2020 20:15
Date Analysis Commenced : 18-Oct-2020
Issue Date : 27-Oct-2020 16:25

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

This Quality Control Report contains the following information:

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

Signatories

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

<i>Signatories</i>	<i>Position</i>	<i>Laboratory Department</i>
Amy Lazure	Lab Assistant	Inorganics, Calgary, Alberta
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Anthony Calero		Metals, Calgary, Alberta
Bruna Botti	Team Leader - Inorganics	Inorganics - Water Quality, Burnaby, British Columbia
Katarzyna Glinka		Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics - Water Quality, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Ruth Morrison		Inorganics, Calgary, Alberta

Page : 2 of 18
Work Order : VA20B8397
Client : Regional District of Kitimat-Stikine
Project : Meziadin Landfill Surface Water



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: 104433)											
KS2002193-001	Anonymous	pH	----	E108	0.10	pH units	10.2	10.2	0.0985%	4%	----
Physical Tests (QC Lot: 104434)											
KS2002193-001	Anonymous	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	295	291	1.36%	20%	----
Physical Tests (QC Lot: 104435)											
KS2002193-001	Anonymous	conductivity	----	E100	2.0	µS/cm	749	760	1.46%	10%	----
Physical Tests (QC Lot: 105307)											
VA20B8323-002	Anonymous	solids, total suspended [TSS]	----	E160-H	3.0	mg/L	11.2	12.2	1.0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 104438)											
KS2002193-001	Anonymous	fluoride	16984-48-8	E235.F	0.100	mg/L	0.388	0.366	0.022	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 104439)											
KS2002193-001	Anonymous	chloride	16887-00-6	E235.Cl	2.50	mg/L	6.04	6.03	0.01	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 104440)											
KS2002193-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.250	mg/L	<0.250	<0.250	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 104441)											
KS2002193-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	<0.0250	<0.0250	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 104442)											
KS2002193-001	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: 104443)											
KS2002193-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	51.2	51.9	1.30%	20%	----
Anions and Nutrients (QC Lot: 107094)											
KS2002207-004	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 108289)											
VA20B8372-004	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0120	0.0096	0.0024	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 108290)											
VA20B8400-008	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Total Metals (QC Lot: 105937)											
VA20B8382-004	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 106220)											
KS2002204-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00016	0.00015	0.000009	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00225	0.00222	1.35%	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: 106220) - continued											
KS2002204-001	Anonymous	barium, total	7440-39-3	E420	0.00010	mg/L	0.0216	0.0217	0.464%	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	0.077	0.078	0.001	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	208	206	0.732%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	0.000012	0.000012	0.0000009	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.0218	0.0213	2.29%	20%	----
		iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000369	0.000364	0.000005	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0041	0.0041	0.00005	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	149	148	0.647%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00053	0.00050	0.00002	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00474	0.00460	2.86%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00118	0.00104	0.00015	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	0.101	0.083	0.018	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	6.32	6.40	1.26%	20%	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00185	0.00202	0.00017	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000166	0.000233	0.000067	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	12.4	12.2	1.49%	20%	----
		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	48.5	48.7	0.351%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.515	0.507	1.55%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	354	348	1.78%	20%	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.0137	0.0138	0.658%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00123	0.00126	0.00003	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0090	0.0080	0.0010	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----

Total Metals (QC Lot: 106221)



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: 106221) - continued											
KS2002204-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00061	0.00054	0.00007	Diff <2x LOR	----
Dissolved Metals (QC Lot: 105932)											
VA20B8371-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 106304)											
VA20B8397-001	SW2017-01 DS	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.207	0.206	0.333%	20%	----
		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	0.00017	0.00017	0.000007	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0149	0.0142	4.47%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000115	0.0000106	0.0000009	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	5.63	5.42	3.78%	20%	----
		cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	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	0.00064	0.00060	0.00003	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.120	0.117	3.09%	20%	----
		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	1.48	1.46	1.22%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00390	0.00373	4.52%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00196	0.00189	0.00007	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	0.515	0.509	1.10%	20%	----
		rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	0.00037	0.00037	0.0000007	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000072	0.000067	0.000005	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.43	3.27	4.60%	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	2.97	2.91	1.93%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0355	0.0343	3.53%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
		tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----



Sub-Matrix: Water					<i>Laboratory Duplicate (DUP) Report</i>						
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>LOR</i>	<i>Unit</i>	<i>Original Result</i>	<i>Duplicate Result</i>	<i>RPD(%) or Difference</i>	<i>Duplicate Limits</i>	<i>Qualifier</i>
Dissolved Metals (QC Lot: 106304) - continued											
VA20B8397-001	SW2017-01 DS	titanium, dissolved	7440-32-6	E421	0.00030	mg/L	0.00128	0.00117	0.00011	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	0.0012	0.0010	0.0002	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	0.00038	0.00036	0.00002	Diff <2x LOR	----
Dissolved Metals (QC Lot: 106305)											
VA20B8397-001	SW2017-01 DS	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00047	0.00047	0.000002	Diff <2x LOR	----
Aggregate Organics (QC Lot: 104589)											
VA20B8318-024	Anonymous	biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	<2.0	<2.0	0.00%	30%	----
Aggregate Organics (QC Lot: 105916)											
VA20B8159-011	Anonymous	chemical oxygen demand [COD]	----	E559	20	mg/L	<20	<20	0	Diff <2x LOR	----



Method Blank (MB) Report

A Method Blank is an analyte-free matrix that undergoes sample processing identical to that carried out for test samples. Method Blank results are used to monitor and control for potential contamination from the laboratory environment and reagents. For most tests, the DQO for Method Blanks is for the result to be < LOR.

Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 104434)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	1.0	----
Physical Tests (QCLot: 104435)						
conductivity	----	E100	1	µS/cm	1.0	----
Physical Tests (QCLot: 105307)						
solids, total suspended [TSS]	----	E160-H	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 104438)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 104439)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 104440)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 104441)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 104442)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 104443)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 107094)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 108289)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 108290)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Total Metals (QCLot: 105937)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 106220)						
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	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 106220) - continued						
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	----
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	----
Total Metals (QCLot: 106221)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 105932)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 106304)						



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 106304) - continued						
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	---
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	---

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 Work Order : VA20B8397
 Client : Regional District of Kitimat-Stikine
 Project : Meziadin Landfill Surface Water



Sub-Matrix: **Water**

<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>LOR</i>	<i>Unit</i>	<i>Result</i>	<i>Qualifier</i>
Dissolved Metals (QCLot: 106304) - continued						
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: 106305)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Aggregate Organics (QCLot: 104589)						
biochemical oxygen demand [BOD]	----	E550	2	mg/L	<2.0	----
Aggregate Organics (QCLot: 105916)						
chemical oxygen demand [COD]	----	E559	20	mg/L	<20	----



Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
Analyte	CAS Number	Method	LOR	Unit	Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
Physical Tests (QCLot: 104433)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 104434)									
alkalinity, total (as CaCO ₃)	----	E290	1	mg/L	500 mg/L	96.7	85.0	115	----
Physical Tests (QCLot: 104435)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	105	90.0	110	----
Physical Tests (QCLot: 105307)									
solids, total suspended [TSS]	----	E160-H	3	mg/L	150 mg/L	90.3	85.0	115	----
Anions and Nutrients (QCLot: 104438)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	98.6	90.0	110	----
Anions and Nutrients (QCLot: 104439)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 104440)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	93.6	85.0	115	----
Anions and Nutrients (QCLot: 104441)									
nitrate (as N)	14797-55-8	E235.NO ₃ -L	0.005	mg/L	2.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 104442)									
nitrite (as N)	14797-65-0	E235.NO ₂ -L	0.001	mg/L	0.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 104443)									
sulfate (as SO ₄)	14808-79-8	E235.SO ₄	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 107094)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	92.7	75.0	125	----
Anions and Nutrients (QCLot: 108289)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.1 mg/L	100	85.0	115	----
Anions and Nutrients (QCLot: 108290)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.1 mg/L	101	85.0	115	----
Total Metals (QCLot: 105937)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	98.9	80.0	120	----
Total Metals (QCLot: 106220)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	106	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	99.4	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	95.0	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	106	80.0	120	----



Sub-Matrix: Water

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		Qualifier
					Concentration	LCS	Low	High	
Total Metals (QCLot: 106220) - continued									
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	110	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	103	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	104	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	109	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	107	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	102	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	105	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	105	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	106	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	106	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	99.9	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	98.4	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	112	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	99.0	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	90.6	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	108	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	110	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	108	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	106	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	90.8	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	96.6	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	104	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	101	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	98.8	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	98.3	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	97.6	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	103	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	107	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	97.4	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	98.1	80.0	120	----
Total Metals (QCLot: 106221)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	103	80.0	120	----



