Regional District of
Kitimat-Stikine

2018 MEZIADIN LANDFILL ANNUAL REPORT

June 2019

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 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 2018, 422 tonnes of solid waste was deposited into the landfill, 122.9 tonnes of metal was diverted, and 0.7 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

Table of Contents

1.0 Introduction

This annual report covers the period from January to December 2018 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 2018;
- Total volume of waste recycled and diverted during 2018;
- Total volume of sewage waste discharge to septage facility during 2018;
- 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 materials that can be repurposed or recycled; the Meziadin landfill will accept over volume general non-recyclable type waste.

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 2018 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 2018

Material	2018 Quantity (tonnes)	
Waste Discharge		
Garbage	422*	
Diverted		
Metal		122.9
Tires		0.7**
Total	**422***	**134**

Note: *This value is based on pre-compaction volume (m^3) data collected from September to December 2018, inclusive, extrapolated to a 12-month data set. Volume data was converted to tonnage using the U.S. Environmental Protection Agencies *Volume to Weight Conversion Factors* (2016) value of 175kg/m^3 for uncompacted mixed municipal solid waste.
**This number is an estimate.

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 2018, 422 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).

The volume of septage received was not tracked during 2018.

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 2018, a total of 122.9 tonnes of metal was collected the Meziadin Landfill as scrap for recycling.

3.1.2 Tires

In 2018, a total of 0.7 tonnes of tires were collected at the Meziadin Facility for recycling through the Tire Stewardship of BC.

3.1.3 Clean Wood Waste

Clean wood waste is considered any wood product that has not be treated or painted. Clean wood is segregated and burned as outlined in the Operational Certificate. The volume of diverted wood waste was not recorded in 2018.

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 the September 2018, it was suspected wolves were gaining access to the facility, as wolf scat was observed within the fence line. After inspection of the fence line, a location was found in which wolves could access the facility under the fence. The fence was immediately repaired and secured, preventing any further access. 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

REPORT

Meziadin Landfill, Meziadin Junction, BC

2018 Annual Environmental Effects Monitoring Report

Submitted to:

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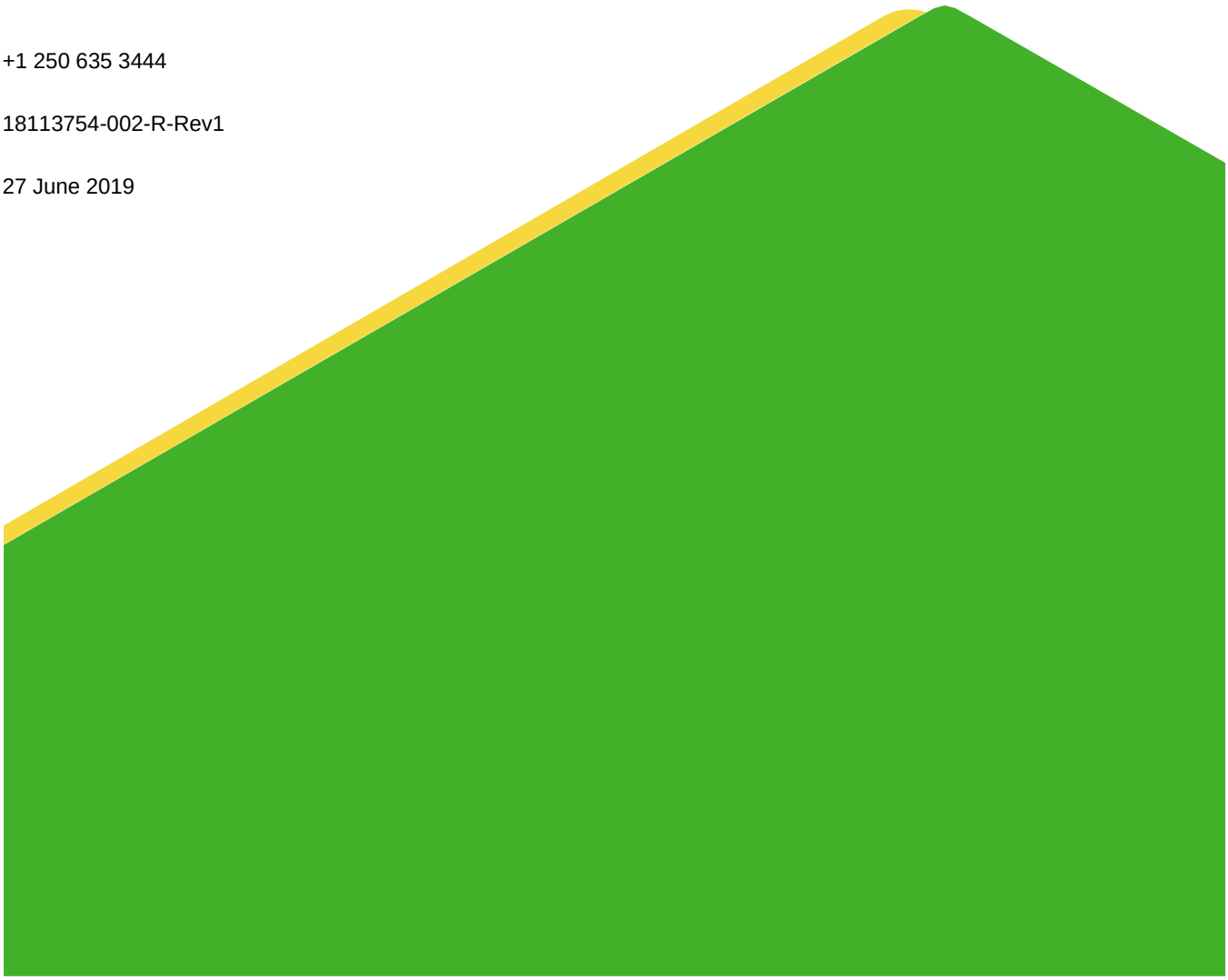

Distribution List

Executive Summary

The 2018 monitoring program indicates that the 2018 analytical results follow historic trends and confirm previous findings by Sperling Hansen Associates (SHA 2017).

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 further downstream, nor groundwater downgradient of the Landfill and the treatment lagoon.

Groundwater in the till unit, which underlies the majority of the Landfill, shows little to no impact from Landfill leachate. Most exceedances of applicable guidelines and regulations in groundwater appear to be the result of natural processes.

The local hydraulic gradient and flow direction appear to be similar to those measured in 1999 (AE 1999). Groundwater is flowing to the south and southeast. Seasonal variations were observed in 2018 and are attributed to differences in average precipitation between spring and fall.

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.

Table of Contents

TABLES

FIGURES

APPENDICES

1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by the Regional District of Kitimat-Stikine (RDKS) to prepare the 2018 Annual Environmental Effects Monitoring (EEM) Report for the Meziadin Landfill (the “Site”). The Site is located approximately 15 km south of Meziadin Junction, British Columbia, accessed from the Stewart-Cassiar Highway. Annual reporting is required by 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, we understand that 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.
- **Groundwater Monitoring**: Collection and analysis of groundwater samples from five monitoring wells, conducted once annually.
- **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 and an interpretation of the environmental monitoring results to assess the potential impacts of the Landfill on the surrounding environment.

The RDKS completed the surface water monitoring and groundwater sampling and quality assurance and control (QAQC) programs for the 2018 monitoring year. Chemical analysis of surface water and groundwater samples was conducted by ALS Environmental Ltd. The RDKS provided Golder with historic and 2018 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) until as recently as 2017 (SHA 2018). 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 15 km south 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 and approximately 900 m east of the Meziadin River. The site is relatively flat, and the Landfill encompasses an approximate area of 12 hectares.

A search of the BC water well atlas identified two domestic water wells located approximately 4 km west of the Landfill boundary. A list of water well records and locations are presented in APPENDIX B.

The Landfill is unlined and constructed on a site with natural attenuation. The Site is bound by two ridges on the east and west of the Site, assumed to be controlled by underlying bedrock. The Site gently slopes to the south, directing surface water flow towards the Meziadin River to the south and the Nass River to the southeast. The Site is underlain by sands and gravel ranging in thickness between 1 and 2 metres, which are 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 generally follows local topography at the Site and generally flows towards the south and southeast, similar to surface water.

Monitoring wells were installed, with the screened portion of the monitoring well set in the glacial till, with the following exceptions (Figure 2):

- MW-1A was screened across the till/underlying bedrock contact.
- MW-1B was screened in a sand and gravel layer bound above and below by glacial till.
- MW-2 was screened across the till/underlying bedrock contact.

Monitoring well information including depth to bottom, depth of screened interval and location data, is provided in 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.

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 collected from 1996 to 2018. Surface water has been collected at the Site since 2002. During the 2018 program, five groundwater monitoring wells and three surface water locations were sampled. Historically, additional select surface water sampling locations have been sampled. Sampling locations are shown in Figure 2. Inferred groundwater flow directions in relation to the Landfill are described below in Section 3.1.

Table 1: Sampling Locations with Spatial and Hydrogeologic Information

Location	Sample Type	Easting *UTM*	Northing *UTM*	Casing Elevation (approximate) *metres relative to local datum* [1]	Depth to Bottom (approximate) *metres relative to local datum* [1]	Ground Elevation (approximate) *metres relative to local datum* [1]	Screen (Top/Bottom, Stratigraphic Unit) *metres below ground surface*	Available Sample Period	Inferred Groundwater Gradient of Landfill
MW-1A (Deep)	**Monitoring Well**	**488849**	**6211888**	**82**	**72.33**	**81.13**	**7.31/8.84, Till/Bedrock**	**1997 – 2018**	**Downgradient**
MW-1B (Shallow)	**Monitoring Well**	**488849**	**6211888**	**82**	**75.19**	**81.13**	**4.42/5.94, Sand and Gravel**	**1997 – 2018**	**Downgradient**
MW-2	**Monitoring Well**	**489086**	**6211991**	**83.63**	**76.44**	**82.73**	**16/21, Till/Bedrock**	**1997 – 2018**	**Downgradient**
MW-3	**Monitoring Well**	**488900**	**6212335**	**90.83**	**80.94**	**89.94**	**25/30, Till**	**1997 – 2018**	**Upgradient**
MW-4	**Monitoring Well**	**488727**	**6212206**	**93.14**	**83.12**	**92.19**	**25/30, Till**	**1997 – 2018**	**Upgradient**
SW-3	**Surface Water**	**489057**	**6212019**	**-**	**-**	**-**	**-**	**2002 - 2018**	**Downgradient**
SW2017-1	**Surface Water**	**489242**	**6211804**	**-**	**-**	**-**	**-**	**2017 - 2018**	**Downgradient**
SW2017-2	**Surface Water**	**488842**	**6212294**	**-**	**-**	**-**	**-**	**2017 - 2018**	**Upgradient**
SW-1	Surface Water	488904	6212309	-	-	-	-	2004 - 2017	Upgradient
SW-2	Surface Water	489143	6212004	-	-	-	-	2003 - 2017	Downgradient
SW2017-3	Surface Water	489008	6211911	-	-	-	-	2017	Downgradient
SW2017-4	Surface Water	489070	6211901	-	-	-	-	2017	Downgradient
SW2017-5	Surface Water	489036	6212056	-	-	-	-	2017	Downgradient

Notes:
[1] Elevations are provided based on local datum of 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.
Bold indicates sampling locations that were sampled in 2018
Underlined indicates sampling locations that are required once per season (Spring (Mar – Apr), Summer (Jul – Aug), and Fall (Oct – Nov)) 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
SW-3	**Sample location of effluent treatment lagoon outlet water.**
SW2017-1	**New downstream surface water sampling location proposed as a replacement for SW-2. Location was established in 2017.**
SW2017-2	**New upstream surface water sampling location proposed as a replacement for SW-1. Location was established in 2017**
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 2018
Underlined indicates sampling locations that are required once per season (Spring (Mar – Apr), Summer (Jul – Aug), and Fall (Oct – Nov)) as per the Permit (APPENDIX A)

2.2 Groundwater Sampling

The 2018 groundwater monitoring program consisted of groundwater sampling at all five existing monitoring wells. Monitoring locations are shown in Figure 2.

Sampling was conducted twice annually (see Section 2.1) by RDKS field staff in May (Spring) and October (fall) 2018, 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 sampling, the depth to groundwater was measured using a water level probe, and the monitoring wells were purged. The monitoring wells were purged and sampled using dedicated Waterra™ tubing and footvalve with 0.016 m (5/8-inch diameter) polyethylene tubing. A maximum of three well volumes, based on the total height of the water column in the monitoring well, were removed prior to sampling.

Prior to any sampling activities, field instruments were calibrated to manufacturer's specifications in the field. During purging, a YSI Professional Plus multi-meter was used to collect measurements of 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 conditions were obtained and three well volumes were removed, indicating representative formation water was present. Purge water from the monitoring well sampling was collected during purging, transported and disposed of at a suitable location at the Landfill.

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 physical parameters, as outlined in above, in accordance of parameters presented in the Permit. Analytical Results and Certificates of Analysis for 2018 are presented in APPENDIX D and APPENDIX E respectively.

Table 3: Analytical water quality parameters analyzed for groundwater wells in 2018

Parameter	Season	
	Summer (May)	Fall (October)
Dissolved metals including mercury	✓	✓
Dissolved Hardness	✓	✓
Alkalinity	✓	✓
Chloride (Cl)	✓	✓
Fluoride (F)	✓	✓
Sulphate (SO_4)	✓	✓
pH	×*	✓
Conductivity	✓	✓
Total Dissolved Solids	✓	✓
Chemical Oxygen Demand (COD)	✓	✓
Ammonia (NH_3), Nitrate (NO_3), Nitrite (NO_2), Total Kjeldahl Nitrogen (TKN)	✓	✓

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.
* Laboratory pH was required in accordance with the Landfill Permit; however, during the May field event, this parameter was not analyzed. Field pH was collected.

Laboratory analysis for pH was not conducted during the May sampling event. However, field pH, which is considered to be more representative of Site conditions, was measured.

2.3 Surface Water Sampling

The surface water monitoring program consisted of water sampling at three locations, as shown in Figure 2. Surface water samples were collected in May 2018, 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). SW-3 was also collected in October 2018. SW2017-1 and SW2017-2 were dry in October 2018 and could not be sampled.

Prior to any sampling activities, field instruments were calibrated to manufacture's 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). Field turbidity measurements were obtained using a calibrated LaMotte 2020we field turbidity meter. 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 possible, 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 monitoring wells and the samples.

The surface samples were submitted to ALS Environmental Ltd for analysis of the following physical parameters, as outlined in Table 4, in accordance with parameters presented in the Permit:

Table 4: Analytical Parameters selected for Surface Water Samples in 2018

Parameter	Season	
	Summer (May)	Fall (October)
Dissolved metals including mercury	✓	✓
Dissolved Hardness	✓	✓
Total metals including mercury	✓	✓
Total Hardness	✓	✓
Alkalinity	✓	✓
Chloride (Cl)	✓	✓
Fluoride (F)	✓	✓
Sulphate (SO_4)	×	✓
pH	×*	✓
Conductivity	✓	✓
Total Suspended Solids	✓	✓
Biological Oxygen Demand (BOD)	✓	✓
Chemical Oxygen Demand (COD)	✓	✓
Ammonia (NH_3), Nitrate (NO_3), Nitrite (NO_2), Total Kjeldahl Nitrogen (TKN)	✓	✓

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.
* Laboratory pH was required in accordance with the Landfill Permit; however, during the May field event, this parameter was not analyzed. Field pH was collected.

Laboratory analysis for pH was not conducted during the May sampling event. However, field pH, which is considered to be more representative of Site conditions, was measured.

Deviations from Landfill Permit requirements

The following samples deviated form the required sampling protocol as follows:

- Summer (May): Surface water samples were not submitted for Sulphate. This omission is assumed to have been caused by an oversight during sampling and the subsequent submission of samples to the laboratory.

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 soil and groundwater 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 for each 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, field staff sample contamination). 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 and submitted for the same analytical parameters as all other samples.

- Submission of field duplicate samples per each 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:

$$RPD\ (\%) = \left|\left(\frac{(x1 - x2)}{average\ (x1, x2)}\right)\right| x100$$

  where *x*1 is the original sample result and *x*2 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 calculated. 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 *x*1 is the original sample result, *x*2 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:

- Groundwater: 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, a RPD greater than these targets may reflect “within 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 be 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 D and 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 March 2019). 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 and the available hydrogeological information of the underlying saturated geological materials gathered as part of previous investigations at the Site, none of the underlying saturated geological materials beneath the Landfill are considered an “aquifer” as defined in Protocol 21. Therefore, future drinking water use is not considered applicable and drinking water standards are not considered applicable to the Site.

Aquatic Life

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

Irrigation and Livestock Watering

The Site is not used for agricultural purposes and is not located within the 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 in monitoring well MW-2 is not required to adhere to the BC Water Quality Guidelines (BC WQG) as this well is located more than 10 m from aquatic receiving environments. The water quality for this well was compared to BC WQG for reference purposes only.

All surface water samples were compared to BC WQG for the protection of aquatic life in freshwater (AW-F) and for reference purposes, were also compared to CSR AW-F standards.

3.0 GROUNDWATER AND SURFACE WATER RESULTS

Analytical Results are presented in APPENDIX D, Table D-1 through D-17. Certificates of Analysis for 2018 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 elevations were measured from the top of casing of all monitoring wells. The local hydraulic gradient and flow direction appear to be similar to those measured in 1999 (AE 1999). Groundwater is flowing to the south and southeast. Groundwater elevation data for 2018 are provided alongside historic groundwater elevations following the installation of the monitoring wells and subsequent sampling events until 1999 (Table 5: Groundwater Elevations).

Table 5: Groundwater Elevations

Monitoring Well	Casing Elevation (approximate) *metres relative to local datum* [1]	Depth to Bottom (approximate) *metres relative to local datum* [1]	Ground Elevation (approximate) *metres relative to local datum* [1]	Depth to Water *(metres below top of casing)* [1]		Geodetic Elevation *(Local Datum)* [1]		Historic Water Level 1997 - 1999 *(Local Datum)* [2]		
				May-18	Oct-18	May-18	Oct-18	Minimum	Maximum	Average
MW-1A (Deep)	82	72.33	81.13	6.77	8.63	75.23	73.37	72.33	75.86	73.818
MW-1B (Shallow)	82	75.19	81.13	2.62	3.26	79.38	78.74	75.19	79.91	78.163
MW-2	83.63	76.44	82.73	1.52	3.04	82.11	80.59	76.44	81.63	79.67667
MW-3	90.83	80.94	89.94	6.1	6.94	84.73	83.89	80.94	85.64	82.66111
MW-4	93.14	83.12	92.19	6	5.91	87.14	87.23	83.12	90.723	85.59578

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

Seasonal variations with higher spring and lower fall water level measurements were observed at Monitoring wells MW-1A, -1B, -2 and -3 in 2018. These variations are attributed to variations in local precipitation. MW-4 did not appear to show seasonal variations in 2018. AE (1999) reported high groundwater elevations in MW-4 in May 1998 (90.723 m) and July 1999 (90.62 m). These high elevations were attributed to surface water seepage into the well. It is unclear if this problem was rectified following the 1999 sampling event. The range of groundwater elevations in MW-4 for years where no seepage was thought to be present ranged from 83.12 m to 85.7 m. Results for water elevations in 2018 are consistent with water elevations obtained in previous sampling events.

MW-1A and -1B are nested monitoring wells and were screened in the till/underlying bedrock interface (MW-1A – Deep well) and a sand and gravel unit bound above and below by glacial till (MW-1B – Shallow well). A slight downward gradient exists from MW-1B to MW-1A. The sand and gravel unit overlying the glacial till appears to be unsaturated everywhere else on Site where it was encountered (AE 1999).

3.2 Groundwater Quality

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

Analytical results for all monitoring wells are compared to CSR and BC WQG. Concentrations of all parameters for all monitoring wells were less than the CSR standards.

Concentrations for dissolved aluminum and manganese were greater than the BC WQG applicable guidelines for downgradient well MW-1B only, as outlined in Table 6. Concentrations at all other monitoring wells were lower than the applicable standards.

Table 6: Groundwater exceedances of BC WQG

Parameter/Guideline			Dissolved	
			Al	Mn
BCWQG AW - F (Long-term average)			0.05	0.61 - 4.13
BCWQG AW - F (Short-term maximum)			**0.1**	**0.54 - 9.37**
MW-1B	Downgradient	Mar-18	0.0209	**7.62**
		Oct-18	**0.118**	**10.5**

Notes:
All concentrations are given in mg/L
BC WQG = BC Water Quality Guidelines
AW – F = Aquatic Life – Freshwater
DW = Drinking Water
- = parameter did not exceed guideline
Al = Aluminum, Mn = Manganese
Underlined indicates parameter exceeds BC WQG Long Term
Bold and grey highlight indicates parameter exceeds BC WQG Maximum

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 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 before discharge.

SW2017-1 is considered downgradient of the Landfill and the Leachate Treatment Lagoon on an unnamed creek 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 7: Surface water exceedances of BC WQG

Parameter/Guideline			TSS	Total				Dissolved		
				Al	Fe	Mn	P	Al	Fe	Mn
BCWQG AW - F (Long-term average)			0.53 - 1.86	0.05	-	0.61 - 4.13	0.005-0.015	0.05	-	1.88 - 2.98
BCWQG AW - F (Short-term maximum)			**25 mg/L (backgr. 25-250 mg/l)**	**0.1**	**1**	**0.54 - 9.37**	-	**0.1**	**0.35**	**3.72 - 6.49**
SW-3	Downgradient	May-18	20	0.0595	**4.21**	**7.91**	0.405	0.0083	4.04	**8.2**
SW2017-1	Downgradient		<1	**0.176**	0.06	0.00178	0.00178	**0.187**	0.067	0.00258
SW2017-2	Upgradient		**61**	**1.13**	**1.13**	0.0423	<0.05	**0.263**	0.071	0.0115
SW-3	Downgradient	Oct-18	<3	0.0129	0.486	**3.58**	0.056	0.0097	0.029	**3.38**
SW2017-1	Downgradient		<3	**0.196**	0.078	0.0145	0.0145	NA	NA	NA
SW2017-2	Upgradient		**38.3**	**0.679**	0.411	0.0634	0.056	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
TSS = Total Suspended Solids, Al = Aluminum, Fe = Iron, Mn = Manganese, Phos = Phosphorous
Underlined indicates parameter exceeds BC WQG Long Term
Bold and grey highlight indicates parameter exceeds BC WQG Maximum
Grey font indicates parameter did not exceeded guidelines, parameter exceeded guideline during separate sampling event

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 surface samples in May and October 2018 to assess variability introduced through sampling and handling procedures. The surface water duplicate samples were collected at surface water station SW2017-2 (May 2018) and the groundwater duplicate samples were collected from MW-2 (October 2018). 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 both surface water and groundwater duplicate samples. The RPD is the absolute difference between the two values divided by the mean concentration and should be calculated for concentrations above five times the method detection limit. For samples with concentrations below this threshold, two times the detection limit value is considered the maximum acceptable difference between duplicates.

The surface water duplicate sample at SW2017-2 in May 2018 indicated the following calculated RPDs above the acceptable limit of 20%:

- Total Suspended Solids – 113% RPD (primary sample concentration 38.3 mg/L, duplicate sample concentration 137 mg/L

- Total Aluminum – 90% RPD (primary sample concentration 0.679 mg/L, duplicate sample concentration 1.8 mg/L)
- Total Barium – 52% RPD (primary sample concentration 0.0158 mg/L, duplicate sample concentration 0.0268 mg/L)
- Total Cadmium – 65% RPD (primary sample concentration 0.0000328 mg/L, duplicate sample concentration 0.0000642 mg/L)
- Total Cesium – 129% RPD (primary sample concentration 0.00002 mg/L, duplicate sample concentration 0.0000642 mg/L)
- Total Chromium – 104% RPD (primary sample concentration 0.00113 mg/L, duplicate sample concentration 0.00359 mg/L)
- Total Cobalt – 45% RPD (primary sample concentration 0.00048 mg/L, duplicate sample concentration 0.00076 mg/L)
- Total Copper – 61% RPD (primary sample concentration 0.00188 mg/L, duplicate sample concentration 0.00353 mg/L)
- Total Iron – 122% RPD (primary sample concentration 0.411 mg/L, duplicate sample concentration 1.69 mg/L)
- Total Iron – 77% RPD (primary sample concentration 0.000154 mg/L, duplicate sample concentration 0.000347 mg/L)
- Total Magnesium – 48% RPD (primary sample concentration 0.618 mg/L, duplicate sample concentration 1.01 mg/L)
- Total Manganese – 58% RPD (primary sample concentration 0.0634 mg/L, duplicate sample concentration 0.115 mg/L)
- Total Nickel – 86% RPD (primary sample concentration 0.00218 mg/L, duplicate sample concentration 0.00548 mg/L)
- Total Potassium – 29% RPD (primary sample concentration 0.24 mg/L, duplicate sample concentration 0.322 mg/L)
- Total Silicon – 34% RPD (primary sample concentration 3.04 mg/L, duplicate sample concentration 4.29 mg/L)
- Total Titanium – 121% RPD (primary sample concentration 0.0058 mg/L, duplicate sample concentration 0.0239 mg/L)

The groundwater duplicate sample at MW-2 (October 2018) showed no parameters with RPDs above the acceptable limit of 20%.

All results exceeding QA/QC limits are below applicable standards, and higher concentrations were generally reported in the secondary sample. Therefore, the results are conservative, and are considered satisfactory for the purpose of this report. The only parameters exceeding the QA/QC limits are total metals. These exceeding parameters are likely indicative of sample heterogeneity and total suspended solids in each sample. The available sampling volume at this site is relatively low. During sampling a high sediment load could have introduced this apparent heterogeneity.

In addition to the field duplicate samples, two field blank samples were submitted in May and October 2018. None of the parameters exceeded the QA/QC criteria in these samples. 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.

Holding times were exceeded for Nitrate and Nitrite in May 2018 suggesting that these parameters are likely biased low.

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

4.0 DISCUSSION

Several forms of graphical presentation were used to evaluate spatial and temporal water quality variations and are shown on Figures 3 through 4. The data set considered covers 1997 through 2018.

4.1 Leachate Indicator Parameters

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

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

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

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

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 2018 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 conductivity and concentrations of chloride, iron and 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.

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:

- Conductivity (Figure 4-A)
- Total and Dissolved Iron (Figure 4-B)
- Total and Dissolved Manganese (Figure 4-C)

In general, the data indicate that all parameters are relatively constant over the available sampling interval. Variations are apparent throughout the years and are indicative of different sampling conditions (i.e. different levels of precipitation, sample handling and sampling procedures). Iron (Figure 4-B) for the monitoring wells shows a minor increase since 2015.

For groundwater, downgradient concentrations (MW-2 and MW-1B) are generally lower than background groundwater concentrations at MW-3 and MW-4, with the exception of iron and manganese. Given that iron and manganese are generally lower than concentrations in the leachate outlet sample SW-3, it is assumed that these parameters are likely affected by a local source rather than landfill leachate.

The apparent fluctuations of manganese and the increase of iron in 2018 may be attributed to overall differences in precipitation and lower water levels. Water levels in all wells, with the exception of MW-4, were lower in October than they were in May suggesting that 2018 was generally drier than previous years and the “wet season” sampling in October was not a true representation of “wet season” conditions in 2018.

4.3 Evaluation of Groundwater and Surface Water Quality

As described in Section 4.2 the overall spatial and temporal analysis indicates that the Landfill generated leachate is quickly attenuated and does not appear to affect local groundwater and surface water. Concentrations downgradient of the Landfill are generally similar or lower than upgradient background concentrations. The highest concentrations of parameters are measured in SW-3 and appear to be quickly attenuated. None of the surface water samples were greater than the applicable CSR standards.

Groundwater at site appears to show little impact from leachate generated by the Landfill. All parameters were below the applicable guidelines and regulations, with the exception of dissolved aluminum and manganese in groundwater. These parameters may originate from natural sources in the glacial till unit underlying the majority of the Landfill.

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 further downstream, nor groundwater downgradient of the Landfill and the treatment lagoon. Groundwater in the till unit, which underlies the majority of the Landfill, shows little to no impact from Landfill leachate. Most exceedances of applicable guidelines and regulations in groundwater appear to be the result of natural processes.

All analytical results obtained in 2018 follow historic trends and confirm previous findings by SHA (2017). The quality control duplicate sample collected at the surface water location SW2017-2 in May 2018 indicated several total metal parameters that showed poor reproducibility. These results are likely indicative of sample heterogeneity and total suspended solids in each sample. The available sampling volume at this site is relatively low. During sampling a high sediment load could have introduced this apparent heterogeneity.

Recommendations for improving quality assurance in the RDKS landfill sampling program are presented below.

- Laboratory analytical results should be evaluated immediately following the receipt of data. This will allow the laboratory to potentially re-analyze samples should doubts exist regarding the quality of the samples (i.e. poor RPD of duplicate pairs, detection of parameters in field blanks, unusual concentrations for parameters).
- Duplicate samples should be collected at locations with the highest impact to water quality, to better evaluate sample collection and handling procedures. Parent and duplicate sample bottles should be filled simultaneously. To accomplish this, the parent sample should be filled to about half the volume, followed by the duplicate sample bottle to about the same volume. The process should be repeated until both bottles are filled. By filling sampling containers in this fashion, the sampling media will not be as strongly impacted by other factors such as suspended sediment.

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.

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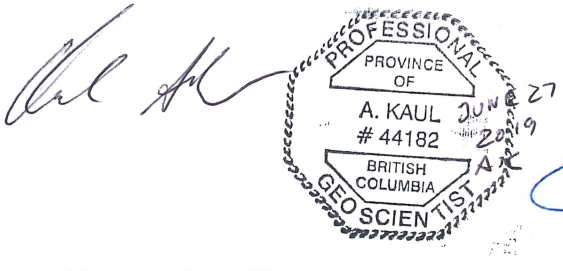

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Tchobanoglous, Theisen, and Vigil. 1993. Integrated Solid Waste Management: Engineering Principles and Management Issues. McGraw-Hill, Inc.

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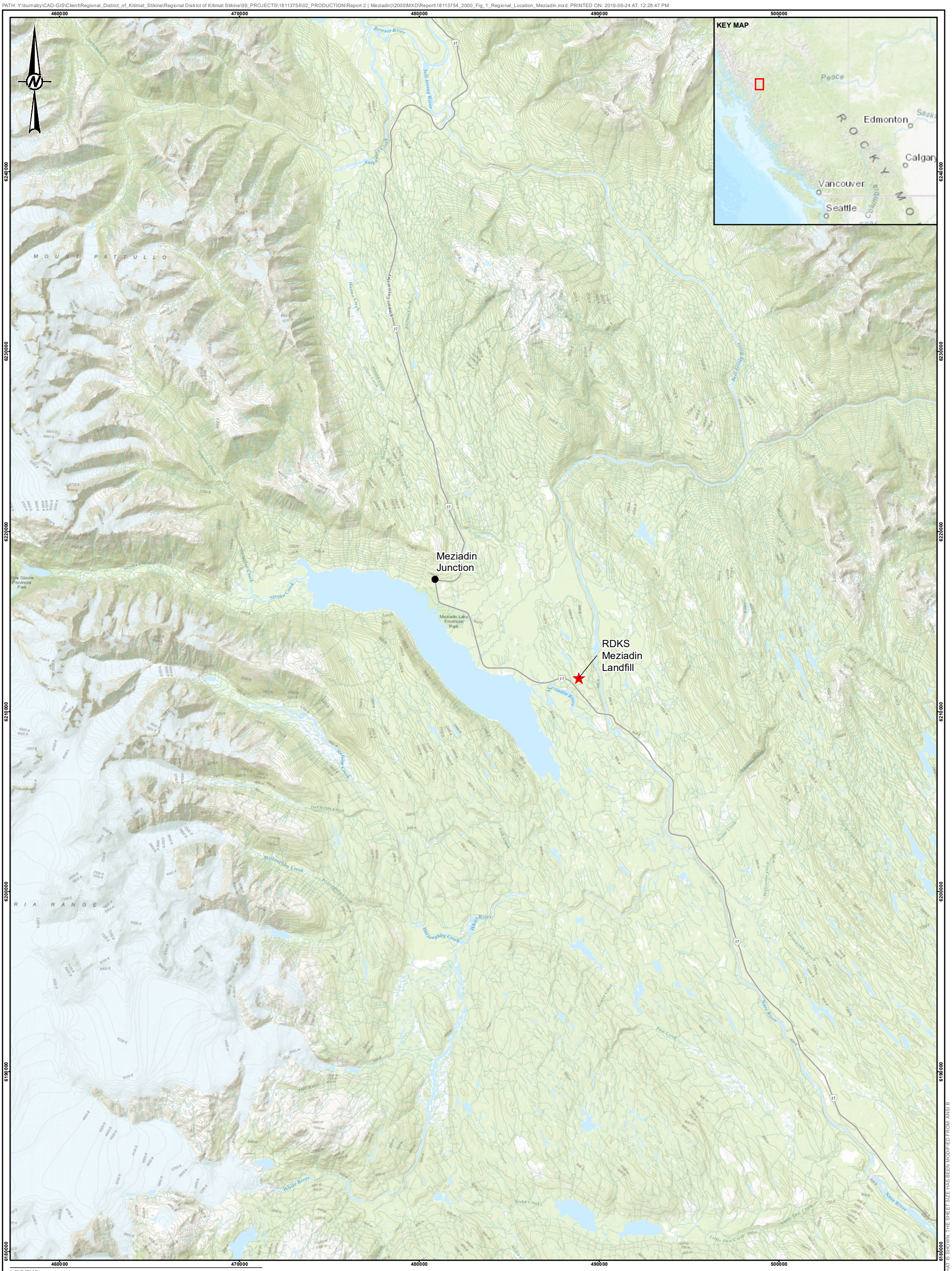

LEGEND

- ★ SITE LOCATION
- ● POINT OF INTEREST

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DATUM: NAD 83 PROJECTION: UTM ZONE 9

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REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT
2018 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT
GOLDER

YYYY-MM-DD	2019-06-24
DESIGNED	AK
PREPARED	CB
REVIEWED	AK
APPROVED	JPS

TITLE
REGIONAL LOCATION MAP

PROJECT NO.	CONTROL	REV.	FIGURE
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LEGEND

- WATERCOURSE
- CONTOUR

SAMPLE LOCATIONS

- MONITORING WELL
- SURFACE WATER

0 60 120

1:3,000 METRES

REFERENCE(S)

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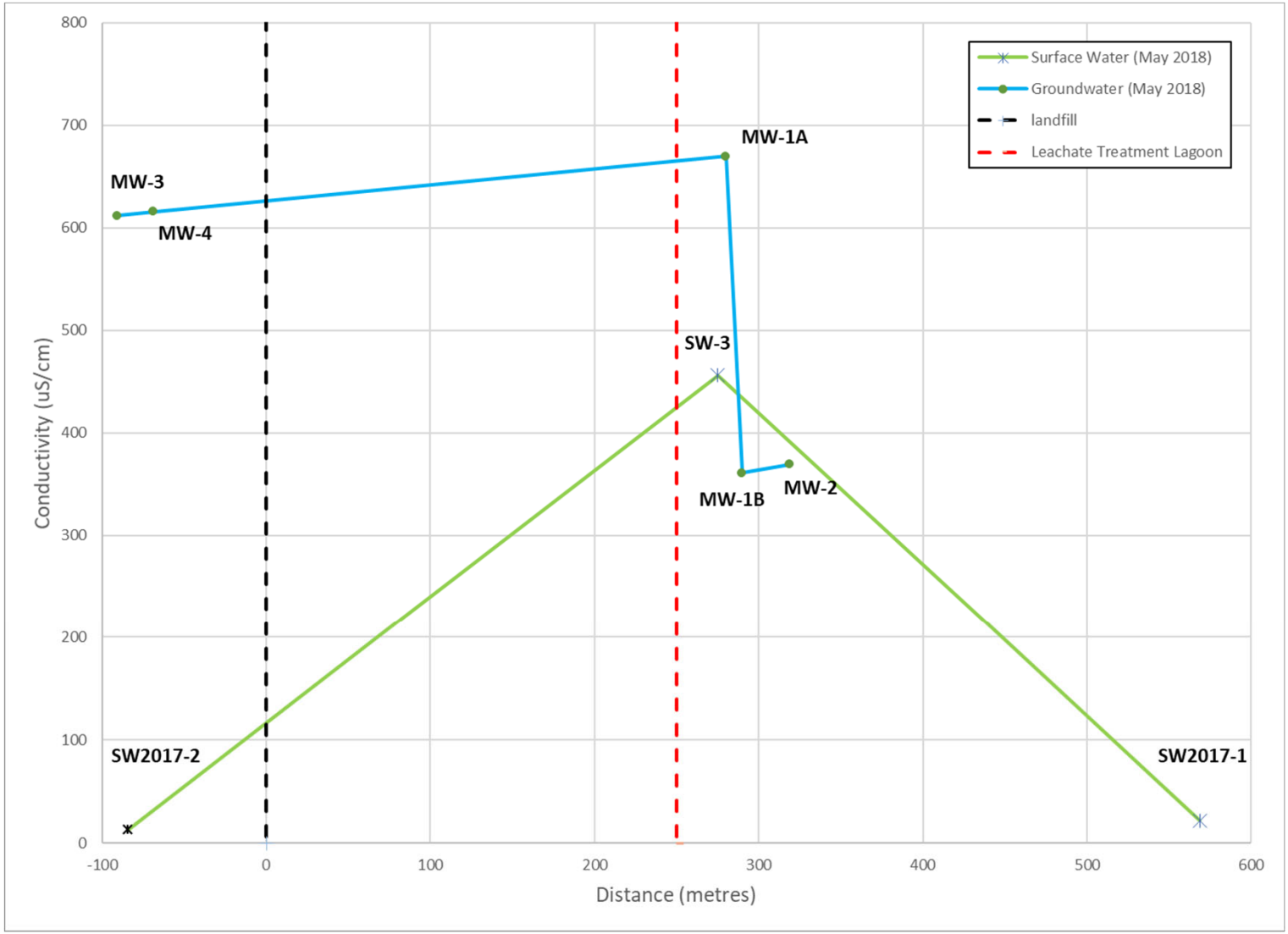

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PREPARED	AK
DESIGN	AK
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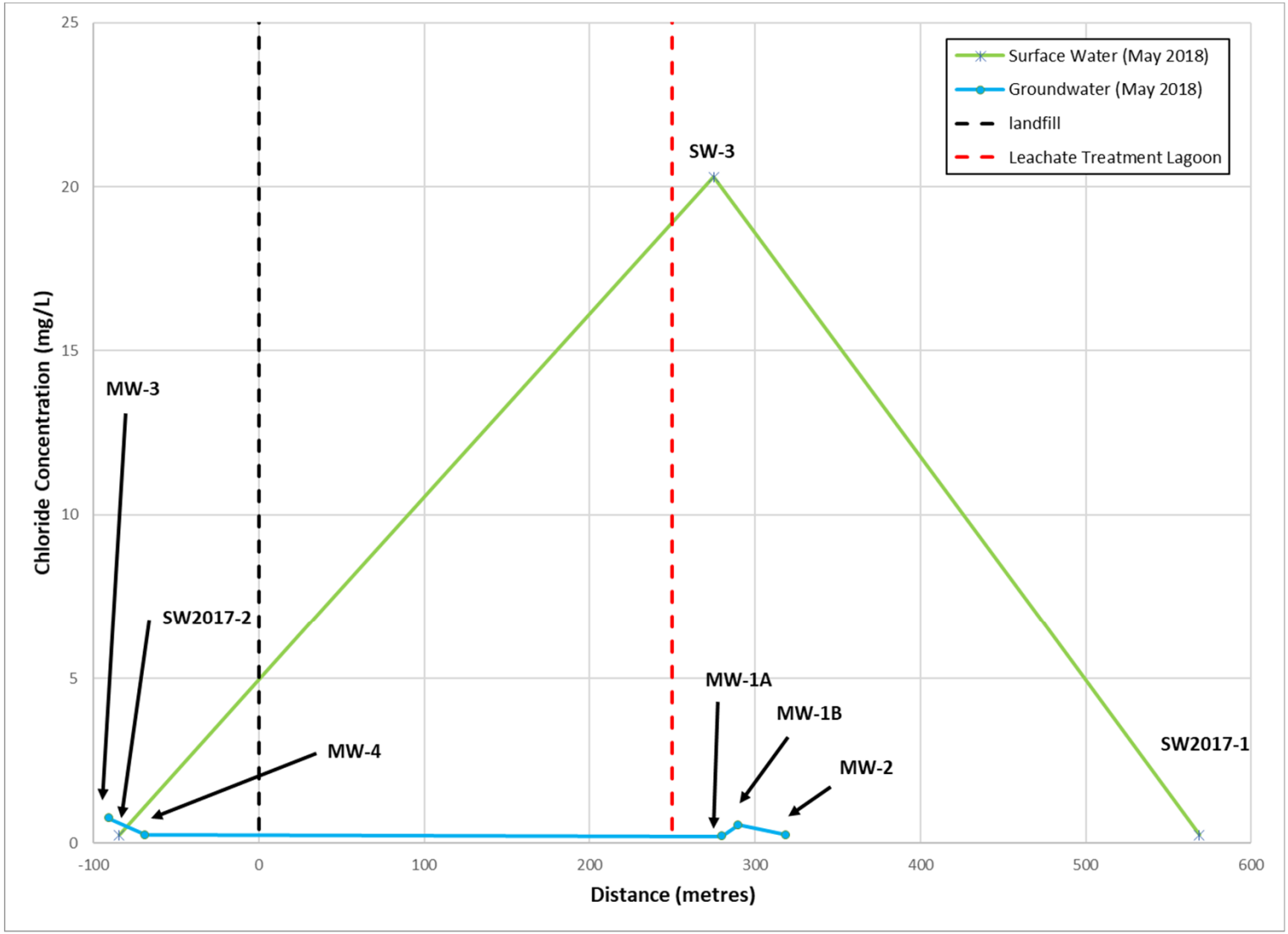

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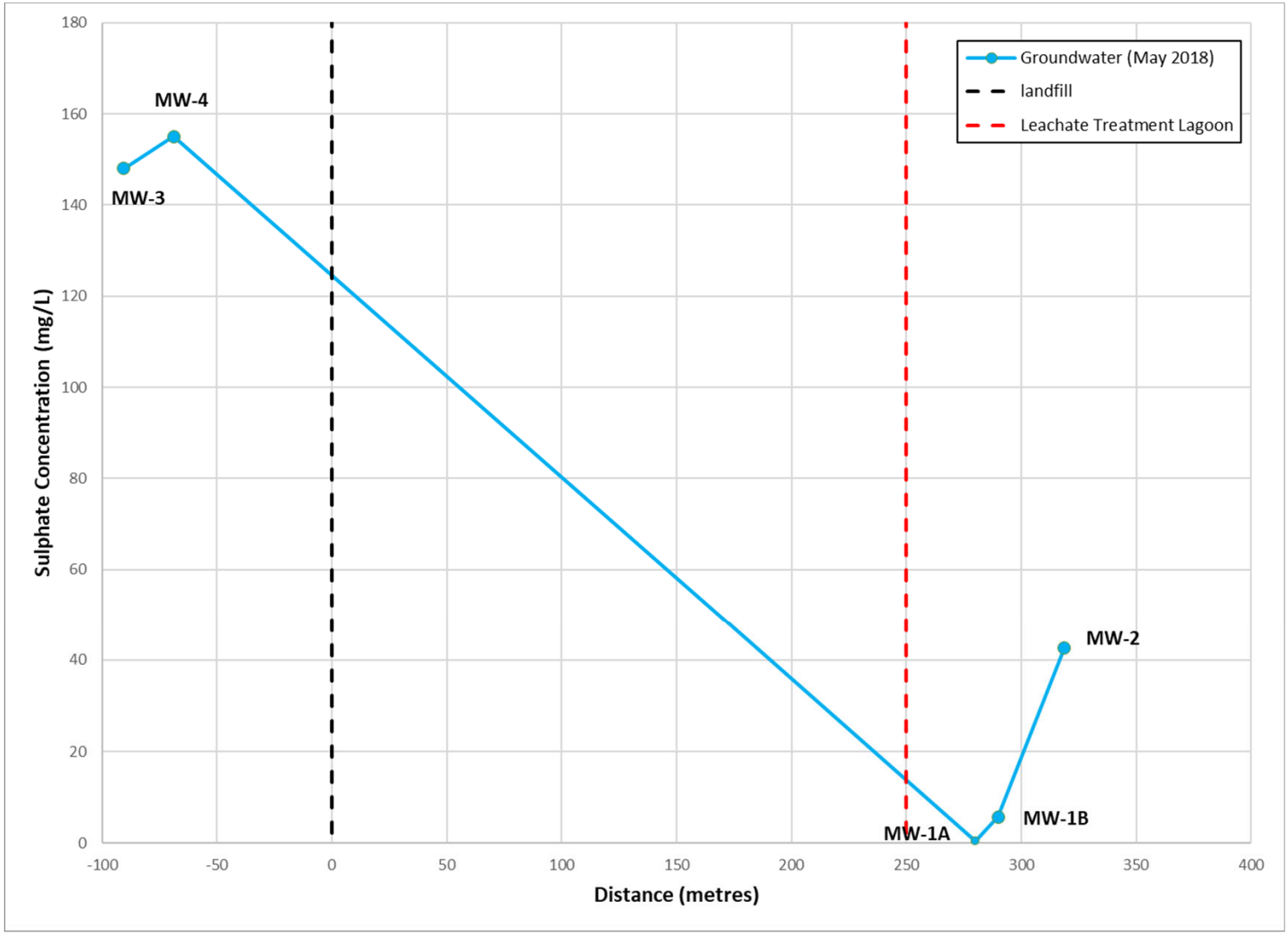

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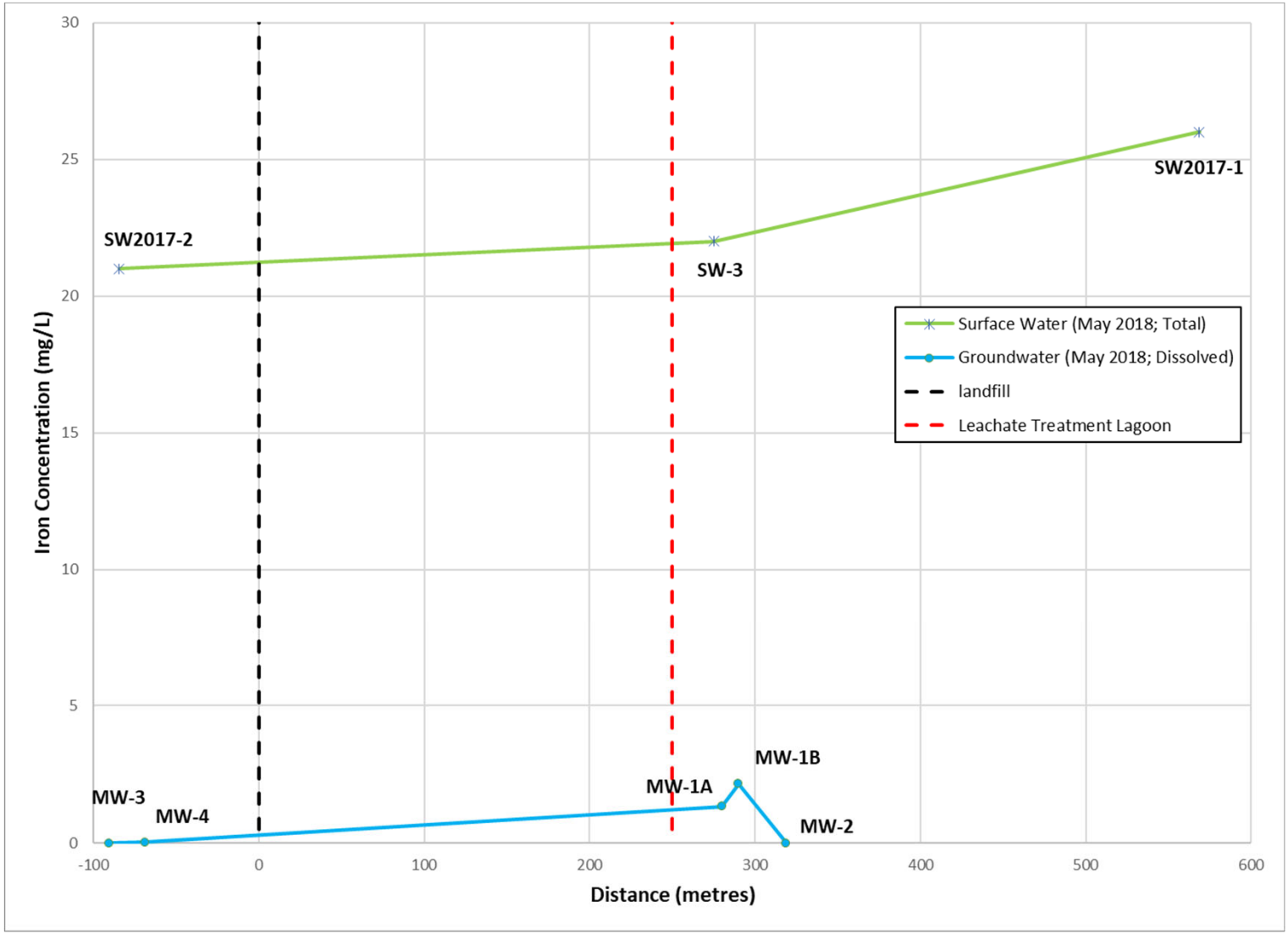

