

# 2019 MEZIADIN LANDFILL ANNUAL REPORT

June 2020

**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 Operation Certificate.

During 2019, 1,598 tonnes of solid waste was deposited into the landfill, an estimated 120 tonnes of metal was diverted, and 0.1 tonnes of tires were diverted for collection by the Tire Stewardship Program.

The details of the Meziadin water quality monitoring program, including groundwater and surface water will be discussed in a document prepared by Golder Associates and can be found in Appendix A. Figure 1 shows the location of the Meziadin Facility.

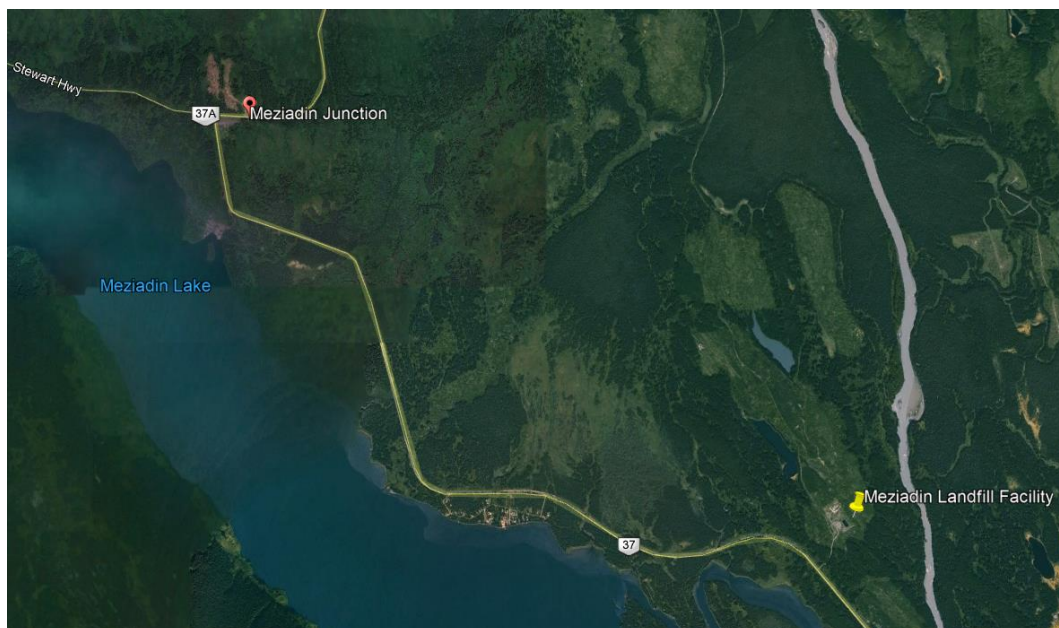


Figure 1 Location of Meziadin Landfill

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## 1.0 Introduction

This annual report covers the period from January to December 2019 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 2019;
- Total volume of waste recycled and diverted during 2019;
- Total volume of sewage waste discharge to septage facility during 2019;
- 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 from January through to December 2019 of municipal solid waste, metal, and tires received at the Meziadin Landfill are shown in Table 1. Details on some of these materials are included below.

**Table 1: Waste Discharge Qualities for 2019**

<b>Material</b>	<b>2019 Quantity (tonnes)</b>	
Waste Discharge		
Garbage	1,598 <sup>*1</sup>	
Diverted		
Metal		120 <sup>*2</sup>
Tires		0.1 <sup>*3</sup>
Clean Wood		53 <sup>*4</sup>
<b>Total</b>		<b>173.1</b>

Note: <sup>\*1</sup>This value is based on pre-compaction volume (m<sup>3</sup>) data collected from January to December 2019. Volume data was converted to tonnage using the U.S. Environmental Protection Agencies *Volume to Weight Conversion Factors* (2016) value of 175kg/m<sup>3</sup> for uncompacted mixed municipal solid waste.

<sup>\*2</sup>This number is an estimate for on-site segregated materials. Scrap metal recycling was not removed from site during 2019, so scale data from the processor is not available.

<sup>\*3</sup>This is an estimate based on tire-counts.

<sup>\*4</sup>This is an estimated based on tracked volume. Volume data was converted to tonnage using the *U.S. Environmental Protection Agencies Volume to Weight Conversion Factors* (2016) value of 101kg/m<sup>3</sup>

### 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 2019, 1,598 tonnes of garbage was 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 2019 approximately 85 cubic meters of septage was received at the Meziadin Facility. This is an estimate based on hauler truck capacity and number of tipping events.

### 3.0 Diverted Materials

Diverted metals, tires, and large appliances are collected and held at the landfill until collection 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 2019, a total of 120 tonnes of metal was collected the Meziadin Landfill as scrap for recycling.

### **3.1.2 Tires**

In 2019, a total of 0.1 tonnes of tires were collected at the Meziadin Facility for recycling through the Tire Stewardship of BC.

### **3.1.3 Clean Wood Waste**

In 2019, a total of 53 tonnes of clean wood clean segregated and burned as outlined in the Operational Certificate.

## **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 access to 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. Soil from the Regional District borrow area is used as daily and intermediate cover.

To more effectively prevent vectors from gaining access to the landfill active face, as of November 2018 the Revelstoke Iron Grizzly (RIG), is used as an alternative daily cover. It is positioned each day to cover all waste, with soil from the borrow-area continuing to be used as intermediate cover.

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

During January and December 2019, wolf tracks and scat were noted near the fence-line of the facility. There was minimal vector activity from birds, including raptor species (bald eagles), and corvid species (crows and ravens).

## **5.0 Environmental Monitoring Report**

Environmental monitoring for the Meziadin Facility was conducted by a Regional District of Kitimat-Stikine Environmental Technician, following Ministry of Environment and Climate Change Strategy, 2013 British Columbia Field Sampling Manual. All in-situ and surface water monitoring results have been analyzed and reviewed by Golder Associates. The complied data, interpretation, and recommendations from Golder Associates can be found in Appendix A.

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# Appendix A

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**REPORT**

**Meziadin Landfill, Meziadin Junction, BC**  
*2019 Annual Environmental Effects Monitoring Report*

Submitted to:

**Regional District of Kitimat-Stikine**

300-4545 Lazelle Avenue  
Terrace, BC  
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Submitted by:

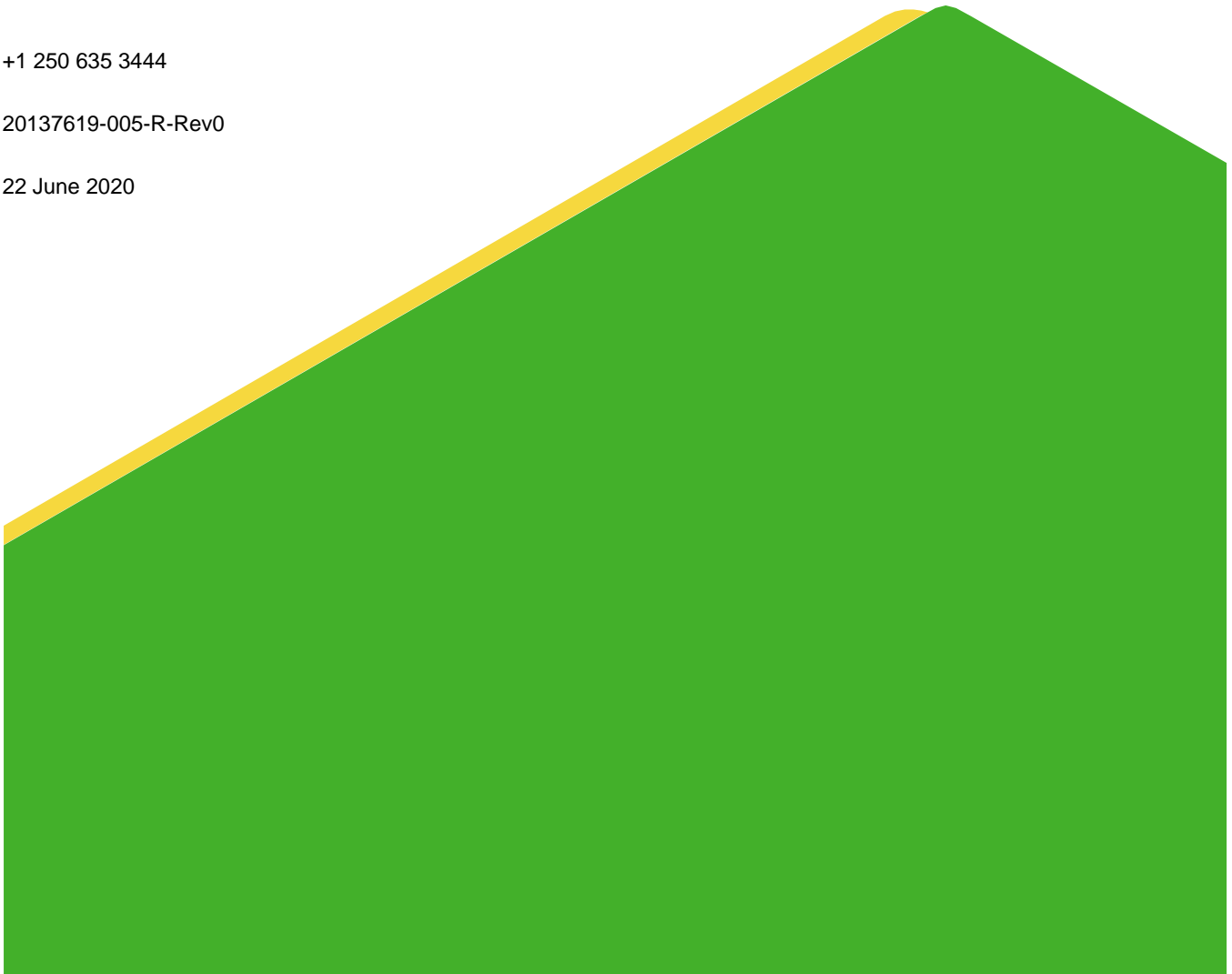
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20137619-005-R-Rev0

22 June 2020



# Distribution List

Regional District of Kitimat-Stikine

## Executive Summary

The 2019 monitoring program indicates that the 2019 results follow historic trends and confirm previous findings.

Seasonal variations in groundwater levels were observed in 2019. 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. The exceedances of applicable guidelines and regulations in surface water downgradient of the Landfill appear to be the result of natural processes.

## 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 January 2019. 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 Associates Ltd. 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 January 2019, 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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### APPENDIX A

Landfill Permit

### APPENDIX B

BC Water Well Atlas – Water Well Records

### APPENDIX C

Borehole Logs

### APPENDIX D

Analytical Results

### APPENDIX E

2018 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 2019 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 the 2013 Amendment Clause 13 of the Landfill Permit No. MR-15681, dated 8 August 2002, amended 3 June 2009 and 28 November 2013 (the “Permit”). 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, 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 2019 monitoring year. Chemical analysis of surface water and groundwater samples was conducted by ALS Environmental Ltd. The RDKS provided Golder with historic and 2019 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 permit 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 2018 (Golder 2019). 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 field, located directly south of the Landfill, contains two ponds intended for septic tank contents, sewage holding tank waste, sewage treatment plant sludge, 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 2017). 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 5 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.
- 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).
- MW-2 is screened across the till/underlying bedrock contact.
- MW-3 is screened in till.
- MW-4 is screened in till.

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 2019. Surface water has been monitored at the Site since 2002. During the 2019 program, five monitoring wells and three surface water locations were sampled. Historically, up to 5 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 <sup>1</sup>	Depth to Bottom (approx.) metres relative to local datum <sup>1</sup>	Ground Elevation (approx.) metres relative to local datum <sup>1</sup>	Screen (Top/Bottom, Stratigraphic Unit) metres below ground surface	Available Sample Period	Location relative to Landfill <sup>2</sup>
<b><u>MW-1A (Deep)</u></b>	<b><u>Monitoring Well</u></b>	<b><u>488849</u></b>	<b><u>6211888</u></b>	<b><u>82</u></b>	<b><u>72.33</u></b>	<b><u>81.13</u></b>	<b><u>7.31/8.84, Till/Bedrock</u></b>	<b><u>1997 – 2019</u></b>	<b><u>Downgradient</u></b>
<b><u>MW-1B (Shallow)</u></b>	<b><u>Monitoring Well</u></b>	<b><u>488849</u></b>	<b><u>6211888</u></b>	<b><u>82</u></b>	<b><u>75.19</u></b>	<b><u>81.13</u></b>	<b><u>4.42/5.94, Sand and Gravel</u></b>	<b><u>1997 – 2019</u></b>	<b><u>Downgradient</u></b>
<b><u>MW-2</u></b>	<b><u>Monitoring Well</u></b>	<b><u>489086</u></b>	<b><u>6211991</u></b>	<b><u>83.63</u></b>	<b><u>76.44</u></b>	<b><u>82.73</u></b>	<b><u>16/21, Till/Bedrock</u></b>	<b><u>1997 – 2019</u></b>	<b><u>Downgradient</u></b>
<b><u>MW-3</u></b>	<b><u>Monitoring Well</u></b>	<b><u>488900</u></b>	<b><u>6212335</u></b>	<b><u>90.83</u></b>	<b><u>80.94</u></b>	<b><u>89.94</u></b>	<b><u>25/30, Till</u></b>	<b><u>1997 – 2019</u></b>	<b><u>Upgradient</u></b>
<b><u>MW-4</u></b>	<b><u>Monitoring Well</u></b>	<b><u>488727</u></b>	<b><u>6212206</u></b>	<b><u>93.14</u></b>	<b><u>83.12</u></b>	<b><u>92.19</u></b>	<b><u>25/30, Till</u></b>	<b><u>1997 – 2019</u></b>	<b><u>Upgradient</u></b>
<b><u>SW-3</u></b>	<b><u>Surface Water</u></b>	<b><u>489057</u></b>	<b><u>6212019</u></b>	-	-	-	-	<b><u>2002 - 2019</u></b>	<b><u>Downgradient</u></b>
<b><u>SW2017-1</u></b>	<b><u>Surface Water</u></b>	<b><u>489242</u></b>	<b><u>6211804</u></b>	-	-	-	-	<b><u>2017 - 2019</u></b>	<b><u>Downgradient</u></b>
<b><u>SW2017-2</u></b>	<b><u>Surface Water</u></b>	<b><u>488842</u></b>	<b><u>6212294</u></b>	-	-	-	-	<b><u>2017 - 2019</u></b>	<b><u>Upgradient</u></b>
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:

<sup>1</sup> 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.

<sup>2</sup> 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 2019

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

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
<b>SW-3</b>	<b><u>Sample location of effluent treatment lagoon outlet water.</u></b>
<b>SW2017-1</b>	<b><u>New downstream surface water sampling location proposed as a replacement for SW-2. Location was established in 2017.</u></b>
<b>SW2017-2</b>	<b><u>New upstream surface water sampling location proposed as a replacement for SW-1. Location was established in 2017.</u></b>
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 2019

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

## 2.2 Groundwater Sampling

The 2019 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 May (Spring) and November (fall) 2019, 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, transported 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 2019 are presented in APPENDIX D and APPENDIX E respectively.

**Table 3: Analytical Parameters for Groundwater Samples in 2019**

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 (SO<sub>4</sub>)</u>	✓	✓
<u>pH</u>	✓	✓
<u>Conductivity</u>	✓	✓
<u>Total Dissolved Solids (TDS)</u>	✓	✓
<u>Chemical Oxygen Demand (COD)</u>	✓	✓
<u>Ammonia (NH<sub>3</sub>), Nitrate (NO<sub>3</sub>), Nitrite (NO<sub>2</sub>), 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, it was assumed 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 May and November 2019, 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 dry in November 2019 and could not be sampled.

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.

**Table 4: Analytical Parameters for Surface Water Samples in 2019**

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 (SO<sub>4</sub>)</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 (NH<sub>3</sub>), Nitrate (NO<sub>3</sub>), Nitrite (NO<sub>2</sub>), 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 a field blank sample per sampling event. A field blank sample 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 2009, the BC Ministry of Environment updated the British Columbia Laboratory Manual which contains recommended Data Quality Objectives (DQOs) for laboratories duplicate RPDs (MoE, 2009). 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 result 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.

## 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 27 May 2020). 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. 13/2019, updated on 24 January 2019]).

### Drinking Water (Current and Future)

Based on ENV Protocol 21, 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, 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 has 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, Table D-1 through D-17. Laboratory certificates of analysis for 2019 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, Table F-1 through F-10.

#### 3.1 Groundwater Flow

Groundwater level elevations were measured from the top of casing of all monitoring wells. The 2019 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 <sup>1</sup>	Depth to Bottom (approximate) metres relative to local datum <sup>1</sup>	Ground Elevation (approximate) metres relative to local datum <sup>1</sup>	Depth to Water (metres below top of casing) <sup>1</sup>		Water level Elevation (Local Datum) <sup>1</sup>		Historic Water Level Elevation 1997 - 1999 (Local Datum) <sup>2</sup>		
				May-19	Nov-19	May-19	Nov-19	Minimum	Maximum	Average
MW-1A (Deep)	82.00	72.33	81.13	8.00	7.790	74.00	74.21	72.33	75.86	73.82
MW-1B (Shallow)	82.00	75.19	81.13	2.50	2.18	79.50	79.82	75.19	79.91	78.16
MW-2	83.63	76.44	82.73	1.50	1.56	82.13	82.07	76.44	81.63	79.68
MW-3	90.83	80.94	89.94	5.90	6.58	84.93	84.25	80.94	85.64	82.66
MW-4	93.14	83.12	92.19	5.00	5.81	88.14	87.33	83.12	90.72	85.60

Notes:

<sup>1</sup> 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.

<sup>2</sup> Based on data provided in AE (1999)

Seasonal variations with higher spring and lower fall water level measurements were observed at monitoring wells MW-3, MW-4 and, to a lesser extent, MW-2 in 2019. These variations are attributed to variations in local precipitation. Conversely, MW-1A and -1B had slightly higher water levels in November relative to May 2019. This well pair also indicates a consistently downward hydraulic gradient.

Results for water elevations in 2019 are consistent with water elevations obtained in previous sampling events.

#### 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 applicable CSR standards. Concentrations of all parameters for all monitoring wells were less than the CSR standards.

### 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 were greater than the applicable CSR standards.

A summary of parameters that were greater than the BC WQG are shown in Table 7.

**Table 6: Surface Water Exceedances of BC WQG**

Parameter/Guideline			Total			Dissolved		
			Al	Fe	Mn	Al	Fe	Mn
BCWQG AW - F (Long-term average)			<u>0.05</u>	-	<u>0.61 - 4.13</u>	<u>0.05</u>	-	<u>1.88 - 2.98</u>
BCWQG AW - F (Short-term maximum)			<b>0.1</b>	<b>1</b>	<b>0.54 - 9.37</b>	<b>0.1</b>	<b>0.35</b>	<b>3.72 - 6.49</b>
<b>SW-3</b>	Downgradient	May-19	<u>0.048</u>	<b>2.46</b>	<u>5.86</u>	0.0083	<b>1.65</b>	<u>5.5</u>
<b>SW2017-1</b>	Downgradient		<u>0.331</u>	0.127	0.00691	<u>0.267</u>	0.061	0.00275
<b>SW2017-2</b>	Upgradient		<u>0.189</u>	0.056	0.00515	<u>0.203</u>	0.059	0.00244
<b>SW-3</b>	Downgradient	Nov-19	<b>0.199</b>	<b>2.22</b>	<u>5.02</u>	0.0115	<b>1.87</b>	<u>5.15</u>
<b>SW2017-1</b>	Downgradient		NA	NA	NA	NA	NA	NA
<b>SW2017-2</b>	Upgradient		NA	NA	NA	NA	NA	NA

Notes:

All concentrations are given in mg/L

BC WQG = BC Water Quality Guidelines

AW – F = Aquatic Life – Freshwater

- = parameter did not exceed guideline

NA = No data available, location not sampled.

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 May and November 2019 to assess variability introduced through sampling and handling procedures. The groundwater duplicate samples were collected at monitoring wells MW-2 (May 2019) and MW-1B (November 2019). Data for the duplicate analyses are presented in APPENDIX D, Table D-17.

The relative percent difference (RPD) and the difference factor (DF) were calculated in APPENDIX D, Table D-17 for groundwater duplicate samples. As stated in Section 2.4, the DQOs applied are: an RPD less than 20% for inorganics and less than 30% for organics and, for 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 May 2019 indicated the following calculated RPDs above the acceptable limit of 20%:

- Alkalinity, Total (as CaCO<sub>3</sub>) – 33% RPD (primary sample concentration 134 mg/L, duplicate sample concentration 186 mg/L)
- Fluoride (F) – 34% RPD (primary sample concentration 0.449 mg/L, duplicate sample concentration 0.163 mg/L)
- Nitrate (as N) – 93% RPD (primary sample concentration 0.449 mg/L, duplicate sample concentration 0.163 mg/L)
- Nitrate + Nitrite (as N) – 94% RPD (primary sample concentration 0.453 mg/L, duplicate sample concentration 0.163 mg/L)
- Total Kjeldahl Nitrogen – 21% RPD (primary sample concentration 0.445 mg/L, duplicate sample concentration 0.552 mg/L)
- Aluminum, Dissolved - 32% RPD (primary sample concentration 0.0191 mg/L, duplicate sample concentration 0.0138 mg/L)
- Cadmium, Dissolved – 38% RPD (primary sample concentration 0.00111 mg/L, duplicate sample concentration 0.000756 mg/L)

The groundwater duplicate sample at MW-1B in November 2019 indicated the following calculated RPDs above the acceptable limit of 20%:

- Nitrate (as N) – 170% RPD (primary sample concentration 0.268 mg/L, duplicate sample concentration 0.0219 mg/L)
- Nitrate + Nitrite (as N) – 170% RPD (primary sample concentration 0.27 mg/L, duplicate sample concentration 0.0219 mg/L)
- Total Kjeldahl Nitrogen – 122% RPD (primary sample concentration 1.24 mg/L, duplicate sample concentration 0.298 mg/L)
- Sulfate (SO<sub>4</sub>) – 47% RPD (primary sample concentration 8.72 mg/L, duplicate sample concentration 5.42 mg/L)
- Zinc, Dissolved – 25% RPD (primary sample concentration 0.0057 mg/L, duplicate sample concentration 0.001 mg/L)

The very poor RPD results for nitrogen analytes (nitrate, nitrite) is likely related to holding time exceedances for these parameters. The laboratory certificates of analysis indicate that the holding time was 7 days in May and 12 days in November 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 exceeded<sup>1</sup>. 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 2019. Therefore, the results are considered satisfactory for the purpose of this report.

In addition to the field duplicate samples, three field blank samples were submitted, two in May 2019 and the other in November 2019, and one trip blanks was submitted in May 2019. 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.

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<sup>1</sup> Biological Oxygen Demand (BOD) hold time was 4 days in November 2019 and the recommended hold time is 3 days.

## 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 2019.

### 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  $\text{CaCO}_3$
- pH
- Total hardness as  $\text{CaCO}_3$
- 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 May and November 2019 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 (MW-2 and MW-1B) are generally similar to or lower than background groundwater concentrations at MW-3 and MW-4, with the exception of dissolved manganese at MW-1B only. The dissolved manganese concentration at MW-1B is 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) which could suggest a potential leachate influence or some other unknown condition not directly related to Landfill leachate effects. 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 groundwater at MW-1A/B 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, fluctuating between 20 to 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 November than they are in May. The relatively higher water levels in November 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 and/or total aluminum, iron and manganese in 2019. Although downgradient surface water at SW2017-1 exceeded the BC WQG for total and dissolved aluminum in May 2019, 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 May 2019.

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 manganese concentrations are elevated in shallow groundwater at one downgradient monitoring well location. The elevated dissolved 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 2019 follow historic trends and confirm previous findings.



## 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.



Alexander Kaul, PGeo  
*Geochemist*

AK/CR/syd



Connie Romano, MSc, PGeo  
*Associate, Senior Hydrogeologist*

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**Golder Associates Ltd.**

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*Geochemist*

Connie Romano, MSc, PGeo  
*Associate, Senior Hydrogeologist*

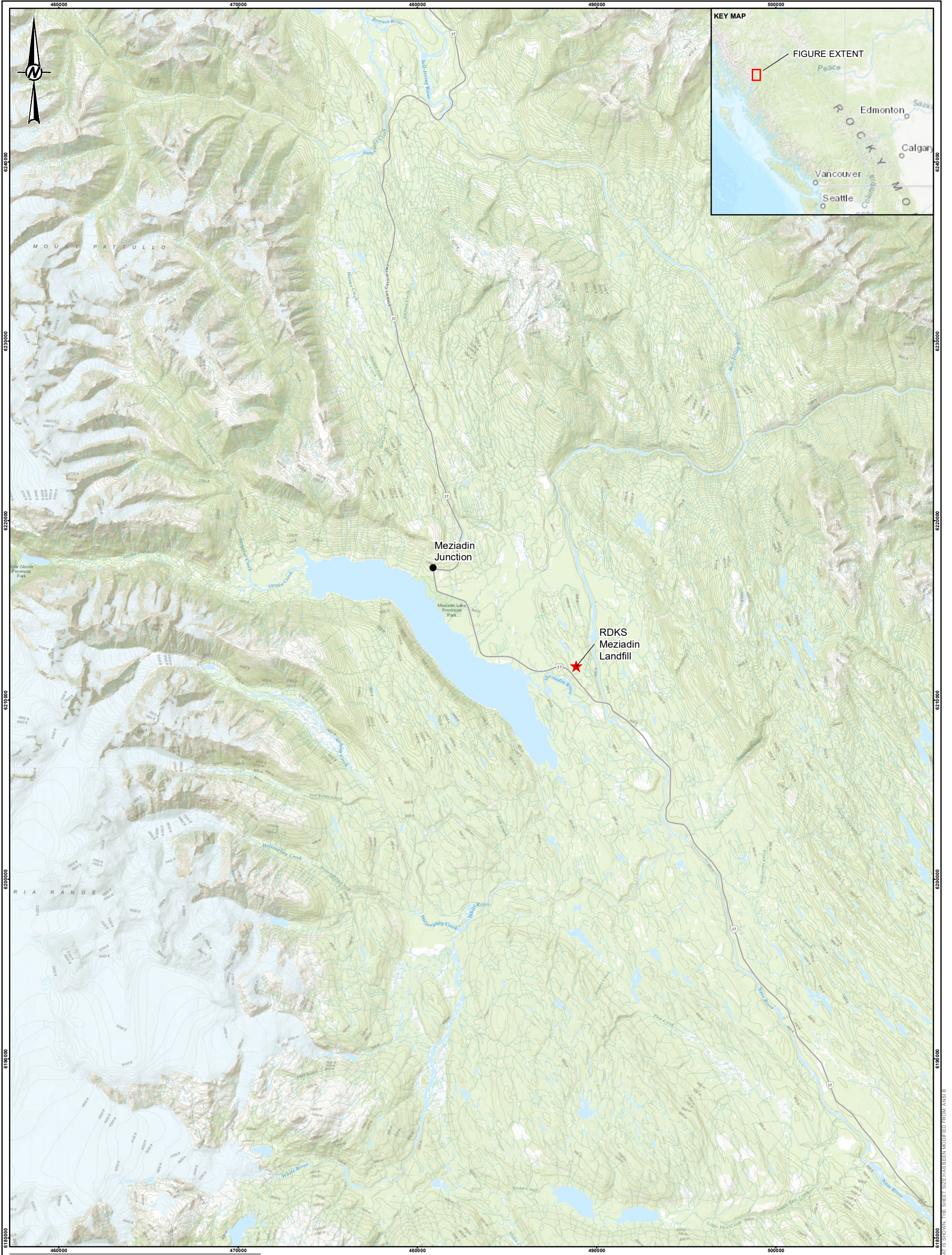
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- LEGEND**
- ★ SITE LOCATION
  - POINT OF INTEREST



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  
2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD	2020-05-11
DESIGNED	AK
PREPARED	CB
REVIEWED	AK
APPROVED	

TITLE  
**REGIONAL LOCATION MAP**

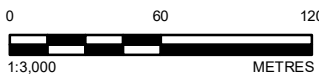
PROJECT NO.	CONTROL	REV.	FIGURE
20137619	3000/100	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A4 (81mm)



**LEGEND**  
 — WATERCOURSE  
 — TOPOGRAPHIC CONTOUR

**SAMPLE LOCATIONS**  
 ◆ MONITORING WELL  
 ▲ SURFACE WATER



**REFERENCE(S)**

1. CANVEC DATA OBTAINED FROM GEOGRATIS, © DEPARTMENT OF NATURAL RESOURCES CANADA. ALL RIGHTS RESERVED.
  2. IMAGERY COPYRIGHT © 2019 ESRI AND ITS LICENSORS. SOURCE: DIGITAL GLOBE. USED UNDER LICENSE, ALL RIGHTS RESERVED.
  3. TOPOGRAPHIC MAP © ESRI AND ITS LICENSORS. USED UNDER LICENSE, ALL RIGHTS RESERVED.
- DATUM: NAD 83 PROJECTION: UTM ZONE 9

CLIENT  
 REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT  
 2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT

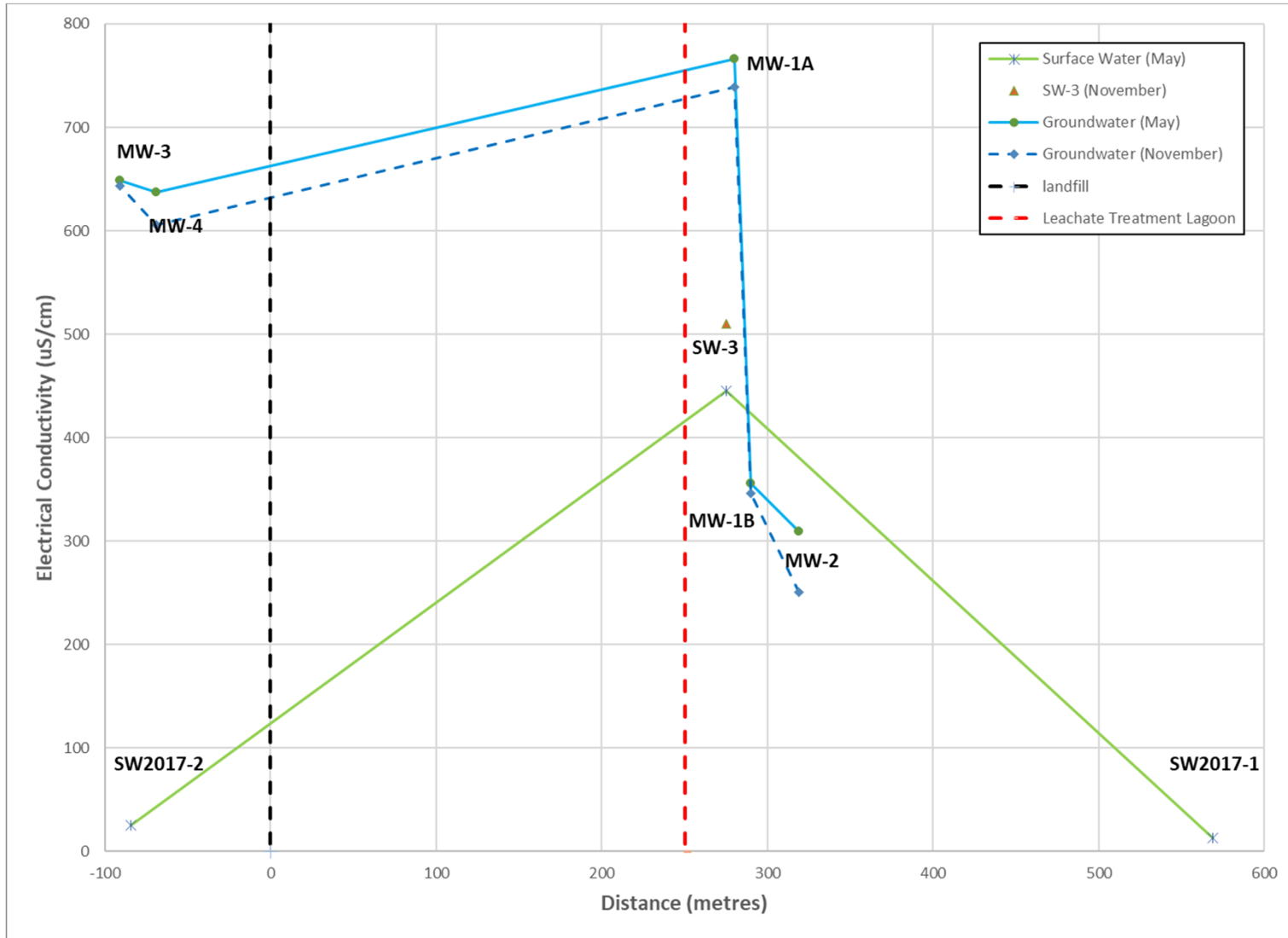


YYYY-MM-DD	2020-06-04
DESIGNED	AK
PREPARED	CB
REVIEWED	AK
APPROVED	

TITLE  
**SAMPLING LOCATIONS FOR MEZIADIN LANDFILL**

PROJECT NO.	CONTROL	REV.	FIGURE
20137619	3000/100	0	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM A3S B



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REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT  
2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD 2019-04-03

PREPARED CA

DESIGN AK

REVIEW AK

APPROVED

TITLE

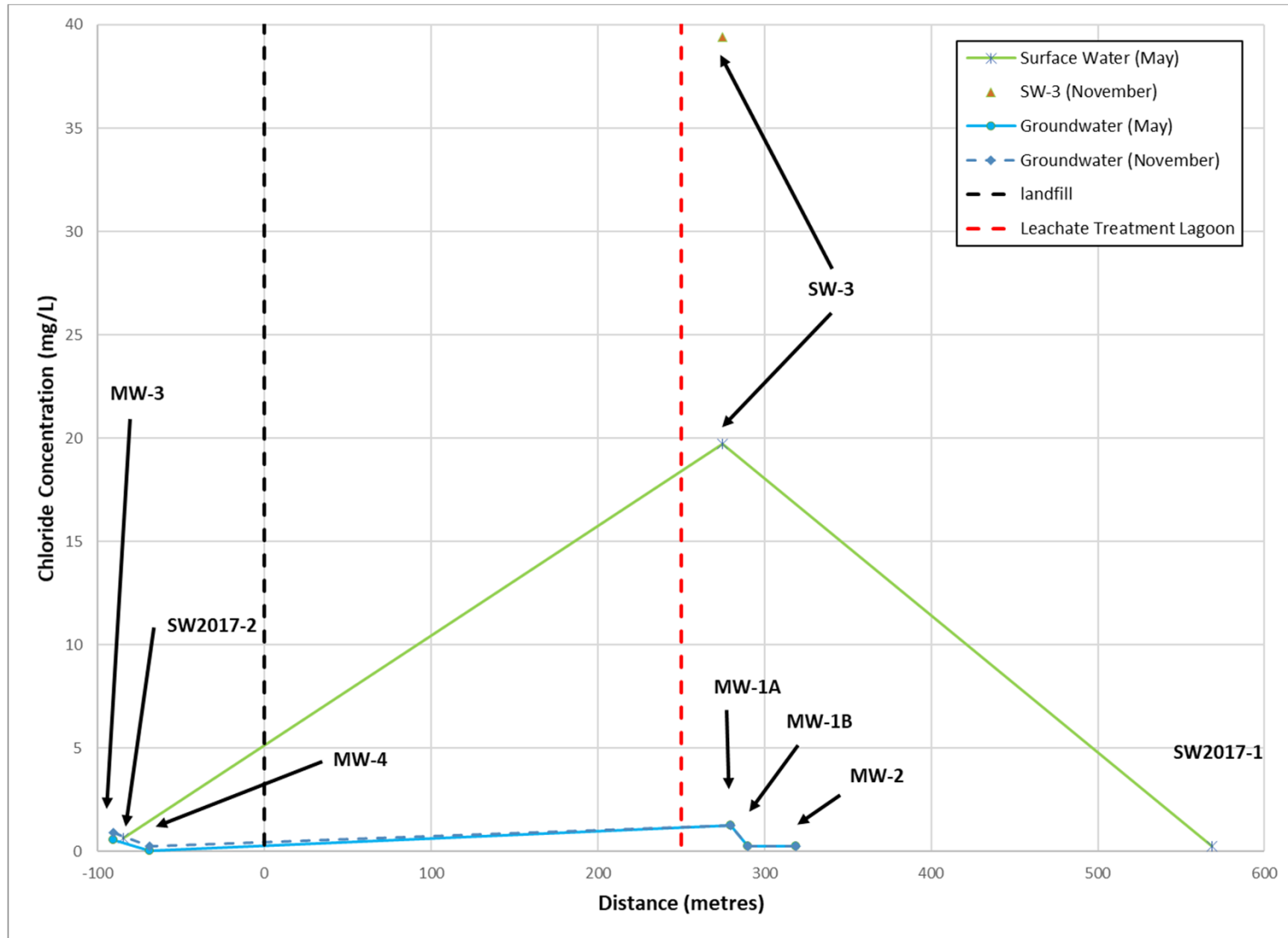
**ELECTRICAL CONDUCTIVITY CONCENTRATIONS  
DISTANCE PLOT**

PROJECT No.  
20137619

CONTROL  
2000

Rev  
0

FIGURE  
3-A



CLIENT  
REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT  
2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD 2019-04-03

PREPARED CA

DESIGN AK

REVIEW AK

APPROVED

TITLE

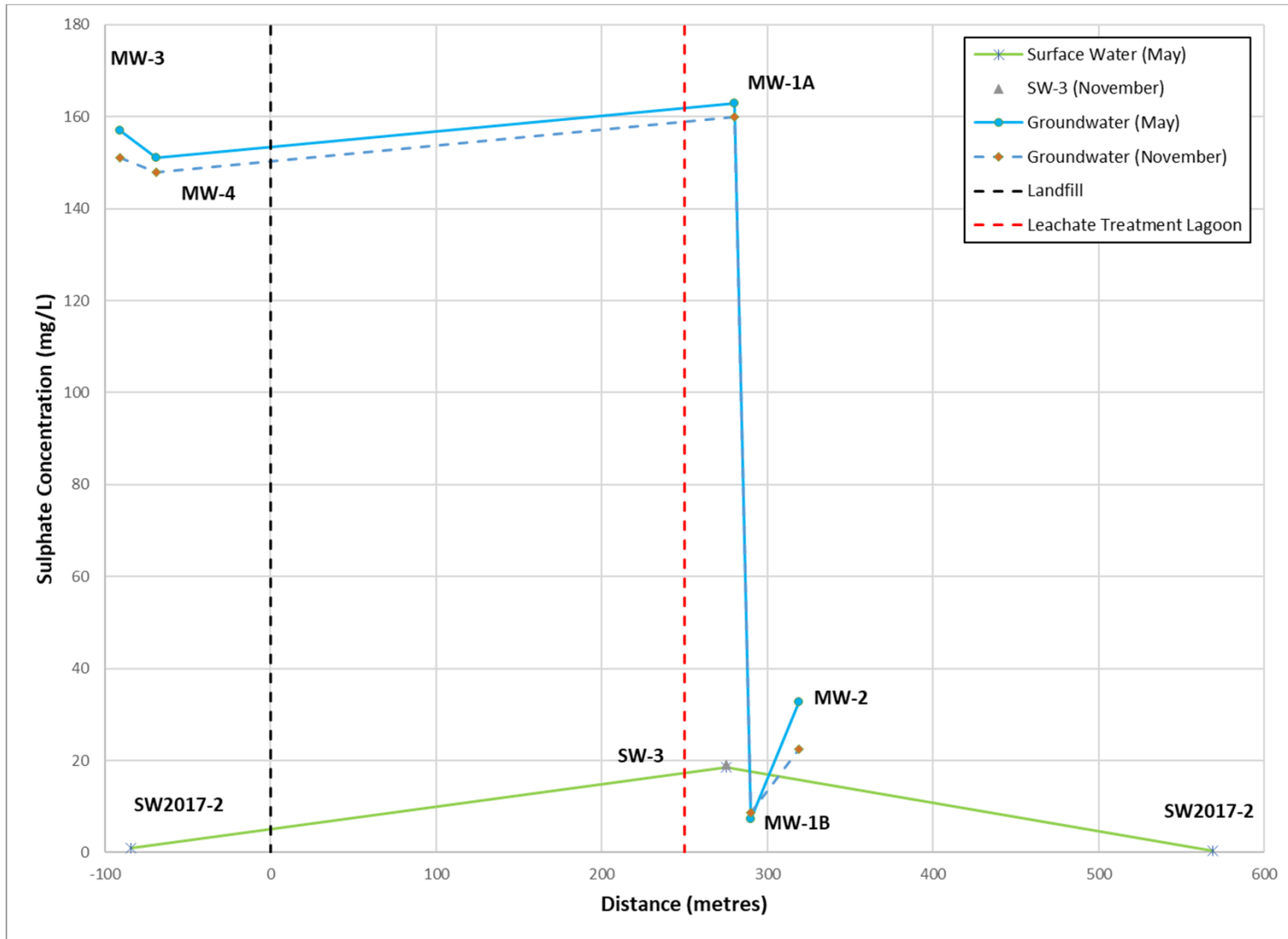
**CHLORIDE CONCENTRATIONS DISTANCE PLOT**

PROJECT No.  
20137619

CONTROL  
2000

Rev  
0

FIGURE  
3-B



CLIENT  
REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT  
2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD 2019-04-03

PREPARED CA

DESIGN AK

REVIEW AK

APPROVED

TITLE

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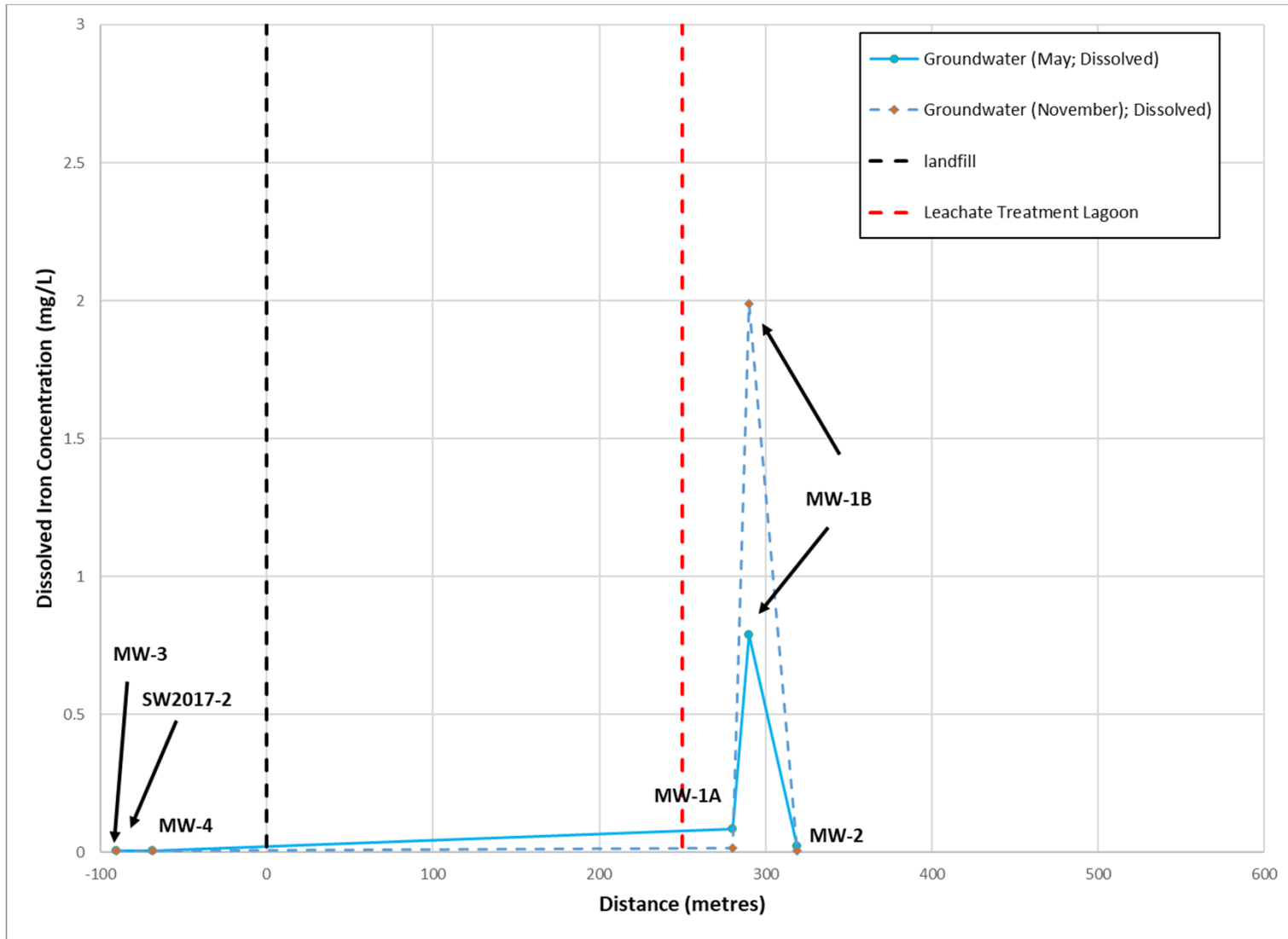
PROJECT No.  
20137619

CONTROL  
2000

Rev  
0

FIGURE  
3-C





CLIENT  
REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT  
2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD 2019-04-03