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 105932)									
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	98.3	80.0	120	----
Dissolved Metals (QCLot: 106304)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	111	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	97.8	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	103	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	110	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	108	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	100	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	111	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	108	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	108	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	110	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	109	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	109	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	106	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	# 121	80.0	120	MES
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	108	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	113	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	100	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	110	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	107	70.0	130	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	115	80.0	120	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	112	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	105	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	107	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	111	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	# 79.1	80.0	120	MES
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	107	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	107	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	100	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	102	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	98.2	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	106	80.0	120	----



Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 106304) - continued									
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	111	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	112	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	94.6	80.0	120	----
Dissolved Metals (QCLot: 106305)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	112	80.0	120	----
Aggregate Organics (QCLot: 104589)									
biochemical oxygen demand [BOD]	----	E550	2	mg/L	198 mg/L	89.4	85.0	115	----
Aggregate Organics (QCLot: 105916)									
chemical oxygen demand [COD]	----	E559	20	mg/L	500 mg/L	96.9	85.0	115	----

Qualifiers

Qualifier	Description
MES	Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).



Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 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: 104438)										
KS2002193-002	Anonymous	fluoride	16984-48-8	E235.F	1.01 mg/L	1 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 104439)										
KS2002193-002	Anonymous	chloride	16887-00-6	E235.Cl	100 mg/L	100 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 104440)										
KS2002193-002	Anonymous	bromide	24959-67-9	E235.Br-L	0.465 mg/L	0.5 mg/L	93.0	75.0	125	----
Anions and Nutrients (QCLot: 104441)										
KS2002193-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.54 mg/L	2.5 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 104442)										
KS2002193-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.478 mg/L	0.5 mg/L	95.7	75.0	125	----
Anions and Nutrients (QCLot: 104443)										
KS2002193-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	99.5 mg/L	100 mg/L	99.5	75.0	125	----
Anions and Nutrients (QCLot: 107094)										
KS2002207-004	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.55 mg/L	2.5 mg/L	102	70.0	130	----
Anions and Nutrients (QCLot: 108289)										
VA20B8372-004	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.114 mg/L	0.1 mg/L	114	75.0	125	----
Anions and Nutrients (QCLot: 108290)										
VA20B8400-008	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.100 mg/L	0.1 mg/L	100	75.0	125	----
Total Metals (QCLot: 105937)										
VA20B8382-005	Anonymous	mercury, total	7439-97-6	E508	0.000108 mg/L	0.0001 mg/L	108	70.0	130	----
Total Metals (QCLot: 106220)										
VA20B8370-001	Anonymous	aluminum, total	7429-90-5	E420	ND mg/L	0.2 mg/L	ND	70.0	130	----
		antimony, total	7440-36-0	E420	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0203 mg/L	0.02 mg/L	102	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	0.0465 mg/L	0.04 mg/L	116	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00973 mg/L	0.01 mg/L	97.3	70.0	130	----
		boron, total	7440-42-8	E420	0.096 mg/L	0.1 mg/L	96.0	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00401 mg/L	0.004 mg/L	100	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: 106220) - continued										
VA20B8370-001	Anonymous	calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.0104 mg/L	0.01 mg/L	104	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		copper, total	7440-50-8	E420	0.0193 mg/L	0.02 mg/L	96.6	70.0	130	----
		iron, total	7439-89-6	E420	2.00 mg/L	2 mg/L	100	70.0	130	----
		lead, total	7439-92-1	E420	0.0198 mg/L	0.02 mg/L	99.2	70.0	130	----
		lithium, total	7439-93-2	E420	0.108 mg/L	0.1 mg/L	108	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0220 mg/L	0.02 mg/L	110	70.0	130	----
		nickel, total	7440-02-0	E420	0.0376 mg/L	0.04 mg/L	94.1	70.0	130	----
		phosphorus, total	7723-14-0	E420	10.8 mg/L	10 mg/L	108	70.0	130	----
		potassium, total	7440-09-7	E420	4.13 mg/L	4 mg/L	103	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0197 mg/L	0.02 mg/L	98.4	70.0	130	----
		selenium, total	7782-49-2	E420	0.0405 mg/L	0.04 mg/L	101	70.0	130	----
		silicon, total	7440-21-3	E420	10.2 mg/L	10 mg/L	102	70.0	130	----
		silver, total	7440-22-4	E420	0.00416 mg/L	0.004 mg/L	104	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	ND mg/L	20 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0414 mg/L	0.04 mg/L	103	70.0	130	----
		thallium, total	7440-28-0	E420	0.00392 mg/L	0.004 mg/L	97.9	70.0	130	----
		thorium, total	7440-29-1	E420	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		tin, total	7440-31-5	E420	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		titanium, total	7440-32-6	E420	0.0405 mg/L	0.04 mg/L	101	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0210 mg/L	0.02 mg/L	105	70.0	130	----
		uranium, total	7440-61-1	E420	0.00417 mg/L	0.004 mg/L	104	70.0	130	----
		vanadium, total	7440-62-2	E420	0.107 mg/L	0.1 mg/L	107	70.0	130	----
		zinc, total	7440-66-6	E420	0.373 mg/L	0.4 mg/L	93.2	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0424 mg/L	0.04 mg/L	106	70.0	130	----
Total Metals (QCLot: 106221)										
VA20B8370-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0408 mg/L	0.04 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 105932)										
VA20B8371-003	Anonymous	mercury, dissolved	7439-97-6	E509	0.000106 mg/L	0.0001 mg/L	106	70.0	130	----
Dissolved Metals (QCLot: 106304)										
VA20B8397-002	SW2017-02 US	aluminum, dissolved	7429-90-5	E421	ND mg/L	0.2 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: 106304) - continued										
VA20B8397-002	SW2017-02 US	antimony, dissolved	7440-36-0	E421	0.0186 mg/L	0.02 mg/L	92.9	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0199 mg/L	0.02 mg/L	99.5	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00841 mg/L	0.01 mg/L	84.1	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.099 mg/L	0.1 mg/L	99.0	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00417 mg/L	0.004 mg/L	104	70.0	130	----
		calcium, dissolved	7440-70-2	E421	4.02 mg/L	4 mg/L	100	70.0	130	----
		cesium, dissolved	7440-46-2	E421	0.00961 mg/L	0.01 mg/L	96.1	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.97 mg/L	2 mg/L	98.3	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0186 mg/L	0.02 mg/L	93.0	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.115 mg/L	0.1 mg/L	115	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	0.964 mg/L	1 mg/L	96.4	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	0.0187 mg/L	0.02 mg/L	93.6	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0406 mg/L	0.04 mg/L	101	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	11.1 mg/L	10 mg/L	111	70.0	130	----
		potassium, dissolved	7440-09-7	E421	4.25 mg/L	4 mg/L	106	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0209 mg/L	0.02 mg/L	104	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0398 mg/L	0.04 mg/L	99.6	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.37 mg/L	10 mg/L	93.7	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00382 mg/L	0.004 mg/L	95.6	70.0	130	----
		sodium, dissolved	17341-25-2	E421	2.11 mg/L	2 mg/L	106	70.0	130	----
		strontium, dissolved	7440-24-6	E421	0.0175 mg/L	0.02 mg/L	87.4	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	18.8 mg/L	20 mg/L	94.1	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0394 mg/L	0.04 mg/L	98.4	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00371 mg/L	0.004 mg/L	92.8	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0192 mg/L	0.02 mg/L	95.8	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0192 mg/L	0.02 mg/L	96.1	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0384 mg/L	0.04 mg/L	96.0	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	0.0183 mg/L	0.02 mg/L	91.6	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00362 mg/L	0.004 mg/L	90.6	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.433 mg/L	0.4 mg/L	108	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0385 mg/L	0.04 mg/L	96.3	70.0	130	----

Page : 18 of 18
 Work Order : VA20B8397
 Client : Regional District of Kitimat-Stikine
 Project : Meziadin Landfill Surface Water