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REVIEW	AK
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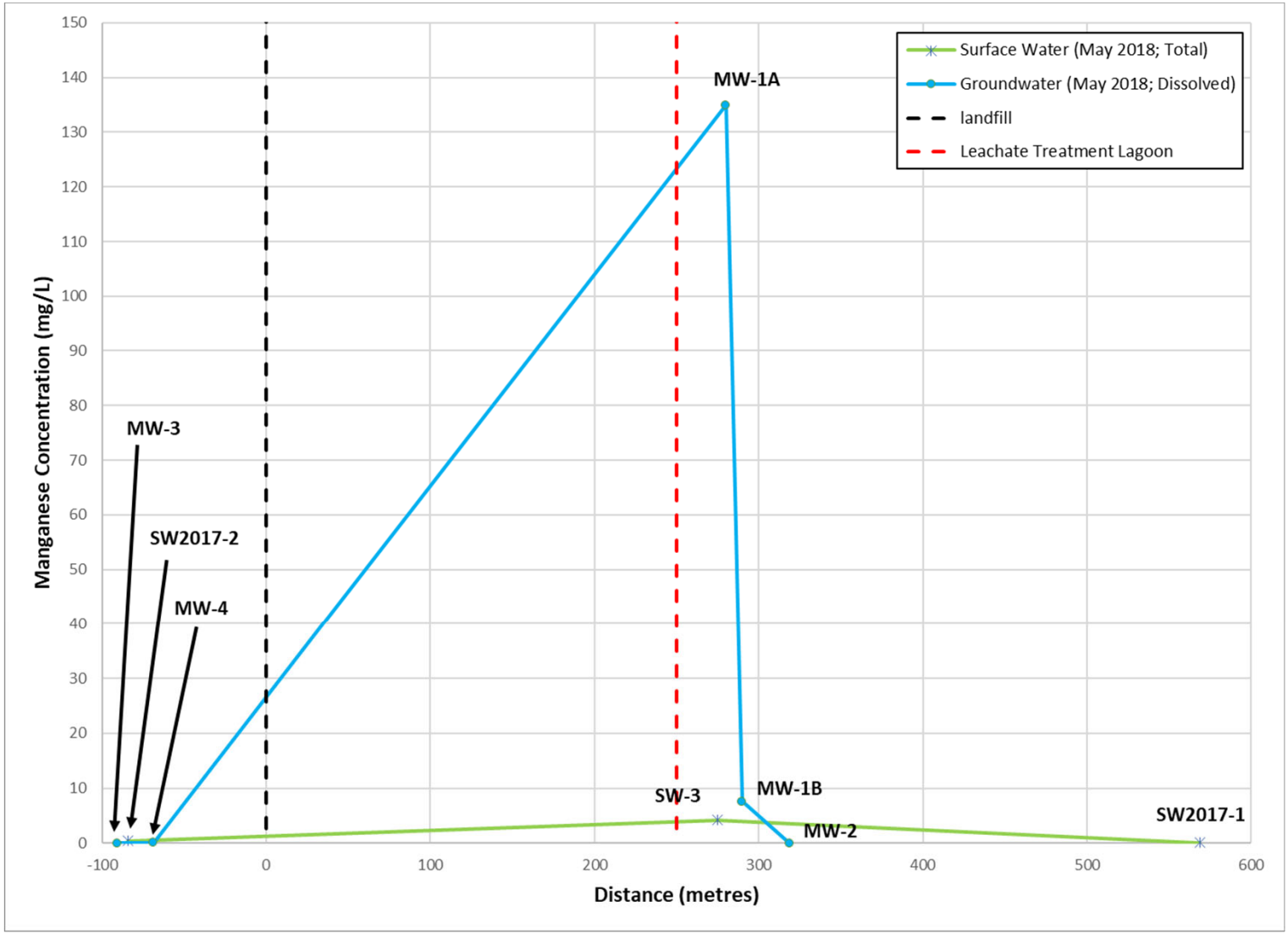

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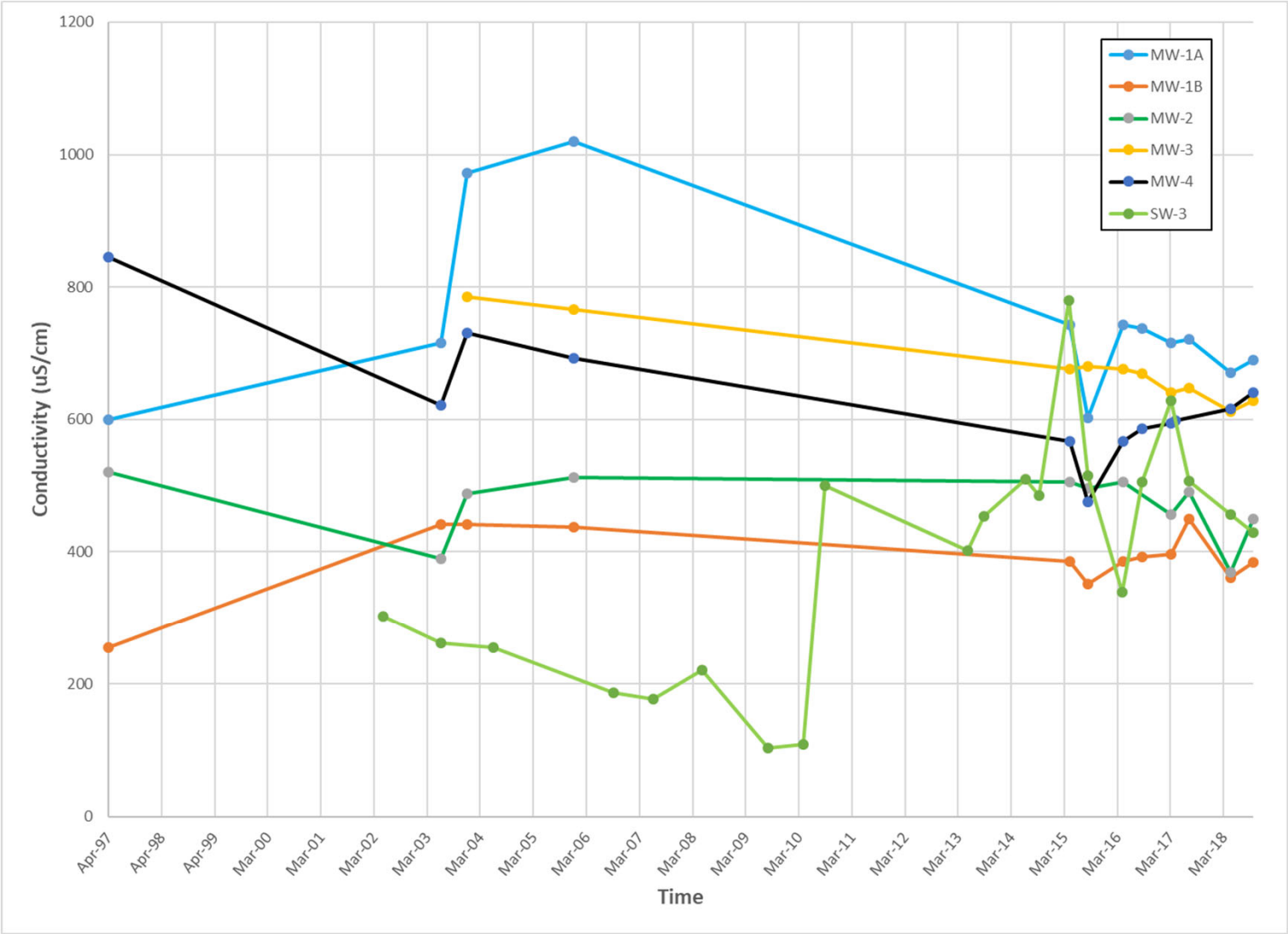

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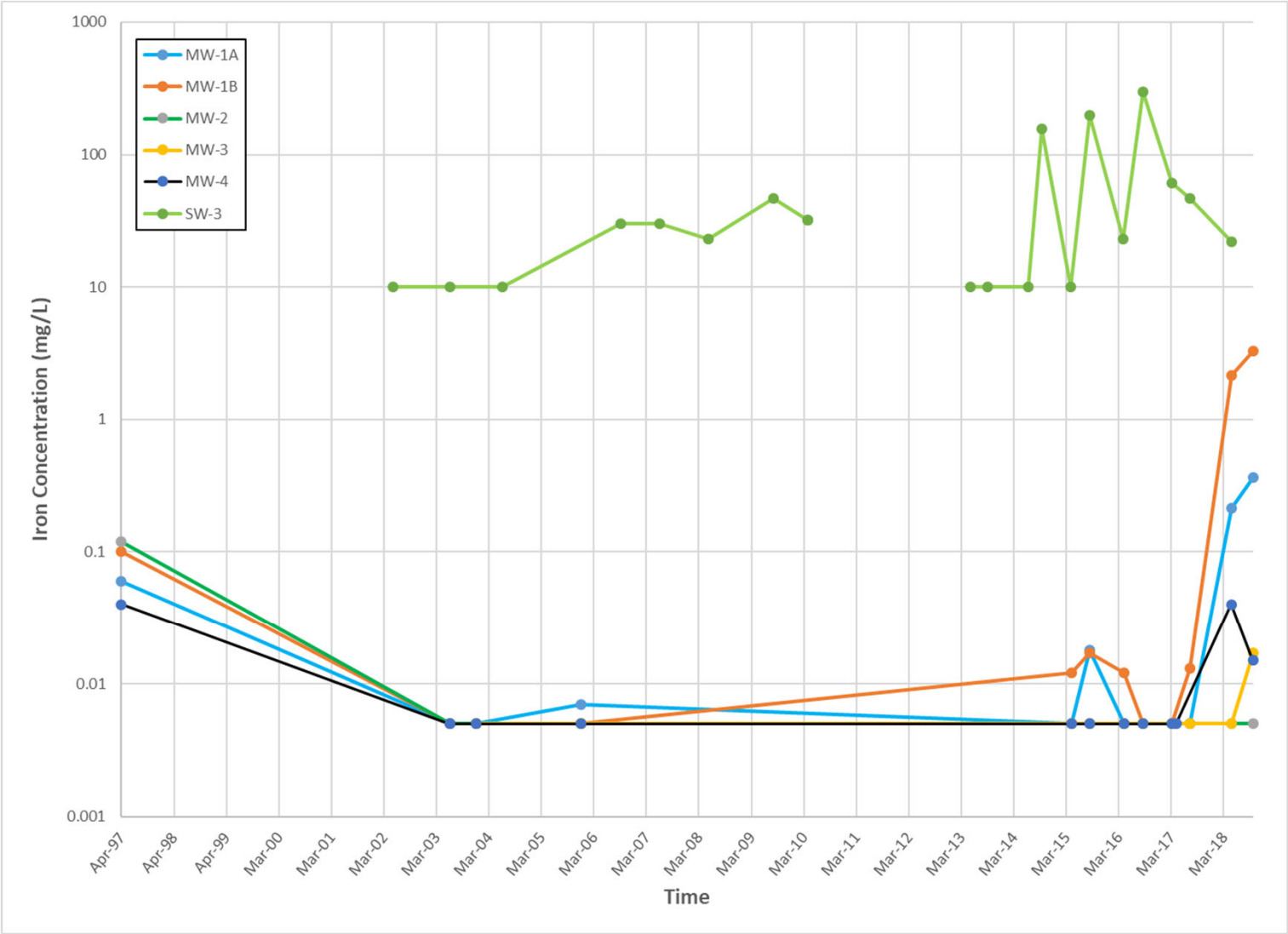
YYYY-MM-DD	2019-04-03
PREPARED	AK
DESIGN	AK
REVIEW	AK
APPROVED	JPS

TITLE
CONDITIVITY CONCENTRATION TIME SERIES PLOT

PROJECT No.	CONTROL	Rev	FIGURE
18113754	2000	0	4-A



Notes

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

CLIENT

REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT

2018 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT

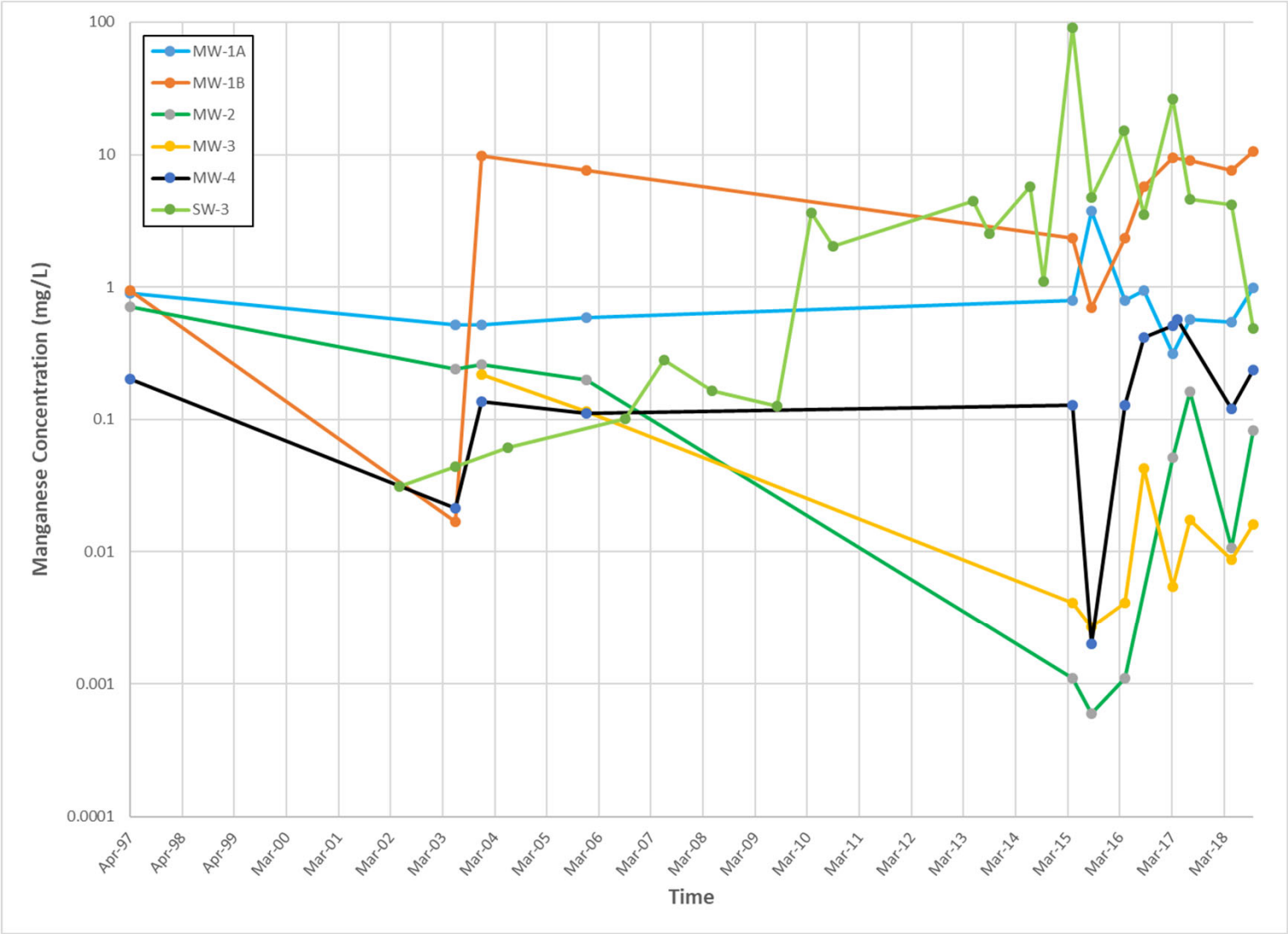
GOLDER

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

TITLE

IRON CONCENTRATION TIME SERIES PLOT (LOGARITHMIC)

PROJECT No.	CONTROL	Rev	FIGURE
18113754	2000	0	4-B



Notes

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

CLIENT

REGIONAL DISTRICT OF KITIMAT-STIKINE

PROJECT

2018 MEZIADIN LANDFILL ANNUAL MONITORING REPORT

CONSULTANT

GOLDER

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

TITLE

MANGANESE CONCENTRATION TIME SERIES PLOT (LOGARITHMIC)

PROJECT No.	CONTROL	Rev	FIGURE
18113754	2000	0	4-C

APPENDIX A

Landfill Permit

PROVINCE OF
BRITISH COLUMBIA

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

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

OPERATIONAL CERTIFICATE
MR-15681

for the

MEZIADAN LANDFILL

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

Regional District of Kitimat-Stikine

Suite 300 – 4545 Lazelle Avenue

Terrace, British Columbia

V8J 4E1

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

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

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

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

1. LOCATION OF LANDFILL PROPERTY

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

2. AUTHORIZED DISCHARGES

2.1. Municipal Solid Waste

This section applies to the discharge of municipal solid waste to ground. The site reference number for this discharge is E245720.

2.1.1. Quantity of Discharge

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

2.1.2. Characteristics of the Discharge

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

2.1.3. Authorized Works

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

2.2. Open Burning Air Contaminants

This section applies to the discharge of air contaminants to the atmosphere from the regulated open burning of selected combustibles. The site reference number for this discharge is E245760.

2.2.1. Quantity of Discharge

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

2.2.2. Characteristics of the Discharge

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

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

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

2.2.3. Authorized Works

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

2.3. Liquid Wastes

This section applies to the discharge of selected liquid wastes to the ground. The site reference number for this discharge is E245721.

2.3.1. Quantity of Discharge

The maximum authorized quantity of discharge is indeterminate.

2.3.2. Characteristics of the Discharge

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

2.3.3. Authorized Works

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

2.4. Leachate

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

2.4.1. Quantity of Discharge

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

2.4.2. Characteristics of the Discharge

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

2.4.3. Authorized Works

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

3. LANDFILL DESIGN

3.1. Design by Qualified Professional(s)

The landfill and associated works [including but not limited to the size(s) and location(s) of disposal area(s), maximum allowable slopes of disposal area(s), leachate management system, progressive and final closure details, etc.] shall be designed by qualified professionals [such as engineer(s) and/or geoscientist(s)] registered in the Province of British Columbia who have expertise in the field of landfill design. Where a design feature prepared by a qualified professional is in conflict with any requirement of this operational certificate, it shall be brought to the attention of the Regional Waste Manager who shall determine a resolution to the conflict.

3.2. Construction

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

3.3. Engineered Footprint

The landfill design shall include preparation of an engineered footprint delineating the maximum extent of solid waste disposal allowable at the facility horizontally (in plan view). The engineered footprint shall be clearly shown on a scaled plan of the site and the plan shall be made available in an electronic format as a computer aided design (CAD) drawing (see section 3.5).

3.4. Engineered Excavation and Final Grade Contours

The landfill design shall include preparation of engineered excavation grade and final grade contours delineating the maximum extent of solid waste disposal allowable at the facility vertically (in cross-sectional view). The engineered excavation and final grade contours shall be clearly shown on scaled drawings (accompanied with typical cross sections to aid in depicting the landfill profile) and the drawings shall be made available in an electronic format as computer aided design (CAD) drawings (see section 3.5).

3.5. Scaled Drawings

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

4. LANDFILL GAS MANAGEMENT

4.1. Lower Explosive Limit

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

4.2. Gas Venting or Recovery and Management Systems

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

5. LEACHATE MANAGEMENT REQUIREMENTS

5.1. Leachate Containment and Collection

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

5.2. Facultative Lagoon

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

5.2.1. Size

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

5.2.2. Location

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

5.2.3. Seepage Control

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

5.2.4. Signage and Fencing

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

5.2.5. Freeboard

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

5.2.6. Sludge Removal and Disposal

Sludge levels shall be monitored and sludge removal conducted as necessary to ensure for the proper functioning of the facultative treatment of leachate. Sludge removed from the leachate treatment lagoon shall not be used for composting. Notwithstanding section 6.2 of this operational certificate, the disposal of sludge from the facultative leachate treatment pond may occur under section 2.1. Leachate sludge deposited at an active face of a designated solid waste disposal area under sections 7 or 8 must be covered immediately with a minimum of 30 centimetres of cover material and then the area of sludge disposal compacted immediately after cover is applied.

6. GENERAL REQUIREMENTS

6.1. Site Identification

A sign shall be erected at the main entrance to the site which identifies the following: site name, owner and operator, contact phone number and address, hours of operation, tipping fees (if applicable) and prohibition of special wastes. The lettering on the sign shall be such that it is clearly readable by the public when they approach the entrance of the landfill site.

6.2. Prohibited Wastes

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

6.3. Waste Asbestos

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

6.4. Contaminated Soil

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

6.5. Waste Measurement

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

6.6. Ozone Depleting Substances

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

6.7. Fire Prevention

The operational certificate holder shall make all reasonable efforts to prevent unauthorized fires from occurring at the landfill site. As a minimum, a fire break clear of all combustible materials at least 15 metres wide shall surround all disposal, treatment and individual storage areas which have received or are receiving combustible materials. Disposal areas that have had 30 cm of compacted mineral soil cell cover or final cover applied are exempt. Water supply and pumping capabilities and/or soil and earth moving equipment shall be maintained at a sufficient level to extinguish fires. In addition, reasonable efforts shall include, but are not necessarily limited to, the preparation of a Fire Prevention and Response Plan.

6.8. Extinguishment of Fires

In the event of an unauthorized fire (including any smouldering fire), the operational certificate holder shall immediately make all reasonable efforts to extinguish the fire. Any fire which poses a threat to public health or to neighboring property shall be reported to the Provincial Emergency Program (phone: 1-800-663-3456) and any local fire authority.

6.9. Buffer Zone

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

6.10. Litter Control

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

6.11. Water Table Restriction

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

6.12. Inert Materials

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

6.13. Bear-Proof Containment of Putrescibles

All putrescible wastes that arrive at the landfill facility must be immediately contained within a bear-proof bin (i.e., on-site transfer station of bear-proof design and construction) or within an area enclosed by an electric fence. Grass, leaves, weeds, branches and ground woodwaste are not considered putrescible for the purposes of this operational certificate.

6.14. Electric Fencing

6.14.1. Design, Construction and Maintenance

Wherever required, electric fencing at the landfill site shall be designed, constructed, and maintained such that bears are prevented from penetrating the fence.

6.14.2. Fence Type

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

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

6.14.3. Wire Tension

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

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

where: *Tension* is in lbs force

Temperature is in °C

6.14.4. Post Spacing

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

6.14.5. Grounding System

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

6.14.6. Period of Operation

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

6.14.7. Minimum Voltage

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

6.14.8. Gate(s)

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

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

6.14.9. Fence Inspections

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

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

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

6.15. Municipal Solid Waste Separation

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

7. OPERATIONAL REQUIREMENTS FOR DISPOSAL OF SOLID WASTES CONTAINING PUTRESCIBLES

7.1. Location

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

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

7.2. Nature of Wastes

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

7.3. Bear-Proofing

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

7.4. Waste Compaction

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

7.5. Maximum Lift Height

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

7.6. Waste Cover

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

7.6.1. Active Face Cover

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

7.6.2. Cell Cover

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

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

7.6.3. Final Cover

Completed portions of the landfill shall progressively receive final cover during the active life of the landfill (see section 15.4).

7.7. Dead Animal Disposal

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

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

8.1. Location

The operational certificate holder may identify an area for the disposal of non-putrescible wastes (herein referred to as the non-putrescible disposal area) that is within the authorized municipal solid waste disposal footprint (see section 2.1.1). Signs which identify the nature of the waste acceptable at the designated non-putrescible disposal area shall be erected and maintained. The lettering on the sign shall be such that it is clearly readable by the public when they approach the non-putrescible disposal area.

8.2. Nature of Wastes

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

8.3. Waste Compaction

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

8.4. Maximum Lift Height

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

8.5. Waste Cover

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

8.5.1. Active Face Cover

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

8.5.2. Cell Cover

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

8.5.3. Final Cover

Completed portions of the landfill shall progressively receive final cover during the active life of the landfill (see section 15.4).

9. OPERATIONAL REQUIREMENTS FOR COMPOSTING

9.1. Location

The operational certificate holder may identify an area for composting (herein referred to as the composting area). Any composting shall be restricted to the designated composting area. This area shall be clearly identified at the landfill site. Signs which identify the nature of the waste acceptable at the designated composting area shall be erected and maintained. The lettering on the sign shall be such that it is clearly readable by the public when they approach the composting area.

9.2. On-Site Usage of Compost Product

Composting may be conducted passively by static pile (i.e., no aeration, etc.) provided the compost product is used on-site at the landfill for cover, reclamation

or landscaping purposes. The compost piles must be rested at least one year after the last addition of organic waste prior to use.

9.3. Use of Sewage Sludge

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

9.4. Off-site Usage of Compost Product

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

9.5. Bear-Proofing

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

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

10.1. Location

The operational certificate holder may identify an area for the storage of selected wastes for salvage and recycling (herein referred to as the salvage/recycling area). Any salvage/recycling shall be restricted to the designated salvage/recycling area. This area shall be clearly identified at the landfill site. Signs which identify the nature of the materials acceptable at the designated salvage/recycling area shall be erected and maintained. The lettering on the sign shall be such that it is clearly readable by the public when they approach the salvage/recycling area.

10.2. Nature of Wastes

Wastes to be salvaged/recycled may be any items with potential salvage or recycling value such as tires, lead-acid batteries, autohulks, white goods, furniture, used lumber, used goods and the like, but shall not include any refuse consisting of or containing putrescibles, any liquid wastes, hot ashes or materials otherwise restricted by section 6.2.

10.3. Compliance

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

10.4. Contamination

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

11. OPERATIONAL REQUIREMENTS FOR REGULATED OPEN BURNING

11.1. Location

The operational certificate holder may identify an area for the use of open burning to treat selected combustibles (herein referred to as the open burning area). Any open burning of selected wastes shall be restricted to the designated open burning area. This area shall be clearly identified at the landfill site. Signs which identify the nature of the waste acceptable at the designated open burning area shall be erected and maintained. The lettering on the sign shall be such that it is clearly readable by the public when they approach the burning area.

11.2. Sources of Wastes

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

11.3. Nature of Wastes

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

11.4. Authorization of Burning

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

11.4.1. Adequate Smoke Dispersion

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

11.4.2. Prevention of Spread of Fire

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

11.5. Fire Accelerant

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

11.6. Minimization of Smoke

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

11.7. Smoke Reduction if Weather Changes

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

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

11.8. Residue of Combustion

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

11.9. Documentation

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

12. OPERATIONAL REQUIREMENTS FOR DISPOSAL OF LIQUID WASTES

12.1. Location

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

12.2. Liquid Waste Disposal Lagoons

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

12.3. Signage and Fencing

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

12.4. Freeboard

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

12.5. Nature of Wastes

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

12.6. Off-Loading Chute

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

12.7. Sludge Removal

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

12.8. Lagoon Closure

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

12.9. Volume Measurement

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

13. MONITORING REQUIREMENTS

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

14. DATA ANALYSES AND REPORTING

14.1. Log Book

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

14.2. Reporting

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

15. CLOSURE REQUIREMENTS

15.1. Notification of Closure

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

15.2. Closure Plan

A Closure Plan shall be submitted to the Regional Waste Manager upon request. The Closure Plan shall, as a minimum, include the following:

- proposed end-use of the landfill property after closure;
- anticipated total waste volume and tonnage, and life of the landfill (i.e., closure date);
- a topographic plan showing the final elevation contours of the landfill and surface water diversion and drainage controls;
- design of the final cover suited to the intended end-use of the site, including the thickness and permeability of barrier layers and drainage layers, and information on topsoil, vegetative cover and erosion prevention controls;
- procedures for notifying the public about the closure and about alternative waste disposal facilities;
- rodent and nuisance wildlife control procedures;

- a comprehensive monitoring plan, including groundwater monitoring, surface water monitoring, landfill gas monitoring, leachate monitoring, final cover monitoring, and erosion and settlement monitoring, for a minimum post-closure period of 25 years;
- a plan and accompanying design for the collection, storage and treatment/use of landfill gas for a minimum 25 year post-closure period (if required by section 4.2);
- a plan for operation of any required pollution abatement engineering works such as leachate collection and treatment systems, for a minimum post-closure period of 25 years; and
- an estimated cost, updated annually, to carry out closure and post-closure activities for a minimum period of 25 years.

15.3. Final Cover

The final cover system shall be designed by a qualified professional to match the intended end-use of the landfill site and to match the needs of any required environmental management systems (leachate minimization or recirculation, as the case may be, landfill gas collection and treatment, etc.). Generally, the final cover shall consist of a layer of 1 metre of low permeability ($<1 \times 10^{-5}$ cm/s) compacted soil followed by a layer of topsoil suitable for establishment of vegetation. Use of higher permeability soil must first be approved by the Regional Waste Manager. The final cover shall be constructed with minimum and maximum slopes as specified by a qualified professional (see section 3.4) to promote runoff and minimize erosion, with appropriate runon/runoff drainage controls, erosion controls, and gas venting controls. The site shall be seeded with a grass/legume mixture suited to the local climate.

15.4. Progressive Application of Final Cover

Completed portions of the landfill shall progressively receive final cover during the active life of the landfill. The maximum area of disposed refuse that has not yet received final cover shall not exceed 25% of the total final footprint area. Final cover is to be applied according to the specifications identified in section 15.3.

16. ENVIRONMENTAL IMPACT

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

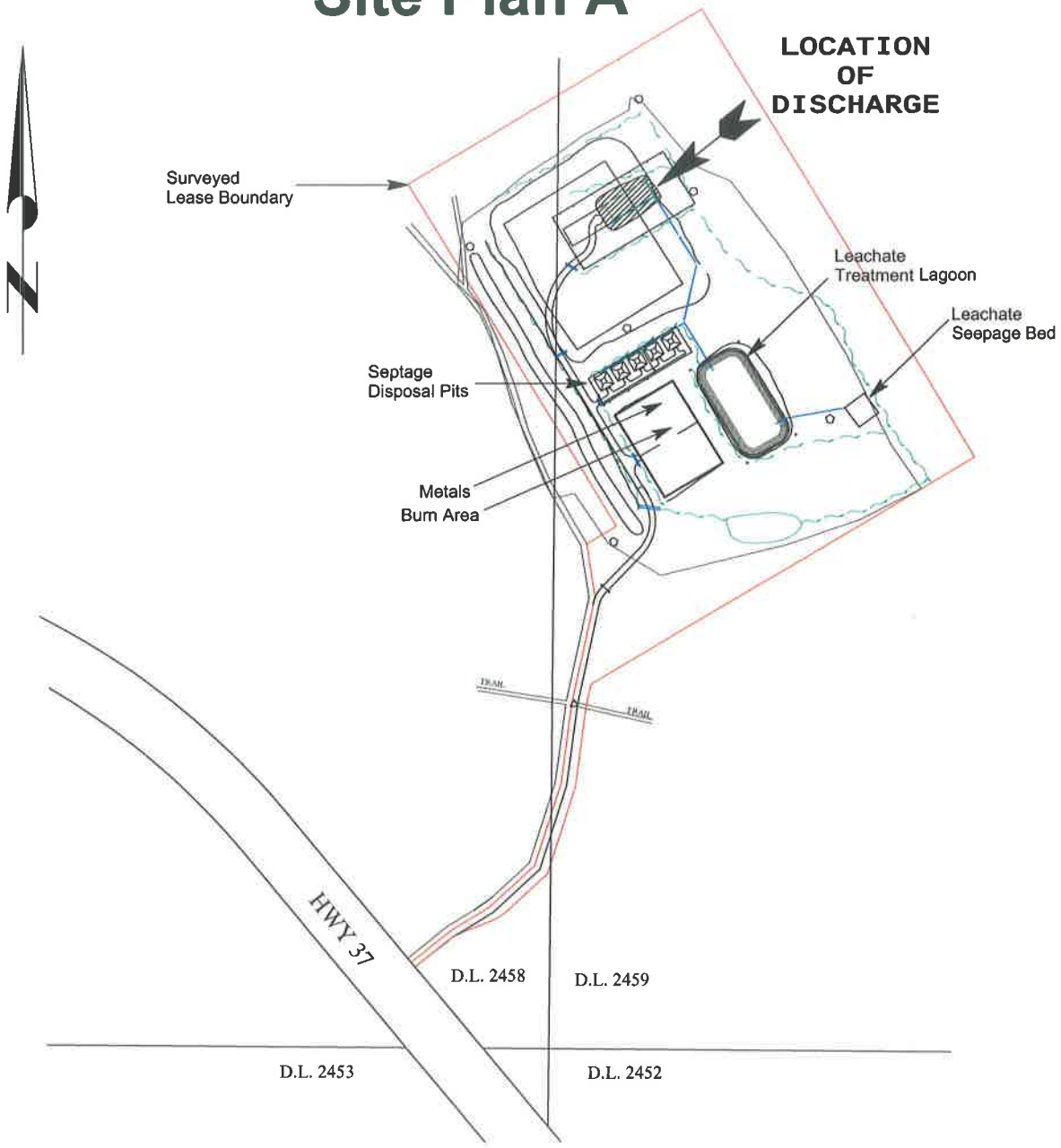
Date Issued: AUG 08 2002
Date Amended:
(most recent)

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

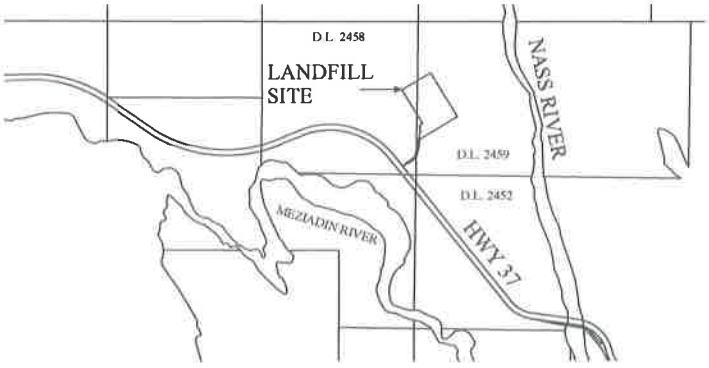
17. MAINTENANCE OF WORKS, EMERGENCY PROCEDURES AND NON-COMPLIANCE REPORTING

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

Site Plan A



Location Map



Permit No.: MR-15681

Date: AUG 08 2002

Jim Hofweber, P.Eng.
Assistant Regional Waste Manager

BRITISH COLUMBIA
The Best Place on Earth

DEC - 4 2013

November 28, 2013 File: MR-15681

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

Dear Roger Tooms:

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

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

13. Environmental Effects Monitoring Program

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

13.1 Surface Water Monitoring

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

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

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

13.2 Groundwater Monitoring

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

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

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

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

13.3 Ground and Surface Water Monitoring Procedures

13.3.1 Sampling

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

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

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

13.3.2 Analyses

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

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

13.3.3 Quality Assurance/Quality Control (QA/QC)

The operational certificate holder is required to conduct the following Quality Assurance and Control Program to determine the acceptability of data required by this permit and Section 2(d) of the Environmental Data Quality Assurance Regulation.

a) Obtain and keep current, the laboratory precision, accuracy and blank quality control criteria for each laboratory analysed parameter from the analytical laboratory.

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

c) Each duplicate sample shall be submitted to the laboratory; one of the pair identified as the regular sample, and the other, as a blind sample identified by a fictitious site-name established solely to identify the duplicate sample.

d) For each parameter, report the results of the field duplicates in terms of the degree of variation as the relative percent difference.

e) A sample collection blank shall be prepared, containing distilled water, and preservative if required, and submitted as a blank sample with one sample set per session. If any result for any parameter indicates detectable concentrations, then efforts shall be made to determine and control the source of contamination.

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

Sincerely,

Eric Pierce
for Director, Environmental Management Act

ME 2 Refuse ~~STEP~~

BRITISH COLUMBIA

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.

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

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,

M. Love

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

BRITISH COLUMBIA

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

Ministry of Water, Land, and Air Protection

Environmental Protection
Skeena Region

Mailing Address:
PO Box 5000
Smithers BC V0J 2N0

Location Address:
3726 Alfred Avenue
Smithers BC
Telephone: (250) 847-7260
Facsimile: (250) 847-7728

APPENDIX B

BC Water Well Atlas – Water Well Records

Groundwater Wells and Aquifers

Well Summary

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

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

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

Location Information

Street Address:
Town/City:

Legal Description:

Lot	12
Plan	7577
District Lot	
Block	
Section	
Township	
Range	
Land District	06
Property Identification Description (PID)	7873069

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

Geographic Coordinates - North American Datum of 1983 (NAD 83)
Latitude: 56.055736 **Longitude:** -129.249944
UTM Easting: 484434 **UTM Northing:** 6212311
Zone: 9 **Location Accuracy Code:**

Well Activity

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

Well Completion Data

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

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

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

Lithology

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

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

Casing Details

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

Surface Seal and Backfill Details

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

Liner Details

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

Liner perforations

From	To
There are no records to show	

Screen Details

Intake Method:
Type:
Material:
Opening:
Bottom:

Installed Screens

From	To	Internal Diameter	Assembly Type	Slot Size
There are no records to show				

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

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:

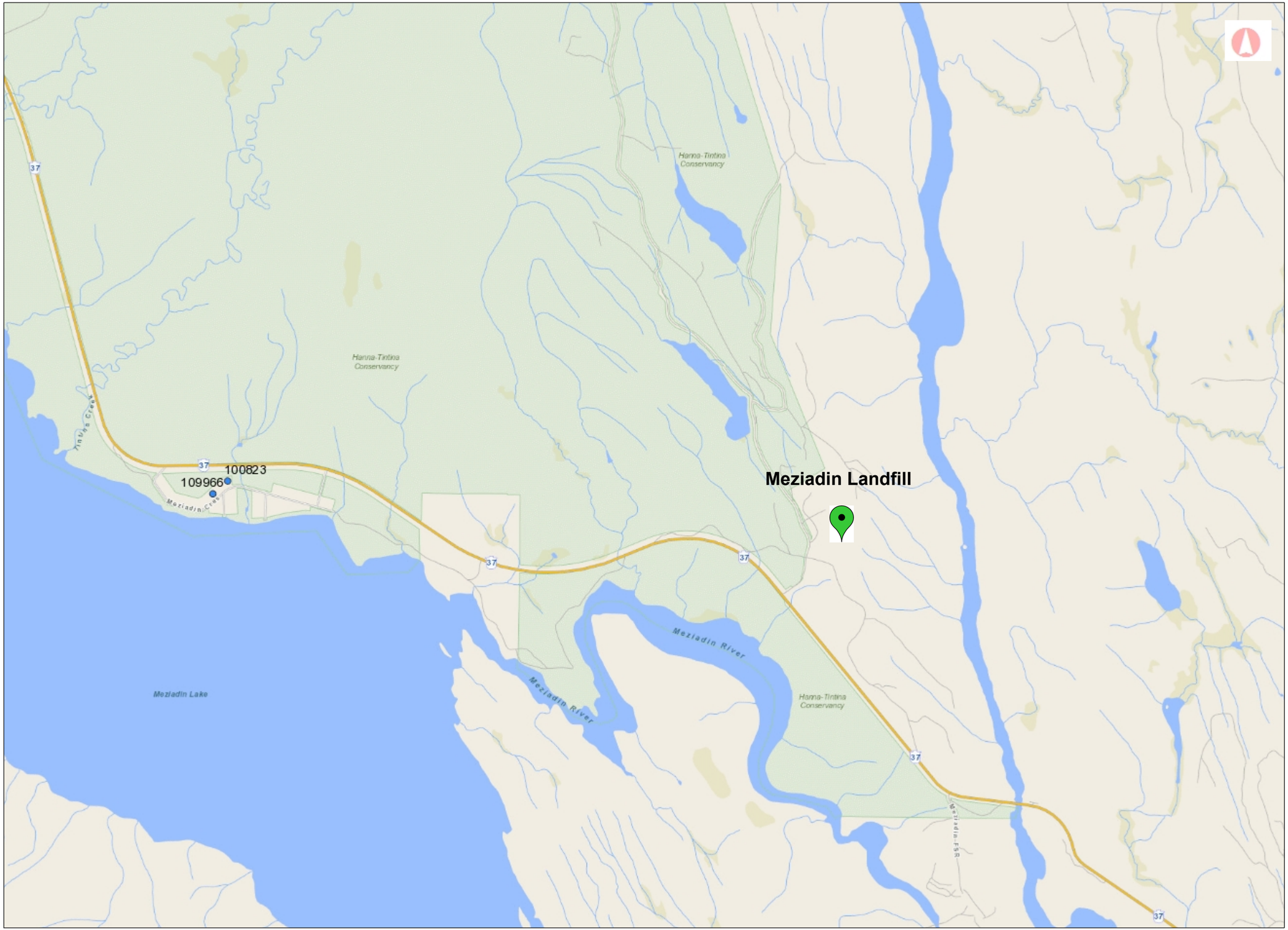
Comments

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.



BRITISH COLUMBIA

Meziadin Landfill

Legend

- Water Wells - All

0 1.02 2.0 km

1: 50,000

Copyright/Disclaimer

Datum:	NAD83
Projection:	WGS_1984_Web_Mercator_Auxiliary_Sphere

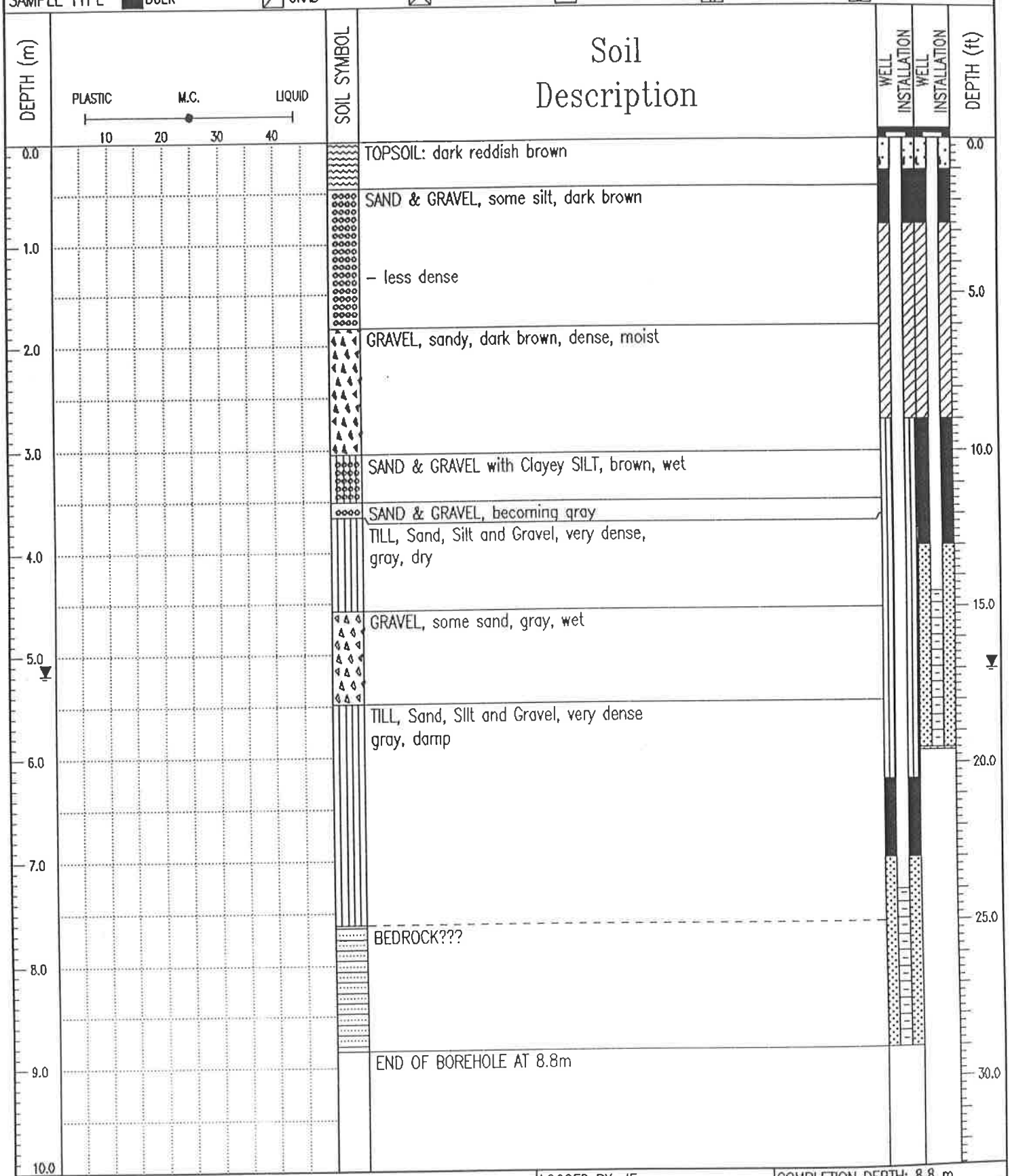
Key Map of British Columbia

APPENDIX C

Borehole Logs

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

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



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

97/02/07 05:26AM

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

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

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

0.0 — TOPSOIL: dark reddish brown

BOULDER

1.0

SAND, some silt, some gravel, brown, damp

2.0

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

3.0

4.0

5.0

BEDROCK???