PREPARED CA

DESIGN AK

REVIEW AK

APPROVED

TITLE

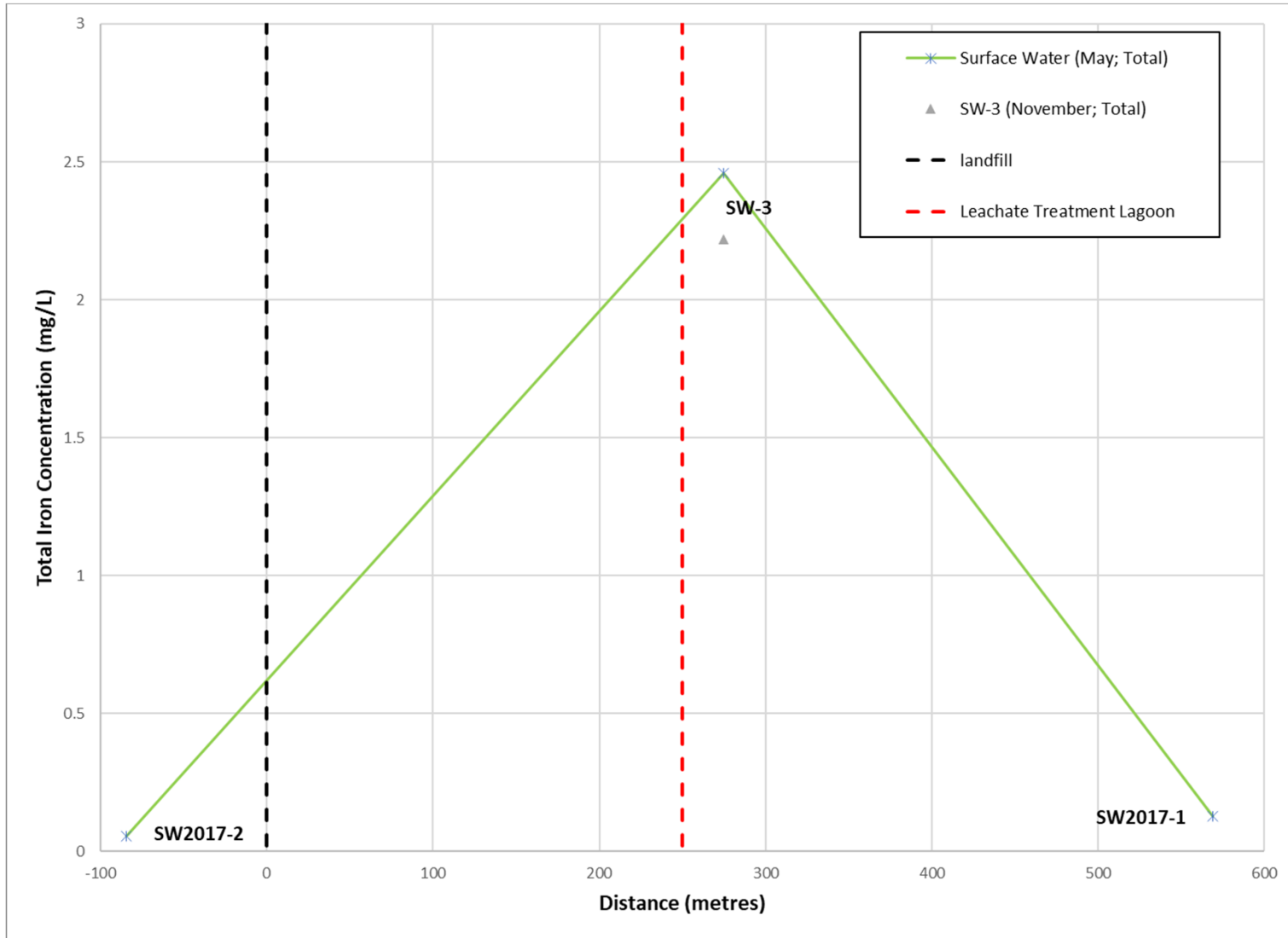
**DISSOLVED IRON CONCENTRATIONS DISTANCE PLOT**

PROJECT No.  
20137619

CONTROL  
2000

Rev  
0

FIGURE  
3-D



CLIENT  
REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT  
2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD 2019-04-03

PREPARED CA

DESIGN AK

REVIEW AK

APPROVED

TITLE

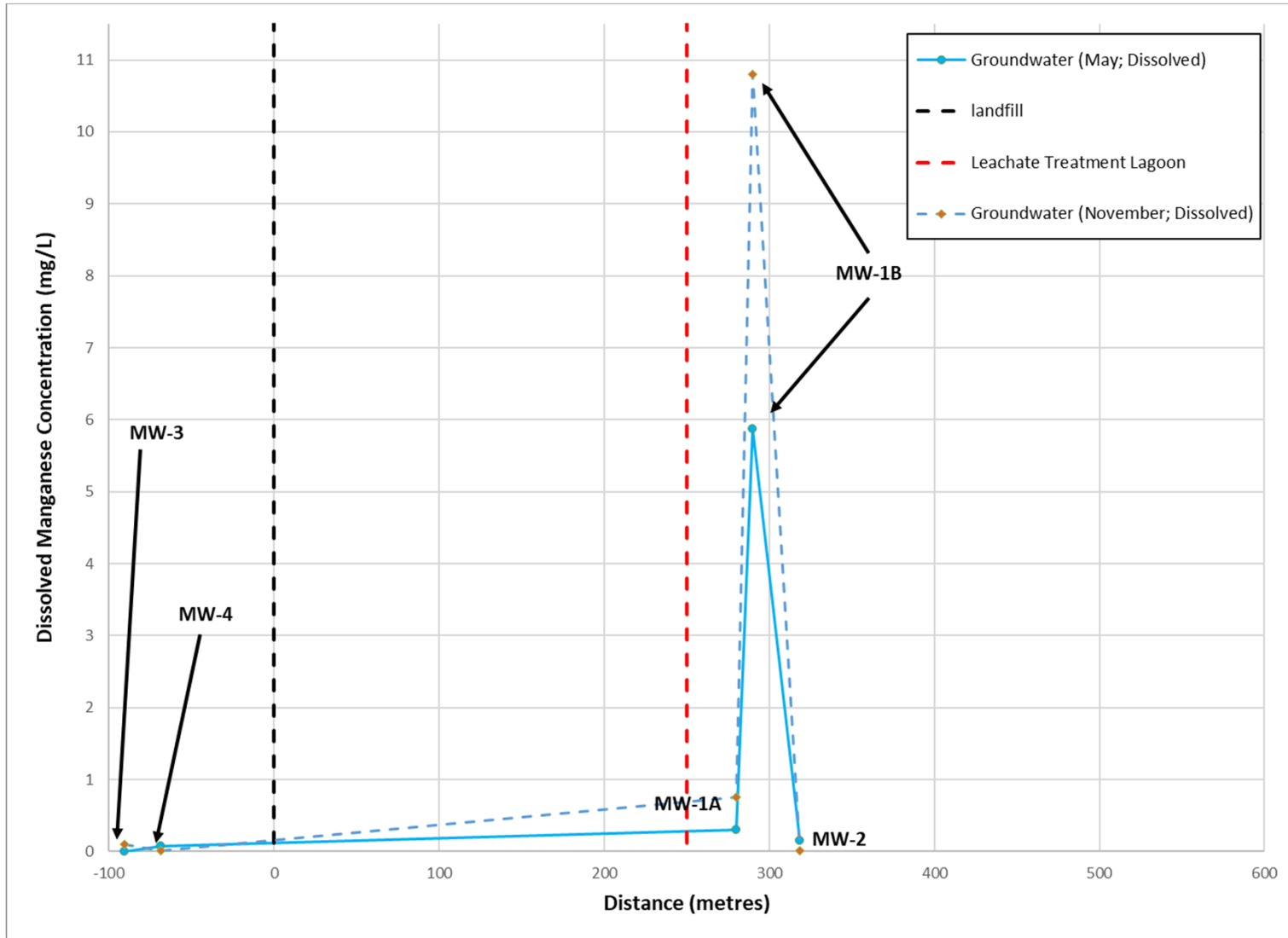
**TOTAL IRON CONCENTRATIONS DISTANCE PLOT**

PROJECT No.  
20137619

CONTROL  
2000

Rev  
0

FIGURE  
3-E



CLIENT  
REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT  
2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD 2019-04-03

PREPARED CA

DESIGN AK

REVIEW AK

APPROVED

TITLE

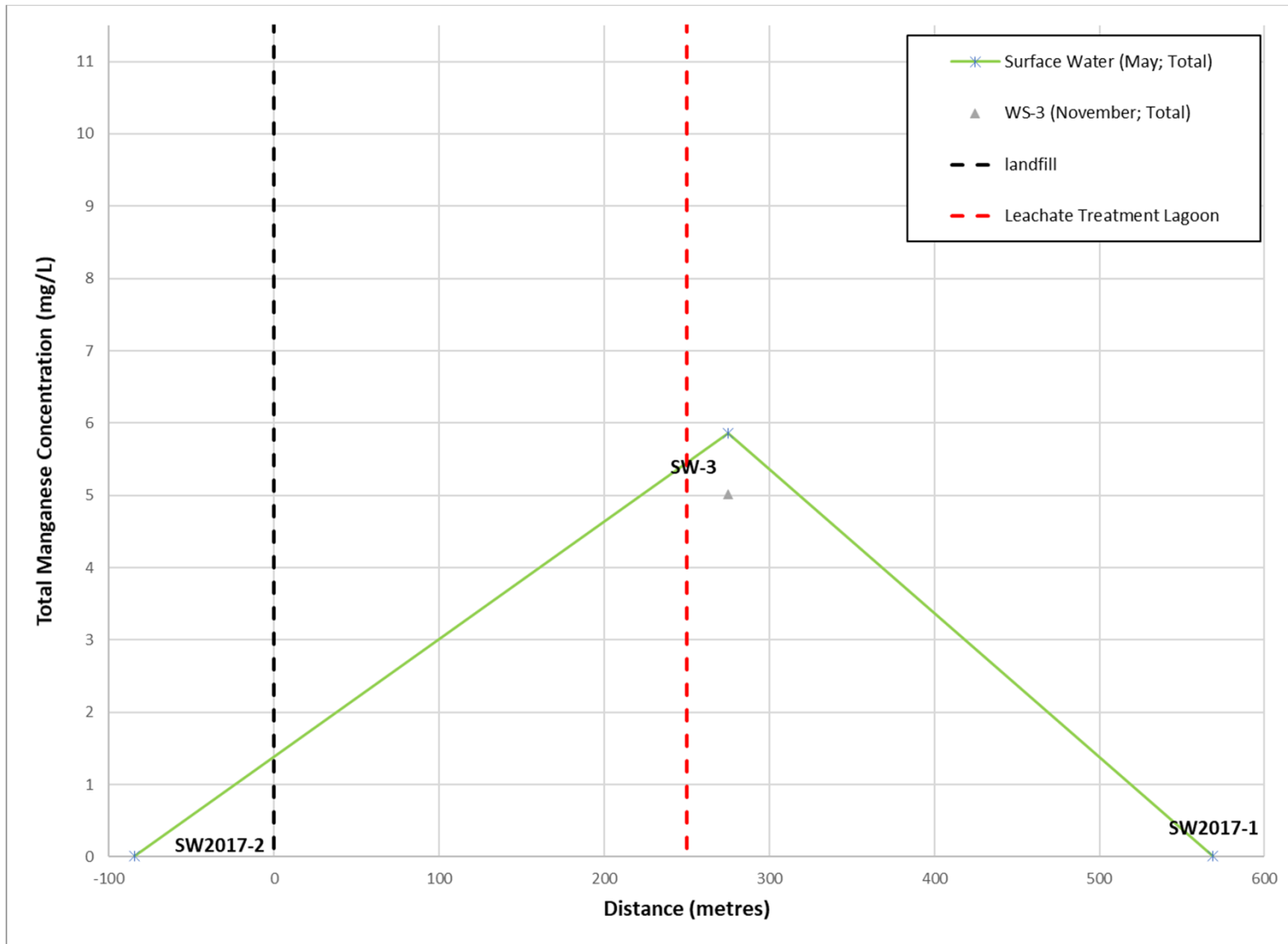
**MANGANESE CONCENTRATIONS DISTANCE PLOT (MAY 2019)**

PROJECT No.  
20137619

CONTROL  
2000

Rev  
0

FIGURE  
3-F



CLIENT  
REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT  
2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD 2019-04-03

PREPARED CA

DESIGN AK

REVIEW AK

APPROVED

TITLE

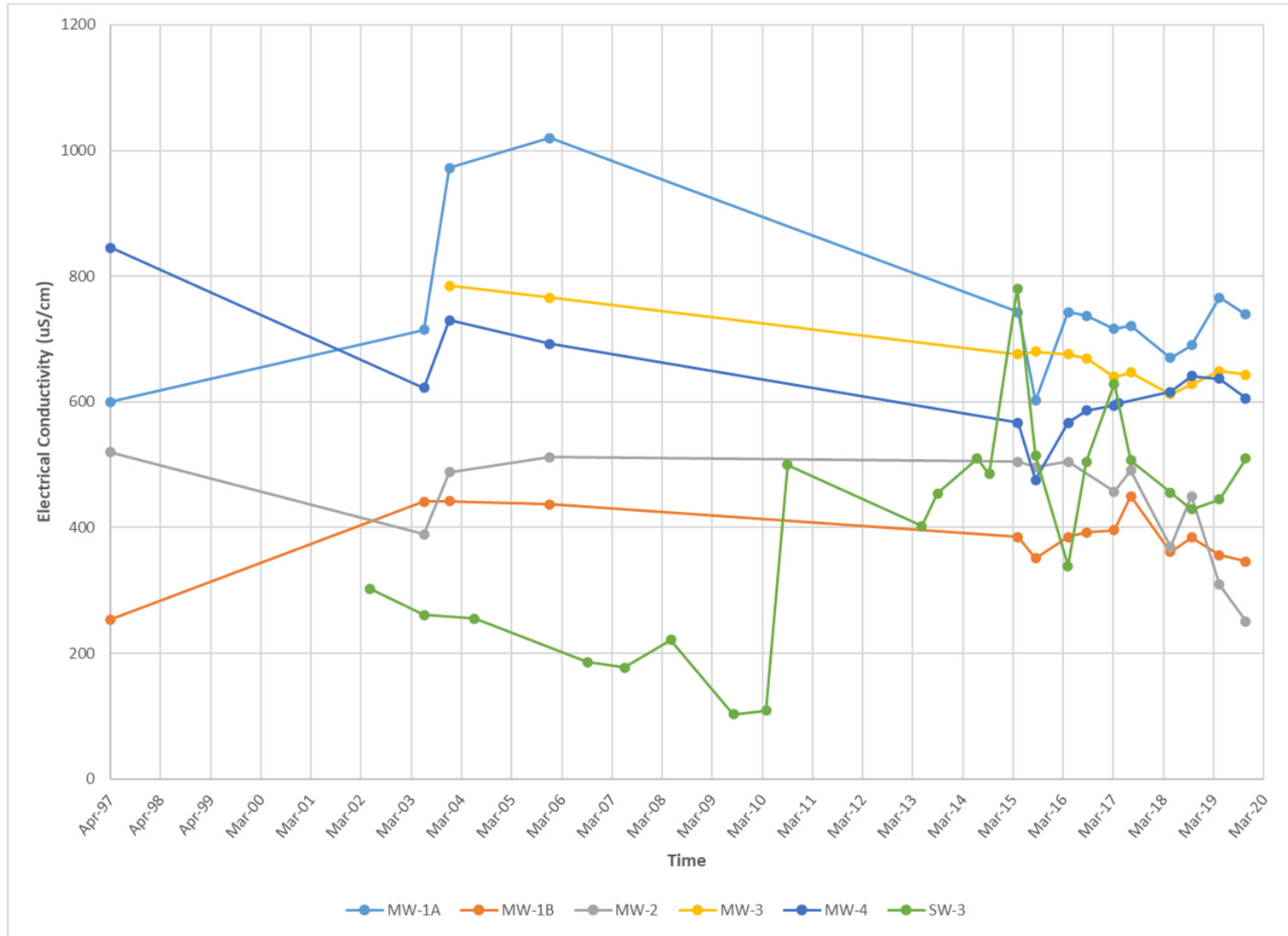
**MANGANESE CONCENTRATIONS DISTANCE PLOT (MAY 2019)**

PROJECT No.  
20137619

CONTROL  
2000

Rev  
0

FIGURE  
3-G



CLIENT  
REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT  
2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD 2019-04-03

PREPARED CA

DESIGN AK

REVIEW AK

APPROVED

TITLE

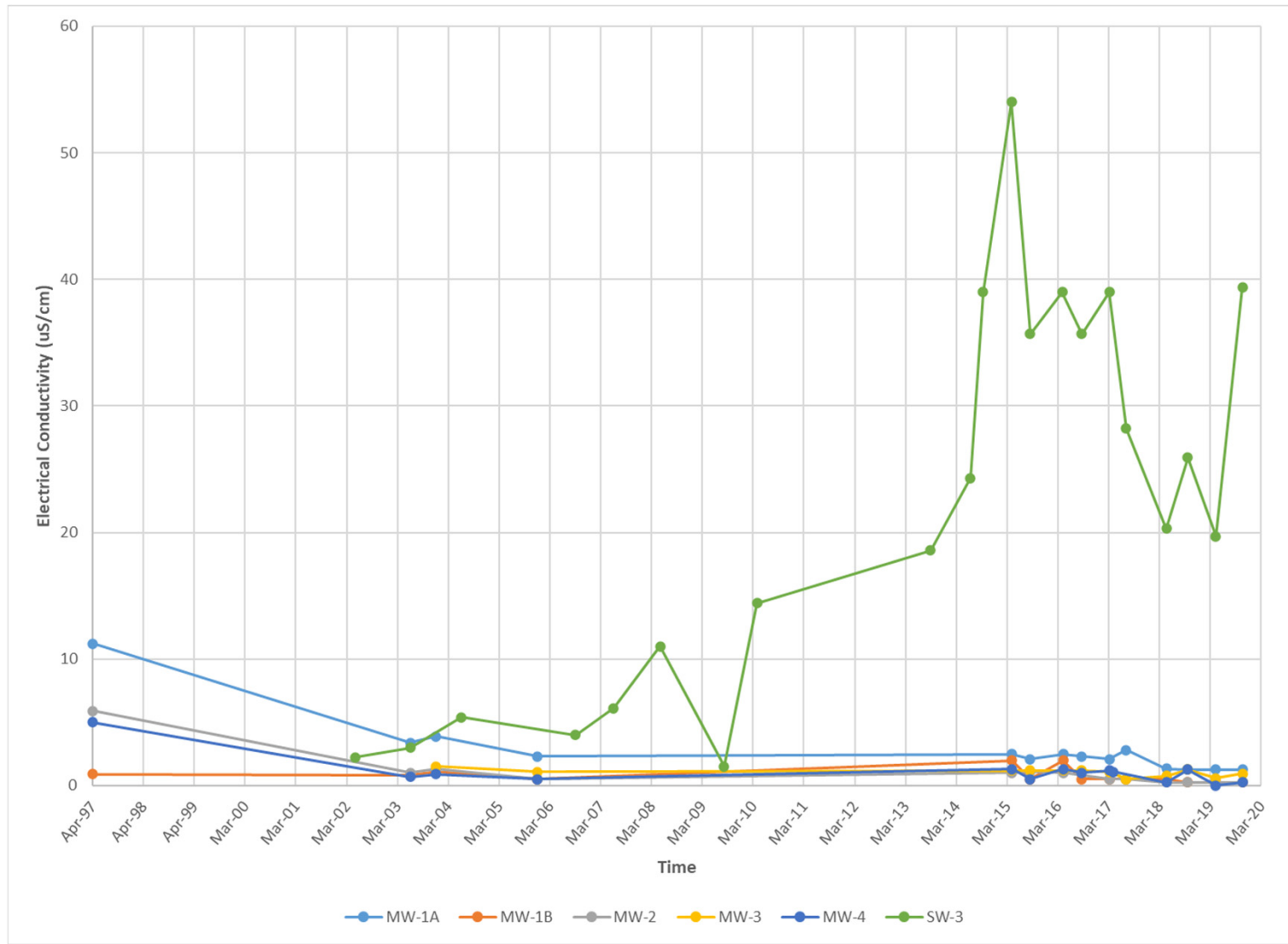
**ELECTRICAL CONDUCTIVITY CONCENTRATION TIME SERIES PLOT**

PROJECT No.  
20137619

CONTROL  
2000

Rev  
0

FIGURE  
4-A



CLIENT  
REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT  
2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD 2019-04-03  
PREPARED CA  
DESIGN AK  
REVIEW AK  
APPROVED

TITLE

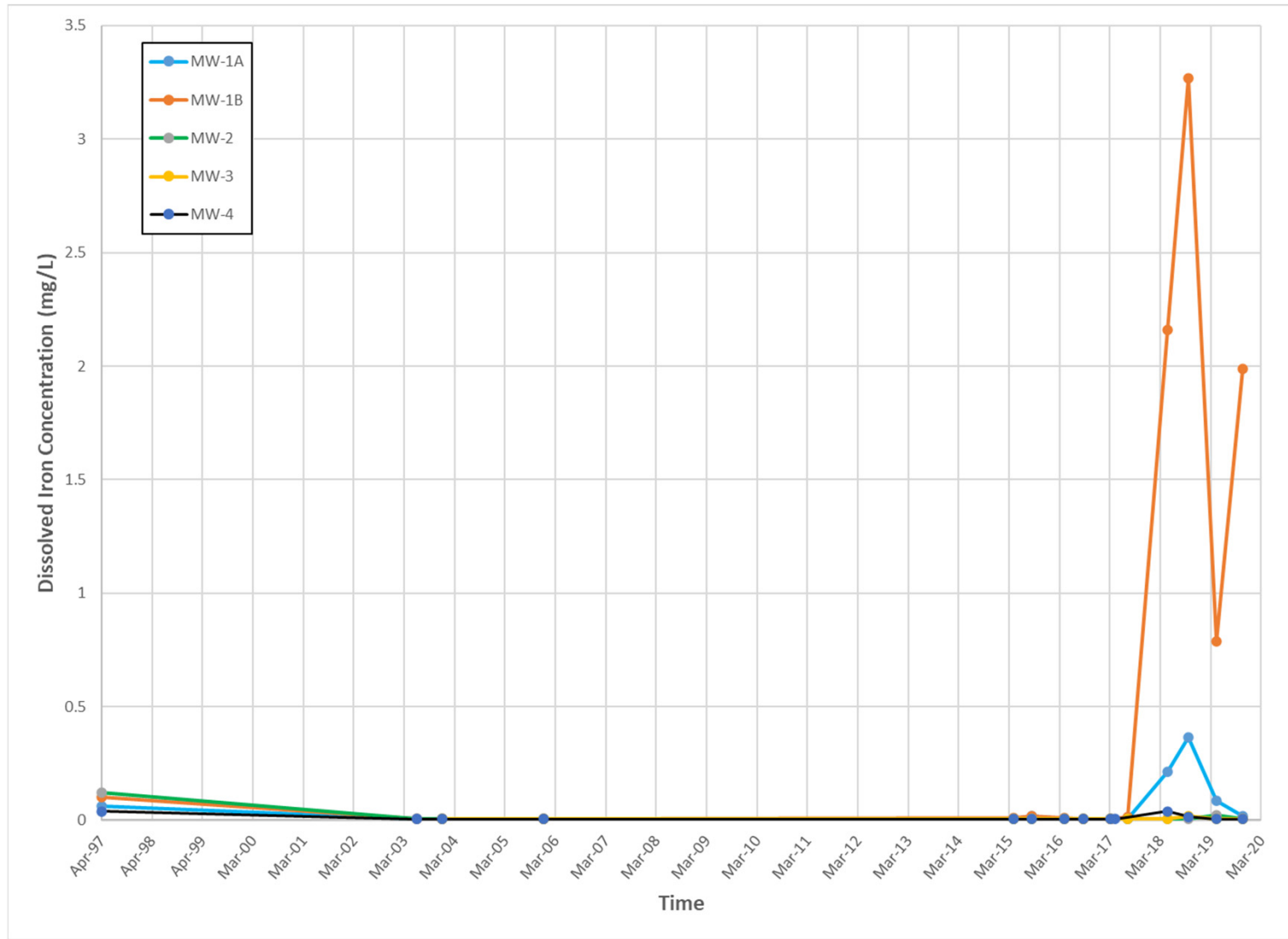
**CHLORIDE CONCENTRATION TIME SERIES PLOT**

PROJECT No.  
20137619

CONTROL  
2000

Rev  
0

FIGURE  
4-B



Notes

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

CLIENT  
REGIONAL DISTRICT OF KITIMAT-STIKINE

CONSULTANT



YYYY-MM-DD 2019-04-03

PREPARED CA

DESIGN AK

REVIEW AK

APPROVED

PROJECT  
2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

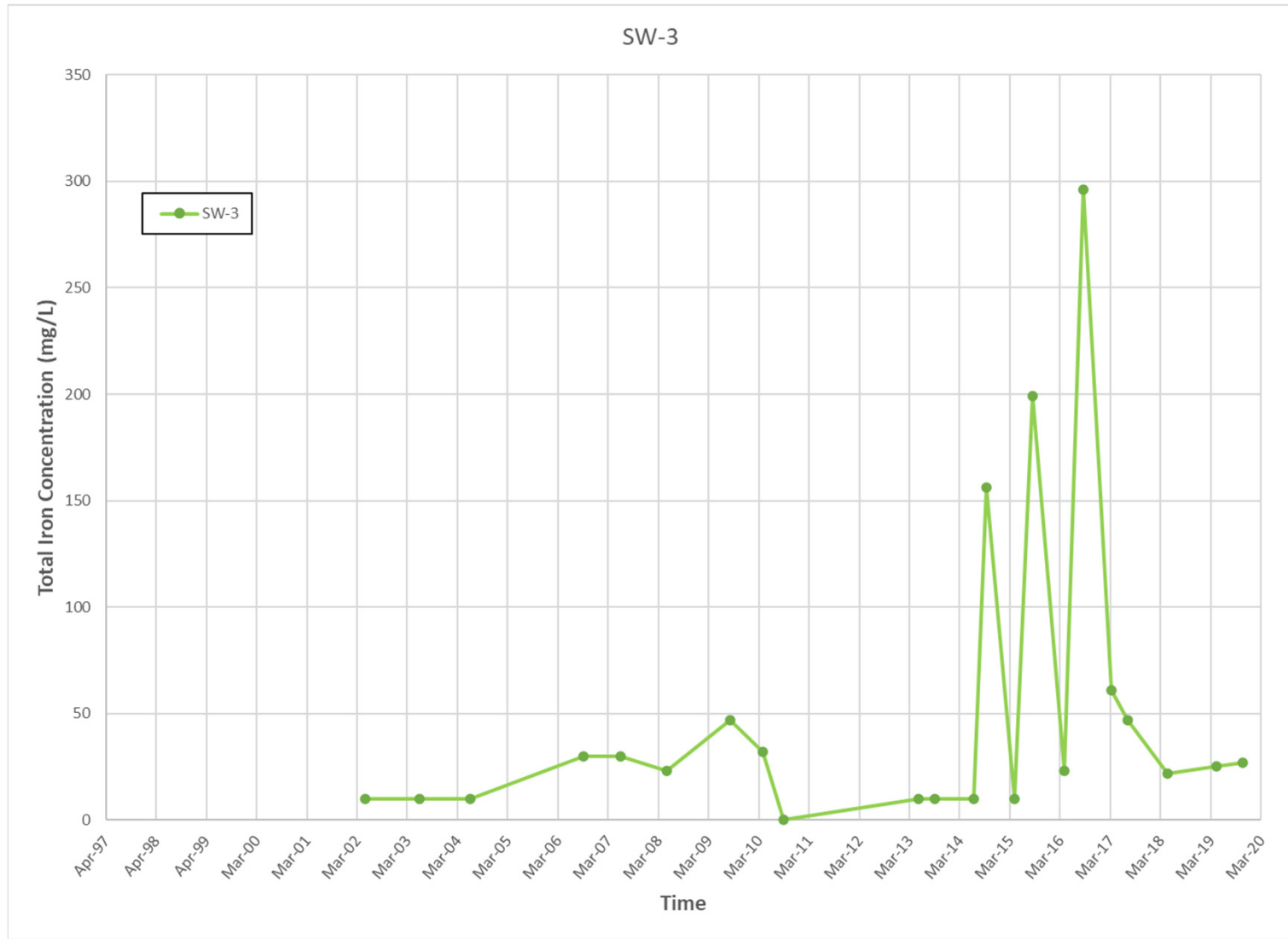
TITLE  
DISSOLVED IRON CONCENTRATION TIME SERIES PLOT

PROJECT No.  
20137619

CONTROL  
2000

Rev  
0

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  
2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD 2019-04-03

PREPARED CA

DESIGN AK

REVIEW AK

APPROVED

TITLE

**TOTAL IRON CONCENTRATION TIME SERIES PLOT**

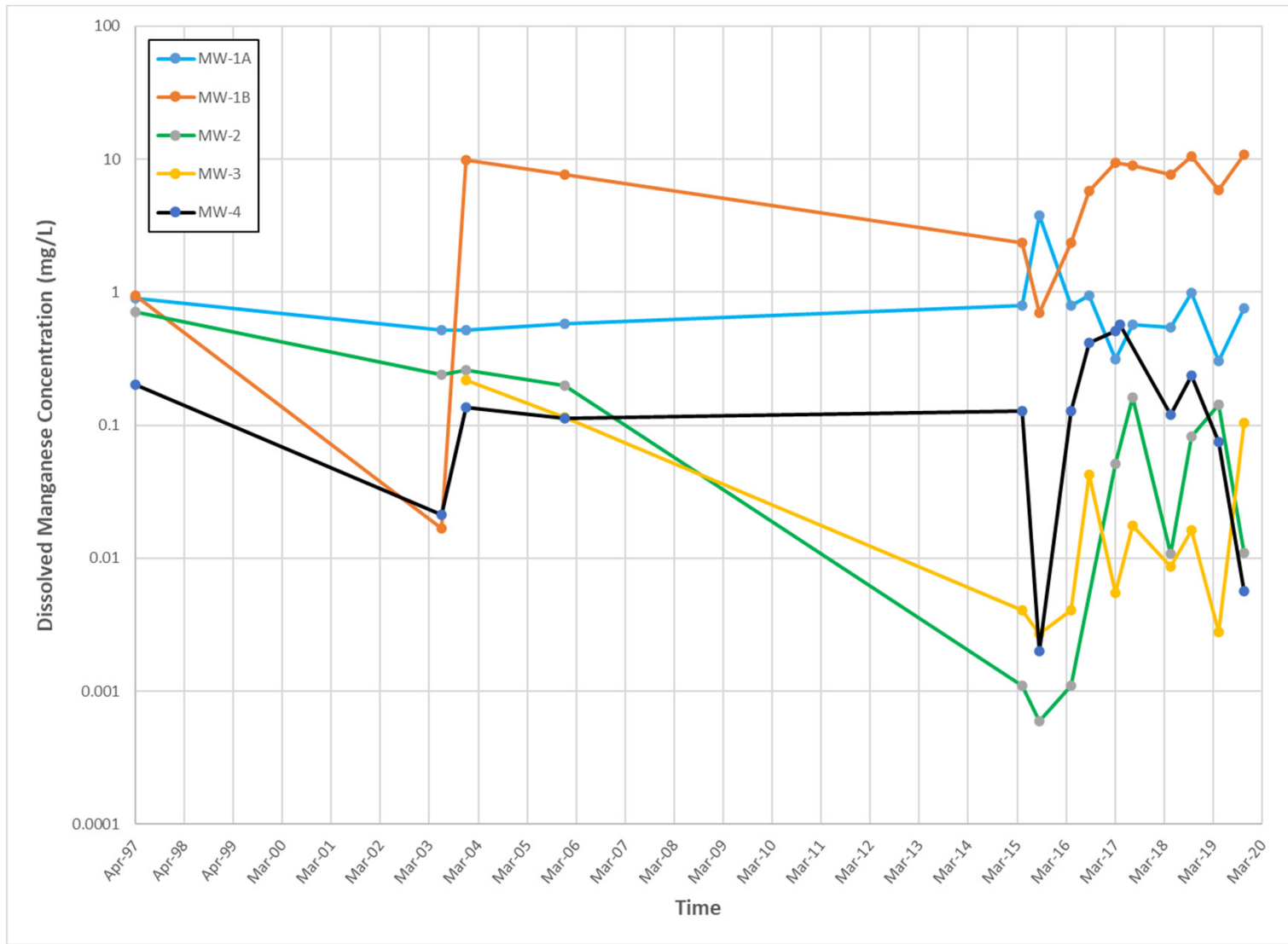
PROJECT No.  
20137619

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

CONSULTANT



YYYY-MM-DD	2019-04-03
PREPARED	CA
DESIGN	AK
REVIEW	AK
APPROVED	

PROJECT  
2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

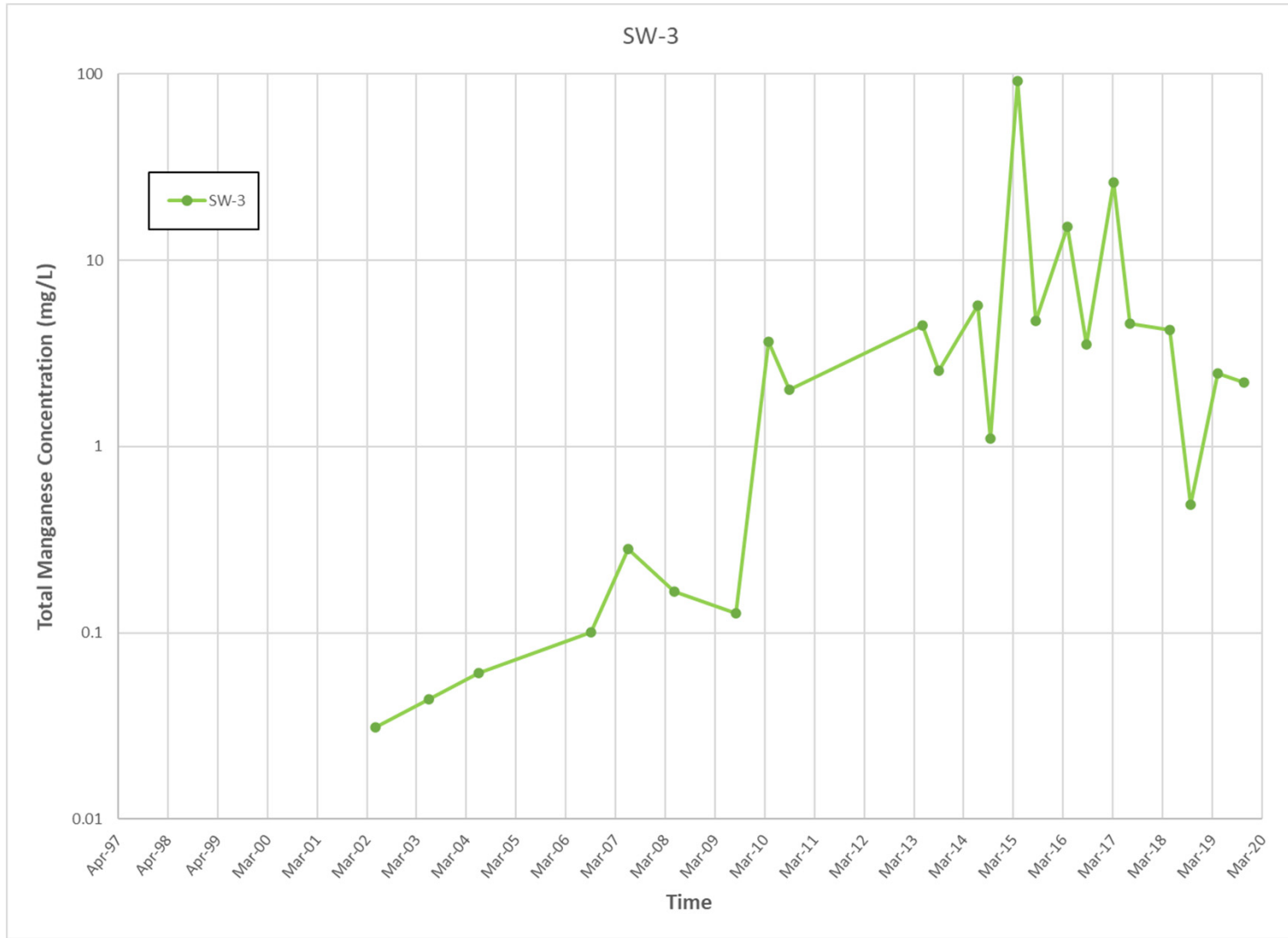
TITLE  
**DISSOLVED MANGANESE CONCENTRATION TIME SERIES PLOT**

PROJECT No.  
20137619

CONTROL  
2000

Rev  
0

FIGURE  
4-E



Notes

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

CLIENT  
REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT  
2019 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT



YYYY-MM-DD 2019-04-03

PREPARED CA

DESIGN AK

REVIEW AK

APPROVED

TITLE

**TOTAL MANGANESE CONCENTRATION TIME SERIES PLOT**

PROJECT No.  
20137619

CONTROL  
2000

Rev  
0

FIGURE  
4-F

**APPENDIX A**

**Landfill Permit**



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

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 autohulks shall not be landfilled.

6.3. **Waste Asbestos**

Notwithstanding section 6.2 of this operational certificate, the disposal of waste asbestos under section 2.1 of this operational certificate and in compliance with the requirements of section 40 of the *Special Waste Regulation* is hereby authorized.

6.4. **Contaminated Soil**

Soil that contains contaminants in concentrations less than "special waste" as defined by the *Special Waste Regulation* may be disposed at the landfill site. Disposal includes monofilling, co-disposal with other wastes, use as a refuse cell berm material and use as a refuse cell cover material. Disposal must occur within a disposal area as authorized by sections 7 and 8 of this operational certificate. Disposal does not include use as final cover material. A Contaminated Soil Relocation Agreement (CSRA) as defined by the *Waste Management Act* is required if the soil contamination exceeds industrial and/or commercial levels and the soil volume being relocated from a specific site exceeds 5 (five) m<sup>3</sup>.

6.5. **Waste Measurement**

The quantity of waste material landfilled at the site shall be measured or estimated by means suitable to the Regional Waste Manager. The results shall be submitted once per year on or before January 31 for the previous year expressed in tonnes/yr and/or m<sup>3</sup>/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  $15 \pm 2$  cm,  $15 \pm 2$  cm,  $15 \pm 2$  cm,  $20 \pm 2$  cm,  $20 \pm 2$  cm,  $20 \pm 2$  cm, and  $25 \pm 2$  cm. Additional strands to this minimum configuration may be used.

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



6.14.3. Wire Tension

For a high tensile smooth wire fence construction, all strands shall be tightened to a minimum of 125 lbs tension at 20°C. The required tension is to be corrected for temperature by use of the following formula for 12-½ gauge high tensile steel wire:

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

where: *Tension* is in lbs force

*Temperature* is in °C

6.14.4. Post Spacing

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

6.14.5. Grounding System

A grounding system shall be installed consisting of solid grounding rods (i.e., not pipe) with a minimum diameter of 16 mm (5/8 inch) that have a buried length of at least 2 metres. A minimum of three grounding rods (spaced at least 3 metres apart) shall be installed and connected to the energizer.

Alternative energizer grounding systems (e.g., grounding plates, or a deep-driven grounding system) may be used provided the grounding is equivalent to or better than three grounding rods. A grounding rod (or equivalent) shall be installed at least once every 450 metres along the fence and connected to the grounded wire stands or uncharged fence fabric. Additional grounding may be required for dry sites or if other conditions affect proper grounding.

6.14.6. Period of Operation

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

6.14.7. Minimum Voltage

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

6.14.8. Gate(s)

Any access through electric fencing for vehicles, equipment and personnel shall consist of an electrified gate system that is closed during non-operating hours. The gate system shall be electrified to a minimum voltage of 6,000

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

#### 6.14.9. Fence Inspections

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

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

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

#### 6.15. Municipal Solid Waste Separation

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

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

#### 7.1. Location

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

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

**7.2. Nature of Wastes**

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

**7.3. Bear-Proofing**

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

**7.4. Waste Compaction**

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

**7.5. Maximum Lift Height**

The maximum height of any lift of compacted refuse in the putrescible disposal area shall not exceed 3 metres.

**7.6. Waste Cover**

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

**7.6.1. Active Face Cover**

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

**7.6.2. Cell Cover**

A uniform cover of 30 cm compacted soil shall be applied to all sides of the active refuse cell such that no more than 300 m<sup>2</sup> of refuse are exposed at the active face at any time and such that the volume of refuse in the cell

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

does not exceed 2500 m<sup>3</sup>. Once the maximum volume of refuse has been reached in a cell, the active face shall be covered with 30 cm of compacted soil and a new refuse cell begun.

7.6.3. Final Cover

Completed portions of the 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.

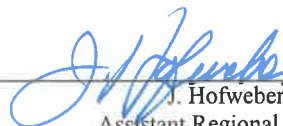
8.3. Waste Compaction

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.

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## 8.5. Waste Cover

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

### 8.5.1. Active Face Cover

Except as otherwise stated in 8.5.2, the active face does not normally require cover. Based on information concerning environmental or public health concerns related to exposed refuse at the active face, however, the Regional Waste Manager may require that the active face be covered completely at a specified frequency with 0.15 m of soil (or functional equivalent) for a specified period.

### 8.5.2. Cell Cover

A uniform cover of 30 cm compacted soil shall be applied to all sides of the active refuse cell such that no more than 300 m<sup>2</sup> of refuse are exposed at the active face at any time and such that the volume of refuse in the cell does not exceed 2500 m<sup>3</sup>. Once the maximum volume of refuse has been reached in a cell, the active face shall be covered with 30 cm of compacted soil and a new refuse cell begun.

### 8.5.3. Final Cover

Completed portions of the 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:

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Assistant Regional Waste Manager

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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.



**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.

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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.

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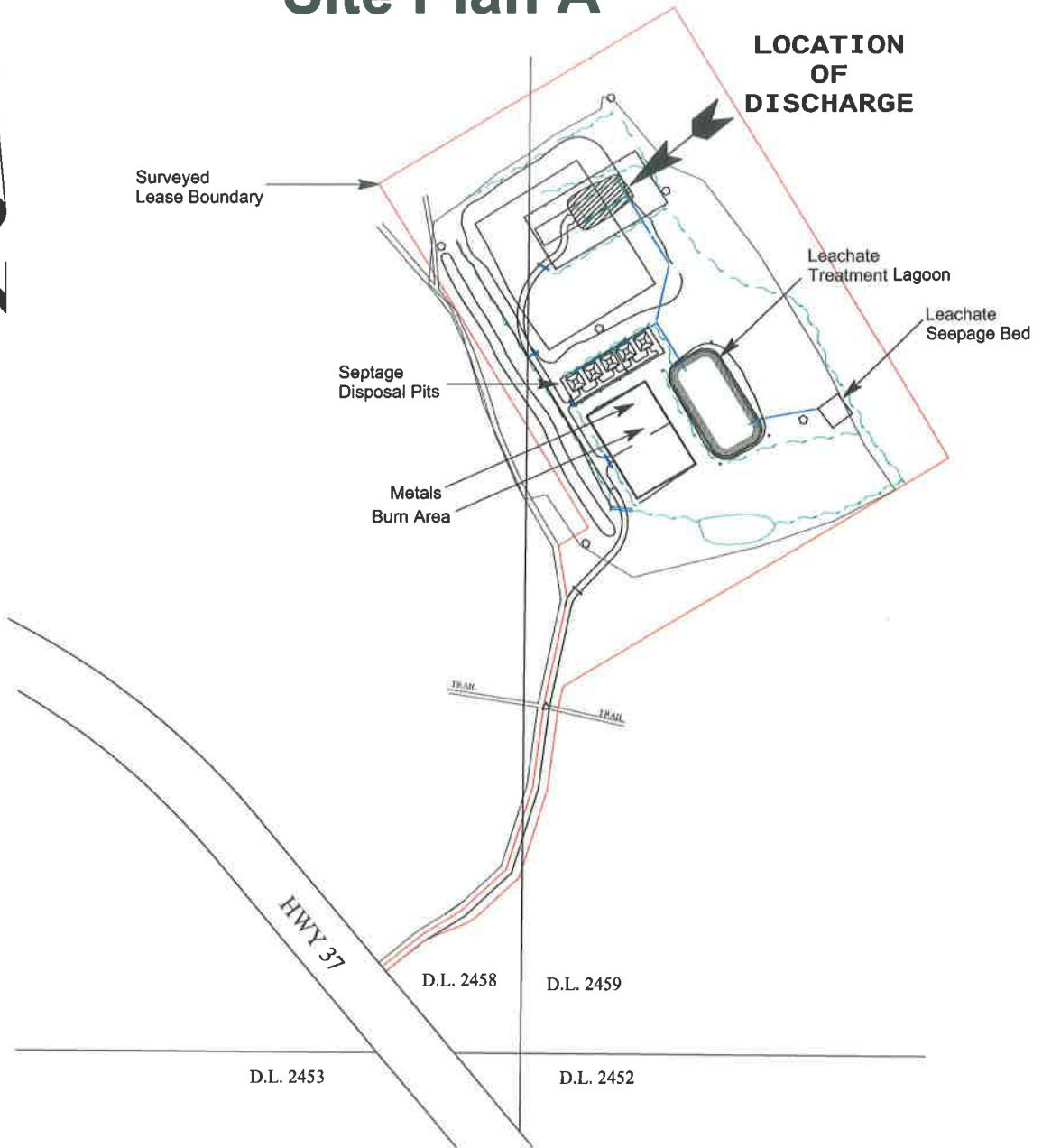


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J. Hofweber, P. Eng.  
Assistant Regional Waste Manager

OPERATIONAL CERTIFICATE: MR-15681

# Site Plan A



## 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.

<b>Locations</b>	<b>Parameters</b>	<b>Frequency</b>
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.