Sub-Matrix: **Water**

					<i>Matrix Spike (MS) Report</i>					
					<i>Spike</i>		<i>Recovery (%)</i>	<i>Recovery Limits (%)</i>		
<i>Laboratory sample ID</i>	<i>Client sample ID</i>	<i>Analyte</i>	<i>CAS Number</i>	<i>Method</i>	<i>Concentration</i>	<i>Target</i>	<i>MS</i>	<i>Low</i>	<i>High</i>	<i>Qualifier</i>
Dissolved Metals (QCLot: 106305)										
VA20B8397-002	SW2017-02 US	chromium, dissolved	7440-47-3	E421.Cr-L	0.0402 mg/L	0.04 mg/L	100	70.0	130	----
Aggregate Organics (QCLot: 105916)										
VA20B8159-012	Anonymous	chemical oxygen demand [COD]	----	E559	140 mg/L	139.5 mg/L	100	75.0	125	----



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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			Report Format / Distribution			Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)																				
Company: Regional District of Kitimat-Stikine			Select Report Format: <input checked="" type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL)			Regular [R] <input checked="" type="checkbox"/> Standard TAT if received by 3 pm - business days - no surcharges apply																				
Contact: Mary Tress			Quality Control (QC) Report with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			PRIORITY (Business Days)					EMERGENCY															
Phone: 250-641-4141			<input checked="" type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked			4 day [P4-20%] <input type="checkbox"/>					1 Business day [E1 - 100%] <input type="checkbox"/>															
Company address below will appear on the final report:			Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			3 day [P3-25%] <input type="checkbox"/>					Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] <input type="checkbox"/>															
Street: 4545 Lazelle Avenue			Email 1 or Fax: eblaney@rdks.bc.ca			Date and Time Required for all E&P TATs:																				
City/Province: Terrace/BC			Email 2: mtress@rdks.bc.ca; mhaley@rdks.bc.ca			For tests that can not be performed according to the service level selected, you will be contacted.																				
Postal Code: V8G4E1			Email 3: sprouse@rdks.bc.ca; mglover@rdks.bc.ca			Analysis Request																				
Invoice To: Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			Invoice Distribution			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																				
Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX			P F/P																				
Company: Regional District of Kitimat-Stikine			Email 1 or Fax: anne-maries@rdks.bc.ca			P P P																				
Contact: Megan Haley			Email 2: mhaley@rdks.bc.ca			P P P																				
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): 8397			ALS Contact:			Sampler: Mary Tress																				
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		
	SW2017-01 DS			15-OCT-20	14:50	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R			6	
	SW2017-02 US				13:10	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R			6	
	Lagoon Outlet				15:40	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R			6	
	Field Blank																									6
	Target Blank					Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R			6	
Drinking Water (DW) Samples¹ (client use)			Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)			SAMPLE CONDITION AS RECEIVED (lab use only)																				
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO			British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)			Frozen <input checked="" type="checkbox"/> SIF Observations Yes <input type="checkbox"/> No <input type="checkbox"/>																				
Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO						Ice Packs <input checked="" type="checkbox"/> Ice Cubes <input type="checkbox"/> Custody seal intact Yes <input type="checkbox"/> No <input type="checkbox"/>																				
						Cooling Initiated <input type="checkbox"/>																				
						INITIAL COOLER TEMPERATURES °C: 4.1 FINAL COOLER TEMPERATURES °C: 8																				
SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)																				
Released by: Mary Tress			Received by: Chris			Received by: [Signature]																				
Date: 16 Oct 2020			Date: 16 Oct 2020			Date: OCT 16 2020																				
Time: 1:10			Time: 1:10			Time: 8:15																				

Environmental Division
Vancouver
Work Order Reference
VA20B8397

Telephone: +1 604 253 4188

APPENDIX F

Historic Analytical Results

**Table F-1: Historic Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Location Site Name Sample ID Laboratory ID Sample Date QAQC	Units	Meziadin - Upstream Surface Water Log Weir																	
		SW-1																	
		2004-Jan-01	2006-Jan-01	2007-Jan-01	2008-Jun-01	2009-Sep-01	2010-Apr-06	2010-Sep-28	2013-Jun-01	2013-Sep-25	2014-Jul-08	2014-Oct-07	2015-Apr-28	2015-Sep-09	2016-Apr-28	2016-Sep-13	2017-Apr-01	2017-Apr-01	
Conventional Parameters																			
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	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	7.99
Hardness (Dissolved as CaCO3)	-	mg/L	19.6	-	-	-	-	-	-	-	-	-	-	-	13.2	-	-	-	-
pH	-	pH	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	6.1
Total Suspended Solids	-	mg/L	14	<4	-	-	-	-	-	-	-	-	-	-	4.2	1.6	5.5	7.5	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	8
Ammonia, Total (as N)	1.31 - 18.4 ^a	mg/L	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	0.03
Bromide (Br)	-	mg/L	0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloride (Cl)	1500	mg/L	0.5	<0.5	0.6	1.7	ND	ND	ND	<1	<1	<1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Fluoride (F)	2.0 - 3.0 ^b	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	<0.10	-	-	-	-
Nitrate (as N)	400	mg/L	0.002	0.007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	0.2 - 2.0 ^c	mg/L	0.002	<0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate + Nitrite (as N)	400	mg/L	0.002	0.007	-	-	-	-	-	-	-	-	-	-	0.013	<0.010	0.034	<1.0	<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	0.53
Phosphorus (P)-Total	-	mg/L	0.012	0.032	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate (SO4)	1280 - 4290 ^b	mg/L	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	<1.0	<1.0
Biological Oxygen Demand (BOD)	-	mg/L	10	-	ND	ND	ND	ND	ND	<4	<6	<4	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0
Chemical Oxygen Demand (COD)	-	mg/L	15	<10	ND	ND	30	14	30	ND	<20	<20	35	22	<20	<20	<20	<20	<20
Total Metals																			
Aluminum	-	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	0.174
Antimony	0.09	mg/L	0.000022	0.000041	ND	ND	ND	-	-	-	0.000075	<0.0005	<0.0005	<0.0001	0.0002	<0.0001	0.0002	<0.00010	<0.00010
Arsenic	0.05	mg/L	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	<0.00050
Barium	10	mg/L	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	0.0075
Beryllium	0.0015	mg/L	0.00002	0.00002	ND	ND	ND	-	-	-	<0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010
Bismuth	-	mg/L	0.00002	<0.00002	ND	ND	ND	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010
Boron	12	mg/L	0.0080	<0.008	ND	ND	ND	-	-	-	<0.05	<0.05	<0.05	0.011	<0.004	0.005	0.011	<0.004	<0.004
Cadmium	0.0005 - 0.004 ^b	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	<0.000010
Calcium	-	mg/L	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	2.13
Chromium	0.01	mg/L	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	<0.00050
Cobalt	0.04	mg/L	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	0.00007
Copper	0.02 - 0.09 ^b	mg/L	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	0.00105
Iron	-	mg/L	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	0.18
Lead	0.04 - 0.16 ^b	mg/L	0.00001	0.00035	ND	ND	0.0003	-	-	-	0.000057	<0.0002	<0.0002	<0.0001	<0.0001	0.0005	<0.0001	<0.00010	<0.00010
Lithium	-	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	0.00012
Magnesium	-	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	0.646
Manganese	-	mg/L	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	0.02
Mercury	0.00025	mg/L	0.0001	0.0001	ND	0.00001	ND	-	0.00001	-	<0.00001	<0.00001	<0.00001	<0.00002	<0.00002	-	-	<0.00002	<0.00002
Molybdenum	10	mg/L	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	<0.00010
Nickel	0.25 - 1.5 ^b	mg/L	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	0.0014
Phosphorus	-	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	<0.050
Potassium	-	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	0.27
Selenium	0.02	mg/L	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	<0.00050
Silicon	-	mg/L	-	-	-	-	3.6	-	-	-	-	-	-	-	1.1	2.1	3	2.1	2.1
Silver	0.0005 - 0.015 ^b	mg/L	0.00002	<0.00002	ND	1.8	-	0.0	-	-	<0.00005	<0.00002	<0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050
Sodium	-	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	0.77
Strontium	-	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	0.0146
Sulfur	-	mg/L	0.5	3.3	0.4	0.04	ND	-	-	-	<15	<3	<3	<1	<1	<1	3	<3.0	<3.0
Tellurium	-	mg/L	0.1	-	-	ND	ND	-	-	-	-	-	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020
Thallium	0.003	mg/L	0.000002	0.000007	ND	ND	ND	-	-	-	<0.000002	<0.00005	<0.00005	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020
Thorium	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010
Tin	-	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	<0.00020
Titanium	-	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	<0.0050
Uranium	1	mg/L	0.0000030	0.0000110	ND	ND	ND	-	-	-	0.0000070	<0.0001	<0.0001	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020
Vanadium	0.085	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	<0.0010
Zinc	0.075 - 2.4 ^b	mg/L	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	<0.0040
Zirconium	-	mg/L	0.005	-	ND	ND	ND	-	-	-	<0.0001	<0.0005	<0.0005	<0.0001	0.0001	0.0002	<0.0001	0.00017	0.00017