6.0

END OF BOREHOLE AT 6.4m

7.0

8.0

9.0

10.0

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

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

97/02/07 05:24AM

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

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

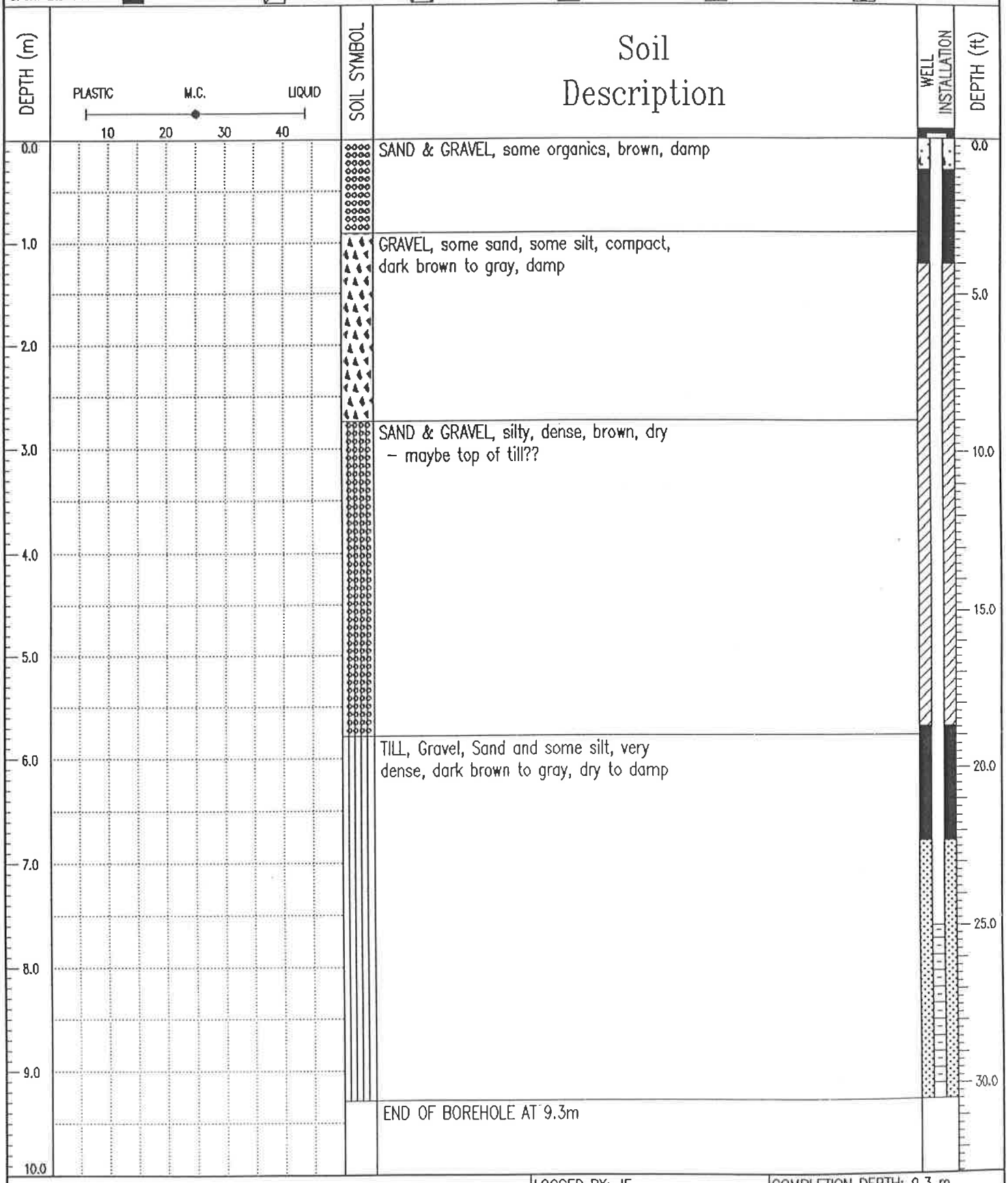
DEPTH (m)	PLASTIC / M.C. / LIQUID (10 20 30 40)	SOIL SYMBOL	Soil Description	WELL INSTALLATION	DEPTH (ft)
0.0			TOPSOIL: dark reddish brown		0.0
1.0					
2.0			SAND & GRAVEL, some organics, brown, damp		5.0
3.0			TILL, Gravel, Sand and some silt, very dense, dark brown to gray, dry to damp		10.0
4.0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

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

97/02/07 05:19AM

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

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



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

97/02/07 05:17AM

APPENDIX D

Analytical Results

Table D-1: Groundwater Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location			Meziadin Landfill											
Monitoring Well	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A
Sample ID			-	-	-	-	-	-	-	-	-	-	L2097663-1	L2183746-1
Laboratory ID			1-Apr-97	1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18
Sample Date			-	-	-	-	-	-	-	-	-	-	-	-
QAQC														
Field Observations														
pH	-	-	-	-	-	-	-	-	-	-	-	-	7.42	7.83
Temperature	-	°C	-	-	-	-	-	-	-	-	-	-	7.9	6.7
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	-	469.3	452.2
Water level	-	m	-	-	-	-	-	-	-	-	-	-	6.77	8.63
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	-	3.1	8.5
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	-	255.4	402.4
Conventional Parameters														
Conductivity	-	uS/cm	600	715	972	1020	743	602	743	737	716	721	670	690
Hardness (Total as CaCO3)	-	mg/L	-	5580	307	290	158	205	158	168	158	155	162	171
Hardness (Dissolved as CaCO3)	-	mg/L	159	164	332	290	-	197	-	-	-	-	-	-
pH	-	pH	7.9	8.1	8.2	8.1	8.1	7.5	8.1	7.9	7.9	7.9	-	8.39
Total Suspended Solids	-	mg/L	-	31300	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	-	mg/L	393	-	658	674	460	330	460	450	450	350	487	452
Alkalinity, Total (as CaCO3)	-	mg/L	198	-	239	251	260	290	260	250	250	250	241	239
Ammonia, Total (as N)	1.31 - 11.3	mg/L	-	-	0.032	1.52	1.26	6.92	1.26	1.3	0.08	0.2	0.0827	0.0532
Bromide (Br)	-	mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-
Chloride (Cl)	1500	mg/L	11.2	3.4	3.9	2.3	2.5	2.1	2.5	2.3	2.1	2.8	1.33	<2.5
Fluoride (F)	2.0-3.0 (e)	mg/L	0.32	-	-	-	-	<0.10	-	-	0.2	0.19	0.19	0.17
Nitrate (as N)	400	mg/L	0.1	-	0.107	0.054	-	-	-	-	-	-	0.138	0.145
Nitrite (as N)	0.2 - 2.0 (h)	mg/L	0.01	-	0.004	0.018	-	-	-	-	-	-	<0.0010	<0.0050
Nitrate + Nitrite (as N)	-	mg/L	-	-	0.111	0.072	0.102	0.131	0.102	0.273	-	0.11	0.138	0.145
Total Kjeldahl Nitrogen	-	mg/L	-	-	3.19	1.4	2.54	10.7	2.54	7.3	1.33	5.43	4.05	0.167
Phosphorus (P)-Total	-	mg/L	-	-	15.6	7.99	-	-	-	-	-	-	-	-
Sulfate (SO4)	128 - 429 (d)	mg/L	99	135	288	285	144	27.5	144	135	135	127	135	130
Biological Oxygen Demand (BOD)	-	mg/L	-	6	10	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	-	mg/L	-	28	23	10	142	<20	142	140	35	119	114	<20
Total Metals														
Aluminum	-	mg/L	-	671	0.0399	27.2	-	-	-	-	-	-	-	-
Antimony	0.09	mg/L	-	0.000899	0.000504	0.000694	-	-	-	-	-	-	-	-
Arsenic	0.05	mg/L	-	0.182	0.0011	0.0107	-	-	-	-	-	-	-	-
Barium	10	mg/L	-	7.72	0.172	0.303	-	-	-	-	-	-	-	-
Beryllium	0.0015	mg/L	-	0.0187	0.00002	0.0018	-	-	-	-	-	-	-	-
Bismuth	-	mg/L	-	0.00002	0.00002	0.00002	-	-	-	-	-	-	-	-
Boron	12	mg/L	-	0.213	0.09	0.081	-	-	-	-	-	-	-	-
Cadmium	0.0005 - 0.004	mg/L	-	0.0229	0.00012	0.00182	-	-	-	-	-	-	-	-
Calcium	-	mg/L	-	837	89.8	136	-	66.1	-	-	-	-	-	-
Chromium	0.01	mg/L	-	2.49	0.0002	0.0805	-	-	-	-	-	-	-	-
Cobalt	0.04	mg/L	-	0.722	0.000882	0.0853	-	-	-	-	-	-	-	-
Copper	0.02 - 0.09	mg/L	-	21.4	0.00107	0.158	-	-	-	-	-	-	-	-
Iron	-	mg/L	-	1.7	0.228	23.1	-	-	-	-	-	-	-	-
Lead	0.04 - 0.16	mg/L	-	0.324	0.00007	0.0237	-	-	-	-	-	-	-	-
Lithium	-	mg/L	-	0.893	0.00406	0.038	-	-	-	-	-	-	-	-
Magnesium	-	mg/L	-	847	20.1	29.1	-	9.7	-	-	-	-	-	-
Manganese	-	mg/L	-	61.1	0.514	7.09	-	-	-	-	-	-	-	-
Mercury	0.00025	mg/L	-	-	0.00005	0.00005	-	-	-	-	-	-	-	-
Molybdenum	10	mg/L	-	0.0502	0.0121	0.0139	-	-	-	-	-	-	-	-
Nickel	0.25 - 1.5	mg/L	-	3.52	0.00304	0.193	-	-	-	-	-	-	-	-
Phosphorus	-	mg/L	-	36.9	0.1	3.2	-	-	-	-	-	-	-	-
Potassium	-	mg/L	-	78	3	6	-	-	-	-	-	-	-	-
Selenium	0.02	mg/L	-	0.02	0.0007	0.0003	-	-	-	-	-	-	-	-
Silver	0.0005 - 0.015	mg/L	-	0.00793	0.00002	0.00005	-	-	-	-	-	-	-	-
Sodium	-	mg/L	-	176	92.3	124	-	-	-	-	-	-	-	-
Strontium	-	mg/L	-	3.54	0.878	1.09	-	-	-	-	-	-	-	-
Sulfur	-	mg/L	-	109	99	92.7	-	-	-	-	-	-	-	-
Tellurium	-	mg/L	-	0.5	0.05	-	-	-	-	-	-	-	-	-
Thallium	0.003	mg/L	-	0.00291	0.000033	0.000161	-	-	-	-	-	-	-	-
Tin	-	mg/L	-	0.00001	0.00001	0.00013	-	-	-	-	-	-	-	-
Titanium	1	mg/L	-	0.003	0.003	0.003	-	-	-	-	-	-	-	-
Uranium	0.085	mg/L	-	0.00386	0.00386	0.0042	-	-	-	-	-	-	-	-
Vanadium	-	mg/L	-	0.00119	0.00119	0.0739	-	-	-	-	-	-	-	-
Zinc	0.075 - 38.1	mg/L	-	0.0001	0.0001	0.321	-	-	-	-	-	-	-	-
Zirconium	-	mg/L	-	0.005	0.005	-	-	-	-	-	-	-	-	-
Dissolved Metals														
Aluminum	-	mg/L	0.2	0.0015	0.0015	0.008	0.015	<0.005	0.015	0.007	<0.0050	0.0063	0.0101	0.0091
Antimony	0.09	mg/L	0.2	0.000473	0.000473	0.000315	0.0004	<0.0001	0.0004	0.0008	0.00035	0.0005	0.00043	0.00031
Arsenic	0.05	mg/L	0.2	0.001	0.001	0.0014	0.002	<0.0005	0.002	0.0021	0.00064	0.00074	0.0017	0.00089
Barium	10	mg/L	0.26	0.176	0.176	0.124	0.068	0.113	0.068	0.295	0.129	0.0531	0.0625	0.0526
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
Bismuth	-	mg/L	0.1	0.00002	0.00002	0.00002	-	-	-	-	<0.00010	<0.00010	<0.000050	<0.000050
Boron	12	mg/L	0.1	0.084	0.084	0.073	0.083	0.023	0.083	0.093	0.085	0.0734	0.067	0.071
Cadmium	0.0005 - 0.004	mg/L	0.01	0.00011	0.00011	0.00007	0.00003	<0.00001	0.00003	0.00005	0.000072	<0.000010	0.000204	0.0000225
Calcium	-	mg/L	47.2	97.5	97.5	85.6	45.6	65.4	45.6	48.3	45.6	44.2	46.6	49.1
Cesium	-	mg/L	-	-	-	-	-	-	-	-	-	-	<0.000010	<0.000010
Chromium	0.01	mg/L	0.01	0.0002	0.0002	0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00015	0.00014
Cobalt	0.04	mg/L	0.01	0.000834	0.000834	0.00103	0.00067	0.00054	0.00067	0.0008	0.00062	0.00074	0.00064	0.00057
Copper	0.02 - 0.09	mg/L	0.01	0.00069	0.00069	0.00189	0.0018	<0.0002	0.0018	0.0143	0.00801	<0.00040	0.00061	<0.00020
Iron	-	mg/L	0.06	0.005	0.005	0.007	<0.010	0.018	<0.010	<0.010	<0.010	<0.010	0.213	0.367
Lead	0.04 - 0.16	mg/L	0.05	0.00001	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	<0.000050	<0.000050
Lithium	-	mg/L	0.01	0.00392	0.00392	0.00488	0.0078	0.0013	0.0078	0.0031	0.00324	0.0042	0.0037	0.0039
Magnesium	-	mg/L	9.94	21.5	21.5	19.2	10.7	8.11	10.7	11.6	10.7	10.8	11.1	11.7
Manganese	-	mg/L	0.904	0.521	0.521	0.584	0.792	3.77	0.792	0.948	0.314	0.567	0.542	0.988
Mercury	0.00025	mg/L	-	0.00005	0.00005	0.00005	<0.00002	<0.00002	<0.00002	-	<0.00002	<0.000010	<0.0000050	<0.0000050
Molybdenum	10	mg/L	0.3	0.0118	0.0118	0.0133	0.0254	0.001	0.0254	0.029	0.0253	0.0295	0.0194	0.0156
Nickel	0.25 - 1.5	mg/L	0.02	0.0028	0.0028	0.0024	0.0045	0.0028	0.0045	0.0034	0.00316	0.00477	0.00194	0.00138
Phosphorus	-	mg/L	0.3	0.1	0.1	0.1	-	-	-	-	<0.050	<0.050	<0.050	<0.050
Potassium	-	mg/L	3	3	3	4	2.52	2.23	2.52	2.55	2.37	2.24	2.43	2.31
Rubidium	-	mg/L	-	-	-	-	-	-	-	-	-	-	0.00037	0.00032
Selenium	0.02	mg/L	0.2	0.0004	0.0004	0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.000066	0.00008
Silicon	-	mg/L	-	-	-	-	-	-	-	-	3.7	3.5	3.87	3.79
Silver	0.0005 - 0.015	mg/L	0.01	0.00002	0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010
Sodium	-	mg/L	71	96.7	96.7	125	98	39	98	91.8	99.2	103	99.7	94.6
Strontium	-	mg/L	0.241	0.883	0.883	0.85	-	-	-	-	0.515	0.505	0.542	0.614
Sulfur	-	mg/L	-	92	92	98.6	-	-	-	-	42.3	41	45.5	51.3
Tellerium	-	mg/L	-	0.05	0.05	-	-	-	-	-	<0.00020	<0.00050	<0.00020	<0.00020
Thallium	0.003	mg/L	0.1	0.000033	0.000033	0.000039	<0.00002	<0.00002	<0.00002	<0.00002	0.000029	<0.000020	<0.000010	<0.000010
Thorium	-	mg/L	-	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin	-	mg/L	0.3	0.00001	0.00001	0.00002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00010	<0.00010
Titanium	1	mg/L	0.01	0.003	0.003	0.003	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	0.00051	0.00037
Tungsten	-	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Uranium	0.085	mg/L	-	0.00389	0.00389	0.00386	0.00361	0.00012	0.00361	0.00285	0.00299	0.00374	0.003	0.00241
Vanadium	-	mg/L	0.03	0.00108	0.00108	0.00059	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	0.00073	<0.00050
Zinc	0.075 - 2.4	mg/L	0.038	0.0001	0.0001	0.0012	<0.004	<0.004	<0.004	0.017	0.0208	<0.0040	0.0048	<0.0010
Zirconium	-	mg/L	-	0.005	0.005	0.005	-	-	-	-	<0.00010	<0.00010	<0.000060	<0.000060

NOTES

BC CSR AW-F — er Quality Guidelines for Protection of Freshwater Aquatic Life
BC CSR LW — on Water Quality Guidelines for Protection of Livestock
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,
QAQC = quality assurance/quality control; FD = field duplicate;

Table D-2: Groundwater Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	Notes	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Notes	Units	Meziadin Landfill											
Monitoring Well						MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A	MW-1A
Sample ID						-	-	-	-	-	-	-	-	-	-	L2097663-1	L2183746-1
Laboratory ID						-	-	-	-	-	-	-	-	-	-	17-May-18	17-Oct-18
Sample Date						1-Apr-97	1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-Aug-17	-	-
QAQC						-	-	-	-	-	-	-	-	-	-	-	-
Field Observations																	
pH	-		-		-	-	-	-	-	-	-	-	-	-	-	7.42	7.83
Temperature	-		-		°C	-	-	-	-	-	-	-	-	-	-	7.9	6.7
Conductivity	-		-		uS/cm	-	-	-	-	-	-	-	-	-	-	469.3	452.2
Water level	-		-		m	-	-	-	-	-	-	-	-	-	-	6.77	8.63
Dissolved Oxygen	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	3.1	8.5
Oxidation Reduction Potential	-		-		mV	-	-	-	-	-	-	-	-	-	-	255.4	402.4
Conventional Parameters																	
Conductivity	-		-		uS/cm	600	715	972	1020	743	602	743	737	716	721	670	690
Hardness (Total as CaCO3)	-		-		mg/L	-	5580	307	290	158	205	158	168	158	155	162	171
Hardness (Dissolved as CaCO3)	-		-		mg/L	159	164	332	290	-	197	-	-	-	-	-	-
pH	6.5-9.0		-		-	7.9	8.1	8.2	8.1	8.1	7.5	8.1	7.9	7.9	7.9	-	8.39
Total Suspended Solids	-		**25 mg/L (backgr. 25-250 mg/l)**		mg/L	-	**31300**	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	-		-		mg/L	393	-	658	674	460	330	460	450	450	350	487	452
Alkalinity, Total (as CaCO3)	-		-		mg/L	198	-	239	251	260	290	260	250	250	250	241	239
Ammonia, Total (as N)	0.461 - 1.85	pH/T*	**2.4 - 12.7**	pH/T*	mg/L	-	-	0.032	1.52	1.26	6.92	1.26	1.3	0.08	0.2	0.0827	0.0532
Bromide (Br)	-		-		mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-
Chloride (Cl)	150		**600**		mg/L	11.2	3.4	3.9	2.3	2.5	2.1	2.5	2.3	2.1	2.8	1.33	<2.5
Fluoride (F)	-		**1.51 - 2.95**	H	mg/L	0.32	-	-	-	-	<0.10	-	-	0.2	0.19	0.19	0.17
Nitrate (as N)	3		**32.8**		mg/L	0.1	-	0.107	0.054	-	-	-	-	-	-	0.138	0.145
Nitrite (as N)	0.02 - 0.2	Cl	**0.06 - 0.6**	Cl	mg/L	0.01	-	0.004	0.018	-	-	-	-	-	-	<0.0010	<0.0050
Nitrate + Nitrite (as N)	-		-		mg/L	-	-	0.111	0.072	0.102	0.131	0.102	0.273	-	0.11	0.138	0.145
Total Kjeldahl Nitrogen	-		-		mg/L	-	-	3.19	1.4	2.54	10.7	2.54	7.3	1.33	5.43	4.05	0.167
Phosphorus (P)-Total	-		-		mg/L	-	-	15.6	7.99	-	-	-	-	-	-	-	-
Sulfate (SO4)	128 - 429	H	-		mg/L	99	135	288	285	144	27.5	144	135	135	127	135	130
Biological Oxygen Demand (BOD)	-		-		mg/L	-	6	10	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	-		-		mg/L	-	28	23	10	142	<20	142	140	35	119	114	<20
Total Metals																	
Aluminum	0.05	pH	**0.1**	pH	mg/L	-	**671**	0.0399	**27.2**	-	-	-	-	-	-	-	-
Antimony	0.009		-		mg/L	-	0.000899	0.000504	0.000694	-	-	-	-	-	-	-	-
Arsenic	0.005		-		mg/L	-	0.182	0.0011	0.0107	-	-	-	-	-	-	-	-
Barium	1		-		mg/L	-	7.72	0.172	0.303	-	-	-	-	-	-	-	-
Beryllium	0.00013		-		mg/L	-	0.0187	0.00002	0.0018	-	-	-	-	-	-	-	-
Bismuth	-		-		mg/L	-	0.00002	0.00002	0.00002	-	-	-	-	-	-	-	-
Boron	1.2		-		mg/L	-	0.213	0.09	0.081	-	-	-	-	-	-	-	-
Cadmium	0.00046 - 0.00408	H	**0.00176 - 0.03703**	H	mg/L	-	0.0229	0.00012	0.00182	-	-	-	-	-	-	-	-
Calcium	-		-		mg/L	-	837	89.8	136	-	66.1	-	-	-	-	-	-
Chromium	0.001 $^{Cr\ VI}$ 0.0089 $^{Cr\ III}$	V	-		mg/L	-	2.49	0.0002	0.0805	-	-	-	-	-	-	-	-
Cobalt	0.004		**0.11**		mg/L	-	0.722	0.000882	0.0853	-	-	-	-	-	-	-	-
Copper	0.002	H	**0.002**	H	mg/L	-	**21.4**	0.00107	**0.158**	-	-	-	-	-	-	-	-
Iron	-		**1**		mg/L	-	**1.7**	0.228	**23.1**	-	-	-	-	-	-	-	-
Lead	0.0157 - 0.5361	H	**0.3166 - 13.6583**	H	mg/L	-	0.324	0.00007	0.0237	-	-	-	-	-	-	-	-
Lithium	-		-		mg/L	-	0.893	0.00406	0.038	-	-	-	-	-	-	-	-
Magnesium	-		-		mg/L	-	847	20.1	29.1	-	9.7	-	-	-	-	-	-
Manganese	0.605	H	**0.54**	H	mg/L	-	61.1	0.514	7.09	-	-	-	-	-	-	-	-
Mercury	0.0001		-		mg/L	-	-	0.00005	0.00005	-	-	-	-	-	-	-	-
Molybdenum	2		-		mg/L	-	0.0502	0.0121	0.0139	-	-	-	-	-	-	-	-
Nickel	0.025-0.15		-		mg/L	-	3.52	0.00304	0.193	-	-	-	-	-	-	-	-
Phosphorus	0.005-0.015		-		mg/L	-	36.9	0.1	3.2	-	-	-	-	-	-	-	-
Potassium	-		-		mg/L	-	78	3	6	-	-	-	-	-	-	-	-
Selenium	0.002		-		mg/L	-	0.02	0.0007	0.0003	-	-	-	-	-	-	-	-
Silver	0.00005, 0.0015	H	**0.0001, 0.003**	H	mg/L	-	0.00793	0.00002	0.00005	-	-	-	-	-	-	-	-
Sodium	-		-		mg/L	-	176	92.3	124	-	-	-	-	-	-	-	-
Strontium	-		-		mg/L	-	3.54	0.878	1.09	-	-	-	-	-	-	-	-
Sulfur	-		-		mg/L	-	109	99	92.7	-	-	-	-	-	-	-	-
Tellurium	-		-		mg/L	-	0.5	0.05	-	-	-	-	-	-	-	-	-
Thallium	0.0008		-		mg/L	-	0.00291	0.000033	0.000161	-	-	-	-	-	-	-	-
Tin	-		-		mg/L	-	0.00001	0.00001	0.00013	-	-	-	-	-	-	-	-
Titanium	-		-		mg/L	-	0.003	0.003	0.003	-	-	-	-	-	-	-	-
Uranium	0.0085		-		mg/L	-	0.00386	0.00386	0.0042	-	-	-	-	-	-	-	-
Vanadium	-		-		mg/L	-	0.00119	0.00119	0.0739	-	-	-	-	-	-	-	-
Zinc	0.0075	H	**0.033**	H	mg/L	-	0.0001	0.0001	0.321	-	-	-	-	-	-	-	-
Zirconium	-		-		mg/L	-	0.005	0.005	-	-	-	-	-	-	-	-	-
Dissolved Metals																	
Aluminum	0.05	pH	**0.1**	pH	mg/L	**0.2**	0.0015	0.0015	0.008	0.015	<0.005	0.015	0.007	<0.0050	0.0063	0.0101	0.0091
Antimony	0.009		-		mg/L	0.2	0.000473	0.000473	0.000315	0.0004	<0.0001	0.0004	0.0008	0.00035	0.0005	0.00043	0.00031
Arsenic	0.005		-		mg/L	0.2	0.001	0.001	0.0014	0.002	<0.0005	0.002	0.0021	0.00064	0.00074	0.0017	0.00089
Barium	-		-		mg/L	0.26	0.176	0.176	0.124	0.068	0.113	0.068	0.295	0.129	0.0531	0.0625	0.0526
Beryllium	-		-		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
Bismuth	-		-		mg/L	0.1	0.00002	0.00002	0.00002	-	-	-	-	<0.00010	<0.00010	<0.000050	<0.000050
Boron	1.2		-		mg/L	0.1	0.084	0.084	0.073	0.083	0.023	0.083	0.093	0.085	0.0734	0.067	0.071
Cadmium	0.00029 - 0.00408	H	**0.00092 - 0.03703**	H	mg/L	**0.01**	0.00011	0.00011	0.00007	0.00003	<0.00001	0.00003	0.00005	0.000072	<0.000010	0.000204	0.0000225
Calcium	-		-		mg/L	47.2	97.5	97.5	85.6	45.6	65.4	45.6	48.3	45.6	44.2	46.6	49.1
Cesium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	<0.000010	<0.000010
Chromium	0.001 $^{Cr\ VI}$ 0.0089 $^{Cr\ III}$	V	-		mg/L	0.01	0.0002	0.0002	0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00015	0.00014
Cobalt	0.004		**0.11**		mg/L	0.01	0.000834	0.000834	0.00103	0.00067	0.00054	0.00067	0.0008	0.00062	0.00074	0.00064	0.00057
Copper	0.0062 - 0.2232	H	**0.01657 - 0.52652**	H	mg/L	**0.01**	0.00069	0.00069	0.00189	0.0018	<0.0002	0.0018	0.0143	0.00801	<0.00040	0.00061	<0.00020
Iron	-		**0.35**		mg/L	0.06	0.005	0.005	0.007	<0.010	0.018	<0.010	<0.010	<0.010	<0.010	0.213	0.367
Lead	0.00887 - 0.53609	H	**0.14263 - 13.65826**	H	mg/L	0.05	0.00001	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	<0.000050	<0.000050
Lithium	-		-		mg/L	0.01	0.00392	0.00392	0.00488	0.0078	0.0013	0.0078	0.0031	0.00324	0.0042	0.0037	0.0039
Magnesium	-		-		mg/L	9.94	21.5	21.5	19.2	10.7	8.11	10.7	11.6	10.7	10.8	11.1	11.7
Manganese	1.287 - 25.157	H	**2.2481 - 62.0316**	H	mg/L	**0.904**	0.521	0.521	0.584	0.792	**3.77**	0.792	0.948	0.314	0.567	0.542	0.988
Mercury	0.0001		-		mg/L	-	0.00005	0.00005	0.00005	<0.00002	<0.00002	<0.00002	-	<0.00002	<0.000010	<0.0000050	<0.0000050
Molybdenum	2		-		mg/L	0.3	0.0118	0.0118	0.0133	0.0254	0.001	0.0254	0.029	0.0253	0.0295	0.0194	0.0156
Nickel	0.025-0.15		-		mg/L	0.02	0.0028	0.0028	0.0024	0.0045	0.0028	0.0045	0.0034	0.00316	0.00477	0.00194	0.00138
Phosphorus	0.005-0.015		-		mg/L	0.3	0.1	0.1	0.1	-	-	-	-	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium	-		-		mg/L	3	3	3	4	2.52	2.23	2.52	2.55	2.37	2.24	2.43	2.31
Rubidium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	0.00037	0.00032
Selenium	0.002		-		mg/L	0.2	0.0004	0.0004	0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.000066	0.00008
Silicon	-		-		mg/L	-	-	-	-	-	-	-	-	3.7	3.5	3.87	3.79
Silver	0.00005, 0.0015	H	**0.0001, 0.003**	H	mg/L	0.01	0.00002	0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010
Sodium	-		-		mg/L	71	96.7	96.7	125	98	39	98	91.8	99.2	103	99.7	94.6
Strontium	-		-		mg/L	0.241	0.883	0.883	0.85	-	-	-	-	0.515	0.505	0.542	0.614
Sulfur	-		-		mg/L	-	92	92	98.6	-	-	-	-	42.3	41	45.5	51.3
Tellerium	-		-		mg/L	-	0.05	0.05	-	-	-	-	-	<0.00020	<0.00050	<0.00020	<0.00020
Thallium	0.0008		-		mg/L	0.1	0.000033	0.000033	0.000039	<0.00002	<0.00002	<0.00002	<0.00002	0.000029	<0.000020	<0.000010	<0.000010
Thorium	-		-		mg/L	-	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin	-		-		mg/L	0.3	0.00001	0.00001	0.00002	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	<0.00010	<0.00010
Titanium	-		-		mg/L	0.01	0.003	0.003	0.003	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	0.00051	0.00037
Tungsten	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Uranium	0.0085		-		mg/L	-	0.00389	0.00389	0.00386	0.00361	0.00012	0.00361	0.00285	0.00299	0.00374	0.003	0.00241
Vanadium	-		-		mg/L	0.03	0.00108	0.00108	0.00059	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	0.00073	<0.00050
Zinc	0.056 - 4.125	H	**0.082 - 4.151**		mg/L	**0.038**	0.0001	0.0001	0.0012	<0.004	<0.004	<0.004	0.017	0.0208	<0.0040	0.0048	<0.0010
Zirconium	-		-		mg/L	-	0.005	0.005	0.005	-	-	-	-	<0.00010	<0.00010	<0.000060	<0.000060

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-3: Groundwater Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	Meziadin Landfill											
Monitoring Well			MW-1B											
Sample ID			MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B
Laboratory ID			-	-	-	-	-	-	-	-	-	-	L2097663-2	L2183746-2
Sample Date			1-Apr-97	1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18
QAQC			-	-	-	-	-	-	-	-	-	-	-	-
Field Observations														
pH	-	-	-	-	-	-	-	-	-	-	-	-	5.86	7.13
Temperature	-	°C	-	-	-	-	-	-	-	-	-	-	7.5	7.1
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	-	264.9	232.2
Water level	-	m	-	-	-	-	-	-	-	-	-	-	2.62	3.26
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	-	2.9	7.9
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	-	270.1	402.7
Conventional Parameters														
Conductivity	-	uS/cm	254	441	442	437	385	351	385	392	396	450	361	384
Hardness (Total as CaCO3)	-	mg/L	116	652	236	200	168	146	168	171	171	208	175	189
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
Total Suspended Solids	-	mg/L	-	9290	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	-	mg/L	143	-	248	260	340	220	340	270	260	220	237	242
Alkalinity, Total (as CaCO3)	-	mg/L	124	-	240	235	200	180	200	210	210	240	209	213
Ammonia, Total (as N)	1.31 - 18.5	mg/L	-	-	0.005	0.02	0.076	0.14	0.076	0.21	0.28	0.26	0.269	0.34
Bromide (Br)	-	mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-
Chloride (Cl)	1500	mg/L	0.9	0.8	1.1	0.5	2	<1.0	2	<1.0	<1.0	<1.0	0.55	<0.50
Fluoride (F)	2.0-3.0 (e)	mg/L	0.22	-	-	-	-	<0.10	-	-	<0.10	<0.10	0.07	0.066
Nitrate (as N)	400	mg/L	0.01	-	0.002	0.003	-	-	-	-	-	-	0.17	0.0481
Nitrite (as N)	0.2 - 2.0 (h)	mg/L	0.01	-	0.002	0.002	-	-	-	-	-	-	0.0058	0.0012
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
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
Phosphorus (P)-Total	-	mg/L	-	-	9.51	7.03	-	-	-	-	-	-	-	-
Sulfate (SO4)	128 - 429 (d)	mg/L	7	2.8	2.6	4	9.5	6.6	9.5	4.7	5.8	6.7	5.74	6.17
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
Total Metals														
Aluminum	-	mg/L	-	18.6	0.0371	8.46	-	-	-	-	-	-	-	-
Antimony	0.09	mg/L	-	0.000497	0.000152	0.000214	-	-	-	-	-	-	-	-
Arsenic	0.05	mg/L	-	0.0047	0.0003	0.0039	-	-	-	-	-	-	-	-
Barium	10	mg/L	-	1.43	0.593	1.53	-	-	-	-	-	-	-	-
Beryllium	0.0015	mg/L	-	0.00211	0.00002	0.00137	-	-	-	-	-	-	-	-
Bismuth	-	mg/L	-	0.00002	0.00002	0.00002	-	-	-	-	-	-	-	-
Boron	12	mg/L	-	0.033	0.008	0.008	-	-	-	-	-	-	-	-
Cadmium	0.0005 - 0.004	mg/L	-	0.00255	0.00079	0.0015	-	-	-	-	-	-	-	-
Calcium	-	mg/L	-	102	75.3	84	-	44.5	-	-	-	-	-	-
Chromium	0.01	mg/L	-	0.0506	0.0004	0.0112	-	-	-	-	-	-	-	-
Cobalt	0.04	mg/L	-	0.0749	0.0141	0.0472	-	-	-	-	-	-	-	-
Copper	0.02 - 0.09	mg/L	-	0.21	0.00505	0.163	-	-	-	-	-	-	-	-
Iron	-	mg/L	-	289	0.144	55.2	-	-	-	-	-	-	-	-
Lead	0.04 - 0.16	mg/L	-	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	0.00025	mg/L	-	-	0.00005	0.00005	-	-	-	-	-	-	-	-
Molybdenum	10	mg/L	-	0.00248	0.00062	0.00052	-	-	-	-	-	-	-	-
Nickel	0.25 - 1.5	mg/L	-	0.169	0.0308	0.0995	-	-	-	-	-	-	-	-
Phosphorus	-	mg/L	-	6.5	0.1	3.4	-	-	-	-	-	-	-	-
Potassium	-	mg/L	-	8	1	1	-	-	-	-	-	-	-	-
Selenium	0.02	mg/L	-	0.0023	0.0003	0.0007	-	-	-	-	-	-	-	-
Silver	0.0005 - 0.015	mg/L	-	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	0.003	mg/L	-	0.000141	0.000026	0.000096	-	-	-	-	-	-	-	-
Tin	-	mg/L	-	0.00003	0.00001	0.00003	-	-	-	-	-	-	-	-
Titanium	1	mg/L	-	0.00207	0.003	0.006	-	-	-	-	-	-	-	-
Uranium	0.085	mg/L	-	0.0162	0.000207	0.000616	-	-	-	-	-	-	-	-
Vanadium	-	mg/L	-	1.84	0.00089	0.0299	-	-	-	-	-	-	-	-
Zinc	0.075 - 38.1	mg/L	-	4.58	0.0051	0.152	-	-	-	-	-	-	-	-
Zirconium	-	mg/L	-	0.05	0.005	-	-	-	-	-	-	-	-	-
Dissolved Metals														
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
Antimony	0.09	mg/L	0.2	0.000885	0.000143	0.000191	0.0002	0.0001	0.0002	0.0005	0.00027	0.00033	<0.00010	0.00011
Arsenic	0.05	mg/L	0.2	0.0008	0.0003	0.0003	0.0025	<0.0005	0.0025	0.0044	0.00371	0.00187	0.00129	0.00227
Barium	10	mg/L	0.25	0.0869	0.612	0.559	0.329	0.066	0.329	0.672	0.506	0.676	0.403	0.543
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
Bismuth	-	mg/L	0.1	0.00002	0.00002	0.00002	-	-	-	-	<0.00010	<0.00010	<0.000050	<0.000050
Boron	12	mg/L	0.1	0.072	0.008	0.008	0.037	0.012	0.037	0.06	0.032	0.0184	<0.010	<0.010
Cadmium	0.0005 - 0.004	mg/L	0.01	0.00011	0.0008	0.0005	0.00019	0.00059	0.00019	0.00022	0.000395	0.000372	0.00007	0.0000567
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
Cesium	-	mg/L	-	-	-	-	-	-	-	-	-	-	0.000011	0.000018
Chromium	0.01	mg/L	0.01	0.003	0.0006	0.0002	0.0006	<0.0005	0.0006	0.0005	0.00058	<0.00050	0.00027	0.00043
Cobalt	0.04	mg/L	0.01	0.0039	0.0139	0.011	0.00338	0.0008	0.00338	0.00775	0.0117	0.0134	0.0117	0.0142
Copper	0.02 - 0.09	mg/L	0.01	0.00272	0.0046	0.00354	0.0186	0.0007	0.0186	0.0296	0.0271	0.00226	0.0006	0.00055
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
Lead	0.04 - 0.16	mg/L	0.05	0.00001	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	0.000084	0.000107
Lithium	-	mg/L	0.05	0.00321	0.00379	0.00328	0.01	0.0042	0.01	0.0079	0.0061	0.00403	0.0033	0.0035
Magnesium	-	mg/L	7.18	10.7	12.8	11.1	10.2	7.67	10.2	10.8	10.6	12.9	10.8	11.4
Manganese	-	mg/L	0.94	0.0169	9.81	7.63	2.34	0.703	2.34	5.76	9.41	8.99	7.62	10.5
Mercury	0.00025	mg/L	-	-	0.00005	0.00005	<0.00002	<0.00002	<0.00002	-	<0.00002	<0.000010	<0.0000050	<0.0000050
Molybdenum	10	mg/L	0.03	0.031	0.00065	0.00036	0.0004	0.0004	0.0004	0.0008	0.00072	0.00095	0.000337	0.000367
Nickel	0.25 - 1.5	mg/L	0.2	0.0011	0.0305	0.0286	0.0112	0.0024	0.0112	0.0154	0.0182	0.0167	0.0131	0.0154
Phosphorus	-	mg/L	0.3	0.1	0.1	0.1	-	-	-	-	<0.050	<0.050	<0.050	<0.050
Potassium	-	mg/L	2	3	1	1	0.81	1.01	0.81	0.9	0.83	0.81	0.898	0.787
Rubidium	-	mg/L	-	-	-	-	-	-	-	-	-	-	0.00053	0.00071
Selenium	0.02	mg/L	0.2	0.02	0.0004	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.000050	0.000054
Silicon	-	mg/L	-	-	-	-	-	-	-	-	7	7.6	6.94	7.67
Silver	0.0005 - 0.015	mg/L	0.01	0.00002	0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010
Sodium	-	mg/L	8	110	4.98	5.04	8.87	25.9	8.87	9.03	7.85	5.12	7.74	4.67
Strontium	-	mg/L	0.26	0.473	0.425	0.365	-	-	-	-	0.342	0.4	0.338	0.38
Sulfur	-	mg/L	-	5806	0.7	1.1	-	-	-	-	<3.0	<3.0	2.32	1.96
Tellerium	-	mg/L	-	0.05	0.05	-	-	-	-	-	<0.00020	<0.00050	<0.00020	<0.00020
Thallium	0.003	mg/L	0.1	0.00006	0.000026	0.000019	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	0.000011	<0.000010
Thorium	-	mg/L	-	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin	-	mg/L	0.3	0.00001	0.00001	0.00001	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	0.00038	<0.00010
Titanium	1	mg/L	-	0.003	0.003	0.003	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	0.00099	<0.0030
Tungsten	-	mg/L	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Uranium	0.085	mg/L	-	0.000323	0.000208	0.000073	0.00017	0.00023	0.00017	0.00015	0.000121	0.000167	0.00008	0.00005
Vanadium	-	mg/L	<0.3	0.00191	0.00078	0.00047	0.001	<0.001	0.001	<0.001	<0.0010	0.0011	<0.00050	0.00064
Zinc	0.075 - 2.4	mg/L	0.036	0.0007	0.0046	0.0027	0.013	0.005	0.013	0.071	0.0793	0.0085	0.0049	0.0043
Zirconium	-	mg/L	-	0.005	0.005	0.005	-	-	-	-	0.00011	<0.00010	0.000193	0.000148

NOTES

BC CSR AW-F — Quality Guidelines for Protection of Freshwater Aquatic Life
BC CSR LW — Water Quality Guidelines for Protection of Livestock
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
QAQC = quality assurance/quality control; FD = field

Table D-4: Groundwater Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	Notes	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Notes	Units	Meziadin Landfill											
Monitoring Well						MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B	MW-1B
Sample ID						-	-	-	-	-	-	-	-	-	-	L2097663-2	L2183746-2
Laboratory ID						-	-	-	-	-	-	-	-	-	-	17-May-18	17-Oct-18
Sample Date						1-Apr-97	1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-Aug-17	-	-
QAQC						-	-	-	-	-	-	-	-	-	-	-	-
Field Observations																	
pH	-		-		-	-	-	-	-	-	-	-	-	-	-	5.86	7.13
Temperature	-		-		°C	-	-	-	-	-	-	-	-	-	-	7.5	7.1
Conductivity	-		-		uS/cm	-	-	-	-	-	-	-	-	-	-	264.9	232.2
Water level	-		-		m	-	-	-	-	-	-	-	-	-	-	2.62	3.26
Dissolved Oxygen	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	2.9	7.9
Oxidation Reduction Potential	-		-		mV	-	-	-	-	-	-	-	-	-	-	270.1	402.7
Conventional Parameters																	
Conductivity	-		-		uS/cm	254	441	442	437	385	351	385	392	396	450	361	384
Hardness (Total as CaCO3)	-		-		mg/L	116	652	236	200	168	146	168	171	171	208	175	189
Hardness (Dissolved as CaCO3)	-		-		mg/L	-	267	260	200	-	128	-	-	-	-	-	-
pH	6.5-9.0		-		-	7.9	7.3	-	7.3	7.6	6.8	7.6	6.8	6.4	6.6	-	7.24
Total Suspended Solids	-		**25 mg/L (backgr. 25-250 mg/l)**		mg/L	-	**9290**	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	-		-		mg/L	143	-	248	260	340	220	340	270	260	220	237	242
Alkalinity, Total (as CaCO3)	-		-		mg/L	124	-	240	235	200	180	200	210	210	240	209	213
Ammonia, Total (as N)	1.34 - 1.85	pH/T*	**6.98 - 24.7**	pH/T*	mg/L	-	-	0.005	0.02	0.076	0.14	0.076	0.21	0.28	0.26	0.269	0.34
Bromide (Br)	-		-		mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-
Chloride (Cl)	150		**600**		mg/L	0.9	0.8	1.1	0.5	2	<1.0	2	<1.0	<1.0	<1.0	0.55	<0.50
Fluoride (F)	-		**1.39 - 2.09**	H	mg/L	0.22	-	-	-	-	<0.10	-	-	<0.10	<0.10	0.07	0.066
Nitrate (as N)	3		**32.8**		mg/L	0.01	-	0.002	0.003	-	-	-	-	-	-	0.17	0.0481
Nitrite (as N)	0.02 - 0.2	Cl	**0.06 - 0.6**	Cl	mg/L	0.01	-	0.002	0.002	-	-	-	-	-	-	0.0058	0.0012
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
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
Phosphorus (P)-Total	-		-		mg/L	-	-	9.51	7.03	-	-	-	-	-	-	-	-
Sulfate (SO4)	128 - 429	H	-		mg/L	7	2.8	2.6	4	9.5	6.6	9.5	4.7	5.8	6.7	5.74	6.17
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
Total Metals																	
Aluminum	0.05	pH	**0.1**	pH	mg/L	-	**18.6**	0.0371	**8.46**	-	-	-	-	-	-	-	-
Antimony	0.009		-		mg/L	-	0.000497	0.000152	0.000214	-	-	-	-	-	-	-	-
Arsenic	0.005		-		mg/L	-	0.0047	0.0003	0.0039	-	-	-	-	-	-	-	-
Barium	1		-		mg/L	-	1.43	0.593	1.53	-	-	-	-	-	-	-	-
Beryllium	0.00013		-		mg/L	-	0.00211	0.00002	0.00137	-	-	-	-	-	-	-	-
Bismuth	-		-		mg/L	-	0.00002	0.00002	0.00002	-	-	-	-	-	-	-	-
Boron	1.2		-		mg/L	-	0.033	0.008	0.008	-	-	-	-	-	-	-	-
Cadmium	0.00035 - 0.00084	H	**0.0012 - 0.00406**	H	mg/L	-	0.00255	0.00079	0.0015	-	-	-	-	-	-	-	-
Calcium	-		-		mg/L	-	102	75.3	84	-	44.5	-	-	-	-	-	-
Chromium	0.001 $^{Cr\ VI}$ 0.0089 $^{Cr\ III}$	V	-		mg/L	-	0.0506	0.0004	0.0112	-	-	-	-	-	-	-	-
Cobalt	0.004		**0.11**		mg/L	-	0.0749	0.0141	0.0472	-	-	-	-	-	-	-	-
Copper	0.002	H	**0.002**	H	mg/L	-	0.21	0.00505	0.163	-	-	-	-	-	-	-	-
Iron	-		**1**		mg/L	-	**289**	0.144	**55.2**	-	-	-	-	-	-	-	-
Lead	0.011 - 0.038	H	**0.1973 - 0.8881**	H	mg/L	-	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	0.605	H	**0.54**	H	mg/L	-	**12.6**	**9.94**	**12.3**	-	-	-	-	-	-	-	-
Mercury	0.0001		-		mg/L	-	-	0.00005	0.00005	-	-	-	-	-	-	-	-
Molybdenum	2		-		mg/L	-	0.00248	0.00062	0.00052	-	-	-	-	-	-	-	-
Nickel	0.025-0.15		-		mg/L	-	0.169	0.0308	0.0995	-	-	-	-	-	-	-	-
Phosphorus	0.005-0.015		-		mg/L	-	6.5	0.1	3.4	-	-	-	-	-	-	-	-
Potassium	-		-		mg/L	-	8	1	1	-	-	-	-	-	-	-	-
Selenium	0.002		-		mg/L	-	0.0023	0.0003	0.0007	-	-	-	-	-	-	-	-
Silver	0.00005, 0.0015	H	**0.0001, 0.003**	H	mg/L	-	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	0.0008		-		mg/L	-	0.000141	0.000026	0.000096	-	-	-	-	-	-	-	-
Tin	-		-		mg/L	-	0.00003	0.00001	0.00003	-	-	-	-	-	-	-	-
Titanium	-		-		mg/L	-	0.00207	0.003	0.006	-	-	-	-	-	-	-	-
Uranium	0.0085		-		mg/L	-	0.0162	0.000207	0.000616	-	-	-	-	-	-	-	-
Vanadium	-		-		mg/L	-	1.84	0.00089	0.0299	-	-	-	-	-	-	-	-
Zinc	0.0075	H	**0.033**	H	mg/L	-	**4.58**	0.0051	**0.152**	-	-	-	-	-	-	-	-
Zirconium	-		-		mg/L	-	0.05	0.005	-	-	-	-	-	-	-	-	-
Dissolved Metals																	
Aluminum	0.05	pH	**0.1**	pH	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**
Antimony	0.009		-		mg/L	0.2	0.000885	0.000143	0.000191	0.0002	0.0001	0.0002	0.0005	0.00027	0.00033	<0.00010	0.00011
Arsenic	0.005		-		mg/L	0.2	0.0008	0.0003	0.0003	0.0025	<0.0005	0.0025	0.0044	0.00371	0.00187	0.00129	0.00227
Barium	-		-		mg/L	0.25	0.0869	0.612	0.559	0.329	0.066	0.329	0.672	0.506	0.676	0.403	0.543
Beryllium	-		-		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
Bismuth	-		-		mg/L	0.1	0.00002	0.00002	0.00002	-	-	-	-	<0.00010	<0.00010	<0.000050	<0.000050
Boron	1.2		-		mg/L	0.1	0.072	0.008	0.008	0.037	0.012	0.037	0.06	0.032	0.0184	<0.010	<0.010
Cadmium	0.00028 - 0.00084	H	**0.00087 - 0.00406**	H	mg/L	0.01	0.00011	0.0008	0.0005	0.00019	0.00059	0.00019	0.00022	0.000395	0.000372	0.00007	0.0000567
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
Cesium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	0.000011	0.000018
Chromium	0.001 $^{Cr\ VI}$ 0.0089 $^{Cr\ III}$	V	-		mg/L	0.01	0.003	0.0006	0.0002	0.0006	<0.0005	0.0006	0.0005	0.00058	<0.00050	0.00027	0.00043
Cobalt	0.004		**0.11**		mg/L	0.01	0.0039	0.0139	0.011	0.00338	0.0008	0.00338	0.00775	0.0117	0.0134	0.0117	0.0142
Copper	0.00464 - 0.02608	H	**0.0129 - 0.06329**	H	mg/L	0.01	0.00272	0.0046	0.00354	0.0186	0.0007	0.0186	0.0296	0.0271	0.00226	0.0006	0.00055
Iron	-		**0.35**		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
Lead	0.00716 - 0.03795	H	**0.09862 - 0.88811**	H	mg/L	0.05	0.00001	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	0.000084	0.000107
Lithium	-		-		mg/L	0.05	0.00321	0.00379	0.00328	0.01	0.0042	0.01	0.0079	0.0061	0.00403	0.0033	0.0035
Magnesium	-		-		mg/L	7.18	10.7	12.8	11.1	10.2	7.67	10.2	10.8	10.6	12.9	10.8	11.4
Manganese	1.1154 - 3.4738	H	**1.81832 - 7.72504**	H	mg/L	0.94	0.0169	**9.81**	**7.63**	2.34	0.703	2.34	**5.76**	**9.41**	**8.99**	**7.62**	**10.5**
Mercury	0.0001		-		mg/L	-	-	0.00005	0.00005	<0.00002	<0.00002	<0.00002	-	<0.00002	<0.000010	<0.0000050	<0.0000050
Molybdenum	2		-		mg/L	0.03	0.031	0.00065	0.00036	0.0004	0.0004	0.0004	0.0008	0.00072	0.00095	0.000337	0.000367
Nickel	0.025-0.15		-		mg/L	0.2	0.0011	0.0305	0.0286	0.0112	0.0024	0.0112	0.0154	0.0182	0.0167	0.0131	0.0154
Phosphorus	0.005-0.015		-		mg/L	0.3	0.1	0.1	0.1	-	-	-	-	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium	-		-		mg/L	2	3	1	1	0.81	1.01	0.81	0.9	0.83	0.81	0.898	0.787
Rubidium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	0.00053	0.00071
Selenium	0.002		-		mg/L	0.2	0.02	0.0004	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.000050	0.000054
Silicon	-		-		mg/L	-	-	-	-	-	-	-	-	7	7.6	6.94	7.67
Silver	0.00005, 0.0015	H	**0.0001, 0.003**	H	mg/L	**0.01**	0.00002	0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010
Sodium	-		-		mg/L	8	110	4.98	5.04	8.87	25.9	8.87	9.03	7.85	5.12	7.74	4.67
Strontium	-		-		mg/L	0.26	0.473	0.425	0.365	-	-	-	-	0.342	0.4	0.338	0.38
Sulfur	-		-		mg/L	-	5806	0.7	1.1	-	-	-	-	<3.0	<3.0	2.32	1.96
Tellerium	-		-		mg/L	-	0.05	0.05	-	-	-	-	-	<0.00020	<0.00050	<0.00020	<0.00020
Thallium	0.0008		-		mg/L	0.1	0.00006	0.000026	0.000019	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	0.000011	<0.000010
Thorium	-		-		mg/L	-	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin	-		-		mg/L	0.3	0.00001	0.00001	0.00001	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00020	0.00038	<0.00010
Titanium	-		-		mg/L	-	0.003	0.003	0.003	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	0.00099	<0.0030
Tungsten	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Uranium	0.0085		-		mg/L	-	0.000323	0.000208	0.000073	0.00017	0.00023	0.00017	0.00015	0.000121	0.000167	0.00008	0.00005
Vanadium	-		-		mg/L	<0.3	0.00191	0.00078	0.00047	0.001	<0.001	0.001	<0.001	<0.0010	0.0011	<0.00050	0.00064
Zinc	0.027 - 0.429	H	**0.053 - 0.455**		mg/L	0.036	0.0007	0.0046	0.0027	0.013	0.005	0.013	0.071	0.0793	0.0085	0.0049	0.0043
Zirconium	-		-		mg/L	-	0.005	0.005	0.005	-	-	-	-	0.00011	<0.00010	0.000193	0.000148