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

Sincerely,

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

Eric Pierce  
*for Director, Environmental Management Act*

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Refuse ~~STATE~~

~~5860 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,

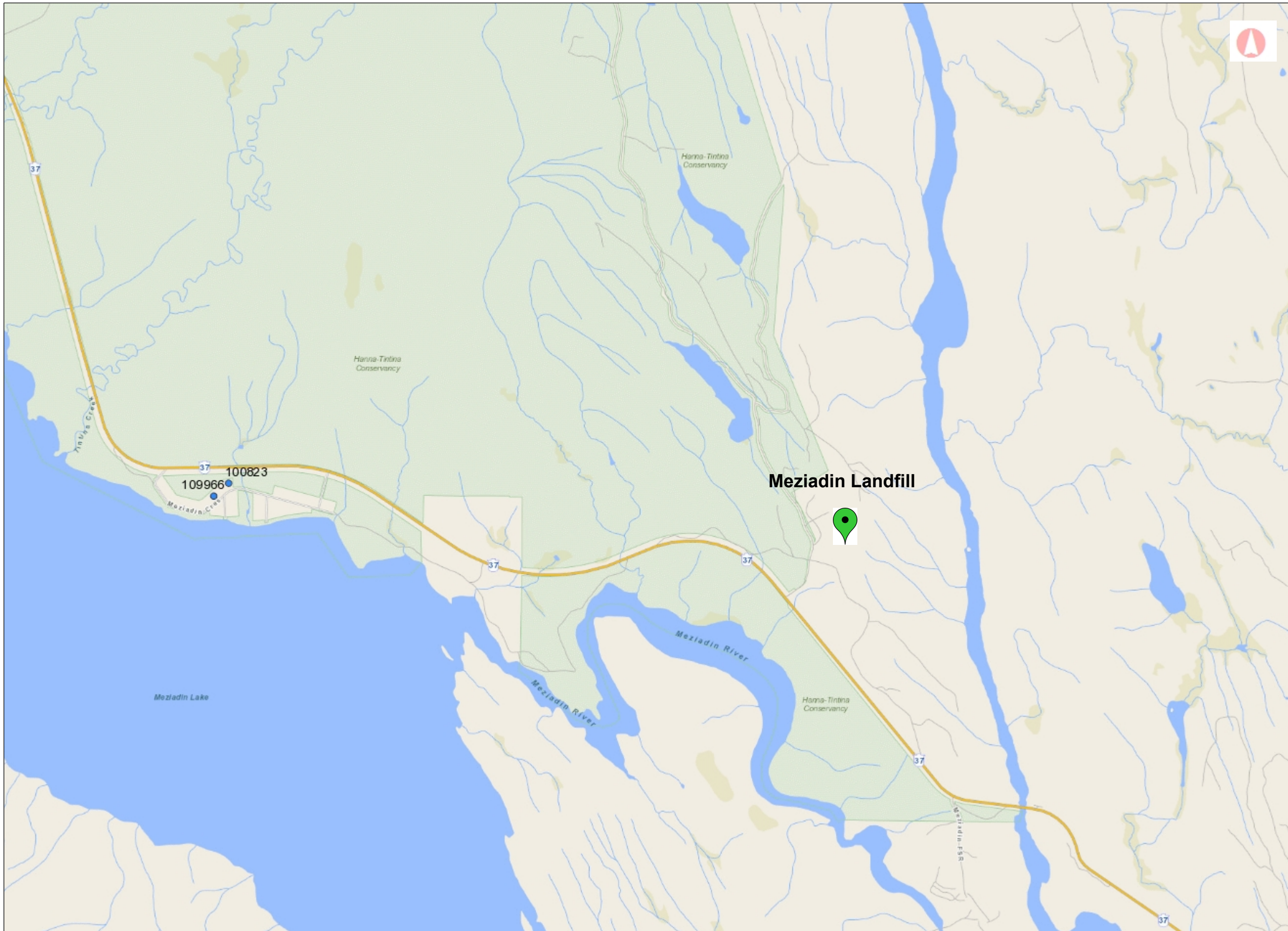
Jim Hofweber, P.Eng.  
Assistant Regional Waste Manager  
Skeena Region

Enclosure



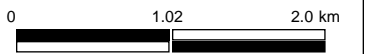
**APPENDIX B**

**BC Water Well Atlas –  
Water Well Records**



**Legend**

- Water Wells - All



1: 50,000

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CAUTION: Maps obtained using this site are not designed to assist in navigation. These maps may be generalized and may not reflect current conditions. Uncharted hazards may exist. DO NOT USE THESE MAPS FOR NAVIGATIONAL PURPOSES.

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

<b>Liner Material:</b>		<b>Liner Thickness:</b>		<b>Liner perforations</b>	
<b>Liner Diameter:</b>		<b>Liner to:</b>		<b>From</b>	<b>To</b>
<b>Liner from:</b>				There are no records to show	

### Screen Details

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

### 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

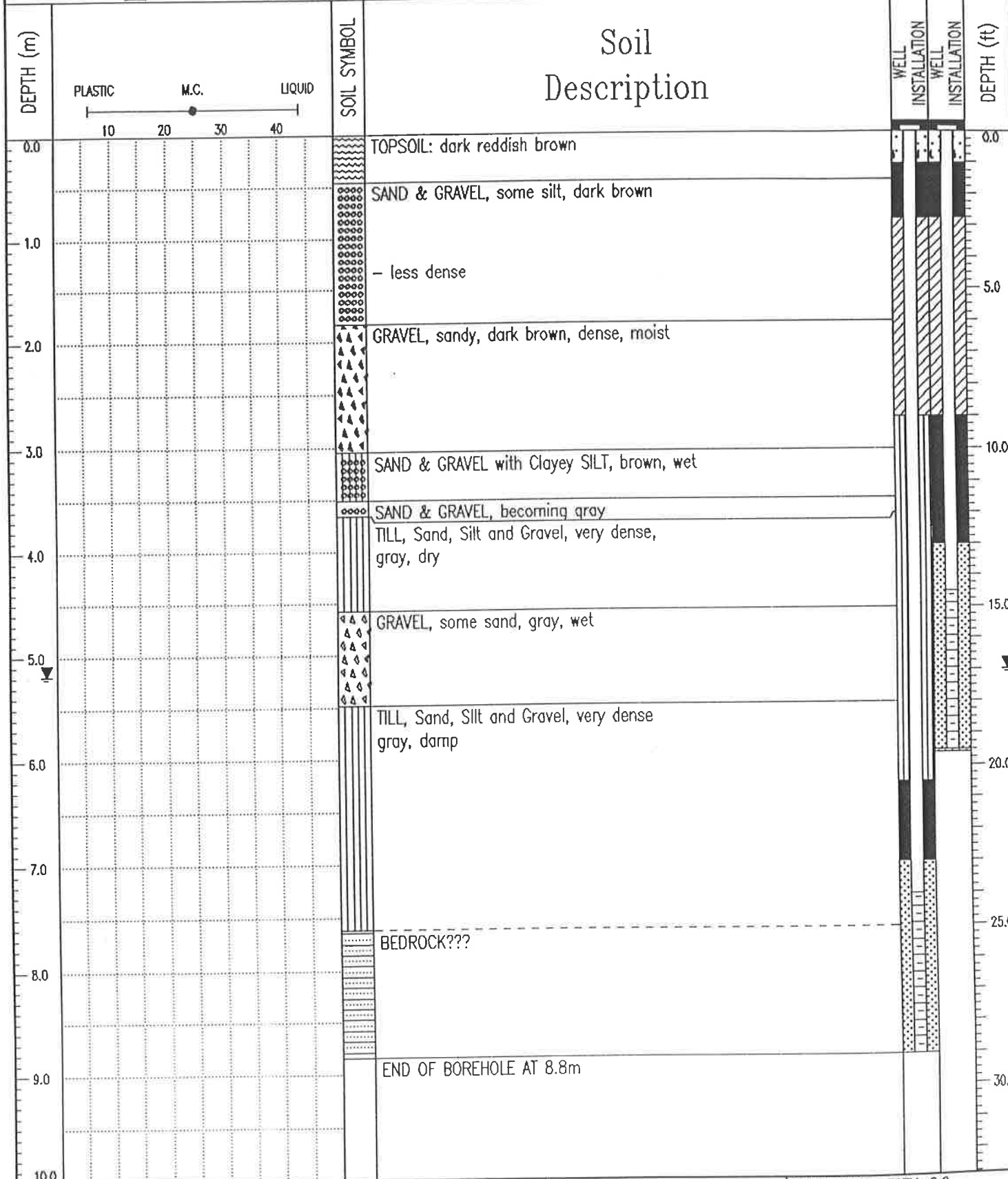
### Documents

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  
REVIEWED BY: GB  
Fig. No:

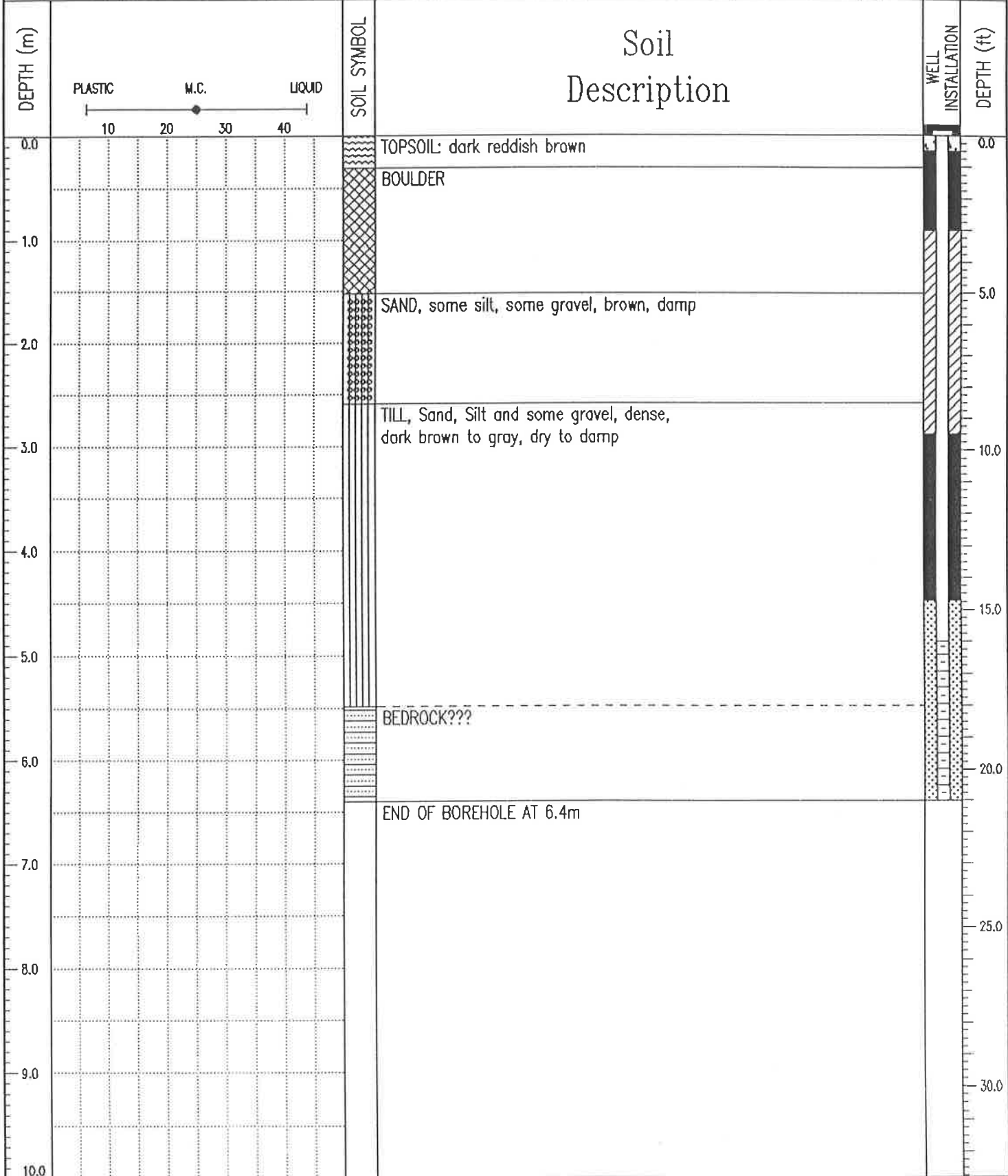
COMPLETION DEPTH: 8.8 m  
COMPLETE: 20/01/97

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



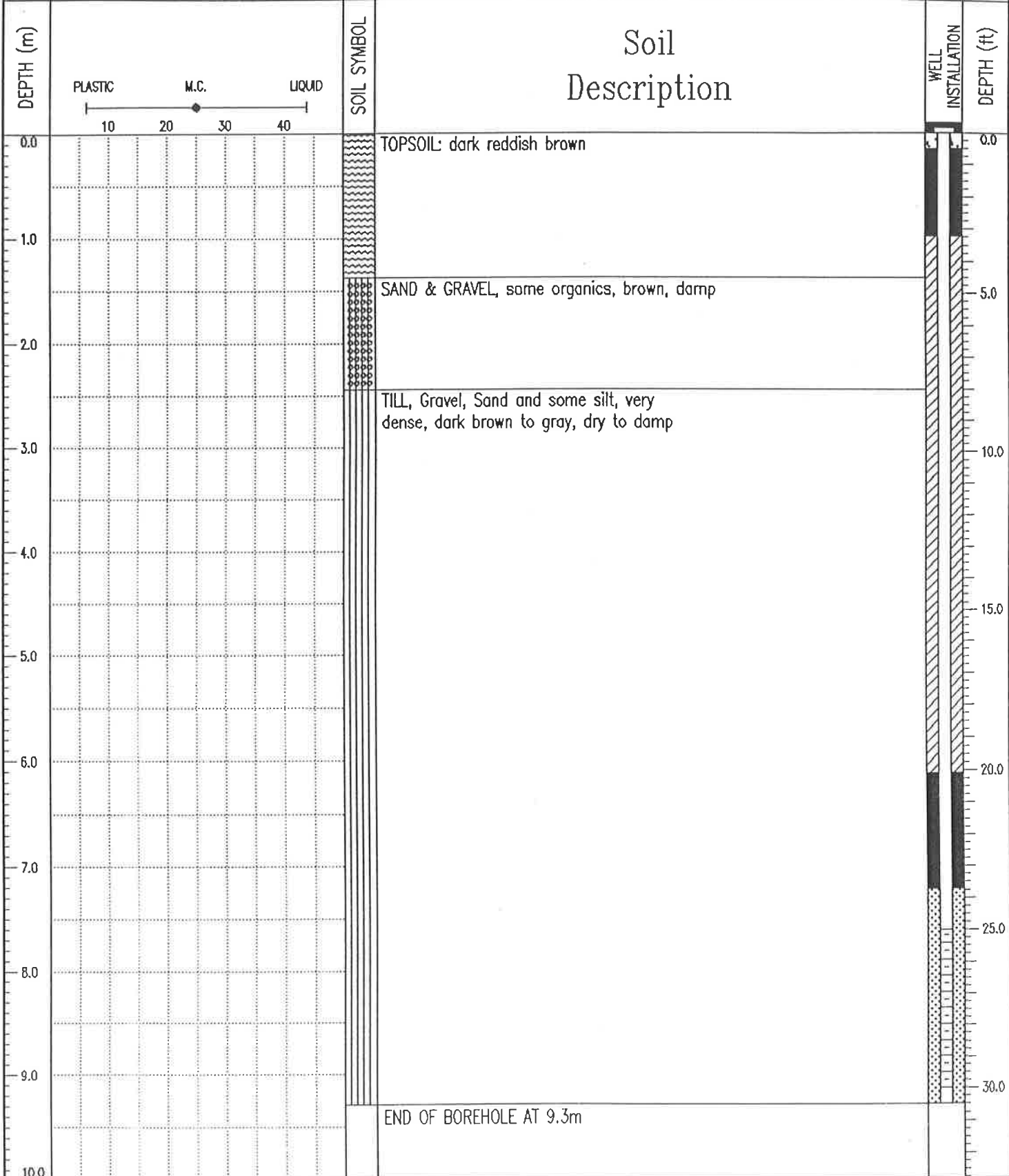
<b>AGRA Earth &amp; Environmental Limited</b> Burnaby, B.C.	LOGGED BY: JE	COMPLETION DEPTH: 6.4 m
	REVIEWED BY: GB	COMPLETE: 20/01/97
	Fig. No:	Page 1 of 1

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:

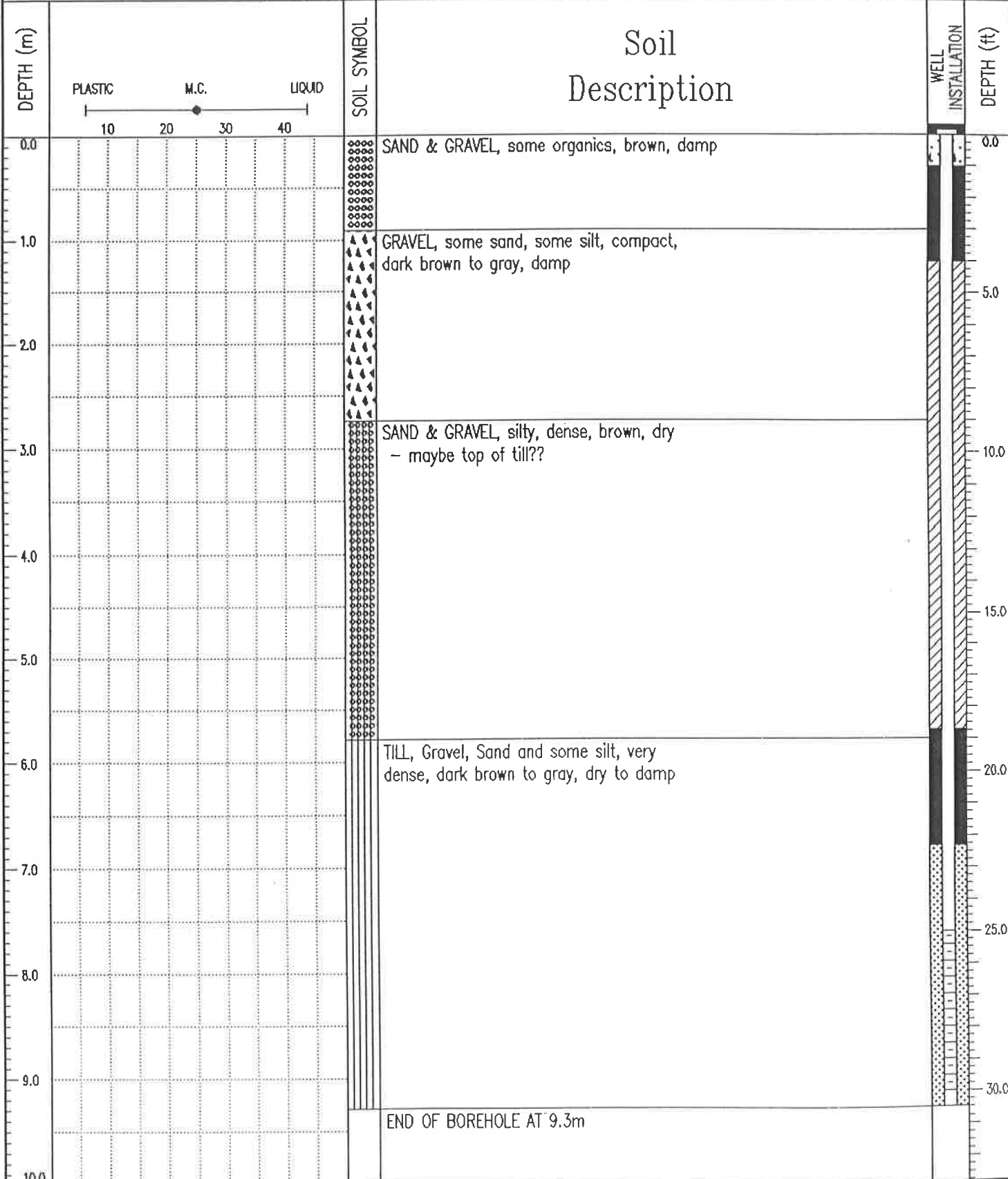
SAMPLE TYPE  BULK  GRAB  SPT  A-CASING  SHELBY TUBE  CORE



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

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

SAMPLE TYPE  BULK  GRAB  SPT  A-CASING  SHELBY TUBE  CORE



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

**APPENDIX D**

**Analytical Results**





**Table D-2: Groundwater Analytical Results**  
**2019 Meziadin Landfill Annual Monitoring Program**  
**Regional District of Kitimat-Stikine**

Location Monitoring Well Sample ID Laboratory ID Sample Date QAQC	CSR Aquatic Life Standard Freshwater (AW-F)	Units	Meziadin Landfill																DUP L2383402-7 2019-Nov-14 FDA FD
			MW-1B																
			MW-1B 1997-Apr-01	MW-1B 2003-Jul-01	MW-1B 2004-Jan-01	MW-1B 2006-Jan-01	MW-1B 2015-May-03	MW-1B 2015-Sep-09	MW-1B 2016-May-03	MW-1B 2016-Sep-13	MW-1B 2017-Apr-01	MW-1B 2017-Aug-01	MW-1B 2018-May-17	MW-1B 2018-Oct-17	MW-1B 2019-May-07	MW-1B 2019-Nov-14	MW-1B 2019-Nov-14		
<b>Field Observations</b>																			
pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Temperature	-	°C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Water level	-	m	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
<b>Conventional Parameters</b>																			
Conductivity	-	uS/cm	254	441	442	437	385	351	385	392	396	450	361	384	356	346	364		
Hardness (Total as CaCO3)	-	mg/L	116	652	236	200	168	146	168	171	171	208	175	189	155	187	186		
Hardness (Dissolved as CaCO3)	-	mg/L	-	267	260	200	-	128	-	-	-	-	-	-	-	-	-		
pH	-	pH	7.9	7.3	-	7.3	7.6	6.8	7.6	6.8	6.4	6.6	-	7.24	7.1	7.95	7.61		
Total Suspended Solids	-	mg/L	-	9290	-	-	-	-	-	-	-	-	-	-	-	-	-		
Total Dissolved Solids	-	mg/L	143	-	248	260	340	220	340	270	260	220	237	242	343	356	334		
Alkalinity, Total (as CaCO3)	-	mg/L	124	-	240	235	200	180	200	210	210	240	209	213	194	190	208		
Ammonia, Total (as N)	-	mg/L	-	-	0.005	0.02	0.076	0.14	0.076	0.21	0.28	0.26	0.269	0.34	0.193	0.127	0.123		
Bromide (Br)	-	mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-	<0.050	<0.050	<0.050		
Chloride (Cl)	-	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		
Fluoride (F)	-	mg/L	0.22	-	-	-	-	<0.10	-	-	<0.10	<0.10	0.07	0.066	0.066	0.069	0.074		
Nitrate (as N)	-	mg/L	0.01	-	0.002	0.003	-	-	-	-	-	-	0.17	0.0481	0.283	0.268	0.0219		
Nitrite (as N)	-	mg/L	0.01	-	0.002	0.002	-	-	-	-	-	-	0.0058	0.0012	0.0095	0.0025	<0.0010		
Nitrate + Nitrite (as N)	-	mg/L	-	-	0.002	0.003	0.36	0.692	0.36	0.297	0.374	0.19	0.176	0.0492	0.293	0.27	0.0219		
Total Kjeldahl Nitrogen	-	mg/L	-	-	1.66	0.16	1.78	0.72	1.78	4.4	2.48	4.53	1.94	0.505	0.429	1.24	0.298		
Phosphorus (P)-Total	-	mg/L	-	-	9.51	7.03	-	-	-	-	-	-	-	-	-	-	-		
Sulfate (SO4)	-	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	8.72	5.42		
Biological Oxygen Demand (BOD)	-	mg/L	-	6	10	-	-	-	-	-	-	-	-	-	-	-	-		
Chemical Oxygen Demand (COD)	-	mg/L	-	20	15	24	108	23	108	82	202	194	71	25	34	53	35		
<b>Total Metals</b>																			
Aluminum	-	mg/L	-	18.6	0.0371	8.46	-	-	-	-	-	-	-	-	-	-	-		
Antimony	-	mg/L	0.09	0.00497	0.000152	0.000214	-	-	-	-	-	-	-	-	-	-	-		
Arsenic	-	mg/L	0.05	0.0047	0.0003	0.0039	-	-	-	-	-	-	-	-	-	-	-		
Barium	-	mg/L	10	1.43	0.593	1.53	-	-	-	-	-	-	-	-	-	-	-		
Beryllium	-	mg/L	0.0015	0.00211	0.00002	0.00137	-	-	-	-	-	-	-	-	-	-	-		
Bismuth	-	mg/L	-	0.00002	0.00002	0.00002	-	-	-	-	-	-	-	-	-	-	-		
Boron	-	mg/L	12	0.033	0.008	0.008	-	-	-	-	-	-	-	-	-	-	-		
Cadmium	-	mg/L	0.0005 - 0.004 <sup>b</sup>	0.00255	0.00079	0.0015	-	-	-	-	-	-	-	-	-	-	-		
Calcium	-	mg/L	-	102	75.3	84	-	44.5	-	-	-	-	-	-	-	-	-		
Chromium <sup>d</sup>	-	mg/L	0.01	0.0506	0.0004	0.0112	-	-	-	-	-	-	-	-	-	-	-		
Cobalt	-	mg/L	0.04	0.0749	0.0141	0.0472	-	-	-	-	-	-	-	-	-	-	-		
Copper	-	mg/L	0.02 - 0.09 <sup>b</sup>	0.21	0.00505	0.163	-	-	-	-	-	-	-	-	-	-	-		
Iron	-	mg/L	-	289	0.144	55.2	-	-	-	-	-	-	-	-	-	-	-		
Lead	-	mg/L	0.04 - 0.16 <sup>b</sup>	0.0271	0.00004	0.0252	-	-	-	-	-	-	-	-	-	-	-		
Lithium	-	mg/L	-	0.0291	0.00381	0.0166	-	-	-	-	-	-	-	-	-	-	-		
Magnesium	-	mg/L	-	96.6	11.6	26.2	-	8.5	-	-	-	-	-	-	-	-	-		
Manganese	-	mg/L	-	12.6	9.94	12.3	-	-	-	-	-	-	-	-	-	-	-		
Mercury	-	mg/L	0.00025	-	0.00005	0.00005	-	-	-	-	-	-	-	-	-	-	-		
Molybdenum	-	mg/L	10	0.00248	0.00062	0.00052	-	-	-	-	-	-	-	-	-	-	-		
Nickel	-	mg/L	0.25 - 1.5 <sup>b</sup>	0.169	0.0308	0.0995	-	-	-	-	-	-	-	-	-	-	-		
Phosphorus	-	mg/L	-	6.5	0.1	3.4	-	-	-	-	-	-	-	-	-	-	-		
Potassium	-	mg/L	-	8	1	1	-	-	-	-	-	-	-	-	-	-	-		
Selenium	-	mg/L	0.02	0.0023	0.0003	0.0007	-	-	-	-	-	-	-	-	-	-	-		
Silver	-	mg/L	0.0005 - 0.015 <sup>b</sup>	0.00006	0.00002	0.00005	-	-	-	-	-	-	-	-	-	-	-		
Sodium	-	mg/L	-	7.49	4.55	5.33	-	-	-	-	-	-	-	-	-	-	-		
Strontium	-	mg/L	-	0.548	0.425	0.476	-	-	-	-	-	-	-	-	-	-	-		
Sulfur	-	mg/L	-	8.9	0.7	1.4	-	-	-	-	-	-	-	-	-	-	-		
Tellurium	-	mg/L	-	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-		
Thallium	-	mg/L	0.003	0.000141	0.000026	0.000096	-	-	-	-	-	-	-	-	-	-	-		
Tin	-	mg/L	-	0.00003	0.00001	0.00003	-	-	-	-	-	-	-	-	-	-	-		
Titanium	-	mg/L	1	0.00207	0.003	0.006	-	-	-	-	-	-	-	-	-	-	-		
Uranium	-	mg/L	0.085	0.0162	0.000207	0.000616	-	-	-	-	-	-	-	-	-	-	-		
Vanadium	-	mg/L	-	1.84	0.00089	0.0299	-	-	-	-	-	-	-	-	-	-	-		
Zinc	-	mg/L	0.075 - 2.4 <sup>b</sup>	4.58	0.0051	0.152	-	-	-	-	-	-	-	-	-	-	-		
Zirconium	-	mg/L	-	0.05	0.005	-	-	-	-	-	-	-	-	-	-	-	-		
<b>Dissolved Metals</b>																			
Aluminum	-	mg/L	0.2	0.0042	0.0038	0.0036	0.009	<0.005	0.009	0.005	0.0074	0.0075	0.0209	0.118	0.025	0.0197	0.0173		
Antimony	-	mg/L	0.09	0.000885	0.000143	0.000191	0.0002	0.0001	0.0002	0.0005	0.00027	0.00033	<0.00010	0.00011	<0.00020	<0.00010	<0.00010		
Arsenic	-	mg/L	0.05	0.0008	0.0003	0.0003	0.0025	<0.0005	0.0025	0.0044	0.00371	0.00187	0.00129	0.00227	0.00063	0.00129	0.00117		
Barium	-	mg/L	10	0.25	0.0869	0.612	0.559	0.329	0.066	0.329	0.672	0.506	0.676	0.403	0.543	0.309	0.496		
Beryllium	-	mg/L	0.0015	0.0005	0.00002	0.00002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00020	<0.00010	<0.00010		
Bismuth	-	mg/L	-	0.1	0.00002	0.00002	0.00002	-	-	-	<0.00010	<0.00010	<0.000050	<0.000050	<0.00010	<0.000050	<0.000050		
Boron	-	mg/L	12	0.1	0.072	0.008	0.008	0.037	0.012	0.037	0.06	0.032	0.0184	<0.010	<0.020	<0.010	<0.010		
Cadmium	-	mg/L	0.0005 - 0.004 <sup>b</sup>	0.01	0.00011	0.0008	0.0005	0.00019	0.00059	0.00019	0.00022	0.000395	0.000372	0.00007	0.0000567	0.000079	0.0000249		
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	57.4		
Cesium	-	mg/L	-	-	-	-	-	-	-	-	-	-	0.00011	0.000018	<0.00020	0.000015	0.000017		
Chromium <sup>d</sup>	-	mg/L	0.01	0.01	0.003	0.0006	0.0006	<0.0005	0.0006	0.0005	0.00058	<0.00050	0.00027	0.00043	<0.00020	0.0003	0.00027		
Cobalt	-	mg/L	0.04	0.01	0.0039	0.011	0.00338	0.0008	0.00338	0.00775	0.0117	0.0134	0.0117	0.0142	0.00932	0.016	0.0163		
Copper	-	mg/L	0.02 - 0.09 <sup>b</sup>	0.01	0.00272	0.0046	0.00354	0.0186	0.0007	0.0186	0.0296	0.0271	0.00226	0.0006	0.00055	0.00065	0.00095		
Iron	-	mg/L	-	0.1	0.005	0.005	0.005	0.012	0.017	0.012	<0.010	<0.010	0.013	2.16	3.27	0.789	1.94		
Lead	-	mg/L	0.04 - 0.16 <sup>b</sup>	0.05	0.00001	0.00001	<0.0001												

**Table D-3: Groundwater Analytical Results**  
**2019 Meziadin Landfill Annual Monitoring Program**  
**Regional District of Kitimat-Stikine**

Location Monitoring Well Sample ID Laboratory ID Sample Date QA/QC	CSR Aquatic Life Standard Freshwater (AW-F)	Units	Meziadin Landfill													DUP L2269973-7 2019-May-07 FDA	MW-2 L2383402-3 2019-Nov-14 FD		
			MW-2											MW-2 L2097663-3 2018-May-17	MW-2 L2183746-3 2018-Oct-17			MW-2 L2269973-3 2019-May-07	
			MW-2 1997-Apr-01	MW-2 2003-Jul-01	MW-2 2004-Jan-01	MW-2 2006-Jan-01	MW-2 2015-May-03	MW-2 2015-Sep-09	MW-2 2016-May-03	MW-2 2017-Apr-01	MW-2 2017-Aug-01	MW-2 2018-May-17	MW-2 2018-Oct-17						MW-2 2019-May-07
<b>Field Observations</b>																			
pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	7.65	7.35	-	7.6
Temperature	-	°C	-	-	-	-	-	-	-	-	-	-	-	-	6.9	6.9	4.6	-	4.6
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	309.8	248.9	234.9	-	99.3
Water level	-	m	-	-	-	-	-	-	-	-	-	-	-	-	1.52	3.04	1.50	-	1.56
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	13.3	6.4	6.5	-	7.7
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	-	-	-	406.5	404.6	410.7	-	314.3
<b>Conventional Parameters</b>																			
Conductivity	-	uS/cm	520	389	488	512	505	496	505	457	491	369	450	309	414	251	-	-	-
Hardness (Total as CaCO3)	-	mg/L	-	265	167	190	151	174	151	139	154	114	142	129	131	65.4	-	-	-
Hardness (Dissolved as CaCO3)	-	mg/L	-	149	188	190	-	168	-	-	-	-	-	-	-	-	-	-	-
pH	-	pH	7.90	8.20	8.10	8.20	7.80	8.00	7.80	7.6	7.80	-	8.36	8.18	8.30	8.25	-	-	-
Total Suspended Solids	-	mg/L	-	3200	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	-	mg/L	338	-	282	290	300	300	210	200	210	200	166	205	134	186	114	-	-
Alkalinity, Total (as CaCO3)	-	mg/L	146	-	182	188	210	200	210	200	200	166	205	134	186	114	-	-	-
Ammonia, Total (as N)	1.31 - 18.4 <sup>a</sup>	mg/L	-	0.01	0.07	0.04	<0.03	<0.03	<0.03	<0.03	0.04	<0.005	0.02	0.03	0.03	<0.0050	<0.0050	<0.0050	<0.0050
Bromide (Br)	-	mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Chloride (Cl)	1500	mg/L	5.90	1.00	1.30	0.50	1.00	1.10	1.00	<1	<1	<0.5	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50
Fluoride (F)	2.0 - 3.0 <sup>b</sup>	mg/L	0.19	-	-	-	-	0.14	-	0.15	0.15	0.136	0.181	0.117	0.165	0.138	-	-	-
Nitrate (as N)	400	mg/L	0.01	-	0.004	0.038	-	-	-	-	-	0.187	0.0105	0.449	0.163	0.383	-	-	-
Nitrite (as N)	0.2 - 2.0 <sup>c</sup>	mg/L	0.01	-	0.002	0.004	-	-	-	-	-	0.0011	<0.0010	0.0035	<0.0010	<0.0010	<0.0010	<0.0010	
Nitrate + Nitrite (as N)	400	mg/L	-	-	0.004	0.042	0.028	0.038	0.028	0.0310	0.0149	0.1880	0.0105	0.453	0.163	0.383	-	-	-
Total Kjeldahl Nitrogen	-	mg/L	-	-	0.19	0.1	0.14	0.08	0.14	0.109	0.325	0.083	0.082	0.445	0.552	0.172	-	-	-
Phosphorus (P)-Total	-	mg/L	-	-	0.923	0.351	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate (SO4)	1280 - 4290 <sup>b</sup>	mg/L	103	47	77	86	59	66	59	55	50	43	49	32.7	44.1	22	-	-	-
Biological Oxygen Demand (BOD)	-	mg/L	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	-	mg/L	-	10	10	10	<20	<20	<20	25	<20	<20	<20	<20	32	<20	-	-	<20
<b>Total Metals</b>																			
Aluminum	-	mg/L	-	7.59	0.185	1.99	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	0.09	mg/L	-	0.000254	0.000147	0.000145	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	0.05	mg/L	-	0.0025	0.0006	0.0013	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	10	mg/L	-	0.277	0.0872	0.12	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	0.0015	mg/L	-	0.00057	0.00002	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-
Bismuth	-	mg/L	-	0.00003	0.00004	0.00002	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron	12	mg/L	-	0.057	0.065	0.051	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	0.0005 - 0.004 <sup>b</sup>	mg/L	-	0.00339	0.0003	0.00076	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	-	mg/L	-	53.5	46.6	56.4	-	48.6	-	-	-	-	-	-	-	-	-	-	-
Chromium <sup>d</sup>	0.01	mg/L	-	0.0222	0.0005	0.0051	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	0.04	mg/L	-	0.0186	0.000597	0.0045	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	0.02 - 0.09 <sup>b</sup>	mg/L	-	0.0879	0.00337	0.0189	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	-	mg/L	-	66.6	0.181	3.94	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	0.04 - 0.16 <sup>b</sup>	mg/L	-	0.0105	0.00018	0.00262	-	-	-	-	-	-	-	-	-	-	-	-	-
Lithium	-	mg/L	-	0.0122	0.0022	0.00498	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	-	mg/L	-	31.8	12.4	15.5	-	12.7	-	-	-	-	-	-	-	-	-	-	-
Manganese	-	mg/L	-	1.26	0.275	0.64	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	0.00025	mg/L	-	-	0.00005	0.00005	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum	10	mg/L	-	0.00951	0.0094	0.0108	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	0.25 - 1.5 <sup>b</sup>	mg/L	-	0.0542	0.00212	0.0129	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphorus	-	mg/L	-	1.4	0.1	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	-	mg/L	-	5	2	2	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	0.02	mg/L	-	0.0043	0.0004	0.0003	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	0.0005 - 0.015 <sup>b</sup>	mg/L	-	0.00006	0.00002	0.00004	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	-	mg/L	-	30.3	34.2	44.8	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium	-	mg/L	-	0.451	0.551	0.586	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfur	-	mg/L	-	16.2	25.4	29.8	-	-	-	-	-	-	-	-	-	-	-	-	-
Tellurium	-	mg/L	-	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	0.003	mg/L	-	0.000231	0.000036	0.000056	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	-	mg/L	-	0.00004	0.00004	0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-
Titanium	1	mg/L	-	0.262	0.003	0.006	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	0.085	mg/L	-	0.00192	0.00198	0.0022	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	-	mg/L	-	0.0299	0.00193	0.00672	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	0.075 - 2.4 <sup>b</sup>	mg/L	-	0.107	0.0014	0.0208	-	-	-	-	-	-	-	-	-	-	-	-	-
Zirconium	-	mg/L	-	0.005	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Dissolved Metals</b>																			
Aluminum	-	mg/L	0.2	0.0047	0.002	0.0043	<0.005	<0.005	<0.005	<0.005	<0.0050	0.0026	0.0015	0.0191	0.0138	0.0058	-	-	-
Antimony	0.09	mg/L	0.2	0.00002	0.000127	0.000096	0.0002	0.0001	0.0002	0.0001	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.05	mg/L	0.2	0.0007	0.0006	0.0005	<0.0005	<0.0005	<0.0005	<0.00050	0.0006	0.00027	0.00037	0.00044	0.00047	0.00026	-	-	-
Barium	10	mg/L	0.19	0.0812	0.0798	0.0825	0.056	0.059	0.056	0.0927	0.0629	0.0498	0.0527	0.0524	0.0506	0.0335	-	-	-
Beryllium	0.0015	mg/L	0.005	0.00002	0.00002	0.00002	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth	-	mg/L	0.1	0.00002	0.00002	0.00002	-	-	-	<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron	12	mg/L	0.1	0.048	0.056	0.053	0.06	0.058	0.06	0.059	0.0589	0.036	0.053	0.046	0.048	0.026	-	-	-
Cadmium	0.0005 - 0.004 <sup>b</sup>	mg/L	0.01	0.00044	0.00025	0.00021	0.00017	0.00021	0.00017	0.000494	0.000192	0.000493	0.000157	0.00111	0.000756	0.00125	-	-	-
Calcium	-	mg/L	60.2																

**Table D-4: Groundwater Analytical Results**  
**2019 Meziadin Landfill Annual Monitoring Program**  
**Regional District of Kitimat-Stikine**

Location Monitoring Well Sample ID Laboratory ID Sample Date QAQC	CSR Aquatic Life Standard Freshwater (AW-F)	Units	Meziadin Landfill												
			MW-3												
			MW-3 2003-Jul-01	MW-3 2004-Jan-01	MW-3 2006-Jan-01	MW-3 2015-May-03	MW-3 2015-Sep-09	MW-3 2016-May-03	MW-3 2016-Sep-13	MW-3 2017-Apr-01	MW-3 2017-Aug-01	MW-3 L2097663-4 2018-May-17	MW-3 L2183746-4 2018-Oct-17	MW-3 L2269973-4 2019-May-07	MW-3 L2383402-4 2019-Nov-14
<b>Field Observations</b>															
pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Temperature	-	°C	-	-	-	-	-	-	-	-	-	-	-	-	
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	
Water level	-	m	-	-	-	-	-	-	-	-	-	-	-	-	
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	-	-	-	
<b>Parameters</b>															
Conductivity	-	uS/cm	-	785	766	676	680	676	669	640	647	612	628	649	643
Hardness (Total as CaCO3)	-	mg/L	473	261	320	199	230	199	194	182	197	208	185	210	223
Hardness (Dissolved as CaCO3)	-	mg/L	-	288	300	-	218	-	-	-	-	-	-	-	-
pH	-	pH	-	8.20	7.90	8.00	8.00	8.00	7.90	7.80	7.70	-	8.32	8.33	8.41
Total Dissolved Solids	-	mg/L	-	496	520	430	430	430	420	420	320	412	420	398	400
Alkalinity, Total (as CaCO3)	-	mg/L	-	197	201	190	190	190	190	180	180	193	195	193	203
Ammonia, Total (as N)	1.31 - 18.4 <sup>a</sup>	mg/L	-	0.02	0.02	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.02	0.03	<0.0050	0.06
Bromide (Br)	-	mg/L	-	0.1	0.1	-	-	-	-	-	-	-	-	<0.050	<0.050
Chloride (Cl)	1500	mg/L	-	1.50	1.10	1.20	1.20	1.20	1.20	1.10	<1.0	0.76	<2.5	0.57	0.93
Fluoride (F)	2.0 - 3.0 <sup>b</sup>	mg/L	-	-	-	-	<0.10	-	-	0.1	0.1	0.095	<0.10	0.085	0.087
Nitrate (as N)	400	mg/L	-	0.137	0.163	-	-	-	-	-	-	0.121	0.066	0.165	0.306
Nitrite (as N)	0.2 - 2.0 <sup>c</sup>	mg/L	-	0.027	0.012	-	-	-	-	-	-	<0.0010	<0.0050	<0.0010	0.0078
Nitrate + Nitrite (as N)	400	mg/L	-	0.164	0.175	0.256	0.270	0.256	0.248	-	0.204	0.121	<0.0710	0.165	0.314
Total Kjeldahl Nitrogen	-	mg/L	-	0.14	0.04	0.27	0.12	0.27	0.2	0.224	0.213	0.173	0.098	0.105	0.38
Phosphorus (P)-Total	-	mg/L	-	0.434	0.82	-	-	-	-	-	-	-	-	-	-
Sulfate (SO4)	1280 - 4290 <sup>b</sup>	mg/L	-	210	205	161	156	161	112	154	148	148	156	157	151
Biological Oxygen Demand (BOD)	-	mg/L	-	10	-	-	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	-	mg/L	-	10	10	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
<b>Total Metals</b>															
Aluminum	-	mg/L	12.6	0.0436	6.15	-	-	-	-	-	-	-	-	-	-
Antimony	0.09	mg/L	0.000221	0.000127	0.000328	-	-	-	-	-	-	-	-	-	-
Arsenic	0.05	mg/L	0.0071	0.0005	0.0027	-	-	-	-	-	-	-	-	-	-
Barium	10	mg/L	0.203	0.0413	0.135	-	-	-	-	-	-	-	-	-	-
Beryllium	0.0015	mg/L	0.00114	0.00002	0.00027	-	-	-	-	-	-	-	-	-	-
Bismuth	-	mg/L	0.00002	0.00002	0.00014	-	-	-	-	-	-	-	-	-	-
Boron	12	mg/L	0.075	0.072	0.065	-	-	-	-	-	-	-	-	-	-
Cadmium	0.0005 - 0.004 <sup>b</sup>	mg/L	0.0106	0.00014	0.00081	-	-	-	-	-	-	-	-	-	-
Calcium	-	mg/L	106	78.8	93.5	-	69.3	-	-	-	-	-	-	-	-
Cesium	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium <sup>d</sup>	0.01	mg/L	0.0353	0.0002	0.0163	-	-	-	-	-	-	-	-	-	-
Cobalt	0.04	mg/L	0.031	0.000207	0.0096	-	-	-	-	-	-	-	-	-	-
Copper	0.02 - 0.09 <sup>b</sup>	mg/L	0.15	0.00092	0.021	-	-	-	-	-	-	-	-	-	-
Iron	-	mg/L	129	0.06	10	-	-	-	-	-	-	-	-	-	-
Lead	0.04 - 0.16 <sup>b</sup>	mg/L	0.0218	0.0001	0.00485	-	-	-	-	-	-	-	-	-	-
Lithium	-	mg/L	0.0201	0.00444	0.0113	-	-	-	-	-	-	-	-	-	-
Magnesium	-	mg/L	50.7	15.6	20.9	-	13.8	-	-	-	-	-	-	-	-
Manganese	-	mg/L	2.21	0.225	0.817	-	-	-	-	-	-	-	-	-	-
Mercury	0.00025	mg/L	-	0.00005	0.00005	-	-	-	-	-	-	-	-	-	-
Molybdenum	10	mg/L	0.00217	0.00574	0.00632	-	-	-	-	-	-	-	-	-	-
Nickel	0.25 - 1.5 <sup>b</sup>	mg/L	0.0866	0.00074	0.0272	-	-	-	-	-	-	-	-	-	-
Phosphorus	-	mg/L	3.2	0.1	0.4	-	-	-	-	-	-	-	-	-	-
Potassium	-	mg/L	6	2	3	-	-	-	-	-	-	-	-	-	-
Rubidium	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	0.02	mg/L	0.0002	0.0004	0.0018	-	-	-	-	-	-	-	-	-	-
Silicon	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	0.0005 - 0.015 <sup>b</sup>	mg/L	0.00004	0.00002	0.00013	-	-	-	-	-	-	-	-	-	-
Sodium	-	mg/L	60.2	58.9	68	-	-	-	-	-	-	-	-	-	-
Strontium	-	mg/L	0.646	0.72	0.784	-	-	-	-	-	-	-	-	-	-
Sulfur	-	mg/L	59.3	74.7	73.2	-	-	-	-	-	-	-	-	-	-
Tellurium	-	mg/L	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-
Thallium	0.003	mg/L	0.000335	0.000023	0.000097	-	-	-	-	-	-	-	-	-	-
Thorium	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	-	mg/L	0.00038	0.00001	0.00023	-	-	-	-	-	-	-	-	-	-
Titanium	1	mg/L	0.498	0.003	0.005	-	-	-	-	-	-	-	-	-	-
Tungsten	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	0.085	mg/L	0.00351	0.00252	0.00243	-	-	-	-	-	-	-	-	-	-
Vanadium	-	mg/L	0.0463	0.00031	0.0187	-	-	-	-	-	-	-	-	-	-
Zinc	0.075 - 2.4 <sup>b</sup>	mg/L	0.202	0.0001	0.0446	-	-	-	-	-	-	-	-	-	-
Zirconium	-	mg/L	0.005	0.005	-	-	-	-	-	-	-	-	-	-	-
<b>Dissolved Metals</b>															
Aluminum	-	mg/L	-	0.0024	0.0044	<0.005	0.012	<0.005	0.007	<0.0050	<0.0050	0.0043	0.0021	0.002	0.0053
Antimony	0.09	mg/L	-	0.000122	0.000146	0.0001	<0.0001	0.0001	0.0003	<0.00010	<0.00020	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic	0.05	mg/L	-	0.0004	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00024	0.00023	0.00022	0.00021
Barium	10	mg/L	-	0.0377	0.0321	0.03	0.025	0.03	0.081	0.0805	0.0286	0.0296	0.0275	0.0288	0.0301
Beryllium	0.0015	mg/L	-	0.00002	0.00002	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth	-	mg/L	-	0.00002	0.00002	-	-	-	-	<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050
Boron	12	mg/L	-	0.072	0.065	0.07	0.068	0.07	0.085	0.068	0.0711	0.061	0.06	0.062	0.068
Cadmium	0.0005 - 0.004 <sup>b</sup>	mg/L	-	0.00013	0.00015	0.00025	0.00055	0.00025	0.00039	0.000275	0.000321	0.000106	0.000111	0.000213	0.000668
Calcium	-	mg/L	-	86.7	89.7	58.1	65.0	58.1	55.7	53.3	57.1	62.3	53.4	61.8	67.3
Cesium	-	mg/L	-	-	-	-	-	-	-	-	-	<0.000010	<0.000010	<0.000010	<0.000010
Chromium <sup>d</sup>	0.01	mg/L	-	0.0002	0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt	0.04	mg/L	-	0.000118	0.000113	<0.00005	<0.00005	<0.00005	<0.00005	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper	0.02 - 0.09 <sup>b</sup>	mg/L	-	0.00098	0.00018	0.0008	0.0009	0.0008	0.028	0.0111	0.00046	0.00065	0.00034	0.00055	0.00188
Iron	-	mg/L	-	0.005	0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017	<0.010	<0.010	<0.010
Lead	0.04 - 0.16 <sup>b</sup>	mg/L	-	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	<0.000050	<0.000050	<0.000050	<0.000050
Lithium	-	mg/L	-	0.00428	0.00481	0.0054	0.0048	0.0054	0.0065	0.00433	0.005	0.0045	0.0045	0.0045	0.0048
Magnesium	-	mg/L	-	17.3	17.7	13.2	13.6	13.2	13.4	11.8	13.0	12.7	12.5	13.5	13.2
Manganese	-	mg/L	-	0.218	0.114	0.0041	0.0027	0.0041	0.0424	0.00546	0.0175	0.00868	0.0162</		