NOTES

Italics indicate that the laboratory detection limit exceeds the applicable standard.
Standards shown are from the BC Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 131/2020 and BC Reg. 161/2020, updated to 1 February 2021])

^a = pH dependent; ^b = hardness dependent; ^c = chloride dependent

^d = most conservative standards applied for chromium (between Cr(III) and Cr(VI))

QAQC = quality assurance/quality control; FD = field duplicate; FDA = field duplicate available

**Table F-3: Historic Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Location Site Name Sample ID Laboratory ID Sample Date QAQC	CSR Aquatic Life Standard Freshwater (AW-F)	Units	Downstream Creek														
			SW-2														
			2003-Jan-01	2004-Jan-01	2006-Jan-01	2007-Jan-01	2008-Jun-08	2010-Apr-06	2010-Sep-28	2014-Jul-08	2014-Oct-07	2015-Apr-28	2015-Sep-09	2016-Apr-28	2017-Apr-01	2017-May-01	2017-Aug-01
Conventional Parameters																	
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
Hardness (Dissolved as CaCO3)	-	mg/L	84.4	72	59	-	-	-	-	-	-	-	81.4	-	-	-	-
pH	-	pH	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	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)	1.31 - 18.4 ^a	mg/L	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)	1500	mg/L	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)	2.0 - 3.0 ^b	mg/L	-	-	-	-	-	-	-	-	-	-	<0.10	-	-	-	-
Nitrate (as N)	400	mg/L	-	0.009	0.048	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	0.2 - 2.0 ^c	mg/L	-	0.002	0.002	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate + Nitrite (as N)	400	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)	1280 - 4290 ^b	mg/L	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
Biological Oxygen Demand (BOD)	-	mg/L	7	10	-	ND	ND	-	ND	<6	<4	<4.0	<4.0	<4.0	<4.0	17	7.6
Chemical Oxygen Demand (COD)	-	mg/L	44	11	10	32	ND	55	35	83	28	24	28	23	34	76	80
Total Metals																	
Aluminum	-	mg/L	1.5	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	0.09	mg/L	0.00166	0.00042	0.00043	ND	ND	-	-	<0.0005	<0.0005	<0.0001	0.0002	<0.0001	<0.00010	0.00013	<0.00020
Arsenic	0.05	mg/L	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	10	mg/L	0.385	0.016	0.027	0.040	0.016	0.030	0.030	0.147	0.0255	0.026	0.061	0.04	0.0488	0.176	0.127
Beryllium	0.0015	mg/L	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	-	mg/L	0.00004	0.00006	0.00002	ND	ND	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010
Boron	12	mg/L	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	0.0005 - 0.004 ^b	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	-	mg/L	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
Chromium	0.01	mg/L	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	0.04	mg/L	0.0357	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	0.02 - 0.09 ^b	mg/L	0.394	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	-	mg/L	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	0.04 - 0.16 ^b	mg/L	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	-	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/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	-	mg/L	37.3	0.11	0.12	ND	2.38	0.53	0.09	3.53	0.07	1.9	0.67	2.51	6.54	8.08	8.5
Mercury	0.00025	mg/L	-	0.00005	0.00005	ND	0.00001	-	-	<0.00001	<0.00001	<0.00002	<0.00002	-	<0.00002	0.00037	<0.00010
Molybdenum	10	mg/L	0.00005	0.00005	0.00008	ND	ND	-	-	<0.001	<0.001	<0.0001	0.0002	<0.0001	0.00032	-	0.00041
Nickel	0.25 - 1.5 ^b	mg/L	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	-	mg/L	0.8000	0.1000	0.1000	ND	-	-	-	-	-	-	-	-	<0.050	0.241	0.309
Potassium	-	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
Selenium	0.02	mg/L	-	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	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	2.2	3	5.1
Silver	0.0005 - 0.015 ^b	mg/L	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	-	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	-	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
Sulfur	-	mg/L	7.5	8	9.7	1.2	0.145	-	7	<3	<3	<1	5	1	<3.0	<3.0	26.8
Tellurium	-	mg/L	0.05	0.05	-	ND	6	-	-	-	-	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00050
Thallium	0.003	mg/L	0.000002	0.000002	0.000002	ND	ND	-	-	<0.00005	<0.00005	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.00020
Thorium	-	mg/L	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010
Tin	-	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	1	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
Uranium	0.085	mg/L	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	-	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	0.075 - 2.4 ^b	mg/L	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	-	mg/L	0.012	0.005	-	ND	ND	-	-	<0.0005	<0.0005	0.0001	0.0001	0.0001	<0.00010	<0.00010	<0.00010

NOTES

Italics indicate that the laboratory detection limit exceeds the applicable standard.
Standards shown are from the BC Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 131/2020 and BC Reg. 161/2020, updated to 1 February 2021])

^a = pH dependent; ^b = hardness dependent, ^c = chloride dependent

^d = most conservative standards applied for chromium (between Cr(III) and Cr(VI))

QAQC = quality assurance/quality control; FD = field duplicate; FDA = field duplicate available