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-5: Groundwater Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location			Meziadin Landfill										
Monitoring Well			MW-2										
Sample ID	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2
Laboratory ID			-	-	-	-	-	-	-	-	-	L2097663-3	L2183746-3
Sample Date			1-Apr-97	1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18
QAQC			-	-	-	-	-	-	-	-	-	-	-
Field Observations													
pH	-	-	-	-	-	-	-	-	-	-	-	7.2	7.65
Temperature	-	°C	-	-	-	-	-	-	-	-	-	6.9	6.9
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	309.8	248.9
Water level	-	m	-	-	-	-	-	-	-	-	-	1.52	3.04
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	13.3	6.4
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	406.5	404.6
Conventional Parameters													
Conductivity	-	uS/cm	520	389	488	512	505	496	505	457	491	369	450
Hardness (Total as CaCO3)	-	mg/L	-	265	167	190	151	174	151	139	154	114	142
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
Total Suspended Solids	-	mg/L	-	3200	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	-	mg/L	338	-	282	290	300	300	300	280	240	233	294
Alkalinity, Total (as CaCO3)	-	mg/L	146	-	182	188	210	200	210	200	200	166	205
Ammonia, Total (as N)	1.31 - 11.3	mg/L	-	0.01	0.07	0.04	<0.03	<0.03	<0.03	<0.03	0.04	<0.005	0.02
Bromide (Br)	-	mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-
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
Fluoride (F)	2.0-3.0 (e)	mg/L	0.19	-	-	-	-	0.14	-	0.15	0.15	0.136	0.181
Nitrate (as N)	400	mg/L	0.01	-	0.004	0.038	-	-	-	-	-	0.187	0.0105
Nitrite (as N)	0.2 - 2.0 (h)	mg/L	0.01	-	0.002	0.004	-	-	-	-	-	0.0011	<0.0010
Nitrate + Nitrite (as N)	-	mg/L	-	-	0.004	0.042	0.028	0.038	0.028	0.0310	0.0149	0.1880	0.0105
Total Kjeldahl Nitrogen	-	mg/L	-	-	0.19	0.1	0.14	0.08	0.14	0.109	0.325	0.083	0.082
Phosphorus (P)-Total	-	mg/L	-	-	0.923	0.351	-	-	-	-	-	-	-
Sulfate (SO4)	128 - 429 (d)	mg/L	103	47	77	86	59	66	59	55	50	43	49
Biological Oxygen Demand (BOD)	-	mg/L	-	-	10	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	-	mg/L	-	10	10	10	<20	<20	<20	25	<20	<20	<20
Total Metals													
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	mg/L	-	0.00339	0.0003	0.00076	-	-	-	-	-	-	-
Calcium	-	mg/L	-	53.5	46.6	56.4	-	48.6	-	-	-	-	-
Chromium	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	mg/L	-	0.0879	0.00337	0.0189	-	-	-	-	-	-	-
Iron	-	mg/L	-	66.6	0.181	3.94	-	-	-	-	-	-	-
Lead	0.04 - 0.16	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	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	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 - 38.1	mg/L	-	0.107	0.0014	0.0208	-	-	-	-	-	-	-
Zirconium	-	mg/L	-	0.005	0.005	-	-	-	-	-	-	-	-
Dissolved Metals			-	-	-	-	-	-	-	-	-	-	-
Aluminum	-	mg/L	0.2	0.0047	0.002	0.0043	<0.005	<0.005	<0.005	<0.0050	<0.0050	0.0026	0.0015
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
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
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
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
Bismuth	-	mg/L	0.1	0.00002	0.00002	0.00002	-	-	-	<0.00010	<0.00010	<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
Cadmium	0.0005 - 0.004	mg/L	0.01	0.00044	0.00025	0.00021	0.00017	0.00021	0.00017	0.000494	0.000192	0.000493	0.000157
Calcium	-	mg/L	60.2	40.6	52.2	53.9	39.7	46.8	39.7	37.2	40.6	31.3	37.9
Cesium	-	mg/L	-	-	-	-	-	-	-	-	-	<0.000010	<0.000010
Chromium	0.01	mg/L	0.01	0.0015	0.0002	0.0002	0.0012	<0.0005	0.0012	<0.00050	<0.00050	0.00035	<0.00010
Cobalt	0.04	mg/L	0.01	0.000311	0.000285	0.00009	<0.00005	<0.00005	<0.00005	0.00014	0.00028	<0.00010	0.0001
Copper	0.02 - 0.09	mg/L	0.01	0.0026	0.0014	0.00078	0.0008	0.0005	0.0008	0.00558	<0.00040	0.00092	<0.00020
Iron	-	mg/L	0.12	0.005	0.005	0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	0.04 - 0.16	mg/L	0.05	0.00001	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	<0.000050	<0.000050
Lithium	-	mg/L	0.01	0.00158	0.00197	0.0024	0.0035	0.0028	0.0035	0.0023	0.00296	0.002	0.0026
Magnesium	-	mg/L	12.6	11.5	13.9	14.0	12.5	12.5	12.5	11.2	12.7	8.68	11.5
Manganese	-	mg/L	0.709	0.239	0.258	0.198	0.0011	0.0006	0.0011	0.0517	0.162	0.0108	0.0821
Mercury	0.00025	mg/L	-	-	0.00005	0.00005	<0.00002	<0.00002	<0.00002	<0.00002	<0.000010	<0.0000050	<0.0000050
Molybdenum	10	mg/L	0.03	0.00914	0.00971	0.0114	0.0161	0.015	0.0161	0.0135	0.0175	0.0103	0.0198
Nickel	0.25 - 1.5	mg/L	0.02	0.00113	0.0012	0.00083	0.0003	0.0005	0.0003	0.00084	0.00173	<0.00050	0.00092
Phosphorus	-	mg/L	0.3	0.1	0.1	0.1	-	-	-	<0.050	<0.050	<0.050	<0.050
Potassium	-	mg/L	2.0	2.0	2.0	2.0	2.0	1.8	2.0	1.8	1.82	1.63	1.91
Rubidium	-	mg/L	-	-	-	-	-	-	-	-	-	0.00025	0.00022
Selenium	0.02	mg/L	0.2	0.0029	0.0004	0.0004	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.000088	<0.000050
Silicon	-	mg/L	-	-	-	-	-	-	-	4.1	4	4.28	3.95
Silver	0.0005 - 0.015	mg/L	0.01	0.00002	0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010
Sodium	-	mg/L	34.0	31.7	39.3	44.7	49.6	44.1	49.6	44.0	49.1	34	47.2
Strontium	-	mg/L	0.3	0.4	0.5	0.6	-	-	-	0.4	0.487	0.36	0.498
Sulfur	-	mg/L	-	16.2	24.5	29.5	-	-	-	16.0	18.1	12.9	16.4
Tellerium	-	mg/L	-	0.1	0.1	-	-	-	-	<0.00020	<0.00050	<0.00020	<0.00020
Thallium	0.003	mg/L	0.1	0.000065	0.00003	0.000022	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.000010	<0.000010
Thorium	-	mg/L	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin	-	mg/L	0.03	0.00001	0.00003	0.00001	0.0004	0.0002	0.0004	<0.00020	<0.00020	<0.00010	<0.00010
Titanium	1	mg/L	0.01	0.003	0.003	0.003	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.00030	<0.00030
Tungsten	-	mg/L	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Uranium	0.085	mg/L	-	0.00166	0.00188	0.00215	0.00252	0.00216	0.00252	0.00181	0.00225	0.00127	0.0019
Vanadium	-	mg/L	0.03	0.00359	0.00133	0.00068	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.00050	<0.00050
Zinc	0.075 - 2.4	mg/L	0.037	0.0004	0.0001	0.00001	<0.004	<0.004	<0.004	0.0191	<0.0040	0.0053	<0.0010
Zirconium	-	mg/L	-	0.005	0.005	0.005	-	-	-	<0.00010	<0.00010	<0.000060	<0.000060

NOTES

BC CSR AW-F — er Quality Guidelines for Protection of Freshwater Aquatic Life
BC CSR LW — on Water Quality Guidelines for Protection of Livestock
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,
QAQC = quality assurance/quality control; FD = field duplicate;

Table D-6: Groundwater Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location						Meziadin Landfill										
Monitoring Well	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	Notes	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Notes	Units	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2
Sample ID						MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2	MW-2
Laboratory ID						-	-	-	-	-	-	-	-	-	L2097663-3	L2183746-3
Sample Date						1-Apr-97	1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18
QAQC						-	-	-	-	-	-	-	-	-	-	-
Field Observations																
pH	-		-		-	-	-	-	-	-	-	-	-	-	7.2	7.65
Temperature	-		-		°C	-	-	-	-	-	-	-	-	-	6.9	6.9
Conductivity	-		-		uS/cm	-	-	-	-	-	-	-	-	-	309.8	248.9
Water level	-		-		m	-	-	-	-	-	-	-	-	-	1.52	3.04
Dissolved Oxygen	-		-		mg/L	-	-	-	-	-	-	-	-	-	13.3	6.4
Oxidation Reduction Potential			-		mV	-	-	-	-	-	-	-	-	-	406.5	404.6
Conventional Parameters																
Conductivity	-		-		uS/cm	520	389	488	512	505	496	505	457	491	369	450
Hardness (Total as CaCO3)	-		-		mg/L	-	265	167	190	151	174	151	139	154	114	142
Hardness (Dissolved as CaCO3)	-		-		mg/L	-	149	188	190	-	168	-	-	-	-	-
pH	6.5-9.0		-		-	7.9	8.2	8.1	8.2	7.8	8	7.8	7.6	7.8	-	8.36
Total Suspended Solids	-		**25 mg/L (backgr. 25 250 mg/l)**		mg/L	-	**3200**	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	-		-		mg/L	338	-	282	290	300	300	300	280	240	233	294
Alkalinity, Total (as CaCO3)	-		-		mg/L	146	-	182	188	210	200	210	200	200	166	205
Ammonia, Total (as N)	0.461 - 1.85	pH/T*	**2.4 - 12.7**	pH/T*	mg/L	-	0.005	0.068	0.043	<0.03	<0.03	<0.03	<0.03	0.04	<0.005	0.0216
Bromide (Br)	-		-		mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-
Chloride (Cl)	150		**600**		mg/L	5.9	1	1.3	0.5	1	1.1	1	<1	<1	<0.5	<0.50
Fluoride (F)	-		**1.39 - 1.73**	H	mg/L	0.19	-	-	-	-	0.14	-	0.15	0.15	0.136	0.181
Nitrate (as N)	3		**32.8**		mg/L	0.01	-	0.004	0.038	-	-	-	-	-	0.187	0.0105
Nitrite (as N)	0.02 - 0.2	Cl	**0.06 - 0.6**	Cl	mg/L	0.01	-	0.002	0.004	-	-	-	-	-	0.0011	<0.0010
Nitrate + Nitrite (as N)	-		-		mg/L	-	-	0.004	0.042	0.028	0.038	0.028	0.031	0.0149	0.188	0.0105
Total Kjeldahl Nitrogen	-		-		mg/L	-	-	0.19	0.1	0.14	0.08	0.14	0.109	0.325	0.083	0.082
Phosphorus (P)-Total	-		-		mg/L	-	-	0.923	0.351	-	-	-	-	-	-	-
Sulfate (SO4)	128 - 429	H	-		mg/L	103	47.1	76.6	85.7	58.6	66.2	58.6	55	50.4	42.7	48.5
Biological Oxygen Demand (BOD)	-		-		mg/L	-	-	10	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	-		-		mg/L	-	10	10	10	<20	<20	<20	25	<20	<20	<20
Total Metals																
Aluminum	0.05	pH	**0.1**	pH	mg/L	-	**7.59**	0.185	**1.99**	-	-	-	-	-	-	-
Antimony	0.009		-		mg/L	-	0.000254	0.000147	0.000145	-	-	-	-	-	-	-
Arsenic	0.005		-		mg/L	-	0.0025	0.0006	0.0013	-	-	-	-	-	-	-
Barium	1		-		mg/L	-	0.277	0.0872	0.12	-	-	-	-	-	-	-
Beryllium	0.00013		-		mg/L	-	0.00057	0.00002	0.0001	-	-	-	-	-	-	-
Bismuth	-		-		mg/L	-	0.00003	0.00004	0.00002	-	-	-	-	-	-	-
Boron	1.2		-		mg/L	-	0.057	0.065	0.051	-	-	-	-	-	-	-
Cadmium	0.00031 - 0.00043	H	**0.001 - 0.0016**	H	mg/L	-	0.00339	0.0003	0.00076	-	-	-	-	-	-	-
Calcium	-		-		mg/L	-	53.5	46.6	56.4	-	48.6	-	-	-	-	-
Chromium	0.001 $^{Cr\ VI}$ 0.0089 $^{Cr\ III}$	V	-		mg/L	-	0.0222	0.0005	0.0051	-	-	-	-	-	-	-
Cobalt	0.004		**0.11**		mg/L	-	0.0186	0.000597	0.0045	-	-	-	-	-	-	-
Copper	0.002	H	**0.002**	H	mg/L	-	**0.0879**	**0.00337**	**0.0189**	-	-	-	-	-	-	-
Iron	-		**1**		mg/L	-	**66.6**	0.181	**3.94**	-	-	-	-	-	-	-
Lead	0.0094 - 0.0143	H	**0.1568 - 0.2823**	H	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	0.605	H	**0.54**	H	mg/L	-	1.26	0.275	0.64	-	-	-	-	-	-	-
Mercury	0.0001		-		mg/L	-	-	0.00005	0.00005	-	-	-	-	-	-	-
Molybdenum	2		-		mg/L	-	0.00951	0.0094	0.0108	-	-	-	-	-	-	-
Nickel	0.025-0.15		-		mg/L	-	0.0542	0.00212	0.0129	-	-	-	-	-	-	-
Phosphorus	0.005-0.015		-		mg/L	-	1.4	0.1	0.2	-	-	-	-	-	-	-
Potassium	-		-		mg/L	-	5	2	2	-	-	-	-	-	-	-
Selenium	0.002		-		mg/L	-	0.0043	0.0004	0.0003	-	-	-	-	-	-	-
Silver	0.00005, 0.0015	H	**0.0001, 0.003**	H	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	0.0008		-		mg/L	-	0.000231	0.000036	0.000056	-	-	-	-	-	-	-
Tin	-		-		mg/L	-	0.00004	0.00004	0.0001	-	-	-	-	-	-	-
Titanium	-		-		mg/L	-	0.262	0.003	0.006	-	-	-	-	-	-	-
Uranium	0.0085		-		mg/L	-	0.00192	0.00198	0.0022	-	-	-	-	-	-	-
Vanadium	-		-		mg/L	-	0.0299	0.00193	0.00672	-	-	-	-	-	-	-
Zinc	0.0075	H	**0.033**	H	mg/L	-	0.107	0.0014	0.0208	-	-	-	-	-	-	-
Zirconium	-		-		mg/L	-	0.005	0.005	-	-	-	-	-	-	-	-
Dissolved Metals																
Aluminum	0.05	pH	**0.1**	pH	mg/L	**0.2**	0.0047	0.002	0.0043	<0.005	<0.005	<0.005	<0.0050	<0.0050	0.0026	0.0015
Antimony	0.009		-		mg/L	0.2	0.00002	0.000127	0.000096	0.0002	0.0001	0.0002	0.0001	<0.00020	<0.00010	<0.00010
Arsenic	0.005		-		mg/L	0.2	0.0007	0.0006	0.0005	<0.0005	<0.0005	<0.0005	<0.00050	0.0006	0.00027	0.00037
Barium	-		-		mg/L	0.19	0.0812	0.0798	0.0825	0.056	0.059	0.056	0.0927	0.0629	0.0498	0.0527
Beryllium	-		-		mg/L	0.005	0.00002	0.00002	0.00002	<0.0001	<0.0001	<0.0001	<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
Boron	1.2		-		mg/L	0.1	0.048	0.056	0.053	0.06	0.058	0.06	0.059	0.0589	0.036	0.053
Cadmium	0.00023 - 0.00071	H	**0.00067 - 0.00321**	H	mg/L	0.01	0.00044	0.00025	0.00021	0.00017	0.00021	0.00017	0.000494	0.000192	0.000493	0.000157
Calcium	-		-		mg/L	60.2	40.6	52.2	53.9	39.7	46.8	39.7	37.2	40.6	31.3	37.9
Cesium	-		-		mg/L	-	-	-	-	-	-	-	-	-	<0.000010	<0.000010
Chromium	0.001 $^{Cr\ VI}$ 0.0089 $^{Cr\ III}$	V	-		mg/L	0.01	0.0015	0.0002	0.0002	0.0012	<0.0005	0.0012	<0.00050	<0.00050	0.00035	<0.00010
Cobalt	0.004		**0.11**		mg/L	0.01	0.000311	0.000285	0.00009	<0.00005	<0.00005	<0.00005	0.00014	0.00028	<0.00010	0.0001
Copper	0.00456 - 0.0106	H	**0.01272 - 0.02691**	H	mg/L	0.01	0.0026	0.0014	0.00078	0.0008	0.0005	0.0008	0.00558	<0.00040	0.00092	<0.00020
Iron	-		**0.35**		mg/L	0.12	0.005	0.005	0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	0.00707 - 0.01432	H	**0.09647 - 0.28231**	H	mg/L	0.05	0.00001	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	<0.000050	<0.000050
Lithium	-		-		mg/L	0.01	0.00158	0.00197	0.0024	0.0035	0.0028	0.0035	0.0023	0.00296	0.002	0.0026
Magnesium	-		-		mg/L	12.6	11.5	13.9	14	12.5	12.5	12.5	11.2	12.7	8.68	11.5
Manganese	1.1066 - 1.771	H	**1.79628 - 3.4603**	H	mg/L	**0.709**	0.239	0.258	0.198	0.0011	0.0006	0.0011	0.0517	0.162	0.0108	0.0821
Mercury	0.0001		-		mg/L	-	-	0.00005	0.00005	<0.00002	<0.00002	<0.00002	<0.00002	<0.000010	<0.0000050	<0.0000050
Molybdenum	2		-		mg/L	0.03	0.00914	0.00971	0.0114	0.0161	0.015	0.0161	0.0135	0.0175	0.0103	0.0198
Nickel	0.025-0.15		-		mg/L	0.02	0.00113	0.0012	0.00083	0.0003	0.0005	0.0003	0.00084	0.00173	<0.00050	0.00092
Phosphorus	0.005-0.015		-		mg/L	0.3	0.1	0.1	0.1	-	-	-	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium	-		-		mg/L	2	2	2	2	1.97	1.83	1.97	1.82	1.82	1.63	1.91
Rubidium	-		-		mg/L	-	-	-	-	-	-	-	-	-	0.00025	0.00022
Selenium	0.002		-		mg/L	0.2	0.0029	0.0004	0.0004	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.000088	<0.000050
Silicon	-		-		mg/L	-	-	-	-	-	-	-	4.1	4	4.28	3.95
Silver	0.00005, 0.0015	H	**0.0001, 0.003**	H	mg/L	0.01	0.00002	0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010
Sodium	-		-		mg/L	34	31.7	39.3	44.7	49.6	44.1	49.6	44	49.1	34	47.2
Strontium	-		-		mg/L	0.282	0.393	0.534	0.578	-	-	-	0.441	0.487	0.36	0.498
Sulfur	-		-		mg/L	-	16.2	24.5	29.5	-	-	-	16	18.1	12.9	16.4
Tellerium	-		-		mg/L	-	0.05	0.05	-	-	-	-	<0.00020	<0.00050	<0.00020	<0.00020
Thallium	0.0008		-		mg/L	0.1	0.000065	0.00003	0.000022	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.000010	<0.000010
Thorium	-		-		mg/L	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin	-		-		mg/L	0.03	0.00001	0.00003	0.00001	0.0004	0.0002	0.0004	<0.00020	<0.00020	<0.00010	<0.00010
Titanium	-		-		mg/L	0.01	0.003	0.003	0.003	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.00030	<0.00030
Tungsten	-		-		mg/L	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Uranium	0.0085		-		mg/L	-	0.00166	0.00188	0.00215	0.00252	0.00216	0.00252	0.00181	0.00225	0.00127	0.0019
Vanadium	-		-		mg/L	0.03	0.00359	0.00133	0.00068	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.00050	<0.00050
Zinc	0.026 - 0.139	H	**0.051 - 0.164**		mg/L	**0.037**	0.0004	0.0001	0.00001	<0.004	<0.004	<0.004	0.0191	<0.0040	0.0053	<0.0010
Zirconium	-		-		mg/L	-	0.005	0.005	0.005	-	-	-	<0.00010	<0.00010	<0.000060	<0.000060

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-7: Groundwater Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location			Meziadin Landfill										
Monitoring Well	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	MW-3										
Sample ID			MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3
Laboratory ID			-	-	-	-	-	-	-	-	-	L2097663-4	L2183746-4
Sample Date			1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18
QAQC			-	-	-	-	-	-	-	-	-	-	-
Field Observations													
pH	-	-	-	-	-	-	-	-	-	-	-	7.19	7.5
Temperature	-	°C	-	-	-	-	-	-	-	-	-	6.6	6.1
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	421.7	391.7
Water level	-	m	-	-	-	-	-	-	-	-	-	6.1	6.94
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	11.2	7.6
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	433.8	412.3
Parameters													
Conductivity	-	uS/cm	-	785	766	676	680	676	669	640	647	612	628
Hardness (Total as CaCO3)	-	mg/L	473	261	320	199	230	199	194	182	197	208	185
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
Total Suspended Solids	-	mg/L	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	-	mg/L	-	496	520	430	430	430	420	420	320	412	420
Alkalinity, Total (as CaCO3)	-	mg/L	-	197	201	190	190	190	190	190	180	193	195
Ammonia, Total (as N)	1.31 - 11.3	mg/L	-	0.02	0.02	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.02	0.03
Bromide (Br)	-	mg/L	-	0.1	0.1	-	-	-	-	-	-	-	-
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
Fluoride (F)	2.0-3.0 (e)	mg/L	-	-	-	-	<0.10	-	-	0.1	0.1	0.095	<0.10
Nitrate (as N)	400	mg/L	-	0.137	0.163	-	-	-	-	-	-	0.121	0.066
Nitrite (as N)	0.2 - 2.0 (h)	mg/L	-	0.027	0.012	-	-	-	-	-	-	<0.0010	<0.0050
Nitrate + Nitrite (as N)	-	mg/L	-	0.164	0.175	0.256	0.270	0.256	0.248	-	0.204	0.121	<0.0710
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
Phosphorus (P)-Total	-	mg/L	-	0.434	0.82	-	-	-	-	-	-	-	-
Sulfate (SO4)	128 - 429 (d)	mg/L	-	210	205	161	156	161	112	154	148	148	156
Biological Oxygen Demand (BOD)	-	mg/L	-	10	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	-	mg/L	-	10	10	<20	<20	<20	<20	<20	<20	<20	<20
Total Metals													
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	mg/L	0.0106	0.00014	0.00081	-	-	-	-	-	-	-	-
Calcium	-	mg/L	106	78.8	93.5	-	69.3	-	-	-	-	-	-
Chromium	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	mg/L	0.15	0.00092	0.021	-	-	-	-	-	-	-	-
Iron	-	mg/L	129	0.06	10	-	-	-	-	-	-	-	-
Lead	0.04 - 0.16	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	mg/L	0.0866	0.00074	0.0272	-	-	-	-	-	-	-	-
Phosphorus	-	mg/L	3.2	0.1	0.4	-	-	-	-	-	-	-	-
Potassium	-	mg/L	6	2	3	-	-	-	-	-	-	-	-
Selenium	0.02	mg/L	0.0002	0.0004	0.0018	-	-	-	-	-	-	-	-
Silver	0.0005 - 0.015	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	-	-	-	-	-	-	-	-
Tin	-	mg/L	0.00038	0.00001	0.00023	-	-	-	-	-	-	-	-
Titanium	1	mg/L	0.498	0.003	0.005	-	-	-	-	-	-	-	-
Uranium	0.085	mg/L	0.00351	0.00252	0.00243	-	-	-	-	-	-	-	-
Vanadium	-	mg/L	0.0463	0.00031	0.0187	-	-	-	-	-	-	-	-
Zinc	0.075 - 38.1	mg/L	0.202	0.0001	0.0446	-	-	-	-	-	-	-	-
Zirconium	-	mg/L	0.005	0.005	-	-	-	-	-	-	-	-	-
Dissolved Metals													
Aluminum	-	mg/L	-	0.0024	0.0044	<0.005	0.012	<0.005	0.007	<0.0050	<0.0050	0.0043	0.0021
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
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
Barium	10	mg/L	-	0.0377	0.0321	0.03	0.025	0.03	0.081	0.0805	0.0286	0.0296	0.0275
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
Bismuth	-	mg/L	-	0.00002	0.00002	-	-	-	-	<0.00010	<0.00010	<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
Cadmium	0.0005 - 0.004	mg/L	-	0.00013	0.00015	0.00025	0.00055	0.00025	0.00039	0.000275	0.000321	0.000106	0.000111
Calcium	-	mg/L	-	86.7	89.7	58.1	65.0	58.1	55.7	53.3	57.1	62.3	53.4
Cesium	-	mg/L	-	-	-	-	-	-	-	-	-	<0.000010	<0.000010
Chromium	0.01	mg/L	-	0.0002	0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00010	<0.00010
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
Copper	0.02 - 0.09	mg/L	-	0.00098	0.00018	0.0008	0.0009	0.0008	0.028	0.0111	0.00046	0.00065	0.00034
Iron	-	mg/L	-	0.005	0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017
Lead	0.04 - 0.16	mg/L	-	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	<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	0.0043
Magnesium	-	mg/L	-	17.3	17.7	13.2	13.6	13.2	13.4	11.8	13.0	12.7	12.5
Manganese	-	mg/L	-	0.218	0.114	0.0041	0.0027	0.0041	0.0424	0.00546	0.0175	0.00868	0.0162
Mercury	0.00025	mg/L	-	0.00005	0.00005	<0.00002	<0.00002	<0.00002	-	<0.00002	<0.000010	<0.0000050	<0.0000050
Molybdenum	10	mg/L	-	0.00579	0.0058	0.0063	0.0065	0.0063	0.0064	0.00607	0.00667	0.00603	0.00472
Nickel	0.25 - 1.5	mg/L	-	0.00058	0.00112	0.0002	0.0025	0.0002	0.0003	0.00023	0.00066	0.00052	<0.00050
Phosphorus	-	mg/L	-	0.1	0.1	-	-	-	-	<0.050	<0.050	<0.050	<0.050
Potassium	-	mg/L	-	2.0	2.0	1.8	1.8	1.8	1.9	1.7	1.7	2.0	1.7
Rubidium	-	mg/L	-	-	-	-	-	-	-	-	-	0.0	0.0
Selenium	0.02	mg/L	-	0.0004	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.000298	0.000199
Silicon	-	mg/L	-	-	-	-	-	-	-	3.1	3.4	3.35	3.22
Silver	0.0005 - 0.015	mg/L	-	0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010
Sodium	-	mg/L	-	64.9	69.2	63.3	65.3	63.3	65.0	60.5	66.0	63.5	57.4
Strontium	-	mg/L	-	0.7	0.8	-	-	-	-	0.5	0.5	0.6	0.6
Sulfur	-	mg/L	-	71.5	74.8	-	-	-	-	45.5	48.6	49.3	47.7
Tellerium	-	mg/L	-	0.1	-	-	-	-	-	<0.00020	<0.00050	<0.00020	<0.00020
Thallium	0.003	mg/L	-	0.000022	0.000032	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.000010	<0.000010
Thorium	-	mg/L	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin	-	mg/L	-	0.00001	0.00002	0.0009	0.0004	0.0009	<0.0002	<0.00020	<0.00020	<0.00010	<0.00010
Titanium	1	mg/L	-	0.003	0.003	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.00030	<0.00030
Tungsten	-	mg/L	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Uranium	0.085	mg/L	-	0.00251	0.00255	0.00175	0.00161	0.00175	0.00144	0.00134	0.00159	0.00148	0.00119
Vanadium	-	mg/L	-	0.00019	0.00027	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.00050	<0.00050
Zinc	0.075 - 2.4	mg/L	-	0.0001	0.0001	<0.004	0.005	<0.004	0.013	0.0149	<0.0040	0.0015	0.0021
Zirconium	-	mg/L	-	0.005	0.005	-	-	-	-	<0.00010	<0.00010	<0.000060	<0.000060

NOTES

BC CSR AW-F — er Quality Guidelines for Protection of Freshwater Aquatic Life
BC CSR LW — on Water Quality Guidelines for Protection of Livestock
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,
QAQC = quality assurance/quality control; FD = field duplicate;

Location	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	Notes	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Notes	Units	Meziadin Landfill										
Monitoring Well						MW-3										
Sample ID						MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3	MW-3
Laboratory ID						-	-	-	-	-	-	-	-	-	L2097663-4	L2183746-4
Sample Date						1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18
QAQC						-	-	-	-	-	-	-	-	-	-	-
Field Observations																
pH	-		-		-	-	-	-	-	-	-	-	-	-	7.19	7.5
Temperature	-		-		°C	-	-	-	-	-	-	-	-	-	6.6	6.1
Conductivity	-		-		uS/cm	-	-	-	-	-	-	-	-	-	421.7	391.7
Water level	-		-		m	-	-	-	-	-	-	-	-	-	6.1	6.94
Dissolved Oxygen	-		-		mg/L	-	-	-	-	-	-	-	-	-	11.2	7.6
Oxidation Reduction Potential			-		mV	-	-	-	-	-	-	-	-	-	433.8	412.3
Conventional Parameters																
Conductivity	-		-		uS/cm	-	785	766	676	680	676	669	640	647	612	628
Hardness (Total as CaCO3)	-		-		mg/L	473	261	320	199	230	199	194	182	197	208	185
Hardness (Dissolved as CaCO3)	-		-		mg/L	-	288	300	-	218	-	-	-	-	-	-
pH	6.5-9.0		-		-	-	8.2	7.9	8	8	8	7.9	7.8	7.7	-	8.32
Total Dissolved Solids	-		-		mg/L	-	496	520	430	430	430	420	420	320	412	420
Alkalinity, Total (as CaCO3)	-		-		mg/L	-	197	201	190	190	190	190	190	180	193	195
Ammonia, Total (as N)	0.575 - 1.86	pH/T*	**2.99 - 12.7**	pH/T*	mg/L	-	0.02	0.024	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	0.0164	0.026
Bromide (Br)	-		-		mg/L	-	0.1	0.1	-	-	-	-	-	-	-	-
Chloride (Cl)	150		**600**		mg/L	-	1.5	1.1	1.2	1.2	1.2	1.2	1.1	<1.0	0.76	<2.5
Fluoride (F)	-		**1.57 - 1.8**	H	mg/L	-	-	-	-	<0.10	-	-	0.1	0.1	0.095	<0.10
Nitrate (as N)	3		**32.8**		mg/L	-	0.137	0.163	-	-	-	-	-	-	0.121	0.066
Nitrite (as N)	0.02 - 0.2	Cl	**0.06 - 0.6**	Cl	mg/L	-	0.027	0.012	-	-	-	-	-	-	<0.0010	<0.0050
Nitrate + Nitrite (as N)	-		-		mg/L	-	0.164	0.175	0.256	0.27	0.256	0.248	-	0.204	0.121	<0.0710
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
Phosphorus (P)-Total	-		-		mg/L	-	0.434	0.82	-	-	-	-	-	-	-	-
Sulfate (SO4)	128 - 429	H	-		mg/L	-	210	205	161	156	161	112	154	148	148	156
Biological Oxygen Demand (BOD)	-		-		mg/L	-	10	-	-	-	-	-	-	-	-	-
Chemical Oxygen Demand (COD)	-		-		mg/L	-	10	10	<20	<20	<20	<20	<20	<20	<20	<20
Total Metals																
Aluminum	0.05	pH	**0.1**	pH	mg/L	12.6	0.0436	6.15	-	-	-	-	-	-	-	-
Antimony	0.009		-		mg/L	0.000221	0.000127	0.000328	-	-	-	-	-	-	-	-
Arsenic	0.005		-		mg/L	0.0071	0.0005	0.0027	-	-	-	-	-	-	-	-
Barium	1		-		mg/L	0.203	0.0413	0.135	-	-	-	-	-	-	-	-
Beryllium	0.00013		-		mg/L	0.00114	0.00002	0.00027	-	-	-	-	-	-	-	-
Bismuth	-		-		mg/L	0.00002	0.00002	0.00014	-	-	-	-	-	-	-	-
Boron	1.2		-		mg/L	0.075	0.072	0.065	-	-	-	-	-	-	-	-
Cadmium	0.00043 - 0.00066	H	**0.00158 - 0.00291**	H	mg/L	0.0106	0.00014	0.00081	-	-	-	-	-	-	-	-
Calcium	-		-		mg/L	106	78.8	93.5	-	69.3	-	-	-	-	-	-
Chromium	0.001 $^{Cr\ VI}$ 0.0089 $^{Cr\ III}$	V	-		mg/L	0.0353	0.0002	0.0163	-	-	-	-	-	-	-	-
Cobalt	0.004		**0.11**		mg/L	0.031	0.000207	0.0096	-	-	-	-	-	-	-	-
Copper	0.002	H	**0.002**	H	mg/L	**0.15**	0.00092	**0.021**	-	-	-	-	-	-	-	-
Iron	-		**1**		mg/L	**129**	0.06	**10**	-	-	-	-	-	-	-	-
Lead	0.0141 - 0.0263	H	**0.2769 - 0.5902**	H	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	1.7534 - 2.6862	H	**3.41622 - 5.75246**	H	mg/L	2.21	0.225	0.817	-	-	-	-	-	-	-	-
Mercury	0.0001		-		mg/L	-	0.00005	0.00005	-	-	-	-	-	-	-	-
Molybdenum	2		-		mg/L	0.00217	0.00574	0.00632	-	-	-	-	-	-	-	-
Nickel	0.025-0.15		-		mg/L	0.0866	0.00074	0.0272	-	-	-	-	-	-	-	-
Phosphorus	0.005-0.015		-		mg/L	3.2	0.1	0.4	-	-	-	-	-	-	-	-
Potassium	-		-		mg/L	6	2	3	-	-	-	-	-	-	-	-
Selenium	0.002		-		mg/L	0.0002	0.0004	0.0018	-	-	-	-	-	-	-	-
Silver	0.00005, 0.0015	H	**0.0001, 0.003**	H	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	0.0008		-		mg/L	0.000335	0.000023	0.000097	-	-	-	-	-	-	-	-
Tin	-		-		mg/L	0.00038	0.00001	0.00023	-	-	-	-	-	-	-	-
Titanium	-		-		mg/L	0.498	0.003	0.005	-	-	-	-	-	-	-	-
Uranium	0.0085		-		mg/L	0.00351	0.00252	0.00243	-	-	-	-	-	-	-	-
Vanadium	-		-		mg/L	0.0463	0.00031	0.0187	-	-	-	-	-	-	-	-
Zinc	0.13575 - 0.29475	H	**0.16125 - 0.32025**	H	mg/L	0.202	0.0001	0.0446	-	-	-	-	-	-	-	-
Zirconium	-		-		mg/L	0.005	0.005	-	-	-	-	-	-	-	-	-
Dissolved Metals																
Aluminum	0.05	pH	**0.1**	pH	mg/L	-	0.0024	0.0044	<0.005	0.012	<0.005	0.007	<0.0050	<0.0050	0.0043	0.0021
Antimony	0.009		-		mg/L	-	0.000122	0.000146	0.0001	<0.0001	0.0001	0.0003	<0.00010	<0.00020	<0.00010	<0.00010
Arsenic	0.005		-		mg/L	-	0.0004	0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00024	0.00023
Barium	-		-		mg/L	-	0.0377	0.0321	0.03	0.025	0.03	0.081	0.0805	0.0286	0.0296	0.0275
Beryllium	-		-		mg/L	-	0.00002	0.00002	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth	-		-		mg/L	-	0.00002	0.00002	-	-	-	-	<0.00010	<0.00010	<0.000050	<0.000050
Boron	1.2		-		mg/L	-	0.072	0.065	0.07	0.068	0.07	0.085	0.068	0.0711	0.061	0.06
Cadmium	0.00033 - 0.0005	H	**0.00109 - 0.00195**	H	mg/L	-	0.00013	0.00015	0.00025	0.00055	0.00025	0.00039	0.000275	0.000321	0.000106	0.000111
Calcium	-		-		mg/L	-	86.7	89.7	58.1	65	58.1	55.7	53.3	57.1	62.3	53.4
Cesium	-		-		mg/L	-	-	-	-	-	-	-	-	-	<0.000010	<0.000010
Chromium	0.001 $^{Cr\ VI}$ 0.0089 $^{Cr\ III}$	V	-		mg/L	-	0.0002	0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	<0.00010	<0.00010
Cobalt	0.004		**0.11**		mg/L	-	0.000118	0.000113	<0.00005	<0.00005	<0.00005	<0.00005	<0.00010	<0.00010	<0.00010	<0.00010
Copper	0.00728 - 0.0128	H	**0.01911 - 0.03208**	H	mg/L	-	0.00098	0.00018	0.0008	0.0009	0.0008	**0.028**	0.0111	0.00046	0.00065	0.00034
Iron	-		**0.35**		mg/L	-	0.005	0.005	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017
Lead	0.01014 - 0.01731	H	**0.17499 - 0.35891**	H	mg/L	-	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	<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	0.0043
Magnesium	-		-		mg/L	-	17.3	17.7	13.2	13.6	13.2	13.4	11.8	13	12.7	12.5
Manganese	1.4058 - 2.013	H	**2.54564 - 4.0664**	H	mg/L	-	0.218	0.114	0.0041	0.0027	0.0041	0.0424	0.00546	0.0175	0.00868	0.0162
Mercury	0.0001		-		mg/L	-	0.00005	0.00005	<0.00002	<0.00002	<0.00002	-	<0.00002	<0.000010	<0.0000050	<0.0000050
Molybdenum	2		-		mg/L	-	0.00579	0.0058	0.0063	0.0065	0.0063	0.0064	0.00607	0.00667	0.00603	0.00472
Nickel	0.025-0.15		-		mg/L	-	0.00058	0.00112	0.0002	0.0025	0.0002	0.0003	0.00023	0.00066	0.00052	<0.00050
Phosphorus	0.005-0.015		-		mg/L	-	0.1	0.1	-	-	-	-	<0.050	<0.050	<0.050	<0.050
Potassium	-		-		mg/L	-	2	2	1.84	1.76	1.84	1.92	1.73	1.69	1.95	1.71
Rubidium	-		-		mg/L	-	-	-	-	-	-	-	-	-	0.00032	0.00026
Selenium	0.002		-		mg/L	-	0.0004	0.0006	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.000298	0.000199
Silicon	-		-		mg/L	-	-	-	-	-	-	-	3.1	3.4	3.35	3.22
Silver	0.00005, 0.0015	H	**0.0001, 0.003**	H	mg/L	-	0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010
Sodium	-		-		mg/L	-	64.9	69.2	63.3	65.3	63.3	65	60.5	66	63.5	57.4
Strontium	-		-		mg/L	-	0.732	0.774	-	-	-	-	0.516	0.543	0.598	0.567
Sulfur	-		-		mg/L	-	71.5	74.8	-	-	-	-	45.5	48.6	49.3	47.7
Tellerium	-		-		mg/L	-	0.05	-	-	-	-	-	<0.00020	<0.00050	<0.00020	<0.00020
Thallium	0.0008		-		mg/L	-	0.000022	0.000032	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.000010	<0.000010
Thorium	-		-		mg/L	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin	-		-		mg/L	-	0.00001	0.00002	0.0009	0.0004	0.0009	<0.0002	<0.00020	<0.00020	<0.00010	<0.00010
Titanium	-		-		mg/L	-	0.003	0.003	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.00030	<0.00030
Tungsten	-		-		mg/L	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Uranium	0.0085		-		mg/L	-	0.00251	0.00255	0.00175	0.00161	0.00175	0.00144	0.00134	0.00159	0.00148	0.00119
Vanadium	-		-		mg/L	-	0.00019	0.00027	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.00050	<0.00050
Zinc	0.077 - 0.18	H	**0.102 - 0.206**		mg/L	-	0.0001	0.0001	<0.004	0.005	<0.004	0.013	0.0149	<0.0040	0.0015	0.0021
Zirconium	-		-		mg/L	-	0.005	0.005	-	-	-	-	<0.00010	<0.00010	<0.000060	<0.000060

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

2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	Meziadin Landfill											
Monitoring Well			MW-4											
Sample ID			MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4
Laboratory ID			-	-	-	-	-	-	-	-	-	-	L2097663-5	L2183746-5
Sample Date			1-Apr-97	1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-May-17	17-May-18	17-Oct-18
QAQC			-	-	-	-	-	-	-	-	-	-	-	-
Field Observations														
pH	-	-	-	-	-	-	-	-	-	-	-	-	7.32	6.97
Temperature	-	°C	-	-	-	-	-	-	-	-	-	-	8.1	7.4
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	-	430.8	428.7
Water level	-	m	-	-	-	-	-	-	-	-	-	-	6	5.91
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	-	13.6	6.3
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	-	307.6	412.7
Parameters														
Conductivity	-	uS/cm	845	622	730	692	567	476	567	586	594	598	616	641
Hardness (Total as CaCO3)	-	mg/L	-	367	263	320	188	218	188	180	177	186	222	216
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
Total Suspended Solids	-	mg/L	-	1530	-	296	-	-	-	-	-	-	-	-
Total Dissolved Solids	-	mg/L	626	-	454	440	350	290	350	360	370	290	467	422
Alkalinity, Total (as CaCO3)	-	mg/L	-	-	216	214	180	190	180	180	180	180	173	191
Ammonia, Total (as N)	1.31 - 11.3	mg/L	-	0.01	0.02	0.05	<0.03	<0.03	<0.03	0.09	0.07	0.07	0.02	0.04
Bromide (Br)	-	mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-
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
Fluoride (F)	2.0-3.0 (e)	mg/L	0.2	-	-	-	-	0.11	-	-	0.13	0.11	0.109	0.1
Nitrate (as N)	400	mg/L	0.01	-	0.037	0.015	-	-	-	-	-	-	0.42	<0.025
Nitrite (as N)	0.2 - 2.0 (h)	mg/L	0.01	-	0.002	0.002	-	-	-	-	-	-	<0.0010	<0.0050
Nitrate + Nitrite (as N)	-	mg/L	-	-	0.037	0.017	0.153	0.378	0.153	0.114	0.030	0.092	0.420	<0.030
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
Phosphorus (P)-Total	-	mg/L	-	-	0.865	0.97	-	-	-	-	-	-	-	-
Sulfate (SO4)	128 - 429 (d)	mg/L	274	156	191	148	110	64	110	151	131	122	155	157
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
Total Metals														
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	mg/L	-	0.00838	0.00028	0.00145	-	-	-	-	-	-	-	-
Calcium	-	mg/L	-	83.8	77.4	94.8	-	62.1	-	-	-	-	-	-
Chromium	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	mg/L	-	0.0607	0.00087	0.0472	-	-	-	-	-	-	-	-
Iron	-	mg/L	-	74.4	0.076	10.3	-	-	-	-	-	-	-	-
Lead	0.04 - 0.16	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	mg/L	-	0.0672	0.00118	0.0318	-	-	-	-	-	-	-	-
Phosphorus	-	mg/L	-	1.8	0.1	1.5	-	-	-	-	-	-	-	-
Potassium	-	mg/L	-	6	2	3	-	-	-	-	-	-	-	-
Selenium	0.02	mg/L	-	0.0007	0.0003	0.0008	-	-	-	-	-	-	-	-
Silver	0.0005 - 0.015	mg/L	-	0.00006	0.00002	0.00004	-	-	-	-	-	-	-	-
Sodium	-	mg/L	-	48.9	52	58.5	-	-	-	-	-	-	-	-
Strontium	-	mg/L	-	0.686	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	-	-	-	-	-	-	-	-
Tin	-	mg/L	-	0.00017	0.00003	0.00009	-	-	-	-	-	-	-	-
Titanium	1	mg/L	-	0.299	0.003	0.003	-	-	-	-	-	-	-	-
Uranium	0.085	mg/L	-	0.00142	0.00141	0.00163	-	-	-	-	-	-	-	-
Vanadium	-	mg/L	-	0.0282	0.00037	0.0106	-	-	-	-	-	-	-	-
Zinc	0.075 - 38.1	mg/L	-	0.143	0.0007	0.0837	-	-	-	-	-	-	-	-
Zirconium	-	mg/L	-	0.005	0.005	-	-	-	-	-	-	-	-	-
Dissolved Metals														
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
Antimony	0.09	mg/L	0.2	0.00029	0.000178	0.000343	0.0001	0.0001	0.0001	0.0003	0.00027	0.00023	<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	<0.00050	<0.00050	0.00015	0.00017
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	0.0236
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
Bismuth	-	mg/L	0.1	0.00002	0.00002	0.00002	-	-	-	-	<0.00010	<0.00010	<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
Cadmium	0.0005 - 0.004	mg/L	0.01	0.00057	0.00027	0.00012	0.00034	0.00013	0.00034	0.00022	0.000056	0.000035	0.000126	0.0000858
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
Cesium	-	mg/L	-	-	-	-	-	-	-	-	-	-	<0.000010	<0.000010
Chromium	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
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
Copper	0.02 - 0.09	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
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
Lead	0.04 - 0.16	mg/L	0.05	0.00001	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	<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
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
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
Mercury	0.00025	mg/L	0.03	-	0.00005	0.00005	<0.00002	<0.00002	<0.00002	-	<0.00002	<0.000010	<0.0000050	<0.0000050
Molybdenum	10	mg/L	0.03	0.011	0.00941	0.00965	0.0108	0.0104	0.0108	0.0114	0.0136	0.014	0.00801	0.00881
Nickel	0.25 - 1.5	mg/L	0.02	0.00005	0.00062	0.00013	0.0004	0.0009	0.0004	0.0009	0.00181	0.00105	<0.00050	0.00058
Phosphorus	-	mg/L	0.3	0.1	0.1	0.1	-	-	-	-	<0.050	<0.050	<0.050	<0.050
Potassium	-	mg/L	5.0	3.0	3.0	2.0	2.4	2.2	2.4	2.3	2.3	2.3	2.4	2.2
Rubidium	-	mg/L	-	-	-	-	-	-	-	-	-	-	0.0	0.0
Selenium	0.02	mg/L	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00028	0.000261
Silicon	-	mg/L	0.2	0.6	0.0006	0.0006	-	-	-	-	3.6	3.7	3.85	3.83
Silver	0.0005 - 0.015	mg/L	0.01	0.00002	0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010
Sodium	-	mg/L	74.0	49.9	55.8	58.0	43.5	24.5	43.5	51.2	54.0	57.0	58.4	56.5
Strontium	-	mg/L	0.9	0.6	0.8	0.8	-	-	-	-	0.6	0.6	0.7	0.7
Sulfur	-	mg/L	0.1	43.9	57.0	52.7	-	-	-	-	40.4	42.4	52.8	54.5
Tellerium	-	mg/L	-	0.1	0.1	-	-	-	-	-	<0.00020	<0.00050	<0.00020	<0.00020
Thallium	0.003	mg/L	0.1	0.000014	0.00001	0.000023	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.000010	<0.000010
Thorium	-	mg/L	-	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin	-	mg/L	0.03	0.00001	0.00002	0.00001	<0.0002	0.0004	<0.0002	<0.0002	<0.00020	<0.00020	<0.00010	<0.00010
Titanium	1	mg/L	0.01	0.003	0.003	0.003	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.00030	<0.00030
Tungsten	-		-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Uranium	0.085	mg/L	-	0.00116	0.00144	0.00145	0.00089	0.00049	0.00089	0.00081	0.000972	0.00102	0.000952	0.000858
Vanadium	-	mg/L	0.03	0.00098	0.00026	0.00045	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.00050	<0.00050
Zinc	0.075 - 2.4	mg/L	0.038	0.0008	0.0001	0.0001	<0.004	0.005	<0.004	0.025	0.0264	<0.0040	0.0016	<0.0010
Zirconium	-	mg/L	-	0.005	-	0.005	-	-	-	-	<0.00010	<0.00010	<0.000060	<0.000060

NOTES

BC CSR AW-F — er Quality Guidelines for Protection of Freshwater Aquatic Life
BC CSR LW — on Water Quality Guidelines for Protection of Livestock
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,
QAQC = quality assurance/quality control; FD = field duplicate;