**Table D-5: Groundwater Analytical Results  
2019 Meziadin Landfill Annual Monitoring Program  
Regional District of Kitimat-Stikine**

Location Monitoring Well Sample ID Laboratory ID Sample Date QAQC	CSR Aquatic Life Standard Freshwater (AW-F)	Units	Meziadin Landfill															
			MW-4															
			MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4
			1997-Apr-01	2003-Jul-01	2004-Jan-01	2006-Jan-01	2015-May-03	2015-Sep-09	2016-May-03	2016-Sep-13	2017-Apr-01	2017-May-01	L2097663-5 2018-May-17	L2183746-5 2018-Oct-17	L2269973-5 2019-May-07	L2383402-5 2019-Nov-14		
<b>Field Observations</b>																		
pH	-	-	-	-	-	-	-	-	-	-	-	-	7.32	6.97	6.4	6.8		
Temperature	-	°C	-	-	-	-	-	-	-	-	-	-	8.1	7.4	5.2	6.7		
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	-	430.8	428.7	409	410.7		
Water level	-	m	-	-	-	-	-	-	-	-	-	-	6	5.91	5.00	5.81		
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	-	13.6	6.3	7.2	2.1		
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	-	307.6	412.7	459	475.6		
<b>Parameters</b>																		
Conductivity	-	uS/cm	845	622	730	692	567	476	567	586	594	598	616	641	637	606		
Hardness (Total as CaCO3)	-	mg/L	-	367	263	320	188	218	188	180	177	186	222	216	202	221		
Hardness (Dissolved as CaCO3)	-	mg/L	323	227	289	250	-	199	-	-	-	-	-	-	-	-		
pH	-	pH	7.90	8.10	7.90	8.20	7.90	8.00	7.90	7.9	7.8	7.8	-	8.33	8.29	8.26		
Total Suspended Solids	-	mg/L	-	1530	-	296	-	-	-	-	-	-	-	-	-	-		
Total Dissolved Solids	-	mg/L	626	-	454	440	350	290	350	360	370	290	467	422	408	383		
Alkalinity, Total (as CaCO3)	-	mg/L	-	-	216	214	180	190	180	180	180	180	173	191	187	192		
Ammonia, Total (as N)	1.31 - 18.4 <sup>a</sup>	mg/L	-	0.01	0.02	0.05	<0.03	<0.03	<0.03	0.09	0.07	0.07	0.02	0.04	0.01	<0.0050		
Bromide (Br)	-	mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-	<0.050	<0.050		
Chloride (Cl)	1500	mg/L	5.00	0.70	0.90	0.50	1.30	<1.0	1.30	1.00	1.20	1.10	<0.50	<2.5	<0.050	<0.50		
Fluoride (F)	2.0 - 3.0 <sup>b</sup>	mg/L	0.2	-	-	-	-	0.11	-	-	0.13	0.11	0.109	0.1	0.106	0.107		
Nitrate (as N)	400	mg/L	0.01	-	0.037	0.015	-	-	-	-	-	-	0.42	<0.025	0.0819	0.0414		
Nitrite (as N)	0.2 - 2.0 <sup>c</sup>	mg/L	0.01	-	0.002	0.002	-	-	-	-	-	-	<0.0010	<0.0050	<0.0010	<0.0010		
Nitrate + Nitrite (as N)	400	mg/L	-	-	0.037	0.017	0.153	0.378	0.153	0.114	0.030	0.092	0.420	<0.030	0.082	0.041		
Total Kjeldahl Nitrogen	-	mg/L	-	-	0.12	0.03	0.14	0.12	0.14	3.76	0.788	0.819	0.678	0.087	0.074	<0.050		
Phosphorus (P)-Total	-	mg/L	-	-	0.865	0.97	-	-	-	-	-	-	-	-	-	-		
Sulfate (SO4)	1280 - 4290 <sup>b</sup>	mg/L	274	156	191	148	110	64	110	151	131	122	155	157	151	148		
Biological Oxygen Demand (BOD)	-	mg/L	-	6	10	-	-	-	-	-	-	-	-	-	-	-		
Chemical Oxygen Demand (COD)	-	mg/L	-	10	10	10	<20	<20	<20	<20	42	<20	<20	<20	<20	<20		
<b>Total Metals</b>																		
Aluminum	-	mg/L	-	10	0.0569	4.01	-	-	-	-	-	-	-	-	-	-		
Antimony	0.09	mg/L	-	0.000332	0.000181	0.000566	-	-	-	-	-	-	-	-	-	-		
Arsenic	0.05	mg/L	-	0.0048	0.0003	0.0032	-	-	-	-	-	-	-	-	-	-		
Barium	10	mg/L	-	0.219	0.0328	0.157	-	-	-	-	-	-	-	-	-	-		
Beryllium	0.0015	mg/L	-	0.001	0.00002	0.00078	-	-	-	-	-	-	-	-	-	-		
Bismuth	-	mg/L	-	0.00002	0.00002	0.00002	-	-	-	-	-	-	-	-	-	-		
Boron	12	mg/L	-	0.077	0.078	0.071	-	-	-	-	-	-	-	-	-	-		
Cadmium	0.0005 - 0.004 <sup>b</sup>	mg/L	-	0.00838	0.00028	0.00145	-	-	-	-	-	-	-	-	-	-		
Calcium	-	mg/L	-	83.8	77.4	94.8	-	62.1	-	-	-	-	-	-	-	-		
Cesium	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Chromium <sup>d</sup>	0.01	mg/L	-	0.0314	0.0002	0.0068	-	-	-	-	-	-	-	-	-	-		
Cobalt	0.04	mg/L	-	0.0233	0.000216	0.0175	-	-	-	-	-	-	-	-	-	-		
Copper	0.02 - 0.09 <sup>b</sup>	mg/L	-	0.0607	0.00087	0.0472	-	-	-	-	-	-	-	-	-	-		
Iron	-	mg/L	-	74.4	0.076	10.3	-	-	-	-	-	-	-	-	-	-		
Lead	0.04 - 0.16 <sup>b</sup>	mg/L	-	0.0254	0.00012	0.0151	-	-	-	-	-	-	-	-	-	-		
Lithium	-	mg/L	-	0.0166	0.00536	0.0119	-	-	-	-	-	-	-	-	-	-		
Magnesium	-	mg/L	-	38.3	17	20.1	-	15.2	-	-	-	-	-	-	-	-		
Manganese	-	mg/L	-	2.89	0.142	2.47	-	-	-	-	-	-	-	-	-	-		
Mercury	0.00025	mg/L	-	-	0.00005	0.00005	-	-	-	-	-	-	-	-	-	-		
Molybdenum	10	mg/L	-	0.0118	0.00934	0.0106	-	-	-	-	-	-	-	-	-	-		
Nickel	0.25 - 1.5 <sup>b</sup>	mg/L	-	0.0672	0.00118	0.0318	-	-	-	-	-	-	-	-	-	-		
Phosphorus	-	mg/L	-	1.8	0.1	1.5	-	-	-	-	-	-	-	-	-	-		
Potassium	-	mg/L	-	6	2	3	-	-	-	-	-	-	-	-	-	-		
Rubidium	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Selenium	0.02	mg/L	-	0.0007	0.0003	0.0008	-	-	-	-	-	-	-	-	-	-		
Silicon	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Silver	0.0005 - 0.015 <sup>b</sup>	mg/L	-	0.00006	0.00002	0.00004	-	-	-	-	-	-	-	-	-	-		
Sodium	-	mg/L	-	48.9	52	58.5	-	-	-	-	-	-	-	-	-	-		
Strontium	-	mg/L	-	686	0.796	0.84	-	-	-	-	-	-	-	-	-	-		
Sulfur	-	mg/L	-	42.3	60.7	52.4	-	-	-	-	-	-	-	-	-	-		
Tellurium	-	mg/L	-	0.05	0.05	-	-	-	-	-	-	-	-	-	-	-		
Thallium	0.003	mg/L	-	0.000065	0.00001	0.000054	-	-	-	-	-	-	-	-	-	-		
Thorium	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Tin	-	mg/L	-	0.00017	0.00003	0.00009	-	-	-	-	-	-	-	-	-	-		
Titanium	1	mg/L	-	0.299	0.003	0.003	-	-	-	-	-	-	-	-	-	-		
Tungsten	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
Uranium	0.085	mg/L	-	0.00142	0.00141	0.00163	-	-	-	-	-	-	-	-	-	-		
Vanadium	-	mg/L	-	0.0282	0.00037	0.0106	-	-	-	-	-	-	-	-	-	-		
Zinc	0.075 - 2.4 <sup>b</sup>	mg/L	-	0.143	0.0007	0.0837	-	-	-	-	-	-	-	-	-	-		
Zirconium	-	mg/L	-	0.005	0.005	-	-	-	-	-	-	-	-	-	-	-		
<b>Dissolved Metals</b>																		
Aluminum	-	mg/L	0.2	0.0039	0.0016	0.0051	<0.005	<0.005	<0.005	<0.005	0.0053	<0.0050	0.0058	0.0013	0.0017	<0.0010		
Antimony	0.09	mg/L	0.2	0.00029	0.000178	0.000343	0.0001	0.0001	0.0001	0.00027	0.00023	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		
Arsenic	0.05	mg/L	0.2	0.0002	0.0003	0.0003	<0.0005	<0.0005	<0.0005	<0.0005	0.00015	<0.00050	0.00015	0.00017	0.00015	0.00015		
Barium	10	mg/L	0.21	0.0453	0.0306	0.0394	0.035	0.082	0.035	0.119	0.103	0.0251	0.0252	0.0226	0.0217	0.0217		
Beryllium	0.0015	mg/L	0.005	0.00002	0.00002	0.00002	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010		
Bismuth	-	mg/L	0.1	0.00002	0.00002	0.00002	-	-	-	-	<0.00010	<0.00010	<0.000050	<0.000050	<0.000050	<0.000050		
Boron	12	mg/L	0.1	0.064	0.072	0.058	0.064	0.046	0.064	0.079	0.08	0.0763	0.066	0.069	0.064	0.074		
Cadmium	0.0005 - 0.004 <sup>b</sup>	mg/L	0.01	0.00057	0.00027	0.00012	0.00034	0.00013	0.00034	0.00022	0.000056	0.000035	0.000126	0.000058	0.000398	0.000032		
Calcium	-	mg/L	94.9	65.5	85.0	75.3	52.9	55.6	52.9	50.9	51.7	53.7	66.0	62.8	58.9	66.3		
Cesium	-	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010		
Chromium <sup>d</sup>	0.01	mg/L	0.01	0.0021	0.0002	0.0002	<0.0005	0.0011	<0.0005	<0.0005	<0.00050	<0.00050	<0.00010	<0.00010	<0.00010	<0.00010		
Cobalt	0.04	mg/L	0.01	0.000005	0.000123	0.000005	<0.00005	<0.00005	<0.00005	0.00017	0.0003	0.00015	<0.00010	<0.00010	<0.00010	<0.00010		
Copper	0.02 - 0.09 <sup>b</sup>	mg/L	0.01	0.00119	0.00054	0.00058	0.001	0.0006	0.001	0.0126	0.0131	<0.00040	0.00023	0.00039	0.00037	0.00036		
Iron	-	mg/L	0.04	0.005	0.005	0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.04	0.015	<0.010	<0.010		
Lead	0.04 - 0.16 <sup>b</sup>	mg/L	0.05	0.00001	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00020	<0.000050	<0.000050	<0.000050	<0.000050		
Lithium	-	mg/L	0.01	0.00406	0.00547	0.00529	0.0068	0.0026	0.0068	0.0039	0.00466	0.00752	0.0047	0.0047	0.0045	0.0047		
Magnesium	-	mg/L	21.0	15.4	18.6	15.8	13.5	14.7	13.5	12.9	11.7	12.6	13.8	14.3	13.2	13.4		
Manganese	-	mg/L	0.203	0.0214	0.137	0.112	0.129	0.002	0.129	0.415	0.509	0.572	0.12	0.235	0.0752	0.00566		
Mercury	0.00025	mg/L	0.03	-	0.00005	0.00005	<0.00002	<0.00002	<0.00002	<0.00002	<0.00002	<0.000010	<0.000050	<0.000050	<0.000050	<0.000050		
Molybdenum	10	mg/L	0.03	0.011	0.00941	0.0												

**Table D-6: Surface Water Analytical Results**  
**2019 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)	CSR Livestock Standard (LW)	Units	Meziadin - Treatment Lagoon Outlet Effluent												
				SW-3												
				SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	
				2002-Jun-01	2003-Jul-01	2004-Jul-01	2006-Oct-01	2007-Jul-01	2008-Jun-01	2009-Sep-01	2010-Apr-26	2010-Sep-28	2013-Jun-01	2013-Sep-25	2014-Jul-08	2014-Oct-07
<b>Field Observations</b>																
pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Temperature	-	-	°C	-	-	-	-	-	-	-	-	-	-	-	-	-
Conductivity	-	-	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Oxygen	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Oxidation Reduction Potential	-	-	mV	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Conventional Parameters</b>																
Conductivity	-	-	uS/cm	303	261	255	186	177	221	103	109	500	402	454	510	485
Hardness (Total as CaCO3)	-	-	mg/L	-	134.0	111.0	85.0	-	-	-	-	161.1	250.5	183.0	175.0	177.0
Hardness (Dissolved as CaCO3)	-	-	mg/L	-	132.0	118.0	85.0	-	-	-	-	-	-	-	-	-
pH	-	-	pH	8.37	6	7.9	7.9	7.66	7.5	6.5	6.8	6.7	6.9	7.00	7.70	7.70
Total Suspended Solids	-	-	mg/L	-	4	4	4	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	-	-	mg/L	-	-	142	102	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	-	-	mg/L	-	-	81	62	74	96	32	173	230	208	205	237	193
Ammonia, Total (as N)	1.31 - 18.4 <sup>a</sup>	-	mg/L	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
Bromide (Br)	-	-	mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-	-
Chloride (Cl)	1500	-	mg/L	2.24	3	5.4	4	6.1	11	1.5	14.4	-	-	18.6	24.3	39
Fluoride (F)	2.0 - 3.0 <sup>b</sup>	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrate (as N)	400	100	mg/L	-	-	0.002	0.002	-	-	-	-	-	-	-	-	-
Nitrite (as N)	0.2 - 2.0 <sup>c</sup>	10	mg/L	-	-	0.002	0.002	-	-	-	-	-	-	-	-	-
Nitrate + Nitrite (as N)	400	-	mg/L	-	-	0.002	0.002	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen	-	-	mg/L	0.2	-	0.4	0.2	0.8	0.6	0.5	0.1	0.9	1.8	2.9	0.3	0.5
Phosphorus (P)-Total	-	-	mg/L	-	-	0.045	0.012	-	-	-	-	-	-	-	-	-
Sulfate (SO4)	1280 - 4290 <sup>b</sup>	1000	mg/L	60.0	50.4	37.1	24.0	17.0	13.5	15.8	3290	-	-	6.0	5.7	<0.5
Biological Oxygen Demand (BOD)	-	-	mg/L	6	6	10	-	10	4.1	ND	13	ND	4.6	11	<6	<4
Chemical Oxygen Demand (COD)	-	-	mg/L	30	10	10	10	30	30	23	47	32	ND	<20	<20	<20
<b>Total Metals</b>																
Aluminum	-	5	mg/L	0.03	0.0114	0.0103	0.0325	0.02	0.011	0.067	0.073	0.019	0.0163	0.0159	0.0884	0.0134
Antimony	0.09	-	mg/L	0.05	0.00007	0.000073	0.00005	0.001	ND	ND	-	-	-	0.00068	<0.0005	<0.0005
Arsenic	0.05	0.025	mg/L	0.05	0.0003	0.0007	0.0003	0.001	0.0005	0.0002	0.0008	0.0015	0.00116	0.00132	0.00193	0.00088
Barium	10	-	mg/L	0.04	0.0167	0.025	0.00794	0.019	0.029	0.023	0.135	0.139	0.249	0.177	0.169	0.709
Beryllium	0.0015	0.1	mg/L	0.0002	0.00002	0.00002	0.00002	0.002	ND	ND	-	-	-	<0.00001	<0.0001	<0.0001
Bismuth	-	-	mg/L	0.1	0.00002	0.00003	0.00002	0.1	ND	ND	0.1	-	-	-	-	-
Boron	12	5	mg/L	0.03	0.034	0.056	0.054	0.054	0.082	ND	0.00027	0.06	0.089	0.117	0.116	0.165
Cadmium	0.0005 - 0.004 <sup>b</sup>	0.08	mg/L	0.002	0.00002	0.00001	0.0001	0.0080	0.0001	0.0001	-	0.0004	0.000120	0.000150	0.000021	0.000024
Calcium	-	1000	mg/L	46.8	41.2	32.8	23.8	22.6	28.6	14.2	50.6	79.8	58.2	56.6	62.4	53.9
Cesium	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	0.01	0.05	mg/L	0.005	0.001	0.0002	0.0002	0.0050	ND	ND	-	-	-	<0.0005	<0.001	<0.001
Cobalt	0.04	1	mg/L	0.005	0.000208	0.000202	0.000137	0.005	0.0008	ND	0.0026	0.0016	0.00099	0.000767	0.00120	0.00097
Copper	0.02 - 0.09 <sup>b</sup>	0.3	mg/L	0.005	0.00111	0.00057	0.00035	0.0009	0.001	0.0017	0.0017	0.0018	0.00032	0.00053	0.00175	0.0105
Iron	-	-	mg/L	0.03	0.04	0.06	0.10	0.28	0.17	0.13	3.65	2.02	4.46	2.55	5.69	1.11
Lead	0.04 - 0.16 <sup>b</sup>	0.1	mg/L	0.030	0.00001	0.00001	0.00005	0.005	ND	ND	0.0	-	-	<0.00005	<0.0002	0.00022
Lithium	-	5	mg/L	-	0.00064	0.00068	0.00082	-	ND	ND	-	-	-	0.00109	<0.005	<0.005
Magnesium	-	-	mg/L	8.2	7.6	7.1	6.6	4.3	4.8	3.5	8.4	12.4	9.1	8.06	10.0	10.4
Manganese	-	-	mg/L	0.4	0.1	0.1	0.2	0.8	1.8	0.2	6.7	7.4	8.0	5.9	9.32	1.95
Mercury	0.00025	0.002	mg/L	0.000050	-	0.000050	0.000050	0.00010	0.000020	ND	-	0.000010	-	<0.00001	<0.00001	<0.00001
Molybdenum	10	0.05	mg/L	0.005	0.00071	0.00078	0.00035	0.005	ND	ND	-	0.001	-	0.000865	0.0011	<0.001
Nickel	0.25 - 1.5 <sup>b</sup>	1	mg/L	0.008	0.00076	0.00136	0.00081	0.008	0.002	0.004	0	0.004	0.0021	0.00216	0.0031	0.0038
Phosphorus	-	-	mg/L	0.1	0.1	0.1	0.1	0.1	-	-	-	-	-	0.327	-	-
Potassium	-	-	mg/L	1	2	2	1	2	1.67	0.54	3.28	1.31	1.33	2.77	1.77	4.25
Rubidium	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	0.02	0.03	mg/L	0.03	0.0002	0.0002	0.0002	0.001	0.0002	ND	0.0001	0.0003	-	0.000065	<0.0001	<0.0001
Silicon	-	-	mg/L	-	-	-	-	-	-	3.3	-	-	-	-	-	-
Silver	0.0005 - 0.015 <sup>b</sup>	-	mg/L	0.0010000	0.0000200	0.0000200	0.0000200	0.000100	0.3660000	-	-	0.0000060	-	0.0000050	<0.00002	<0.00002
Sodium	-	-	mg/L	4.26	4.77	5.78	4.86	7.9	ND	2.14	8.21	6.56	8.48	12.5	12.8	20.4
Strontium	-	-	mg/L	0.223	0.174	0.167	0.129	0.116	5.44	0.077	0.265	0.419	0.327	0.324	0.332	0.335
Sulfur	-	-	mg/L	20.5	16.5	12.9	8.6	5.0	0.1	ND	7.0	11.0	-	<15	<3	<3
Tellurium	-	-	mg/L	0.1	0.1	0.1	-	-	4.0	ND	-	-	-	-	-	-
Thallium	0.003	-	mg/L	0.03	0.00001	0.000002	0.000002	0.0001	ND	ND	-	-	-	<0.000002	<0.00005	<0.00005
Thorium	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Tin	-	-	mg/L	0.0200	0.00002	0.00001	0.00003	0.0200	ND	ND	-	-	-	<0.0002	<0.005	<0.005
Titanium	1	-	mg/L	0.0030	0.0030	0.0030	0.0030	0.0030	ND	ND	-	-	-	<0.0005	<0.005	<0.005
Tungsten	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Uranium	0.085	0.2	mg/L	-	0.0000490	0.0000280	0.0000090	0.0001000	ND	ND	-	-	-	0.0000310	<0.0001	<0.0001
Vanadium	-	0.1	mg/L	0.0050	0.0002	0.0001	0.0001	0.0050	ND	ND	-	-	-	<0.0005	<0.005	<0.005
Zinc	0.075 - 2.4 <sup>b</sup>	2	mg/L	0.011	0.0009	0.0005	0.0006	0.005	0.009	0.006	0.028	0.005	-	0.0013	0.0076	0.0223
Zirconium	-	-	mg/L	0.0	0.005	0.005	-	0.005	ND	ND	-	-	-	<0.0001	<0.0005	<0.0005
<b>Dissolved Metals</b>																
Aluminum (Al)-Dissolved	-	5	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony (Sb)-Dissolved	0.09	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic (As)-Dissolved	0.05	0.025	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium (Ba)-Dissolved	10	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium (Be)-Dissolved	0.0015	0.1	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Bismuth (Bi)-Dissolved	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Boron (B)-Dissolved	12	5	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium (Cd)-Dissolved	0.0005 - 0.004 <sup>b</sup>	0.08	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium (Ca)-Dissolved	-	1000	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Cesium (Cs)-Dissolved	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium (Cr)-Dissolved	0.01	0.05	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt (Co)-Dissolved	0.04	1	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper (Cu)-Dissolved	0.02 - 0.09 <sup>b</sup>	0.3	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron (Fe)-Dissolved	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead (Pb)-Dissolved	0.04 - 0.16 <sup>b</sup>	0.1	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Lithium (Li)-Dissolved	-	5	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium (Mg)-Dissolved	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese (Mn)-Dissolved	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury (Hg)-Dissolved	0.00025	0.002	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Molybdenum (Mo)-Dissolved	10	0.05	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel (Ni)-Dissolved	0.25 - 1.5 <sup>b</sup>	1	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Phosphorus (P)-Dissolved	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium (K)-Dissolved	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Rubidium (Rb)-Dissolved	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium (Se)-Dissolved	0.02	0.03	mg/L	-</												

**Table D-6: Surface Water Analytical Results**  
**2019 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)	CSR Livestock Standard (LW)	Units	Meziadin - Treatment Lagoon Outlet Effluent										
				SW-3										
				SW-3 2015-Apr-28	SW-3 2015-Sep-09	SW-3 2016-Apr-28	SW-3 2016-Sep-13	SW-3 2017-Apr-01	SW-3 2017-Aug-01	SW-3 L2097662-3 2018-May-17	SW-3 L2183745-1 2018-Oct-17	Lagoon Outlet L2269974-3 2019-May-07	Lagoon Outlet L2383403-1 2019-Nov-14	
<b>Field Observations</b>														
pH	-	-	-	-	-	-	-	-	-	-	6.61	7.45	6.62	7.01
Temperature	-	-	°C	-	-	-	-	-	-	-	7.4	9.4	6.2	5.1
Conductivity	-	-	uS/cm	-	-	-	-	-	-	-	345	316.6	290.8	313
Dissolved Oxygen	-	-	mg/L	-	-	-	-	-	-	-	4.7	5.5	4.2	5.3
Oxidation Reduction Potential	-	-	mV	-	-	-	-	-	-	-	203.1	408.8	420.7	185.3
<b>Conventional Parameters</b>														
Conductivity	-	-	uS/cm	780	515	339	505	629	507	456	429	445	510	
Hardness (Total as CaCO3)	-	-	mg/L	288.0	201.0	164.0	179.0	207.0	204.0	207.0	157.0	172	169	
Hardness (Dissolved as CaCO3)	-	-	mg/L	-	197.0	-	-	-	-	-	-	-	-	
pH	-	-	pH	7.00	7.20	7.00	7.40	6.7	7	-	8.2	7.70	7.70	
Total Suspended Solids	-	-	mg/L	-	9.6	280	8.9	280	31	20.5	<3.0	7.5	16.8	
Total Dissolved Solids	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	
Alkalinity, Total (as CaCO3)	-	-	mg/L	320	220	180	220	240	230	215	192	198	189	
Ammonia, Total (as N)	1.31 - 18.4 <sup>a</sup>	-	mg/L	8.53	1.73	0.15	2.15	5.45	1.1	1.65	2.84	1.74	3.09	
Bromide (Br)	-	-	mg/L	-	-	-	-	-	-	-	0.077	0.052	0.092	
Chloride (Cl)	1500	-	mg/L	54	35.7	39	35.7	39	28.2	20.3	25.9	19.7	39.4	
Fluoride (F)	2.0 - 3.0 <sup>b</sup>	-	mg/L	-	<0.10	-	-	-	-	0.069	0.113	0.075	0.065	
Nitrate (as N)	400	100	mg/L	-	-	-	-	-	-	<0.0050	0.0956	0.0157	0.0053	
Nitrite (as N)	0.2 - 2.0 <sup>c</sup>	10	mg/L	-	-	-	-	-	-	<0.0010	0.0114	<0.0010	<0.0010	
Nitrate + Nitrite (as N)	400	-	mg/L	-	<0.010	0.066	0.044	5.45	1.1	<0.0051	0.107	0.0157	0.0053	
Total Kjeldahl Nitrogen	-	-	mg/L	2.0	2.8	1.7	7.4	11.8	1.6	3.5	3.3	2.7	3.8	
Phosphorus (P)-Total	-	-	mg/L	-	-	-	-	-	-	-	-	-	-	
Sulfate (SO4)	1280 - 4290 <sup>b</sup>	1000	mg/L	11.0	1.7	11.8	1.2	17.9	2.4	-	8.7	18.6	19.2	
Biological Oxygen Demand (BOD)	-	-	mg/L	66	<4.0	64	<8.0	>130	<5.0	9.9	<2.0	6.6	7.6	
Chemical Oxygen Demand (COD)	-	-	mg/L	156	<20	199	23	296	61	47	22	25	27	
<b>Total Metals</b>														
Aluminum	-	5	mg/L	0.917	0.01	1.49	0.007	1.16	0.018	0.0595	0.0129	0.048	0.199	
Antimony	0.09	-	mg/L	0.002	<0.0001	0.0008	0.0003	0.00063	<0.00020	0.00017	0.00014	<0.00020	0.00017	
Arsenic	0.05	0.025	mg/L	0.0135	0.0028	0.0025	0.0026	0.00305	0.00219	0.00141	0.00082	0.00127	0.00104	
Barium	10	-	mg/L	0.741	0.155	0.281	0.144	0.607	0.138	0.196	0.1	0.128	0.128	
Beryllium	0.0015	0.1	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00020	<0.00010	
Bismuth	-	-	mg/L	-	-	-	-	<0.00010	<0.00010	<0.000050	<0.00010	<0.00010	<0.000050	
Boron	12	5	mg/L	0.317	0.184	0.25	0.22	0.32	0.218	0.155	0.2	0.124	0.226	
Cadmium	0.0005 - 0.004 <sup>b</sup>	0.08	mg/L	0.00022	0.00002	0.00024	0.00001	0.00014	0.000012	0.0000127	<0.0000050	0.000019	0.0000707	
Calcium	-	1000	mg/L	91.2	63.8	45.6	59.1	69.6	61.9	59.7	52.2	55.1	50.8	
Cesium	-	-	mg/L	-	-	-	-	-	0.0	0.0	0.0	<0.000020	0.0	
Chromium	0.01	0.05	mg/L	0.0122	0.001	0.005	<0.0005	0.00544	<0.00050	0.001	0.00019	0.00055	0.00085	
Cobalt	0.04	1	mg/L	0.0063	0.00062	0.0036	0.00044	0.00559	0.00072	0.00122	0.00024	0.00099	0.00075	
Copper	0.02 - 0.09 <sup>b</sup>	0.3	mg/L	0.0082	0.0003	0.0098	0.0004	0.00696	<0.00040	<0.00050	<0.00050	<0.0010	0.00108	
Iron	-	-	mg/L	91.6	4.73	15.10	3.54	26.30	4.59	4.21	0.49	2.46	2.22	
Lead	0.04 - 0.16 <sup>b</sup>	0.1	mg/L	0.0006	<0.0001	0.0013	<0.0001	0.00094	<0.00020	0.000336	0.00063	<0.0010	0.000221	
Lithium	-	5	mg/L	0.0039	0.0011	0.0036	0.0013	0.00306	0.00132	0.0015	<0.0010	<0.0020	0.002	
Magnesium	-	-	mg/L	14.6	9.98	10.8	10.4	12.7	11.8	10.9	7.58	10.2	10.3	
Manganese	-	-	mg/L	12.4	8.76	5.64	8.28	10.3	8.56	7.91	3.58	5.86	5.02	
Mercury	0.00025	0.002	mg/L	<0.00002	<0.00002	-	-	<0.00002	<0.000010	0.000005	<0.0000050	<0.0000050	<0.0000050	
Molybdenum	10	0.05	mg/L	0.0016	0.0014	0.0006	0.0008	0.00156	0.00083	0.00083	0.00234	0.0007	0.00024	
Nickel	0.25 - 1.5 <sup>b</sup>	1	mg/L	0.0167	0.0024	0.0102	0.0025	0.0131	0.00239	0.00317	0.00278	0.0028	0.00328	
Phosphorus	-	-	mg/L	-	-	-	-	0.762	0.216	0.405	0.056	0.21	0.069	
Potassium	-	-	mg/L	9.79	3.27	5.17	3.81	8.03	2.44	3.85	4.04	3.51	6.22	
Rubidium	-	-	mg/L	-	-	-	-	-	0.00164	0.00192	0.0015	0.0015	0.00303	
Selenium	0.02	0.03	mg/L	0.0018	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00009	0.00008	<0.00010	0.00095	
Silicon	-	-	mg/L	-	-	-	-	5.2	4.6	3.27	3.58	2.49	1.95	
Silver	0.0005 - 0.015 <sup>b</sup>	-	mg/L	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010	<0.000020	<0.00010	
Sodium	-	-	mg/L	34.2	23	21.7	25.6	29.8	20.6	18.2	20.2	16	27	
Strontium	-	-	mg/L	0.563	0.348	0.314	0.38	0.428	0.353	0.378	0.367	0.31	0.284	
Sulfur	-	-	mg/L	3	<1	4	<1	3.8	<3.0	3.12	2.72	6.8	6.95	
Tellurium	-	-	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	0.00020	<0.00050	<0.00020	<0.00020	<0.00040	<0.00020	
Thallium	0.003	-	mg/L	<0.00002	<0.00002	<0.00002	<0.00002	<0.00020	<0.00020	<0.00010	<0.00010	<0.00020	<0.00010	
Thorium	-	-	mg/L	0.0002	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	
Tin	-	-	mg/L	0.0006	0.0003	0.0002	<0.0002	<0.00020	<0.00020	0.00011	0.0004	<0.00020	<0.00010	
Titanium	1	-	mg/L	0.013	<0.005	0.018	<0.005	0.0223	<0.0050	0.00064	0.00032	<0.00090	<0.0027	
Tungsten	-	-	mg/L	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00020	<0.00010	
Uranium	0.085	0.2	mg/L	0.0001	0.00002	0.00004	<0.00002	0.000049	0.000023	0.000034	0.000044	0.000029	0.000023	
Vanadium	-	0.1	mg/L	0.004	<0.001	0.004	<0.001	0.0038	<0.0010	<0.00050	<0.00050	<0.0010	0.00064	
Zinc	0.075 - 2.4 <sup>b</sup>	2	mg/L	0.061	<0.004	0.056	<0.004	0.0496	0.0045	0.0049	0.0034	<0.0060	0.0055	
Zirconium	-	-	mg/L	0.0008	0.0001	0.0004	<0.0001	0.00051	<0.00010	<0.000060	<0.000060	<0.00012	<0.00020	
<b>Dissolved Metals</b>														
Aluminum (Al)-Dissolved	-	5	mg/L	-	-	-	-	-	-	0.0083	0.0097	0.0083	0.0115	
Antimony (Sb)-Dissolved	0.09	-	mg/L	-	-	-	-	-	-	0.00013	0.00013	<0.00020	0.00017	
Arsenic (As)-Dissolved	0.05	0.025	mg/L	-	-	-	-	-	-	0.00129	0.00061	0.00124	0.00084	
Barium (Ba)-Dissolved	10	-	mg/L	-	-	-	-	-	-	0.162	0.0968	0.112	0.115	
Beryllium (Be)-Dissolved	0.0015	0.1	mg/L	-	-	-	-	-	-	<0.00010	<0.00010	<0.00020	<0.00010	
Bismuth (Bi)-Dissolved	-	-	mg/L	-	-	-	-	-	-	<0.000050	<0.000050	<0.00010	<0.000050	
Boron (B)-Dissolved	12	5	mg/L	-	-	-	-	-	-	0.146	0.186	0.116	0.215	
Cadmium (Cd)-Dissolved	0.0005 - 0.004 <sup>b</sup>	0.08	mg/L	-	-	-	-	-	-	0.0000066	0.0000602	0.000012	0.000086	
Calcium (Ca)-Dissolved	-	1000	mg/L	-	-	-	-	-	-	63.7	50.1	52.6	48.8	
Cesium (Cs)-Dissolved	-	-	mg/L	-	-	-	-	-	-	0.000011	0.000026	<0.000020	0.000013	
Chromium (Cr)-Dissolved	0.01	0.05	mg/L	-	-	-	-	-	-	0.00088	0.00011	0.00032	0.00027	
Cobalt (Co)-Dissolved	0.04	1	mg/L	-	-	-	-	-	-	0.00121	0.00022	0.0009	0.00061	
Copper (Cu)-Dissolved	0.02 - 0.09 <sup>b</sup>	0.3	mg/L	-	-	-	-	-	-	<0.00020	0.0014	<0.00040	0.00037	
Iron (Fe)-Dissolved	-	-	mg/L	-	-	-	-	-	-	4.04	0.029	1.65	1.87	
Lead (Pb)-Dissolved	0.04 - 0.16 <sup>b</sup>	0.1	mg/L	-	-	-	-	-	-	<0.000050	<0.000050	<0.00010	<0.000050	
Lithium (Li)-Dissolved	-	5	mg/L	-	-	-	-	-	-	0.0014	<0.0010	<0.0020	0.0018	
Magnesium (Mg)-Dissolved	-	-	mg/L	-	-	-	-	-	-	11.6	7.83			







**Table D-7: Surface Water Analytical Results**  
**2019 Meziadin Landfill Annual Monitoring Program**  
**Regional District of Kitimat-Stikine**

Monitoring Location	Location BC WQG Aquatic Life - Freshwater Sample ID Laboratory ID Sample Date QAQC	Notes	BC WQG Aquatic Life Freshwater (Short-term maximum)	Notes	Units	Meziadin - Treatment Lagoon Outlet Effluent				
						SW-3		SW-3		Lagoon Outlet
						2017-Aug-01	2018-May-17	2018-Oct-17	2019-May-07	2019-Nov-14
<b>Field Observations</b>										
pH	-	-	-	-	-	6.61	7.45	6.62	7.01	
Temperature	-	-	-	-	°C	7.4	9.4	6.2	5.1	
Conductivity	-	-	-	-	uS/cm	345	316.6	290.8	313	
Water level	-	-	-	-	m	-	-	-	-	
Dissolved Oxygen	-	-	-	-	mg/L	4.7	5.5	4.2	5.3	
Oxidation Reduction Potential	-	-	-	-	mV	203.1	408.8	420.7	185.3	
<b>Conventional Parameters</b>										
Conductivity	-	-	-	-	uS/cm	507	456	429	445	
Hardness (Total as CaCO3)	-	-	-	-	mg/L	204	207	157	172	
Hardness (Dissolved as CaCO3)	-	-	-	-	mg/L	-	-	-	-	
pH	6.5-9.0	-	-	-	-	7	-	8.2	7.7	
Total Suspended Solids	-	-	25 mg/L (backgr. 25-250 mg/l)	-	mg/L	31	20.5	<3.0	7.5	
Total Dissolved Solids	-	-	-	-	mg/L	-	-	-	-	
Alkalinity, Total (as CaCO3)	-	-	-	-	mg/L	230	215	192	198	
Ammonia, Total (as N)	0.461 - 1.86	pH/T*	2.4 - 25.5	pH/T*	mg/L	1.1	1.65	2.84	1.74	
Bromide (Br)	-	-	-	-	mg/L	-	-	0.077	0.052	
Chloride (Cl)	150	-	600	-	mg/L	28.2	20.3	25.9	19.7	
Fluoride (F)	-	-	1.52 - 1.63	-	mg/L	-	0.069	0.113	0.075	
Nitrate (as N)	3	-	32.8	-	mg/L	-	<0.0050	0.0956	0.0157	
Nitrite (as N)	0.02 - 0.2	Cl	0.06 - 0.6	Cl	mg/L	-	<0.0010	0.0114	<0.0010	
Nitrate + Nitrite (as N)	-	-	-	-	mg/L	1.1	<0.0051	0.107	0.0157	
Total Kjeldahl Nitrogen	-	-	-	-	mg/L	1.57	3.51	3.29	2.71	
Phosphorus (P)-Total	-	-	-	-	mg/L	-	-	-	-	
Sulfate (SO4)	309 - 429	H	-	-	mg/L	2.4	-	8.69	18.6	
Biological Oxygen Demand (BOD)	-	-	-	-	mg/L	<5.0	9.9	<2.0	6.6	
Chemical Oxygen Demand (COD)	-	-	-	-	mg/L	61	47	22	25	
<b>Total Metals</b>										
Aluminum	0.05	pH	0.1	pH	mg/L	0.018	0.0595	0.0129	0.048	
Antimony	-	-	-	-	mg/L	<0.00020	0.00017	0.00014	<0.00020	
Arsenic	-	-	0.005	-	mg/L	0.00219	0.00141	0.00082	0.00127	
Barium	-	-	-	-	mg/L	0.138	0.196	0.1	0.128	
Beryllium	-	-	-	-	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	
Bismuth	-	-	-	-	mg/L	<0.00010	<0.000050	<0.000050	<0.00010	
Boron	1.2	-	-	-	mg/L	0.218	0.155	0.2	0.124	
Cadmium	0.00019 - 0.00046	H	0.0005 - 0.00175	H	mg/L	0.00012	0.000127	<0.000050	0.000019	
Calcium	-	-	-	-	mg/L	61.9	59.7	52.2	55.1	
Cesium	-	-	-	-	mg/L	-	0.00011	0.00003	<0.000020	
Chromium	-	-	-	-	mg/L	<0.00050	0.001	0.00019	0.00055	
Cobalt	0.004	-	0.11	-	mg/L	0.00072	0.00122	0.00024	0.00099	
Copper	0.0034 - 0.01	H	0.01 - 0.0291	H	mg/L	<0.00040	<0.00050	<0.00050	<0.0010	
Iron	-	-	1	-	mg/L	4.59	4.21	0.486	2.46	
Lead	0.0059 - 0.0156	H	0.0664 - 0.3139	H	mg/L	<0.00020	0.000336	0.000063	<0.00010	
Lithium	-	-	-	-	mg/L	0.00132	0.0015	<0.0010	<0.0020	
Magnesium	-	-	-	-	mg/L	11.8	10.9	7.58	10.2	
Manganese	0.979 - 1.70733	H	1.4767 - 3.71376	H	mg/L	8.56	7.91	3.58	5.86	
Mercury	0.0001	-	-	-	mg/L	<0.000010	0.000005	<0.0000050	<0.0000050	
Molybdenum	<1	-	2	-	mg/L	0.00083	0.00083	0.00234	0.0007	
Nickel	-	-	-	-	mg/L	0.00239	0.00317	0.00278	0.0028	
Phosphorus	-	-	-	-	mg/L	0.216	0.405	0.056	0.21	
Potassium	-	-	-	-	mg/L	2.44	3.85	4.04	3.51	
Rubidium	-	-	-	-	mg/L	-	0.00164	0.00192	0.0015	
Selenium	0.002	-	-	-	mg/L	<0.00050	0.00009	0.00008	<0.00010	
Silicon	-	-	-	-	mg/L	4.6	3.27	3.58	2.49	
Silver	0.00005 - 0.0015	H	0.0001 - 0.003	H	mg/L	<0.000050	<0.000010	<0.000010	<0.000010	
Sodium	-	-	-	-	mg/L	20.6	18.2	20.2	16	
Strontium	-	-	-	-	mg/L	0.353	0.378	0.367	0.31	
Sulfur	-	-	-	-	mg/L	<3.0	3.12	2.72	6.8	
Tellurium	-	-	-	-	mg/L	<0.00050	<0.00020	<0.00020	<0.00040	
Thallium	-	-	-	-	mg/L	<0.000020	<0.000010	<0.000010	<0.000020	
Thorium	-	-	-	-	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	
Tin	-	-	-	-	mg/L	<0.00020	0.00011	0.0004	<0.00020	
Titanium	-	-	-	-	mg/L	<0.00050	0.00064	0.00032	<0.00090	
Tungsten	-	-	-	-	mg/L	-	<0.00010	<0.00010	<0.00020	
Uranium	-	-	-	-	mg/L	0.000023	0.000034	0.000044	0.000029	
Vanadium	-	-	-	-	mg/L	<0.00010	<0.00050	<0.00050	<0.0010	
Zinc	0.0075 - 0.156	H	0.033 - 0.1815	H	mg/L	0.0045	0.0049	0.0034	<0.0060	
Zirconium	-	-	-	-	mg/L	<0.00010	<0.000060	<0.000060	<0.00012	
<b>Dissolved Metals</b>										
Aluminum	0.05	pH	0.1	pH	mg/L	-	0.0083	0.0097	0.0083	
Antimony	-	-	-	-	mg/L	-	0.00013	0.00013	<0.00020	
Arsenic	-	-	0.005	-	mg/L	-	0.00129	0.00061	0.00124	
Barium	-	-	-	-	mg/L	-	0.162	0.0968	0.112	
Beryllium	-	-	-	-	mg/L	-	<0.00010	<0.00010	<0.00010	
Bismuth	-	-	-	-	mg/L	-	<0.000050	<0.000050	<0.00010	
Boron	1.2	-	-	-	mg/L	-	0.146	0.186	0.116	
Cadmium	0.00029 - 0.00036	H	0.00094 - 0.00124	H	mg/L	-	0.0000066	0.0000602	0.000012	
Calcium	-	-	-	-	mg/L	-	63.7	50.1	52.6	
Cesium	-	-	-	-	mg/L	-	0.00011	0.00026	<0.000020	
Chromium	-	V	-	-	mg/L	-	0.00088	0.00011	0.00032	
Cobalt	0.004	-	0.11	-	mg/L	-	0.00121	0.00022	0.0009	
Copper	0.00628 - 0.00828	H	0.01676 - 0.02146	H	mg/L	-	<0.00020	0.0014	<0.00040	
Iron	-	-	0.35	-	mg/L	-	4.04	0.029	1.65	
Lead	0.00897 - 0.01135	H	0.14498 - 0.20614	H	mg/L	-	<0.000050	<0.000050	<0.00010	
Lithium	-	-	-	-	mg/L	-	0.0014	<0.0010	<0.0020	
Magnesium	-	-	-	-	mg/L	-	11.6	7.83	9.9	
Manganese	1.2958 - 1.5158	H	2.27014 - 2.82114	H	mg/L	-	8.2	3.38	5.5	
Mercury	0.0001	-	-	-	mg/L	-	<0.0000050	<0.0000050	<0.0000050	
Molybdenum	<1	-	2	-	mg/L	-	0.000766	0.0022	0.00063	
Nickel	-	-	-	-	mg/L	-	0.00307	0.00267	0.0027	
Phosphorus	-	-	-	-	mg/L	-	0.098	<0.050	<0.050	
Potassium	-	-	-	-	mg/L	-	4.05	4.03	3.4	
Rubidium	-	-	-	-	mg/L	-	0.00167	0.00197	0.00154	
Selenium	0.002	-	-	-	mg/L	-	0.00121	0.000076	<0.00010	
Silicon	-	-	-	-	mg/L	-	3.16	3.45	2.45	
Silver	0.00005 - 0.0015	H	0.0001 - 0.003	H	mg/L	-	<0.000010	<0.000010	<0.000020	
Sodium	-	-	-	-	mg/L	-	18.8	20.3	16.5	
Strontium	-	-	-	-	mg/L	-	0.362	0.35	0.263	
Sulfur	-	-	-	-	mg/L	-	3.4	3.25	6.6	
Tellurium	-	-	-	-	mg/L	-	<0.00020	<0.00020	<0.00040	
Thallium	-	-	-	-	mg/L	-	<0.000010	<0.000010	<0.000020	
Thorium	-	-	-	-	mg/L	-	<0.00010	<0.00010	<0.00020	
Tin	-	-	-	-	mg/L	-	<0.00010	<0.00010	<0.00020	
Titanium	-	-	-	-	mg/L	-	<0.00030	<0.00030	<0.00060	
Tungsten	-	-	-	-	mg/L	-	<0.00010	<0.00010	<0.00020	
Uranium	-	-	-	-	mg/L	-	0.000031	0.000041	0.000027	
Vanadium	-	-	-	-	mg/L	-	<0.00050	<0.00050	<0.0010	
Zinc	0.058 - 0.095	H	0.083 - 0.121	H	mg/L	-	0.0013	0.0031	0.0023	
Zirconium	-	-	-	-	mg/L	-	<0.000060	<0.000060	<0.00012	