**Table F-4: Historic Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Location Monitoring Location Sample ID Laboratory ID Sample Date QAQC	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	Notes	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Notes	Units	Downstream Creek															
						SW-2															
						SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2	SW-2
						2003-Jan-01	2004-Jan-01	2006-Jan-01	2007-Jan-01	2008-Jun-08	2010-Apr-06	2010-Sep-28	2014-Jul-08	2014-Oct-07	2015-Apr-28	2015-Sep-09	2016-Apr-28	2017-Apr-01	2017-May-01	2017-Aug-01	
Conventional Parameters																					
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	65.9	59	-	-	-	-	121	48.9	43.2	89.1	45.7	79.7	133	116	
Hardness (Dissolved as CaCO3)	-				mg/L	84.4	72	59	-	-	-	-	-	-	81.4	-	-	-	-	-	
pH	6.5-9.0				-	7.5	7.6	7.2	7.14	6.7	5.8	5.9	7.5	6.9	6.8	6.5	6.7	6.9	7.2	6.4	
Total Suspended Solids	-		25 mg/L (backgr. 25-250 mg/l)		mg/L	212	4	4	-	-	-	-	-	-	-	18	83	7.7	53	93	
Total Dissolved Solids	-				mg/L	-	118	88	-	-	-	-	-	-	-	-	-	-	-	-	
Alkalinity, Total (as CaCO3)	-				mg/L	-	51	27.7	48	110	8.4	20	138	36.5	44	56	46	100	140	60	
Ammonia, Total (as N)	1.84 - 1.85	pH/T*	11.2 - 25.5	pH/T*	mg/L	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)	150		600		mg/L	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	
Nitrate (as N)	3		32.8		mg/L	-	0.009	0.048	-	-	-	-	-	-	-	-	-	-	-	-	
Nitrite (as N)	0.02 - 0.2	Cl	0.06 - 0.6	Cl	mg/L	-	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	1.896	0.53	1.11	1	1.52	1.83	3.45	1.99	
Phosphorus (P)-Total	-				mg/L	-	0.006	0.015	-	-	-	-	-	-	-	-	-	-	-	-	
Sulfate (SO4)	218 - 309	H			mg/L	16.6	25.5	23.9	6	18.3	3.1	19.6	9.05	10.8	2.3	16	3.5	1.3	2	69.3	
Biological Oxygen Demand (BOD)	-				mg/L	7	10	-	ND	ND	ND	ND	<6	<4	<4.0	<4.0	<4.0	<4.0	<4.0	17	7.6
Chemical Oxygen Demand (COD)	-				mg/L	44	11	10	32	ND	55	35	83	28	24	28	23	34	76	80	
Phenols (4AAP)	-				mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Metals																					
Aluminum	0.05	pH	0.1	pH	mg/L	1.5	0.0279	0.0665	0.08	0.028	0.395	0.099	0.136	0.052	0.091	0.092	0.082	0.0237	0.0129	0.0937	
Antimony	-				mg/L	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	-		0.005		mg/L	0.0012	0.0002	0.0003	ND	0.0002	0.0003	-	0.00128	0.00016	<0.0005	0.0005	<0.0005	<0.00050	0.00071	0.00144	
Barium	-				mg/L	0.385	0.0162	0.0265	0.04	0.016	0.016	0.03	0.147	0.0255	0.026	0.061	0.04	0.0488	0.176	0.127	
Beryllium	-				mg/L	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	-				mg/L	0.00004	0.00006	0.00002	ND	ND	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	
Boron	1.2				mg/L	0.008	0.027	0.016	0.019	ND	-	-	0.152	<0.05	0.046	0.155	0.055	0.083	0.193	0.559	
Cadmium	0.00011 - 0.00026	H	0.00025 - 0.00079	H	mg/L	0.00026	0.00003	0.00023	ND	0.00017	0.00114	0.00004	0.000126	0.000053	0.00002	0.00015	0.00006	0.000017	0.000025	0.000146	
Calcium	-				mg/L	31.9	19.3	17.7	14.8	32.5	2.77	11.4	37.3	13.7	13.2	27.5	13.3	23.5	40.2	39.6	
Chromium	-				mg/L	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	0.004		0.11		mg/L	0.0357	0.000145	0.000154	ND	ND	0.002	-	0.00277	<0.0005	0.00039	0.00085	0.0007	0.00105	0.00216	0.00396	
Copper	0.002 - 0.0053	H	0.002 - 0.0145	H	mg/L	0.394	0.00026	0.00115	0.0011	0.0026	0.0036	0.0021	0.00148	0.00109	0.0011	0.0019	0.0018	0.00055	0.0013	0.00265	
Iron	-		1		mg/L	20.5	0.055	0.068	0.4	0.592	3.13	0.065	6.63	0.091	0.34	0.91	0.92	0.248	1.22	4.26	
Lead	0.0044 - 0.0079	H	0.028 - 0.12	H	mg/L	0.00012	0.00001	0.00012	ND	ND	0.0002	-	0.00031	<0.0002	<0.0001	<0.0001	0.0001	<0.00010	<0.00010	<0.00020	
Lithium	-				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/L	6.64	4.29	4.15	0.762	7.51	0.88	2.85	6.73	3.53	2.46	4.92	3.02	5.07	7.95	7.78	
Manganese	0.8 - 1.19	H	1.02 - 2.01	H	mg/L	37.3	0.113	0.117	ND	2.38	0.525	0.089	3.53	0.0749	1.9	0.667	2.51	6.54	8.08	8.5	
Mercury	0.0001				mg/L	-	0.00005	0.00005	ND	0.00001	-	-	<0.00001	<0.00001	<0.00002	<0.00002	-	<0.00002	0.00037	<0.000010	
Molybdenum	<1		2		mg/L	0.00005	0.00005	0.00008	ND	ND	-	-	<0.001	<0.001	<0.0001	0.0002	<0.0001	0.00032	-	0.00041	
Nickel	-				mg/L	0.013	0.00089	0.00131	ND	0.001	0.002	0.001	0.0032	0.0016	0.0012	0.0028	0.0016	0.00258	0.00382	0.00405	
Phosphorus	-				mg/L	0.8	0.1	0.1	ND	-	-	-	-	-	-	-	-	<0.050	0.241	0.309	
Potassium	-				mg/L	1	1	1	ND	0.1	0.39	1	0.416	0.81	1.19	0.92	1.01	2.2	4.63	2.87	
Selenium	0.002				mg/L	-	0.0002	0.0002	ND	ND	0.0001	-	0.00011	<0.0001	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	
Silver	0.00005, 0.0015	H	0.0001, 0.003	H	mg/L	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	-				mg/L	2.98	3.08	3.92	2.06	ND	1.18	2.34	10.8	3.73	4.89	9.74	4.79	9.18	17.2	13.6	
Strontium	-				mg/L	0.162	0.0891	0.086	0.078	4.24	0.017	0.066	0.216	0.0813	0.077	0.146	0.089	0.154	0.256	0.258	
Sulfur	-				mg/L	7.5	8	9.7	1.2	0.145	-	7	<3	<3	<1	5	1	<3.0	<3.0	26.8	
Tellurium	-				mg/L	0.05	0.05	-	ND	6	-	-	-	-	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00050	
Thallium	-				mg/L	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	-				mg/L	-	-	-	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	
Tin	-				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	-				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	
Uranium	-				mg/L	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	-				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	0.0075 - 0.04	H	0.033 - 0.065	H	mg/L	0.0226	0.0002	0.0061	ND	0.018	0.015	0.006	0.006	<0.005	<0.004	0.007	0.005	<0.0040	<0.0040	0.0138	
Zirconium	-				mg/L	0.012	0.005	-	ND	ND	-	-	<0.0005	<0.0005	0.0001	0.0001	0.0001	<0.00010	<0.00010	<0.00010	

NOTES

BCWQG AWF Long-term BC Water Quality Guidelines for Freshwater Aquatic Life - Chronic Long-term Average

BCWQG AWF Short-term BC Water Quality Guidelines for Freshwater Aquatic Life - Short-term Maximum

Italics indicate that the laboratory detection limit exceeds the applicable standard.

British Columbia Approved and Working (or interim) Water Quality Guidelines (BC WQG), updated from time to time

H = standard is hardness dependent; pH = standard is pH dependent; Cl = standard is chloride dependent; T = standard varies with temperature

* = for ammonia guideline, an average temperature of 10 degrees Celsius and a pH of 7.5 was chosen where no data was available

QAQC = Quality Assurance and Control; FDA = Field Duplicate Available; FD = Field Duplicate

**Table F-5: Historic Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Location Site Name Sample ID Laboratory ID Sample Date QAQC	CSR Aquatic Life Standard Freshwater (AW-F)	Units	Downstream surface from metal storage	
			SW2017-3	
			SW2017-3 1-May-17	SW2017-3 1-Aug-17
Conventional Parameters				
Conductivity	-	uS/cm	88.1	204
Hardness (Total as CaCO ₃)	-	mg/L	29.3	54.5
pH	-	pH	6.9	6.8
Total Suspended Solids	-	mg/L	3.7	3.8
Alkalinity, Total (as CaCO ₃)	-	mg/L	36	52
Ammonia, Total (as N)	<u>18.4 - 18.4</u>	mg/L	<0.03	<0.03
Chloride (Cl)	<u>1500</u>	mg/L	3.4	9.9
Nitrate + Nitrite (as N)	-	mg/L	-	0.0162
Total Kjeldahl Nitrogen	-	mg/L	0.348	0.838
Sulfate (SO ₄)	<u>128 - 429 (d)</u>	mg/L	6.0	26.9
Biological Oxygen Demand (BOD)	-	mg/L	<5.0	-
Chemical Oxygen Demand (COD)	-	mg/L	<20	45
Total Metals				
Aluminum	-	mg/L	0.362	0.0437
Antimony	<u>0.09</u>	mg/L	0.0001	<0.00020
Arsenic	<u>0.05</u>	mg/L	0.00061	0.00076
Barium	<u>10</u>	mg/L	0.0114	0.0217
Beryllium	<u>0.0015</u>	mg/L	<0.00010	<0.00010
Bismuth	-	mg/L	<0.00010	<0.00010
Boron	<u>12</u>	mg/L	0.043	0.103
Cadmium	<u>0.0005 - 0.004</u>	mg/L	0.0000170	0.000595
Calcium	-	mg/L	8.7	14.5
Chromium	<u>0.01</u>	mg/L	0.0013	0.0008
Cobalt	<u>0.04</u>	mg/L	0.00104	0.00242
Copper	<u>0.02 - 0.09</u>	mg/L	0.00179	0.00393
Iron	-	mg/L	1.54	3.50
Lead	<u>0.04 - 0.16</u>	mg/L	0.0002	<0.00020
Lithium	-	mg/L	0.0004	0.00017
Magnesium	-	mg/L	2.19	5.27
Manganese	-	mg/L	1.68	2.41
Mercury	<u>0.00025</u>	mg/L	-	0.00001
Molybdenum	<u>10</u>	mg/L	<0.00010	0.00015
Nickel	<u>0.25 - 1.5</u>	mg/L	0.00304	0.00782
Phosphorus	-	mg/L	<0.050	<0.050
Potassium	-	mg/L	1.1	4.16
Selenium	<u>0.02</u>	mg/L	<0.00050	<0.00050
Silicon	-	mg/L	3.3	4.0
Silver	<u>0.0005 - 0.015</u>	mg/L	<0.000050	<0.000050
Sodium	-	mg/L	6.19	18.2
Strontium	-	mg/L	0.042	0.0816
Sulfur	-	mg/L	<3.0	10.4
Tellurium	-	mg/L	<0.00020	<0.00050
Thallium	<u>0.003</u>	mg/L	<0.000020	<0.000020
Thorium	-	mg/L	<0.00010	<0.00010
Tin	-	mg/L	<0.00020	<0.00020
Titanium	<u>1</u>	mg/L	0.0077	<0.0050
Uranium	<u>0.085</u>	mg/L	<0.000020	<0.000020
Vanadium	-	mg/L	0.0011	<0.0010
Zinc	<u>0.075 - 38.1</u>	mg/L	<0.0040	0.0384
Zirconium	-	mg/L	0.0005	0.0002