Table D-10: Groundwater Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	Notes	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Notes	Units	Meziadin Landfill											
Monitoring Well						MW-4											
Sample ID						MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4	MW-4
Laboratory ID						-	-	-	-	-	-	-	-	-	-	L2097663-5	L2183746-5
Sample Date						1-Apr-97	1-Jul-03	1-Jan-04	1-Jan-06	3-May-15	9-Sep-15	3-May-16	13-Sep-16	1-Apr-17	1-May-17	17-May-18	17-Oct-18
QAQC						-	-	-	-	-	-	-	-	-	-	-	-
Field Observations																	
pH	-		-		-	-	-	-	-	-	-	-	-	-	-	7.32	6.97
Temperature	-		-		°C	-	-	-	-	-	-	-	-	-	-	8.1	7.4
Conductivity	-		-		uS/cm	-	-	-	-	-	-	-	-	-	-	430.8	428.7
Water level	-		-		m	-	-	-	-	-	-	-	-	-	-	6	5.91
Dissolved Oxygen	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	13.6	6.3
Oxidation Reduction Potential			-		mV	-	-	-	-	-	-	-	-	-	-	307.6	412.7
Conventional Parameters																	
Conductivity	-		-		uS/cm	845	622	730	692	567	476	567	586	594	598	616	641
Hardness (Total as CaCO3)	-		-		mg/L	-	367	263	320	188	218	188	180	177	186	222	216
Hardness (Dissolved as CaCO3)	-		-		mg/L	323	227	289	250	-	199	-	-	-	-	-	-
pH	6.5-9.0		-		-	7.9	8.1	7.9	8.2	7.9	8	7.9	7.9	7.8	7.8	-	8.33
Total Suspended Solids	-		**25 mg/L (backgr. 25-250 mg/l)**		mg/L	-	**1530**	-	**296**	-	-	-	-	-	-	-	-
Total Dissolved Solids	-		-		mg/L	626	-	454	440	350	290	350	360	370	290	467	422
Alkalinity, Total (as CaCO3)	-		-		mg/L	-	-	216	214	180	190	180	180	180	180	173	191
Ammonia, Total (as N)	0.575 - 1.85	pH/T*	**2.99 - 12.7**	pH/T*	mg/L	-	0.007	0.021	0.046	<0.03	<0.03	<0.03	0.09	0.07	0.07	0.021	0.0412
Bromide (Br)	-		-		mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-
Chloride (Cl)	150		**600**		mg/L	5	0.7	0.9	0.5	1.3	<1.0	1.3	1	1.2	1.1	<0.50	<2.5
Fluoride (F)	-		**1.56 - 1.86**	H	mg/L	0.2	-	-	-	-	0.11	-	-	0.13	0.11	0.109	0.1
Nitrate (as N)	3		**32.8**		mg/L	0.01	-	0.037	0.015	-	-	-	-	-	-	0.42	<0.025
Nitrite (as N)	0.02 - 0.2	Cl	**0.06 - 0.6**	Cl	mg/L	0.01	-	0.002	0.002	-	-	-	-	-	-	<0.0010	<0.0050
Nitrate + Nitrite (as N)	-		-		mg/L	-	-	0.037	0.017	0.153	0.378	0.153	0.114	0.03	0.0919	0.42	<0.030
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
Phosphorus (P)-Total	-		-		mg/L	-	-	0.865	0.97	-	-	-	-	-	-	-	-
Sulfate (SO4)	128 - 429	H	-		mg/L	274	156	191	148	110	64	110	151	131	122	155	157
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
Total Metals																	
Aluminum	0.05	pH	**0.1**	pH	mg/L	-	**10**	0.0569	**4.01**	-	-	-	-	-	-	-	-
Antimony	0.009		-		mg/L	-	0.000332	0.000181	0.000566	-	-	-	-	-	-	-	-
Arsenic	0.005		-		mg/L	-	0.0048	0.0003	0.0032	-	-	-	-	-	-	-	-
Barium	1		-		mg/L	-	0.219	0.0328	0.157	-	-	-	-	-	-	-	-
Beryllium	0.00013		-		mg/L	-	0.001	0.00002	0.00078	-	-	-	-	-	-	-	-
Bismuth	-		-		mg/L	-	0.00002	0.00002	0.00002	-	-	-	-	-	-	-	-
Boron	1.2		-		mg/L	-	0.077	0.078	0.071	-	-	-	-	-	-	-	-
Cadmium	0.00043 - 0.00055	H	**0.00159 - 0.00224**	H	mg/L	-	0.00838	0.00028	0.00145	-	-	-	-	-	-	-	-
Calcium	-		-		mg/L	-	83.8	77.4	94.8	-	62.1	-	-	-	-	-	-
Chromium	0.001 Cr VI 0.0089 Cr III	V	-		mg/L	-	0.0314	0.0002	0.0068	-	-	-	-	-	-	-	-
Cobalt	0.004		**0.11**		mg/L	-	0.0233	0.000216	0.0175	-	-	-	-	-	-	-	-
Copper	0.0105 - 0.0147	H	**0.0267 - 0.0365**	H	mg/L	-	**0.0607**	0.00087	**0.0472**	-	-	-	-	-	-	-	-
Iron	-		**1**		mg/L	-	**74.4**	0.076	**10.3**	-	-	-	-	-	-	-	-
Lead	0.0142 - 0.02	H	**0.2796 - 0.4273**	H	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	1.7622 - 2.2198	H	**3.43826 - 4.58434**	H	mg/L	-	2.89	0.142	2.47	-	-	-	-	-	-	-	-
Mercury	0.0001		-		mg/L	-	-	0.00005	0.00005	-	-	-	-	-	-	-	-
Molybdenum	2		-		mg/L	-	0.0118	0.00934	0.0106	-	-	-	-	-	-	-	-
Nickel	0.025-0.15		-		mg/L	-	0.0672	0.00118	0.0318	-	-	-	-	-	-	-	-
Phosphorus	0.005-0.015		-		mg/L	-	1.8	0.1	1.5	-	-	-	-	-	-	-	-
Potassium	-		-		mg/L	-	6	2	3	-	-	-	-	-	-	-	-
Selenium	0.002		-		mg/L	-	0.0007	0.0003	0.0008	-	-	-	-	-	-	-	-
Silver	0.00005, 0.0015	H	**0.0001, 0.003**	H	mg/L	-	0.00006	0.00002	0.00004	-	-	-	-	-	-	-	-
Sodium	-		-		mg/L	-	48.9	52	58.5	-	-	-	-	-	-	-	-
Strontium	-		-		mg/L	-	0.686	0.796	0.84	-	-	-	-	-	-	-	-
Sulfur	-		-		mg/L	-	42.3	60.7	52.4	-	-	-	-	-	-	-	-
Tellurium	-		-		mg/L	-	0.05	0.05	-	-	-	-	-	-	-	-	-
Thallium	0.0008		-		mg/L	-	0.000065	0.00001	0.000054	-	-	-	-	-	-	-	-
Tin	-		-		mg/L	-	0.00017	0.00003	0.00009	-	-	-	-	-	-	-	-
Titanium	-		-		mg/L	-	0.299	0.003	0.003	-	-	-	-	-	-	-	-
Uranium	0.0085		-		mg/L	-	0.00142	0.00141	0.00163	-	-	-	-	-	-	-	-
Vanadium	-		-		mg/L	-	0.0282	0.00037	0.0106	-	-	-	-	-	-	-	-
Zinc	0.13725 - 0.21525	H	**0.16275 - 0.24075**	H	mg/L	-	0.143	0.0007	0.0837	-	-	-	-	-	-	-	-
Zirconium	-		-		mg/L	-	0.005	0.005	-	-	-	-	-	-	-	-	-
Dissolved Metals																	
Aluminum	0.05	pH	**0.1**	pH	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
Antimony	0.009		-		mg/L	0.2	0.00029	0.000178	0.000343	0.0001	0.0001	0.0001	0.0003	0.00027	0.00023	<0.00010	<0.00010
Arsenic	0.005		-		mg/L	0.2	0.0002	0.0003	0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00015	0.00017
Barium	-		-		mg/L	0.21	0.0453	0.0306	0.0394	0.035	0.082	0.035	0.119	0.103	0.0251	0.0252	0.0236
Beryllium	-		-		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
Bismuth	-		-		mg/L	0.1	0.00002	0.00002	0.00002	-	-	-	-	<0.00010	<0.00010	<0.000050	<0.000050
Boron	1.2		-		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
Cadmium	0.00032 - 0.00055	H	**0.00106 - 0.00224**	H	mg/L	**0.01**	0.00057	0.00027	0.00012	0.00034	0.00013	0.00034	0.00022	0.000056	0.000035	0.000126	0.0000858
Calcium	-		-		mg/L	94.9	65.5	85	75.3	52.9	55.6	52.9	50.9	51.7	53.7	66	62.8
Cesium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	<0.000010	<0.000010
Chromium	0.001 Cr VI 0.0089 Cr III	V	-		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
Cobalt	0.004		**0.11**		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
Copper	0.00708 - 0.01468	H	**0.01864 - 0.0365**	H	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
Iron	-		**0.35**		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
Lead	0.0099 - 0.01998	H	**0.16889 - 0.42732**	H	mg/L	0.05	0.00001	0.00001	0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00020	<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
Magnesium	-		-		mg/L	21	15.4	18.6	15.8	13.5	14.7	13.5	12.9	11.7	12.6	13.8	14.3
Manganese	1.3838 - 2.2198	H	**2.49054 - 4.58434**	H	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
Mercury	0.0001		-		mg/L	0.03	-	0.00005	0.00005	<0.00002	<0.00002	<0.00002	-	<0.00002	<0.000010	<0.0000050	<0.0000050
Molybdenum	2		-		mg/L	0.03	0.011	0.00941	0.00965	0.0108	0.0104	0.0108	0.0114	0.0136	0.014	0.00801	0.00881
Nickel	0.025-0.15		-		mg/L	0.02	0.00005	0.00062	0.00013	0.0004	0.0009	0.0004	0.0009	0.00181	0.00105	<0.00050	0.00058
Phosphorus	0.005-0.015		-		mg/L	0.3	0.1	0.1	0.1	-	-	-	-	*<0.050*	*<0.050*	*<0.050*	*<0.050*
Potassium	-		-		mg/L	5	3	3	2	2.38	2.2	2.38	2.26	2.31	2.27	2.41	2.24
Rubidium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	0.00043	0.00033
Selenium	0.002		-		mg/L	-	-	-	-	<0.0005	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00028	0.000261
Silicon	-		-		mg/L	0.2	0.6	0.0006	0.0006	-	-	-	-	3.6	3.7	3.85	3.83
Silver	0.00005, 0.0015	H	**0.0001, 0.003**	H	mg/L	**0.01**	0.00002	0.00002	0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010
Sodium	-		-		mg/L	74	49.9	55.8	58	43.5	24.5	43.5	51.2	54	57	58.4	56.5
Strontium	-		-		mg/L	0.925	0.599	0.79	0.757	-	-	-	-	0.556	0.584	0.709	0.733
Sulfur	-		-		mg/L	0.1	43.9	57	52.7	-	-	-	-	40.4	42.4	52.8	54.5
Tellerium	-		-		mg/L	-	0.05	0.05	-	-	-	-	-	<0.00020	<0.00050	<0.00020	<0.00020
Thallium	0.0008		-		mg/L	0.1	0.000014	0.00001	0.000023	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.000010	<0.000010
Thorium	-		-		mg/L	-	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.00010	<0.00010
Tin	-		-		mg/L	0.03	0.00001	0.00002	0.00001	<0.0002	0.0004	<0.0002	<0.0002	<0.00020	<0.00020	<0.00010	<0.00010
Titanium	-		-		mg/L	0.01	0.003	0.003	0.003	<0.005	<0.005	<0.005	<0.005	<0.0050	<0.0050	<0.00030	<0.00030
Tungsten	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Uranium	0.0085		-		mg/L	-	0.00116	0.00144	0.00145	0.00089	0.00049	0.00089	0.00081	0.000972	0.00102	0.000952	0.000858
Vanadium	-		-		mg/L	0.03	0.00098	0.00026	0.00045	<0.001	<0.001	<0.001	<0.001	<0.0010	<0.0010	<0.00050	<0.00050
Zinc	0.073 - 0.215	H	**0.098 - 0.241**		mg/L	**0.038**	0.0008	0.0001	0.0001	<0.004	0.005	<0.004	0.025	0.0264	<0.0040	0.0016	<0.0010
Zirconium	-		-		mg/L	-	0.005	-	0.005	-	-	-	-	<0.00010	<0.00010	<0.000060	<0.000060

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

Location			Meziadin - Treatment Lagoon Outlet Effluent																			
Site Name			SW-3																			
Sample ID	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	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	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3
Laboratory ID			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L2097662-3	L2183745-1
Sample Date			1-Jun-02	1-Jul-03	1-Jul-04	1-Oct-06	1-Jul-07	1-Jun-08	1-Sep-09	26-Apr-10	28-Sep-10	1-Jun-13	25-Sep-13	8-Jul-14	7-Oct-14	28-Apr-15	9-Sep-15	28-Apr-16	13-Sep-16	1-Apr-17	1-Aug-17	17-May-18	17-Oct-18
QAQC			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Observations																						
pH	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.61	7.45
Temperature	-	°C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.4	9.4
Conductivity	-	uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	345	316.6
Dissolved Oxygen	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.7	5.5
Oxidation Reduction Potential	-	mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	203.1	408.8
Conventional Parameters																						
Conductivity	-	uS/cm	303	261	255	186	177	221	103	109	500	402	454	510	485	780	515	339	505	629	507	456	429
Hardness (Total as CaCO3)	-	mg/L	-	134.0	111.0	85.0	-	-	-	161.1	250.5	183.0	175.0	197.0	177.0	288.0	201.0	164.0	179.0	207.0	204.0	207.0	157.0
Hardness (Dissolved as CaCO3)	-	mg/L	-	132.0	118.0	85.0	-	-	-	-	-	-	-	-	-	-	197.0	-	-	-	-	-	-
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	7.00	7.20	7.00	7.40	6.7	7	-	8.2
Total Suspended Solids	-	mg/L	-	4	4	4	-	-	-	-	-	-	-	-	-	-	9.6	280	8.9	280	31	20.5	<3.0
Total Dissolved Solids	-	mg/L	-	-	142	102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	-	mg/L	-	-	81	62	74	96	32	173	230	208	205	237	193	320	220	180	220	240	230	215	192
Ammonia, Total (as N)	3.7 - 18.5	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	8.53	1.73	0.15	2.15	5.45	1.1	1.65	2.84
Bromide (Br)	-	mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.077
Chloride (Cl)	1500	mg/L	2.24	3	5.4	4	6.1	11	1.5	14.4	-	-	18.6	24.3	39	54	35.7	39	35.7	39	28.2	20.3	25.9
Fluoride (F)	2.0-3.0 (e)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.10	-	-	-	-	0.069	0.113
Nitrate (as N)	400	mg/L	-	-	0.002	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0050	0.0956
Nitrite (as N)	0.2 - 2.0 (h)	mg/L	-	-	0.002	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0010	0.0114
Nitrate + Nitrite (as N)	-	mg/L	-	-	0.002	0.002	-	-	-	-	-	-	-	-	-	-	<0.010	0.066	0.044	5.45	1.1	<0.0051	0.107
Total Kjeldahl Nitrogen	-	mg/L	0.2	-	0.4	0.2	0.8	0.6	0.5	0.1	0.9	1.8	2.9	0.3	0.5	2.0	2.8	1.7	7.4	11.8	1.6	3.5	3.3
Phosphorus (P)-Total	-	mg/L	-	-	0.045	0.012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate (SO4)	128 - 429 (d)	mg/L	60.0	50.4	37.1	24.0	17.0	13.5	15.8	3290	-	-	6.0	5.7	<0.5	11.0	1.7	11.8	1.2	17.9	2.4	-	8.7
Biological Oxygen Demand (BOD)	-	mg/L	6	6	10	-	10	4.1	ND	13	ND	4.6	11	<6	<4	66	<4.0	64	<8.0	>130	<5.0	9.9	<2.0
Chemical Oxygen Demand (COD)	-	mg/L	30	10	10	10	30	30	23	47	32	ND	<20	<20	<20	156	<20	199	23	296	61	47	22
Total Metals																							
Aluminum	-	mg/L	0.03	0.0114	0.0103	0.0325	0.02	0.011	0.067	0.073	0.019	0.0163	0.0159	0.0884	0.0134	0.917	0.01	1.49	0.007	1.16	0.018	0.0595	0.0129
Antimony	0.09	mg/L	0.05	0.00007	0.000073	0.00005	0.001	ND	ND	-	-	-	0.000068	<0.0005	<0.0005	0.002	<0.0001	0.0008	0.0003	0.00063	<0.00020	0.00017	0.00014
Arsenic	0.05	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	0.0135	0.0028	0.0025	0.0026	0.00305	0.00219	0.00141	0.00082
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	0.0709	0.741	0.155	0.281	0.144	0.607	0.138	0.196	0.1
Beryllium	0.0015	mg/L	0.0002	0.00002	0.00002	0.00002	0.002	ND	ND	-	-	-	<0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth	-	mg/L	0.1	0.00002	0.00003	0.00002	0.1	ND	ND	0.1	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.000050	<0.000050
Boron	12	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	0.317	0.184	0.25	0.22	0.32	0.218	0.155	0.2
Cadmium	0.0005 - 0.004	mg/L	0.002	0.00002	0.00001	0.0001	0.0080	0.0001	0.0001	-	0.0004	0.0000120	0.0000150	0.000021	0.000024	0.00022	0.00002	0.00024	0.00001	0.00014	0.000012	0.0000127	<0.0000050
Calcium	-	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	91.2	63.8	45.6	59.1	69.6	61.9	59.7	52.2
Cesium	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	0.0
Chromium	0.01	mg/L	0.005	0.001	0.0002	0.0002	0.0050	ND	ND	-	-	-	<0.0005	<0.001	<0.001	0.0122	0.001	0.005	<0.0005	0.00544	<0.00050	0.001	0.00019
Cobalt	0.04	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	0.0063	0.00062	0.0036	0.00044	0.00559	0.00072	0.00122	0.00024
Copper	0.02 - 0.09	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	0.0082	0.0003	0.0098	0.0004	0.00696	<0.00040	<0.00050	<0.00050
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	91.6	4.73	15.10	3.54	26.30	4.59	4.21	0.49
Lead	0.04 - 0.16	mg/L	0.030	0.00001	0.00001	0.00005	0.005	ND	ND	0.0	-	-	<0.00005	<0.0002	0.00022	0.0006	<0.0001	0.0013	<0.0001	0.00094	<0.00020	0.000336	0.000063
Lithium	-	mg/L	-	0.00064	0.00068	0.00082	-	ND	ND	-	-	-	0.00109	<0.005	<0.005	0.0039	0.0011	0.0036	0.0013	0.00306	0.00132	0.0015	<0.0010
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	14.6	9.98	10.8	10.4	12.7	11.8	10.9	7.58
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	12.4	8.76	5.64	8.28	10.3	8.56	7.91	3.58
Mercury	0.00025	mg/L	0.000050	-	0.000050	0.000050	0.000010	0.000020	ND	-	0.000010	-	<0.00001	<0.00001	<0.00001	<0.00002	<0.00002	-	-	<0.00002	<0.000010	0.000005	<0.0000050
Molybdenum	10	mg/L	0.005	0.00071	0.00078	0.00035	0.005	ND	ND	-	0.001	-	0.000865	0.0011	<0.001	0.0016	0.0014	0.0006	0.0008	0.00156	0.00083	0.00083	0.00234
Nickel	0.25 - 1.5	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	0.0167	0.0024	0.0102	0.0025	0.0131	0.00239	0.00317	0.00278
Phosphorus	-	mg/L	0.1	0.1	0.1	0.1	0.1	-	-	-	-	0.327	-	-	-	-	-	-	-	0.762	0.216	0.405	0.056
Potassium	-	mg/L	1	2	2	1	2	1.67	0.54	3.28	1.31	1.33	2.77	1.77	4.25	9.79	3.27	5.17	3.81	8.03	2.44	3.85	4.04
Rubidium	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00164	0.00192
Selenium	0.02	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	0.0018	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00009	0.00008
Silicon	-	mg/L	-	-	-	-	-	-	3.3	-	-	-	-	-	-	-	-	-	-	5.2	4.6	3.27	3.58
Silver	0.0005 - 0.015	mg/L	0.0010000	0.0000200	0.0000200	0.0000200	0.0000100	0.3660000	-	-	0.0000060	-	0.0000050	<0.00002	<0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010
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	34.2	23	21.7	25.6	29.8	20.6	18.2	20.2
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	0.563	0.348	0.314	0.38	0.428	0.353	0.378	0.367
Sulfur	-	mg/L	20.5	16.5	12.9	8.6	5.0	0.1	ND	7.0	11.0	-	<15	<3	<3	3	<1	4	<1	3.8	<3.0	3.12	2.72
Tellurium	-	mg/L	0.1	0.1	0.1	-	-	4.0	ND	-	-	-	-	-	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00050	<0.00020	<0.00020
Thallium	0.003	mg/L	0.03	0.00001	0.000002	0.000002	0.0001	ND	ND	-	-	-	<0.000002	<0.00005	<0.00005	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.000010	<0.000010
Thorium	-	mg/L	-	-	-	-	-	-	ND	-	-	-	-	-	-	0.0002	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Tin	-	mg/L	0.0200	0.00002	0.00001	0.00003	0.0200	ND	ND	-	-	-	<0.0002	<0.005	<0.005	0.0006	0.0003	0.0002	<0.0002	<0.00020	<0.00020	0.00011	0.0004
Titanium	1	mg/L	0.0030	0.0030	0.0030	0.0030	0.0030	ND	ND	-	-	-	<0.005	<0.005	<0.005	0.013	<0.005	0.018	<0.005	0.0223	<0.0050	0.00064	0.00032
Tungsten	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Uranium	0.085	mg/L	-	0.0000490	0.0000280	0.0000090	0.0001000	ND	ND	-	-	-	0.0000310	<0.0001	<0.0001	0.0001	0.00002	0.00004	<0.00002	0.000049	0.000023	0.000034	0.000044
Vanadium	-	mg/L	0.0050	0.0002	0.0001	0.0001	0.0050	ND	ND	-	-	-	<0.0005	<0.005	<0.005	0.004	<0.001	0.004	<0.001	0.0038	<0.0010	<0.00050	<0.00050
Zinc	0.075 - 38.1	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	0.061	<0.004	0.056	<0.004	0.0496	0.0045	0.0049	0.0034
Zirconium	-	mg/L	0.0	0.005	0.005	-	0.005	ND	ND	-	-	-	<0.0001	<0.0005	<0.0005	0.0008	0.0001	0.0004	<0.0001	0.00051	<0.00010	<0.000060	<0.000060
Dissolved Metals																							
Aluminum (Al)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0083	0.0097
Antimony (Sb)-Dissolved	0.09	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00013	0.00013
Arsenic (As)-Dissolved	0.05	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00129	0.00061
Barium (Ba)-Dissolved	10	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.162	0.0968
Beryllium (Be)-Dissolved	0.0015	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Bismuth (Bi)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.000050	<0.000050
Boron (B)-Dissolved	12	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.146	0.186
Cadmium (Cd)-Dissolved	0.0005 - 0.004	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0000066	0.0000602
Calcium (Ca)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63.7	50.1
Cesium (Cs)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000011	0.000026
Chromium (Cr)-Dissolved	0.01	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00088	0.00011
Cobalt (Co)-Dissolved	0.04	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00121	0.00022
Copper (Cu)-Dissolved	0.02 - 0.09	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00020	0.0014
Iron (Fe)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.04	0.029
Lead (Pb)-Dissolved	0.04 - 0.16	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.000050	<0.000050
Lithium (Li)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0014	<0.0010
Magnesium (Mg)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.6	7.83
Manganese (Mn)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.2	3.38
Mercury (Hg)-Dissolved	0.00025	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	10	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000766	0.0022
Nickel (Ni)-Dissolved	0.25 - 1.5	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00307	0.00267
Phosphorus (P)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.098	<0.050
Potassium (K)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.05	4.03
Rubidium (Rb)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00167	0.00197
Selenium (Se)-Dissolved	0.02	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00121	0.000076
Silicon (Si)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.16	3.45
Silver (Ag)-Dissolved	0.0005 - 0.015	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.000010	<0.000010
Sodium (Na)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.8	20.3
Strontium (Sr) -Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.362	0.35
Sulfur (S)- Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	3.25
Tellerium (Te)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00020	<0.00020
Thallium (Tl)-Dissolved	0.003	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.000010	<0.000010
Thorium (Th)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Tin (Sn)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Titanium (Ti)-Dissolved	1	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00030	<0.00030
Tungsten (W)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Uranium (U)-Dissolved	0.085	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000031	0.000041
Vanadium (V)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050
Zinc (Zn)-Dissolved	0.075 - 2.4	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0013	0.0031
Zirconium (Zr)-Dissolved	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.000060	<0.000060

NOTES

BC CSR AW-F er Quality Guidelines for Protection of Freshwater Aquatic Life
BC CSR LW on Water Quality Guidelines for Protection of Livestock
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,
QAQC = quality assurance/quality control; FD = field duplicate;

Table D-12: Surface Water Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location						Meziadin - Treatment Lagoon Outlet Effluent																	
Monitoring Location	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	Notes	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Notes	Units	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	SW-3	SW-3	SW-3	SW-3	SW-3	SW-3
Sample ID						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Laboratory ID						1-Jun-02	1-Jul-03	1-Jul-04	1-Oct-06	1-Jul-07	1-Jun-08	1-Sep-09	26-Apr-10	28-Sep-10	1-Jun-13	25-Sep-13	8-Jul-14	7-Oct-14	28-Apr-15	9-Sep-15	28-Apr-16	13-Sep-16	1-Apr-17	1-Aug-17	L2097662-3	L2183745-1
Sample Date						17-May-18	17-Oct-18																	
QAQC						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Field Observations																										
pH	-		-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.61	7.45
Temperature	-		-		°C	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.4	9.4
Conductivity	-		-		uS/cm	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	345	316.6
Dissolved Oxygen	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.7	5.5
Oxidation Reduction Potential	-		-		mV	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	203.1	408.8
Conventional Parameters																										
Conductivity	-		-		uS/cm	303	261	255	186	177	221	103	109	500	402	454	510	485	780	515	339	505	629	507	456	429
Hardness (Total as CaCO3)	-		-		mg/L	-	134	111	85	-	-	-	161.0679	250.52881	183	175	197	177	288	201	164	179	207	204	207	157
Hardness (Dissolved as CaCO3)	-		-		mg/L	-	132	118	85	-	-	-	-	-	-	-	-	-	-	197	-	-	-	-	-	-
pH	6.5-9.0		-		-	8.37	6	7.9	7.9	7.66	7.5	6.5	6.8	6.7	6.9	7	7.7	7.7	7	7.2	7	7.4	6.7	7	-	8.2
Total Suspended Solids	-		25 mg/L (backgr. 25-250 mg/l)		mg/L	-	4	4	4	-	-	-	-	-	-	-	-	-	-	9.6	280	8.9	280	31	20.5	<3.0
Total Dissolved Solids	-		-		mg/L	-	-	142	102	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	-		-		mg/L	-	-	80.9	61.7	74	96	32	173	230	208	205	237	193	320	220	180	220	240	230	215	192
Ammonia, Total (as N)	0.461 - 1.86	pH/T*	2.4 - 25.5	pH/T*	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	8.53	1.73	0.15	2.15	5.45	1.1	1.65	2.84
Bromide (Br)	-		-		mg/L	-	0.1	0.1	0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.077
Chloride (Cl)	150		600		mg/L	2.24	3	5.4	4	6.1	11	1.5	14.4	-	-	18.6	24.3	39	54	35.7	39	35.7	39	28.2	20.3	25.9
Fluoride (F)	-		1.52 - 1.63	H	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.10	-	-	-	-	0.069	0.113
Nitrate (as N)	3		32.8		mg/L	-	-	0.002	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0050	0.0956
Nitrite (as N)	0.02 - 0.2	Cl	0.06 - 0.6	Cl	mg/L	-	-	0.002	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0010	0.0114
Nitrate + Nitrite (as N)	-		-		mg/L	-	-	0.002	0.002	-	-	-	-	-	-	-	-	-	-	<0.010	0.066	0.044	5.45	1.1	<0.0051	0.107
Total Kjeldahl Nitrogen	-		-		mg/L	0.2	-	0.43	0.21	0.82	0.59	0.49	0.11	0.86	1.81	2.94	0.315	0.463	2	2.8	1.69	7.37	11.8	1.57	3.51	3.29
Phosphorus (P)-Total	-		-		mg/L	-	-	0.045	0.012	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate (SO4)	128 - 429	H	-		mg/L	60	50.4	37.1	24	17	13.5	15.8	3290	-	-	6	5.74	<0.5	11	1.7	11.8	1.2	17.9	2.4	-	8.69
Biological Oxygen Demand (BOD)	-		-		mg/L	6	6	10	-	10	4.1	ND	13	ND	4.6	11	<8	<4	66	<4.0	64	<8.0	>130	<5.0	9.9	<2.0
Chemical Oxygen Demand (COD)	-		-		mg/L	30	10	10	10	30	30	23	47	32	ND	<20	<20	<20	156	<20	199	23	296	61	47	22
Total Metals																										
Aluminum	0.05	pH	0.1	pH	mg/L	0.03	0.0114	0.0103	0.0325	0.02	0.011	0.067	0.073	0.019	0.0163	0.0159	0.0884	0.0134	0.917	0.01	1.49	0.007	1.16	0.018	0.0595	0.0129
Antimony	0.009		-		mg/L	0.05	0.00007	0.000073	0.00005	0.001	ND	ND	-	-	-	0.000068	<0.0005	<0.0005	0.002	<0.0001	0.0008	0.0003	0.00063	<0.00020	0.00017	0.00014
Arsenic	0.005		-		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	0.0135	0.0028	0.0025	0.0026	0.00305	0.00219	0.00141	0.00082
Barium	1		-		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	0.0709	0.741	0.155	0.281	0.144	0.607	0.06	0.196	0.1
Beryllium	0.00013		-		mg/L	0.0002	0.00002	0.00002	0.00002	0.002	ND	ND	-	-	-	<0.00001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Bismuth	-		-		mg/L	0.05	0.00002	0.00003	0.00002	0.05	ND	ND	0.131	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010	<0.000050	<0.000050
Boron	1.2		-		mg/L	0.03	0.034	0.056	0.054	0.054	0.062	ND	0.00027	0.06	0.089	0.117	0.116	0.165	0.317	0.184	0.25	0.22	0.32	0.218	0.155	0.2
Cadmium	0.00019 - 0.00046	H	0.0005 - 0.00175	H	mg/L	0.002	0.00002	0.00001	0.0001	0.008	0.00006	0.00008	-	0.0004	0.000012	0.000015	0.000021	0.000024	0.00022	0.00002	0.00024	0.00001	0.00014	0.000012	0.0000127	<0.0000050
Calcium	-		-		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	91.2	63.8	45.6	59.1	69.6	61.9	59.7	52.2
Cesium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000011	0.00003
Chromium	0.001 Cr VI 0.0089 Cr III	V	-		mg/L	0.005	0.0005	0.0002	0.0002	0.005	ND	ND	-	-	-	<0.0005	<0.001	<0.001	0.0122	0.001	0.005	<0.0005	0.00544	<0.00050	0.001	0.00019
Cobalt	0.004		0.11		mg/L	0.005	0.000208	0.000202	0.000137	0.005	0.0008	ND	0.0026	0.0016	0.00099	0.000767	0.0012	0.00097	0.0063	0.00062	0.0036	0.0044	0.00559	0.00072	0.00122	0.00024
Copper	0.0034 - 0.01	H	0.01 - 0.0291	H	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	0.0082	0.0003	0.0098	0.0004	0.00696	<0.00040	<0.00050	<0.00050
Iron	-		1		mg/L	0.031	0.044	0.061	0.101	0.283	0.166	0.127	3.65	2.02	4.46	2.55	5.69	1.11	91.6	4.73	15.1	3.54	26.3	4.59	4.21	0.486
Lead	0.0059 - 0.0156	H	0.0664 - 0.3139	H	mg/L	0.03	0.00001	0.00001	0.00005	0.005	ND	ND	0.0002	-	-	<0.00005	<0.0002	0.00022	0.0006	<0.0001	0.0013	<0.0001	0.00094	<0.00020	0.000336	0.000063
Lithium	-		-		mg/L	-	0.00064	0.00068	0.00082	-	ND	ND	-	-	-	0.00109	<0.005	<0.005	0.0039	0.0011	0.0036	0.0013	0.00306	0.00132	0.0015	<0.0010
Magnesium	-		-		mg/L	8.21	7.6	7.11	6.61	4.27	4.8	3.5	8.4	12.4	9.07	8.06	10	10.4	14.6	9.98	10.8	10.4	12.7	11.8	10.9	7.58
Manganese	0.979 - 1.70733	H	1.4767 - 3.71376	H	mg/L	0.402	0.139	0.134	0.16	0.79	1.82	0.196	6.73	7.43	7.96	5.9	9.32	1.95	12.4	8.76	5.64	8.28	10.3	8.56	7.91	3.58
Mercury	0.0001		-		mg/L	0.00005	-	0.00005	0.00005	0.00001	0.00002	ND	-	0.00001	-	<0.00001	<0.00001	<0.00001	<0.00002	<0.00002	-	-	<0.00002	<0.000010	0.000005	<0.0000050
Molybdenum	2		-		mg/L	0.005	0.00071	0.00078	0.00035	0.005	ND	ND	-	0.001	-	0.000865	0.0011	<0.001	0.0016	0.0014	0.0006	0.0008	0.00156	0.00083	0.00083	0.00234
Nickel	0.025-0.15		-		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	0.0167	0.0024	0.0102	0.0025	0.0131	0.00239	0.00317	0.00278
Phosphorus	0.005-0.015		-		mg/L	0.1	0.1	0.1	0.1	0.1	-	-	-	-	0.327	-	-	-	-	-	-	-	0.762	0.216	0.405	0.056
Potassium	-		-		mg/L	1	2	2	1	2	1.67	0.54	3.28	1.31	1.33	2.77	1.77	4.25	9.79	3.27	5.17	3.81	8.03	2.44	3.85	4.04
Rubidium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	0.002		-		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	0.0018	<0.0005	<0.0005	<0.0005	<0.00050	<0.00050	0.00009	0.00008
Silicon	-		-		mg/L	-	-	-	-	-	-	3.3	-	-	-	-	-	-	-	-	-	-	5.2	4.6	3.27	3.58
Silver	0.00005, 0.0015	H	0.0001, 0.003	H	mg/L	0.001	0.00002	0.00002	0.00002	0.00001	0.366	-	-	0.000006	-	0.000005	<0.00002	<0.00002	<0.00005	<0.00005	<0.00005	<0.00005	<0.000050	<0.000050	<0.000010	<0.000010
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	34.2	23	21.7	25.6	29.8	20.6	18.2	20.2
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	0.563	0.348	0.314	0.38	0.428	0.353	0.378	0.367
Sulfur	-		-		mg/L	20.5	16.5	12.9	8.6	5	0.146	ND	7	11	-	<15	<3	<3	3	<1	4	<1	3.8	<3.0	3.12	2.72
Tellurium	-		-		mg/L	0.05	0.05	0.05	-	-	4	ND	-	-	-	-	-	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.00020	<0.00050	<0.00020	<0.00020
Thallium	0.0008		-		mg/L	0.03	0.000007	0.000002	0.000002	0.0001	ND	ND	-	-	-	<0.00002	<0.00005	<0.00005	<0.00002	<0.00002	<0.00002	<0.00002	<0.000020	<0.000020	<0.000010	<0.000010
Thorium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0002	<0.0001	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010	<0.00010
Tin	-		-		mg/L	0.02	0.00002	0.00001	0.00003	0.02	ND	ND	-	-	-	<0.0002	<0.005	<0.005	0.0006	0.0003	0.0002	<0.0002	<0.00020	<0.00020	0.00011	0.0004
Titanium	-		-		mg/L	0.003	0.003	0.003	0.003	0.003	ND	ND	-	-	-	<0.005	<0.005	<0.005	0.013	<0.005	0.018	<0.005	0.0223	<0.0050	0.00064	0.00032
Tungsten	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Uranium	0.0085		-		mg/L	-	0.000049	0.000028	0.000009	0.0001	ND	ND	-	-	-	0.000031	<0.0001	<0.0001	0.0001	0.00002	0.00004	<0.00002	0.000049	0.000023	0.000034	0.000044
Vanadium	-		-		mg/L	0.005	0.00022	0.00006	0.00006	0.005	ND	ND	-	-	-	<0.0005	<0.005	<0.005	0.004	<0.001	0.004	<0.001	0.0038	<0.0010	<0.00050	<0.00050
Zinc	0.0075 - 0.156	H	0.033 - 0.1815	H	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	0.061	<0.004	0.056	<0.004	0.0496	0.0045	0.0049	0.0034
Zirconium	-		-		mg/L	0.005	0.005	0.005	-	0.005	ND	ND	-	-	-	<0.0001	<0.0005	<0.0005	0.0008	0.0001	0.0004	<0.0001	0.00051	<0.00010	<0.000060	<0.000060
Dissolved Metals																										
Aluminum	0.05	pH	0.1	pH	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0083	0.0097
Antimony	0.009		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00013	0.00013
Arsenic	0.005		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00129	0.00061
Barium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.162	0.0968
Beryllium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Bismuth	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.000050	<0.000050
Boron	1.2 (j)		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.146	0.186
Cadmium	0.00029 - 0.00036	H	0.00094 - 0.00124	H	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0000066	0.0000602
Calcium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63.7	50.1
Cesium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000011	0.000026
Chromium	0.001 Cr VI 0.0089 Cr III	V	-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00088	0.00011
Cobalt	0.004		0.11		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00121	0.00022
Copper	0.00628 - 0.00828	H	0.01676 - 0.02146	H	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00020	0.0014
Iron	-		0.35		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.04	0.029
Lead	0.00897 - 0.01135	H	0.14498 - 0.20614	H	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.000050	<0.000050
Lithium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0014	<0.0010
Magnesium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.6	7.83
Manganese	1.2958 - 1.5158	H	2.27014 - 2.82114	H	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.2	3.38
Mercury	0.0001		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.0000050	<0.0000050
Molybdenum	2		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000766	0.0022
Nickel	0.025-0.15		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00307	0.00267
Phosphorus	0.005-0.015		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.098	<0.050
Potassium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.05	4.03
Rubidium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00167	0.00197
Selenium	0.002		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00121	0.000076
Silicon	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.16	3.45
Silver	0.00005, 0.0015	H	0.0001, 0.003	H	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.000010	<0.000010
Sodium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18.8	20.3
Strontium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.362	0.35
Sulfur	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	3.25
Tellerium	-		-		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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00030	<0.00030
Tungsten	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00010	<0.00010
Uranium	0.0085		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.000031	0.000041
Vanadium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.00050	<0.00050
Zinc	0.058 - 0.095	H	0.083 - 0.121		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0013	0.0031
Zirconium	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.000060	<0.000060

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
H = standard is hardness dependent; pH = standard is pH dependent; Cl = standard is chloride dependent; T = standard
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-13: Surface Water Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location			Downstream Location	
Site Name			SW2017-1	
Sample ID	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	SW2017-1	SW2017-1
Laboratory ID			-	L2097662-1
Sample Date			1-May-17	17-May-18
QAQC			-	-
Field Observations				
pH	-	-	-	5.83
Temperature	-	°C	-	10.1
Conductivity	-	uS/cm	-	17.5
Dissolved Oxygen	-	mg/L	-	10.5
Oxidation Reduction Potential	-	mV	-	400.1
Conventional Parameters				
Conductivity	-	uS/cm	32.3	22.1
Hardness (Total as CaCO3)	-	mg/L	11.6	10.8
pH	-	pH	6.5	-
Total Suspended Solids	-	mg/L	<1	<3.0
Alkalinity, Total (as CaCO3)	-	mg/L	12	8.7
Ammonia, Total (as N)	1.3	mg/L	<0.03	0.0075
Chloride (Cl)	1500	mg/L	2.1	<0.50
Fluoride (F)	2.0-3.0 (e)	mg/L	-	0.021
Nitrate (as N)	400	mg/L	-	0.0615
Nitrite (as N)	0.2 - 2.0 (h)	mg/L	-	<0.0010
Nitrate + Nitrite (as N)	-	mg/L	-	0.0615
Total Kjeldahl Nitrogen	-	mg/L	0.403	0.432
Sulfate (SO4)	128 - 429 (d)	mg/L	<1	-
Biological Oxygen Demand (BOD)	-	mg/L	<5	<2.0
Chemical Oxygen Demand (COD)	-	mg/L	24	26
Total Metals				
Aluminum	-	mg/L	0.176	0.196
Antimony	0.09	mg/L	<0.00010	<0.00010
Arsenic	0.05	mg/L	<0.00050	0.00015
Barium	10	mg/L	0.0096	0.00949
Beryllium	0.0015	mg/L	<0.00010	<0.00010
Bismuth	-	mg/L	<0.00010	<0.000050
Boron	12	mg/L	0.017	<0.010
Cadmium	0.0005 - 0.004	mg/L	0.0000110	0.0000118
Calcium	-	mg/L	3.5	3.1
Cesium	-	mg/L	-	<0.000010
Chromium	0.01	mg/L	<0.00050	0.000
Cobalt	0.04	mg/L	<0.00010	<0.00010
Copper	0.02 - 0.09	mg/L	0.00087	0.00073
Iron	-	mg/L	0.06	0.08
Lead	0.04 - 0.16	mg/L	<0.00010	<0.000050
Lithium	-	mg/L	<0.00010	<0.0010
Magnesium	-	mg/L	0.972	0.803
Manganese	-	mg/L	0.00178	0.0145
Mercury	0.00025	mg/L	-	0.0000068
Molybdenum	10	mg/L	<0.00010	<0.000050
Nickel	0.25 - 1.5	mg/L	0.0013	0.00107
Phosphorus	-	mg/L	<0.050	<0.050
Potassium	-	mg/L	0.34	0.194
Rubidium	-	mg/L	-	<0.00020
Selenium	0.02	mg/L	<0.00050	0.00006
Silicon	-	mg/L	1.6	2.04
Silver	0.0005 - 0.015	mg/L	<0.000050	<0.000010
Sodium	-	mg/L	2.25	1.34
Strontium	-	mg/L	0.0226	0.021
Sulfur	-	mg/L	<3.0	<0.50
Tellurium	-	mg/L	<0.00020	<0.00020
Thallium	0.003	mg/L	<0.000020	<0.000010
Thorium	-	mg/L	<0.00010	<0.00010
Tin	-	mg/L	<0.00020	<0.00010
Titanium	1	mg/L	<0.0050	0.0
Tungsten	-	mg/L	-	<0.00010
Uranium	0.085	mg/L	<0.000020	<0.000010
Vanadium	-	mg/L	<0.0010	<0.00050
Zinc	0.075 - 38.1	mg/L	<0.0040	<0.0030
Zirconium	-	mg/L	0.0002	0.0002
Dissolved Metals				
Aluminum	-	mg/L	-	0.187
Antimony	0.09	mg/L	-	<0.00010
Arsenic	0.05	mg/L	-	0.00014
Barium	10	mg/L	-	0.00928
Beryllium	0.0015	mg/L	-	<0.00010
Bismuth	-	mg/L	-	<0.000050
Boron	12	mg/L	-	<0.010
Cadmium	0.0005 - 0.004	mg/L	-	0.0000066
Calcium	-	mg/L	-	3
Cesium	-	mg/L	-	<0.000010
Chromium	0.01	mg/L	-	0.00039
Cobalt	0.04	mg/L	-	<0.00010
Copper	0.02 - 0.09	mg/L	-	0.00067
Iron	-	mg/L	-	0.067
Lead	0.04 - 0.16	mg/L	-	<0.000050
Lithium	-	mg/L	-	<0.0010
Magnesium	-	mg/L	-	0.803
Manganese	-	mg/L	-	0.00258
Mercury	0.00025	mg/L	-	<0.0000050
Molybdenum	10	mg/L	-	<0.000050
Nickel	0.25 - 1.5	mg/L	-	0.0011
Phosphorus	-	mg/L	-	<0.050
Potassium	-	mg/L	-	0.198
Rubidium	-	mg/L	-	<0.00020
Selenium	0.02	mg/L	-	0.000063
Silicon	-	mg/L	-	1.89
Silver	0.0005 - 0.015	mg/L	-	<0.000010
Sodium	-	mg/L	-	1.25
Strontium	-	mg/L	-	0.0207
Sulfur	-	mg/L	-	<0.50
Tellerium	-	mg/L	-	<0.00020
Thallium	0.003	mg/L	-	<0.000010
Thorium	-	mg/L	-	<0.00010
Tin	-	mg/L	-	<0.00010
Titanium	1	mg/L	-	0.00072
Tungsten	-	mg/L	-	<0.00010
Uranium	0.085	mg/L	-	<0.000010
Vanadium	-	mg/L	-	<0.00050
Zinc	0.075 - 2.4	mg/L	-	<0.0010
Zirconium	-	mg/L	-	0.000216

NOTES

BC CSR AW-F: er Quality Guidelines for Protection of Freshwater Aquatic Lif
BC CSR LW: on Water Quality Guidelines for Protection of Livestocl

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

Table D-14: Surface Water Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	Notes	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Notes	Units	Downstream Location SW2017-1	
Monitoring Location						SW2017-1	SW2017-1
Sample ID						-	L2097662-1
Laboratory ID						1-May-17	17-May-18
Sample Date						-	-
QAQC							
Field Observations							
pH	-		-		-	-	5.83
Temperature	-		-		°C	-	10.1
Conductivity	-		-		uS/cm	-	17.5
Dissolved Oxygen	-		-		mg/L	-	10.5
Oxidation Reduction Potential			-		mV	-	400.1
Conventional Parameters							
Conductivity	-		-		uS/cm	32.3	22.1
Hardness (Total as CaCO3)	-		-		mg/L	11.6	10.8
pH	6.5-9.0		-		-	6.5	-
Total Suspended Solids	-		**25 mg/L (backgr. 25-250 mg/l)**		mg/L	<1	<3.0
Alkalinity, Total (as CaCO3)	-		-		mg/L	12	8.7
Ammonia, Total (as N)	1.84 - 1.85	pH/T*	**12.7 - 25.5**	pH/T*	mg/L	<0.03	0.0075
Chloride (Cl)	150		**600**		mg/L	2.1	<0.50
Fluoride (F)	-		**0.44 - 0.47**	H	mg/L	-	0.021
Nitrate (as N)	3		**32.8**		mg/L	-	0.0615
Nitrite (as N)	0.04 - 0.2	Cl	**0.12 - 0.6**	Cl	mg/L	-	<0.0010
Nitrate + Nitrite (as N)	-		-		mg/L	-	0.0615
Total Kjeldahl Nitrogen	-		-		mg/L	0.403	0.432
Sulfate (SO4)	128 - 429	H	-		mg/L	<1	-
Biological Oxygen Demand (BOD)	-		-		mg/L	<5	<2.0
Chemical Oxygen Demand (COD)	-		-		mg/L	24	26
Total Metals							
Aluminum	0.05	pH	**0.1**	pH	mg/L	**0.176**	**0.196**
Antimony	0.009		-		mg/L	<0.00010	<0.00010
Arsenic	0.005		-		mg/L	<0.00050	0.00015
Barium	1		-		mg/L	0.0096	0.00949
Beryllium	0.00013		-		mg/L	<0.00010	<0.00010
Bismuth	-		-		mg/L	<0.00010	<0.000050
Boron	1.2		-		mg/L	0.017	<0.010
Cadmium	0.00004 - 0.00004	H	**0.00006 - 0.00006**	H	mg/L	0.000011	0.0000118
Calcium	-		-		mg/L	3.52	3.08
Cesium	-		-		mg/L	-	<0.000010
Chromium	0.001 $^{Cr\ VI}$ 0.0089 $^{Cr\ III}$	V	-		mg/L	<0.00050	0.00043
Cobalt	0.004		**0.11**		mg/L	<0.00010	<0.00010
Copper	0.002	H	**0.002**	H	mg/L	0.00087	0.00073
Iron	-		**1**		mg/L	0.06	0.078
Lead	0.0035 - 0.0035	H	**0.0048 - 0.0053**	H	mg/L	<0.00010	<0.000050
Lithium	-		-		mg/L	<0.00010	<0.0010
Magnesium	-		-		mg/L	0.972	0.803
Manganese	0.65252 - 0.65604	H	**0.65902 - 0.667832**	H	mg/L	0.00178	0.0145
Mercury	0.0001		-		mg/L	-	0.0000068
Molybdenum	2		-		mg/L	<0.00010	<0.000050
Nickel	0.025-0.15		-		mg/L	0.0013	0.00107
Phosphorus	0.005-0.015		-		mg/L	*<0.050*	*<0.050*
Potassium	-		-		mg/L	0.34	0.194
Rubidium	-		-		mg/L	-	<0.00020
Selenium	0.002		-		mg/L	<0.00050	0.00006
Silicon	-		-		mg/L	1.6	2.04
Silver	0.00005, 0.0015	H	**0.0001, 0.003**	H	mg/L	<0.000050	<0.000010
Sodium	-		-		mg/L	2.25	1.34
Strontium	-		-		mg/L	0.0226	0.021
Sulfur	-		-		mg/L	<3.0	<0.50
Tellurium	-		-		mg/L	<0.00020	<0.00020
Thallium	0.0008		-		mg/L	<0.000020	<0.000010
Thorium	-		-		mg/L	<0.00010	<0.00010
Tin	-		-		mg/L	<0.00020	<0.00010
Titanium	-		-		mg/L	<0.0050	0.00077
Tungsten	-		-		mg/L	-	<0.00010
Uranium	0.0085		-		mg/L	<0.000020	<0.000010
Vanadium	-		-		mg/L	<0.0010	<0.00050
Zinc	0.0075	H	**0.033**	H	mg/L	<0.0040	<0.0030
Zirconium	-		-		mg/L	0.0002	0.00021
Dissolved Metals							
Aluminum	0.05	pH	**0.1**	pH	mg/L	-	**0.187**
Antimony	0.009		-		mg/L	-	<0.00010
Arsenic	0.005		-		mg/L	-	0.00014
Barium	-		-		mg/L	-	0.00928
Beryllium	-		-		mg/L	-	<0.00010
Bismuth	-		-		mg/L	-	<0.000050
Boron	1.2		-		mg/L	-	<0.010
Cadmium	0.00004	H	**0.00006**	H	mg/L	-	0.0000066
Calcium	-		-		mg/L	-	3
Cesium	-		-		mg/L	-	<0.000010
Chromium	0.001 $^{Cr\ VI}$ 0.0089 $^{Cr\ III}$	V	-		mg/L	-	0.00039
Cobalt	0.004		**0.11**		mg/L	-	<0.00010
Copper	0.002	H	**0.002**	H	mg/L	-	0.00067
Iron	-		**0.35**		mg/L	-	0.067
Lead	0.0035	H	**0.0048**	H	mg/L	-	<0.000050
Lithium	-		-		mg/L	-	<0.0010
Magnesium	-		-		mg/L	-	0.803
Manganese	0.65252	H	**0.65902**	H	mg/L	-	0.00258
Mercury	0.0001		-		mg/L	-	<0.0000050
Molybdenum	2		-		mg/L	-	<0.000050
Nickel	0.025-0.15		-		mg/L	-	0.0011
Phosphorus	0.005-0.015		-		mg/L	-	<0.050
Potassium	-		-		mg/L	-	0.198
Rubidium	-		-		mg/L	-	<0.00020
Selenium	0.002		-		mg/L	-	0.000063
Silicon	-		-		mg/L	-	1.89
Silver	0.00005, 0.0015	H	**0.0001, 0.003**	H	mg/L	-	<0.000010
Sodium	-		-		mg/L	-	1.25
Strontium	-		-		mg/L	-	0.0207
Sulfur	-		-		mg/L	-	<0.50
Tellerium	-		-		mg/L	-	<0.00020
Thallium	0.0008		-		mg/L	-	<0.000010
Thorium	-		-		mg/L	-	<0.00010
Tin	-		-		mg/L	-	<0.00010
Titanium	-		-		mg/L	-	0.00072
Tungsten	-		-		mg/L	-	<0.00010
Uranium	0.0085		-		mg/L	-	<0.000010
Vanadium	-		-		mg/L	-	<0.00050
Zinc	0.008	H	**0.033**		mg/L	-	<0.0010
Zirconium	-		-		mg/L	-	0.000216