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 D-8 Surface Water Analytical Results  
2019 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)	CSR Livestock Standard (LW)	Units	Downstream Location		
				SW2017-1	SW2017-1	SW2017-01
				2017-May-01	2018-May-17	2019-May-07
<b>Field Observations</b>						
pH	-	-	-	-	5.83	5.73
Temperature	-	-	°C	-	10.1	5.30
Conductivity	-	-	uS/cm	-	17.5	8.70
Dissolved Oxygen	-	-	mg/L	-	10.5	8.10
Oxidation Reduction Potential	-	-	mV	-	400.1	449.90
<b>Conventional Parameters</b>						
Conductivity	-	-	uS/cm	32.3	22.1	12.9
Hardness (Total as CaCO3)	-	-	mg/L	11.6	10.8	5.37
pH	-	-	pH	6.5	-	6.31
Total Suspended Solids	-	-	mg/L	<1	<3.0	3.7
Alkalinity, Total (as CaCO3)	-	-	mg/L	12	8.7	4.2
Ammonia, Total (as N)	1.3	-	mg/L	<0.03	0.0075	0.0077
Bromide (Br)	-	-	mg/L	-	-	<0.050
Chloride (Cl)	1500	-	mg/L	2.1	<0.50	<0.50
Fluoride (F)	2.0-3.0	-	mg/L	-	0.021	0.020
Nitrate (as N)	400	100	mg/L	-	0.0615	<0.0050
Nitrite (as N)	0.2 - 2.0	10	mg/L	-	<0.0010	<0.0010
Nitrate + Nitrite (as N)	-	-	mg/L	-	0.0615	<0.0051
Total Kjeldahl Nitrogen	-	-	mg/L	0.403	0.432	0.236
Sulfate (SO4)	128 - 429	1000	mg/L	<1	-	0.42
Biological Oxygen Demand (BOD)	-	-	mg/L	<5	<2.0	<2.0
Chemical Oxygen Demand (COD)	-	-	mg/L	24	26	<20
<b>Total Metals</b>						
Aluminum	-	5	mg/L	0.176	0.196	0.331
Antimony	0.09	-	mg/L	<0.00010	<0.00010	<0.00010
Arsenic	0.05	0.025	mg/L	<0.00050	0.00015	0.00012
Barium	10	-	mg/L	0.0096	0.00949	0.00894
Beryllium	0.0015	0.1	mg/L	<0.00010	<0.00010	<0.00010
Bismuth	-	-	mg/L	<0.00010	<0.000050	<0.000050
Boron	12	5	mg/L	0.017	<0.010	<0.010
Cadmium	0.0005 - 0.004	0.08	mg/L	0.0000110	0.0000118	0.0000179
Calcium	-	1000	mg/L	3.5	3.1	1.4
Cesium	-	-	mg/L	-	<0.000010	<0.000010
Chromium	0.01	0.05	mg/L	<0.00050	0.000	0.00063
Cobalt	0.04	1	mg/L	<0.00010	<0.00010	<0.00010
Copper	0.02 - 0.09	0.3	mg/L	0.00087	0.00073	0.00112
Iron	-	-	mg/L	0.06	0.08	0.127
Lead	0.04 - 0.16	0.1	mg/L	<0.00010	<0.000050	<0.000050
Lithium	-	5	mg/L	<0.00010	<0.0010	<0.0010
Magnesium	-	-	mg/L	0.972	0.803	0.485
Manganese	-	-	mg/L	0.00178	0.0145	0.00691
Mercury	0.00025	0.002	mg/L	-	0.0000068	0.0000100
Molybdenum	10	0.05	mg/L	<0.00010	<0.000050	<0.000050
Nickel	0.25 - 1.5	1	mg/L	0.0013	0.00107	0.00133
Phosphorus	-	-	mg/L	<0.050	<0.050	<0.050
Potassium	-	-	mg/L	0.34	0.194	0.179
Rubidium	-	-	mg/L	-	<0.00020	0.00022
Selenium	0.02	0.03	mg/L	<0.00050	0.00006	0.000115
Silicon	-	-	mg/L	1.6	2.04	2.37
Silver	0.0005 - 0.015	-	mg/L	<0.000050	<0.000010	<0.000010
Sodium	-	-	mg/L	2.25	1.34	0.705
Strontium	-	-	mg/L	0.0226	0.021	0.00988
Sulfur	-	-	mg/L	<3.0	<0.50	<0.50
Tellurium	-	-	mg/L	<0.00020	<0.00020	<0.00020
Thallium	0.003	-	mg/L	<0.000020	<0.000010	<0.000010
Thorium	-	-	mg/L	<0.00010	<0.00010	<0.00010
Tin	-	-	mg/L	<0.00020	<0.00010	<0.00010
Titanium	1	-	mg/L	<0.0050	0.0	0.00264
Tungsten	-	-	mg/L	-	<0.00010	<0.00010
Uranium	0.085	0.2	mg/L	<0.000020	<0.000010	<0.000010
Vanadium	-	0.1	mg/L	<0.0010	<0.00050	<0.00050
Zinc	0.075 - 38.1	2	mg/L	<0.0040	<0.0030	<0.0030
Zirconium	-	-	mg/L	0.0002	0.0002	0.000337
<b>Dissolved Metals</b>						
Aluminum	-	5	mg/L	-	0.187	0.267
Antimony	0.09	-	mg/L	-	<0.00010	<0.00010
Arsenic	0.05	0.025	mg/L	-	0.00014	0.00012
Barium	10	-	mg/L	-	0.00928	0.00844
Beryllium	0.0015	0.1	mg/L	-	<0.00010	<0.00010
Bismuth	-	-	mg/L	-	<0.000050	<0.000050
Boron	12	5	mg/L	-	<0.010	<0.010
Cadmium	0.0005 - 0.004	0.08	mg/L	-	0.0000066	0.0000115
Calcium	-	1000	mg/L	-	3	1.42
Cesium	-	-	mg/L	-	<0.000010	<0.000010
Chromium	0.01	0.05	mg/L	-	0.00039	0.00042
Cobalt	0.04	1	mg/L	-	<0.00010	<0.00010
Copper	0.02 - 0.09	0.3	mg/L	-	0.00067	0.00102
Iron	-	-	mg/L	-	0.067	0.061
Lead	0.04 - 0.16	0.1	mg/L	-	<0.000050	<0.000050
Lithium	-	5	mg/L	-	<0.0010	<0.0010
Magnesium	-	-	mg/L	-	0.803	0.441
Manganese	-	-	mg/L	-	0.00258	0.00275
Mercury	0.00025	0.002	mg/L	-	<0.0000050	0.0000076
Molybdenum	10	0.05	mg/L	-	<0.000050	<0.000050
Nickel	0.25 - 1.5	1	mg/L	-	0.0011	0.00109
Phosphorus	-	-	mg/L	-	<0.050	<0.050
Potassium	-	-	mg/L	-	0.198	0.175
Rubidium	-	-	mg/L	-	<0.00020	<0.00020
Selenium	0.02	0.03	mg/L	-	0.000063	0.000102
Silicon	-	-	mg/L	-	1.89	2.19
Silver	0.0005 - 0.015	-	mg/L	-	<0.000010	<0.000010
Sodium	-	-	mg/L	-	1.25	0.754
Strontium	-	-	mg/L	-	0.0207	0.00851
Sulfur	-	-	mg/L	-	<0.50	<0.50
Tellurium	-	-	mg/L	-	<0.00020	<0.00020
Thallium	0.003	-	mg/L	-	<0.000010	<0.000010
Thorium	-	-	mg/L	-	<0.00010	<0.00010
Tin	-	-	mg/L	-	<0.00010	<0.00010
Titanium	1	-	mg/L	-	0.00072	0.00114
Tungsten	-	-	mg/L	-	<0.00010	<0.00010
Uranium	0.085	0.2	mg/L	-	<0.000010	<0.000010
Vanadium	-	0.1	mg/L	-	<0.00050	<0.00050
Zinc	0.075 - 2.4	2	mg/L	-	<0.0010	<0.0010
Zirconium	-	-	mg/L	-	0.000216	0.000309

**NOTES**

Italics indicate that the laboratory detection limit exceeds the applicable standard.  
<sup>d</sup> = 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  
2019 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 Location		
						SW2017-1		
						SW2017-1 2017-May-01	SW2017-1 L2097662-1 2018-May-17	SW2017-01 L2269974-1 2019-May-07
<b>Field Observations</b>								
pH	-	-	-	-	-	-	5.83	5.73
Temperature	-	-	-	-	°C	-	10.1	5.30
Conductivity	-	-	-	-	uS/cm	-	17.5	8.70
Dissolved Oxygen	-	-	-	-	mg/L	-	10.5	8.10
Oxidation Reduction Potential	-	-	-	-	mV	-	400.1	449.90
<b>Conventional Parameters</b>								
Conductivity	-	-	-	-	uS/cm	32.3	22.1	12.9
Hardness (Total as CaCO3)	-	-	-	-	mg/L	11.6	10.8	5.37
Hardness (Dissolved as CaCO3)	-	-	-	-	mg/L	-	-	-
pH	6.5-9.0	-	-	-	-	6.5	-	6.31
Total Suspended Solids	-	-	25 mg/L (backgr. 25-250 mg/l)	-	mg/L	<1	<3.0	3.7
Alkalinity, Total (as CaCO3)	-	-	-	-	mg/L	12	8.7	4.2
Ammonia, Total (as N)	1.84 - 1.85	pH/T*	12.7 - 25.5	pH/T*	mg/L	<0.03	0.0075	0.0077
Bromide (Br)	-	-	-	-	mg/L	-	-	<0.050
Chloride (Cl)	150	-	600	-	mg/L	2.1	<0.50	<0.50
Fluoride (F)	-	-	0.44 - 0.47	H	mg/L	-	0.021	0.02
Nitrate (as N)	3	-	32.8	-	mg/L	-	0.0615	<0.0050
Nitrite (as N)	0.04 - 0.2	Cl	0.12 - 0.6	Cl	mg/L	-	<0.0010	<0.0010
Nitrate + Nitrite (as N)	-	-	-	-	mg/L	-	0.0615	<0.0051
Total Kjeldahl Nitrogen	-	-	-	-	mg/L	0.403	0.432	0.236
Sulfate (SO4)	128 - 429	H	-	-	mg/L	<1	-	0.42
Biological Oxygen Demand (BOD)	-	-	-	-	mg/L	<5	<2.0	<2.0
Chemical Oxygen Demand (COD)	-	-	-	-	mg/L	24	26	<20
<b>Total Metals</b>								
Aluminum	0.05	pH	0.1	pH	mg/L	0.176	0.196	0.331
Antimony	0.009	-	-	-	mg/L	<0.00010	<0.00010	<0.00010
Arsenic	0.005	-	-	-	mg/L	<0.00050	0.00015	0.00012
Barium	1	-	-	-	mg/L	0.0096	0.00949	0.00894
Beryllium	0.00013	-	-	-	mg/L	<0.00010	<0.00010	<0.00010
Bismuth	-	-	-	-	mg/L	<0.00010	<0.000050	<0.000050
Boron	1.2	-	-	-	mg/L	0.017	<0.010	<0.010
Cadmium	0.00002 - 0.00004	H	0.00003 - 0.00006	H	mg/L	0.00011	0.000118	0.000179
Calcium	-	-	-	-	mg/L	3.52	3.08	1.41
Cesium	-	-	-	-	mg/L	-	<0.000010	<0.000010
Chromium	0.001 Cr VI 0.0089 Cr III	V	-	-	mg/L	<0.00050	0.00043	0.00063
Cobalt	0.004	-	0.11	-	mg/L	<0.00010	<0.00010	<0.00010
Copper	0.002	H	0.002	H	mg/L	0.00087	0.00073	0.00112
Iron	-	-	1	-	mg/L	0.06	0.078	0.127
Lead	0.0034 - 0.0035	H	0.002 - 0.0053	H	mg/L	<0.00010	<0.000050	<0.000050
Lithium	-	-	-	-	mg/L	<0.00010	<0.0010	<0.0010
Magnesium	-	-	-	-	mg/L	0.972	0.803	0.485
Manganese	0.62863 - 0.65604	H	0.59918 - 0.667832	H	mg/L	0.00178	0.0145	0.00691
Mercury	0.0001	-	-	-	mg/L	-	0.0000068	0.00001
Molybdenum	2	-	-	-	mg/L	<0.00010	<0.000050	<0.000050
Nickel	0.025-0.15	-	-	-	mg/L	0.0013	0.00107	0.00133
Phosphorus	0.005-0.015	-	-	-	mg/L	<0.050	<0.050	<0.050
Potassium	-	-	-	-	mg/L	0.34	0.194	0.179
Rubidium	-	-	-	-	mg/L	-	<0.00020	0.00022
Selenium	0.002	-	-	-	mg/L	<0.00050	0.00006	0.000115
Silicon	-	-	-	-	mg/L	1.6	2.04	2.37
Silver	0.00005, 0.0015	H	0.0001, 0.003	H	mg/L	<0.000050	<0.000010	<0.000010
Sodium	-	-	-	-	mg/L	2.25	1.34	0.705
Strontium	-	-	-	-	mg/L	0.0226	0.021	0.00988
Sulfur	-	-	-	-	mg/L	<3.0	<0.50	<0.50
Tellurium	-	-	-	-	mg/L	<0.00020	<0.00020	<0.00020
Thallium	0.0008	-	-	-	mg/L	<0.000020	<0.000010	<0.000010
Thorium	-	-	-	-	mg/L	<0.00010	<0.00010	<0.00010
Tin	-	-	-	-	mg/L	<0.00020	<0.00010	<0.00010
Titanium	-	-	-	-	mg/L	<0.00050	0.00077	0.00264
Tungsten	-	-	-	-	mg/L	-	<0.00010	<0.00010
Uranium	0.0085	-	-	-	mg/L	<0.000020	<0.000010	<0.000010
Vanadium	-	-	-	-	mg/L	<0.0010	<0.00050	<0.00050
Zinc	0.0075	H	0.033	H	mg/L	<0.0040	<0.0030	<0.0030
Zirconium	-	-	-	-	mg/L	0.0002	0.00021	0.000337
<b>Dissolved Metals</b>								
Aluminum	0.05	pH	0.1	pH	mg/L	-	0.187	0.267
Antimony	0.009	-	-	-	mg/L	-	<0.00010	<0.00010
Arsenic	0.005	-	-	-	mg/L	-	0.00014	0.00012
Barium	-	-	-	-	mg/L	-	0.00928	0.00844
Beryllium	-	-	-	-	mg/L	-	<0.00010	<0.00010
Bismuth	-	-	-	-	mg/L	-	<0.000050	<0.000050
Boron	1.2	-	-	-	mg/L	-	<0.010	<0.010
Cadmium	0.00002 - 0.00004	H	0.00003 - 0.00006	H	mg/L	-	0.0000066	0.0000115
Calcium	-	-	-	-	mg/L	-	3	1.42
Cesium	-	-	-	-	mg/L	-	<0.000010	<0.000010
Chromium	0.001 Cr VI 0.0089 Cr III	V	-	-	mg/L	-	0.00039	0.00042
Cobalt	0.004	-	0.11	-	mg/L	-	<0.00010	<0.00010
Copper	0.002	H	0.002	H	mg/L	-	0.00067	0.00102
Iron	-	-	0.35	-	mg/L	-	0.067	0.061
Lead	0.00339 - 0.0035	H	0.00197 - 0.0048	H	mg/L	-	<0.000050	<0.000050
Lithium	-	-	-	-	mg/L	-	<0.0010	<0.0010
Magnesium	-	-	-	-	mg/L	-	0.803	0.441
Manganese	0.62863 - 0.65252	H	0.59918 - 0.65902	H	mg/L	-	0.00258	0.00275
Mercury	0.0001	-	-	-	mg/L	-	<0.0000050	0.0000076
Molybdenum	2	-	-	-	mg/L	-	<0.000050	<0.000050
Nickel	0.025-0.15	-	-	-	mg/L	-	0.0011	0.00109
Phosphorus	0.005-0.015	-	-	-	mg/L	-	<0.050	<0.050
Potassium	-	-	-	-	mg/L	-	0.198	0.175
Rubidium	-	-	-	-	mg/L	-	<0.00020	<0.00020
Selenium	0.002	-	-	-	mg/L	-	0.000063	0.000102
Silicon	-	-	-	-	mg/L	-	1.89	2.19
Silver	0.00005, 0.0015	H	0.0001, 0.003	H	mg/L	-	<0.000010	<0.000010
Sodium	-	-	-	-	mg/L	-	1.25	0.754
Strontium	-	-	-	-	mg/L	-	0.0207	0.00851
Sulfur	-	-	-	-	mg/L	-	<0.50	<0.50
Tellurium	-	-	-	-	mg/L	-	<0.00020	<0.00020
Thallium	0.0008	-	-	-	mg/L	-	<0.000010	<0.000010
Thorium	-	-	-	-	mg/L	-	<0.00010	<0.00010
Tin	-	-	-	-	mg/L	-	<0.00010	<0.00010
Titanium	-	-	-	-	mg/L	-	0.00072	0.00114
Tungsten	-	-	-	-	mg/L	-	<0.00010	<0.00010
Uranium	0.0085	-	-	-	mg/L	-	<0.000010	<0.000010
Vanadium	-	-	-	-	mg/L	-	<0.00050	<0.00050
Zinc	0.008	H	0.033	H	mg/L	-	<0.0010	<0.0010
Zirconium	-	-	-	-	mg/L	-	0.000216	0.000309

**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 D-10 Surface Water Analytical Results  
2019 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)	CSR Livestock Standard (LW)	Units	Upstream surface location SW2017-2		
				SW2017-2 2017-May-01	SW2017-2 L2097662-2 2018-May-17	SW2017-02 L2269974-2 2019-May-07
<b>Field Observations</b>						
pH	-	-	-	-	5.42	7.32
Temperature	-	-	°C	-	8	8.8
Conductivity	-	-	uS/cm	-	160	20.1
Dissolved Oxygen	-	-	mg/L	-	13.4	9.1
Oxidation Reduction Potential	-	-	mV	-	444.6	400.8
<b>Conventional Parameters</b>						
Conductivity	-	-	uS/cm	15.8	12.7	25.4
Hardness (Total as CaCO3)	-	-	mg/L	8.93	5.9	11.3
pH	-	-	pH	6	-	6.75
Total Suspended Solids	-	-	mg/L	61	38.3	<3.0
Alkalinity, Total (as CaCO3)	-	-	mg/L	6	4.8	8.7
Ammonia, Total (as N)	1.3	-	mg/L	<0.03	0.0	0.0095
Bromide (Br)	-	-	mg/L	-	-	<0.050
Chloride (Cl)	1500	-	mg/L	<1.0	<0.50	0.67
Fluoride (F)	2.0-3.0 (e)	-	mg/L	-	0.0	0.02
Nitrate (as N)	400	100	mg/L	-	<0.0050	0.055
Nitrite (as N)	0.2 - 2.0 (h)	10	mg/L	-	<0.0010	<0.0010
Nitrate + Nitrite (as N)	-	-	mg/L	-	<0.0051	0.055
Total Kjeldahl Nitrogen	-	-	mg/L	0.353	0.3	0.39
Sulfate (SO4)	128 - 429 (d)	1000	mg/L	<1.0	-	0.99
Biological Oxygen Demand (BOD)	-	-	mg/L	<5.0	<2.0	<2.0
Chemical Oxygen Demand (COD)	-	-	mg/L	26	21.0	28
<b>Total Metals</b>						
Aluminum	-	5	mg/L	1.13	0.679	0.189
Antimony	0.09	-	mg/L	<0.00010	<0.00010	<0.00010
Arsenic	0.05	0.025	mg/L	<0.00050	0.00021	0.00012
Barium	10	-	mg/L	0.0164	0.0158	0.00878
Beryllium	0.0015	0.1	mg/L	<0.00010	<0.00010	<0.00010
Bismuth	-	-	mg/L	<0.00010	<0.000050	<0.000050
Boron	12	5	mg/L	0.005	<0.010	<0.010
Cadmium	0.0005 - 0.004	0.08	mg/L	0.0000270	0.0000328	0.0000584
Calcium	-	1000	mg/L	2.1	1.61	3.07
Cesium	-	-	mg/L	-	0.00002	<0.000010
Chromium	0.01	0.05	mg/L	0.003	0.00113	0.00039
Cobalt	0.04	1	mg/L	0.00042	0.00048	<0.00010
Copper	0.02 - 0.09	0.3	mg/L	0.00263	0.00188	0.00086
Iron	-	-	mg/L	1.13	0.411	0.056
Lead	0.04 - 0.16	0.1	mg/L	0.0002	0.000154	<0.000050
Lithium	-	5	mg/L	0.00075	<0.0010	<0.0010
Magnesium	-	-	mg/L	0.919	0.618	0.795
Manganese	-	-	mg/L	0.0423	0.0634	0.00515
Mercury	0.00025	0.002	mg/L	-	0.0000103	0.0000085
Molybdenum	10	0.05	mg/L	<0.00010	<0.000050	<0.000050
Nickel	0.25 - 1.5	1	mg/L	0.00434	0.00218	0.00106
Phosphorus	-	-	mg/L	<0.050	0.056	<0.050
Potassium	-	-	mg/L	0.29	0.24	0.215
Rubidium	-	-	mg/L	-	0.00042	<0.00020
Selenium	0.02	0.03	mg/L	<0.00050	0.000084	0.000066
Silicon	-	-	mg/L	3.7	3.04	1.93
Silver	0.0005 - 0.015	-	mg/L	<0.000050	0.0000150	<0.000010
Sodium	-	-	mg/L	0.85	0.816	1.27
Strontium	-	-	mg/L	0.0125	0.013	0.0202
Sulfur	-	-	mg/L	<3.0	<0.50	0.53
Tellurium	-	-	mg/L	<0.00020	<0.00020	<0.00020
Thallium	0.003	-	mg/L	<0.000020	<0.000010	<0.000010
Thorium	-	-	mg/L	<0.00010	<0.00010	<0.00010
Tin	-	-	mg/L	<0.00020	<0.00010	<0.00010
Titanium	1	-	mg/L	0.0192	0.0058	0.00079
Tungsten	-	-	mg/L	-	<0.00010	<0.00010
Uranium	0.085	0.2	mg/L	0.0000230	0.0000150	<0.000010
Vanadium	-	0.1	mg/L	0.0020	0.0008	<0.00050
Zinc	0.075 - 38.1	2	mg/L	<0.0040	<0.0030	<0.0030
Zirconium	-	-	mg/L	0.0005	0.0003	0.000210
<b>Dissolved Metals</b>						
Aluminum	-	5	mg/L	-	0.263	0.203
Antimony	0.09	-	mg/L	-	<0.00010	<0.00010
Arsenic	0.05	0.025	mg/L	-	0.00011	0.00012
Barium	10	-	mg/L	-	0.0097	0.00939
Beryllium	0.0015	0.1	mg/L	-	<0.00010	<0.00010
Bismuth	-	-	mg/L	-	<0.000050	<0.000050
Boron	12	5	mg/L	-	<0.010	<0.010
Cadmium	0.0005 - 0.004	0.08	mg/L	-	0.000014	0.0000474
Calcium	-	1000	mg/L	-	1.5	3.19
Cesium	-	-	mg/L	-	<0.000010	<0.000010
Chromium	0.01	0.05	mg/L	-	0.00047	0.00036
Cobalt	0.04	1	mg/L	-	<0.00010	<0.00010
Copper	0.02 - 0.09	0.3	mg/L	-	0.00109	0.00089
Iron	-	-	mg/L	-	0.071	0.059
Lead	0.04 - 0.16	0.1	mg/L	-	<0.000050	<0.000050
Lithium	-	5	mg/L	-	<0.0010	<0.0010
Magnesium	-	-	mg/L	-	0.518	0.804
Manganese	-	-	mg/L	-	0.0115	0.00244
Mercury	0.00025	0.002	mg/L	-	0.0000054	<0.0000050
Molybdenum	10	0.05	mg/L	-	<0.000050	<0.000050
Nickel	0.25 - 1.5	1	mg/L	-	0.00116	0.00113
Phosphorus	-	-	mg/L	-	<0.050	<0.050
Potassium	-	-	mg/L	-	0.224	0.230
Rubidium	-	-	mg/L	-	<0.00020	<0.00020
Selenium	0.02	0.03	mg/L	-	0.000063	0.00008
Silicon	-	-	mg/L	-	2.57	1.89
Silver	0.0005 - 0.015	-	mg/L	-	<0.000010	<0.000010
Sodium	-	-	mg/L	-	0.788	1.38
Strontium	-	-	mg/L	-	0.011	0.0187
Sulfur	-	-	mg/L	-	<0.50	<0.50
Tellurium	-	-	mg/L	-	<0.00020	<0.00020
Thallium	0.003	-	mg/L	-	<0.000010	<0.000010
Thorium	-	-	mg/L	-	<0.00010	<0.00010
Tin	-	-	mg/L	-	<0.00010	<0.00010
Titanium	1	-	mg/L	-	0.00125	0.00079
Tungsten	-	-	mg/L	-	<0.00010	<0.00010
Uranium	0.085	0.2	mg/L	-	<0.000010	<0.000010
Vanadium	-	0.1	mg/L	-	<0.00050	<0.00050
Zinc	0.075 - 2.4	2	mg/L	-	0.001	<0.0010
Zirconium	-	-	mg/L	-	0.000261	0.000252

**NOTES**

Italics indicate that the laboratory detection limit exceeds the applicable standard.  
<sup>d</sup> = 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  
2019 Meziadin Landfill Annual Monitoring Program  
Regional District of Kitimat-Stikine**

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	Upstream surface location		
						SW2017-2		
						SW2017-2 2017-May-01	SW2017-2 L2097662-2 2018-May-17	SW2017-02 L2269974-2 2019-May-07
<b>Field Observations</b>								
pH	-	-	-	-	-	-	5.42	7.32
Temperature	-	-	-	-	°C	-	8	8.8
Conductivity	-	-	-	-	uS/cm	-	160	20.1
Dissolved Oxygen	-	-	-	-	mg/L	-	13.4	9.1
Oxidation Reduction Potential	-	-	-	-	mV	-	444.6	400.8
<b>Conventional Parameters</b>								
Conductivity	-	-	-	-	uS/cm	15.8	12.7	25.4
Hardness (Total as CaCO3)	-	-	-	-	mg/L	8.93	5.87	11.3
pH	6.5-9.0	-	-	-	-	6	-	6.75
Total Suspended Solids	-	-	25 mg/L (backgr. 25-250 mg/l)	-	mg/L	61	38.3	<3.0
Total Dissolved Solids	-	-	-	-	mg/L	-	-	-
Alkalinity, Total (as CaCO3)	-	-	-	-	mg/L	6	4.8	-
Ammonia, Total (as N)	1.84 - 1.85	pH/T*	12.7 - 22.9	pH/T*	mg/L	<0.03	0.0069	-
Chloride (Cl)	150	-	600	-	mg/L	<1.0	<0.50	0.67
Fluoride (F)	-	-	0.19 - 0.46	-	mg/L	-	0.02	0.02
Nitrate (as N)	3	-	32.8	-	mg/L	-	<0.0050	0.055
Nitrite (as N)	0.02 - 0.2	Cl	0.06 - 0.6	Cl	mg/L	-	<0.0010	<0.0010
Nitrate + Nitrite (as N)	-	-	-	-	mg/L	-	<0.0051	0.055
Total Kjeldahl Nitrogen	-	-	-	-	mg/L	0.353	0.269	0.389
Sulfate (SO4)	128 - 429	H	-	-	mg/L	<1	-	0.99
Biological Oxygen Demand (BOD)	-	-	-	-	mg/L	<5	<2.0	<2.0
Chemical Oxygen Demand (COD)	-	-	-	-	mg/L	24	26	28
<b>Total Metals</b>								
Aluminum	0.05	pH	0.1	pH	mg/L	1.13	0.679	0.189
Antimony	0.009	-	-	-	mg/L	<0.00010	<0.00010	<0.00010
Arsenic	0.005	-	-	-	mg/L	<0.00050	0.00021	0.00012
Barium	1	-	-	-	mg/L	0.0164	0.0158	0.00878
Beryllium	0.00013	-	-	-	mg/L	<0.00010	<0.00010	<0.00010
Bismuth	-	-	-	-	mg/L	<0.00010	<0.000050	<0.000050
Boron	1.2	-	-	-	mg/L	0.005	<0.010	<0.010
Cadmium	0.00003 - 0.00004	H	0.00003 - 0.00006	H	mg/L	0.000027	0.0000328	0.0000584
Calcium	-	-	-	-	mg/L	2.06	1.61	3.07
Cesium	-	-	-	-	mg/L	-	0.00002	<0.000010
Chromium	0.001 Cr VI 0.0089 Cr III	V	-	-	mg/L	0.00279	0.00113	0.00039
Cobalt	0.004	-	0.11	-	mg/L	0.00042	0.00048	<0.00010
Copper	0.002	H	0.002	H	mg/L	0.00263	0.00188	0.00086
Iron	-	-	1	-	mg/L	1.13	0.411	0.056
Lead	0.0034 - 0.0035	H	0.0022 - 0.0051	H	mg/L	0.00018	0.000154	<0.000050
Lithium	-	-	-	-	mg/L	0.00075	<0.0010	<0.0010
Magnesium	-	-	-	-	mg/L	0.919	0.618	0.795
Manganese	0.63083 - 0.65472	H	0.60469 - 0.664526	H	mg/L	0.0423	0.0634	0.00515
Mercury	0.0001	-	-	-	mg/L	-	0.0000103	0.0000085
Molybdenum	2	-	-	-	mg/L	<0.00010	<0.000050	<0.000050
Nickel	0.025-0.15	-	-	-	mg/L	0.00434	0.00218	0.00106
Phosphorus	0.005-0.015	-	-	-	mg/L	<0.050	0.056	<0.050
Potassium	-	-	-	-	mg/L	0.29	0.24	0.215
Rubidium	-	-	-	-	mg/L	-	0.00042	<0.00020
Selenium	0.002	-	-	-	mg/L	<0.00050	0.000084	0.000066
Silicon	-	-	-	-	mg/L	3.7	3.04	1.93
Silver	0.00005, 0.0015	H	0.0001, 0.003	H	mg/L	<0.000050	0.000015	<0.000010
Sodium	-	-	-	-	mg/L	0.85	0.816	1.27
Strontium	-	-	-	-	mg/L	0.0125	0.013	0.0202
Sulfur	-	-	-	-	mg/L	<3.0	<0.50	0.53
Tellurium	-	-	-	-	mg/L	<0.00020	<0.00020	<0.00020
Thallium	0.0008	-	-	-	mg/L	<0.000020	<0.000010	<0.000010
Thorium	-	-	-	-	mg/L	<0.00010	<0.00010	<0.00010
Tin	-	-	-	-	mg/L	<0.00020	<0.00010	<0.00010
Titanium	-	-	-	-	mg/L	0.0192	0.00584	0.00079
Tungsten	-	-	-	-	mg/L	-	<0.00010	<0.00010
Uranium	0.0085	-	-	-	mg/L	0.000023	0.000015	<0.000010
Vanadium	-	-	-	-	mg/L	0.002	0.00084	<0.00050
Zinc	0.0075	H	0.033	H	mg/L	<0.0040	<0.0030	<0.0030
Zirconium	-	-	-	-	mg/L	0.00045	0.000287	0.00021
<b>Dissolved Metals</b>								
Aluminum	0.05	pH	0.1	pH	mg/L	-	0.263	0.203
Antimony	0.009	-	-	-	mg/L	-	<0.00010	<0.00010
Arsenic	0.005	-	-	-	mg/L	-	0.00011	0.00012
Barium	-	-	-	-	mg/L	-	0.0097	0.00939
Beryllium	-	-	-	-	mg/L	-	<0.00010	<0.00010
Bismuth	-	-	-	-	mg/L	-	<0.000050	<0.000050
Boron	1.2	-	-	-	mg/L	-	<0.010	<0.010
Cadmium	0.00003 - 0.00004	H	0.00003 - 0.00006	H	mg/L	-	0.000014	0.0000474
Calcium	-	-	-	-	mg/L	-	1.5	3.19
Cesium	-	-	-	-	mg/L	-	<0.000010	<0.000010
Chromium	0.001 Cr VI 0.0089 Cr III	V	-	-	mg/L	-	0.00047	0.00036
Cobalt	0.004	-	0.11	-	mg/L	-	<0.00010	<0.00010
Copper	0.002	H	0.002	H	mg/L	-	0.00109	0.00089
Iron	-	-	0.35	-	mg/L	-	0.071	0.059
Lead	0.0034 - 0.00351	H	0.00221 - 0.00509	H	mg/L	-	<0.000050	<0.000050
Lithium	-	-	-	-	mg/L	-	<0.0010	<0.0010
Magnesium	-	-	-	-	mg/L	-	0.518	0.804
Manganese	0.63083 - 0.65472	H	0.60469 - 0.66453	H	mg/L	-	0.0115	0.00244
Mercury	0.0001	-	-	-	mg/L	-	0.0000054	<0.0000050
Molybdenum	2	-	-	-	mg/L	-	<0.000050	<0.000050
Nickel	0.025-0.15	-	-	-	mg/L	-	0.00116	0.00113
Phosphorus	0.005-0.015	-	-	-	mg/L	-	<0.050	<0.050
Potassium	-	-	-	-	mg/L	-	0.224	0.23
Rubidium	-	-	-	-	mg/L	-	<0.00020	<0.00020
Selenium	0.002	-	-	-	mg/L	-	0.000063	0.00008
Silicon	-	-	-	-	mg/L	-	2.57	1.89
Silver	0.00005, 0.0015	H	0.0001, 0.003	H	mg/L	-	<0.000010	<0.000010
Sodium	-	-	-	-	mg/L	-	0.788	1.38
Strontium	-	-	-	-	mg/L	-	0.011	0.0187
Sulfur	-	-	-	-	mg/L	-	<0.50	<0.50
Tellurium	-	-	-	-	mg/L	-	<0.00020	<0.00020
Thallium	0.0008	-	-	-	mg/L	-	<0.000010	<0.000010
Thorium	-	-	-	-	mg/L	-	<0.00010	<0.00010
Tin	-	-	-	-	mg/L	-	<0.00010	<0.00010
Titanium	-	-	-	-	mg/L	-	0.00125	0.00079
Tungsten	-	-	-	-	mg/L	-	<0.00010	<0.00010
Uranium	0.0085	-	-	-	mg/L	-	<0.000010	<0.000010
Vanadium	-	-	-	-	mg/L	-	<0.00050	<0.00050
Zinc	0.008	H	0.033	H	mg/L	-	0.001	<0.0010
Zirconium	-	-	-	-	mg/L	-	0.000261	0.000252

**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

Table D-12: Quality Control Analytical Results  
2019 Meziadin Landfill Annual Monitoring Program  
Regional District of Kitimat-Stikine

Sampling Location	Sample ID	MW-2						MW1B						BLANK	TRIP	BLANK	FIELD BLANK
		L2269973-3 2019-May-07 FDA	L2269973-7 2019-May-07 FD	Laboratory Reporting Limit	Mean	Relative Percent Difference (%)	Difference Factor (-)	L2383402-2 2019-Nov-14 FDA	L2383402-7 2019-Nov-14 FD	Laboratory Reporting Limit	Mean	Relative Percent Difference (%)	Difference Factor (-)				
<b>Conventional Parameters</b>																	
Conductivity	uS/cm	309	414	2	361.5	29%	NA	346	364	2	355	5%	NA	<2.0	<2.0	<2.0	<2.0
Hardness (Total as CaCO3)	mg/L	129	131	0.5	130	2%	NA	187	186	0.5	186.5	1%	NA	-	<0.50	-	<0.50
Hardness (Dissolved as CaCO3)	mg/L	-	-	-	NC	NC	NA	-	-	-	NC	NC	NA	-	-	-	-
pH		8.18	8.3	-	8.24	NC	NA	7.95	7.61	0.1	7.78	4%	NA	5.47	5.35	5.33	-
Total Suspended Solids	mg/L	-	-	3	NC	NC	NA	-	-	-	NC	NC	NA	-	51.3	<3.0	-
Total Dissolved Solids	mg/L	198	306	-	252	NC	NA	356	334	20	345	6%	NA	<10	-	-	-
Alkalinity, Total (as CaCO3)	mg/L	134	186	1	160	33%	NA	190	208	1	199	9%	NA	<1.0	<1.0	<1.0	<1.0
Ammonia, Total (as N)	mg/L	0.0336	0.034	0.005	0.0338	1%	NA	0.127	0.123	0.005	0.125	3%	NA	<0.0050	<0.0050	<0.0050	<0.0050
Bromide (Br)	mg/L	<0.050	<0.050	-	NC	NC	NA	<0.050	<0.050	-	NC	NC	NA	<0.050	<0.050	<0.050	-
Chloride (Cl)	mg/L	<0.50	<0.50	0.5	NC	NC	NA	<0.50	<0.50	0.5	NC	NC	NA	<0.50	<0.50	<0.50	-
Fluoride (F)	mg/L	0.117	0.165	0.02	0.141	34%	NA	0.069	0.074	0.02	0.0715	NC	0.25	<0.020	<0.020	<0.020	-
Nitrate (as N)	mg/L	0.449	0.163	0.005	0.306	93%	NA	0.268	0.0219	0.005	0.14495	170%	NA	<0.0050	<0.0050	<0.0050	-
Nitrite (as N)	mg/L	0.0035	<0.0010	0.001	0.0035	NC	NA	0.0025	<0.0010	0.001	0.0025	NC	NA	<0.0010	<0.0010	<0.0010	-
Nitrate + Nitrite (as N)	mg/L	0.453	0.163	0.01	0.308	94%	NA	0.27	0.0219	0.01	0.14595	170%	NA	<0.0051	<0.0051	<0.0051	-
Total Kjeldahl Nitrogen	mg/L	0.445	0.552	0.05	0.4985	21%	NA	1.24	0.298	0.05	0.769	122%	NA	<0.050	<0.050	<0.050	-
Phosphorus (P)-Total	mg/L	-	-	-	NC	NC	NA	-	-	-	NC	NC	NA	-	-	-	-
Sulfate (SO4)	mg/L	32.7	44.1	-	38.4	NC	NA	8.72	5.42	0.3	7.07	47%	NA	<0.30	<0.30	<0.30	-
Biological Oxygen Demand (BOD)	mg/L	-	-	2	NC	NC	NA	-	-	-	NC	NC	NA	<2.0	<2.0	<2.0	-
Chemical Oxygen Demand (COD)	mg/L	<20	32	20	32	NC	NA	53	35	20	44	NC	0.9	<20	<20	<20	-
Phenols (4AAP)	mg/L	-	-	-	NC	NC	NA	-	-	-	NC	NC	NA	-	-	-	-
<b>Total Metals</b>																	
Aluminum	mg/L	-	-	0.003	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.0030	<0.0030	-
Antimony	mg/L	-	-	0.0	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.0010	<0.0010	-
Arsenic	mg/L	-	-	0.0001	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.0010	<0.0010	-
Barium	mg/L	-	-	0.0001	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.0010	<0.0010	-
Beryllium	mg/L	-	-	0.0001	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.0010	<0.0010	-
Bismuth	mg/L	-	-	0.00005	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.000050	<0.000050	-
Boron	mg/L	-	-	0.01	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.010	<0.010	-
Cadmium	mg/L	-	-	0.00005	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.000050	<0.000050	-
Calcium	mg/L	-	-	0.05	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.050	<0.050	<0.050
Cesium	mg/L	-	-	0.00001	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.000010	<0.000010	-
Chromium	mg/L	-	-	0.0001	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.00010	<0.00010	-
Cobalt	mg/L	-	-	0.0001	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.00010	<0.00010	-
Copper	mg/L	-	-	0.0	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.0050	<0.0050	-
Iron	mg/L	-	-	0.01	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.010	<0.010	-
Lead	mg/L	-	-	0.00005	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.000050	<0.000050	-
Lithium	mg/L	-	-	0.001	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.0010	<0.0010	-
Magnesium	mg/L	-	-	0.005	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.0050	<0.0050	-
Manganese	mg/L	-	-	0.0001	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.00010	<0.00010	-
Mercury	mg/L	-	-	0.000005	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.0000050	<0.0000050	-
Molybdenum	mg/L	-	-	0.00005	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.000050	<0.000050	-
Nickel	mg/L	-	-	0.0005	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.00050	<0.00050	-
Phosphorus	mg/L	-	-	0.05	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.050	<0.050	-
Potassium	mg/L	-	-	0.05	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.050	<0.050	-
Rubidium	mg/L	-	-	0.0002	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.00020	<0.00020	-
Selenium	mg/L	-	-	0.00005	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.000050	<0.000050	-
Silicon	mg/L	-	-	0.1	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.10	<0.10	-
Silver	mg/L	-	-	0.00001	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.000010	<0.000010	-
Sodium	mg/L	-	-	0.05	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.050	<0.050	-
Strontium	mg/L	-	-	0.0002	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.00020	<0.00020	-
Sulfur	mg/L	-	-	0.5	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.50	<0.50	-
Tellurium	mg/L	-	-	0.0002	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.00020	<0.00020	-
Thallium	mg/L	-	-	0.00001	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.000010	<0.000010	-
Thorium	mg/L	-	-	0.0001	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.00010	<0.00010	-
Tin	mg/L	-	-	0.0001	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.00010	<0.00010	-
Titanium	mg/L	-	-	0.0003	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.00030	<0.00030	-
Tungsten	mg/L	-	-	0.0001	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.00010	<0.00010	-
Uranium	mg/L	-	-	0.00001	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.000010	<0.000010	-
Vanadium	mg/L	-	-	0.0005	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.00050	<0.00050	-
Zinc	mg/L	-	-	0.003	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.0030	<0.0030	-
Zirconium	mg/L	-	-	0.00006	NC	NC	NA	-	-	-	NC	NC	NA	-	<0.000060	<0.000060	-
<b>Dissolved Metals</b>																	
Aluminum	mg/L	0.0191	0.0138	0.001	0.01645	32%	NA	0.0197	0.0173	0.001	0.0185	13%	NA	-	<0.0010	-	-
Antimony	mg/L	<0.00010	<0.00010	0.0001	NC	NC	NA	<0.00010	<0.00010	0.0001	NC	NC	NA	-	<0.00010	-	-
Arsenic	mg/L	0.00044	0.00047	0.0001	0.000455	NC	0.3	0.00129	0.00117	0.0001	0.00123	10%	NA	-	<0.00010	-	-
Barium	mg/L	0.0524	0.0506	0.0001	0.0515	3%	NA	0.496	0.511	0.0001	0.5035	3%	NA	-	<0.00010	-	-
Beryllium	mg/L	<0.00010	<0.00010	0.0001	NC	NC	NA	<0.00010	<0.00010	0.0001	NC	NC	NA	-	<0.00010	-	-
Bismuth	mg/L	<0.000050	<0.000050	0.00005	NC	NC	NA	<0.000050	<0.000050	0.00005	NC	NC	NA	-	<0.000050	-	-
Boron	mg/L	0.046	0.048	0.01	0.047	NC	0.2	<0.010	<0.010	0.01	NC	NC	NA	-	<0.010	-	-
Cadmium	mg/L	0.00111	0.000756	0.00005	0.000933	38%	NA	0.0000249	0.0000188	0.00005	0.00002185	NC	1.22	-	<0.000050	-	-
Calcium	mg/L	34.7	35.4	0.05	35.05	2%	NA	57.4	56.6	0.05	57	1%	NA	-	<0.050	-	<0.050
Cesium	mg/L	<0.000010	<0.000010	0.00001	NC	NC	NA	0.000015	0.000017	0.00001	0.000016	NC	0.2	-	<0.000010	-	-
Chromium	mg/L	0.00017	<0.00010	0.0001	0.00017	NC	NA	0.0003	0.00027	0.0001	0.000285	NC	0.3	-	<0.00010	-	-
Cobalt	mg/L	0.00015	0.00012	0.0001	0.000135	NC	0.3	0.016	0.0163	0.0001	0.01615	2%	NA	-	<0.00010	-	-
Copper	mg/L	0.0007	0.00062	0.0002	0.00066	NC	0.4	0.00095	0.00026	0.0002	0.000605	NC	3.45	-	<0.00020	-	-
Iron	mg/L	0.021	0.016	0.0													