NOTES

Italics indicate that the laboratory detection limit exceeds the applicable Standards shown are from the BC Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 131/2020 and BC Reg. 161/2020, updated to 1 February 2021])

^a = pH dependent; ^b = hardness dependent, ^c = chloride dependent

^d = most conservative standards applied for chromium (between Cr(III) and

QAQC = quality assurance/quality control; FD = field duplicate; FDA = field duplicate available

**Table F-6: Historic Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Monitoring Location Sample ID Laboratory ID Sample Date QAQC	Location	Notes	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	Notes	Units	Downstream surface from metal storage	
	BC WQG Aquatic Life - Freshwater (Short-term maximum)		SW2017-3				
			SW2017-3			SW2017-3	
						1-May-17	1-Aug-17
						-	-
						-	-
Conventional Parameters							
Conductivity	-		-		uS/cm	88.1	204
Hardness (Total as CaCO3)	-		-		mg/L	29.3	54.5
pH	6.5-9.0		-		-	6.9	6.8
Total Suspended Solids	-		25 mg/L (backgr. 25-250 mg/l)		mg/L	3.7	3.8
Alkalinity, Total (as CaCO3)	-		-		mg/L	36	52
Ammonia, Total (as N)	1.84	pH/T*	21.8 - 22.9	pH/T*	mg/L	<0.03	<0.03
Chloride (Cl)	150		600		mg/L	3.4	9.9
Nitrate + Nitrite (as N)	-		-		mg/L	-	0.0162
Total Kjeldahl Nitrogen	-		-		mg/L	0.348	0.838
Sulfate (SO4)	128 - 429	H	-		mg/L	6	26.9
Biological Oxygen Demand (BOD)	-		-		mg/L	<5.0	-
Chemical Oxygen Demand (COD)	-		-		mg/L	<20	45
Total Metals							
Aluminum	0.05	pH	0.1	pH	mg/L	0.362	0.0437
Antimony	0.009		-		mg/L	0.0001	<0.00020
Arsenic	0.005		-		mg/L	0.00061	0.00076
Barium	1		-		mg/L	0.0114	0.0217
Beryllium	0.00013		-		mg/L	<0.00010	<0.00010
Bismuth	-		-		mg/L	<0.00010	<0.00010
Boron	1.2		-		mg/L	0.043	0.103
Cadmium	0.00009 - 0.00014	H	0.00017 - 0.00031	H	mg/L	0.000017	0.000595
Calcium	-		-		mg/L	8.67	14.5
Chromium	0.001 Cr VI 0.0089 Cr III	V	-		mg/L	0.0013	0.00084
Cobalt	0.004		0.11		mg/L	0.00104	0.00242
Copper	0.002 - 0.0022	H	0.002 - 0.0071	H	mg/L	0.00179	0.00393
Iron	-		1		mg/L	1.54	3.5
Lead	0.004 - 0.0048	H	0.0171 - 0.0377	H	mg/L	0.00022	<0.00020
Lithium	-		-		mg/L	0.0004	0.00017
Magnesium	-		-		mg/L	2.19	5.27
Manganese	0.73392 - 0.8448	H	0.86289 - 1.14059	H	mg/L	1.68	2.41
Mercury	0.0001		-		mg/L	-	0.00001
Molybdenum	2		-		mg/L	<0.00010	0.00015
Nickel	0.025-0.15		-		mg/L	0.00304	0.00782
Phosphorus	0.005-0.015		-		mg/L	<0.050	<0.050
Potassium	-		-		mg/L	1.1	4.16
Selenium	0.002		-		mg/L	<0.00050	<0.00050
Silicon	-		-		mg/L	3.3	4
Silver	0.00005, 0.0015	H	0.0001, 0.003	H	mg/L	<0.000050	<0.000050
Sodium	-		-		mg/L	6.19	18.2
Strontium	-		-		mg/L	0.042	0.0816
Sulfur	-		-		mg/L	<3.0	10.4
Tellurium	-		-		mg/L	<0.00020	<0.00050
Thallium	0.0008		-		mg/L	<0.000020	<0.000020
Thorium	-		-		mg/L	<0.00010	<0.00010
Tin	-		-		mg/L	<0.00020	<0.00020
Titanium	-		-		mg/L	0.0077	<0.0050
Uranium	0.0085		-		mg/L	<0.000020	<0.000020
Vanadium	-		-		mg/L	0.0011	<0.0010
Zinc	0.0075	H	0.033	H	mg/L	<0.0040	0.0384
Zirconium	-		-		mg/L	0.00052	0.00019

NOTES

BCWQG AWF Long-term BC Water Quality Guidelines for Freshwater Aquatic Life - Chronic Long-term Average
BCWQG AWF Short-term BC Water Quality Guidelines for Freshwater Aquatic Life - Short-term Maximum

Italics indicate that the laboratory detection limit exceeds the applicable standard.
 British Columbia Approved and Working (or interim) Water Quality Guidelines (BC WQG),
 H = standard is hardness dependent; pH = standard is pH dependent; Cl = standard is chloride dependent; T =
 V = Standard is valence dependent VI refers to chromium VI and III refers to chromium III; Ca = standard is calcium dependent
 * = for ammonia guideline, an average temperature of 10 degrees Celsius and a pH of 7.5 was chosen where no data was available
 MAC = Maximum Acceptable Concentration
 AO = Aesthetic Objective
 QAQC = Quality Assurance and Control; FDA = Field Duplicate Available; FD = Field Duplicate

**Table F-7: Historic Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Location Site Name Sample ID Laboratory ID Sample Date QAQC	CSR Aquatic Life Standard Freshwater (AW-F)	Units	Downstream surface at the end of the lagoon, downstream of	
			SW2017-03	
			SW2017-4	SW2017-4
			-	-
			1-May-17	1-Aug-17
			-	-
Conventional Parameters				
Conductivity	-	uS/cm	103	108
Hardness (Total as CaCO ₃)	-	mg/L	31.2	39.5
Hardness (Dissolved as CaCO ₃)	-	mg/L	-	-
pH	-	pH	6.6	7.1
Total Suspended Solids	-	mg/L	8.2	11
Total Dissolved Solids	-	mg/L	-	-
Alkalinity, Total (as CaCO ₃)	-	mg/L	39	38
Ammonia, Total (as N)	<u>18.4 - 18.5</u>	mg/L	<0.03	<0.03
Bromide (Br)	-	mg/L	-	-
Chloride (Cl)	<u>1500</u>	mg/L	3.5	2.2
Fluoride (F)	<u>2.0-3.0 (e)</u>	mg/L	-	-
Nitrate (as N)	<u>400</u>	mg/L	-	-
Nitrite (as N)	<u>0.2 - 2.0 (h)</u>	mg/L	-	-
Nitrate + Nitrite (as N)	-	mg/L	-	0.013
Total Kjeldahl Nitrogen	-	mg/L	0.4	0.7
Phosphorus (P)-Total	-	mg/L	-	-
Sulfate (SO ₄)	<u>128 - 429 (d)</u>	mg/L	6.8	10.9
Biological Oxygen Demand (BOD)	-	mg/L	<5.0	5.7
Chemical Oxygen Demand (COD)	-	mg/L	22	32
Total Metals				
Aluminum	-	mg/L	0.317	0.0173
Antimony	<u>0.09</u>	mg/L	<0.00010	<0.00020
Arsenic	<u>0.05</u>	mg/L	0.00064	0.00074
Barium	<u>10</u>	mg/L	0.0122	<0.0050
Beryllium	<u>0.0015</u>	mg/L	<0.00010	<0.00010
Bismuth	-	mg/L	<0.00010	<0.00010
Boron	<u>12</u>	mg/L	0.046	0.0612
Cadmium	<u>0.0005 - 0.004</u>	mg/L	0.00003	0.000028
Calcium	-	mg/L	9.4	11.3
Cesium	-	mg/L	-	-
Chromium	<u>0.01</u>	mg/L	0.00116	<0.00050
Cobalt	<u>0.04</u>	mg/L	0.00108	0.00021
Copper	<u>0.02 - 0.09</u>	mg/L	0.00175	0.00145
Iron	-	mg/L	1.56	0.64
Lead	<u>0.04 - 0.16</u>	mg/L	0.00019	<0.00020
Lithium	-	mg/L	0.00042	0.00014
Magnesium	-	mg/L	2.34	2.7
Manganese	-	mg/L	1.89	0.257
Mercury	<u>0.00025</u>	mg/L	-	0.000016
Molybdenum	<u>10</u>	mg/L	<0.00010	0.00012
Nickel	<u>0.25 - 1.5</u>	mg/L	0.00315	0.00098
Phosphorus	-	mg/L	<0.050	<0.050
Potassium	-	mg/L	1.17	1.22
Rubidium	-	mg/L	-	-
Selenium	<u>0.02</u>	mg/L	<0.00050	<0.00050
Silicon	-	mg/L	3.2	<1.0
Silver	<u>0.0005 - 0.015</u>	mg/L	<0.000050	<0.000050
Sodium	-	mg/L	6.88	6.39
Strontium	-	mg/L	0.0461	0.0585
Sulfur	-	mg/L	<3.0	4.4
Tellurium	-	mg/L	<0.00020	<0.00050
Thallium	<u>0.003</u>	mg/L	<0.000020	<0.000020
Thorium	-	mg/L	<0.00010	<0.00010
Tin	-	mg/L	<0.00020	<0.00020
Titanium	<u>1</u>	mg/L	0.0083	<0.0050
Tungsten	-	mg/L	-	-
Uranium	<u>0.085</u>	mg/L	<0.000020	<0.000020
Vanadium	-	mg/L	<0.0010	<0.0010
Zinc	<u>0.075 - 38.1</u>	mg/L	<0.0040	<0.0040
Zirconium	-	mg/L	0.00032	<0.00010