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-15: Surface Water Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	Upstream surface location	
Site Name			SW2017-2	
Sample ID			SW2017-2	SW2017-2
Laboratory ID			-	L2097662-2
Sample Date			1-May-17	17-May-18
QAQC			-	-
Field Observations				
pH	-	-	-	5.42
Temperature	-	°C	-	8
Conductivity	-	uS/cm	-	160
Dissolved Oxygen	-	mg/L	-	13.4
Oxidation Reduction Potential	-	mV	-	444.6
Conventional Parameters				
Conductivity	-	uS/cm	15.8	12.7
Hardness (Total as CaCO3)	-	mg/L	8.93	5.9
pH	-	pH	6	-
Total Suspended Solids	-	mg/L	61	38.3
Alkalinity, Total (as CaCO3)	-	mg/L	6	4.8
Ammonia, Total (as N)	1.3	mg/L	<0.03	0.0
Chloride (Cl)	1500	mg/L	<1.0	<0.50
Fluoride (F)	2.0-3.0 (e)	mg/L	-	0.0
Nitrate (as N)	400	mg/L	-	<0.0050
Nitrite (as N)	0.2 - 2.0 (h)	mg/L	-	<0.0010
Nitrate + Nitrite (as N)	-	mg/L	-	<0.0051
Total Kjeldahl Nitrogen	-	mg/L	0.353	0.3
Sulfate (SO4)	128 - 429 (d)	mg/L	<1.0	-
Biological Oxygen Demand (BOD)	-	mg/L	<5.0	<2.0
Chemical Oxygen Demand (COD)	-	mg/L	26	21.0
Total Metals				
Aluminum	-	mg/L	1.13	0.679
Antimony	0.09	mg/L	<0.00010	<0.00010
Arsenic	0.05	mg/L	<0.00050	0.00021
Barium	10	mg/L	0.0164	0.0158
Beryllium	0.0015	mg/L	<0.00010	<0.00010
Bismuth	-	mg/L	<0.00010	<0.000050
Boron	12	mg/L	0.005	<0.010
Cadmium	0.0005 - 0.004	mg/L	0.0000270	0.0000328
Calcium	-	mg/L	2.1	1.61
Cesium	-	mg/L	-	0.00002
Chromium	0.01	mg/L	0.003	0.00113
Cobalt	0.04	mg/L	0.00042	0.00048
Copper	0.02 - 0.09	mg/L	0.00263	0.00188
Iron	-	mg/L	1.13	0.411
Lead	0.04 - 0.16	mg/L	0.0002	0.000154
Lithium	-	mg/L	0.00075	<0.0010
Magnesium	-	mg/L	0.919	0.618
Manganese	-	mg/L	0.0423	0.0634
Mercury	0.00025	mg/L	-	0.0000103
Molybdenum	10	mg/L	<0.00010	<0.000050
Nickel	0.25 - 1.5	mg/L	0.00434	0.00218
Phosphorus	-	mg/L	<0.050	0.056
Potassium	-	mg/L	0.29	0.24
Rubidium	-	mg/L	-	0.00042
Selenium	0.02	mg/L	<0.00050	0.000084
Silicon	-	mg/L	3.7	3.04
Silver	0.0005 - 0.015	mg/L	<0.000050	0.0000150
Sodium	-	mg/L	0.85	0.816
Strontium	-	mg/L	0.0125	0.013
Sulfur	-	mg/L	<3.0	<0.50
Tellurium	-	mg/L	<0.00020	<0.00020
Thallium	0.003	mg/L	<0.000020	<0.000010
Thorium	-	mg/L	<0.00010	<0.00010
Tin	-	mg/L	<0.00020	<0.00010
Titanium	1	mg/L	0.0192	0.0058
Tungsten	-	mg/L	-	<0.00010
Uranium	0.085	mg/L	0.0000230	0.0000150
Vanadium	-	mg/L	0.0020	0.0008
Zinc	0.075 - 38.1	mg/L	<0.0040	<0.0030
Zirconium	-	mg/L	0.0005	0.0003
Dissolved Metals				
Aluminum	-	mg/L	-	0.263
Antimony	0.09	mg/L	-	<0.00010
Arsenic	0.05	mg/L	-	0.00011
Barium	10	mg/L	-	0.0097
Beryllium	0.0015	mg/L	-	<0.00010
Bismuth	-	mg/L	-	<0.000050
Boron	12	mg/L	-	<0.010
Cadmium	0.0005 - 0.004	mg/L	-	0.000014
Calcium	-	mg/L	-	1.5
Cesium	-	mg/L	-	<0.000010
Chromium	0.01	mg/L	-	0.00047
Cobalt	0.04	mg/L	-	<0.00010
Copper	0.02 - 0.09	mg/L	-	0.00109
Iron	-	mg/L	-	0.071
Lead	0.04 - 0.16	mg/L	-	<0.000050
Lithium	-	mg/L	-	<0.0010
Magnesium	-	mg/L	-	0.518
Manganese	-	mg/L	-	0.0115
Mercury	0.00025	mg/L	-	0.0000054
Molybdenum	10	mg/L	-	<0.000050
Nickel	0.25 - 1.5	mg/L	-	0.00116
Phosphorus	-	mg/L	-	<0.050
Potassium	-	mg/L	-	0.224
Rubidium	-	mg/L	-	<0.00020
Selenium	0.02	mg/L	-	0.000063
Silicon	-	mg/L	-	2.57
Silver	0.0005 - 0.015	mg/L	-	<0.000010
Sodium	-	mg/L	-	0.788
Strontium	-	mg/L	-	0.011
Sulfur	-	mg/L	-	<0.50
Tellerium	-	mg/L	-	<0.00020
Thallium	0.003	mg/L	-	<0.000010
Thorium	-	mg/L	-	<0.00010
Tin	-	mg/L	-	<0.00010
Titanium	1	mg/L	-	0.00125
Tungsten	-	mg/L	-	<0.00010
Uranium	0.085	mg/L	-	<0.000010
Vanadium	-	mg/L	-	<0.00050
Zinc	0.075 - 2.4	mg/L	-	0.001
Zirconium	-	mg/L	-	0.000261

NOTES

BC CSR AW-F — er Quality Guidelines for Protection of Freshwater Aquatic Life
BC CSR LW — on Water Quality Guidelines for Protection of Livestock
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,
QAQC = quality assurance/quality control; FD = field duplicate;

Table D-16: Surface Water Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location						Upstream surface location	
Monitoring Location						SW2017-2	
Sample ID	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	Notes	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Notes	Units	SW2017-2	SW2017-2
Laboratory ID						-	L2097662-2
Sample Date						1-May-17	17-May-18
QAQC						-	-
Field Observations							
pH	-		-		-	-	5.42
Temperature	-		-		°C	-	8
Conductivity	-		-		uS/cm	-	160
Dissolved Oxygen	-		-		mg/L	-	13.4
Oxidation Reduction Potential			-		mV	-	444.6
Conventional Parameters							
Conductivity	-		-		uS/cm	15.8	12.7
Hardness (Total as CaCO3)	-		-		mg/L	8.93	5.87
pH	6.5-9.0		-		-	6	-
Total Suspended Solids	-		**25 mg/L (backgr. 25-250 mg/l)**		mg/L	**61**	**38.3**
Total Dissolved Solids	-		-		mg/L	-	-
Alkalinity, Total (as CaCO3)	-		-		mg/L	6	4.8
Ammonia, Total (as N)	1.85	pH/T*	**12.7**	pH/T*	mg/L	<0.03	0.0069
Chloride (Cl)	150		**600**		mg/L	<1.0	<0.50
Fluoride (F)	-		**0.19 - 0.36**	H	mg/L	-	0.02
Nitrate (as N)	3		**32.8**		mg/L	-	<0.0050
Nitrite (as N)	0.2	Cl	**0.6**	Cl	mg/L	-	<0.0010
Nitrate + Nitrite (as N)	-		-		mg/L	-	<0.0051
Total Kjeldahl Nitrogen	-		-		mg/L	0.353	0.269
Sulfate (SO4)	128 - 429	H	-		mg/L	<1	-
Biological Oxygen Demand (BOD)	-		-		mg/L	<5	<2.0
Chemical Oxygen Demand (COD)	-		-		mg/L	24	26
Total Metals							
Aluminum	0.05	pH	**0.1**	pH	mg/L	**1.13**	**0.679**
Antimony	0.009		-		mg/L	<0.00010	<0.00010
Arsenic	0.005		-		mg/L	<0.00050	0.00021
Barium	1		-		mg/L	0.0164	0.0158
Beryllium	0.00013		-		mg/L	<0.00010	<0.00010
Bismuth	-		-		mg/L	<0.00010	<0.000050
Boron	1.2		-		mg/L	0.005	<0.010
Cadmium	0.00003 - 0.00004	H	**0.00003 - 0.00005**	H	mg/L	0.000027	0.0000328
Calcium	-		-		mg/L	2.06	1.61
Cesium	-		-		mg/L	-	0.00002
Chromium	0.001 $^{Cr\ VI}$ 0.0089 $^{Cr\ III}$	V	-		mg/L	0.00279	0.00113
Cobalt	0.004		**0.11**		mg/L	0.00042	0.00048
Copper	0.002	H	**0.002**	H	mg/L	0.00263	0.00188
Iron	-		**1**		mg/L	**1.13**	0.411
Lead	0.0034 - 0.0035	H	**0.0022 - 0.0038**	H	mg/L	0.00018	0.000154
Lithium	-		-		mg/L	0.00075	<0.0010
Magnesium	-		-		mg/L	0.919	0.618
Manganese	0.63083 - 0.64429	H	**0.60469 - 0.638409**	H	mg/L	0.0423	0.0634
Mercury	0.0001		-		mg/L	-	0.0000103
Molybdenum	2		-		mg/L	<0.00010	<0.000050
Nickel	0.025-0.15		-		mg/L	0.00434	0.00218
Phosphorus	0.005-0.015		-		mg/L	<0.050	0.056
Potassium	-		-		mg/L	0.29	0.24
Rubidium	-		-		mg/L	-	0.00042
Selenium	0.002		-		mg/L	<0.00050	0.000084
Silicon	-		-		mg/L	3.7	3.04
Silver	0.00005, 0.0015	H	**0.0001, 0.003**	H	mg/L	<0.000050	0.000015
Sodium	-		-		mg/L	0.85	0.816
Strontium	-		-		mg/L	0.0125	0.013
Sulfur	-		-		mg/L	<3.0	<0.50
Tellurium	-		-		mg/L	<0.00020	<0.00020
Thallium	0.0008		-		mg/L	<0.000020	<0.000010
Thorium	-		-		mg/L	<0.00010	<0.00010
Tin	-		-		mg/L	<0.00020	<0.00010
Titanium	-		-		mg/L	0.0192	0.00584
Tungsten	-		-		mg/L	-	<0.00010
Uranium	0.0085		-		mg/L	0.000023	0.000015
Vanadium	-		-		mg/L	0.002	0.00084
Zinc	0.0075	H	**0.033**	H	mg/L	<0.0040	<0.0030
Zirconium	-		-		mg/L	0.00045	0.000287
Dissolved Metals							
Aluminum	0.05	pH	**0.1**	pH	mg/L	-	**0.263**
Antimony	0.009		-		mg/L	-	<0.00010
Arsenic	0.005		-		mg/L	-	0.00011
Barium	-		-		mg/L	-	0.0097
Beryllium	-		-		mg/L	-	<0.00010
Bismuth	-		-		mg/L	-	<0.000050
Boron	1.2		-		mg/L	-	<0.010
Cadmium	0.00003	H	**0.00003**	H	mg/L	-	0.000014
Calcium	-		-		mg/L	-	1.5
Cesium	-		-		mg/L	-	<0.000010
Chromium	0.001 $^{Cr\ VI}$ 0.0089 $^{Cr\ III}$	V	-		mg/L	-	0.00047
Cobalt	0.004		**0.11**		mg/L	-	<0.00010
Copper	0.002	H	**0.002**	H	mg/L	-	0.00109
Iron	-		**0.35**		mg/L	-	0.071
Lead	0.0034	H	**0.00221**	H	mg/L	-	<0.000050
Lithium	-		-		mg/L	-	<0.0010
Magnesium	-		-		mg/L	-	0.518
Manganese	0.63083	H	**0.60469**	H	mg/L	-	0.0115
Mercury	0.0001		-		mg/L	-	0.0000054
Molybdenum	2		-		mg/L	-	<0.000050
Nickel	0.025-0.15		-		mg/L	-	0.00116
Phosphorus	0.005-0.015		-		mg/L	-	<0.050
Potassium	-		-		mg/L	-	0.224
Rubidium	-		-		mg/L	-	<0.00020
Selenium	0.002		-		mg/L	-	0.000063
Silicon	-		-		mg/L	-	2.57
Silver	0.00005, 0.0015	H	**0.0001, 0.003**	H	mg/L	-	<0.000010
Sodium	-		-		mg/L	-	0.788
Strontium	-		-		mg/L	-	0.011
Sulfur	-		-		mg/L	-	<0.50
Tellerium	-		-		mg/L	-	<0.00020
Thallium	0.0008		-		mg/L	-	<0.000010
Thorium	-		-		mg/L	-	<0.00010
Tin	-		-		mg/L	-	<0.00010
Titanium	-		-		mg/L	-	0.00125
Tungsten	-		-		mg/L	-	<0.00010
Uranium	0.0085		-		mg/L	-	<0.000010
Vanadium	-		-		mg/L	-	<0.00050
Zinc	0.008	H	**0.033**		mg/L	-	0.001
Zirconium	-		-		mg/L	-	0.000261

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

Sampling Location		SW2017-2						MW-2						Blank	Blank
Sample ID		SW2017-2	DUP	Laboratory Reporting Limit	Mean	Relative Percent Difference (%)	Difference Factor (-)	MW-2	DUP	Laboratory Reporting Limit	Mean	Relative Percent Difference (%)	Difference Factor (-)	BLANK	BLANK
Laboratory ID		L2097662-2	L2097662-4					L2183746-3	L2183746-7					L2097663-6	L2183746-6
Sample Date		17-May-18	17-May-18					17-Oct-18	43390					17-May-18	17-Oct-18
QAQC	Units	FDA	FD					FDA	FD					FB	FB
Conventional Parameters															
Conductivity	uS/cm	12.7	12.3	2	12.5	3%	NA	450	458	2	458	2%	NA	<2.0	<2.0
Hardness (Total as CaCO3)	mg/L	5.9	6.05	0.5	5.96	3%	NA	142	145	0.5	145	2%	NA	<0.50	-
pH	pH	-	-	-	NC	NC	NA	8.36	8.37	0.1	8.37	0%	NA	-	5.39
Total Suspended Solids	mg/L	38.3	137	3	87.65	**113%**	NA	-	-	-	NC	NC	NA	-	-
Total Dissolved Solids	mg/L	-	-	-	NC	NC	NA	294	284	20	284	4%	NA	<10	<10
Alkalinity, Total (as CaCO3)	mg/L	4.8	4.7	1	4.75	NC	0.1	205	208	1	206.5	1%	NA	<1.0	<1.0
Ammonia, Total (as N)	mg/L	0.0	0.0055	0.005	0.0062	NC	0.28	0.02	0.0158	0.005	0.0187	NC	1.16	<0.0050	<0.0050
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
Fluoride (F)	mg/L	0.0	0.023	0.02	0.0215	NC	0.15	0.181	0.183	0.02	0.182	1%	NA	<0.020	<0.020
Nitrate (as N)	mg/L	<0.0050	<0.0050	0.005	NC	NC	NA	0.0105	0.0085	0.005	0.0095	NC	0.4	<0.0050	<0.0050
Nitrite (as N)	mg/L	<0.0010	<0.0010	0.001	NC	NC	NA	<0.0010	<0.0010	0.001	NC	NC	NA	<0.0010	<0.0010
Nitrate + Nitrite (as N)	mg/L	<0.0051	<0.0051	0.0051	NC	NC	NA	0.0105	0.0085	0.0051	0.0095	NC	0.39	<0.0051	<0.0051
Total Kjeldahl Nitrogen	mg/L	0.3	0.304	0.05	0.2865	12%	NA	0.082	0.06	0.05	0.071	NC	0.44	<0.050	<0.050
Sulfate (SO4)	mg/L	-	-	-	NC	NC	NA	49	48.5	0.3	48.5	0%	NA	<0.30	<0.30
Biological Oxygen Demand (BOD)	mg/L	<2.0	<2.0	2	NC	NC	NA	-	-	-	NC	NC	NA	-	-
Chemical Oxygen Demand (COD)	mg/L	21.0	22	20	21.5	NC	0.05	<20	<20	20	NC	NC	NA	<20	<20
Phenols (4AAP)	mg/L	-	-	-	NC	NC	NA	-	-	-	NC	NC	NA	-	-
Total Metals															
Aluminum	mg/L	0.679	1.8	0.003	1.2395	**90%**	NA	-	-	-	NC	NC	NA	-	-
Antimony	mg/L	<0.00010	<0.00010	0.0001	NC	NC	NA	-	-	-	NC	NC	NA	-	-
Arsenic	mg/L	0.00021	0.00037	0.0001	0.00029	NC	1.6	-	-	-	NC	NC	NA	-	-
Barium	mg/L	0.0158	0.0268	0.0001	0.0213	**52%**	NA	-	-	-	NC	NC	NA	-	-
Beryllium	mg/L	<0.00010	<0.00010	0.0001	NC	NC	NA	-	-	-	NC	NC	NA	-	-
Bismuth	mg/L	<0.000050	<0.000050	0.00005	NC	NC	NA	-	-	-	NC	NC	NA	-	-
Boron	mg/L	<0.010	<0.010	0.01	NC	NC	NA	-	-	-	NC	NC	NA	-	-
Cadmium	mg/L	0.0000328	0.0000642	0.000005	0.0000485	**65%**	NA	-	-	-	NC	NC	NA	-	-
Calcium	mg/L	1.61	1.72	0.05	1.665	6.6%	NA	-	-	-	NC	NC	NA	-	-
Cesium	mg/L	0.00002	0.000092	0.00001	0.000056	**129%**	NA	-	-	-	NC	NC	NA	-	-
Chromium	mg/L	0.00113	0.00359	0.0001	0.00236	**104%**	NA	-	-	-	NC	NC	NA	-	-
Cobalt	mg/L	0.00048	0.00076	0.0001	0.00062	**45%**	NA	-	-	-	NC	NC	NA	-	-
Copper	mg/L	0.00188	0.00353	0.0005	0.002705	**61%**	NA	-	-	-	NC	NC	NA	-	-
Iron	mg/L	0.411	1.69	0.01	1.0505	**122%**	NA	-	-	-	NC	NC	NA	-	-
Lead	mg/L	0.000154	0.000347	0.00005	0.0002505	**77%**	NA	-	-	-	NC	NC	NA	-	-
Lithium	mg/L	<0.0010	0.0013	0.001	0.0013	NC	NA	-	-	-	NC	NC	NA	-	-
Magnesium	mg/L	0.618	1.01	0.005	0.814	**48%**	NA	-	-	-	NC	NC	NA	-	-
Manganese	mg/L	0.0634	0.115	0.0001	0.0892	**58%**	NA	-	-	-	NC	NC	NA	-	-
Mercury	mg/L	0.0000103	0.0000151	0.000005	0.0000127	NC	0.96	-	-	-	NC	NC	NA	-	-
Molybdenum	mg/L	<0.000050	0.000071	0.00005	0.000071	NC	NA	-	-	-	NC	NC	NA	-	-
Nickel	mg/L	0.00218	0.00548	0.0005	0.00383	**86%**	NA	-	-	-	NC	NC	NA	-	-
Phosphorus	mg/L	0.056	0.105	0.05	0.0805	NC	0.98	-	-	-	NC	NC	NA	-	-
Potassium	mg/L	0.24	0.322	0.05	0.281	**29%**	NA	-	-	-	NC	NC	NA	-	-
Rubidium	mg/L	0.00042	0.00111	0.0002	0.000765	NC	3.45	-	-	-	NC	NC	NA	-	-
Selenium	mg/L	0.000084	0.000152	0.00005	0.000118	NC	1.36	-	-	-	NC	NC	NA	-	-
Silicon	mg/L	3.04	4.29	0.1	3.665	**34%**	NA	-	-	-	NC	NC	NA	-	-
Silver	mg/L	0.0000150	0.000037	0.00001	0.000026	NC	2.2	-	-	-	NC	NC	NA	-	-
Sodium	mg/L	0.816	0.862	0.05	0.839	5%	NA	-	-	-	NC	NC	NA	-	-
Strontium	mg/L	0.013	0.0146	0.0002	0.0138	12%	NA	-	-	-	NC	NC	NA	-	-
Sulfur	mg/L	<0.50	<0.50	0.5	NC	NC	NA	-	-	-	NC	NC	NA	-	-
Tellurium	mg/L	<0.00020	<0.00020	0.0002	NC	NC	NA	-	-	-	NC	NC	NA	-	-
Thallium	mg/L	<0.000010	0.000012	0.00001	0.000012	NC	NA	-	-	-	NC	NC	NA	-	-
Thorium	mg/L	<0.00010	<0.00010	0.0001	NC	NC	NA	-	-	-	NC	NC	NA	-	-
Tin	mg/L	<0.00010	<0.00010	0.0001	NC	NC	NA	-	-	-	NC	NC	NA	-	-
Titanium	mg/L	0.0058	0.0239	0.0003	0.01487	**121%**	NA	-	-	-	NC	NC	NA	-	-
Tungsten	mg/L	<0.00010	<0.00010	0.0001	NC	NC	NA	-	-	-	NC	NC	NA	-	-
Uranium	mg/L	0.0000150	0.000029	0.00001	0.000022	NC	1.4	-	-	-	NC	NC	NA	-	-
Vanadium	mg/L	0.0008	0.00308	0.0005	0.00196	NC	4.48	-	-	-	NC	NC	NA	-	-
Zinc	mg/L	<0.0030	0.0061	0.003	0.0061	NC	NA	-	-	-	NC	NC	NA	-	-
Zirconium	mg/L	0.0003	0.000348	0.00006	0.0003175	19%	NA	-	-	-	NC	NC	NA	-	-

Sampling Location		SW2017-2						MW-2						Blank	Blank
Sample ID		SW2017-2	DUP	Laboratory Reporting Limit	Mean	Relative Percent Difference (%)	Difference Factor (-)	MW-2	DUP	Laboratory Reporting Limit	Mean	Relative Percent Difference (%)	Difference Factor (-)	BLANK	BLANK
Laboratory ID		L2097662-2	L2097662-4					L2183746-3	L2183746-7					L2097663-6	L2183746-6
Sample Date		17-May-18	17-May-18					17-Oct-18	43390					17-May-18	17-Oct-18
QAQC	Units	FDA	FD					FDA	FD					FB	FB
Dissolved Metals															
Aluminum	mg/L	0.263	0.274	0.001	0.2685	4%	NA	0.0015	0.0017	0.001	0.0016	NC	0.2	0.0041	-
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	0.00011	0.00012	0.0001	0.000115	NC	0.1	0.00037	0.00043	0.0001	0.0004	NC	0.6	<0.00010	-
Barium	mg/L	0.0097	0.0096	0.0001	0.00965	1%	NA	0.0527	0.0512	0.0001	0.05195	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	<0.010	<0.010	0.01	NC	NC	NA	0.053	0.055	0.01	0.054	4%	NA	<0.010	-
Cadmium	mg/L	0.000014	0.0000139	0.000005	0.00001395	NC	0.02	0.000157	0.000171	0.000005	0.000164	9%	NA	0.0000224	-
Calcium	mg/L	1.5	1.54	0.05	1.52	3%	NA	37.9	38.9	0.05	38.4	3%	NA	<0.050	-
Cesium	mg/L	<0.000010	<0.000010	0.00001	NC	NC	NA	<0.000010	<0.000010	0.00001	NC	NC	NA	<0.000010	-
Chromium	mg/L	0.00047	0.00042	0.0001	0.000445	NC	0.5	<0.00010	<0.00010	0.0001	NC	NC	NA	<0.00010	-
Cobalt	mg/L	<0.00010	<0.00010	0.0001	NC	NC	NA	0.0001	<0.00010	0.0001	0.0001	NC	NA	<0.00010	-
Copper	mg/L	0.00109	0.00109	0.0002	0.00109	0%	NA	<0.00020	<0.00020	0.0002	NC	NC	NA	0.00021	-
Iron	mg/L	0.071	0.068	0.01	0.0695	4%	NA	<0.010	<0.010	0.01	NC	NC	NA	<0.010	-
Lead	mg/L	<0.000050	<0.000050	0.00005	NC	NC	NA	<0.000050	<0.000050	0.00005	NC	NC	NA	<0.000050	-
Lithium	mg/L	<0.0010	<0.0010	0.001	NC	NC	NA	0.0026	0.0027	0.001	0.00265	NC	0.1	<0.0010	-
Magnesium	mg/L	0.518	0.535	0.005	0.5265	3%	NA	11.5	11.6	0.005	11.55	1%	NA	<0.0050	-
Manganese	mg/L	0.0115	0.0125	0.0001	0.012	8%	NA	0.0821	0.0763	0.0001	0.0792	7%	NA	0.00058	-
Mercury	mg/L	0.0000054	0.0000052	0.000005	0.0000053	NC	0.04	<0.0000050	<0.0000050	0.000005	NC	NC	NA	<0.0000050	-
Molybdenum	mg/L	<0.000050	<0.000050	0.00005	NC	NC	NA	0.0198	0.0197	0.00005	0.01975	1%	NA	<0.000050	-
Nickel	mg/L	0.00116	0.0011	0.0005	0.00113	NC	0.12	0.00092	0.00082	0.0005	0.00087	NC	0.2	<0.00050	-
Phosphorus	mg/L	<0.050	<0.050	0.05	NC	NC	NA	<0.050	<0.050	0.05	NC	NC	NA	<0.050	-
Potassium	mg/L	0.224	0.245	0.05	0.2345	NC	0.42	1.91	1.9	0.05	1.905	1%	NA	<0.050	-
Rubidium	mg/L	<0.00020	0.0002	0.0002	0.0002	NC	NA	0.00022	0.00023	0.0002	0.000225	NC	0.05	<0.00020	-
Selenium	mg/L	0.000063	0.000113	0.00005	0.000088	NC	1	<0.000050	<0.000050	0.00005	NC	NC	NA	<0.000050	-
Silicon	mg/L	2.57	2.49	0.05	2.53	3%	NA	3.95	3.96	0.05	3.955	0%	NA	<0.050	-
Silver	mg/L	<0.000010	<0.000010	0.00001	NC	NC	NA	<0.000010	<0.000010	0.00001	NC	NC	NA	<0.000010	-
Sodium	mg/L	0.788	0.809	0.05	0.7985	3%	NA	47.2	47.6	0.05	47.4	1%	NA	<0.050	-
Strontium	mg/L	0.011	0.0113	0.0002	0.01115	3%	NA	0.498	0.492	0.0002	0.495	1%	NA	<0.00020	-
Sulfur	mg/L	<0.50	<0.50	0.5	NC	NC	NA	16.4	15.9	0.5	16.15	3%	NA	<0.50	-
Tellerium	mg/L	<0.00020	<0.00020	0.0002	NC	NC	NA	<0.00020	<0.00020	0.0002	NC	NC	NA	<0.00020	-
Thallium	mg/L	<0.000010	<0.000010	0.00001	NC	NC	NA	<0.000010	<0.000010	0.00001	NC	NC	NA	<0.000010	-
Thorium	mg/L	<0.00010	<0.00010	0.0001	NC	NC	NA	<0.00010	<0.00010	0.0001	NC	NC	NA	<0.00010	-
Tin	mg/L	<0.00010	<0.00010	0.0001	NC	NC	NA	<0.00010	<0.00010	0.0001	NC	NC	NA	<0.00010	-
Titanium	mg/L	0.00125	0.00133	0.0003	0.00129	NC	0.266666667	<0.00030	<0.00030	0.0003	NC	NC	NA	<0.00030	-
Tungsten	mg/L	<0.00010	<0.00010	0.0001	NC	NC	NA	<0.00010	<0.00010	0.0001	NC	NC	NA	<0.00010	-
Uranium	mg/L	<0.000010	<0.000010	0.00001	NC	NC	NA	0.0019	0.00197	0.00001	0.001935	4%	NA	<0.000010	-
Vanadium	mg/L	<0.00050	<0.00050	0.0005	NC	NC	NA	<0.00050	<0.00050	0.0005	NC	NC	NA	<0.00050	-
Zinc	mg/L	0.001	<0.0010	0.001	0.001	NC	NA	<0.0010	0.0011	0.001	0.0011	NC	NA	<0.0010	-
Zirconium	mg/L	0.000261	0.000296	0.00006	0.0002785	NC	0.583333333	<0.000060	<0.000060	0.00006	NC	NC	NA	<0.000060	-

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

APPENDIX E

2018 Certificates of Analysis

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

Date Received: 19-MAY-18
Report Date: 01-JUN-18 12:33 (MT)
Version: FINAL

Client Phone: 250-615-6100

Certificate of Analysis

Lab Work Order #: L2097663

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

Amber Springer, B.Sc
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2097663-1 WATER 17-MAY-18 15:20 MW1A	L2097663-2 WATER 17-MAY-18 15:10 MW1B	L2097663-3 WATER 17-MAY-18 13:40 MW2	L2097663-4 WATER 17-MAY-18 11:55 MW3	L2097663-5 WATER 17-MAY-18 14:30 MW4
WATER						
Physical Tests	Conductivity (uS/cm)	670	361	369	612	616
	Hardness (as CaCO3) (mg/L)	162	175	114	208	222
	Total Dissolved Solids (mg/L)	487	237	233	412	467
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	241	209	166	193	173
	Ammonia, Total (as N) (mg/L)	0.0827	0.269	<0.0050	0.0164	0.0210
	Chloride (Cl) (mg/L)	1.33	0.55	<0.50	0.76	<0.50
	Fluoride (F) (mg/L)	0.190	0.070	0.136	0.095	0.109
	Nitrate and Nitrite (as N) (mg/L)	0.138	0.176	0.188	0.121	0.0420
	Nitrate (as N) (mg/L)	0.138	0.170	0.187	0.121	0.0420
	Nitrite (as N) (mg/L)	<0.0010	0.0058	0.0011	<0.0010	<0.0010
	Total Kjeldahl Nitrogen (mg/L)	4.05	1.94	0.083	0.173	0.678
	Sulfate (SO4) (mg/L)	135	5.74	42.7	148	155
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0101	0.0209	0.0026	0.0043	0.0058
	Antimony (Sb)-Dissolved (mg/L)	0.00043	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00170	0.00129	0.00027	0.00024	0.00015
	Barium (Ba)-Dissolved (mg/L)	0.0625	0.403	0.0498	0.0296	0.0252
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	0.067	<0.010	0.036	0.061	0.066
	Cadmium (Cd)-Dissolved (mg/L)	0.000204	0.0000700	0.000493	0.000106	0.000126
	Calcium (Ca)-Dissolved (mg/L)	46.6	52.2	31.3	62.3	66.0
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	0.000011	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	0.00015	0.00027	0.00035	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	0.00064	0.0117	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00061	0.00060	0.00092	0.00065	0.00023
	Iron (Fe)-Dissolved (mg/L)	0.213	2.16	<0.010	<0.010	0.040
	Lead (Pb)-Dissolved (mg/L)	<0.000050	0.000084	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0037	0.0033	0.0020	0.0045	0.0047
	Magnesium (Mg)-Dissolved (mg/L)	11.1	10.8	8.68	12.7	13.8
	Manganese (Mn)-Dissolved (mg/L)	0.542	7.62	0.0108	0.00868	0.120
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.0194	0.000337	0.0103	0.00603	0.00801
	Nickel (Ni)-Dissolved (mg/L)	0.00194	0.0131	<0.00050	0.00052	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	2.43	0.898	1.63	1.95	2.41

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2097663-6				
	Description					
	Sampled Date	17-MAY-18				
	Sampled Time	12:00				
	Client ID	BLANK				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	<2.0				
	Hardness (as CaCO3) (mg/L)	<0.50				
	Total Dissolved Solids (mg/L)	<10				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	<1.0				
	Ammonia, Total (as N) (mg/L)	<0.0050				
	Chloride (Cl) (mg/L)	<0.50				
	Fluoride (F) (mg/L)	<0.020				
	Nitrate and Nitrite (as N) (mg/L)	<0.0051				
	Nitrate (as N) (mg/L)	<0.0050				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	<0.050				
	Sulfate (SO4) (mg/L)	<0.30				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0041 RRV				
	Antimony (Sb)-Dissolved (mg/L)	<0.00010				
	Arsenic (As)-Dissolved (mg/L)	<0.00010				
	Barium (Ba)-Dissolved (mg/L)	<0.00010				
	Beryllium (Be)-Dissolved (mg/L)	<0.00010				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	<0.010				
	Cadmium (Cd)-Dissolved (mg/L)	0.0000224 RRV				
	Calcium (Ca)-Dissolved (mg/L)	<0.050				
	Cesium (Cs)-Dissolved (mg/L)	<0.000010				
	Chromium (Cr)-Dissolved (mg/L)	<0.00010				
	Cobalt (Co)-Dissolved (mg/L)	<0.00010				
	Copper (Cu)-Dissolved (mg/L)	0.00021 RRV				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	<0.0010				
	Magnesium (Mg)-Dissolved (mg/L)	<0.0050				
	Manganese (Mn)-Dissolved (mg/L)	0.00058 RRV				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	<0.000050				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	<0.050				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2097663-1 WATER 17-MAY-18 15:20 MW1A	L2097663-2 WATER 17-MAY-18 15:10 MW1B	L2097663-3 WATER 17-MAY-18 13:40 MW2	L2097663-4 WATER 17-MAY-18 11:55 MW3	L2097663-5 WATER 17-MAY-18 14:30 MW4
WATER						
Dissolved Metals	Rubidium (Rb)-Dissolved (mg/L)	0.00037	0.00053	0.00025	0.00032	0.00043
	Selenium (Se)-Dissolved (mg/L)	0.000066	<0.000050	0.000088	0.000298	0.000280
	Silicon (Si)-Dissolved (mg/L)	3.87	6.94	4.28	3.35	3.85
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	99.7	7.74	34.0	63.5	58.4
	Strontium (Sr)-Dissolved (mg/L)	0.542	0.338	0.360	0.598	0.709
	Sulfur (S)-Dissolved (mg/L)	45.5	2.32	12.9	49.3	52.8
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	0.000011	<0.000010	<0.000010	<0.000010
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	0.00038	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	0.00051	0.00099	<0.00030	<0.00030	<0.00030
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Uranium (U)-Dissolved (mg/L)	0.00300	0.000080	0.00127	0.00148	0.000952
	Vanadium (V)-Dissolved (mg/L)	0.00073	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0048	0.0049	0.0053	0.0015	0.0016
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060	0.000193	<0.000060	<0.000060	<0.000060
Aggregate Organics	COD (mg/L)	114	71	<20	<20	<20

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2097663-6				
	Description					
	Sampled Date	17-MAY-18				
	Sampled Time	12:00				
	Client ID	BLANK				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Rubidium (Rb)-Dissolved (mg/L)	<0.00020				
	Selenium (Se)-Dissolved (mg/L)	<0.000050				
	Silicon (Si)-Dissolved (mg/L)	<0.050				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	<0.050				
	Strontium (Sr)-Dissolved (mg/L)	<0.00020				
	Sulfur (S)-Dissolved (mg/L)	<0.50				
	Tellurium (Te)-Dissolved (mg/L)	<0.00020				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Thorium (Th)-Dissolved (mg/L)	<0.00010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.00030				
	Tungsten (W)-Dissolved (mg/L)	<0.00010				
	Uranium (U)-Dissolved (mg/L)	<0.000010				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	<0.0010				
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060				
Aggregate Organics	COD (mg/L)	<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	L2097663-1, -2, -3, -4, -5, -6
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2097663-6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2097663-1, -2, -3, -4, -5, -6
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2097663-6
Matrix Spike	Copper (Cu)-Dissolved	MS-B	L2097663-6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2097663-1, -2, -3, -4, -5, -6
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2097663-6
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2097663-6
Matrix Spike	Potassium (K)-Dissolved	MS-B	L2097663-6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2097663-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2097663-6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2097663-1, -2, -3, -4, -5, -6
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2097663-6

Qualifiers for Individual Parameters Listed:

Qualifier	Description
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RRV	Reported Result Verified By Repeat Analysis

Test Method References:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

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

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

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

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

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

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

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

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

Reference Information

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

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

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

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

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

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
ALK-TITR-VA	**Water**							
Batch R4057171								
WG2779291-3 CRM		**VA-ALK-TITR-CONTROL**						
Alkalinity, Total (as CaCO3)			101.3		%		85-115	26-MAY-18
WG2779291-5 DUP		**L2097663-1**						
Alkalinity, Total (as CaCO3)		241	244		mg/L	1.2	20	26-MAY-18
WG2779291-1 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	26-MAY-18
Batch R4061112								
WG2779086-3 CRM		**VA-ALK-TITR-CONTROL**						
Alkalinity, Total (as CaCO3)			98.2		%		85-115	28-MAY-18
WG2779086-1 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	28-MAY-18
CL-IC-N-VA	**Water**							
Batch R4059031								
WG2779130-2 LCS								
Chloride (Cl)			100.9		%		90-110	25-MAY-18
WG2779130-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	25-MAY-18
Batch R4061768								
WG2779294-3 DUP		**L2097663-1**						
Chloride (Cl)		1.33	1.33		mg/L	0.1	20	25-MAY-18
WG2779294-2 LCS								
Chloride (Cl)			101.7		%		90-110	25-MAY-18
WG2779294-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	25-MAY-18
WG2779294-4 MS		**L2097663-2**						
Chloride (Cl)			100.9		%		75-125	25-MAY-18
COD-COL-VA	**Water**							
Batch R4048627								
WG2776878-7 DUP		**L2097663-6**						
COD		<20	<20	RPD-NA	mg/L	N/A	20	20-MAY-18
WG2776878-3 LCS								
COD			97.1		%		85-115	20-MAY-18
WG2776878-6 LCS								
COD			95.8		%		85-115	20-MAY-18
WG2776878-1 MB								
COD			<20		mg/L		20	20-MAY-18
WG2776878-5 MB								
COD			<20		mg/L		20	20-MAY-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
COD-COL-VA	**Water**							
Batch R4048627								
WG2776878-8 MS		**L2097663-4**						
COD			99.4		%		75-125	20-MAY-18
EC-PCT-VA	**Water**							
Batch R4057171								
WG2779291-4 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			98.7		%		90-110	26-MAY-18
WG2779291-5 DUP		**L2097663-1**						
Conductivity		670	670		uS/cm	0.0	10	26-MAY-18
WG2779291-1 MB								
Conductivity			<2.0		uS/cm		2	26-MAY-18
Batch R4061112								
WG2779086-4 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			98.9		%		90-110	28-MAY-18
WG2779086-1 MB								
Conductivity			<2.0		uS/cm		2	28-MAY-18
F-IC-N-VA	**Water**							
Batch R4059031								
WG2779130-2 LCS								
Fluoride (F)			103.1		%		90-110	25-MAY-18
WG2779130-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	25-MAY-18
Batch R4061768								
WG2779294-3 DUP		**L2097663-1**						
Fluoride (F)		0.190	0.191		mg/L	0.3	20	25-MAY-18
WG2779294-2 LCS								
Fluoride (F)			103.6		%		90-110	25-MAY-18
WG2779294-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	25-MAY-18
WG2779294-4 MS		**L2097663-2**						
Fluoride (F)			101.5		%		75-125	25-MAY-18
HG-D-CVAA-VA	**Water**							
Batch R4055469								
WG2777775-14 LCS								
Mercury (Hg)-Dissolved			105.9		%		80-120	24-MAY-18
WG2777775-13 MB		**NP**						
Mercury (Hg)-Dissolved			<0.000005(		mg/L		0.000005	24-MAY-18
MET-D-CCMS-VA	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4059909								
WG2777785-2 LCS								
Aluminum (Al)-Dissolved			94.3		%		80-120	26-MAY-18
Antimony (Sb)-Dissolved			92.2		%		80-120	26-MAY-18
Arsenic (As)-Dissolved			100.6		%		80-120	26-MAY-18
Barium (Ba)-Dissolved			99.8		%		80-120	26-MAY-18
Beryllium (Be)-Dissolved			95.9		%		80-120	26-MAY-18
Bismuth (Bi)-Dissolved			95.5		%		80-120	26-MAY-18
Boron (B)-Dissolved			86.5		%		80-120	26-MAY-18
Cadmium (Cd)-Dissolved			100.5		%		80-120	26-MAY-18
Calcium (Ca)-Dissolved			97.4		%		80-120	26-MAY-18
Cesium (Cs)-Dissolved			95.1		%		80-120	26-MAY-18
Chromium (Cr)-Dissolved			98.3		%		80-120	26-MAY-18
Cobalt (Co)-Dissolved			97.8		%		80-120	26-MAY-18
Copper (Cu)-Dissolved			99.0		%		80-120	26-MAY-18
Iron (Fe)-Dissolved			97.3		%		80-120	26-MAY-18
Lead (Pb)-Dissolved			93.4		%		80-120	26-MAY-18
Lithium (Li)-Dissolved			94.6		%		80-120	26-MAY-18
Magnesium (Mg)-Dissolved			100.6		%		80-120	26-MAY-18
Manganese (Mn)-Dissolved			98.5		%		80-120	26-MAY-18
Molybdenum (Mo)-Dissolved			93.8		%		80-120	26-MAY-18
Nickel (Ni)-Dissolved			101.9		%		80-120	26-MAY-18
Phosphorus (P)-Dissolved			107.3		%		80-120	26-MAY-18
Potassium (K)-Dissolved			102.9		%		80-120	26-MAY-18
Rubidium (Rb)-Dissolved			102.2		%		80-120	26-MAY-18
Selenium (Se)-Dissolved			95.2		%		80-120	26-MAY-18
Silicon (Si)-Dissolved			98.4		%		80-120	26-MAY-18
Silver (Ag)-Dissolved			94.1		%		80-120	26-MAY-18
Sodium (Na)-Dissolved			105.9		%		80-120	26-MAY-18
Strontium (Sr)-Dissolved			94.1		%		80-120	26-MAY-18
Sulfur (S)-Dissolved			99.5		%		80-120	26-MAY-18
Tellurium (Te)-Dissolved			94.4		%		80-120	26-MAY-18
Thallium (Tl)-Dissolved			93.5		%		80-120	26-MAY-18
Thorium (Th)-Dissolved			93.0		%		80-120	26-MAY-18
Tin (Sn)-Dissolved			94.9		%		80-120	26-MAY-18
Titanium (Ti)-Dissolved			97.5		%		80-120	26-MAY-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4059909								
WG2777785-2 LCS								
Tungsten (W)-Dissolved			95.1		%		80-120	26-MAY-18
Uranium (U)-Dissolved			95.4		%		80-120	26-MAY-18
Vanadium (V)-Dissolved			98.8		%		80-120	26-MAY-18
Zinc (Zn)-Dissolved			93.0		%		80-120	26-MAY-18
Zirconium (Zr)-Dissolved			88.8		%		80-120	26-MAY-18
WG2777785-1 MB		**NP**						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	26-MAY-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	26-MAY-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	26-MAY-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	26-MAY-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	26-MAY-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	26-MAY-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	26-MAY-18
Cadmium (Cd)-Dissolved			<0.000005(		mg/L		0.000005	26-MAY-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	26-MAY-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	26-MAY-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	26-MAY-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	26-MAY-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	26-MAY-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	26-MAY-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	26-MAY-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	26-MAY-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	26-MAY-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	26-MAY-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	26-MAY-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	26-MAY-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	26-MAY-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	26-MAY-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	26-MAY-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	26-MAY-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	26-MAY-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	26-MAY-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	26-MAY-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	26-MAY-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4059909								
WG2777785-1 MB		**NP**						
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	26-MAY-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	26-MAY-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	26-MAY-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	26-MAY-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	26-MAY-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	26-MAY-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	26-MAY-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	26-MAY-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	26-MAY-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	26-MAY-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	26-MAY-18
Batch R4061539								
WG2782774-2 LCS								
Aluminum (Al)-Dissolved			98.6		%		80-120	29-MAY-18
Antimony (Sb)-Dissolved			94.6		%		80-120	29-MAY-18
Arsenic (As)-Dissolved			97.4		%		80-120	29-MAY-18
Barium (Ba)-Dissolved			97.5		%		80-120	29-MAY-18
Beryllium (Be)-Dissolved			98.5		%		80-120	29-MAY-18
Bismuth (Bi)-Dissolved			94.6		%		80-120	29-MAY-18
Boron (B)-Dissolved			87.0		%		80-120	29-MAY-18
Cadmium (Cd)-Dissolved			96.1		%		80-120	29-MAY-18
Calcium (Ca)-Dissolved			94.8		%		80-120	29-MAY-18
Cesium (Cs)-Dissolved			96.1		%		80-120	29-MAY-18
Chromium (Cr)-Dissolved			97.1		%		80-120	29-MAY-18
Cobalt (Co)-Dissolved			96.7		%		80-120	29-MAY-18
Copper (Cu)-Dissolved			95.3		%		80-120	29-MAY-18
Iron (Fe)-Dissolved			97.5		%		80-120	29-MAY-18
Lead (Pb)-Dissolved			96.2		%		80-120	29-MAY-18
Lithium (Li)-Dissolved			96.7		%		80-120	29-MAY-18
Magnesium (Mg)-Dissolved			100.8		%		80-120	29-MAY-18
Manganese (Mn)-Dissolved			97.0		%		80-120	29-MAY-18
Molybdenum (Mo)-Dissolved			98.7		%		80-120	29-MAY-18
Nickel (Ni)-Dissolved			95.6		%		80-120	29-MAY-18
Phosphorus (P)-Dissolved			100.2		%		80-120	29-MAY-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4061539								
WG2782774-2 LCS								
Potassium (K)-Dissolved			97.9		%		80-120	29-MAY-18
Rubidium (Rb)-Dissolved			95.0		%		80-120	29-MAY-18
Selenium (Se)-Dissolved			100.4		%		80-120	29-MAY-18
Silicon (Si)-Dissolved			95.0		%		80-120	29-MAY-18
Silver (Ag)-Dissolved			101.9		%		80-120	29-MAY-18
Sodium (Na)-Dissolved			97.9		%		80-120	29-MAY-18
Strontium (Sr)-Dissolved			97.3		%		80-120	29-MAY-18
Sulfur (S)-Dissolved			84.6		%		80-120	29-MAY-18
Tellurium (Te)-Dissolved			103.0		%		80-120	29-MAY-18
Thallium (Tl)-Dissolved			97.7		%		80-120	29-MAY-18
Thorium (Th)-Dissolved			94.1		%		80-120	29-MAY-18
Tin (Sn)-Dissolved			95.9		%		80-120	29-MAY-18
Titanium (Ti)-Dissolved			95.4		%		80-120	29-MAY-18
Tungsten (W)-Dissolved			95.3		%		80-120	29-MAY-18
Uranium (U)-Dissolved			98.7		%		80-120	29-MAY-18
Vanadium (V)-Dissolved			97.6		%		80-120	29-MAY-18
Zinc (Zn)-Dissolved			92.1		%		80-120	29-MAY-18
Zirconium (Zr)-Dissolved			92.4		%		80-120	29-MAY-18
WG2782774-1 MB		**NP**						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	29-MAY-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	29-MAY-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	29-MAY-18
Cadmium (Cd)-Dissolved			<0.000005(		mg/L		0.000005	29-MAY-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	29-MAY-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	29-MAY-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	29-MAY-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	29-MAY-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	29-MAY-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4061539								
WG2782774-1 MB		**NP**						
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	29-MAY-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	29-MAY-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	29-MAY-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	29-MAY-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	29-MAY-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	29-MAY-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	29-MAY-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	29-MAY-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	29-MAY-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	29-MAY-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	29-MAY-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	29-MAY-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	29-MAY-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	29-MAY-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	29-MAY-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	29-MAY-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	29-MAY-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	29-MAY-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	29-MAY-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	29-MAY-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	29-MAY-18
NH3-F-VA	**Water**							
Batch R4061215								
WG2782543-10 LCS								
Ammonia, Total (as N)			96.8		%		85-115	29-MAY-18
WG2782543-9 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	29-MAY-18
NO2-L-IC-N-VA	**Water**							
Batch R4059031								
WG2779130-2 LCS								
Nitrite (as N)			100.9		%		90-110	25-MAY-18
WG2779130-1 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-VA	**Water**							
Batch R4059031								
WG2779130-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	25-MAY-18
Batch R4061768								
WG2779294-3 DUP		**L2097663-1**						
Nitrite (as N)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	25-MAY-18
WG2779294-2 LCS								
Nitrite (as N)			101.6		%		90-110	25-MAY-18
WG2779294-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	25-MAY-18
WG2779294-4 MS		**L2097663-2**						
Nitrite (as N)			97.7		%		75-125	25-MAY-18
NO3-L-IC-N-VA	**Water**							
Batch R4059031								
WG2779130-2 LCS								
Nitrate (as N)			101.2		%		90-110	25-MAY-18
WG2779130-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	25-MAY-18
Batch R4061768								
WG2779294-3 DUP		**L2097663-1**						
Nitrate (as N)		0.138	0.136		mg/L	1.0	20	25-MAY-18
WG2779294-2 LCS								
Nitrate (as N)			102.1		%		90-110	25-MAY-18
WG2779294-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	25-MAY-18
WG2779294-4 MS		**L2097663-2**						
Nitrate (as N)			101.4		%		75-125	25-MAY-18
SO4-IC-N-VA	**Water**							
Batch R4059031								
WG2779130-2 LCS								
Sulfate (SO4)			102.1		%		90-110	25-MAY-18
WG2779130-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	25-MAY-18
Batch R4061768								
WG2779294-3 DUP		**L2097663-1**						
Sulfate (SO4)		135	135		mg/L	0.1	20	25-MAY-18
WG2779294-2 LCS								
Sulfate (SO4)			102.9		%		90-110	25-MAY-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-VA	**Water**							
Batch R4061768								
WG2779294-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	25-MAY-18
WG2779294-4 MS		**L2097663-2**						
Sulfate (SO4)			100.6		%		75-125	25-MAY-18
TDS-VA	**Water**							
Batch R4056284								
WG2780028-5 LCS								
Total Dissolved Solids			101.1		%		85-115	24-MAY-18
WG2780028-8 LCS								
Total Dissolved Solids			104.7		%		85-115	24-MAY-18
WG2780028-4 MB								
Total Dissolved Solids			<10		mg/L		10	24-MAY-18
WG2780028-7 MB								
Total Dissolved Solids			<10		mg/L		10	24-MAY-18
TKN-F-VA	**Water**							
Batch R4063657								
WG2784775-10 LCS								
Total Kjeldahl Nitrogen			98.9		%		75-125	31-MAY-18
WG2784775-14 LCS								
Total Kjeldahl Nitrogen			99.5		%		75-125	31-MAY-18
WG2784775-13 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	31-MAY-18
WG2784775-9 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	31-MAY-18

Legend:

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:

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

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrate in Water by IC (Low Level)							
	1	17-MAY-18 15:20	25-MAY-18 06:06	3	8	days	EHT
	2	17-MAY-18 15:10	25-MAY-18 06:06	3	8	days	EHT
	3	17-MAY-18 13:40	25-MAY-18 06:06	3	8	days	EHT
	4	17-MAY-18 11:55	25-MAY-18 06:06	3	8	days	EHT
	5	17-MAY-18 14:30	26-MAY-18 12:15	3	9	days	EHT
	6	17-MAY-18 12:00	26-MAY-18 12:15	3	9	days	EHT
Nitrite in Water by IC (Low Level)							
	1	17-MAY-18 15:20	25-MAY-18 06:06	3	8	days	EHT
	2	17-MAY-18 15:10	25-MAY-18 06:06	3	8	days	EHT
	3	17-MAY-18 13:40	25-MAY-18 06:06	3	8	days	EHT
	4	17-MAY-18 11:55	25-MAY-18 06:06	3	8	days	EHT
	5	17-MAY-18 14:30	26-MAY-18 12:15	3	9	days	EHT
	6	17-MAY-18 12:00	26-MAY-18 12:15	3	9	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 L2097663 were received on 19-MAY-18 11:00.