**APPENDIX E**

**2018 Certificates of Analysis**



REGIONAL DISTRICT OF KITIMAT-STIKINE  
ATTN: Chris Kerr  
# 300 - 4545 Lazelle Avenue  
Terrace BC V8G 4E1

Date Received: 08-MAY-19  
Report Date: 17-MAY-19 12:36 (MT)  
Version: FINAL

Client Phone: 250-615-6100

## Certificate of Analysis

Lab Work Order #: L2269973  
Project P.O. #: NOT SUBMITTED  
Job Reference: MEZIADIN LANDFILL GROUNDWATER  
C of C Numbers:  
Legal Site Desc:

---

Amber Springer, B.Sc  
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700  
ALS CANADA LTD Part of the ALS Group An ALS Limited Company



## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	Description	Sampled Date	Sampled Time	Client ID	L2269973-1	L2269973-2	L2269973-3	L2269973-4	L2269973-5
					Water	Water	Water	Water	Water
		07-MAY-19	14:50	MW1A	07-MAY-19	07-MAY-19	07-MAY-19	07-MAY-19	07-MAY-19
					14:50	15:00	13:45	12:50	11:15
					MW1A	MW1B	MW2	MW3	MW4
Grouping	Analyte								
<b>WATER</b>									
<b>Physical Tests</b>	Conductivity (uS/cm)				766	356	309	649	637
	Hardness (as CaCO3) (mg/L)				180	155	129	210	202
	pH (pH)				8.23	7.10	8.18	8.33	8.29
	Total Dissolved Solids (mg/L)				593	343	198	398	408
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO3) (mg/L)				246	194	134	193	187
	Ammonia, Total (as N) (mg/L)				0.0965	0.193	0.0336	<0.0050	0.0120
	Bromide (Br) (mg/L)				<0.25 <sup>DLDS</sup>	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)				<2.5 <sup>DLDS</sup>	<0.50	<0.50	0.57	<0.50
	Fluoride (F) (mg/L)				0.15	0.066	0.117	0.085	0.106
	Nitrate and Nitrite (as N) (mg/L)				0.101	0.293	0.453	0.165	0.0819
	Nitrate (as N) (mg/L)				0.093	0.283 <sup>HTD</sup>	0.449	0.165 <sup>HTD</sup>	0.0819
	Nitrite (as N) (mg/L)				0.0083	0.0095 <sup>HTD</sup>	0.0035	<0.0010 <sup>HTD</sup>	<0.0010
	Total Kjeldahl Nitrogen (mg/L)				2.21	0.429	0.445	0.105	0.074
	Sulfate (SO4) (mg/L)				163	7.29	32.7	157	151
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location				FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location				FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)				0.0039	0.0250	0.0191	0.0020	0.0017
	Antimony (Sb)-Dissolved (mg/L)				0.00025	<0.00020 <sup>DLA</sup>	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)				0.00103	0.00063	0.00044	0.00022	0.00015
	Barium (Ba)-Dissolved (mg/L)				0.0738	0.309	0.0524	0.0288	0.0226
	Beryllium (Be)-Dissolved (mg/L)				<0.00010	<0.00020 <sup>DLA</sup>	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)				<0.000050	<0.00010 <sup>DLA</sup>	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)				0.071	<0.020 <sup>DLA</sup>	0.046	0.062	0.064
	Cadmium (Cd)-Dissolved (mg/L)				0.0000126	0.000079	0.00111	0.000213	0.000398
	Calcium (Ca)-Dissolved (mg/L)				52.8	46.6	34.7	61.8	58.9
	Cesium (Cs)-Dissolved (mg/L)				<0.000010	<0.000020 <sup>DLA</sup>	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)				<0.00010	<0.00020 <sup>DLA</sup>	0.00017	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)				0.00019	0.00932	0.00015	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)				0.00105	0.00065	0.00070	0.00055	0.00037
	Iron (Fe)-Dissolved (mg/L)				0.085	0.789	0.021	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)				0.000063	<0.00010 <sup>DLA</sup>	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)				0.0037	0.0029	0.0024	0.0045	0.0045
	Magnesium (Mg)-Dissolved (mg/L)				11.8	9.41	10.2	13.5	13.2
	Manganese (Mn)-Dissolved (mg/L)				0.303	5.87	0.144	0.00278	0.0752
	Mercury (Hg)-Dissolved (mg/L)				<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)				0.0125	0.00016	0.0182	0.00596	0.00761
	Nickel (Ni)-Dissolved (mg/L)				0.00079	0.0101	0.00117	<0.00050	<0.00050

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L2269973-6 Water  BLANK	L2269973-7 Water 07-MAY-19 12:50 DUP			
Grouping	Analyte				
<b>WATER</b>					
<b>Physical Tests</b>	Conductivity (uS/cm)	<2.0	414		
	Hardness (as CaCO3) (mg/L)		131		
	pH (pH)	5.47	8.30		
	Total Dissolved Solids (mg/L)	<10	306		
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO3) (mg/L)	<1.0	186		
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0340		
	Bromide (Br) (mg/L)	<0.050	<0.050		
	Chloride (Cl) (mg/L)	<0.50	<0.50		
	Fluoride (F) (mg/L)	<0.020	0.165		
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.163		
	Nitrate (as N) (mg/L)	<0.0050	0.163 <sup>HTD</sup>		
	Nitrite (as N) (mg/L)	<0.0010	<0.0010 <sup>HTD</sup>		
	Total Kjeldahl Nitrogen (mg/L)	<0.050	0.552		
	Sulfate (SO4) (mg/L)	<0.30	44.1		
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location		FIELD		
	Dissolved Metals Filtration Location		FIELD		
	Aluminum (Al)-Dissolved (mg/L)		0.0138		
	Antimony (Sb)-Dissolved (mg/L)		<0.00010		
	Arsenic (As)-Dissolved (mg/L)		0.00047		
	Barium (Ba)-Dissolved (mg/L)		0.0506		
	Beryllium (Be)-Dissolved (mg/L)		<0.00010		
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050		
	Boron (B)-Dissolved (mg/L)		0.048		
	Cadmium (Cd)-Dissolved (mg/L)		0.000756		
	Calcium (Ca)-Dissolved (mg/L)		35.4		
	Cesium (Cs)-Dissolved (mg/L)		<0.000010		
	Chromium (Cr)-Dissolved (mg/L)		<0.00010		
	Cobalt (Co)-Dissolved (mg/L)		0.00012		
	Copper (Cu)-Dissolved (mg/L)		0.00062		
	Iron (Fe)-Dissolved (mg/L)		0.016		
	Lead (Pb)-Dissolved (mg/L)		<0.000050		
	Lithium (Li)-Dissolved (mg/L)		0.0025		
	Magnesium (Mg)-Dissolved (mg/L)		10.3		
	Manganese (Mn)-Dissolved (mg/L)		0.130		
	Mercury (Hg)-Dissolved (mg/L)		<0.000050		
	Molybdenum (Mo)-Dissolved (mg/L)		0.0195		
	Nickel (Ni)-Dissolved (mg/L)		0.00096		

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2269973-1	L2269973-2	L2269973-3	L2269973-4	L2269973-5
		Description	Water	Water	Water	Water	Water
		Sampled Date	07-MAY-19	07-MAY-19	07-MAY-19	07-MAY-19	07-MAY-19
		Sampled Time	14:50	15:00	13:45	12:50	11:15
		Client ID	MW1A	MW1B	MW2	MW3	MW4
Grouping	Analyte						
<b>WATER</b>							
<b>Dissolved Metals</b>	Phosphorus (P)-Dissolved (mg/L)	0.050	<0.10 <sup>DLA</sup>	0.063	<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)	2.46	0.65	1.85	1.90	2.28	
	Rubidium (Rb)-Dissolved (mg/L)	0.00027	0.00056	0.00023	0.00031	0.00043	
	Selenium (Se)-Dissolved (mg/L)	0.000143	<0.00010 <sup>DLA</sup>	0.000054	0.000298	0.000197	
	Silicon (Si)-Dissolved (mg/L)	3.59	6.53	3.98	3.40	3.58	
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000020 <sup>DLA</sup>	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	101	6.69	46.3	65.1	56.9	
	Strontium (Sr)-Dissolved (mg/L)	0.594	0.276	0.360	0.542	0.603	
	Sulfur (S)-Dissolved (mg/L)	54.3	2.6	14.4	50.9	48.8	
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00040 <sup>DLA</sup>	<0.00020	<0.00020	<0.00020	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000020 <sup>DLA</sup>	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00020 <sup>DLA</sup>	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00020 <sup>DLA</sup>	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00060 <sup>DLA</sup>	0.00092	<0.00030	<0.00030	
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00020 <sup>DLA</sup>	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Dissolved (mg/L)	0.00273	0.000091	0.00190	0.00147	0.00100	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.0010 <sup>DLA</sup>	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	0.0034	0.0061	0.0053	0.0012	<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	<0.00012 <sup>DLA</sup>	<0.000060	<0.000060	<0.000060	
<b>Aggregate Organics</b>	COD (mg/L)	127	34	<20	<20	<20	

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID Description Sampled Date Sampled Time Client ID</b>	L2269973-6 Water  BLANK	L2269973-7 Water 07-MAY-19 12:50 DUP		
Grouping	Analyte				
<b>WATER</b>					
<b>Dissolved Metals</b>	Phosphorus (P)-Dissolved (mg/L)		0.061		
	Potassium (K)-Dissolved (mg/L)		1.82		
	Rubidium (Rb)-Dissolved (mg/L)		0.00024		
	Selenium (Se)-Dissolved (mg/L)		0.000069		
	Silicon (Si)-Dissolved (mg/L)		3.95		
	Silver (Ag)-Dissolved (mg/L)		<0.000010		
	Sodium (Na)-Dissolved (mg/L)		47.0		
	Strontium (Sr)-Dissolved (mg/L)		0.377		
	Sulfur (S)-Dissolved (mg/L)		14.4		
	Tellurium (Te)-Dissolved (mg/L)		<0.00020		
	Thallium (Tl)-Dissolved (mg/L)		<0.000010		
	Thorium (Th)-Dissolved (mg/L)		<0.00010		
	Tin (Sn)-Dissolved (mg/L)		<0.00010		
	Titanium (Ti)-Dissolved (mg/L)		0.00060		
	Tungsten (W)-Dissolved (mg/L)		<0.00010		
	Uranium (U)-Dissolved (mg/L)		0.00204		
	Vanadium (V)-Dissolved (mg/L)		<0.00050		
	Zinc (Zn)-Dissolved (mg/L)		0.0025		
	Zirconium (Zr)-Dissolved (mg/L)		0.000067		
<b>Aggregate Organics</b>	COD (mg/L)	<20	32		

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

## Reference Information

### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2269973-1, -2, -3, -4, -5, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2269973-1, -2, -3, -4, -5, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2269973-1, -2, -3, -4, -5, -7
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2269973-1, -2, -3, -4, -5, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2269973-1, -2, -3, -4, -5, -7
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2269973-1, -2, -3, -4, -5, -7

### Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>ALK-TITR-VA</b>	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
<b>ANIONS-N+N-CALC-VA</b>	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).			
<b>BR-L-IC-N-VA</b>	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>CL-IC-N-VA</b>	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>COD-COL-VA</b>	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND
This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.			
<b>EC-PCT-VA</b>	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
<b>EC-SCREEN-VA</b>	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
<b>F-IC-N-VA</b>	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>HARDNESS-CALC-VA</b>	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
<b>HG-D-CVAA-VA</b>	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
<b>MET-D-CCMS-VA</b>	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
<b>NH3-F-VA</b>	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Weston et al.			
<b>NO2-L-IC-N-VA</b>	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)

## Reference Information

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

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

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

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

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

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

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

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

**TDS-VA** Water Total Dissolved Solids by Gravimetric APHA 2540 C - GRAVIMETRIC

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, TDS is determined by evaporating the filtrate to dryness at 180 degrees celsius.

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

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

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

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

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

### Chain of Custody Numbers:

#### GLOSSARY OF REPORT TERMS

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

*mg/kg - milligrams per kilogram based on dry weight of sample.*

*mg/kg wwt - milligrams per kilogram based on wet weight of sample.*

*mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.*

*mg/L - milligrams per litre.*

*< - Less than.*

*D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).*

*N/A - Result not available. Refer to qualifier code and definition for explanation.*

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

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*



## Quality Control Report

Workorder: L2269973

Report Date: 17-MAY-19

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Client: REGIONAL DISTRICT OF KITIMAT-STIKINE  
 # 300 - 4545 Lazelle Avenue  
 Terrace BC V8G 4E1

Contact: Chris Kerr

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>ALK-TITR-VA</b>		<b>Water</b>						
Batch	R4632271							
<b>WG3046055-3</b>	<b>CRM</b>	<b>VA-ALK-TITR-CONTROL</b>						
Alkalinity, Total (as CaCO3)			98.5		%		85-115	11-MAY-19
<b>WG3046055-5</b>	<b>DUP</b>	<b>L2269973-1</b>						
Alkalinity, Total (as CaCO3)		246	249		mg/L	1.6	20	11-MAY-19
<b>WG3046055-1</b>	<b>MB</b>							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	11-MAY-19
<b>BR-L-IC-N-VA</b>		<b>Water</b>						
Batch	R4634873							
<b>WG3046057-3</b>	<b>DUP</b>	<b>L2269973-1</b>						
Bromide (Br)		<0.25	<0.25	RPD-NA	mg/L	N/A	20	10-MAY-19
<b>WG3046057-2</b>	<b>LCS</b>							
Bromide (Br)			97.5		%		85-115	10-MAY-19
<b>WG3046057-1</b>	<b>MB</b>							
Bromide (Br)			<0.050		mg/L		0.05	10-MAY-19
<b>WG3046057-4</b>	<b>MS</b>	<b>L2269973-6</b>						
Bromide (Br)			101.0		%		75-125	10-MAY-19
Batch	R4635747							
<b>WG3049679-2</b>	<b>LCS</b>							
Bromide (Br)			103.6		%		85-115	14-MAY-19
<b>WG3049679-1</b>	<b>MB</b>							
Bromide (Br)			<0.050		mg/L		0.05	14-MAY-19
<b>CL-IC-N-VA</b>		<b>Water</b>						
Batch	R4634873							
<b>WG3046057-3</b>	<b>DUP</b>	<b>L2269973-1</b>						
Chloride (Cl)		<2.5	<2.5	RPD-NA	mg/L	N/A	20	10-MAY-19
<b>WG3046057-2</b>	<b>LCS</b>							
Chloride (Cl)			96.9		%		90-110	10-MAY-19
<b>WG3046057-1</b>	<b>MB</b>							
Chloride (Cl)			<0.50		mg/L		0.5	10-MAY-19
<b>WG3046057-4</b>	<b>MS</b>	<b>L2269973-6</b>						
Chloride (Cl)			99.7		%		75-125	10-MAY-19
Batch	R4635747							
<b>WG3049679-2</b>	<b>LCS</b>							
Chloride (Cl)			103.4		%		90-110	14-MAY-19
<b>WG3049679-1</b>	<b>MB</b>							
Chloride (Cl)			<0.50		mg/L		0.5	14-MAY-19
<b>COD-COL-VA</b>		<b>Water</b>						



## Quality Control Report

Workorder: L2269973

Report Date: 17-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>COD-COL-VA</b>		<b>Water</b>						
Batch	R4635834							
WG3050401-2	DUP	L2269973-7						
COD		32	42	J	mg/L	10	40	15-MAY-19
WG3050401-3	LCS		104.9		%		85-115	15-MAY-19
COD								
WG3050401-6	LCS		104.9		%		85-115	15-MAY-19
COD								
WG3050401-1	MB		<20		mg/L		20	15-MAY-19
COD								
WG3050401-5	MB		<20		mg/L		20	15-MAY-19
COD								
<b>EC-PCT-VA</b>		<b>Water</b>						
Batch	R4632271							
WG3046055-4	CRM	VA-EC-PCT-CONTROL						
Conductivity			100.8		%		90-110	11-MAY-19
WG3046055-5	DUP	L2269973-1						
Conductivity		766	764		uS/cm	0.3	10	11-MAY-19
WG3046055-1	MB		<2.0		uS/cm		2	11-MAY-19
Conductivity								
<b>F-IC-N-VA</b>		<b>Water</b>						
Batch	R4634873							
WG3046057-3	DUP	L2269973-1						
Fluoride (F)		0.15	0.15		mg/L	2.4	20	10-MAY-19
WG3046057-2	LCS		97.2		%		90-110	10-MAY-19
Fluoride (F)								
WG3046057-1	MB		<0.020		mg/L		0.02	10-MAY-19
Fluoride (F)								
WG3046057-4	MS	L2269973-6						
Fluoride (F)			99.8		%		75-125	10-MAY-19
Batch	R4635747							
WG3049679-2	LCS		100.8		%		90-110	14-MAY-19
Fluoride (F)								
WG3049679-1	MB		<0.020		mg/L		0.02	14-MAY-19
Fluoride (F)								
<b>HG-D-CVAA-VA</b>		<b>Water</b>						
Batch	R4630750							
WG3046644-3	DUP	L2269973-1						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	10-MAY-19
WG3046644-2	LCS							





## Quality Control Report

Workorder: L2269973

Report Date: 17-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>HG-D-CVAA-VA</b>		<b>Water</b>						
<b>Batch</b>	<b>R4630750</b>							
<b>WG3046644-2</b>	<b>LCS</b>							
Mercury (Hg)-Dissolved			106.7		%		80-120	10-MAY-19
<b>WG3046644-1</b>	<b>MB</b>							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	10-MAY-19
<b>MET-D-CCMS-VA</b>		<b>Water</b>						
<b>Batch</b>	<b>R4630452</b>							
<b>WG3045551-2</b>	<b>LCS</b>							
Aluminum (Al)-Dissolved			98.3		%		80-120	10-MAY-19
Antimony (Sb)-Dissolved			91.4		%		80-120	10-MAY-19
Arsenic (As)-Dissolved			92.8		%		80-120	10-MAY-19
Barium (Ba)-Dissolved			90.0		%		80-120	10-MAY-19
Beryllium (Be)-Dissolved			91.1		%		80-120	10-MAY-19
Bismuth (Bi)-Dissolved			91.5		%		80-120	10-MAY-19
Boron (B)-Dissolved			88.8		%		80-120	10-MAY-19
Cadmium (Cd)-Dissolved			89.9		%		80-120	10-MAY-19
Calcium (Ca)-Dissolved			93.1		%		80-120	10-MAY-19
Cesium (Cs)-Dissolved			98.7		%		80-120	10-MAY-19
Chromium (Cr)-Dissolved			92.2		%		80-120	10-MAY-19
Cobalt (Co)-Dissolved			89.8		%		80-120	10-MAY-19
Copper (Cu)-Dissolved			92.6		%		80-120	10-MAY-19
Iron (Fe)-Dissolved			100.4		%		80-120	10-MAY-19
Lead (Pb)-Dissolved			94.0		%		80-120	10-MAY-19
Lithium (Li)-Dissolved			93.2		%		80-120	10-MAY-19
Magnesium (Mg)-Dissolved			94.7		%		80-120	10-MAY-19
Manganese (Mn)-Dissolved			93.2		%		80-120	10-MAY-19
Molybdenum (Mo)-Dissolved			99.1		%		80-120	10-MAY-19
Nickel (Ni)-Dissolved			91.4		%		80-120	10-MAY-19
Phosphorus (P)-Dissolved			94.9		%		70-130	10-MAY-19
Potassium (K)-Dissolved			90.9		%		80-120	10-MAY-19
Rubidium (Rb)-Dissolved			93.5		%		80-120	10-MAY-19
Selenium (Se)-Dissolved			89.5		%		80-120	10-MAY-19
Silicon (Si)-Dissolved			92.6		%		60-140	10-MAY-19
Silver (Ag)-Dissolved			96.5		%		80-120	10-MAY-19
Sodium (Na)-Dissolved			90.8		%		80-120	10-MAY-19
Strontium (Sr)-Dissolved			93.4		%		80-120	10-MAY-19



## Quality Control Report

Workorder: L2269973

Report Date: 17-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4630452</b>							
<b>WG3045551-2</b>	<b>LCS</b>							
Sulfur (S)-Dissolved			95.3		%		80-120	10-MAY-19
Tellurium (Te)-Dissolved			93.5		%		80-120	10-MAY-19
Thallium (Tl)-Dissolved			89.6		%		80-120	10-MAY-19
Thorium (Th)-Dissolved			95.7		%		80-120	10-MAY-19
Tin (Sn)-Dissolved			92.9		%		80-120	10-MAY-19
Titanium (Ti)-Dissolved			90.9		%		80-120	10-MAY-19
Tungsten (W)-Dissolved			96.2		%		80-120	10-MAY-19
Uranium (U)-Dissolved			100.6		%		80-120	10-MAY-19
Vanadium (V)-Dissolved			95.3		%		80-120	10-MAY-19
Zinc (Zn)-Dissolved			87.0		%		80-120	10-MAY-19
Zirconium (Zr)-Dissolved			95.5		%		80-120	10-MAY-19
<b>WG3045551-1</b>	<b>MB</b>	<b>NP</b>						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	10-MAY-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	10-MAY-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	10-MAY-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	10-MAY-19
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	10-MAY-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	10-MAY-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	10-MAY-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	10-MAY-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	10-MAY-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-19
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	10-MAY-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	10-MAY-19



## Quality Control Report

Workorder: L2269973

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4630452</b>							
<b>WG3045551-1</b>	<b>MB</b>	<b>NP</b>						
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	10-MAY-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	10-MAY-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	10-MAY-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	10-MAY-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	10-MAY-19
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	10-MAY-19
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	10-MAY-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	10-MAY-19
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	10-MAY-19
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	10-MAY-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	10-MAY-19
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	10-MAY-19
<b>NH3-F-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4634886</b>							
<b>WG3048622-2</b>	<b>LCS</b>							
Ammonia, Total (as N)			95.3		%		85-115	14-MAY-19
<b>WG3048622-1</b>	<b>MB</b>							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	14-MAY-19
<b>NO2-L-IC-N-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4634873</b>							
<b>WG3046057-3</b>	<b>DUP</b>	<b>L2269973-1</b>						
Nitrite (as N)		0.0083	0.0079		mg/L	4.8	20	10-MAY-19
<b>WG3046057-2</b>	<b>LCS</b>							
Nitrite (as N)			96.2		%		90-110	10-MAY-19
<b>WG3046057-1</b>	<b>MB</b>							
Nitrite (as N)			<0.0010		mg/L		0.001	10-MAY-19
<b>WG3046057-4</b>	<b>MS</b>	<b>L2269973-6</b>						
Nitrite (as N)			99.1		%		75-125	10-MAY-19



## Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>NO2-L-IC-N-VA</b>								
Batch	R4635747							
<b>WG3049679-2</b>	<b>LCS</b>							
Nitrite (as N)			100.5		%		90-110	14-MAY-19
<b>WG3049679-1</b>	<b>MB</b>							
Nitrite (as N)			<0.0010		mg/L		0.001	14-MAY-19
<b>NO3-L-IC-N-VA</b>								
Batch	R4634873							
<b>WG3046057-3</b>	<b>DUP</b>	<b>L2269973-1</b>						
Nitrate (as N)		0.093	0.088		mg/L	4.5	20	10-MAY-19
<b>WG3046057-2</b>	<b>LCS</b>							
Nitrate (as N)			97.7		%		90-110	10-MAY-19
<b>WG3046057-1</b>	<b>MB</b>							
Nitrate (as N)			<0.0050		mg/L		0.005	10-MAY-19
<b>WG3046057-4</b>	<b>MS</b>	<b>L2269973-6</b>						
Nitrate (as N)			100.3		%		75-125	10-MAY-19
Batch	R4635747							
<b>WG3049679-2</b>	<b>LCS</b>							
Nitrate (as N)			104.1		%		90-110	14-MAY-19
<b>WG3049679-1</b>	<b>MB</b>							
Nitrate (as N)			<0.0050		mg/L		0.005	14-MAY-19
<b>PH-PCT-VA</b>								
Batch	R4632271							
<b>WG3046055-2</b>	<b>CRM</b>	<b>VA-PH7-BUF</b>						
pH			7.00		pH		6.9-7.1	11-MAY-19
<b>WG3046055-5</b>	<b>DUP</b>	<b>L2269973-1</b>						
pH		8.23	8.24	J	pH	0.01	0.3	11-MAY-19
<b>SO4-IC-N-VA</b>								
Batch	R4634873							
<b>WG3046057-3</b>	<b>DUP</b>	<b>L2269973-1</b>						
Sulfate (SO4)		163	163		mg/L	0.2	20	10-MAY-19
<b>WG3046057-2</b>	<b>LCS</b>							
Sulfate (SO4)			97.4		%		90-110	10-MAY-19
<b>WG3046057-1</b>	<b>MB</b>							
Sulfate (SO4)			<0.30		mg/L		0.3	10-MAY-19
<b>WG3046057-4</b>	<b>MS</b>	<b>L2269973-6</b>						
Sulfate (SO4)			100.0		%		75-125	10-MAY-19



## Quality Control Report

Workorder: L2269973

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>SO4-IC-N-VA</b>								
<b>Batch R4635747</b>								
<b>WG3049679-2</b>	<b>LCS</b>							
Sulfate (SO4)			103.6		%		90-110	14-MAY-19
<b>WG3049679-1</b>	<b>MB</b>							
Sulfate (SO4)			<0.30		mg/L		0.3	14-MAY-19
<b>TDS-VA</b>								
<b>Batch R4635517</b>								
<b>WG3049459-6</b>	<b>DUP</b>	<b>L2269973-7</b>						
Total Dissolved Solids		306	318		mg/L	4.0	20	14-MAY-19
<b>WG3049459-2</b>	<b>LCS</b>							
Total Dissolved Solids			105.5		%		85-115	14-MAY-19
<b>WG3049459-5</b>	<b>LCS</b>							
Total Dissolved Solids			101.1		%		85-115	14-MAY-19
<b>WG3049459-1</b>	<b>MB</b>							
Total Dissolved Solids			<10		mg/L		10	14-MAY-19
<b>WG3049459-4</b>	<b>MB</b>							
Total Dissolved Solids			<10		mg/L		10	14-MAY-19
<b>TKN-F-VA</b>								
<b>Batch R4636832</b>								
<b>WG3048624-2</b>	<b>LCS</b>							
Total Kjeldahl Nitrogen			103.9		%		75-125	16-MAY-19
<b>WG3048624-1</b>	<b>MB</b>							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	16-MAY-19

# Quality Control Report

Workorder: L2269973

Report Date: 17-MAY-19

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## Legend:

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Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

## Sample Parameter Qualifier Definitions:

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Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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# Quality Control Report

Workorder: L2269973

Report Date: 17-MAY-19

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## Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
<b>Physical Tests</b>							
pH by Meter (Automated)							
	1	07-MAY-19 14:50	11-MAY-19 09:50	0.25	91	hours	EHTR-FM
	2	07-MAY-19 15:00	11-MAY-19 09:50	0.25	91	hours	EHTR-FM
	3	07-MAY-19 13:45	11-MAY-19 09:50	0.25	92	hours	EHTR-FM
	4	07-MAY-19 12:50	11-MAY-19 09:50	0.25	93	hours	EHTR-FM
	5	07-MAY-19 11:15	11-MAY-19 09:50	0.25	95	hours	EHTR-FM
	6	Not provided	11-MAY-19 09:50	0.25	66	hours	EHTR-FM
	7	07-MAY-19 12:50	11-MAY-19 09:50	0.25	93	hours	EHTR-FM

## Anions and Nutrients

### Nitrate in Water by IC (Low Level)

2	07-MAY-19 15:00	14-MAY-19 10:40	3	7	days	EHT
4	07-MAY-19 12:50	14-MAY-19 10:40	3	7	days	EHT
7	07-MAY-19 12:50	14-MAY-19 10:40	3	7	days	EHT

### Nitrite in Water by IC (Low Level)

2	07-MAY-19 15:00	14-MAY-19 10:40	3	7	days	EHT
4	07-MAY-19 12:50	14-MAY-19 10:40	3	7	days	EHT
7	07-MAY-19 12:50	14-MAY-19 10:40	3	7	days	EHT

## Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.  
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2269973 were received on 08-MAY-19 16:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes 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 pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.







REGIONAL DISTRICT OF KITIMAT-STIKINE  
ATTN: Chris Kerr  
# 300 - 4545 Lazelle Avenue  
Terrace BC V8G 4E1

Date Received: 16-NOV-19  
Report Date: 28-NOV-19 13:15 (MT)  
Version: FINAL

Client Phone: 250-615-6100

## Certificate of Analysis

Lab Work Order #: L2383403  
Project P.O. #: NOT SUBMITTED  
Job Reference: MEZIADIN LANDFILL SURFACE WATER  
C of C Numbers:  
Legal Site Desc:

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Amber Springer, B.Sc  
Account Manager

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ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700  
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# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>				
	L2383403-1 Water 14-NOV-19 15:30 LAGOON OUTLET				
Grouping	Analyte				
<b>WATER</b>					
<b>Physical Tests</b>	Conductivity (uS/cm)	510			
	Hardness (as CaCO3) (mg/L)	169			
	pH (pH)	7.70			
	Total Suspended Solids (mg/L)	16.8			
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO3) (mg/L)	189			
	Ammonia, Total (as N) (mg/L)	3.09			
	Bromide (Br) (mg/L)	0.092			
	Chloride (Cl) (mg/L)	39.4			
	Fluoride (F) (mg/L)	0.065			
	Nitrate and Nitrite (as N) (mg/L)	0.0053			
	Nitrate (as N) (mg/L)	0.0053			
	Nitrite (as N) (mg/L)	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	3.83			
	Sulfate (SO4) (mg/L)	19.2			
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	0.199			
	Antimony (Sb)-Total (mg/L)	0.00017			
	Arsenic (As)-Total (mg/L)	0.00104			
	Barium (Ba)-Total (mg/L)	0.128			
	Beryllium (Be)-Total (mg/L)	<0.00010			
	Bismuth (Bi)-Total (mg/L)	<0.000050			
	Boron (B)-Total (mg/L)	0.226			
	Cadmium (Cd)-Total (mg/L)	0.0000707			
	Calcium (Ca)-Total (mg/L)	50.8			
	Cesium (Cs)-Total (mg/L)	0.000025			
	Chromium (Cr)-Total (mg/L)	0.00085			
	Cobalt (Co)-Total (mg/L)	0.00075			
	Copper (Cu)-Total (mg/L)	0.00108			
	Iron (Fe)-Total (mg/L)	2.22			
	Lead (Pb)-Total (mg/L)	0.000221			
	Lithium (Li)-Total (mg/L)	0.0020			
	Magnesium (Mg)-Total (mg/L)	10.3			
	Manganese (Mn)-Total (mg/L)	5.02			
	Mercury (Hg)-Total (mg/L)	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.000240			
	Nickel (Ni)-Total (mg/L)	0.00328			
	Phosphorus (P)-Total (mg/L)	0.069			
	Potassium (K)-Total (mg/L)	6.22			

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>	L2383403-1 Water 14-NOV-19 15:30 LAGOON OUTLET			
Grouping	Analyte				
<b>WATER</b>					
<b>Total Metals</b>	Rubidium (Rb)-Total (mg/L)	0.00303			
	Selenium (Se)-Total (mg/L)	0.000095			
	Silicon (Si)-Total (mg/L)	1.95			
	Silver (Ag)-Total (mg/L)	<0.000010			
	Sodium (Na)-Total (mg/L)	27.0			
	Strontium (Sr)-Total (mg/L)	0.284			
	Sulfur (S)-Total (mg/L)	6.95			
	Tellurium (Te)-Total (mg/L)	<0.00020			
	Thallium (Tl)-Total (mg/L)	<0.000010			
	Thorium (Th)-Total (mg/L)	<0.00010			
	Tin (Sn)-Total (mg/L)	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.0027 <sup>DLM</sup>			
	Tungsten (W)-Total (mg/L)	<0.00010			
	Uranium (U)-Total (mg/L)	0.000023			
	Vanadium (V)-Total (mg/L)	0.00064			
	Zinc (Zn)-Total (mg/L)	0.0055			
	Zirconium (Zr)-Total (mg/L)	<0.00020			
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location	FIELD			
	Dissolved Metals Filtration Location	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0115			
	Antimony (Sb)-Dissolved (mg/L)	0.00017			
	Arsenic (As)-Dissolved (mg/L)	0.00084			
	Barium (Ba)-Dissolved (mg/L)	0.115			
	Beryllium (Be)-Dissolved (mg/L)	<0.00010			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050			
	Boron (B)-Dissolved (mg/L)	0.215			
	Cadmium (Cd)-Dissolved (mg/L)	0.0000086			
	Calcium (Ca)-Dissolved (mg/L)	48.8			
	Cesium (Cs)-Dissolved (mg/L)	0.000013			
	Chromium (Cr)-Dissolved (mg/L)	0.00027			
	Cobalt (Co)-Dissolved (mg/L)	0.00061			
	Copper (Cu)-Dissolved (mg/L)	0.00037			
	Iron (Fe)-Dissolved (mg/L)	1.87			
	Lead (Pb)-Dissolved (mg/L)	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.0018			
	Magnesium (Mg)-Dissolved (mg/L)	11.4			
	Manganese (Mn)-Dissolved (mg/L)	5.15			

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	Sample ID	Description	Sampled Date	Sampled Time	Client ID
		L2383403-1	Water	14-NOV-19	15:30	LAGOON OUTLET
<b>WATER</b>						
<b>Dissolved Metals</b>	Mercury (Hg)-Dissolved (mg/L)					<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)					0.000210
	Nickel (Ni)-Dissolved (mg/L)					0.00270
	Phosphorus (P)-Dissolved (mg/L)					<0.050
	Potassium (K)-Dissolved (mg/L)					6.77
	Rubidium (Rb)-Dissolved (mg/L)					0.00318
	Selenium (Se)-Dissolved (mg/L)					0.000698 <sup>DTSE</sup>
	Silicon (Si)-Dissolved (mg/L)					1.73
	Silver (Ag)-Dissolved (mg/L)					<0.000010
	Sodium (Na)-Dissolved (mg/L)					27.7
	Strontium (Sr)-Dissolved (mg/L)					0.316
	Sulfur (S)-Dissolved (mg/L)					9.78 <sup>DTS</sup>
	Tellurium (Te)-Dissolved (mg/L)					<0.00020
	Thallium (Tl)-Dissolved (mg/L)					<0.000010
	Thorium (Th)-Dissolved (mg/L)					<0.00010
	Tin (Sn)-Dissolved (mg/L)					0.00011
	Titanium (Ti)-Dissolved (mg/L)					0.00035
	Tungsten (W)-Dissolved (mg/L)					<0.00010
	Uranium (U)-Dissolved (mg/L)					0.000019
	Vanadium (V)-Dissolved (mg/L)					<0.00050
	Zinc (Zn)-Dissolved (mg/L)					0.0011
	Zirconium (Zr)-Dissolved (mg/L)					<0.00020
<b>Aggregate Organics</b>	BOD (mg/L)					7.6
	COD (mg/L)					27

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

## Reference Information

### Qualifiers for Sample Submission Listed:

Qualifier	Description
WSMD	Water sample(s) for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.
WSMT	Water sample(s) for total mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	COD	MS-B	L2383403-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2383403-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L2383403-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2383403-1
Matrix Spike	Silicon (Si)-Total	MS-B	L2383403-1
Matrix Spike	Sodium (Na)-Total	MS-B	L2383403-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L2383403-1
Matrix Spike	Sulfur (S)-Total	MS-B	L2383403-1
Matrix Spike	Ammonia, Total (as N)	MS-B	L2383403-1

### Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTS	Dissolved Sulfur concentration exceeds total. Negative bias on Total Sulfur suspected due to presence of volatile sulfur species lost during digestion.
DTSE	Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>ALK-TITR-VA</b>	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
<b>ANIONS-N+N-CALC-VA</b>	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).			
<b>BOD5-VA</b>	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- BIOCHEMICAL OXYGEN DEMAND
This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
<b>BR-L-IC-N-VA</b>	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>CL-IC-N-VA</b>	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>COD-COL-VA</b>	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND
This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.			
<b>EC-PCT-VA</b>	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
<b>EC-SCREEN-VA</b>	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
<b>F-IC-N-VA</b>	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

## Reference Information

<b>HARDNESS-CALC-VA</b>	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
<b>HG-D-CVAA-VA</b>	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
<b>HG-T-CVAA-VA</b>	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
<b>MET-D-CCMS-VA</b>	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
<b>MET-T-CCMS-VA</b>	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
<b>NH3-F-VA</b>	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
<b>NO2-L-IC-N-VA</b>	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>NO3-L-IC-N-VA</b>	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>PH-PCT-VA</b>	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode			
It is recommended that this analysis be conducted in the field.			
<b>SO4-IC-N-VA</b>	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>TKN-F-VA</b>	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
<b>TSS-VA</b>	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.			

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

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

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

**Chain of Custody Numbers:**

## Reference Information

### GLOSSARY OF REPORT TERMS

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

*mg/kg* - milligrams per kilogram based on dry weight of sample.

*mg/kg wwt* - milligrams per kilogram based on wet weight of sample.

*mg/kg lwt* - milligrams per kilogram based on lipid-adjusted weight of sample.

*mg/L* - milligrams per litre.

*<* - Less than.

*D.L.* - The reported Detection Limit, also known as the Limit of Reporting (LOR).

*N/A* - Result not available. Refer to qualifier code and definition for explanation.

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

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*

## Quality Control Report

Workorder: L2383403

Report Date: 28-NOV-19

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Client: REGIONAL DISTRICT OF KITIMAT-STIKINE  
 # 300 - 4545 Lazelle Avenue  
 Terrace BC V8G 4E1  
 Contact: Chris Kerr

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>ALK-TITR-VA</b>		<b>Water</b>						
Batch	R4915284							
<b>WG3220653-3</b>	<b>LCS</b>							
Alkalinity, Total (as CaCO3)			101.1		%		85-115	18-NOV-19
<b>WG3220653-1</b>	<b>MB</b>							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	18-NOV-19
<b>BOD5-VA</b>		<b>Water</b>						
Batch	R4922260							
<b>WG3221035-2</b>	<b>LCS</b>							
BOD			101.0		%		85-115	18-NOV-19
<b>WG3221035-1</b>	<b>MB</b>							
BOD			<2.0		mg/L		2	18-NOV-19
<b>BR-L-IC-N-VA</b>		<b>Water</b>						
Batch	R4915402							
<b>WG3220780-2</b>	<b>LCS</b>							
Bromide (Br)			94.6		%		85-115	17-NOV-19
<b>WG3220780-1</b>	<b>MB</b>							
Bromide (Br)			<0.050		mg/L		0.05	17-NOV-19
<b>CL-IC-N-VA</b>		<b>Water</b>						
Batch	R4915402							
<b>WG3220780-2</b>	<b>LCS</b>							
Chloride (Cl)			100.1		%		90-110	17-NOV-19
<b>WG3220780-1</b>	<b>MB</b>							
Chloride (Cl)			<0.50		mg/L		0.5	17-NOV-19
<b>COD-COL-VA</b>		<b>Water</b>						
Batch	R4927281							
<b>WG3228950-3</b>	<b>LCS</b>							
COD			102.6		%		85-115	26-NOV-19
<b>WG3228950-6</b>	<b>LCS</b>							
COD			100.1		%		85-115	26-NOV-19
<b>WG3228950-1</b>	<b>MB</b>							
COD			<20		mg/L		20	26-NOV-19
<b>WG3228950-5</b>	<b>MB</b>							
COD			<20		mg/L		20	26-NOV-19
<b>EC-PCT-VA</b>		<b>Water</b>						
Batch	R4915284							
<b>WG3220653-3</b>	<b>LCS</b>							
Conductivity			102.5		%		90-110	18-NOV-19
<b>WG3220653-1</b>	<b>MB</b>							





## Quality Control Report

Workorder: L2383403

Report Date: 28-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>EC-PCT-VA</b>								
<b>Water</b>								
Batch R4915284								
WG3220653-1 MB								
Conductivity			<2.0		uS/cm		2	18-NOV-19
<b>F-IC-N-VA</b>								
<b>Water</b>								
Batch R4915402								
WG3220780-2 LCS								
Fluoride (F)			98.9		%		90-110	17-NOV-19
WG3220780-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	17-NOV-19
<b>HG-D-CVAA-VA</b>								
<b>Water</b>								
Batch R4923087								
WG3228019-3 DUP								
Mercury (Hg)-Dissolved		L2383403-1	<0.0000050	RPD-NA	mg/L	N/A	20	26-NOV-19
WG3228019-2 LCS								
Mercury (Hg)-Dissolved			97.3		%		80-120	26-NOV-19
WG3228019-1 MB								
Mercury (Hg)-Dissolved		NP	<0.0000050		mg/L		0.000005	26-NOV-19
<b>HG-T-CVAA-VA</b>								
<b>Water</b>								
Batch R4923087								
WG3228056-2 LCS								
Mercury (Hg)-Total			97.6		%		80-120	26-NOV-19
WG3228056-1 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	26-NOV-19
WG3228056-4 MS								
Mercury (Hg)-Total		L2383403-1	126.4		%		70-130	26-NOV-19
<b>MET-D-CCMS-VA</b>								
<b>Water</b>								
Batch R4916453								
WG3221827-2 LCS								
Aluminum (Al)-Dissolved			109.7		%		80-120	19-NOV-19
Antimony (Sb)-Dissolved			99.9		%		80-120	19-NOV-19
Arsenic (As)-Dissolved			102.7		%		80-120	19-NOV-19
Barium (Ba)-Dissolved			100.1		%		80-120	19-NOV-19
Beryllium (Be)-Dissolved			100.2		%		80-120	19-NOV-19
Bismuth (Bi)-Dissolved			100.7		%		80-120	19-NOV-19
Boron (B)-Dissolved			102.3		%		80-120	19-NOV-19
Cadmium (Cd)-Dissolved			100.4		%		80-120	19-NOV-19
Calcium (Ca)-Dissolved			100.2		%		80-120	19-NOV-19



## Quality Control Report

Workorder: L2383403

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4916453</b>							
<b>WG3221827-2</b>	<b>LCS</b>							
Cesium (Cs)-Dissolved			99.6		%		80-120	19-NOV-19
Chromium (Cr)-Dissolved			103.5		%		80-120	19-NOV-19
Cobalt (Co)-Dissolved			100.8		%		80-120	19-NOV-19
Copper (Cu)-Dissolved			98.9		%		80-120	19-NOV-19
Iron (Fe)-Dissolved			101.9		%		80-120	19-NOV-19
Lead (Pb)-Dissolved			105.4		%		80-120	19-NOV-19
Lithium (Li)-Dissolved			95.3		%		80-120	19-NOV-19
Magnesium (Mg)-Dissolved			102.5		%		80-120	19-NOV-19
Manganese (Mn)-Dissolved			109.8		%		80-120	19-NOV-19
Molybdenum (Mo)-Dissolved			101.8		%		80-120	19-NOV-19
Nickel (Ni)-Dissolved			101.7		%		80-120	19-NOV-19
Phosphorus (P)-Dissolved			103.3		%		70-130	19-NOV-19
Potassium (K)-Dissolved			109.4		%		80-120	19-NOV-19
Rubidium (Rb)-Dissolved			105.6		%		80-120	19-NOV-19
Selenium (Se)-Dissolved			101.1		%		80-120	19-NOV-19
Silicon (Si)-Dissolved			103.4		%		60-140	19-NOV-19
Silver (Ag)-Dissolved			99.6		%		80-120	19-NOV-19
Sodium (Na)-Dissolved			108.7		%		80-120	19-NOV-19
Strontium (Sr)-Dissolved			105.6		%		80-120	19-NOV-19
Sulfur (S)-Dissolved			96.4		%		80-120	19-NOV-19
Tellurium (Te)-Dissolved			97.8		%		80-120	19-NOV-19
Thallium (Tl)-Dissolved			103.0		%		80-120	19-NOV-19
Thorium (Th)-Dissolved			103.7		%		80-120	19-NOV-19
Tin (Sn)-Dissolved			98.5		%		80-120	19-NOV-19
Titanium (Ti)-Dissolved			106.2		%		80-120	19-NOV-19
Tungsten (W)-Dissolved			106.7		%		80-120	19-NOV-19
Uranium (U)-Dissolved			105.7		%		80-120	19-NOV-19
Vanadium (V)-Dissolved			103.1		%		80-120	19-NOV-19
Zinc (Zn)-Dissolved			102.3		%		80-120	19-NOV-19
Zirconium (Zr)-Dissolved			103.2		%		80-120	19-NOV-19
<b>WG3221827-1</b>	<b>MB</b>	<b>NP</b>						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	19-NOV-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19



## Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4916453</b>							
<b>WG3221827-1</b>	<b>MB</b>	<b>NP</b>						
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	19-NOV-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	19-NOV-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	19-NOV-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	19-NOV-19
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	19-NOV-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	19-NOV-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-NOV-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-NOV-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	19-NOV-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	19-NOV-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	19-NOV-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	19-NOV-19
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	19-NOV-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-NOV-19
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	19-NOV-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	19-NOV-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	19-NOV-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	19-NOV-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-NOV-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	19-NOV-19
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	19-NOV-19
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	19-NOV-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	19-NOV-19
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	19-NOV-19
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-NOV-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	19-NOV-19