NOTES

Italics indicate that the laboratory detection limit exceeds the applicable standard.

Standards shown are from the BC Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 131/2020 and BC Reg. 161/2020, updated to 1 February 2021])

^a = pH dependent; ^b = hardness dependent, ^c = chloride dependent

^d = most conservative standards applied for chromium (between Cr(III) and Cr(VI))

QAQC = quality assurance/quality control; FD = field duplicate; FDA = field duplicate available

**Table F-8: Historic Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Location Monitoring Location Sample ID Laboratory ID Sample Date QAQC	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	Notes	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Notes	Units	Downstream surface at the end of the lagoon, downstream of SW2017-03	
						SW2017-4	SW2017-4
						SW2017-4 - 1-May-17 -	SW2017-4 - 1-Aug-17 -
Conventional Parameters							
Conductivity	-		-		uS/cm	103	108
Hardness (Total as CaCO3)	-		-		mg/L	31.2	39.5
Hardness (Dissolved as CaCO3)	-		-		mg/L	-	-
pH	<u>6.5-9.0</u>		-		-	6.6	7.1
Total Suspended Solids	-		25 mg/L (backgr. 25-250 mg/l)		mg/L	8.2	11
Alkalinity, Total (as CaCO3)	-		-		mg/L	39	38
Ammonia, Total (as N)	<u>1.84</u>	pH/T*	19.1 - 24.7	pH/T*	mg/L	<0.03	<0.03
Chloride (Cl)	<u>150</u>		600		mg/L	3.5	2.2
Nitrate + Nitrite (as N)	-		-		mg/L	-	0.013
Total Kjeldahl Nitrogen	-		-		mg/L	0.394	0.676
Sulfate (SO4)	<u>128 - 429</u>	H	-		mg/L	6.8	10.9
Biological Oxygen Demand (BOD)	-		-		mg/L	<5.0	5.7
Chemical Oxygen Demand (COD)	-		-		mg/L	<20	45
Total Metals							
Aluminum	<u>0.05</u>	pH	0.1	pH	mg/L	0.317	0.0173
Antimony	<u>0.009</u>		-		mg/L	<0.00010	<0.00020
Arsenic	<u>0.005</u>		-		mg/L	0.00064	0.00074
Barium	<u>1</u>		-		mg/L	0.0122	<0.0050
Beryllium	<u>0.00013</u>		-		mg/L	<0.00010	<0.00010
Bismuth	-		-		mg/L	<0.00010	<0.00010
Boron	<u>1.2</u>		-		mg/L	0.046	0.0612
Cadmium	<u>0.00009 - 0.00011</u>	H	0.00018 - 0.00023	H	mg/L	0.00003	0.000028
Calcium	-		-		mg/L	9.37	11.3
Chromium	<u>0.001</u> Cr VI <u>0.0089</u> Cr III	V	-		mg/L	0.00116	<0.00050
Cobalt	<u>0.004</u>		0.11		mg/L	0.00108	0.00021
Copper	<u>0.002</u>	H	0.002	H	mg/L	0.00175	0.00145
Iron	-		1		mg/L	1.56	0.635
Lead	<u>0.004 - 0.0043</u>	H	0.0185 - 0.025	H	mg/L	0.00019	<0.00020
Lithium	-		-		mg/L	0.00042	0.00014
Magnesium	-		-		mg/L	2.34	2.7
Manganese	<u>0.74228 - 0.7788</u>	H	0.88382 - 0.97529	H	mg/L	1.89	0.257
Mercury	<u>0.0001</u>		-		mg/L	-	0.000016
Molybdenum	<u>2</u>		-		mg/L	<0.00010	0.00012
Nickel	<u>0.025-0.15</u>		-		mg/L	0.00315	0.00098
Phosphorus	<u>0.005-0.015</u>		-		mg/L	<0.050	<0.050
Potassium	-		-		mg/L	1.17	1.22
Selenium	<u>0.002</u>		-		mg/L	<0.00050	<0.00050
Silicon	-		-		mg/L	3.2	<1.0
Silver	<u>0.00005, 0.0015</u>	H	0.0001, 0.003	H	mg/L	<0.000050	<0.000050
Sodium	-		-		mg/L	6.88	6.39
Strontium	-		-		mg/L	0.0461	0.0585
Sulfur	-		-		mg/L	<3.0	4.4
Tellurium	-		-		mg/L	<0.00020	<0.00050
Thallium	<u>0.0008</u>		-		mg/L	<0.000020	<0.000020
Thorium	-		-		mg/L	<0.00010	<0.00010
Tin	-		-		mg/L	<0.00020	<0.00020
Titanium	-		-		mg/L	0.0083	<0.0050
Uranium	<u>0.0085</u>		-		mg/L	<0.000020	<0.000020
Vanadium	-		-		mg/L	<0.0010	<0.0010
Zinc	<u>0.0075</u>	H	0.033	H	mg/L	<0.0040	<0.0040
Zirconium	-		-		mg/L	0.00032	<0.00010

NOTES

BCWQG AWF Long-term BC Water Quality Guidelines for Freshwater Aquatic Life - Chronic Long-term Average

BCWQG AWF Short-term BC Water Quality Guidelines for Freshwater Aquatic Life - Short-term Maximum

Italics indicate that the laboratory detection limit exceeds the applicable standard.

British Columbia Approved and Working (or interim) Water Quality Guidelines (BC WQG),

H = standard is hardness dependent; pH = standard is pH dependent; Cl = standard is chloride dependent; T =

V = Standard is valence dependent VI refers to chromium VI and III refers to chromium III; Ca = standard is calcium dependent

* = for ammonia guideline, an average temperature of 10 degrees Celsius and a pH of 7.5 was chosen where no data was available

MAC = Maximum Acceptable Concentration

AO = Aesthetic Objective

QAQC = Quality Assurance and Control; FDA = Field Duplicate Available; FD = Field Duplicate