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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2097663-COFC

COC Number: 17 -

Page 1 of 1

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

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☑ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax rtooms@rdks.bc.ca

Email 2 ckerr@rdks.bc.ca

Email 3 mhaley@rdks.bc.ca

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax rtooms@rdks.bc.ca

Email 2 ckerr@rdks.bc.ca

Project Information

ALS Account # / Quote #:

Job #: Meziadin Landfill Groundwater

PO / AFE:

LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#

Major/Minor Code: Routing Code:

Requisitioner:

Location:

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

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

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

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

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

Date and Time Required for all E&P TATs:

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

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	hardness	alkalinity	total Kjeldahl nitrogen	P	nitrate + nitrite	P	fluoride	Dissolved Metals	F/P	chloride	ammonia	P	sulphate	conductivity	temperature	total dissolved solids	[illegible]	COD	SAMPLES ON HOLD	Sample is hazardous (please provide further detail	NUMBER OF CONTAINERS
	MW1A	17-5-18	3:20	Water	X	X	X		X		X	X		X	X		X	X	X	X		X			4
	MW1B	" " "	3:10	Water	X	X	X		X		X	X		X	X		X	X	X	X		X			4
	MW2	" " "	1:40	Water	X	X	X		X		X	X		X	X		X	X	X	X		X			4
	MW3	" " "	11:55	Water	X	X	X		X		X	X		X	X		X	X	X	X		X			4
	MW4	" " "	2:30	Water	X	X	X		X		X	X		X	X		X	X	X	X		X			4
	BLANK	" " "	12:00		X	X	X		X		X	X		X	X		X	X	X	X		X			

Drinking Water (DW) Samples[1] (client use)

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

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

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

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

Cooling Initiated ☐

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

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: CHRIS KERR	Date: 18-5-18	Time:	Received by:	Date:	Time:	Received by:	Date: May 19	Time: 11AM

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

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

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

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

Date Received: 18-OCT-18
Report Date: 26-OCT-18 13:30 (MT)
Version: FINAL

Client Phone: 250-615-6100

Certificate of Analysis

Lab Work Order #: L2183746

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

Amber Springer, B.Sc
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2183746-1 Water 17-OCT-18 01:15 MW1A	L2183746-2 Water 17-OCT-18 01:00 MW1B	L2183746-3 Water 17-OCT-18 12:15 MW2	L2183746-4 Water 17-OCT-18 10:45 MW3	L2183746-5 Water 17-OCT-18 10:00 MW4
WATER						
Physical Tests	Conductivity (uS/cm)	690	384	450	628	641
	Hardness (as CaCO3) (mg/L)	171	189	142	185	216
	pH (pH)	8.39	7.24	8.36	8.32	8.33
	Total Dissolved Solids (mg/L)	452	242	294	420	422
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	239	213	205	195	191
	Ammonia, Total (as N) (mg/L)	0.0532	0.340	0.0216	0.0260	0.0412
	Chloride (Cl) (mg/L)	<2.5 DLDS	<0.50	<0.50	<2.5 DLDS	<2.5 DLDS
	Fluoride (F) (mg/L)	0.17	0.066	0.181	<0.10 DLDS	0.10
	Nitrate and Nitrite (as N) (mg/L)	0.145	0.0492	0.0105	0.066	<0.025
	Nitrate (as N) (mg/L)	0.145	0.0481	0.0105	0.066	<0.025 DLDS
	Nitrite (as N) (mg/L)	<0.0050 DLDS	0.0012	<0.0010	<0.0050 DLDS	<0.0050 DLDS
	Total Kjeldahl Nitrogen (mg/L)	0.167	0.505	0.082	0.098	0.087
	Sulfate (SO4) (mg/L)	130	6.17	48.5	156	157
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0091	0.118	0.0015	0.0021	0.0013
	Antimony (Sb)-Dissolved (mg/L)	0.00031	0.00011	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00089	0.00227	0.00037	0.00023	0.00017
	Barium (Ba)-Dissolved (mg/L)	0.0526	0.543	0.0527	0.0275	0.0236
	Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	0.071	<0.010	0.053	0.060	0.069
	Cadmium (Cd)-Dissolved (mg/L)	0.0000225	0.0000567	0.000157	0.000111	0.0000858
	Calcium (Ca)-Dissolved (mg/L)	49.1	57.0	37.9	53.4	62.8
	Cesium (Cs)-Dissolved (mg/L)	<0.000010	0.000018	<0.000010	<0.000010	<0.000010
	Chromium (Cr)-Dissolved (mg/L)	0.00014	0.00043	<0.00010	<0.00010	<0.00010
	Cobalt (Co)-Dissolved (mg/L)	0.00057	0.0142	0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	<0.00020	0.00055	<0.00020	0.00034	0.00039
	Iron (Fe)-Dissolved (mg/L)	0.367	3.27	<0.010	0.017	0.015
	Lead (Pb)-Dissolved (mg/L)	<0.000050	0.000107	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0039	0.0035	0.0026	0.0043	0.0047
	Magnesium (Mg)-Dissolved (mg/L)	11.7	11.4	11.5	12.5	14.3
	Manganese (Mn)-Dissolved (mg/L)	0.988	10.5	0.0821	0.0162	0.235
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.0156	0.000367	0.0198	0.00472	0.00881
	Nickel (Ni)-Dissolved (mg/L)	0.00138	0.0154	0.00092	<0.00050	0.00058
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2183746-6	L2183746-7			
	Description	Water	Water			
	Sampled Date	17-OCT-18	17-OCT-18			
	Sampled Time		12:00			
	Client ID	BLANK	DUP			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	<2.0	458			
	Hardness (as CaCO3) (mg/L)		145			
	pH (pH)	5.39	8.37			
	Total Dissolved Solids (mg/L)	<10	284			
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	<1.0	208			
	Ammonia, Total (as N) (mg/L)	<0.0050	0.0158			
	Chloride (Cl) (mg/L)	<0.50	<0.50			
	Fluoride (F) (mg/L)	<0.020	0.183			
	Nitrate and Nitrite (as N) (mg/L)	<0.0051	0.0085			
	Nitrate (as N) (mg/L)	<0.0050	0.0085			
	Nitrite (as N) (mg/L)	<0.0010	<0.0010			
	Total Kjeldahl Nitrogen (mg/L)	<0.050	0.060			
	Sulfate (SO4) (mg/L)	<0.30	48.5			
Dissolved Metals	Dissolved Mercury Filtration Location		FIELD			
	Dissolved Metals Filtration Location		FIELD			
	Aluminum (Al)-Dissolved (mg/L)		0.0017			
	Antimony (Sb)-Dissolved (mg/L)		<0.00010			
	Arsenic (As)-Dissolved (mg/L)		0.00043			
	Barium (Ba)-Dissolved (mg/L)		0.0512			
	Beryllium (Be)-Dissolved (mg/L)		<0.00010			
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050			
	Boron (B)-Dissolved (mg/L)		0.055			
	Cadmium (Cd)-Dissolved (mg/L)		0.000171			
	Calcium (Ca)-Dissolved (mg/L)		38.9			
	Cesium (Cs)-Dissolved (mg/L)		<0.000010			
	Chromium (Cr)-Dissolved (mg/L)		<0.00010			
	Cobalt (Co)-Dissolved (mg/L)		<0.00010			
	Copper (Cu)-Dissolved (mg/L)		<0.00020			
	Iron (Fe)-Dissolved (mg/L)		<0.010			
	Lead (Pb)-Dissolved (mg/L)		<0.000050			
	Lithium (Li)-Dissolved (mg/L)		0.0027			
	Magnesium (Mg)-Dissolved (mg/L)		11.6			
	Manganese (Mn)-Dissolved (mg/L)		0.0763			
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)		0.0197			
	Nickel (Ni)-Dissolved (mg/L)		0.00082			
	Phosphorus (P)-Dissolved (mg/L)		<0.050			

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2183746-1	L2183746-2	L2183746-3	L2183746-4	L2183746-5
Description	Water	Water	Water	Water	Water
Sampled Date	17-OCT-18	17-OCT-18	17-OCT-18	17-OCT-18	17-OCT-18
Sampled Time	01:15	01:00	12:15	10:45	10:00
Client ID	MW1A	MW1B	MW2	MW3	MW4
Grouping / **Analyte**					
WATER					
Dissolved Metals					
Potassium (K)-Dissolved (mg/L)	2.31	0.787	1.91	1.71	2.24
Rubidium (Rb)-Dissolved (mg/L)	0.00032	0.00071	0.00022	0.00026	0.00033
Selenium (Se)-Dissolved (mg/L)	0.000080	0.000054	<0.000050	0.000199	0.000261
Silicon (Si)-Dissolved (mg/L)	3.79	7.67	3.95	3.22	3.83
Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved (mg/L)	94.6	4.67	47.2	57.4	56.5
Strontium (Sr)-Dissolved (mg/L)	0.614	0.380	0.498	0.567	0.733
Sulfur (S)-Dissolved (mg/L)	51.3	1.96	16.4	47.7	54.5
Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Dissolved (mg/L)	0.00037	<0.0030 DLM	<0.00030	<0.00030	<0.00030
Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved (mg/L)	0.00241	0.000050	0.00190	0.00119	0.000858
Vanadium (V)-Dissolved (mg/L)	<0.00050	0.00064	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0043	<0.0010	0.0021	<0.0010
Zirconium (Zr)-Dissolved (mg/L)	<0.000060	0.000148	<0.000060	<0.000060	<0.000060
Aggregate Organics					
COD (mg/L)	<20	25	<20	<20	<20

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2183746-6	L2183746-7			
	Description	Water	Water			
	Sampled Date	17-OCT-18	17-OCT-18			
	Sampled Time		12:00			
	Client ID	BLANK	DUP			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Potassium (K)-Dissolved (mg/L)		1.90			
	Rubidium (Rb)-Dissolved (mg/L)		0.00023			
	Selenium (Se)-Dissolved (mg/L)		<0.000050			
	Silicon (Si)-Dissolved (mg/L)		3.96			
	Silver (Ag)-Dissolved (mg/L)		<0.000010			
	Sodium (Na)-Dissolved (mg/L)		47.6			
	Strontium (Sr)-Dissolved (mg/L)		0.492			
	Sulfur (S)-Dissolved (mg/L)		15.9			
	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)		<0.00030			
	Tungsten (W)-Dissolved (mg/L)		<0.00010			
	Uranium (U)-Dissolved (mg/L)		0.00197			
	Vanadium (V)-Dissolved (mg/L)		<0.00050			
	Zinc (Zn)-Dissolved (mg/L)		0.0011			
	Zirconium (Zr)-Dissolved (mg/L)		<0.000060			
Aggregate Organics	COD (mg/L)	<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	L2183746-1, -2, -3, -4, -5, -7
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2183746-1, -2, -3, -4, -5, -7
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2183746-1, -2, -3, -4, -5, -7
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2183746-1, -2, -3, -4, -5, -7
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2183746-1, -2, -3, -4, -5, -7
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2183746-1, -2, -3, -4, -5, -7
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2183746-1, -2, -3, -4, -5, -7
Matrix Spike	Uranium (U)-Dissolved	MS-B	L2183746-1, -2, -3, -4, -5, -7
Matrix Spike	Sulfate (SO4)	MS-B	L2183746-1, -2, -3, -4, -5, -6, -7

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLM	Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

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

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

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

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

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

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

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

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

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

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: L2183746 Report Date: 26-OCT-18

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
ALK-TITR-VA	**Water**							
Batch R4289862								
WG2908888-3 CRM		**VA-ALK-TITR-CONTROL**						
Alkalinity, Total (as CaCO3)			100.4		%		85-115	20-OCT-18
WG2908888-1 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	20-OCT-18
CL-IC-N-VA	**Water**							
Batch R4295010								
WG2908962-2 LCS								
Chloride (Cl)			101.1		%		90-110	19-OCT-18
WG2908962-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	19-OCT-18
COD-COL-VA	**Water**							
Batch R4299345								
WG2912907-2 DUP		**L2183746-4**						
COD		<20	<20	RPD-NA	mg/L	N/A	20	24-OCT-18
WG2912907-3 LCS								
COD			102.0		%		85-115	24-OCT-18
WG2912907-1 MB								
COD			<20		mg/L		20	24-OCT-18
EC-PCT-VA	**Water**							
Batch R4289862								
WG2908888-4 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			100.8		%		90-110	20-OCT-18
WG2908888-1 MB								
Conductivity			<2.0		uS/cm		2	20-OCT-18
F-IC-N-VA	**Water**							
Batch R4295010								
WG2908962-2 LCS								
Fluoride (F)			100.9		%		90-110	19-OCT-18
WG2908962-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	19-OCT-18
HG-D-CVAA-VA	**Water**							
Batch R4290008								
WG2908022-15 DUP		**L2183746-2**						
Mercury (Hg)-Dissolved		<0.0000050	<0.000005(	RPD-NA	mg/L	N/A	20	21-OCT-18
WG2908022-14 LCS								
Mercury (Hg)-Dissolved			85.3		%		80-120	21-OCT-18
WG2908022-13 MB		**NP**						

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA	**Water**							
Batch R4290008								
WG2908022-13 MB		**NP**						
Mercury (Hg)-Dissolved			<0.000005(		mg/L		0.000005	21-OCT-18
WG2908022-16 MS		**L2183746-1**						
Mercury (Hg)-Dissolved			97.4		%		70-130	21-OCT-18
MET-D-CCMS-VA	**Water**							
Batch R4290005								
WG2909257-2 LCS								
Aluminum (Al)-Dissolved			97.7		%		80-120	20-OCT-18
Antimony (Sb)-Dissolved			95.8		%		80-120	20-OCT-18
Arsenic (As)-Dissolved			96.9		%		80-120	20-OCT-18
Barium (Ba)-Dissolved			97.0		%		80-120	20-OCT-18
Beryllium (Be)-Dissolved			98.1		%		80-120	20-OCT-18
Bismuth (Bi)-Dissolved			96.9		%		80-120	20-OCT-18
Boron (B)-Dissolved			96.2		%		80-120	20-OCT-18
Cadmium (Cd)-Dissolved			98.9		%		80-120	20-OCT-18
Calcium (Ca)-Dissolved			94.1		%		80-120	20-OCT-18
Cesium (Cs)-Dissolved			92.9		%		80-120	20-OCT-18
Chromium (Cr)-Dissolved			94.6		%		80-120	20-OCT-18
Cobalt (Co)-Dissolved			96.3		%		80-120	20-OCT-18
Copper (Cu)-Dissolved			96.5		%		80-120	20-OCT-18
Iron (Fe)-Dissolved			96.3		%		80-120	20-OCT-18
Lead (Pb)-Dissolved			100.9		%		80-120	20-OCT-18
Lithium (Li)-Dissolved			99.2		%		80-120	20-OCT-18
Magnesium (Mg)-Dissolved			101.0		%		80-120	20-OCT-18
Manganese (Mn)-Dissolved			94.8		%		80-120	20-OCT-18
Molybdenum (Mo)-Dissolved			95.6		%		80-120	20-OCT-18
Nickel (Ni)-Dissolved			96.7		%		80-120	20-OCT-18
Phosphorus (P)-Dissolved			97.8		%		70-130	20-OCT-18
Potassium (K)-Dissolved			94.5		%		80-120	20-OCT-18
Rubidium (Rb)-Dissolved			97.0		%		80-120	20-OCT-18
Selenium (Se)-Dissolved			97.8		%		80-120	20-OCT-18
Silicon (Si)-Dissolved			98.8		%		60-140	20-OCT-18
Silver (Ag)-Dissolved			90.8		%		80-120	20-OCT-18
Sodium (Na)-Dissolved			101.2		%		80-120	20-OCT-18
Strontium (Sr)-Dissolved			92.4		%		80-120	20-OCT-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4290005								
WG2909257-2 LCS								
Sulfur (S)-Dissolved			92.3		%		80-120	20-OCT-18
Tellurium (Te)-Dissolved			95.5		%		80-120	20-OCT-18
Thallium (Tl)-Dissolved			99.6		%		80-120	20-OCT-18
Thorium (Th)-Dissolved			96.8		%		80-120	20-OCT-18
Tin (Sn)-Dissolved			94.1		%		80-120	20-OCT-18
Titanium (Ti)-Dissolved			93.0		%		80-120	20-OCT-18
Tungsten (W)-Dissolved			103.8		%		80-120	20-OCT-18
Uranium (U)-Dissolved			96.3		%		80-120	20-OCT-18
Vanadium (V)-Dissolved			97.3		%		80-120	20-OCT-18
Zinc (Zn)-Dissolved			92.1		%		80-120	20-OCT-18
Zirconium (Zr)-Dissolved			95.8		%		80-120	20-OCT-18
WG2909257-1 MB		**NP**						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	20-OCT-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	20-OCT-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	20-OCT-18
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	20-OCT-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	20-OCT-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	20-OCT-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	20-OCT-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	20-OCT-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	20-OCT-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	20-OCT-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	20-OCT-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	20-OCT-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	20-OCT-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	20-OCT-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	20-OCT-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4290005								
WG2909257-1 MB		**NP**						
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	20-OCT-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	20-OCT-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	20-OCT-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	20-OCT-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	20-OCT-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	20-OCT-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	20-OCT-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	20-OCT-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	20-OCT-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	20-OCT-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	20-OCT-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	20-OCT-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	20-OCT-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	20-OCT-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	20-OCT-18
NH3-F-VA	**Water**							
Batch R4293975								
WG2910979-3 DUP		**L2183746-5**						
Ammonia, Total (as N)		0.0412	0.0402		mg/L	2.4	20	23-OCT-18
WG2910979-2 LCS								
Ammonia, Total (as N)			97.2		%		85-115	23-OCT-18
WG2910979-6 LCS								
Ammonia, Total (as N)			97.1		%		85-115	23-OCT-18
WG2910979-1 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	23-OCT-18
WG2910979-5 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	23-OCT-18
WG2910979-4 MS		**L2183746-5**						
Ammonia, Total (as N)			99.5		%		75-125	23-OCT-18
NO2-L-IC-N-VA	**Water**							
Batch R4295010								
WG2908962-2 LCS								
Nitrite (as N)			100.7		%		90-110	19-OCT-18
WG2908962-1								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-VA	**Water**							
Batch R4295010								
WG2908962-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	19-OCT-18
NO3-L-IC-N-VA	**Water**							
Batch R4295010								
WG2908962-2 LCS								
Nitrate (as N)			101.8		%		90-110	19-OCT-18
WG2908962-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	19-OCT-18
PH-PCT-VA	**Water**							
Batch R4289862								
WG2908888-2 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	20-OCT-18
SO4-IC-N-VA	**Water**							
Batch R4295010								
WG2908962-2 LCS								
Sulfate (SO4)			102.0		%		90-110	19-OCT-18
WG2908962-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	19-OCT-18
TDS-VA	**Water**							
Batch R4295072								
WG2910879-5 LCS								
Total Dissolved Solids			108.2		%		85-115	22-OCT-18
WG2910879-4 MB								
Total Dissolved Solids			<10		mg/L		10	22-OCT-18
TKN-F-VA	**Water**							
Batch R4299833								
WG2912992-7 DUP		**L2183746-1**						
Total Kjeldahl Nitrogen		0.167	0.157		mg/L	6.0	20	25-OCT-18
WG2912992-10 LCS								
Total Kjeldahl Nitrogen			94.9		%		75-125	25-OCT-18
WG2912992-6 LCS								
Total Kjeldahl Nitrogen			96.9		%		75-125	25-OCT-18
WG2912992-5 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	25-OCT-18
WG2912992-9 MB								

Quality Control Report

Workorder: L2183746 Report Date: 26-OCT-18

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-F-VA	**Water**							
Batch R4299833								
WG2912992-9 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	25-OCT-18
WG2912992-8 MS		**L2183746-2**						
Total Kjeldahl Nitrogen			98.8		%		70-130	25-OCT-18

Legend:

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:

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

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH by Meter (Automated)							
	1	17-OCT-18 01:15	20-OCT-18 10:21	0.25	81	hours	EHTR-FM
	2	17-OCT-18 01:00	20-OCT-18 10:21	0.25	81	hours	EHTR-FM
	3	17-OCT-18 12:15	20-OCT-18 10:21	0.25	70	hours	EHTR-FM
	4	17-OCT-18 10:45	20-OCT-18 10:21	0.25	72	hours	EHTR-FM
	5	17-OCT-18 10:00	20-OCT-18 10:21	0.25	72	hours	EHTR-FM
	6	17-OCT-18	20-OCT-18 10:21	0.25	70	hours	EHTR-FM
	7	17-OCT-18 12:00	20-OCT-18 10:21	0.25	70	hours	EHTR-FM

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 L2183746 were received on 18-OCT-18 19:30.

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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2183746-COFC

COC Number: 17 -

Page of

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

Project Information

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

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☑ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	rtooms@rdks.bc.ca
Email 2	ckerr@rdks.bc.ca
Email 3	mhaley@rdks.bc.ca

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	anne-maries@rdks.bc.ca
Email 2	ckerr@rdks.bc.ca; mhaley@rdks.bc.ca

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): **ALS Contact:** **Sampler:** Chris Kerr

...w - Contact your AM to confirm all E&P TATs (surcharges may apply)

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

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

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

Date and Time Required for all E&P TATs:

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

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	conductivity	hardness	total dissolved solids	alkalinity	ammonia (P)	total kjeldahl nitrogen (P)	nitrate + nitrite	chloride	sulphate	fluoride	dissolved metals (F/P)	COD (P)	pH	temperature	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
	MW1A	17/Oct/18	01:15	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	MW1B	17/Oct/18	01:00	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	MW2	17/Oct/18	12:15	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	MW3	17/Oct/18	10:45	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	MW4	17/Oct/18	10:00	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	Blank	17/Oct/18	—	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			
	DUP	17/Oct/18	12:00pm	Water	R	R	R	R	R	R	R	R	R	R	R	R	R	R			

Drinking Water (DW) Samples[1] (client use)

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

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

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

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

Cooling Initiated ☑

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
7.2							5

SHIPMENT RELEASE (client use)

Released by: Date: Oct 17/18 Time: 4:05

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Jennifer Haussen Date: Oct.17/18 Time: 4:05

FINAL SHIPMENT RECEPTION (lab use only)

Received by: HA Date: 10/18 Time: 1,30P

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

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

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

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

Date Received: 19-MAY-18
Report Date: 05-JUN-18 13:39 (MT)
Version: FINAL

Client Phone: 250-615-6100

Certificate of Analysis

Lab Work Order #: L2097662

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

Amber Springer, B.Sc
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2097662-1	L2097662-2	L2097662-3	L2097662-4	
Description	WATER	WATER	WATER	WATER	
Sampled Date	17-MAY-18	17-MAY-18	17-MAY-18	17-MAY-18	
Sampled Time	13:15	11:15	14:05	12:00	
Client ID	SW2017-01	SW2017-02	LAGOON OUTLET	DUP	
Grouping / **Analyte**					
WATER					
Physical Tests					
Conductivity (uS/cm)	22.1	12.7	456	12.3	
Hardness (as CaCO3) (mg/L)	10.8	5.87	207	6.05	
Total Suspended Solids (mg/L)	<3.0	38.3	20.5	137	
Anions and Nutrients					
Alkalinity, Total (as CaCO3) (mg/L)	8.7	4.8	215	4.7	
Ammonia, Total (as N) (mg/L)	0.0075	0.0069	1.65	0.0055	
Chloride (Cl) (mg/L)	<0.50	<0.50	20.3	<0.50	
Fluoride (F) (mg/L)	0.021	0.020	0.069	0.023	
Nitrate and Nitrite (as N) (mg/L)	0.0615	<0.0051	<0.0051	<0.0051	
Nitrate (as N) (mg/L)	0.0615	<0.0050	<0.0050	<0.0050	
Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	
Total Kjeldahl Nitrogen (mg/L)	0.432	0.269	3.51	0.304	
Total Metals					
Aluminum (Al)-Total (mg/L)	0.196	0.679	0.0595	1.80	
Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010	0.00017	<0.00010	
Arsenic (As)-Total (mg/L)	0.00015	0.00021	0.00141	0.00037	
Barium (Ba)-Total (mg/L)	0.00949	0.0158	0.196	0.0268	
Beryllium (Be)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
Boron (B)-Total (mg/L)	<0.010	<0.010	0.155	<0.010	
Cadmium (Cd)-Total (mg/L)	0.0000118	0.0000328	0.0000127	0.0000642	
Calcium (Ca)-Total (mg/L)	3.08	1.61	59.7	1.72	
Cesium (Cs)-Total (mg/L)	<0.000010	0.000020	0.000011	0.000092	
Chromium (Cr)-Total (mg/L)	0.00043	0.00113	0.00100	0.00359	
Cobalt (Co)-Total (mg/L)	<0.00010	0.00048	0.00122	0.00076	
Copper (Cu)-Total (mg/L)	0.00073	0.00188	<0.00050	0.00353	
Iron (Fe)-Total (mg/L)	0.078	0.411	4.21	1.69	
Lead (Pb)-Total (mg/L)	<0.000050	0.000154	0.000336	0.000347	
Lithium (Li)-Total (mg/L)	<0.0010	<0.0010	0.0015	0.0013	
Magnesium (Mg)-Total (mg/L)	0.803	0.618	10.9	1.01	
Manganese (Mn)-Total (mg/L)	0.0145	0.0634	7.91	0.115	
Mercury (Hg)-Total (mg/L)	0.0000068	0.0000103	0.0000050	0.0000151	
Molybdenum (Mo)-Total (mg/L)	<0.000050	<0.000050	0.000830	0.000071	
Nickel (Ni)-Total (mg/L)	0.00107	0.00218	0.00317	0.00548	
Phosphorus (P)-Total (mg/L)	<0.050	0.056	0.405	0.105	
Potassium (K)-Total (mg/L)	0.194	0.240	3.85	0.322	
Rubidium (Rb)-Total (mg/L)	<0.00020	0.00042	0.00164	0.00111	
Selenium (Se)-Total (mg/L)	0.000060	0.000084	0.000090	0.000152	
Silicon (Si)-Total (mg/L)	2.04	3.04	3.27	4.29	

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID	L2097662-1	L2097662-2	L2097662-3	L2097662-4	
Description	WATER	WATER	WATER	WATER	
Sampled Date	17-MAY-18	17-MAY-18	17-MAY-18	17-MAY-18	
Sampled Time	13:15	11:15	14:05	12:00	
Client ID	SW2017-01	SW2017-02	LAGOON OUTLET	DUP	
Grouping / **Analyte**					
WATER					
Total Metals Silver (Ag)-Total (mg/L)	<0.000010	0.000015	<0.000010	0.000037	
Sodium (Na)-Total (mg/L)	1.34	0.816	18.2	0.862	
Strontium (Sr)-Total (mg/L)	0.0210	0.0130	0.378	0.0146	
Sulfur (S)-Total (mg/L)	<0.50	<0.50	3.12	<0.50	
Tellurium (Te)-Total (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010	<0.000010	0.000012	
Thorium (Th)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
Tin (Sn)-Total (mg/L)	<0.00010	<0.00010	0.00011	<0.00010	
Titanium (Ti)-Total (mg/L)	0.00077	0.00584	0.00064	0.0239	
Tungsten (W)-Total (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
Uranium (U)-Total (mg/L)	<0.000010	0.000015	0.000034	0.000029	
Vanadium (V)-Total (mg/L)	<0.00050	0.00084	<0.00050	0.00308	
Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030	0.0049	0.0061	
Zirconium (Zr)-Total (mg/L)	0.000210	0.000287	<0.000060	0.000348	
Dissolved Metals Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	
Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	
Aluminum (Al)-Dissolved (mg/L)	0.187	0.263	0.0083	0.274	
Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	0.00013	<0.00010	
Arsenic (As)-Dissolved (mg/L)	0.00014	0.00011	0.00129	0.00012	
Barium (Ba)-Dissolved (mg/L)	0.00928	0.00970	0.162	0.00960	
Beryllium (Be)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
Boron (B)-Dissolved (mg/L)	<0.010	<0.010	0.146	<0.010	
Cadmium (Cd)-Dissolved (mg/L)	0.0000066	0.0000140	0.0000066	0.0000139	
Calcium (Ca)-Dissolved (mg/L)	3.00	1.50	63.7	1.54	
Cesium (Cs)-Dissolved (mg/L)	<0.000010	<0.000010	0.000011	<0.000010	
Chromium (Cr)-Dissolved (mg/L)	0.00039	0.00047	0.00088	0.00042	
Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	0.00121	<0.00010	
Copper (Cu)-Dissolved (mg/L)	0.00067	0.00109	<0.00020	0.00109	
Iron (Fe)-Dissolved (mg/L)	0.067	0.071	4.04	0.068	
Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	
Lithium (Li)-Dissolved (mg/L)	<0.0010	<0.0010	0.0014	<0.0010	
Magnesium (Mg)-Dissolved (mg/L)	0.803	0.518	11.6	0.535	
Manganese (Mn)-Dissolved (mg/L)	0.00258	0.0115	8.20	0.0125	
Mercury (Hg)-Dissolved (mg/L)	<0.0000050	0.0000054	<0.0000050	0.0000052	
Molybdenum (Mo)-Dissolved (mg/L)	<0.000050	<0.000050	0.000766	<0.000050	
Nickel (Ni)-Dissolved (mg/L)	0.00110	0.00116	0.00307	0.00110	

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

Grouping	Analyte	L2097662-1 WATER 17-MAY-18 13:15 SW2017-01	L2097662-2 WATER 17-MAY-18 11:15 SW2017-02	L2097662-3 WATER 17-MAY-18 14:05 LAGOON OUTLET	L2097662-4 WATER 17-MAY-18 12:00 DUP	
Sample ID						
Description						
Sampled Date						
Sampled Time						
Client ID						
WATER						
Dissolved Metals	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	0.098	<0.050	
	Potassium (K)-Dissolved (mg/L)	0.198	0.224	4.05	0.245	
	Rubidium (Rb)-Dissolved (mg/L)	<0.00020	<0.00020	0.00167	0.00020	
	Selenium (Se)-Dissolved (mg/L)	0.000063	0.000063	0.00121 DTMF	0.000113	
	Silicon (Si)-Dissolved (mg/L)	1.89	2.57	3.16	2.49	
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)	1.25	0.788	18.8	0.809	
	Strontium (Sr)-Dissolved (mg/L)	0.0207	0.0110	0.362	0.0113	
	Sulfur (S)-Dissolved (mg/L)	<0.50	<0.50	3.40	<0.50	
	Tellurium (Te)-Dissolved (mg/L)	<0.00020	<0.00020	<0.00020	<0.00020	
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	
	Thorium (Th)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Titanium (Ti)-Dissolved (mg/L)	0.00072	0.00125	<0.00030	0.00133	
	Tungsten (W)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	
	Uranium (U)-Dissolved (mg/L)	<0.000010	<0.000010	0.000031	<0.000010	
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)	<0.0010	0.0010	0.0013	<0.0010	
	Zirconium (Zr)-Dissolved (mg/L)	0.000216	0.000261	<0.000060	0.000296	
Aggregate Organics	BOD (mg/L)	<2.0	<2.0	9.9	<2.0	
	COD (mg/L)	26	21	47	22	

* 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	Calcium (Ca)-Dissolved	MS-B	L2097662-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2097662-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2097662-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2097662-1, -2, -3, -4
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2097662-1, -2, -3, -4
Matrix Spike	Antimony (Sb)-Total	MS-B	L2097662-1, -2, -3, -4
Matrix Spike	Arsenic (As)-Total	MS-B	L2097662-1, -2, -3, -4
Matrix Spike	Calcium (Ca)-Total	MS-B	L2097662-1, -2, -3, -4
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2097662-1, -2, -3, -4
Matrix Spike	Manganese (Mn)-Total	MS-B	L2097662-1, -2, -3, -4
Matrix Spike	Potassium (K)-Total	MS-B	L2097662-1, -2, -3, -4
Matrix Spike	Sodium (Na)-Total	MS-B	L2097662-1, -2, -3, -4
Matrix Spike	Strontium (Sr)-Total	MS-B	L2097662-1, -2, -3, -4
Matrix Spike	Sulfur (S)-Total	MS-B	L2097662-1, -2, -3, -4

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

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

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

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

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

BOD5-VA 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.

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

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

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

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

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

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

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

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

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

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

HARDNESS-CALC-VA Water Hardness APHA 2340B

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

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

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

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

Reference Information

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

** 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

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
ALK-TITR-VA	**Water**							
Batch R4061112								
WG2779086-3 CRM		**VA-ALK-TITR-CONTROL**						
Alkalinity, Total (as CaCO3)			98.2		%		85-115	28-MAY-18
WG2779086-1 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	28-MAY-18
BOD5-VA	**Water**							
Batch R4055863								
WG2776949-3 DUP		**L2097662-2**						
BOD		<2.0	<2.0	RPD-NA	mg/L	N/A	20	20-MAY-18
WG2776949-2 LCS								
BOD			101.3		%		85-115	20-MAY-18
WG2776949-1 MB								
BOD			<2.0		mg/L		2	20-MAY-18
CL-IC-N-VA	**Water**							
Batch R4059031								
WG2779130-2 LCS								
Chloride (Cl)			100.9		%		90-110	25-MAY-18
WG2779130-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	25-MAY-18
COD-COL-VA	**Water**							
Batch R4048627								
WG2776878-3 LCS								
COD			97.1		%		85-115	20-MAY-18
WG2776878-6 LCS								
COD			95.8		%		85-115	20-MAY-18
WG2776878-1 MB								
COD			<20		mg/L		20	20-MAY-18
WG2776878-5 MB								
COD			<20		mg/L		20	20-MAY-18
EC-PCT-VA	**Water**							
Batch R4061112								
WG2779086-4 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			98.9		%		90-110	28-MAY-18
WG2779086-1 MB								
Conductivity			<2.0		uS/cm		2	28-MAY-18
F-IC-N-VA	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-IC-N-VA	**Water**							
Batch R4059031								
WG2779130-2 LCS								
Fluoride (F)			103.1		%		90-110	25-MAY-18
WG2779130-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	25-MAY-18
HG-D-CVAA-VA	**Water**							
Batch R4055469								
WG2777775-14 LCS								
Mercury (Hg)-Dissolved			105.9		%		80-120	24-MAY-18
WG2777775-13 MB		**NP**						
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	24-MAY-18
HG-T-CVAA-VA	**Water**							
Batch R4057515								
WG2781746-2 LCS								
Mercury (Hg)-Total			103.2		%		80-120	27-MAY-18
WG2781746-1 MB								
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	27-MAY-18
MET-D-CCMS-VA	**Water**							
Batch R4063373								
WG2779120-3 DUP		**L2097662-1**						
Aluminum (Al)-Dissolved		0.187	0.183		mg/L	2.4	20	30-MAY-18
Antimony (Sb)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	30-MAY-18
Arsenic (As)-Dissolved		0.00014	0.00012		mg/L	14	20	30-MAY-18
Barium (Ba)-Dissolved		0.00928	0.00923		mg/L	0.5	20	30-MAY-18
Beryllium (Be)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	30-MAY-18
Bismuth (Bi)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	30-MAY-18
Boron (B)-Dissolved		<0.010	<0.010	RPD-NA	mg/L	N/A	20	30-MAY-18
Cadmium (Cd)-Dissolved		0.0000066	0.0000061		mg/L	8.2	20	30-MAY-18
Calcium (Ca)-Dissolved		3.00	2.94		mg/L	2.2	20	30-MAY-18
Cesium (Cs)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	30-MAY-18
Chromium (Cr)-Dissolved		0.00039	0.00036		mg/L	8.9	20	30-MAY-18
Cobalt (Co)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	30-MAY-18
Copper (Cu)-Dissolved		0.00067	0.00071		mg/L	4.9	20	30-MAY-18
Iron (Fe)-Dissolved		0.067	0.067		mg/L	0.7	20	30-MAY-18
Lead (Pb)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	30-MAY-18
Lithium (Li)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	30-MAY-18
Magnesium (Mg)-Dissolved		0.803	0.799		mg/L	0.4	20	30-MAY-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch	**R4063373**							
WG2779120-3	**DUP**	**L2097662-1**						
Manganese (Mn)-Dissolved		0.00258	0.00266		mg/L	3.4	20	30-MAY-18
Molybdenum (Mo)-Dissolved		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	30-MAY-18
Nickel (Ni)-Dissolved		0.00110	0.00112		mg/L	2.2	20	30-MAY-18
Phosphorus (P)-Dissolved		<0.050	<0.050	RPD-NA	mg/L	N/A	20	30-MAY-18
Potassium (K)-Dissolved		0.198	0.189		mg/L	4.6	20	30-MAY-18
Rubidium (Rb)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	30-MAY-18
Selenium (Se)-Dissolved		0.000063	0.000065		mg/L	3.7	20	30-MAY-18
Silicon (Si)-Dissolved		1.89	1.83		mg/L	3.0	20	30-MAY-18
Silver (Ag)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	30-MAY-18
Sodium (Na)-Dissolved		1.25	1.25		mg/L	0.5	20	30-MAY-18
Strontium (Sr)-Dissolved		0.0207	0.0199		mg/L	4.0	20	30-MAY-18
Sulfur (S)-Dissolved		<0.50	<0.50	RPD-NA	mg/L	N/A	20	30-MAY-18
Tellurium (Te)-Dissolved		<0.00020	<0.00020	RPD-NA	mg/L	N/A	20	30-MAY-18
Thallium (Tl)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	30-MAY-18
Thorium (Th)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	30-MAY-18
Tin (Sn)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	30-MAY-18
Titanium (Ti)-Dissolved		0.00072	0.00071		mg/L	1.7	20	30-MAY-18
Tungsten (W)-Dissolved		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	30-MAY-18
Uranium (U)-Dissolved		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	30-MAY-18
Vanadium (V)-Dissolved		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-MAY-18
Zinc (Zn)-Dissolved		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	30-MAY-18
Zirconium (Zr)-Dissolved		0.000216	0.000205		mg/L	5.1	20	30-MAY-18
WG2779120-2	**LCS**							
Aluminum (Al)-Dissolved			99.99		%		80-120	30-MAY-18
Antimony (Sb)-Dissolved			98.6		%		80-120	30-MAY-18
Arsenic (As)-Dissolved			98.8		%		80-120	30-MAY-18
Barium (Ba)-Dissolved			100.5		%		80-120	30-MAY-18
Beryllium (Be)-Dissolved			96.6		%		80-120	30-MAY-18
Bismuth (Bi)-Dissolved			103.2		%		80-120	30-MAY-18
Boron (B)-Dissolved			90.1		%		80-120	30-MAY-18
Cadmium (Cd)-Dissolved			101.1		%		80-120	30-MAY-18
Calcium (Ca)-Dissolved			99.9		%		80-120	30-MAY-18
Cesium (Cs)-Dissolved			98.1		%		80-120	30-MAY-18
Chromium (Cr)-Dissolved			96.9		%		80-120	30-MAY-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4063373								
WG2779120-2 LCS								
Cobalt (Co)-Dissolved			100.5		%		80-120	30-MAY-18
Copper (Cu)-Dissolved			98.4		%		80-120	30-MAY-18
Iron (Fe)-Dissolved			98.9		%		80-120	30-MAY-18
Lead (Pb)-Dissolved			100.7		%		80-120	30-MAY-18
Lithium (Li)-Dissolved			96.1		%		80-120	30-MAY-18
Magnesium (Mg)-Dissolved			102.8		%		80-120	30-MAY-18
Manganese (Mn)-Dissolved			98.1		%		80-120	30-MAY-18
Molybdenum (Mo)-Dissolved			95.6		%		80-120	30-MAY-18
Nickel (Ni)-Dissolved			97.7		%		80-120	30-MAY-18
Phosphorus (P)-Dissolved			98.4		%		80-120	30-MAY-18
Potassium (K)-Dissolved			101.6		%		80-120	30-MAY-18
Rubidium (Rb)-Dissolved			97.7		%		80-120	30-MAY-18
Selenium (Se)-Dissolved			96.5		%		80-120	30-MAY-18
Silicon (Si)-Dissolved			96.8		%		80-120	30-MAY-18
Silver (Ag)-Dissolved			99.8		%		80-120	30-MAY-18
Sodium (Na)-Dissolved			100.6		%		80-120	30-MAY-18
Strontium (Sr)-Dissolved			97.9		%		80-120	30-MAY-18
Sulfur (S)-Dissolved			94.8		%		80-120	30-MAY-18
Tellurium (Te)-Dissolved			94.1		%		80-120	30-MAY-18
Thallium (Tl)-Dissolved			98.7		%		80-120	30-MAY-18
Thorium (Th)-Dissolved			97.0		%		80-120	30-MAY-18
Tin (Sn)-Dissolved			99.0		%		80-120	30-MAY-18
Titanium (Ti)-Dissolved			92.7		%		80-120	30-MAY-18
Tungsten (W)-Dissolved			99.6		%		80-120	30-MAY-18
Uranium (U)-Dissolved			102.2		%		80-120	30-MAY-18
Vanadium (V)-Dissolved			99.6		%		80-120	30-MAY-18
Zinc (Zn)-Dissolved			93.9		%		80-120	30-MAY-18
Zirconium (Zr)-Dissolved			94.8		%		80-120	30-MAY-18
WG2779120-1 MB		**NP**						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	30-MAY-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	30-MAY-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	30-MAY-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	30-MAY-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	30-MAY-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4063373								
WG2779120-1 MB		**NP**						
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	30-MAY-18
Boron (B)-Dissolved			<0.010		mg/L		0.01	30-MAY-18
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	30-MAY-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	30-MAY-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	30-MAY-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	30-MAY-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	30-MAY-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	30-MAY-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	30-MAY-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	30-MAY-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	30-MAY-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	30-MAY-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	30-MAY-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	30-MAY-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	30-MAY-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	30-MAY-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	30-MAY-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	30-MAY-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	30-MAY-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	30-MAY-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	30-MAY-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	30-MAY-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	30-MAY-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	30-MAY-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	30-MAY-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	30-MAY-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	30-MAY-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	30-MAY-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	30-MAY-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	30-MAY-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	30-MAY-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	30-MAY-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	30-MAY-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	30-MAY-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	**Water**							
Batch R4063647								
WG2781416-2 LCS								
Aluminum (Al)-Total			109.6		%		80-120	30-MAY-18
Antimony (Sb)-Total			111.0		%		80-120	30-MAY-18
Arsenic (As)-Total			105.8		%		80-120	30-MAY-18
Barium (Ba)-Total			110.1		%		80-120	30-MAY-18
Beryllium (Be)-Total			107.1		%		80-120	30-MAY-18
Bismuth (Bi)-Total			109.0		%		80-120	30-MAY-18
Boron (B)-Total			101.9		%		80-120	30-MAY-18
Cadmium (Cd)-Total			107.5		%		80-120	30-MAY-18
Calcium (Ca)-Total			102.5		%		80-120	30-MAY-18
Cesium (Cs)-Total			102.3		%		80-120	30-MAY-18
Chromium (Cr)-Total			106.3		%		80-120	30-MAY-18
Cobalt (Co)-Total			104.6		%		80-120	30-MAY-18
Copper (Cu)-Total			105.4		%		80-120	30-MAY-18
Iron (Fe)-Total			106.7		%		80-120	30-MAY-18
Lead (Pb)-Total			109.4		%		80-120	30-MAY-18
Lithium (Li)-Total			110.6		%		80-120	30-MAY-18
Magnesium (Mg)-Total			109.2		%		80-120	30-MAY-18
Manganese (Mn)-Total			109.0		%		80-120	30-MAY-18
Molybdenum (Mo)-Total			104.2		%		80-120	30-MAY-18
Nickel (Ni)-Total			106.3		%		80-120	30-MAY-18
Phosphorus (P)-Total			112.8		%		80-120	30-MAY-18
Potassium (K)-Total			108.0		%		80-120	30-MAY-18
Rubidium (Rb)-Total			107.6		%		80-120	30-MAY-18
Selenium (Se)-Total			111.2		%		80-120	30-MAY-18
Silicon (Si)-Total			108.4		%		80-120	30-MAY-18
Silver (Ag)-Total			109.7		%		80-120	30-MAY-18
Sodium (Na)-Total			106.3		%		80-120	30-MAY-18
Strontium (Sr)-Total			114.2		%		80-120	30-MAY-18
Sulfur (S)-Total			106.0		%		80-120	30-MAY-18
Tellurium (Te)-Total			99.95		%		80-120	30-MAY-18
Thallium (Tl)-Total			107.4		%		80-120	30-MAY-18
Thorium (Th)-Total			111.0		%		80-120	30-MAY-18
Tin (Sn)-Total			100.5		%		80-120	30-MAY-18
Titanium (Ti)-Total			106.5		%		80-120	30-MAY-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	**Water**							
Batch R4063647								
WG2781416-2 LCS								
Tungsten (W)-Total			107.8		%		80-120	30-MAY-18
Uranium (U)-Total			113.3		%		80-120	30-MAY-18
Vanadium (V)-Total			107.7		%		80-120	30-MAY-18
Zinc (Zn)-Total			104.3		%		80-120	30-MAY-18
Zirconium (Zr)-Total			103.4		%		80-120	30-MAY-18
WG2781416-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	30-MAY-18
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	30-MAY-18
Arsenic (As)-Total			<0.00010		mg/L		0.0001	30-MAY-18
Barium (Ba)-Total			<0.00010		mg/L		0.0001	30-MAY-18
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	30-MAY-18
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	30-MAY-18
Boron (B)-Total			<0.010		mg/L		0.01	30-MAY-18
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	30-MAY-18
Calcium (Ca)-Total			<0.050		mg/L		0.05	30-MAY-18
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	30-MAY-18
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	30-MAY-18
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	30-MAY-18
Copper (Cu)-Total			<0.00050		mg/L		0.0005	30-MAY-18
Iron (Fe)-Total			<0.010		mg/L		0.01	30-MAY-18
Lead (Pb)-Total			<0.000050		mg/L		0.00005	30-MAY-18
Lithium (Li)-Total			<0.0010		mg/L		0.001	30-MAY-18
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	30-MAY-18
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	30-MAY-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	30-MAY-18
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	30-MAY-18
Phosphorus (P)-Total			<0.050		mg/L		0.05	30-MAY-18
Potassium (K)-Total			<0.050		mg/L		0.05	30-MAY-18
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	30-MAY-18
Selenium (Se)-Total			<0.000050		mg/L		0.00005	30-MAY-18
Silicon (Si)-Total			<0.10		mg/L		0.1	30-MAY-18
Silver (Ag)-Total			<0.000010		mg/L		0.00001	30-MAY-18
Sodium (Na)-Total			<0.050		mg/L		0.05	30-MAY-18
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	30-MAY-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	**Water**							
Batch R4063647								
WG2781416-1 MB								
Sulfur (S)-Total			<0.50		mg/L		0.5	30-MAY-18
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	30-MAY-18
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	30-MAY-18
Thorium (Th)-Total			<0.00010		mg/L		0.0001	30-MAY-18
Tin (Sn)-Total			<0.00010		mg/L		0.0001	30-MAY-18
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	30-MAY-18
Tungsten (W)-Total			<0.00010		mg/L		0.0001	30-MAY-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	30-MAY-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	30-MAY-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	30-MAY-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	30-MAY-18
NH3-F-VA	**Water**							
Batch R4063660								
WG2785907-2 LCS								
Ammonia, Total (as N)			100.3		%		85-115	31-MAY-18
WG2785907-1 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	31-MAY-18
Batch R4064102								
WG2786076-2 LCS								
Ammonia, Total (as N)			98.3		%		85-115	01-JUN-18
WG2786076-1 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	01-JUN-18
NO2-L-IC-N-VA	**Water**							
Batch R4059031								
WG2779130-2 LCS								
Nitrite (as N)			100.9		%		90-110	25-MAY-18
WG2779130-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	25-MAY-18
NO3-L-IC-N-VA	**Water**							
Batch R4059031								
WG2779130-2 LCS								
Nitrate (as N)			101.2		%		90-110	25-MAY-18
WG2779130-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	25-MAY-18
TKN-F-VA	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-F-VA	**Water**							
Batch R4064535								
WG2785728-2 LCS								
Total Kjeldahl Nitrogen			101.7		%		75-125	01-JUN-18
WG2785728-6 LCS								
Total Kjeldahl Nitrogen			100.5		%		75-125	01-JUN-18
WG2785728-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-JUN-18
WG2785728-5 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	01-JUN-18
Batch R4068049								
WG2786801-2 LCS								
Total Kjeldahl Nitrogen			103.2		%		75-125	04-JUN-18
WG2786801-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	04-JUN-18
TSS-VA	**Water**							
Batch R4056296								
WG2780107-5 LCS								
Total Suspended Solids			100.1		%		85-115	24-MAY-18
WG2780107-4 MB								
Total Suspended Solids			<3.0		mg/L		3	24-MAY-18

Legend:

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:

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

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Anions and Nutrients							
Nitrate in Water by IC (Low Level)							
	1	17-MAY-18 13:15	26-MAY-18 12:15	3	9	days	EHT
	2	17-MAY-18 11:15	26-MAY-18 12:15	3	9	days	EHTL
	3	17-MAY-18 14:05	26-MAY-18 12:15	3	9	days	EHT
	4	17-MAY-18 12:00	26-MAY-18 12:15	3	9	days	EHT
Nitrite in Water by IC (Low Level)							
	1	17-MAY-18 13:15	26-MAY-18 12:15	3	9	days	EHT
	2	17-MAY-18 11:15	26-MAY-18 12:15	3	9	days	EHTL
	3	17-MAY-18 14:05	26-MAY-18 12:15	3	9	days	EHT
	4	17-MAY-18 12:00	26-MAY-18 12:15	3	9	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 L2097662 were received on 19-MAY-18 11:00.