## Quality Control Report

Workorder: L2383403

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4916453</b>							
<b>WG3221827-1</b>	<b>MB</b>	<b>NP</b>						
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	19-NOV-19
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	19-NOV-19
<b>MET-T-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4918528</b>							
<b>WG3222529-2</b>	<b>LCS</b>							
Aluminum (Al)-Total			97.8		%		80-120	20-NOV-19
Antimony (Sb)-Total			93.3		%		80-120	20-NOV-19
Arsenic (As)-Total			100.9		%		80-120	20-NOV-19
Barium (Ba)-Total			98.7		%		80-120	20-NOV-19
Beryllium (Be)-Total			94.7		%		80-120	20-NOV-19
Bismuth (Bi)-Total			106.3		%		80-120	20-NOV-19
Boron (B)-Total			97.2		%		80-120	20-NOV-19
Cadmium (Cd)-Total			97.4		%		80-120	20-NOV-19
Calcium (Ca)-Total			96.9		%		80-120	20-NOV-19
Cesium (Cs)-Total			93.2		%		80-120	20-NOV-19
Chromium (Cr)-Total			99.8		%		80-120	20-NOV-19
Cobalt (Co)-Total			97.7		%		80-120	20-NOV-19
Copper (Cu)-Total			98.5		%		80-120	20-NOV-19
Iron (Fe)-Total			89.5		%		80-120	20-NOV-19
Lead (Pb)-Total			98.5		%		80-120	20-NOV-19
Lithium (Li)-Total			97.9		%		80-120	20-NOV-19
Magnesium (Mg)-Total			92.3		%		80-120	20-NOV-19
Manganese (Mn)-Total			96.6		%		80-120	20-NOV-19
Molybdenum (Mo)-Total			91.2		%		80-120	20-NOV-19
Nickel (Ni)-Total			96.1		%		80-120	20-NOV-19
Phosphorus (P)-Total			96.9		%		80-120	20-NOV-19
Potassium (K)-Total			98.9		%		80-120	20-NOV-19
Rubidium (Rb)-Total			99.0		%		80-120	20-NOV-19
Selenium (Se)-Total			99.9		%		80-120	20-NOV-19
Silicon (Si)-Total			100.8		%		80-120	20-NOV-19
Silver (Ag)-Total			93.7		%		80-120	20-NOV-19
Sodium (Na)-Total			102.7		%		80-120	20-NOV-19
Strontium (Sr)-Total			92.3		%		80-120	20-NOV-19
Sulfur (S)-Total			97.5		%		80-120	20-NOV-19



## Quality Control Report

Workorder: L2383403

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-VA</b>		<b>Water</b>						
<b>Batch</b>	<b>R4918528</b>							
<b>WG3222529-2 LCS</b>								
Tellurium (Te)-Total			87.8		%		80-120	20-NOV-19
Thallium (Tl)-Total			94.1		%		80-120	20-NOV-19
Thorium (Th)-Total			98.1		%		80-120	20-NOV-19
Tin (Sn)-Total			92.4		%		80-120	20-NOV-19
Titanium (Ti)-Total			96.1		%		80-120	20-NOV-19
Tungsten (W)-Total			100.1		%		80-120	20-NOV-19
Uranium (U)-Total			100.1		%		80-120	20-NOV-19
Vanadium (V)-Total			98.7		%		80-120	20-NOV-19
Zinc (Zn)-Total			101.1		%		80-120	20-NOV-19
Zirconium (Zr)-Total			90.0		%		80-120	20-NOV-19
<b>WG3222529-1 MB</b>								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	20-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	20-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	20-NOV-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	20-NOV-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	20-NOV-19
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	20-NOV-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	20-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	20-NOV-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	20-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	20-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	20-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	20-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	20-NOV-19
Phosphorus (P)-Total			<0.050		mg/L		0.05	20-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	20-NOV-19
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	20-NOV-19



## Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-VA</b>		<b>Water</b>						
<b>Batch</b>	<b>R4918528</b>							
<b>WG3222529-1</b>	<b>MB</b>							
Selenium (Se)-Total			<0.000050		mg/L		0.00005	20-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	20-NOV-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	20-NOV-19
Sodium (Na)-Total			<0.050		mg/L		0.05	20-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	20-NOV-19
Sulfur (S)-Total			<0.50		mg/L		0.5	20-NOV-19
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	20-NOV-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	20-NOV-19
Thorium (Th)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	20-NOV-19
Tungsten (W)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	20-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	20-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	20-NOV-19
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	20-NOV-19
<b>NH3-F-VA</b>		<b>Water</b>						
<b>Batch</b>	<b>R4921958</b>							
<b>WG3226248-2</b>	<b>LCS</b>							
Ammonia, Total (as N)			97.9		%		85-115	22-NOV-19
<b>WG3226248-1</b>	<b>MB</b>							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	22-NOV-19
<b>NO2-L-IC-N-VA</b>		<b>Water</b>						
<b>Batch</b>	<b>R4915402</b>							
<b>WG3220780-2</b>	<b>LCS</b>							
Nitrite (as N)			99.7		%		90-110	17-NOV-19
<b>WG3220780-1</b>	<b>MB</b>							
Nitrite (as N)			<0.0010		mg/L		0.001	17-NOV-19
<b>NO3-L-IC-N-VA</b>		<b>Water</b>						
<b>Batch</b>	<b>R4915402</b>							
<b>WG3220780-2</b>	<b>LCS</b>							
Nitrate (as N)			100.9		%		90-110	17-NOV-19
<b>WG3220780-1</b>	<b>MB</b>							
Nitrate (as N)			<0.0050		mg/L		0.005	17-NOV-19
<b>PH-PCT-VA</b>		<b>Water</b>						



## Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>PH-PCT-VA</b>	<b>Water</b>							
Batch	R4915284							
WG3220653-2	CRM	VA-PH7-BUF						
pH			7.03		pH		6.9-7.1	18-NOV-19
<b>SO4-IC-N-VA</b>	<b>Water</b>							
Batch	R4915402							
WG3220780-2	LCS							
Sulfate (SO4)			100.6		%		90-110	17-NOV-19
WG3220780-1	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	17-NOV-19
<b>TKN-F-VA</b>	<b>Water</b>							
Batch	R4923006							
WG3226267-2	LCS							
Total Kjeldahl Nitrogen			105.8		%		75-125	26-NOV-19
WG3226267-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	26-NOV-19
<b>TSS-VA</b>	<b>Water</b>							
Batch	R4916130							
WG3221914-2	LCS							
Total Suspended Solids			94.7		%		85-115	19-NOV-19
WG3221914-1	MB							
Total Suspended Solids			<3.0		mg/L		3	19-NOV-19

# Quality Control Report

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## Legend:

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Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

## Sample Parameter Qualifier Definitions:

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Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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# Quality Control Report

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Report Date: 28-NOV-19

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## Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
<b>Physical Tests</b>							
pH by Meter (Automated)	1	14-NOV-19 15:30	18-NOV-19 08:14	0.25	89	hours	EHTR-FM
<b>Aggregate Organics</b>							
Biochemical Oxygen Demand- 5 day	1	14-NOV-19 15:30	18-NOV-19 11:21	3	4	days	EHT

## Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.  
EHTR: Exceeded ALS recommended hold time prior to sample receipt.  
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.  
EHT: Exceeded ALS recommended hold time prior to analysis.  
Rec. HT: ALS recommended hold time (see units).

### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.  
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2383403 were received on 16-NOV-19 09:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes 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 pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.





REGIONAL DISTRICT OF KITIMAT-STIKINE  
ATTN: Chris Kerr  
# 300 - 4545 Lazelle Avenue  
Terrace BC V8G 4E1

Date Received: 16-NOV-19  
Report Date: 28-NOV-19 13:15 (MT)  
Version: FINAL

Client Phone: 250-615-6100

## Certificate of Analysis

Lab Work Order #: L2383403  
Project P.O. #: NOT SUBMITTED  
Job Reference: MEZIADIN LANDFILL SURFACE WATER  
C of C Numbers:  
Legal Site Desc:

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Amber Springer, B.Sc  
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700  
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>	L2383403-1 Water 14-NOV-19 15:30 LAGOON OUTLET			
Grouping	Analyte				
<b>WATER</b>					
<b>Physical Tests</b>	Conductivity (uS/cm)	510			
	Hardness (as CaCO3) (mg/L)	169			
	pH (pH)	7.70			
	Total Suspended Solids (mg/L)	16.8			
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO3) (mg/L)	189			
	Ammonia, Total (as N) (mg/L)	3.09			
	Bromide (Br) (mg/L)	0.092			
	Chloride (Cl) (mg/L)	39.4			
	Fluoride (F) (mg/L)	0.065			
	Nitrate and Nitrite (as N) (mg/L)	0.0053			
	Nitrate (as N) (mg/L)	0.0053			
	Nitrite (as N) (mg/L)	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	3.83			
	Sulfate (SO4) (mg/L)	19.2			
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	0.199			
	Antimony (Sb)-Total (mg/L)	0.00017			
	Arsenic (As)-Total (mg/L)	0.00104			
	Barium (Ba)-Total (mg/L)	0.128			
	Beryllium (Be)-Total (mg/L)	<0.00010			
	Bismuth (Bi)-Total (mg/L)	<0.000050			
	Boron (B)-Total (mg/L)	0.226			
	Cadmium (Cd)-Total (mg/L)	0.0000707			
	Calcium (Ca)-Total (mg/L)	50.8			
	Cesium (Cs)-Total (mg/L)	0.000025			
	Chromium (Cr)-Total (mg/L)	0.00085			
	Cobalt (Co)-Total (mg/L)	0.00075			
	Copper (Cu)-Total (mg/L)	0.00108			
	Iron (Fe)-Total (mg/L)	2.22			
	Lead (Pb)-Total (mg/L)	0.000221			
	Lithium (Li)-Total (mg/L)	0.0020			
	Magnesium (Mg)-Total (mg/L)	10.3			
	Manganese (Mn)-Total (mg/L)	5.02			
	Mercury (Hg)-Total (mg/L)	<0.0000050			
	Molybdenum (Mo)-Total (mg/L)	0.000240			
	Nickel (Ni)-Total (mg/L)	0.00328			
	Phosphorus (P)-Total (mg/L)	0.069			
	Potassium (K)-Total (mg/L)	6.22			

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>	L2383403-1 Water 14-NOV-19 15:30 LAGOON OUTLET			
Grouping	Analyte				
<b>WATER</b>					
<b>Total Metals</b>	Rubidium (Rb)-Total (mg/L)	0.00303			
	Selenium (Se)-Total (mg/L)	0.000095			
	Silicon (Si)-Total (mg/L)	1.95			
	Silver (Ag)-Total (mg/L)	<0.000010			
	Sodium (Na)-Total (mg/L)	27.0			
	Strontium (Sr)-Total (mg/L)	0.284			
	Sulfur (S)-Total (mg/L)	6.95			
	Tellurium (Te)-Total (mg/L)	<0.00020			
	Thallium (Tl)-Total (mg/L)	<0.000010			
	Thorium (Th)-Total (mg/L)	<0.00010			
	Tin (Sn)-Total (mg/L)	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.0027 <sup>DLM</sup>			
	Tungsten (W)-Total (mg/L)	<0.00010			
	Uranium (U)-Total (mg/L)	0.000023			
	Vanadium (V)-Total (mg/L)	0.00064			
	Zinc (Zn)-Total (mg/L)	0.0055			
	Zirconium (Zr)-Total (mg/L)	<0.00020			
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location	FIELD			
	Dissolved Metals Filtration Location	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	0.0115			
	Antimony (Sb)-Dissolved (mg/L)	0.00017			
	Arsenic (As)-Dissolved (mg/L)	0.00084			
	Barium (Ba)-Dissolved (mg/L)	0.115			
	Beryllium (Be)-Dissolved (mg/L)	<0.00010			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050			
	Boron (B)-Dissolved (mg/L)	0.215			
	Cadmium (Cd)-Dissolved (mg/L)	0.0000086			
	Calcium (Ca)-Dissolved (mg/L)	48.8			
	Cesium (Cs)-Dissolved (mg/L)	0.000013			
	Chromium (Cr)-Dissolved (mg/L)	0.00027			
	Cobalt (Co)-Dissolved (mg/L)	0.00061			
	Copper (Cu)-Dissolved (mg/L)	0.00037			
	Iron (Fe)-Dissolved (mg/L)	1.87			
	Lead (Pb)-Dissolved (mg/L)	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.0018			
	Magnesium (Mg)-Dissolved (mg/L)	11.4			
	Manganese (Mn)-Dissolved (mg/L)	5.15			

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	Sample ID	Description	Sampled Date	Sampled Time	Client ID
		L2383403-1	Water	14-NOV-19	15:30	LAGOON OUTLET
<b>WATER</b>						
<b>Dissolved Metals</b>	Mercury (Hg)-Dissolved (mg/L)					<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)					0.000210
	Nickel (Ni)-Dissolved (mg/L)					0.00270
	Phosphorus (P)-Dissolved (mg/L)					<0.050
	Potassium (K)-Dissolved (mg/L)					6.77
	Rubidium (Rb)-Dissolved (mg/L)					0.00318
	Selenium (Se)-Dissolved (mg/L)					0.000698 <sup>DTSE</sup>
	Silicon (Si)-Dissolved (mg/L)					1.73
	Silver (Ag)-Dissolved (mg/L)					<0.000010
	Sodium (Na)-Dissolved (mg/L)					27.7
	Strontium (Sr)-Dissolved (mg/L)					0.316
	Sulfur (S)-Dissolved (mg/L)					9.78 <sup>DTS</sup>
	Tellurium (Te)-Dissolved (mg/L)					<0.00020
	Thallium (Tl)-Dissolved (mg/L)					<0.000010
	Thorium (Th)-Dissolved (mg/L)					<0.00010
	Tin (Sn)-Dissolved (mg/L)					0.00011
	Titanium (Ti)-Dissolved (mg/L)					0.00035
	Tungsten (W)-Dissolved (mg/L)					<0.00010
	Uranium (U)-Dissolved (mg/L)					0.000019
	Vanadium (V)-Dissolved (mg/L)					<0.00050
	Zinc (Zn)-Dissolved (mg/L)					0.0011
	Zirconium (Zr)-Dissolved (mg/L)					<0.00020
<b>Aggregate Organics</b>	BOD (mg/L)					7.6
	COD (mg/L)					27

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

## Reference Information

### Qualifiers for Sample Submission Listed:

Qualifier	Description
WSMD	Water sample(s) for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.
WSMT	Water sample(s) for total mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	COD	MS-B	L2383403-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2383403-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L2383403-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2383403-1
Matrix Spike	Silicon (Si)-Total	MS-B	L2383403-1
Matrix Spike	Sodium (Na)-Total	MS-B	L2383403-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L2383403-1
Matrix Spike	Sulfur (S)-Total	MS-B	L2383403-1
Matrix Spike	Ammonia, Total (as N)	MS-B	L2383403-1

### Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
DTS	Dissolved Sulfur concentration exceeds total. Negative bias on Total Sulfur suspected due to presence of volatile sulfur species lost during digestion.
DTSE	Dissolved Se concentration exceeds total. Positive bias on D-Se suspected due to signal enhancement from volatile selenium species. Contact ALS if an alternative test to address this interference is needed.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>ALK-TITR-VA</b>	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
<b>ANIONS-N+N-CALC-VA</b>	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).			
<b>BOD5-VA</b>	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- BIOCHEMICAL OXYGEN DEMAND
This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
<b>BR-L-IC-N-VA</b>	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>CL-IC-N-VA</b>	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>COD-COL-VA</b>	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND
This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.			
<b>EC-PCT-VA</b>	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
<b>EC-SCREEN-VA</b>	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
<b>F-IC-N-VA</b>	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

## Reference Information

<b>HARDNESS-CALC-VA</b>	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
<b>HG-D-CVAA-VA</b>	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
<b>HG-T-CVAA-VA</b>	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
<b>MET-D-CCMS-VA</b>	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
<b>MET-T-CCMS-VA</b>	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
<b>NH3-F-VA</b>	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
<b>NO2-L-IC-N-VA</b>	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>NO3-L-IC-N-VA</b>	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>PH-PCT-VA</b>	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode			
It is recommended that this analysis be conducted in the field.			
<b>SO4-IC-N-VA</b>	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>TKN-F-VA</b>	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
<b>TSS-VA</b>	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.			

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

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

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

**Chain of Custody Numbers:**



## Reference Information

### GLOSSARY OF REPORT TERMS

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

*mg/kg* - milligrams per kilogram based on dry weight of sample.

*mg/kg wwt* - milligrams per kilogram based on wet weight of sample.

*mg/kg lwt* - milligrams per kilogram based on lipid-adjusted weight of sample.

*mg/L* - milligrams per litre.

*<* - Less than.

*D.L.* - The reported Detection Limit, also known as the Limit of Reporting (LOR).

*N/A* - Result not available. Refer to qualifier code and definition for explanation.

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

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*



## Quality Control Report

Workorder: L2383403

Report Date: 28-NOV-19

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Client: REGIONAL DISTRICT OF KITIMAT-STIKINE  
 # 300 - 4545 Lazelle Avenue  
 Terrace BC V8G 4E1

Contact: Chris Kerr

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>ALK-TITR-VA</b>		<b>Water</b>						
Batch	R4915284							
<b>WG3220653-3</b>	<b>LCS</b>							
Alkalinity, Total (as CaCO3)			101.1		%		85-115	18-NOV-19
<b>WG3220653-1</b>	<b>MB</b>							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	18-NOV-19
<b>BOD5-VA</b>		<b>Water</b>						
Batch	R4922260							
<b>WG3221035-2</b>	<b>LCS</b>							
BOD			101.0		%		85-115	18-NOV-19
<b>WG3221035-1</b>	<b>MB</b>							
BOD			<2.0		mg/L		2	18-NOV-19
<b>BR-L-IC-N-VA</b>		<b>Water</b>						
Batch	R4915402							
<b>WG3220780-2</b>	<b>LCS</b>							
Bromide (Br)			94.6		%		85-115	17-NOV-19
<b>WG3220780-1</b>	<b>MB</b>							
Bromide (Br)			<0.050		mg/L		0.05	17-NOV-19
<b>CL-IC-N-VA</b>		<b>Water</b>						
Batch	R4915402							
<b>WG3220780-2</b>	<b>LCS</b>							
Chloride (Cl)			100.1		%		90-110	17-NOV-19
<b>WG3220780-1</b>	<b>MB</b>							
Chloride (Cl)			<0.50		mg/L		0.5	17-NOV-19
<b>COD-COL-VA</b>		<b>Water</b>						
Batch	R4927281							
<b>WG3228950-3</b>	<b>LCS</b>							
COD			102.6		%		85-115	26-NOV-19
<b>WG3228950-6</b>	<b>LCS</b>							
COD			100.1		%		85-115	26-NOV-19
<b>WG3228950-1</b>	<b>MB</b>							
COD			<20		mg/L		20	26-NOV-19
<b>WG3228950-5</b>	<b>MB</b>							
COD			<20		mg/L		20	26-NOV-19
<b>EC-PCT-VA</b>		<b>Water</b>						
Batch	R4915284							
<b>WG3220653-3</b>	<b>LCS</b>							
Conductivity			102.5		%		90-110	18-NOV-19
<b>WG3220653-1</b>	<b>MB</b>							



## Quality Control Report

Workorder: L2383403

Report Date: 28-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>EC-PCT-VA</b>								
<b>Water</b>								
Batch R4915284								
WG3220653-1 MB								
Conductivity			<2.0		uS/cm		2	18-NOV-19
<b>F-IC-N-VA</b>								
<b>Water</b>								
Batch R4915402								
WG3220780-2 LCS								
Fluoride (F)			98.9		%		90-110	17-NOV-19
WG3220780-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	17-NOV-19
<b>HG-D-CVAA-VA</b>								
<b>Water</b>								
Batch R4923087								
WG3228019-3 DUP								
Mercury (Hg)-Dissolved		L2383403-1	<0.0000050	RPD-NA	mg/L	N/A	20	26-NOV-19
WG3228019-2 LCS								
Mercury (Hg)-Dissolved			97.3		%		80-120	26-NOV-19
WG3228019-1 MB								
Mercury (Hg)-Dissolved		NP	<0.0000050		mg/L		0.000005	26-NOV-19
<b>HG-T-CVAA-VA</b>								
<b>Water</b>								
Batch R4923087								
WG3228056-2 LCS								
Mercury (Hg)-Total			97.6		%		80-120	26-NOV-19
WG3228056-1 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	26-NOV-19
WG3228056-4 MS								
Mercury (Hg)-Total		L2383403-1	126.4		%		70-130	26-NOV-19
<b>MET-D-CCMS-VA</b>								
<b>Water</b>								
Batch R4916453								
WG3221827-2 LCS								
Aluminum (Al)-Dissolved			109.7		%		80-120	19-NOV-19
Antimony (Sb)-Dissolved			99.9		%		80-120	19-NOV-19
Arsenic (As)-Dissolved			102.7		%		80-120	19-NOV-19
Barium (Ba)-Dissolved			100.1		%		80-120	19-NOV-19
Beryllium (Be)-Dissolved			100.2		%		80-120	19-NOV-19
Bismuth (Bi)-Dissolved			100.7		%		80-120	19-NOV-19
Boron (B)-Dissolved			102.3		%		80-120	19-NOV-19
Cadmium (Cd)-Dissolved			100.4		%		80-120	19-NOV-19
Calcium (Ca)-Dissolved			100.2		%		80-120	19-NOV-19



## Quality Control Report

Workorder: L2383403

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4916453</b>							
<b>WG3221827-2</b>	<b>LCS</b>							
Cesium (Cs)-Dissolved			99.6		%		80-120	19-NOV-19
Chromium (Cr)-Dissolved			103.5		%		80-120	19-NOV-19
Cobalt (Co)-Dissolved			100.8		%		80-120	19-NOV-19
Copper (Cu)-Dissolved			98.9		%		80-120	19-NOV-19
Iron (Fe)-Dissolved			101.9		%		80-120	19-NOV-19
Lead (Pb)-Dissolved			105.4		%		80-120	19-NOV-19
Lithium (Li)-Dissolved			95.3		%		80-120	19-NOV-19
Magnesium (Mg)-Dissolved			102.5		%		80-120	19-NOV-19
Manganese (Mn)-Dissolved			109.8		%		80-120	19-NOV-19
Molybdenum (Mo)-Dissolved			101.8		%		80-120	19-NOV-19
Nickel (Ni)-Dissolved			101.7		%		80-120	19-NOV-19
Phosphorus (P)-Dissolved			103.3		%		70-130	19-NOV-19
Potassium (K)-Dissolved			109.4		%		80-120	19-NOV-19
Rubidium (Rb)-Dissolved			105.6		%		80-120	19-NOV-19
Selenium (Se)-Dissolved			101.1		%		80-120	19-NOV-19
Silicon (Si)-Dissolved			103.4		%		60-140	19-NOV-19
Silver (Ag)-Dissolved			99.6		%		80-120	19-NOV-19
Sodium (Na)-Dissolved			108.7		%		80-120	19-NOV-19
Strontium (Sr)-Dissolved			105.6		%		80-120	19-NOV-19
Sulfur (S)-Dissolved			96.4		%		80-120	19-NOV-19
Tellurium (Te)-Dissolved			97.8		%		80-120	19-NOV-19
Thallium (Tl)-Dissolved			103.0		%		80-120	19-NOV-19
Thorium (Th)-Dissolved			103.7		%		80-120	19-NOV-19
Tin (Sn)-Dissolved			98.5		%		80-120	19-NOV-19
Titanium (Ti)-Dissolved			106.2		%		80-120	19-NOV-19
Tungsten (W)-Dissolved			106.7		%		80-120	19-NOV-19
Uranium (U)-Dissolved			105.7		%		80-120	19-NOV-19
Vanadium (V)-Dissolved			103.1		%		80-120	19-NOV-19
Zinc (Zn)-Dissolved			102.3		%		80-120	19-NOV-19
Zirconium (Zr)-Dissolved			103.2		%		80-120	19-NOV-19
<b>WG3221827-1</b>	<b>MB</b>	<b>NP</b>						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	19-NOV-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4916453</b>							
<b>WG3221827-1</b>	<b>MB</b>	<b>NP</b>						
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	19-NOV-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	19-NOV-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	19-NOV-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	19-NOV-19
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	19-NOV-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	19-NOV-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-NOV-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-NOV-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	19-NOV-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	19-NOV-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	19-NOV-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	19-NOV-19
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	19-NOV-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-NOV-19
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	19-NOV-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	19-NOV-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	19-NOV-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	19-NOV-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-NOV-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	19-NOV-19
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	19-NOV-19
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	19-NOV-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	19-NOV-19
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	19-NOV-19
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	19-NOV-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-NOV-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	19-NOV-19



## Quality Control Report

Workorder: L2383403

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4916453</b>							
<b>WG3221827-1</b>	<b>MB</b>	<b>NP</b>						
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	19-NOV-19
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	19-NOV-19
<b>MET-T-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4918528</b>							
<b>WG3222529-2</b>	<b>LCS</b>							
Aluminum (Al)-Total			97.8		%		80-120	20-NOV-19
Antimony (Sb)-Total			93.3		%		80-120	20-NOV-19
Arsenic (As)-Total			100.9		%		80-120	20-NOV-19
Barium (Ba)-Total			98.7		%		80-120	20-NOV-19
Beryllium (Be)-Total			94.7		%		80-120	20-NOV-19
Bismuth (Bi)-Total			106.3		%		80-120	20-NOV-19
Boron (B)-Total			97.2		%		80-120	20-NOV-19
Cadmium (Cd)-Total			97.4		%		80-120	20-NOV-19
Calcium (Ca)-Total			96.9		%		80-120	20-NOV-19
Cesium (Cs)-Total			93.2		%		80-120	20-NOV-19
Chromium (Cr)-Total			99.8		%		80-120	20-NOV-19
Cobalt (Co)-Total			97.7		%		80-120	20-NOV-19
Copper (Cu)-Total			98.5		%		80-120	20-NOV-19
Iron (Fe)-Total			89.5		%		80-120	20-NOV-19
Lead (Pb)-Total			98.5		%		80-120	20-NOV-19
Lithium (Li)-Total			97.9		%		80-120	20-NOV-19
Magnesium (Mg)-Total			92.3		%		80-120	20-NOV-19
Manganese (Mn)-Total			96.6		%		80-120	20-NOV-19
Molybdenum (Mo)-Total			91.2		%		80-120	20-NOV-19
Nickel (Ni)-Total			96.1		%		80-120	20-NOV-19
Phosphorus (P)-Total			96.9		%		80-120	20-NOV-19
Potassium (K)-Total			98.9		%		80-120	20-NOV-19
Rubidium (Rb)-Total			99.0		%		80-120	20-NOV-19
Selenium (Se)-Total			99.9		%		80-120	20-NOV-19
Silicon (Si)-Total			100.8		%		80-120	20-NOV-19
Silver (Ag)-Total			93.7		%		80-120	20-NOV-19
Sodium (Na)-Total			102.7		%		80-120	20-NOV-19
Strontium (Sr)-Total			92.3		%		80-120	20-NOV-19
Sulfur (S)-Total			97.5		%		80-120	20-NOV-19



## Quality Control Report

Workorder: L2383403

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-VA</b>		<b>Water</b>						
<b>Batch</b>	<b>R4918528</b>							
<b>WG3222529-2 LCS</b>								
Tellurium (Te)-Total			87.8		%		80-120	20-NOV-19
Thallium (Tl)-Total			94.1		%		80-120	20-NOV-19
Thorium (Th)-Total			98.1		%		80-120	20-NOV-19
Tin (Sn)-Total			92.4		%		80-120	20-NOV-19
Titanium (Ti)-Total			96.1		%		80-120	20-NOV-19
Tungsten (W)-Total			100.1		%		80-120	20-NOV-19
Uranium (U)-Total			100.1		%		80-120	20-NOV-19
Vanadium (V)-Total			98.7		%		80-120	20-NOV-19
Zinc (Zn)-Total			101.1		%		80-120	20-NOV-19
Zirconium (Zr)-Total			90.0		%		80-120	20-NOV-19
<b>WG3222529-1 MB</b>								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	20-NOV-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	20-NOV-19
Boron (B)-Total			<0.010		mg/L		0.01	20-NOV-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	20-NOV-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	20-NOV-19
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	20-NOV-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	20-NOV-19
Iron (Fe)-Total			<0.010		mg/L		0.01	20-NOV-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	20-NOV-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	20-NOV-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	20-NOV-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	20-NOV-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	20-NOV-19
Phosphorus (P)-Total			<0.050		mg/L		0.05	20-NOV-19
Potassium (K)-Total			<0.050		mg/L		0.05	20-NOV-19
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	20-NOV-19



## Quality Control Report

Workorder: L2383403

Report Date: 28-NOV-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-VA</b>		<b>Water</b>						
<b>Batch</b>	<b>R4918528</b>							
<b>WG3222529-1</b>	<b>MB</b>							
Selenium (Se)-Total			<0.000050		mg/L		0.00005	20-NOV-19
Silicon (Si)-Total			<0.10		mg/L		0.1	20-NOV-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	20-NOV-19
Sodium (Na)-Total			<0.050		mg/L		0.05	20-NOV-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	20-NOV-19
Sulfur (S)-Total			<0.50		mg/L		0.5	20-NOV-19
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	20-NOV-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	20-NOV-19
Thorium (Th)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	20-NOV-19
Tungsten (W)-Total			<0.00010		mg/L		0.0001	20-NOV-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	20-NOV-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	20-NOV-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	20-NOV-19
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	20-NOV-19
<b>NH3-F-VA</b>		<b>Water</b>						
<b>Batch</b>	<b>R4921958</b>							
<b>WG3226248-2</b>	<b>LCS</b>							
Ammonia, Total (as N)			97.9		%		85-115	22-NOV-19
<b>WG3226248-1</b>	<b>MB</b>							
Ammonia, Total (as N)			<0.0050		mg/L		0.005	22-NOV-19
<b>NO2-L-IC-N-VA</b>		<b>Water</b>						
<b>Batch</b>	<b>R4915402</b>							
<b>WG3220780-2</b>	<b>LCS</b>							
Nitrite (as N)			99.7		%		90-110	17-NOV-19
<b>WG3220780-1</b>	<b>MB</b>							
Nitrite (as N)			<0.0010		mg/L		0.001	17-NOV-19
<b>NO3-L-IC-N-VA</b>		<b>Water</b>						
<b>Batch</b>	<b>R4915402</b>							
<b>WG3220780-2</b>	<b>LCS</b>							
Nitrate (as N)			100.9		%		90-110	17-NOV-19
<b>WG3220780-1</b>	<b>MB</b>							
Nitrate (as N)			<0.0050		mg/L		0.005	17-NOV-19
<b>PH-PCT-VA</b>		<b>Water</b>						



## Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>PH-PCT-VA</b>	<b>Water</b>							
Batch	R4915284							
WG3220653-2	CRM	VA-PH7-BUF						
pH			7.03		pH		6.9-7.1	18-NOV-19
<b>SO4-IC-N-VA</b>	<b>Water</b>							
Batch	R4915402							
WG3220780-2	LCS							
Sulfate (SO4)			100.6		%		90-110	17-NOV-19
WG3220780-1	MB							
Sulfate (SO4)			<0.30		mg/L		0.3	17-NOV-19
<b>TKN-F-VA</b>	<b>Water</b>							
Batch	R4923006							
WG3226267-2	LCS							
Total Kjeldahl Nitrogen			105.8		%		75-125	26-NOV-19
WG3226267-1	MB							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	26-NOV-19
<b>TSS-VA</b>	<b>Water</b>							
Batch	R4916130							
WG3221914-2	LCS							
Total Suspended Solids			94.7		%		85-115	19-NOV-19
WG3221914-1	MB							
Total Suspended Solids			<3.0		mg/L		3	19-NOV-19

# Quality Control Report

Workorder: L2383403

Report Date: 28-NOV-19

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## Legend:

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Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

## Sample Parameter Qualifier Definitions:

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Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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# Quality Control Report

Workorder: L2383403

Report Date: 28-NOV-19

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## Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
<b>Physical Tests</b>							
pH by Meter (Automated)	1	14-NOV-19 15:30	18-NOV-19 08:14	0.25	89	hours	EHTR-FM
<b>Aggregate Organics</b>							
Biochemical Oxygen Demand- 5 day	1	14-NOV-19 15:30	18-NOV-19 11:21	3	4	days	EHT

## Legend & Qualifier Definitions:

EHTR-FM: Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.  
EHTR: Exceeded ALS recommended hold time prior to sample receipt.  
EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.  
EHT: Exceeded ALS recommended hold time prior to analysis.  
Rec. HT: ALS recommended hold time (see units).

### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.  
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2383403 were received on 16-NOV-19 09:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes 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 pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.





REGIONAL DISTRICT OF KITIMAT-STIKINE  
ATTN: Chris Kerr  
# 300 - 4545 Lazelle Avenue  
Terrace BC V8G 4E1

Date Received: 08-MAY-19  
Report Date: 22-MAY-19 15:59 (MT)  
Version: FINAL

Client Phone: 250-615-6100

## Certificate of Analysis

Lab Work Order #: L2269974  
Project P.O. #: NOT SUBMITTED  
Job Reference: MEZIADIN LANDFILL SURFACE WATER  
C of C Numbers:  
Legal Site Desc:

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Amber Springer, B.Sc  
Account Manager

[This report shall not be reproduced except in full without the written authority of the Laboratory.]

ADDRESS: 8081 Lougheed Hwy, Suite 100, Burnaby, BC V5A 1W9 Canada | Phone: +1 604 253 4188 | Fax: +1 604 253 6700  
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2269974-1	L2269974-2	L2269974-3	L2269974-4	L2269974-5
		Description	Water	Water	Water	Water	Water
		Sampled Date	07-MAY-19	07-MAY-19	07-MAY-19	07-MAY-19	07-MAY-19
		Sampled Time	12:30	14:30	13:15		12:00
		Client ID	SW2017-01	SW2017-02	LAGOON OUTLET	BLANK	TRIP
Grouping	Analyte						
<b>WATER</b>							
<b>Physical Tests</b>	Conductivity (uS/cm)		12.9	25.4	445	<2.0	<2.0
	Hardness (as CaCO3) (mg/L)		5.37	11.3	172		<0.50
	pH (pH)		6.31	6.75	7.70	5.33	5.35
	Total Suspended Solids (mg/L)		3.7	<3.0	7.5	<3.0	51.3
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO3) (mg/L)		4.2	8.7	198	<1.0	<1.0
	Ammonia, Total (as N) (mg/L)		0.0077	0.0095	1.74	<0.0050	<0.0050
	Bromide (Br) (mg/L)		<0.050	<0.050	0.052	<0.050	<0.050
	Chloride (Cl) (mg/L)		<0.50	0.67	19.7	<0.50	<0.50
	Fluoride (F) (mg/L)		0.020	0.020	0.075	<0.020	<0.020
	Nitrate and Nitrite (as N) (mg/L)		<0.0051	0.0550	0.0157	<0.0051	<0.0051
	Nitrate (as N) (mg/L)		<0.0050	0.0550	0.0157	<0.0050	<0.0050
	Nitrite (as N) (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)		0.236	0.389	2.71	<0.050	<0.050
Sulfate (SO4) (mg/L)		0.42	0.99	18.6	<0.30	<0.30	
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)		0.331	0.189	0.0480	<0.0030	<0.0030
	Antimony (Sb)-Total (mg/L)		<0.00010	<0.00010	<0.00020 <sup>DLA</sup>	<0.00010	<0.00010
	Arsenic (As)-Total (mg/L)		0.00012	0.00012	0.00127	<0.00010	<0.00010
	Barium (Ba)-Total (mg/L)		0.00894	0.00878	0.128	<0.00010	<0.00010
	Beryllium (Be)-Total (mg/L)		<0.00010	<0.00010	<0.00020 <sup>DLA</sup>	<0.00010	<0.00010
	Bismuth (Bi)-Total (mg/L)		<0.000050	<0.000050	<0.00010 <sup>DLA</sup>	<0.000050	<0.000050
	Boron (B)-Total (mg/L)		<0.010	<0.010	0.124	<0.010	<0.010
	Cadmium (Cd)-Total (mg/L)		0.0000179	0.0000584	0.000019	<0.000050	<0.000050
	Calcium (Ca)-Total (mg/L)		1.41	3.07	55.1	<0.050	<0.050
	Cesium (Cs)-Total (mg/L)		<0.000010	<0.000010	<0.000020 <sup>DLA</sup>	<0.000010	<0.000010
	Chromium (Cr)-Total (mg/L)		0.00063	0.00039	0.00055	<0.00010	<0.00010
	Cobalt (Co)-Total (mg/L)		<0.00010	<0.00010	0.00099	<0.00010	<0.00010
	Copper (Cu)-Total (mg/L)		0.00112	0.00086	<0.0010 <sup>DLA</sup>	<0.00050	<0.00050
	Iron (Fe)-Total (mg/L)		0.127	0.056	2.46	<0.010	<0.010
	Lead (Pb)-Total (mg/L)		<0.000050	<0.000050	<0.00010 <sup>DLA</sup>	<0.000050	<0.000050
	Lithium (Li)-Total (mg/L)		<0.0010	<0.0010	<0.0020 <sup>DLA</sup>	<0.0010	<0.0010
	Magnesium (Mg)-Total (mg/L)		0.485	0.795	10.2	<0.0050	<0.0050
	Manganese (Mn)-Total (mg/L)		0.00691	0.00515	5.86	<0.00010	<0.00010
	Mercury (Hg)-Total (mg/L)		0.0000100	0.0000085	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Total (mg/L)		<0.000050	<0.000050	0.00070	<0.000050	<0.000050
	Nickel (Ni)-Total (mg/L)		0.00133	0.00106	0.0028	<0.00050	<0.00050
	Phosphorus (P)-Total (mg/L)		<0.050	<0.050	0.21	<0.050	<0.050
	Potassium (K)-Total (mg/L)		0.179	0.215	3.51	<0.050	<0.050

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L2269974-1 Water 07-MAY-19 12:30 SW2017-01	L2269974-2 Water 07-MAY-19 14:30 SW2017-02	L2269974-3 Water 07-MAY-19 13:15 LAGOON OUTLET	L2269974-4 Water 07-MAY-19 BLANK	L2269974-5 Water 07-MAY-19 12:00 TRIP
Grouping	Analyte					
<b>WATER</b>						
<b>Total Metals</b>	Rubidium (Rb)-Total (mg/L)	0.00022	<0.00020	0.00150 <sup>DLA</sup>	<0.00020	<0.00020
	Selenium (Se)-Total (mg/L)	0.000115	0.000066	<0.00010	<0.000050	<0.000050
	Silicon (Si)-Total (mg/L)	2.37	1.93	2.49 <sup>DLA</sup>	<0.10	<0.10
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010	<0.000020	<0.000010	<0.000010
	Sodium (Na)-Total (mg/L)	0.705	1.27	16.0	<0.050	<0.050
	Strontium (Sr)-Total (mg/L)	0.00988	0.0202	0.310	<0.00020	<0.00020
	Sulfur (S)-Total (mg/L)	<0.50	0.53	6.8 <sup>DLA</sup>	<0.50	<0.50
	Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00040 <sup>DLA</sup>	<0.00020	<0.00020
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000020 <sup>DLA</sup>	<0.000010	<0.000010
	Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00020 <sup>DLA</sup>	<0.00010	<0.00010
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	<0.00020 <sup>DLA</sup>	<0.00010	<0.00010
	Titanium (Ti)-Total (mg/L)	0.00264	0.00079	<0.00090 <sup>DLM</sup>	<0.00030	<0.00030
	Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00020 <sup>DLA</sup>	<0.00010	<0.00010
	Uranium (U)-Total (mg/L)	<0.000010	<0.000010	0.000029 <sup>DLA</sup>	<0.000010	<0.000010
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050	<0.0010 <sup>DLA</sup>	<0.00050	<0.00050
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	<0.0060 <sup>DLA</sup>	<0.0030	<0.0030
	Zirconium (Zr)-Total (mg/L)	0.000337	0.000210	<0.00012 <sup>DLA</sup>	<0.000060	<0.000060
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD		FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD		FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.267	0.203	0.0083 <sup>DLA</sup>		<0.0010
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00020		<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00012	0.00012	0.00124		<0.00010
	Barium (Ba)-Dissolved (mg/L)	0.00844	0.00939	0.112 <sup>DLA</sup>		<0.00010
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00020 <sup>DLA</sup>		<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.00010 <sup>DLA</sup>		<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	0.116		<0.010
	Cadmium (Cd)-Dissolved (mg/L)	0.0000115	0.0000474	0.000012		<0.0000050
	Calcium (Ca)-Dissolved (mg/L)	1.42	3.19	52.6 <sup>DLA</sup>		<0.050
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000020		<0.000010
	Chromium (Cr)-Dissolved (mg/L)	0.00042	0.00036	0.00032		<0.00010
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	0.00090 <sup>DLA</sup>		<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00102	0.00089	<0.00040 <sup>DLA</sup>		<0.00020
	Iron (Fe)-Dissolved (mg/L)	0.061	0.059	1.65 <sup>DLA</sup>		<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.00010 <sup>DLA</sup>		<0.000050
	Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	<0.0020 <sup>DLA</sup>		<0.0010
	Magnesium (Mg)-Dissolved (mg/L)	0.441	0.804	9.90		<0.0050
	Manganese (Mn)-Dissolved (mg/L)	0.00275	0.00244	5.50		<0.00010

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L2269974-1	L2269974-2	L2269974-3	L2269974-4	L2269974-5
		Description	Water	Water	Water	Water	Water
		Sampled Date	07-MAY-19	07-MAY-19	07-MAY-19	07-MAY-19	07-MAY-19
		Sampled Time	12:30	14:30	13:15		12:00
		Client ID	SW2017-01	SW2017-02	LAGOON OUTLET	BLANK	TRIP
Grouping	Analyte						
<b>WATER</b>							
<b>Dissolved Metals</b>	Mercury (Hg)-Dissolved (mg/L)		0.0000076	<0.0000050	<0.0000050		<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)		<0.000050	<0.000050	0.00063		<0.000050
	Nickel (Ni)-Dissolved (mg/L)		0.00109	0.00113	0.0027		<0.00050
	Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050	<0.10 <sup>DLA</sup>		<0.050
	Potassium (K)-Dissolved (mg/L)		0.175	0.230	3.40		<0.050
	Rubidium (Rb)-Dissolved (mg/L)		<0.00020	<0.00020	0.00154		<0.00020
	Selenium (Se)-Dissolved (mg/L)		0.000102	0.000080	<0.00010 <sup>DLA</sup>		<0.000050
	Silicon (Si)-Dissolved (mg/L)		2.19	1.89	2.45 <sup>DLA</sup>		<0.050
	Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000020 <sup>DLA</sup>		<0.000010
	Sodium (Na)-Dissolved (mg/L)		0.754	1.38	16.5		<0.050
	Strontium (Sr)-Dissolved (mg/L)		0.00851	0.0187	0.263		<0.00020
	Sulfur (S)-Dissolved (mg/L)		<0.50	<0.50	6.6 <sup>DLA</sup>		<0.50
	Tellurium (Te)-Dissolved (mg/L)		<0.00020	<0.00020	<0.00040 <sup>DLA</sup>		<0.00020
	Thallium (Tl)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000020 <sup>DLA</sup>		<0.000010
	Thorium (Th)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00020 <sup>DLA</sup>		<0.00010
	Tin (Sn)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00020 <sup>DLA</sup>		<0.00010
	Titanium (Ti)-Dissolved (mg/L)		0.00114	0.00079	<0.00060 <sup>DLA</sup>		<0.00030
	Tungsten (W)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00020 <sup>DLA</sup>		<0.00010
	Uranium (U)-Dissolved (mg/L)		<0.000010	<0.000010	0.000027 <sup>DLA</sup>		<0.000010
	Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050	<0.0010 <sup>DLA</sup>		<0.00050
	Zinc (Zn)-Dissolved (mg/L)		<0.0010	<0.0010	0.0023 <sup>DLA</sup>		<0.0010
	Zirconium (Zr)-Dissolved (mg/L)		0.000309	0.000252	<0.00012 <sup>DLA</sup>		<0.000060
<b>Aggregate Organics</b>	BOD (mg/L)		<2.0	<2.0	6.6	<2.0	<2.0
	COD (mg/L)		<20	28	25	<20	<20

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



## Reference Information

### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2269974-1, -2, -3, -5
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2269974-1, -2, -3, -5
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2269974-1, -2, -3, -5
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2269974-1, -2, -3, -5
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2269974-1, -2, -3, -5
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2269974-1, -2, -3, -5
Matrix Spike	Barium (Ba)-Total	MS-B	L2269974-5
Matrix Spike	Boron (B)-Total	MS-B	L2269974-5
Matrix Spike	Calcium (Ca)-Total	MS-B	L2269974-5
Matrix Spike	Copper (Cu)-Total	MS-B	L2269974-5
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2269974-5
Matrix Spike	Manganese (Mn)-Total	MS-B	L2269974-5
Matrix Spike	Molybdenum (Mo)-Total	MS-B	L2269974-5
Matrix Spike	Potassium (K)-Total	MS-B	L2269974-5
Matrix Spike	Selenium (Se)-Total	MS-B	L2269974-5
Matrix Spike	Sodium (Na)-Total	MS-B	L2269974-5
Matrix Spike	Strontium (Sr)-Total	MS-B	L2269974-5
Matrix Spike	Sulfur (S)-Total	MS-B	L2269974-5

### Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLA	Detection Limit adjusted for required dilution
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

### Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
<b>ALK-TITR-VA</b>	Water	Alkalinity Species by Titration	APHA 2320 Alkalinity
This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.			
<b>ANIONS-N+N-CALC-VA</b>	Water	Nitrite & Nitrate in Water (Calculation)	EPA 300.0
Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).			
<b>BOD5-VA</b>	Water	Biochemical Oxygen Demand- 5 day	APHA 5210 B- BIOCHEMICAL OXYGEN DEMAND
This analysis is carried out using procedures adapted from APHA Method 5210 B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.			
<b>BR-L-IC-N-VA</b>	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>CL-IC-N-VA</b>	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>COD-COL-VA</b>	Water	Chemical Oxygen Demand by Colorimetric	APHA 5220 D. CHEMICAL OXYGEN DEMAND
This analysis is carried out using procedures adapted from APHA Method 5220 "Chemical Oxygen Demand (COD)". Chemical oxygen demand is determined using the closed reflux colourimetric method.			
<b>EC-PCT-VA</b>	Water	Conductivity (Automated)	APHA 2510 Auto. Conduc.
This analysis is carried out using procedures adapted from APHA Method 2510 "Conductivity". Conductivity is determined using a conductivity electrode.			
<b>EC-SCREEN-VA</b>	Water	Conductivity Screen (Internal Use Only)	APHA 2510
Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.			
<b>F-IC-N-VA</b>	Water	Fluoride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			

## Reference Information

<b>HARDNESS-CALC-VA</b>	Water	Hardness	APHA 2340B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
<b>HG-D-CVAA-VA</b>	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)
Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
<b>HG-T-CVAA-VA</b>	Water	Total Mercury in Water by CVAAS or CVAFS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.			
<b>MET-D-CCMS-VA</b>	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
<b>MET-T-CCMS-VA</b>	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.			
Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.			
<b>NH3-F-VA</b>	Water	Ammonia in Water by Fluorescence	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.			
<b>NO2-L-IC-N-VA</b>	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>NO3-L-IC-N-VA</b>	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>PH-PCT-VA</b>	Water	pH by Meter (Automated)	APHA 4500-H pH Value
This analysis is carried out using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode			
It is recommended that this analysis be conducted in the field.			
<b>SO4-IC-N-VA</b>	Water	Sulfate in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
<b>TKN-F-VA</b>	Water	TKN in Water by Fluorescence	APHA 4500-NORG D.
This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.			
<b>TSS-VA</b>	Water	Total Suspended Solids by Gravimetric	APHA 2540 D - GRAVIMETRIC
This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, TSS is determined by drying the filter at 104 degrees celsius. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.			