**Table F-9: Historic Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Location Site Name Sample ID Laboratory ID Sample Date QAQC	CSR Aquatic Life Standard Freshwater (AW-F)	Units	Surface seepage from toe of lagoon SW2017-5	
			SW2017-5 - 1-May-17 -	SW2017-5 - 1-Aug-17 -
Parameters				
Conductivity	-	uS/cm	546	726
Hardness (Total as CaCO3)	-	mg/L	278	296
pH	-	pH	7.1	6.3
Total Suspended Solids	-	mg/L	56	30
Alkalinity, Total (as CaCO3)	-	mg/L	230	320
Ammonia, Total (as N)	<u>18.4 - 18.5</u>	mg/L	0.08	0.82
Chloride (Cl)	<u>1500</u>	mg/L	12.2	35.1
Nitrate + Nitrite (as N)	-	mg/L	-	0.0546
Total Kjeldahl Nitrogen	-	mg/L	1.29	1.79
Sulfate (SO4)	<u>128 - 429 (d)</u>	mg/L	34.1	7.9
Biological Oxygen Demand (BOD)	-	mg/L	11	6.5
Chemical Oxygen Demand (COD)	-	mg/L	49	37
Total Metals				
Aluminum	-	mg/L	0.051	0.0187
Antimony	<u>0.09</u>	mg/L	<0.00010	<0.00020
Arsenic	<u>0.05</u>	mg/L	0.00124	0.00099
Barium	<u>10</u>	mg/L	0.0978	0.129
Beryllium	<u>0.0015</u>	mg/L	<0.00010	<0.00010
Bismuth	-	mg/L	<0.00010	<0.00010
Boron	<u>12</u>	mg/L	0.059	0.172
Cadmium	<u>0.0005 - 0.004</u>	mg/L	0.0000300	0.0000700
Calcium	-	mg/L	80.4	86.4
Chromium	<u>0.01</u>	mg/L	<0.00050	0.0007
Cobalt	<u>0.04</u>	mg/L	0.00129	0.00291
Copper	<u>0.02 - 0.09</u>	mg/L	0.0011	0.00056
Iron	-	mg/L	5.20	2.41
Lead	<u>0.04 - 0.16</u>	mg/L	<0.00010	<0.00020
Lithium	-	mg/L	0.00037	0.0003
Magnesium	-	mg/L	18.7	19.5
Manganese	-	mg/L	7.8	29
Mercury	<u>0.00025</u>	mg/L	-	<0.000010
Molybdenum	<u>10</u>	mg/L	0.00172	0.0024
Nickel	<u>0.25 - 1.5</u>	mg/L	0.00186	0.00353
Phosphorus	-	mg/L	0.09	0.108
Potassium	-	mg/L	0.75	1.44
Selenium	<u>0.02</u>	mg/L	<0.00050	<0.00050
Silicon	-	mg/L	2.6	2.8
Silver	<u>0.0005 - 0.015</u>	mg/L	<0.000050	<0.000050
Sodium	-	mg/L	9.49	26.3
Strontium	-	mg/L	0.395	0.451
Sulfur	-	mg/L	12.1	<3.0
Tellurium	-	mg/L	<0.00020	<0.00050
Thallium	<u>0.003</u>	mg/L	<0.00020	0.0
Thorium	-	mg/L	<0.00010	<0.00010
Tin	-	mg/L	<0.00020	<0.00020
Titanium	<u>1</u>	mg/L	<0.0050	<0.0050
Uranium	<u>0.085</u>	mg/L	0.0001050	0.0001040
Vanadium	-	mg/L	<0.0010	<0.0010
Zinc	<u>0.075 - 38.1</u>	mg/L	<0.0040	0.0071
Zirconium	-	mg/L	0.0002	0.0002

NOTES

Italics indicate that the laboratory detection limit exceeds the applicable standard.

Standards shown are from the BC Contaminated Sites Regulation (CSR; BC Reg. 375/96, O.C. 1480/96 and M271/2004, as updated [includes amendments up to BC Reg. 131/2020 and BC Reg. 161/2020, updated to 1 February 2021])

^d = most conservative standards applied for chromium (between Cr(III) and Cr(VI))

QAQC = quality assurance/quality control; FD = field duplicate; FDA = field duplicate available

**Table F-10: Historic Surface Water Analytical Results
2020 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine**

Location Monitoring Location Sample ID Laboratory ID Sample Date QAQC	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	Notes	BC WQG Aquatic Life Freshwater (Short-term maximum)	Notes	Units	Surface seepage from toe of lagoon	
						SW2017-5	
						SW2017-5 1-May-17	SW2017-5 1-Aug-17
Conventional Parameters							
Conductivity	-		-		uS/cm	546	726
Hardness (Total as CaCO3)	-		-		mg/L	278	296
pH	6.5-9.0		-		-	7.1	6.3
Total Suspended Solids	-		25 mg/L (backgr. 25-250 mg/l)		mg/L	56	30
Alkalinity, Total (as CaCO3)	-		-		mg/L	230	320
Ammonia, Total (as N)	1.84	pH/T*	19.1	pH/T*	mg/L	0.08	0.82
Chloride (Cl)	150		600		mg/L	12.2	35.1
Nitrate + Nitrite (as N)	-		-		mg/L	-	0.0546
Total Kjeldahl Nitrogen	-		-		mg/L	1.29	1.79
Sulfate (SO4)	128 - 429	H	-		mg/L	34.1	7.9
Biological Oxygen Demand (BOD)	-		-		mg/L	11	6.5
Chemical Oxygen Demand (COD)	-		-		mg/L	<20	45
Total Metals							
Aluminum	0.05	pH	0.1	pH	mg/L	0.051	0.0187
Antimony	0.009		-		mg/L	<0.00010	<0.00020
Arsenic	0.005		-		mg/L	0.00124	0.00099
Barium	1		-		mg/L	0.0978	0.129
Beryllium	0.00013		-		mg/L	<0.00010	<0.00010
Bismuth	-		-		mg/L	<0.00010	<0.00010
Boron	1.2		-		mg/L	0.059	0.172
Cadmium	0.0183 - 0.01833	H	0.30235 - 0.30301	H	mg/L	0.00003	0.00007
Calcium	-		-		mg/L	80.4	86.4
Chromium	0.001 Cr VI 0.0089 Cr III	V	-		mg/L	<0.00050	0.00067
Cobalt	0.004		0.11		mg/L	0.00129	0.00291
Copper	0.0111 - 0.0118	H	0.0281 - 0.0298	H	mg/L	0.0011	0.00056
Iron	-		1		mg/L	5.2	2.41
Lead	0.015 - 0.016	H	0.3001 - 0.325	H	mg/L	<0.00010	<0.00020
Lithium	-		-		mg/L	0.00037	0.0003
Magnesium	-		-		mg/L	18.7	19.5
Manganese	1.8282 - 1.9074	H	3.60356 - 3.80192	H	mg/L	7.8	29
Mercury	0.0001		-		mg/L	-	<0.000010
Molybdenum	2		-		mg/L	0.00172	0.0024
Nickel	0.025-0.15		-		mg/L	0.00186	0.00353
Phosphorus	0.005-0.015		-		mg/L	0.09	0.108
Potassium	-		-		mg/L	0.75	1.44
Selenium	0.002		-		mg/L	<0.00050	<0.00050
Silicon	-		-		mg/L	2.6	2.8
Silver	0.00005 - 0.0015	H	0.0001, 0.003	H	mg/L	<0.000050	<0.000050
Sodium	-		-		mg/L	9.49	26.3
Strontium	-		-		mg/L	0.395	0.451
Sulfur	-		-		mg/L	12.1	<3.0
Tellurium	-		-		mg/L	<0.00020	<0.00050
Thallium	0.0008		-		mg/L	<0.000020	0.000022
Thorium	-		-		mg/L	<0.00010	<0.00010
Tin	-		-		mg/L	<0.00020	<0.00020
Titanium	-		-		mg/L	<0.0050	<0.0050
Uranium	0.0085		-		mg/L	0.000105	0.000104
Vanadium	-		-		mg/L	<0.0010	<0.0010
Zinc	0.1485 - 0.162	H	0.174 - 0.1875	H	mg/L	<0.0040	0.0071
Zirconium	-		-		mg/L	0.00018	0.00016

NOTES

BCWQG AWF Long-term BC Water Quality Guidelines for Freshwater Aquatic Life - Chronic Long-term Average

BCWQG AWF Short-term BC Water Quality Guidelines for Freshwater Aquatic Life - Short-term Maximum

Italics indicate that the laboratory detection limit exceeds the applicable standard.

British Columbia Approved and Working (or interim) Water Quality Guidelines (BC WQG), updated

H = standard is hardness dependent; pH = standard is pH dependent; Cl = standard is chloride dependent; T =

V = Standard is valence dependent VI refers to chromium VI and III refers to chromium III; Ca = standard is calcium dependent

* = for ammonia guideline, an average temperature of 10 degrees Celsius and a pH of 7.5 was chosen where no data was available

MAC = Maximum Acceptable Concentration

AO = Aesthetic Objective

QAQC = Quality Assurance and Control; FDA = Field Duplicate Available; FD = Field Duplicate



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