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

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

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

**Chain of Custody Numbers:**

## Reference Information

### GLOSSARY OF REPORT TERMS

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

*mg/kg* - milligrams per kilogram based on dry weight of sample.

*mg/kg wwt* - milligrams per kilogram based on wet weight of sample.

*mg/kg lwt* - milligrams per kilogram based on lipid-adjusted weight of sample.

*mg/L* - milligrams per litre.

*<* - Less than.

*D.L.* - The reported Detection Limit, also known as the Limit of Reporting (LOR).

*N/A* - Result not available. Refer to qualifier code and definition for explanation.

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

**UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.**

*Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.*



## Quality Control Report

Workorder: L2269974

Report Date: 22-MAY-19

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Client: REGIONAL DISTRICT OF KITIMAT-STIKINE  
 # 300 - 4545 Lazelle Avenue  
 Terrace BC V8G 4E1

Contact: Chris Kerr

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>ALK-TITR-VA</b>								
	<b>Water</b>							
Batch	R4636456							
<b>WG3050881-3</b>	<b>CRM</b>	<b>VA-ALK-TITR-CONTROL</b>						
Alkalinity, Total (as CaCO3)			101.7		%		85-115	16-MAY-19
<b>WG3050881-1</b>	<b>MB</b>							
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	16-MAY-19
<b>BOD5-VA</b>								
	<b>Water</b>							
Batch	R4634780							
<b>WG3045602-2</b>	<b>LCS</b>							
BOD			107.5		%		85-115	09-MAY-19
<b>WG3045602-1</b>	<b>MB</b>							
BOD			<2.0		mg/L		2	09-MAY-19
<b>BR-L-IC-N-VA</b>								
	<b>Water</b>							
Batch	R4634873							
<b>WG3046433-2</b>	<b>LCS</b>							
Bromide (Br)			96.9		%		85-115	10-MAY-19
<b>WG3046433-1</b>	<b>MB</b>							
Bromide (Br)			<0.050		mg/L		0.05	10-MAY-19
<b>CL-IC-N-VA</b>								
	<b>Water</b>							
Batch	R4634873							
<b>WG3046433-2</b>	<b>LCS</b>							
Chloride (Cl)			97.0		%		90-110	10-MAY-19
<b>WG3046433-1</b>	<b>MB</b>							
Chloride (Cl)			<0.50		mg/L		0.5	10-MAY-19
<b>COD-COL-VA</b>								
	<b>Water</b>							
Batch	R4636781							
<b>WG3051458-3</b>	<b>LCS</b>							
COD			102.2		%		85-115	16-MAY-19
<b>WG3051458-1</b>	<b>MB</b>							
COD			<20		mg/L		20	16-MAY-19
<b>WG3051458-4</b>	<b>MS</b>	<b>L2269974-1</b>						
COD			104.5		%		75-125	16-MAY-19
<b>EC-PCT-VA</b>								
	<b>Water</b>							
Batch	R4636456							
<b>WG3050881-4</b>	<b>CRM</b>	<b>VA-EC-PCT-CONTROL</b>						
Conductivity			101.8		%		90-110	16-MAY-19
<b>WG3050881-1</b>	<b>MB</b>							
Conductivity			<2.0		uS/cm		2	16-MAY-19
<b>F-IC-N-VA</b>								
	<b>Water</b>							

## Quality Control Report

Workorder: L2269974

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>F-IC-N-VA</b>								
<b>Water</b>								
<b>Batch</b>	<b>R4634873</b>							
<b>WG3046433-2</b>	<b>LCS</b>							
Fluoride (F)			97.3		%		90-110	10-MAY-19
<b>WG3046433-1</b>	<b>MB</b>							
Fluoride (F)			<0.020		mg/L		0.02	10-MAY-19
<b>HG-D-CVAA-VA</b>								
<b>Water</b>								
<b>Batch</b>	<b>R4630750</b>							
<b>WG3046644-2</b>	<b>LCS</b>							
Mercury (Hg)-Dissolved			106.7		%		80-120	10-MAY-19
<b>WG3046644-1</b>	<b>MB</b>							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	10-MAY-19
<b>HG-T-CVAA-VA</b>								
<b>Water</b>								
<b>Batch</b>	<b>R4632026</b>							
<b>WG3047668-9</b>	<b>DUP</b>	<b>L2269974-5</b>						
Mercury (Hg)-Total		<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20	13-MAY-19
<b>WG3047668-8</b>	<b>LCS</b>							
Mercury (Hg)-Total			98.8		%		80-120	13-MAY-19
<b>WG3047668-7</b>	<b>MB</b>							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	13-MAY-19
<b>MET-D-CCMS-VA</b>								
<b>Water</b>								
<b>Batch</b>	<b>R4630452</b>							
<b>WG3045551-2</b>	<b>LCS</b>							
Aluminum (Al)-Dissolved			98.3		%		80-120	10-MAY-19
Antimony (Sb)-Dissolved			91.4		%		80-120	10-MAY-19
Arsenic (As)-Dissolved			92.8		%		80-120	10-MAY-19
Barium (Ba)-Dissolved			90.0		%		80-120	10-MAY-19
Beryllium (Be)-Dissolved			91.1		%		80-120	10-MAY-19
Bismuth (Bi)-Dissolved			91.5		%		80-120	10-MAY-19
Boron (B)-Dissolved			88.8		%		80-120	10-MAY-19
Cadmium (Cd)-Dissolved			89.9		%		80-120	10-MAY-19
Calcium (Ca)-Dissolved			93.1		%		80-120	10-MAY-19
Cesium (Cs)-Dissolved			98.7		%		80-120	10-MAY-19
Chromium (Cr)-Dissolved			92.2		%		80-120	10-MAY-19
Cobalt (Co)-Dissolved			89.8		%		80-120	10-MAY-19
Copper (Cu)-Dissolved			92.6		%		80-120	10-MAY-19
Iron (Fe)-Dissolved			100.4		%		80-120	10-MAY-19
Lead (Pb)-Dissolved			94.0		%		80-120	10-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4630452</b>							
<b>WG3045551-2</b>	<b>LCS</b>							
Lithium (Li)-Dissolved			93.2		%		80-120	10-MAY-19
Magnesium (Mg)-Dissolved			94.7		%		80-120	10-MAY-19
Manganese (Mn)-Dissolved			93.2		%		80-120	10-MAY-19
Molybdenum (Mo)-Dissolved			99.1		%		80-120	10-MAY-19
Nickel (Ni)-Dissolved			91.4		%		80-120	10-MAY-19
Phosphorus (P)-Dissolved			94.9		%		70-130	10-MAY-19
Potassium (K)-Dissolved			90.9		%		80-120	10-MAY-19
Rubidium (Rb)-Dissolved			93.5		%		80-120	10-MAY-19
Selenium (Se)-Dissolved			89.5		%		80-120	10-MAY-19
Silicon (Si)-Dissolved			92.6		%		60-140	10-MAY-19
Silver (Ag)-Dissolved			96.5		%		80-120	10-MAY-19
Sodium (Na)-Dissolved			90.8		%		80-120	10-MAY-19
Strontium (Sr)-Dissolved			93.4		%		80-120	10-MAY-19
Sulfur (S)-Dissolved			95.3		%		80-120	10-MAY-19
Tellurium (Te)-Dissolved			93.5		%		80-120	10-MAY-19
Thallium (Tl)-Dissolved			89.6		%		80-120	10-MAY-19
Thorium (Th)-Dissolved			95.7		%		80-120	10-MAY-19
Tin (Sn)-Dissolved			92.9		%		80-120	10-MAY-19
Titanium (Ti)-Dissolved			90.9		%		80-120	10-MAY-19
Tungsten (W)-Dissolved			96.2		%		80-120	10-MAY-19
Uranium (U)-Dissolved			100.6		%		80-120	10-MAY-19
Vanadium (V)-Dissolved			95.3		%		80-120	10-MAY-19
Zinc (Zn)-Dissolved			87.0		%		80-120	10-MAY-19
Zirconium (Zr)-Dissolved			95.5		%		80-120	10-MAY-19
<b>WG3045551-1</b>	<b>MB</b>	<b>NP</b>						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	10-MAY-19
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-19
Boron (B)-Dissolved			<0.010		mg/L		0.01	10-MAY-19
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	10-MAY-19
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	10-MAY-19



## Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4630452</b>							
<b>WG3045551-1</b>	<b>MB</b>	<b>NP</b>						
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	10-MAY-19
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	10-MAY-19
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	10-MAY-19
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-19
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	10-MAY-19
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	10-MAY-19
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-19
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-19
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	10-MAY-19
Potassium (K)-Dissolved			<0.050		mg/L		0.05	10-MAY-19
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	10-MAY-19
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	10-MAY-19
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	10-MAY-19
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	10-MAY-19
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	10-MAY-19
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	10-MAY-19
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	10-MAY-19
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	10-MAY-19
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	10-MAY-19
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	10-MAY-19
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	10-MAY-19
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	10-MAY-19
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	10-MAY-19
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	10-MAY-19
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	10-MAY-19

**MET-T-CCMS-VA**

**Water**



## Quality Control Report

Workorder: L2269974

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4630134</b>							
<b>WG3045727-3</b>	<b>DUP</b>	<b>L2269974-4</b>						
Aluminum (Al)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	10-MAY-19
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-19
Arsenic (As)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-19
Barium (Ba)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-19
Beryllium (Be)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-19
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-MAY-19
Boron (B)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	10-MAY-19
Cadmium (Cd)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	10-MAY-19
Calcium (Ca)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	10-MAY-19
Cesium (Cs)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	10-MAY-19
Chromium (Cr)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-19
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-19
Copper (Cu)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-19
Iron (Fe)-Total		<0.010	<0.010	RPD-NA	mg/L	N/A	20	10-MAY-19
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-MAY-19
Lithium (Li)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	10-MAY-19
Magnesium (Mg)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	10-MAY-19
Manganese (Mn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-19
Molybdenum (Mo)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-MAY-19
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-19
Phosphorus (P)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	10-MAY-19
Potassium (K)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	10-MAY-19
Rubidium (Rb)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	10-MAY-19
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	10-MAY-19
Silicon (Si)-Total		<0.10	<0.10	RPD-NA	mg/L	N/A	20	10-MAY-19
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	10-MAY-19
Sodium (Na)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	10-MAY-19
Strontium (Sr)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	10-MAY-19
Sulfur (S)-Total		<0.50	<0.50	RPD-NA	mg/L	N/A	20	10-MAY-19
Tellurium (Te)-Total		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	10-MAY-19
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	10-MAY-19
Thorium (Th)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-19
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-19
Titanium (Ti)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	10-MAY-19



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4630134</b>							
<b>WG3045727-3</b>	<b>DUP</b>	<b>L2269974-4</b>						
Tungsten (W)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	10-MAY-19
Uranium (U)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	10-MAY-19
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	10-MAY-19
Zinc (Zn)-Total		<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	10-MAY-19
Zirconium (Zr)-Total		<0.000060	<0.000060	RPD-NA	mg/L	N/A	20	10-MAY-19
<b>WG3045727-2</b>	<b>LCS</b>							
Aluminum (Al)-Total			96.7		%		80-120	10-MAY-19
Antimony (Sb)-Total			101.3		%		80-120	10-MAY-19
Arsenic (As)-Total			96.4		%		80-120	10-MAY-19
Barium (Ba)-Total			94.6		%		80-120	10-MAY-19
Beryllium (Be)-Total			97.8		%		80-120	10-MAY-19
Bismuth (Bi)-Total			99.1		%		80-120	10-MAY-19
Boron (B)-Total			92.5		%		80-120	10-MAY-19
Cadmium (Cd)-Total			96.5		%		80-120	10-MAY-19
Calcium (Ca)-Total			97.1		%		80-120	10-MAY-19
Cesium (Cs)-Total			98.0		%		80-120	10-MAY-19
Chromium (Cr)-Total			99.6		%		80-120	10-MAY-19
Cobalt (Co)-Total			98.6		%		80-120	10-MAY-19
Copper (Cu)-Total			98.6		%		80-120	10-MAY-19
Iron (Fe)-Total			96.3		%		80-120	10-MAY-19
Lead (Pb)-Total			100.4		%		80-120	10-MAY-19
Lithium (Li)-Total			96.0		%		80-120	10-MAY-19
Magnesium (Mg)-Total			99.8		%		80-120	10-MAY-19
Manganese (Mn)-Total			97.3		%		80-120	10-MAY-19
Molybdenum (Mo)-Total			102.0		%		80-120	10-MAY-19
Nickel (Ni)-Total			98.4		%		80-120	10-MAY-19
Phosphorus (P)-Total			98.2		%		80-120	10-MAY-19
Potassium (K)-Total			98.1		%		80-120	10-MAY-19
Rubidium (Rb)-Total			101.4		%		80-120	10-MAY-19
Selenium (Se)-Total			93.3		%		80-120	10-MAY-19
Silicon (Si)-Total			92.1		%		80-120	10-MAY-19
Silver (Ag)-Total			100.1		%		80-120	10-MAY-19
Sodium (Na)-Total			95.7		%		80-120	10-MAY-19
Strontium (Sr)-Total			97.9		%		80-120	10-MAY-19



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-VA</b>		<b>Water</b>						
<b>Batch</b>	<b>R4630134</b>							
<b>WG3045727-2</b>	<b>LCS</b>							
Sulfur (S)-Total			96.7		%		80-120	10-MAY-19
Tellurium (Te)-Total			102.5		%		80-120	10-MAY-19
Thallium (Tl)-Total			100.9		%		80-120	10-MAY-19
Thorium (Th)-Total			101.5		%		80-120	10-MAY-19
Tin (Sn)-Total			97.0		%		80-120	10-MAY-19
Titanium (Ti)-Total			96.5		%		80-120	10-MAY-19
Tungsten (W)-Total			103.1		%		80-120	10-MAY-19
Uranium (U)-Total			99.8		%		80-120	10-MAY-19
Vanadium (V)-Total			99.7		%		80-120	10-MAY-19
Zinc (Zn)-Total			95.8		%		80-120	10-MAY-19
Zirconium (Zr)-Total			97.0		%		80-120	10-MAY-19
<b>WG3045727-1</b>	<b>MB</b>							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	10-MAY-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	10-MAY-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	10-MAY-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	10-MAY-19
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	10-MAY-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	10-MAY-19
Boron (B)-Total			<0.010		mg/L		0.01	10-MAY-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	10-MAY-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	10-MAY-19
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	10-MAY-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	10-MAY-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	10-MAY-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	10-MAY-19
Iron (Fe)-Total			<0.010		mg/L		0.01	10-MAY-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	10-MAY-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	10-MAY-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	10-MAY-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	10-MAY-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	10-MAY-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	10-MAY-19
Phosphorus (P)-Total			<0.050		mg/L		0.05	10-MAY-19
Potassium (K)-Total			<0.050		mg/L		0.05	10-MAY-19



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4630134</b>							
<b>WG3045727-1 MB</b>								
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	10-MAY-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	10-MAY-19
Silicon (Si)-Total			<0.10		mg/L		0.1	10-MAY-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	10-MAY-19
Sodium (Na)-Total			<0.050		mg/L		0.05	10-MAY-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	10-MAY-19
Sulfur (S)-Total			<0.50		mg/L		0.5	10-MAY-19
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	10-MAY-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	10-MAY-19
Thorium (Th)-Total			<0.00010		mg/L		0.0001	10-MAY-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	10-MAY-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	10-MAY-19
Tungsten (W)-Total			<0.00010		mg/L		0.0001	10-MAY-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	10-MAY-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	10-MAY-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	10-MAY-19
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	10-MAY-19
<b>WG3045727-4 MS</b>		<b>L2269974-5</b>						
Aluminum (Al)-Total			97.7		%		70-130	10-MAY-19
Antimony (Sb)-Total			97.0		%		70-130	10-MAY-19
Arsenic (As)-Total			96.3		%		70-130	10-MAY-19
Barium (Ba)-Total			90.7		%		70-130	10-MAY-19
Beryllium (Be)-Total			100.7		%		70-130	10-MAY-19
Bismuth (Bi)-Total			94.6		%		70-130	10-MAY-19
Boron (B)-Total			100.2		%		70-130	10-MAY-19
Cadmium (Cd)-Total			98.6		%		70-130	10-MAY-19
Calcium (Ca)-Total			96.4		%		70-130	10-MAY-19
Cesium (Cs)-Total			97.6		%		70-130	10-MAY-19
Chromium (Cr)-Total			94.5		%		70-130	10-MAY-19
Cobalt (Co)-Total			97.7		%		70-130	10-MAY-19
Copper (Cu)-Total			97.2		%		70-130	10-MAY-19
Iron (Fe)-Total			98.7		%		70-130	10-MAY-19
Lead (Pb)-Total			95.3		%		70-130	10-MAY-19
Lithium (Li)-Total			99.0		%		70-130	10-MAY-19

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4630134</b>							
<b>WG3045727-4 MS</b>		<b>L2269974-5</b>						
Magnesium (Mg)-Total			98.5		%		70-130	10-MAY-19
Molybdenum (Mo)-Total			96.1		%		70-130	10-MAY-19
Nickel (Ni)-Total			97.8		%		70-130	10-MAY-19
Phosphorus (P)-Total			99.7		%		70-130	10-MAY-19
Potassium (K)-Total			97.0		%		70-130	10-MAY-19
Rubidium (Rb)-Total			97.1		%		70-130	10-MAY-19
Selenium (Se)-Total			97.2		%		70-130	10-MAY-19
Silicon (Si)-Total			91.1		%		70-130	10-MAY-19
Silver (Ag)-Total			100.2		%		70-130	10-MAY-19
Sodium (Na)-Total			95.8		%		70-130	10-MAY-19
Strontium (Sr)-Total			95.0		%		70-130	10-MAY-19
Sulfur (S)-Total			96.2		%		70-130	10-MAY-19
Tellurium (Te)-Total			99.2		%		70-130	10-MAY-19
Thallium (Tl)-Total			94.5		%		70-130	10-MAY-19
Thorium (Th)-Total			97.9		%		70-130	10-MAY-19
Tin (Sn)-Total			95.8		%		70-130	10-MAY-19
Titanium (Ti)-Total			98.0		%		70-130	10-MAY-19
Tungsten (W)-Total			96.4		%		70-130	10-MAY-19
Uranium (U)-Total			94.6		%		70-130	10-MAY-19
Vanadium (V)-Total			96.5		%		70-130	10-MAY-19
Zinc (Zn)-Total			98.9		%		70-130	10-MAY-19
Zirconium (Zr)-Total			94.8		%		70-130	10-MAY-19
<b>Batch</b>	<b>R4632495</b>							
<b>WG3046968-2 LCS</b>								
Aluminum (Al)-Total			98.5		%		80-120	11-MAY-19
Antimony (Sb)-Total			98.4		%		80-120	11-MAY-19
Arsenic (As)-Total			94.8		%		80-120	11-MAY-19
Barium (Ba)-Total			94.9		%		80-120	11-MAY-19
Beryllium (Be)-Total			91.0		%		80-120	11-MAY-19
Bismuth (Bi)-Total			89.9		%		80-120	11-MAY-19
Boron (B)-Total			92.1		%		80-120	11-MAY-19
Cadmium (Cd)-Total			93.8		%		80-120	11-MAY-19
Calcium (Ca)-Total			91.1		%		80-120	11-MAY-19
Cesium (Cs)-Total			96.2		%		80-120	11-MAY-19



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-VA</b>		<b>Water</b>						
<b>Batch</b>	<b>R4632495</b>							
<b>WG3046968-2</b>	<b>LCS</b>							
Chromium (Cr)-Total			96.1		%		80-120	11-MAY-19
Cobalt (Co)-Total			95.0		%		80-120	11-MAY-19
Copper (Cu)-Total			91.8		%		80-120	11-MAY-19
Iron (Fe)-Total			95.6		%		80-120	11-MAY-19
Lead (Pb)-Total			91.0		%		80-120	11-MAY-19
Lithium (Li)-Total			93.7		%		80-120	11-MAY-19
Magnesium (Mg)-Total			95.9		%		80-120	11-MAY-19
Manganese (Mn)-Total			96.7		%		80-120	11-MAY-19
Molybdenum (Mo)-Total			98.2		%		80-120	11-MAY-19
Nickel (Ni)-Total			92.1		%		80-120	11-MAY-19
Phosphorus (P)-Total			101.6		%		80-120	11-MAY-19
Potassium (K)-Total			95.9		%		80-120	11-MAY-19
Rubidium (Rb)-Total			99.1		%		80-120	11-MAY-19
Selenium (Se)-Total			94.9		%		80-120	11-MAY-19
Silicon (Si)-Total			101.7		%		80-120	11-MAY-19
Silver (Ag)-Total			92.7		%		80-120	11-MAY-19
Sodium (Na)-Total			100.3		%		80-120	11-MAY-19
Strontium (Sr)-Total			94.0		%		80-120	11-MAY-19
Sulfur (S)-Total			103.3		%		80-120	11-MAY-19
Tellurium (Te)-Total			93.2		%		80-120	11-MAY-19
Thallium (Tl)-Total			88.4		%		80-120	11-MAY-19
Thorium (Th)-Total			88.0		%		80-120	11-MAY-19
Tin (Sn)-Total			95.9		%		80-120	11-MAY-19
Titanium (Ti)-Total			89.8		%		80-120	11-MAY-19
Tungsten (W)-Total			102.8		%		80-120	11-MAY-19
Uranium (U)-Total			89.2		%		80-120	11-MAY-19
Vanadium (V)-Total			95.6		%		80-120	11-MAY-19
Zinc (Zn)-Total			93.0		%		80-120	11-MAY-19
Zirconium (Zr)-Total			95.0		%		80-120	11-MAY-19
<b>WG3046968-1</b>	<b>MB</b>							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	11-MAY-19
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	11-MAY-19
Arsenic (As)-Total			<0.00010		mg/L		0.0001	11-MAY-19
Barium (Ba)-Total			<0.00010		mg/L		0.0001	11-MAY-19



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4632495</b>							
<b>WG3046968-1</b>	<b>MB</b>							
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	11-MAY-19
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	11-MAY-19
Boron (B)-Total			<0.010		mg/L		0.01	11-MAY-19
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	11-MAY-19
Calcium (Ca)-Total			<0.050		mg/L		0.05	11-MAY-19
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	11-MAY-19
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	11-MAY-19
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	11-MAY-19
Copper (Cu)-Total			<0.00050		mg/L		0.0005	11-MAY-19
Iron (Fe)-Total			<0.010		mg/L		0.01	11-MAY-19
Lead (Pb)-Total			<0.000050		mg/L		0.00005	11-MAY-19
Lithium (Li)-Total			<0.0010		mg/L		0.001	11-MAY-19
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	11-MAY-19
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	11-MAY-19
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	11-MAY-19
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	11-MAY-19
Phosphorus (P)-Total			<0.050		mg/L		0.05	11-MAY-19
Potassium (K)-Total			<0.050		mg/L		0.05	11-MAY-19
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	11-MAY-19
Selenium (Se)-Total			<0.000050		mg/L		0.00005	11-MAY-19
Silicon (Si)-Total			<0.10		mg/L		0.1	11-MAY-19
Silver (Ag)-Total			<0.000010		mg/L		0.00001	11-MAY-19
Sodium (Na)-Total			<0.050		mg/L		0.05	11-MAY-19
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	11-MAY-19
Sulfur (S)-Total			<0.50		mg/L		0.5	11-MAY-19
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	11-MAY-19
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	11-MAY-19
Thorium (Th)-Total			<0.00010		mg/L		0.0001	11-MAY-19
Tin (Sn)-Total			<0.00010		mg/L		0.0001	11-MAY-19
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	11-MAY-19
Tungsten (W)-Total			<0.00010		mg/L		0.0001	11-MAY-19
Uranium (U)-Total			<0.000010		mg/L		0.00001	11-MAY-19
Vanadium (V)-Total			<0.00050		mg/L		0.0005	11-MAY-19
Zinc (Zn)-Total			<0.0030		mg/L		0.003	11-MAY-19



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-VA</b>								
Water								
Batch R4632495								
WG3046968-1 MB								
Zirconium (Zr)-Total								
			<0.000060		mg/L		0.00006	11-MAY-19
<b>NH3-F-VA</b>								
Water								
Batch R4640477								
WG3053246-2 LCS								
Ammonia, Total (as N)								
			100.7		%		85-115	22-MAY-19
WG3053246-1 MB								
Ammonia, Total (as N)								
			<0.0050		mg/L		0.005	22-MAY-19
<b>NO2-L-IC-N-VA</b>								
Water								
Batch R4634873								
WG3046433-2 LCS								
Nitrite (as N)								
			96.3		%		90-110	10-MAY-19
WG3046433-1 MB								
Nitrite (as N)								
			<0.0010		mg/L		0.001	10-MAY-19
<b>NO3-L-IC-N-VA</b>								
Water								
Batch R4634873								
WG3046433-2 LCS								
Nitrate (as N)								
			97.8		%		90-110	10-MAY-19
WG3046433-1 MB								
Nitrate (as N)								
			<0.0050		mg/L		0.005	10-MAY-19
<b>PH-PCT-VA</b>								
Water								
Batch R4636456								
WG3050881-2 CRM								
pH								
		VA-PH7-BUF	6.99		pH		6.9-7.1	16-MAY-19
<b>SO4-IC-N-VA</b>								
Water								
Batch R4634873								
WG3046433-2 LCS								
Sulfate (SO4)								
			97.3		%		90-110	10-MAY-19
WG3046433-1 MB								
Sulfate (SO4)								
			<0.30		mg/L		0.3	10-MAY-19
<b>TKN-F-VA</b>								
Water								
Batch R4640661								
WG3053250-5 DUP								
Total Kjeldahl Nitrogen								
		L2269974-3	2.74		mg/L	0.8	20	22-MAY-19
		2.71						
WG3053250-2 LCS								

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>TKN-F-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4640661</b>							
<b>WG3053250-2</b>	<b>LCS</b>							
Total Kjeldahl Nitrogen			104.7		%		75-125	22-MAY-19
<b>WG3053250-1</b>	<b>MB</b>							
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	22-MAY-19
<b>WG3053250-6</b>	<b>MS</b>	<b>L2269974-2</b>						
Total Kjeldahl Nitrogen			104.0		%		70-130	22-MAY-19
<b>TSS-VA</b>								
	<b>Water</b>							
<b>Batch</b>	<b>R4635377</b>							
<b>WG3049483-8</b>	<b>LCS</b>							
Total Suspended Solids			91.3		%		85-115	14-MAY-19
<b>WG3049483-7</b>	<b>MB</b>							
Total Suspended Solids			<3.0		mg/L		3	14-MAY-19



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## Legend:

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Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

## Sample Parameter Qualifier Definitions:

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Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

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# Quality Control Report

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## Hold Time Exceedances:

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ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
<b>Physical Tests</b>							
pH by Meter (Automated)							
	1	07-MAY-19 12:30	16-MAY-19 12:32	0.25	216	hours	EHTR-FM
	2	07-MAY-19 14:30	16-MAY-19 12:32	0.25	214	hours	EHTR-FM
	3	07-MAY-19 13:15	16-MAY-19 12:32	0.25	215	hours	EHTR-FM
	4	07-MAY-19	16-MAY-19 12:32	0.25	216	hours	EHTR-FM
	5	07-MAY-19 12:00	16-MAY-19 12:32	0.25	216	hours	EHTR-FM

## Legend & Qualifier Definitions:

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EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

### Notes\*:

Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.  
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2269974 were received on 08-MAY-19 16:00.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

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The ALS Quality Control Report is provided to ALS clients upon request. ALS includes 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 pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.



**APPENDIX F**

# Historic Analytical Results

**Table F-1: Historic Surface Water Analytical Results  
2019 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																	
		SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	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	
<b>Conventional Parameters</b>																			
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 <sup>a</sup>	mg/L	0.005	<0.005	ND	ND	ND	ND	0.03	0.03	<0.03	0.05	<0.03	<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
Fluoride (F)	2.0 - 3.0 <sup>b</sup>	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.10	-	-	-	-	-
Nitrate (as N)	400	mg/L	0.002	0.007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	0.2 - 2.0 <sup>c</sup>	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	<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 <sup>b</sup>	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
<b>Total Metals</b>																			
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	<0.0001	<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 <sup>b</sup>	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 <sup>b</sup>	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 <sup>b</sup>	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 <sup>b</sup>	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 <sup>b</sup>	mg/L	0.00002	<0.00002	ND	1.8	-	-	0.0	-	<0.000005	<0.00002	<0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<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	-	-	-	-	ND	-	-	-	-	-	-	<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	1	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	0.085	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	-	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 <sup>b</sup>	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 M40/2019, includes amendments up to BC Regs. 11/2019 and 13/2019, updated to 24 Jan 2019).

<sup>a</sup> = pH dependent; <sup>b</sup> = hardness dependent; <sup>c</sup> = chloride dependent

<sup>d</sup> = 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-2: Historic Surface Water Analytical Results  
2019 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	Meziadin - Upstream Surface Water Log Weir																
						SW-1																
						SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	SW-1	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	
<b>Conventional Parameters</b>																						
Conductivity	-	-	-	-	uS/cm	40	70	49	52.3	28.9	16.2	40.2	71.6	56.2	44.4	31.7	15.3	32.7	20	49.2	19.1	
Hardness (Total as CaCO3)	-	-	-	-	mg/L	18.6	-	-	-	-	9.664506173	18.92479424	34.6	19.6	20.5	12.4	6.38	13.3	8.37	20.4	7.99	
Hardness (Dissolved as CaCO3)	-	-	-	-	mg/L	19.6	-	-	-	-	-	-	-	-	-	-	-	13.2	-	-	-	
pH	6.5-9.0	-	-	-	-	7.3	7.4	7.14	7.2	6.3	6.2	6.1	6.9	6.4	7.1	6.5	6.1	6	6.2	6.5	6.1	
Total Suspended Solids	-	-	25 mg/L (backgr. 25-250 mg/l)	-	mg/L	14	<4	-	-	-	-	-	-	-	-	-	4.2	1.6	5.5	7.5	-	
Total Dissolved Solids	-	-	-	-	mg/L	24	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Alkalinity, Total (as CaCO3)	-	-	-	-	mg/L	16.6	23.1	26	26	12.5	11.8	14	38.1	19.6	22.5	8.5	8	9	10	12	8	
Ammonia, Total (as N)	1.84 - 1.85	pH/T*	14.4 - 25.5	pH/T*	mg/L	0.005	<0.005	ND	ND	ND	ND	0.03	0.03	<0.03	0.05	<0.03	<0.03	<0.03	0.03	0.03		
Bromide (Br)	-	-	-	-	mg/L	0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Chloride (Cl)	150	-	600	-	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		
Fluoride (F)	-	-	0.23 - 0.91	H	mg/L	-	-	-	-	-	-	-	-	-	-	-	<0.10	-	-	-	-	
Nitrate (as N)	3	-	32.8	-	mg/L	0.002	0.007	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
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	0.002	0.007	-	-	-	-	-	-	-	-	-	-	0.013	<0.010	0.034	<1.0	
Total Kjeldahl Nitrogen	-	-	-	-	mg/L	0.24	0.16	0.38	0.27	0.4	0.14	0.34	0.278	10.7	0.736	0.463	0.19	1.07	0.22	0.53	0.53	
Phosphorus (P)-Total	-	-	-	-	mg/L	0.012	0.032	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sulfate (SO4)	128 - 218	H	-	-	mg/L	1.2	8.8	ND	ND	2	ND	-	ND	11.1	0.9	<0.5	<1.0	4.8	<1.0	0.034	<1.0	
Biological Oxygen Demand (BOD)	-	-	-	-	mg/L	10	-	ND	ND	ND	ND	ND	ND	<4	<6	<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	
<b>Total Metals</b>																						
Aluminum	0.05	pH	0.1	pH	mg/L	0.176	0.352	0.02	0.037	0.295	0.144	0.421	0.0318	0.182	0.132	0.337	0.159	0.087	0.179	0.116	0.174	
Antimony	-	-	-	-	mg/L	0.000022	0.000041	ND	ND	ND	-	-	-	0.000075	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	0.0002	<0.00010	
Arsenic	-	-	0.005	-	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	
Barium	-	-	-	-	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	
Beryllium	-	-	-	-	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	
Bismuth	-	-	-	-	mg/L	0.00002	<0.00002	ND	ND	ND	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	
Boron	1.2	-	-	-	mg/L	0.008	<0.008	ND	ND	ND	-	-	-	<0.05	<0.05	<0.05	0.011	<0.004	0.005	0.011	<0.004	
Cadmium	0.00003 - 0.0001	H	0.00003 - 0.0002	H	mg/L	0.00001	0.00003	ND	0.00015	ND	0.00001	-	0.000348	0.000018	0.000097	0.000011	0.00002	0.00009	0.00003	0.00004	<0.000010	
Calcium	-	-	-	-	mg/L	5.31	8.55	6.6	6.72	4.9	2.73	5.43	10.1	5.26	5.87	3.34	1.8	3.8	2.3	5.4	2.13	
Chromium	-	-	-	-	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	
Cobalt	0.004	-	0.11	-	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	0.0007	
Copper	0.002	H	0.002	H	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	
Iron	-	-	1	-	mg/L	0.063	0.361	0.048	0.166	0.285	0.093	0.0025	0.324	0.248	1.53	0.25	0.1	0.28	0.16	0.22	0.181	
Lead	0.0034 - 0.0041	H	0.0025 - 0.0211	H	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	
Lithium	-	-	-	-	mg/L	0.00017	0.00035	1.57	ND	ND	-	-	-	<0.0005	<0.005	<0.005	0.0003	0.0001	0.0001	0.0002	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	
Manganese	0.63307 - 0.75724	H	0.6103 - 0.9213	H	mg/L	0.00417	0.0122	0.038	0.089	0.014	0.034	0.025	0.999	0.0708	2.54	0.0111	0.0388	0.662	0.0861	0.715	0.0244	
Mercury	0.0001	-	-	-	mg/L	0.00005	0.00005	ND	0.00001	ND	-	0.00001	-	<0.00001	<0.00001	<0.00001	<0.00002	<0.00002	-	-	<0.00002	
Molybdenum	-	-	2	-	mg/L	0.00005	0.00007	0.00007	ND	ND	0.001	0.001	-	<0.00005	<0.001	<0.001	<0.0001	<0.0001	<0.0001	0.0001	<0.00010	
Nickel	-	-	-	-	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	
Phosphorus	-	-	-	-	mg/L	0.1	0.1	ND	-	-	-	-	0.022	0.124	0.101	0.038	<0.02	0.14	0.04	0.05	<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	
Selenium	0.002	-	-	-	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	
Silicon	-	-	-	-	mg/L	-	-	-	-	3.6	-	-	-	-	-	-	1.1	2.1	3	2.1	2.1	
Silver	0.00005 - 0.0015	H	0.0001 - 0.003	H	mg/L	0.00002	<0.00002	ND	1.81	-	-	0.000017	-	<0.00005	<0.00002	<0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	
Sodium	-	-	-	-	mg/L	1.19	1.69	1.45	ND	0.96	0.69	1.22	1.37	1.24	1.3	1.02	0.63	0.68	0.71	1.34	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	
Sulfur	-	-	-	-	mg/L	0.5	3.3	0.4	0.043	ND	-	-	-	<15	<3	<3	<1	<1	<1	3	<3.0	
Tellurium	-	-	-	-	mg/L	0.05	-	-	ND	ND	-	-	-	-	-	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	
Thallium	-	-	-	-	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	
Thorium	-	-	-	-	mg/L	-	-	-	-	ND	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<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	
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	
Uranium	-	-	-	-	mg/L	0.000003	0.000011	ND	ND	ND	-	-	-	0.000007	<0.0001	<0.0001	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	
Vanadium	-	-	-	-	mg/L	0.00016	0.00087	ND	ND	ND	-	-	-	0.00092	<0.005	<0.005	<0.001	<0.001	<0.001	<0.001	<0.0010	
Zinc	0.0075	H	0.03	H	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	
Zirconium	-	-	-	-	mg/L	0.005	-	ND	ND	ND	-	-	-	<0.0001	<0.0005	<0.0005	<0.0001	0.0001	0.0002	<0.0001	0.00017	

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 (AW-F).  
 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-3: Historic Surface Water Analytical Results  
2019 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
<b>Conventional Parameters</b>																	
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 <sup>a</sup>	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 <sup>b</sup>	mg/L	-	-	-	-	-	-	-	-	-	-	<0.10	-	-	-	-
Nitrate (as N)	400	mg/L	-	0.009	0.048	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	0.2 - 2.0 <sup>c</sup>	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 <sup>d</sup>	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
<b>Total Metals</b>																	
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	0.016	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 <sup>b</sup>	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 <sup>b</sup>	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 <sup>b</sup>	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 <sup>b</sup>	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 <sup>b</sup>	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	<0.000020
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	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 <sup>b</sup>	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 M40/2019, includes amendments up to BC Regs. 11/2019 and 13/2019, updated to 24 Jan 2019).  
<sup>a</sup> = pH dependent; <sup>b</sup> = hardness dependent; <sup>c</sup> = chloride dependent  
<sup>d</sup> = 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  
2019 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	
<b>Conventional Parameters</b>																					
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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
<b>Total Metals</b>																					
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  
2019 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
<b>Conventional Parameters</b>				
Conductivity	-	uS/cm	88.1	204
Hardness (Total as CaCO3)	-	mg/L	29.3	54.5
pH	-	pH	6.9	6.8
Total Suspended Solids	-	mg/L	3.7	3.8
Alkalinity, Total (as CaCO3)	-	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 (SO4)	<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
<b>Total Metals</b>				
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;  
<sup>a</sup> = pH dependent; <sup>b</sup> = hardness dependent; <sup>c</sup> = chloride dependent  
<sup>d</sup> = 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  
2019 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
<b>Conventional Parameters</b>							
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	-		<b>25 mg/L (backgr. 25-250 mg/l)</b>		mg/L	3.7	3.8
Alkalinity, Total (as CaCO3)	-		-		mg/L	36	52
Ammonia, Total (as N)	1.84	pH/T*	<b>21.8 - 22.9</b>	pH/T*	mg/L	<0.03	<0.03
Chloride (Cl)	150		<b>600</b>		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
<b>Total Metals</b>							
Aluminum	0.05	pH	<b>0.1</b>	pH	mg/L	<b>0.362</b>	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	<b>0.00017 - 0.00031</b>	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		<b>0.11</b>		mg/L	0.00104	0.00242
Copper	0.002 - 0.0022	H	<b>0.002 - 0.0071</b>	H	mg/L	0.00179	<b>0.00393</b>
Iron	-		<b>1</b>		mg/L	1.54	3.5
Lead	0.004 - 0.0048	H	<b>0.0171 - 0.0377</b>	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	<b>0.86289 - 1.14059</b>	H	mg/L	<b>1.68</b>	<b>2.41</b>
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	<b>0.0001, 0.003</b>	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	<b>0.033</b>	H	mg/L	<0.0040	<b>0.0384</b>
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  
2019 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 -	SW2017-4 - 1-Aug-17 -
<b>Conventional Parameters</b>				
Conductivity	-	uS/cm	103	108
Hardness (Total as CaCO3)	-	mg/L	31.2	39.5
Hardness (Dissolved as CaCO3)	-	mg/L	-	-
pH	-	pH	6.6	7.1
Total Suspended Solids	-	mg/L	8.2	11
Total Dissolved Solids	-	mg/L	-	-
Alkalinity, Total (as CaCO3)	-	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 (SO4)	<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
<b>Total Metals</b>				
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 Standards shown are from the BC Contaminated Sites Regulation (CSR);  
<sup>d</sup> = most conservative standards applied for chromium (between Cr(III) and  
 QAQC = quality assurance/quality control; FD = field duplicate;  
 FDA = field duplicate available

**Table F-8: Historic Surface Water Analytical Results  
2019 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	SW2017-4
						1-May-17	1-Aug-17
						-	-
						-	-
<b>Conventional Parameters</b>							
Conductivity	-		-		uS/cm	103	108
Hardness (Total as CaCO3)	-		-		mg/L	31.2	39.5
Hardness (Dissolved as CaCO3)	-		-		mg/L	-	-
pH	6.5-9.0		-		-	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)	1.84	pH/T*	19.1 - 24.7	pH/T*	mg/L	<0.03	<0.03
Chloride (Cl)	150		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)	128 - 429	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
<b>Total Metals</b>							
Aluminum	0.05	pH	0.1	pH	mg/L	0.317	0.0173
Antimony	0.009		-		mg/L	<0.00010	<0.00020
Arsenic	0.005		-		mg/L	0.00064	0.00074
Barium	1		-		mg/L	0.0122	<0.0050
Beryllium	0.00013		-		mg/L	<0.00010	<0.00010
Bismuth	-		-		mg/L	<0.00010	<0.00010
Boron	1.2		-		mg/L	0.046	0.0612
Cadmium	0.00009 - 0.00011	H	0.00018 - 0.00023	H	mg/L	0.00003	0.000028
Calcium	-		-		mg/L	9.37	11.3
Chromium	0.001 Cr VI, 0.0089 Cr III	V	-		mg/L	0.00116	<0.00050
Cobalt	0.004		0.11		mg/L	0.00108	0.00021
Copper	0.002	H	0.002	H	mg/L	0.00175	0.00145
Iron	-		1		mg/L	1.56	0.635
Lead	0.004 - 0.0043	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	0.74228 - 0.7788	H	0.88382 - 0.97529	H	mg/L	1.89	0.257
Mercury	0.0001		-		mg/L	-	0.000016
Molybdenum	2		-		mg/L	<0.00010	0.00012
Nickel	0.025-0.15		-		mg/L	0.00315	0.00098
Phosphorus	0.005-0.015		-		mg/L	<0.050	<0.050
Potassium	-		-		mg/L	1.17	1.22
Selenium	0.002		-		mg/L	<0.00050	<0.00050
Silicon	-		-		mg/L	3.2	<1.0
Silver	0.00005, 0.0015	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	0.0008		-		mg/L	<0.00020	<0.00020
Thorium	-		-		mg/L	<0.00010	<0.00010
Tin	-		-		mg/L	<0.00020	<0.00020
Titanium	-		-		mg/L	0.0083	<0.0050
Uranium	0.0085		-		mg/L	<0.00020	<0.00020
Vanadium	-		-		mg/L	<0.0010	<0.0010
Zinc	0.0075	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  
2019 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	SW2017-5
			-	-
			1-May-17	1-Aug-17
			-	-
<b>Parameters</b>				
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
<b>Total Metals</b>				
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 Standards shown are from the BC Contaminated Sites Regulation (CSR);  
<sup>d</sup> = most conservative standards applied for chromium (between Cr(III) and  
 QAQC = quality assurance/quality control; FD = field duplicate;  
 FDA = field duplicate available

**Table F-10: Historic Surface Water Analytical Results  
2019 Meziadin Landfill Annual Monitoring Program  
Regional District of Kitimat-Stikine**

Monitoring Location	Location 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 -
<b>Conventional Parameters</b>							
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	-		<b>25 mg/L (backgr. 25-250 mg/l)</b>		mg/L	<b>56</b>	<b>30</b>
Alkalinity, Total (as CaCO3)	-		-		mg/L	230	320
Ammonia, Total (as N)	1.84	pH/T*	<b>19.1</b>	pH/T*	mg/L	0.08	0.82
Chloride (Cl)	150		<b>600</b>		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
<b>Total Metals</b>							
Aluminum	0.05	pH	<b>0.1</b>	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	<b>0.30235 - 0.30301</b>	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		<b>0.11</b>		mg/L	0.00129	0.00291
Copper	0.0111 - 0.0118	H	<b>0.0281 - 0.0298</b>	H	mg/L	0.0011	0.00056
Iron	-		<b>1</b>		mg/L	<b>5.2</b>	<b>2.41</b>
Lead	0.015 - 0.016	H	<b>0.3001 - 0.325</b>	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	<b>3.60356 - 3.80192</b>	H	mg/L	<b>7.8</b>	<b>29</b>
Mercury	0.0001		-		mg/L	-	<0.00010
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	<b>0.09</b>	<b>0.108</b>
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	<b>0.0001, 0.003</b>	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	<0.00020	0.00022
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	<b>0.174 - 0.1875</b>	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),

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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