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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

L2097662-COFC

COC Number: 17 -

Page 1 of 1

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

Report Format / Distribution

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

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax rtooms@rdks.bc.ca
Email 2 ckerr@rdks.bc.ca

Project Information

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

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

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

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

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

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

Date and Time Required for all E&P TATs:

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

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	F/P	P							P	P	P					SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
					Dissolved metals	total metals	conductivity	temperature	hardness	alkalinity	BOD; COD	TSS	ammonia	total Kjeldahl nitrogen	nitrate + nitrite	chloride			fluoride			
	SW2017-01	17/5/18	1:15 pm	Water	X	X	X	X	X	X	X	X	X	X	X	X		X	X			6
	SW2017-02	"	11:15 am	Water	X	X	X	X	X	X	X	X	X	X	X	X		X	X			6
	Lagoon Outlet	"	2:05 pm	Water	X	X	X	X	X	X	X	X	X	X	X	X		X	X			6
	DUP	"	12:00 pm	Water	X	X	X	X	X	X	X	X	X	X	X	X		X	X			6
	[illegible]			Water	X	X	X	X	X	X	X	X	X	X	X	X		X	X			6

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO
Are samples for human consumption/ use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)

SAMPLE CONDITION AS RECEIVED (lab use only)

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

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
4.1					6 °C		

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
CHRIS KERR	18/5/18	

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
[signature]	May 18/18	8:00

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
[signature]	May 19	11 Bm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

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

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

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

Date Received: 18-OCT-18
Report Date: 31-OCT-18 11:40 (MT)
Version: FINAL

Client Phone: 250-615-6100

Certificate of Analysis

Lab Work Order #: L2183745

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

Amber Springer, B.Sc
Account Manager

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2183745-1				
	Description	Water				
	Sampled Date	17-OCT-18				
	Sampled Time	11:30				
	Client ID	LAGOON OUTLET				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (uS/cm)	429				
	Hardness (as CaCO3) (mg/L)	157				
	pH (pH)	8.20				
	Total Suspended Solids (mg/L)	<3.0				
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	192				
	Ammonia, Total (as N) (mg/L)	2.84				
	Bromide (Br) (mg/L)	0.077				
	Chloride (Cl) (mg/L)	25.9				
	Fluoride (F) (mg/L)	0.113				
	Nitrate and Nitrite (as N) (mg/L)	0.107				
	Nitrate (as N) (mg/L)	0.0956				
	Nitrite (as N) (mg/L)	0.0114				
	Total Kjeldahl Nitrogen (mg/L)	3.29				
	Sulfate (SO4) (mg/L)	8.69				
Total Metals	Aluminum (Al)-Total (mg/L)	0.0129				
	Antimony (Sb)-Total (mg/L)	0.00014				
	Arsenic (As)-Total (mg/L)	0.00082				
	Barium (Ba)-Total (mg/L)	0.100				
	Beryllium (Be)-Total (mg/L)	<0.00010				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	0.200				
	Cadmium (Cd)-Total (mg/L)	<0.0000050				
	Calcium (Ca)-Total (mg/L)	52.2				
	Cesium (Cs)-Total (mg/L)	0.000030				
	Chromium (Cr)-Total (mg/L)	0.00019				
	Cobalt (Co)-Total (mg/L)	0.00024				
	Copper (Cu)-Total (mg/L)	<0.00050				
	Iron (Fe)-Total (mg/L)	0.486				
	Lead (Pb)-Total (mg/L)	0.000063				
	Lithium (Li)-Total (mg/L)	<0.0010				
	Magnesium (Mg)-Total (mg/L)	7.58				
	Manganese (Mn)-Total (mg/L)	3.58				
	Mercury (Hg)-Total (mg/L)	<0.0000050				
	Molybdenum (Mo)-Total (mg/L)	0.00234				
	Nickel (Ni)-Total (mg/L)	0.00278				
	Phosphorus (P)-Total (mg/L)	0.056				
	Potassium (K)-Total (mg/L)	4.04				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2183745-1				
	Description	Water				
	Sampled Date	17-OCT-18				
	Sampled Time	11:30				
	Client ID	LAGOON OUTLET				
Grouping	**Analyte**					
WATER						
Total Metals	Rubidium (Rb)-Total (mg/L)	0.00192				
	Selenium (Se)-Total (mg/L)	0.000080				
	Silicon (Si)-Total (mg/L)	3.58				
	Silver (Ag)-Total (mg/L)	<0.000010				
	Sodium (Na)-Total (mg/L)	20.2				
	Strontium (Sr)-Total (mg/L)	0.367				
	Sulfur (S)-Total (mg/L)	2.72				
	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)	0.00040				
	Titanium (Ti)-Total (mg/L)	0.00032				
	Tungsten (W)-Total (mg/L)	<0.00010				
	Uranium (U)-Total (mg/L)	0.000044				
	Vanadium (V)-Total (mg/L)	<0.00050				
	Zinc (Zn)-Total (mg/L)	0.0034				
	Zirconium (Zr)-Total (mg/L)	<0.000060				
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD				
	Dissolved Metals Filtration Location	FIELD				
	Aluminum (Al)-Dissolved (mg/L)	0.0097				
	Antimony (Sb)-Dissolved (mg/L)	0.00013				
	Arsenic (As)-Dissolved (mg/L)	0.00061				
	Barium (Ba)-Dissolved (mg/L)	0.0968				
	Beryllium (Be)-Dissolved (mg/L)	<0.00010				
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050				
	Boron (B)-Dissolved (mg/L)	0.186				
	Cadmium (Cd)-Dissolved (mg/L)	0.0000602 DTMF				
	Calcium (Ca)-Dissolved (mg/L)	50.1				
	Cesium (Cs)-Dissolved (mg/L)	0.000026				
	Chromium (Cr)-Dissolved (mg/L)	0.00011				
	Cobalt (Co)-Dissolved (mg/L)	0.00022				
	Copper (Cu)-Dissolved (mg/L)	0.00140				
	Iron (Fe)-Dissolved (mg/L)	0.029				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	<0.0010				
	Magnesium (Mg)-Dissolved (mg/L)	7.83				
	Manganese (Mn)-Dissolved (mg/L)	3.38				

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2183745-1				
	Description	Water				
	Sampled Date	17-OCT-18				
	Sampled Time	11:30				
	Client ID	LAGOON OUTLET				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.00220				
	Nickel (Ni)-Dissolved (mg/L)	0.00267				
	Phosphorus (P)-Dissolved (mg/L)	<0.050				
	Potassium (K)-Dissolved (mg/L)	4.03				
	Rubidium (Rb)-Dissolved (mg/L)	0.00197				
	Selenium (Se)-Dissolved (mg/L)	0.000076				
	Silicon (Si)-Dissolved (mg/L)	3.45				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	20.3				
	Strontium (Sr)-Dissolved (mg/L)	0.350				
	Sulfur (S)-Dissolved (mg/L)	3.25				
	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)	<0.00030				
	Tungsten (W)-Dissolved (mg/L)	<0.00010				
	Uranium (U)-Dissolved (mg/L)	0.000041				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	0.0031				
	Zirconium (Zr)-Dissolved (mg/L)	<0.000060				
Aggregate Organics	BOD (mg/L)	<2.0				
	COD (mg/L)	22				

* 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	Aluminum (Al)-Dissolved	MS-B	L2183745-1
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2183745-1
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2183745-1
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2183745-1
Matrix Spike	Manganese (Mn)-Dissolved	MS-B	L2183745-1
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2183745-1
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2183745-1
Matrix Spike	Arsenic (As)-Total	MS-B	L2183745-1
Matrix Spike	Barium (Ba)-Total	MS-B	L2183745-1
Matrix Spike	Calcium (Ca)-Total	MS-B	L2183745-1
Matrix Spike	Iron (Fe)-Total	MS-B	L2183745-1
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2183745-1
Matrix Spike	Manganese (Mn)-Total	MS-B	L2183745-1
Matrix Spike	Sodium (Na)-Total	MS-B	L2183745-1
Matrix Spike	Strontium (Sr)-Total	MS-B	L2183745-1
Matrix Spike	Sulfur (S)-Total	MS-B	L2183745-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DTMF	Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

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

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

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

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

BOD5-VA	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.

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

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

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

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

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

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

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

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

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

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

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

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

HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Reference Information

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

** 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

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
ALK-TITR-VA	**Water**							
Batch R4289862								
WG2908726-3 CRM		**VA-ALK-TITR-CONTROL**						
Alkalinity, Total (as CaCO3)			100.2		%		85-115	20-OCT-18
WG2908726-1 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	20-OCT-18
BOD5-VA	**Water**							
Batch R4299720								
WG2909451-2 LCS								
BOD			98.5		%		85-115	20-OCT-18
WG2909451-1 MB								
BOD			<2.0		mg/L		2	20-OCT-18
BR-L-IC-N-VA	**Water**							
Batch R4295675								
WG2908715-2 LCS								
Bromide (Br)			99.4		%		85-115	20-OCT-18
WG2908715-1 MB								
Bromide (Br)			<0.050		mg/L		0.05	20-OCT-18
CL-IC-N-VA	**Water**							
Batch R4295675								
WG2908715-2 LCS								
Chloride (Cl)			96.4		%		90-110	20-OCT-18
WG2908715-1 MB								
Chloride (Cl)			<0.50		mg/L		0.5	20-OCT-18
COD-COL-VA	**Water**							
Batch R4299780								
WG2914503-3 LCS								
COD			102.6		%		85-115	25-OCT-18
WG2914503-6 LCS								
COD			102.5		%		85-115	25-OCT-18
WG2914503-1 MB								
COD			<20		mg/L		20	25-OCT-18
WG2914503-5 MB								
COD			<20		mg/L		20	25-OCT-18
EC-PCT-VA	**Water**							
Batch R4289862								
WG2908726-4 CRM		**VA-EC-PCT-CONTROL**						
Conductivity			98.1		%		90-110	20-OCT-18
WG2908726-1 MB								

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
EC-PCT-VA	**Water**							
Batch R4289862								
WG2908726-1 MB								
Conductivity			<2.0		uS/cm		2	20-OCT-18
F-IC-N-VA	**Water**							
Batch R4295675								
WG2908715-2 LCS								
Fluoride (F)			97.8		%		90-110	20-OCT-18
WG2908715-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	20-OCT-18
HG-D-CVAA-VA	**Water**							
Batch R4290008								
WG2908022-14 LCS								
Mercury (Hg)-Dissolved			85.3		%		80-120	21-OCT-18
WG2908022-13 MB		**NP**						
Mercury (Hg)-Dissolved			<0.000005		mg/L		0.000005	21-OCT-18
HG-T-CVAA-VA	**Water**							
Batch R4293929								
WG2911084-2 LCS								
Mercury (Hg)-Total			96.9		%		80-120	23-OCT-18
WG2911084-1 MB								
Mercury (Hg)-Total			<0.000005		mg/L		0.000005	23-OCT-18
MET-D-CCMS-VA	**Water**							
Batch R4301493								
WG2914746-2 LCS								
Aluminum (Al)-Dissolved			99.1		%		80-120	26-OCT-18
Antimony (Sb)-Dissolved			96.2		%		80-120	26-OCT-18
Arsenic (As)-Dissolved			96.7		%		80-120	26-OCT-18
Barium (Ba)-Dissolved			100.3		%		80-120	26-OCT-18
Beryllium (Be)-Dissolved			94.2		%		80-120	26-OCT-18
Bismuth (Bi)-Dissolved			93.3		%		80-120	26-OCT-18
Boron (B)-Dissolved			91.8		%		80-120	26-OCT-18
Cadmium (Cd)-Dissolved			96.1		%		80-120	26-OCT-18
Calcium (Ca)-Dissolved			94.8		%		80-120	26-OCT-18
Cesium (Cs)-Dissolved			99.3		%		80-120	26-OCT-18
Chromium (Cr)-Dissolved			96.9		%		80-120	26-OCT-18
Cobalt (Co)-Dissolved			96.3		%		80-120	26-OCT-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4301493								
WG2914746-2 LCS								
Copper (Cu)-Dissolved			96.2		%		80-120	26-OCT-18
Iron (Fe)-Dissolved			98.6		%		80-120	26-OCT-18
Lead (Pb)-Dissolved			93.6		%		80-120	26-OCT-18
Lithium (Li)-Dissolved			95.9		%		80-120	26-OCT-18
Magnesium (Mg)-Dissolved			102.1		%		80-120	26-OCT-18
Manganese (Mn)-Dissolved			97.6		%		80-120	26-OCT-18
Molybdenum (Mo)-Dissolved			98.2		%		80-120	26-OCT-18
Nickel (Ni)-Dissolved			97.6		%		80-120	26-OCT-18
Phosphorus (P)-Dissolved			104.8		%		70-130	26-OCT-18
Potassium (K)-Dissolved			102.7		%		80-120	26-OCT-18
Rubidium (Rb)-Dissolved			99.2		%		80-120	26-OCT-18
Selenium (Se)-Dissolved			97.8		%		80-120	26-OCT-18
Silicon (Si)-Dissolved			96.9		%		60-140	26-OCT-18
Silver (Ag)-Dissolved			93.9		%		80-120	26-OCT-18
Sodium (Na)-Dissolved			100.3		%		80-120	26-OCT-18
Strontium (Sr)-Dissolved			100.6		%		80-120	26-OCT-18
Sulfur (S)-Dissolved			102.5		%		80-120	26-OCT-18
Tellurium (Te)-Dissolved			92.9		%		80-120	26-OCT-18
Thallium (Tl)-Dissolved			92.5		%		80-120	26-OCT-18
Thorium (Th)-Dissolved			94.5		%		80-120	26-OCT-18
Tin (Sn)-Dissolved			97.5		%		80-120	26-OCT-18
Titanium (Ti)-Dissolved			92.0		%		80-120	26-OCT-18
Tungsten (W)-Dissolved			94.3		%		80-120	26-OCT-18
Uranium (U)-Dissolved			97.4		%		80-120	26-OCT-18
Vanadium (V)-Dissolved			98.0		%		80-120	26-OCT-18
Zinc (Zn)-Dissolved			96.8		%		80-120	26-OCT-18
Zirconium (Zr)-Dissolved			98.2		%		80-120	26-OCT-18
WG2914746-1 MB		**NP**						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	26-OCT-18
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-18
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-18
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-18
Beryllium (Be)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-18
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	26-OCT-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R4301493								
WG2914746-1 MB		**NP**						
Boron (B)-Dissolved			<0.010		mg/L		0.01	26-OCT-18
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	26-OCT-18
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	26-OCT-18
Cesium (Cs)-Dissolved			<0.000010		mg/L		0.00001	26-OCT-18
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-18
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-18
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	26-OCT-18
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	26-OCT-18
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	26-OCT-18
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	26-OCT-18
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	26-OCT-18
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-18
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	26-OCT-18
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	26-OCT-18
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	26-OCT-18
Potassium (K)-Dissolved			<0.050		mg/L		0.05	26-OCT-18
Rubidium (Rb)-Dissolved			<0.00020		mg/L		0.0002	26-OCT-18
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	26-OCT-18
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	26-OCT-18
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	26-OCT-18
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	26-OCT-18
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	26-OCT-18
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	26-OCT-18
Tellurium (Te)-Dissolved			<0.00020		mg/L		0.0002	26-OCT-18
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	26-OCT-18
Thorium (Th)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-18
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-18
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	26-OCT-18
Tungsten (W)-Dissolved			<0.00010		mg/L		0.0001	26-OCT-18
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	26-OCT-18
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	26-OCT-18
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	26-OCT-18
Zirconium (Zr)-Dissolved			<0.000060		mg/L		0.00006	26-OCT-18
MET-T-CCMS-VA	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	**Water**							
Batch R4301800								
WG2913873-2 LCS								
Aluminum (Al)-Total			104.6		%		80-120	26-OCT-18
Antimony (Sb)-Total			101.0		%		80-120	26-OCT-18
Arsenic (As)-Total			98.0		%		80-120	26-OCT-18
Barium (Ba)-Total			94.0		%		80-120	26-OCT-18
Beryllium (Be)-Total			97.8		%		80-120	26-OCT-18
Bismuth (Bi)-Total			98.8		%		80-120	26-OCT-18
Boron (B)-Total			99.0		%		80-120	26-OCT-18
Cadmium (Cd)-Total			98.0		%		80-120	26-OCT-18
Calcium (Ca)-Total			96.5		%		80-120	26-OCT-18
Cesium (Cs)-Total			102.0		%		80-120	26-OCT-18
Chromium (Cr)-Total			100.6		%		80-120	26-OCT-18
Cobalt (Co)-Total			100.8		%		80-120	26-OCT-18
Copper (Cu)-Total			98.3		%		80-120	26-OCT-18
Iron (Fe)-Total			101.7		%		80-120	26-OCT-18
Lead (Pb)-Total			102.5		%		80-120	26-OCT-18
Lithium (Li)-Total			97.9		%		80-120	26-OCT-18
Magnesium (Mg)-Total			100.3		%		80-120	26-OCT-18
Manganese (Mn)-Total			102.5		%		80-120	26-OCT-18
Molybdenum (Mo)-Total			102.5		%		80-120	26-OCT-18
Nickel (Ni)-Total			99.6		%		80-120	26-OCT-18
Phosphorus (P)-Total			102.9		%		80-120	26-OCT-18
Potassium (K)-Total			105.0		%		80-120	26-OCT-18
Rubidium (Rb)-Total			100.8		%		80-120	26-OCT-18
Selenium (Se)-Total			108.5		%		80-120	26-OCT-18
Silicon (Si)-Total			103.2		%		80-120	26-OCT-18
Silver (Ag)-Total			95.9		%		80-120	26-OCT-18
Sodium (Na)-Total			104.0		%		80-120	26-OCT-18
Strontium (Sr)-Total			102.8		%		80-120	26-OCT-18
Sulfur (S)-Total			87.2		%		80-120	26-OCT-18
Tellurium (Te)-Total			95.1		%		80-120	26-OCT-18
Thallium (Tl)-Total			101.1		%		80-120	26-OCT-18
Thorium (Th)-Total			99.4		%		80-120	26-OCT-18
Tin (Sn)-Total			99.5		%		80-120	26-OCT-18
Titanium (Ti)-Total			96.2		%		80-120	26-OCT-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	**Water**							
Batch R4301800								
WG2913873-2 LCS								
Tungsten (W)-Total			97.9		%		80-120	26-OCT-18
Uranium (U)-Total			103.9		%		80-120	26-OCT-18
Vanadium (V)-Total			102.5		%		80-120	26-OCT-18
Zinc (Zn)-Total			99.4		%		80-120	26-OCT-18
Zirconium (Zr)-Total			97.6		%		80-120	26-OCT-18
WG2913873-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	26-OCT-18
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	26-OCT-18
Arsenic (As)-Total			<0.00010		mg/L		0.0001	26-OCT-18
Barium (Ba)-Total			<0.00010		mg/L		0.0001	26-OCT-18
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	26-OCT-18
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	26-OCT-18
Boron (B)-Total			<0.010		mg/L		0.01	26-OCT-18
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	26-OCT-18
Calcium (Ca)-Total			<0.050		mg/L		0.05	26-OCT-18
Cesium (Cs)-Total			<0.000010		mg/L		0.00001	26-OCT-18
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	26-OCT-18
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	26-OCT-18
Copper (Cu)-Total			<0.00050		mg/L		0.0005	26-OCT-18
Iron (Fe)-Total			<0.010		mg/L		0.01	26-OCT-18
Lead (Pb)-Total			<0.000050		mg/L		0.00005	26-OCT-18
Lithium (Li)-Total			<0.0010		mg/L		0.001	26-OCT-18
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	26-OCT-18
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	26-OCT-18
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	26-OCT-18
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	26-OCT-18
Phosphorus (P)-Total			<0.050		mg/L		0.05	26-OCT-18
Potassium (K)-Total			<0.050		mg/L		0.05	26-OCT-18
Rubidium (Rb)-Total			<0.00020		mg/L		0.0002	26-OCT-18
Selenium (Se)-Total			<0.000050		mg/L		0.00005	26-OCT-18
Silicon (Si)-Total			<0.10		mg/L		0.1	26-OCT-18
Silver (Ag)-Total			<0.000010		mg/L		0.00001	26-OCT-18
Sodium (Na)-Total			<0.050		mg/L		0.05	26-OCT-18
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	26-OCT-18

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	**Water**							
Batch R4301800								
WG2913873-1 MB								
Sulfur (S)-Total			<0.50		mg/L		0.5	26-OCT-18
Tellurium (Te)-Total			<0.00020		mg/L		0.0002	26-OCT-18
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	26-OCT-18
Thorium (Th)-Total			<0.00010		mg/L		0.0001	26-OCT-18
Tin (Sn)-Total			<0.00010		mg/L		0.0001	26-OCT-18
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	26-OCT-18
Tungsten (W)-Total			<0.00010		mg/L		0.0001	26-OCT-18
Uranium (U)-Total			<0.000010		mg/L		0.00001	26-OCT-18
Vanadium (V)-Total			<0.00050		mg/L		0.0005	26-OCT-18
Zinc (Zn)-Total			<0.0030		mg/L		0.003	26-OCT-18
Zirconium (Zr)-Total			<0.000060		mg/L		0.00006	26-OCT-18
NH3-F-VA	**Water**							
Batch R4300348								
WG2913377-2 LCS								
Ammonia, Total (as N)			101.3		%		85-115	26-OCT-18
WG2913377-1 MB								
Ammonia, Total (as N)			<0.0050		mg/L		0.005	26-OCT-18
NO2-L-IC-N-VA	**Water**							
Batch R4295675								
WG2908715-2 LCS								
Nitrite (as N)			96.0		%		90-110	20-OCT-18
WG2908715-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	20-OCT-18
NO3-L-IC-N-VA	**Water**							
Batch R4295675								
WG2908715-2 LCS								
Nitrate (as N)			96.8		%		90-110	20-OCT-18
WG2908715-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	20-OCT-18
PH-PCT-VA	**Water**							
Batch R4289862								
WG2908726-2 CRM		**VA-PH7-BUF**						
pH			7.02		pH		6.9-7.1	20-OCT-18
SO4-IC-N-VA	**Water**							

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-IC-N-VA	**Water**							
Batch R4295675								
WG2908715-2 LCS								
Sulfate (SO4)			97.4		%		90-110	20-OCT-18
WG2908715-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	20-OCT-18
TKN-F-VA	**Water**							
Batch R4308029								
WG2917387-6 LCS								
Total Kjeldahl Nitrogen			100.2		%		75-125	30-OCT-18
WG2917387-5 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	30-OCT-18
TSS-VA	**Water**							
Batch R4295715								
WG2911104-5 LCS								
Total Suspended Solids			93.3		%		85-115	23-OCT-18
WG2911104-4 MB								
Total Suspended Solids			<3.0		mg/L		3	23-OCT-18

Legend:

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

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
pH by Meter (Automated)							
	1	17-OCT-18 11:30	20-OCT-18 10:21	0.25	71	hours	EHTR-FM

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 L2183745 were received on 18-OCT-18 19:30.

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.

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

Canada Toll Free: 1 800 668 9878

www.alsglobal.com

L2183745-COFC

COC Number: 17 -

Page of

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

Report Form

Select Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☑ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	rtooms@rdks.bc.ca
Email 2	ckerr@rdks.bc.ca
Email 3	mhaley@rdks.bc.ca

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	anne-maries@rdks.bc.ca
Email 2	ckerr@rdks.bc.ca; mhaley@rdks.bc.ca

Project Information

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

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler:

...ow - Contact your AM to confirm all E&P TATs (surcharges may apply)

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

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

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

Date and Time Required for all E&P TATs:

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

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	Dissolved metals (F/P)	total metals (P)	conductivity	temperature	hardness	alkalinity	BOD; COD	TSS	ammonia (P)	total Kjeldahl nitrogen (P)	nitrate + nitrite (P)	chloride		pH	fluoride	SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
	SW2017-01			Water																		6
	SW2017-02			Water																		6
	Lagoon Outlet	17/Oct/18	11:30	Water	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓			6
	DUP		12:00	Water																		6
	Blank			Water																		6

Terrace Shipping X (

Coolers

Drinking Water (DW) Samples[1] (client use)

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

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

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

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

Cooling Initiated ☑

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
7.2							5

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:
	Oct 17/18	4:05	Jennifer Broussard	Oct-17/18	4:05	HA	10/18	7:30P

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

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

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

APPENDIX F

Historic Analytical Results

Table F-1: Historic Surface Water Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location			Meziadin - Upstream Surface Water Log Weir															
Site Name			SW-1															
Sample ID	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	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
Laboratory ID			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sample Date			1-Jan-04	1-Jan-06	1-Jan-07	1-Jun-08	1-Sep-09	6-Apr-10	28-Sep-10	1-Jun-13	25-Sep-13	8-Jul-14	7-Oct-14	28-Apr-15	9-Sep-15	28-Apr-16	13-Sep-16	1-Apr-17
QAQC			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conventional Parameters																		
Conductivity	-	uS/cm	40	70	49	52.3	28.9	16.2	40.2	71.6	56.2	44.4	31.7	15.3	32.7	20	49.2	19.1
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
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
Total Suspended Solids	-	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	17	23	26	26	13	12	14	38	20	23	9	8	9	10	12	8
Ammonia, Total (as N)	18.4 - 18.5	mg/L	0.005	<0.005	ND	ND	ND	ND	ND	0.03	0.03	<0.03	0.05	<0.03	<0.03	<0.03	0.03	0.03
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
Fluoride (F)	2.0-3.0 (e)	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	<0.10	-	-	-
Nitrate (as N)	400	mg/L	0.002	0.007	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	0.2 - 2.0 (h)	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	0.40	0.14	0.34	0.28	10.70	0.74	0.46	0.19	1.07	0.22	0.53	0.53
Phosphorus (P)-Total	-	mg/L	0.012	0.032	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate (SO4)	128 - 429 (d)	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
Biological Oxygen Demand (BOD)	-	mg/L	10	-	ND	ND	ND	ND	ND	ND	<4	<6	<4	<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
Total Metals																		
Aluminum	-	mg/L	0.176	0.352	0.02	0.037	0.295	0.144	0.421	0.0318	0.182	0.132	0.337	0.159	0.087	0.179	0.116	0.174
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
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
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
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
Bismuth	-	mg/L	0.00002	<0.00002	ND	ND	ND	-	-	-	-	-	-	<0.0001	<0.0001	<0.0001	<0.0001	<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
Cadmium	0.0005 - 0.004	mg/L	0.0000100	0.0000300	ND	0.0001500	ND	0.0000100	-	0.0003480	0.0000180	0.000097	0.000011	0.00002	0.00009	0.00003	0.00004	<0.000010
Calcium	-	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
Cesium	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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
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
Copper	0.02 - 0.09	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	-	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
Lead	0.04 - 0.16	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	0.0	0.0	1.6	ND	ND	-	-	-	<0.0005	<0.005	<0.005	0.0003	0.0001	0.0001	0.0002	0.00012
Magnesium	-	mg/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	-	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
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
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
Nickel	0.25 - 1.5	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	0.1010	0.0380	<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
Rubidium	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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
Silicon	-	mg/L	-	-	-	-	3.6	-	-	-	-	-	-	-	1.1	2.1	3	2.1
Silver	0.0005 - 0.015	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
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
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	0.04	ND	-	-	-	<15	<3	<3	<1	<1	<1	3	<3.0
Tellurium	-	mg/L	0.1	-	-	ND	ND	-	-	-	-	-	-	<0.0002	<0.0002	<0.0002	<0.0002	<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
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	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
Tungsten	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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
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	0.075 - 38.1	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

BC CSR AW-F — er Quality Guidelines for Protection of Freshwater Aquatic Life
BC CSR LW — on Water Quality Guidelines for Protection of Livestock
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,
QAQC = quality assurance/quality control; FD = field duplicate;

Table F-2: Historic Surface Water Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location						Meziadin - Upstream Surface Water Log Weir													
Monitoring Location	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	Notes	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Notes	Units	SW-1													
Sample ID						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
Laboratory ID						-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sample Date						1-Jan-04	1-Jan-06	1-Jan-07	1-Jun-08	1-Sep-09	6-Apr-10	28-Sep-10	1-Jun-13	25-Sep-13	8-Jul-14	7-Oct-14	28-Apr-15	9-Sep-15	28-Apr-16	13-Sep-16	1-Apr-17
QAQC						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conventional Parameters																			
Conductivity	-		-		uS/cm	40	70	49	52.3	28.9	16.2	40.2	71.6	56.2	44.4	31.7	15.3	32.7	20	49.2	19.1
Hardness (Total as CaCO3)	-		-		mg/L	18.6	-	-	-	-	9.6645062	18.924794	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	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)	-		0.52 - 0.52	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 - 429	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	<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
Total Metals																			
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	0.009		-		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	1		-		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	0.00013		-		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	0.001 $^{Cr\ VI}$ 0.0089 $^{Cr\ III}$	V	-		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	0.00007
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	0.61031 - 0.921292	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	0.025-0.15		-		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	0.005-0.015		-		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
Silver	0.00005, 0.0015	H	0.0001, 0.003	H	mg/L	0.00002	<0.00002	ND	**1.81**	-	-	0.000017	-	<0.000005	<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	0.0008		-		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	0.0085		-		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	#VALUE!	H	#VALUE!	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
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-3: Historic Surface Water Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	Downstream Creek														
Site Name			SW-2														
Sample ID			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
Laboratory ID			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sample Date			1-Jan-03	1-Jan-04	1-Jan-06	1-Jan-07	8-Jun-08	6-Apr-10	28-Sep-10	8-Jul-14	7-Oct-14	28-Apr-15	9-Sep-15	28-Apr-16	1-Apr-17	1-May-17	1-Aug-17
QAQC			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conventional Parameters																	
Conductivity	-	uS/cm	169	170	133	99	242	20.6	102	314	125	116	216	116	236	370	320
Hardness (Total as CaCO3)	-	mg/L	107.0	65.9	59.0	-	-	-	-	121.0	48.9	43.2	89.1	45.7	79.7	133.0	116.0
Hardness (Dissolved as CaCO3)	-	mg/L	84.4	72	59	-	-	-	-	-	-	-	81.4	-	-	-	-
pH	-	pH	7.5	7.6	7.2	7.14	6.7	5.8	5.9	7.50	6.90	6.80	6.50	6.70	6.9	7.2	6.4
Total Suspended Solids	-	mg/L	212	4	4	-	-	-	-	-	-	-	18	83	7.7	53	93
Total Dissolved Solids	-	mg/L	-	118	88	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	-	mg/L	-	51	28	48	110	8	20	138	37	44	56	46	100	140	60
Ammonia, Total (as N)	11.3 - 18.5	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 (e)	mg/L	-	-	-	-	-	-	-	-	-	-	<0.10	-	-	-	-
Nitrate (as N)	400	mg/L	-	0.009	0.048	-	-	-	-	-	-	-	-	-	-	-	-
Nitrite (as N)	0.2 - 2.0 (h)	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	1.90	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)	128 - 429 (d)	mg/L	16.6	25.5	23.9	6.0	18.3	3.1	19.6	9.1	10.8	2.3	16.0	3.5	1.3	2.0	69.3
Biological Oxygen Demand (BOD)	-	mg/L	7	10	-	ND	ND	-	ND	<6	<4	<4.0	<4.0	<4.0	<4.0	17	7.6
Chemical Oxygen Demand (COD)	-	mg/L	44	11	10	32	ND	55	35	83	28	24	28	23	34	76	80
Total Metals																	
Aluminum	-	mg/L	1.5	0.028	0.067	0.080	0.028	0.395	0.099	0.136	0.0520	0.091	0.092	0.082	0.0237	0.0129	0.0937
Antimony	0.09	mg/L	0.000166	0.000042	0.000043	ND	ND	-	-	<0.0005	<0.0005	<0.0001	0.0002	<0.0001	<0.00010	0.00013	<0.00020
Arsenic	0.05	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	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
Cesium	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	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	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	<0.000010
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	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
Rubidium	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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	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
Tungsten	-	mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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 - 38.1	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

BC CSR AW-F — er Quality Guidelines for Protection of Freshwater Aquatic Life
BC CSR LW — on Water Quality Guidelines for Protection of Livestock
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,
QAQC = quality assurance/quality control; FD = field duplicate;

Table F-4: Historic Surface Water Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location						Downstream Creek												
Monitoring Location						SW-2												
Sample ID	BC WQG Aquatic Life - Freshwater (Chronic - Long-term average)	Notes	BC WQG Aquatic Life - Freshwater (Short-term maximum)	Notes	Units	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
Laboratory ID						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sample Date						1-Jan-03	1-Jan-04	1-Jan-06	1-Jan-07	8-Jun-08	6-Apr-10	28-Sep-10	8-Jul-14	7-Oct-14	28-Apr-15	9-Sep-15	28-Apr-16	1-Apr-17	1-May-17	1-Aug-17
QAQC						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Conventional Parameters																				
Conductivity	-		-		uS/cm	169	170	133	99	242	20.6	102	314	125	116	216	116	236	370	320
Hardness (Total as CaCO3)	-		-		mg/L	107	65.9	59	-	-	-	-	121	48.9	43.2	89.1	45.7	79.7	133	116
Hardness (Dissolved as CaCO3)	-		-		mg/L	84.4	72	59	-	-	-	-	-	-	-	81.4	-	-	-	-
pH	6.5-9.0		-		-	7.5	7.6	7.2	7.14	6.7	5.8	5.9	7.5	6.9	6.8	6.5	6.7	6.9	7.2	6.4
Total Suspended Solids	-		**25 mg/L (backgr. 25-250 mg/l)**		mg/L	212	4	4	-	-	-	-	-	-	-	18	83	7.7	53	93
Total Dissolved Solids	-		-		mg/L	-	118	88	-	-	-	-	-	-	-	-	-	-	-	-
Alkalinity, Total (as CaCO3)	-		-		mg/L	-	51	27.7	48	110	8.4	20	138	36.5	44	56	46	100	140	60
Ammonia, Total (as N)	1.84 - 1.85	pH/T*	**11.2 - 25.5**	pH/T*	mg/L	0.064	0.005	0.007	ND	ND	ND	ND	1.02	0.03	0.57	0.11	0.26	1.36	1.31	0.76
Bromide (Br)	-		-		mg/L	0.1	0.1	0.1	-	-	-	-	-	-	-	-	-	-	-	-
Chloride (Cl)	150		**600**		mg/L	1.2	3.1	3.9	0.5	8.5	1	4.1	12.3	8.2	6.5	19	6.7	12.8	25.5	12.7
Fluoride (F)	-		**1.29 - 1.29**	H	mg/L	-	-	-	-	-	-	-	-	-	-	<0.10	-	-	-	-
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)	128 - 429	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	<6	<4	<4.0	<4.0	<4.0	<4.0	17	7.6
Chemical Oxygen Demand (COD)	-		-		mg/L	44	11	10	32	ND	55	35	83	28	24	28	23	34	76	80
Total Metals																				
Aluminum	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	0.009		-		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	1		-		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	0.00013		-		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	0.001 $^{Cr\ VI}$ 0.0089 $^{Cr\ III}$	V	-		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 - 0.0048	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 - 0.1174**	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	0.79508 - 1.1374	H	**1.01606 - 2.00566**	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	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	0.025-0.15		-		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	0.005-0.015		-		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
Silicon	-		-		mg/L	-	-	-	-	-	-	-	-	-	-	-	-	2.2	3	5.1
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	0.0008		-		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	0.0085		-		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 - 0.03975	H	**0.033 - 0.06525**	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),
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-5: Historic Surface Water Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location			Downstream surface from metal storage	
Site Name			SW2017-3	
Sample ID	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	SW2017-3	SW2017-3
Laboratory ID				
Sample Date			1-May-17	1-Aug-17
QAQC				
Conventional Parameters				
Conductivity	-	uS/cm	88.1	204
Hardness (Total as CaCO3)	-	mg/L	29.3	54.5
Hardness (Dissolved as CaCO3)	-	mg/L	-	-
pH	-	pH	6.9	6.8
Total Suspended Solids	-	mg/L	3.7	3.8
Total Dissolved Solids	-	mg/L	-	-
Alkalinity, Total (as CaCO3)	-	mg/L	36	52
Ammonia, Total (as N)	18.4 - 18.4	mg/L	<0.03	<0.03
Bromide (Br)	-	mg/L	-	-
Chloride (Cl)	1500	mg/L	3.4	9.9
Fluoride (F)	2.0-3.0 (e)	mg/L	-	-
Nitrate (as N)	400	mg/L	-	-
Nitrite (as N)	0.2 - 2.0 (h)	mg/L	-	-
Nitrate + Nitrite (as N)	-	mg/L	-	0.0162
Total Kjeldahl Nitrogen	-	mg/L	0.348	0.838
Phosphorus (P)-Total	-	mg/L	-	-
Sulfate (SO4)	128 - 429 (d)	mg/L	6.0	26.9
Biological Oxygen Demand (BOD)	-	mg/L	<5.0	-
Chemical Oxygen Demand (COD)	-	mg/L	<20	45
Total Metals				
Aluminum	-	mg/L	0.362	0.0437
Antimony	0.09	mg/L	0.0001	<0.00020
Arsenic	0.05	mg/L	0.00061	0.00076
Barium	10	mg/L	0.0114	0.0217
Beryllium	0.0015	mg/L	<0.00010	<0.00010
Bismuth	-	mg/L	<0.00010	<0.00010
Boron	12	mg/L	0.043	0.103
Cadmium	0.0005 - 0.004	mg/L	0.0000170	0.000595
Calcium	-	mg/L	8.7	14.5
Cesium	-	mg/L	-	-
Chromium	0.01	mg/L	0.0013	0.0008
Cobalt	0.04	mg/L	0.00104	0.00242
Copper	0.02 - 0.09	mg/L	0.00179	0.00393
Iron	-	mg/L	1.54	3.50
Lead	0.04 - 0.16	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	0.00025	mg/L	-	0.00001
Molybdenum	10	mg/L	<0.00010	0.00015
Nickel	0.25 - 1.5	mg/L	0.00304	0.00782
Phosphorus	-	mg/L	<0.050	<0.050
Potassium	-	mg/L	1.1	4.16
Rubidium	-	mg/L	-	-
Selenium	0.02	mg/L	<0.00050	<0.00050
Silicon	-	mg/L	3.3	4.0
Silver	0.0005 - 0.015	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	0.003	mg/L	<0.000020	<0.000020
Thorium	-	mg/L	<0.00010	<0.00010
Tin	-	mg/L	<0.00020	<0.00020
Titanium	1	mg/L	0.0077	<0.0050
Tungsten	-	mg/L	-	-
Uranium	0.085	mg/L	<0.000020	<0.000020
Vanadium	-	mg/L	0.0011	<0.0010
Zinc	0.075 - 38.1	mg/L	<0.0040	0.0384
Zirconium	-	mg/L	0.0005	0.0002

NOTES

BC CSR AW-F er Quality Guidelines for Protection of Freshwater Aquatic Life
BC CSR LW on Water Quality Guidelines for Protection of Livestock
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
QAQC = quality assurance/quality control; FD = field duplicate;

Table F-6: Historic Surface Water Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

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

NOTES

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

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

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

Table F-7: Historic Surface Water Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location			Downstream surface at the end of the lagoon, downstream of SW2017-03	
Site Name	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	SW2017-4	
Sample ID			SW2017-4	SW2017-4
Laboratory ID			-	-
Sample Date			1-May-17	1-Aug-17
QAQC			-	-
Conventinoal Parameters				
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)	18.4 - 18.5	mg/L	<0.03	<0.03
Bromide (Br)	-	mg/L	-	-
Chloride (Cl)	1500	mg/L	3.5	2.2
Fluoride (F)	2.0-3.0 (e)	mg/L	-	-
Nitrate (as N)	400	mg/L	-	-
Nitrite (as N)	0.2 - 2.0 (h)	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)	128 - 429 (d)	mg/L	6.8	10.9
Biological Oxygen Demand (BOD)	-	mg/L	<5.0	5.7
Chemical Oxygen Demand (COD)	-	mg/L	22	32
Total Metals				
Aluminum	-	mg/L	0.317	0.0173
Antimony	0.09	mg/L	<0.00010	<0.00020
Arsenic	0.05	mg/L	0.00064	0.00074
Barium	10	mg/L	0.0122	<0.0050
Beryllium	0.0015	mg/L	<0.00010	<0.00010
Bismuth	-	mg/L	<0.00010	<0.00010
Boron	12	mg/L	0.046	0.0612
Cadmium	0.0005 - 0.004	mg/L	0.00003	0.000028
Calcium	-	mg/L	9.4	11.3
Cesium	-	mg/L	-	-
Chromium	0.01	mg/L	0.00116	<0.00050
Cobalt	0.04	mg/L	0.00108	0.00021
Copper	0.02 - 0.09	mg/L	0.00175	0.00145
Iron	-	mg/L	1.56	0.64
Lead	0.04 - 0.16	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	0.00025	mg/L	-	0.000016
Molybdenum	10	mg/L	<0.00010	0.00012
Nickel	0.25 - 1.5	mg/L	0.00315	0.00098
Phosphorus	-	mg/L	<0.050	<0.050
Potassium	-	mg/L	1.17	1.22
Rubidium	-	mg/L	-	-
Selenium	0.02	mg/L	<0.00050	<0.00050
Silicon	-	mg/L	3.2	<1.0
Silver	0.0005 - 0.015	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	0.003	mg/L	<0.000020	<0.000020
Thorium	-	mg/L	<0.00010	<0.00010
Tin	-	mg/L	<0.00020	<0.00020
Titanium	1	mg/L	0.0083	<0.0050
Tungsten	-	mg/L	-	-
Uranium	0.085	mg/L	<0.000020	<0.000020
Vanadium	-	mg/L	<0.0010	<0.0010
Zinc	0.075 - 38.1	mg/L	<0.0040	<0.0040
Zirconium	-	mg/L	0.00032	<0.00010

NOTES

BC CSR AW-F er Quality Guidelines for Protection of Freshwater Aquatic Life
BC CSR LW on Water Quality Guidelines for Protection of Livestock
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
QAQC = quality assurance/quality control; FD = field duplicate;

2018 Meziadin Landfill Annual Monitoring Program

Regional District of Kitimat-Stikine

Location	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	
Monitoring Location						SW2017-4	
Sample ID						SW2017-4	SW2017-4
Laboratory ID						-	-
Sample Date						1-May-17	1-Aug-17
QAQC						-	-
Conventional Parameters							
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
Total Metals							
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	<0.000020	<0.000020
Thorium	-		-		mg/L	<0.00010	<0.00010
Tin	-		-		mg/L	<0.00020	<0.00020
Titanium	-		-		mg/L	0.0083	<0.0050
Uranium	0.0085		-		mg/L	<0.000020	<0.000020
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
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

Location			Surface seepage from toe of lagoon	
Site Name	CSR Aquatic Life Standard, Freshwater (AW-F)	Units	SW2017-5	SW2017-5
Sample ID			SW2017-5	SW2017-5
Laboratory ID			-	-
Sample Date			1-May-17	1-Aug-17
QAQC			-	-
Parameters				
Conductivity	-	uS/cm	546	726
Hardness (Total as CaCO3)	-	mg/L	278	296
Hardness (Dissolved as CaCO3)	-	mg/L	-	-
pH	-	pH	7.1	6.3
Total Suspended Solids	-	mg/L	56	30
Total Dissolved Solids	-	mg/L	-	-
Alkalinity, Total (as CaCO3)	-	mg/L	230	320
Ammonia, Total (as N)	18.4 - 18.5	mg/L	0.08	0.82
Bromide (Br)	-	mg/L	-	-
Chloride (Cl)	1500	mg/L	12.2	35.1
Fluoride (F)	2.0-3.0 (e)	mg/L	-	-
Nitrate (as N)	400	mg/L	-	-
Nitrite (as N)	0.2 - 2.0 (h)	mg/L	-	-
Nitrate + Nitrite (as N)	-	mg/L	-	0.0546
Total Kjeldahl Nitrogen	-	mg/L	1.29	1.79
Phosphorus (P)-Total	-	mg/L	-	-
Sulfate (SO4)	128 - 429 (d)	mg/L	34.1	7.9
Biological Oxygen Demand (BOD)	-	mg/L	11	6.5
Chemical Oxygen Demand (COD)	-	mg/L	49	37
Total Metals				
Aluminum	-	mg/L	0.051	0.0187
Antimony	0.09	mg/L	<0.00010	<0.00020
Arsenic	0.05	mg/L	0.00124	0.00099
Barium	10	mg/L	0.0978	0.129
Beryllium	0.0015	mg/L	<0.00010	<0.00010
Bismuth	-	mg/L	<0.00010	<0.00010
Boron	12	mg/L	0.059	0.172
Cadmium	0.0005 - 0.004	mg/L	0.0000300	0.0000700
Calcium	-	mg/L	80.4	86.4
Cesium	-	mg/L	-	-
Chromium	0.01	mg/L	<0.00050	0.0007
Cobalt	0.04	mg/L	0.00129	0.00291
Copper	0.02 - 0.09	mg/L	0.0011	0.00056
Iron	-	mg/L	5.20	2.41
Lead	0.04 - 0.16	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	0.00025	mg/L	-	<0.000010
Molybdenum	10	mg/L	0.00172	0.0024
Nickel	0.25 - 1.5	mg/L	0.00186	0.00353
Phosphorus	-	mg/L	0.09	0.108
Potassium	-	mg/L	0.75	1.44
Rubidium	-	mg/L	-	-
Selenium	0.02	mg/L	<0.00050	<0.00050
Silicon	-	mg/L	2.6	2.8
Silver	0.0005 - 0.015	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	0.003	mg/L	<0.000020	0.0
Thorium	-	mg/L	<0.00010	<0.00010
Tin	-	mg/L	<0.00020	<0.00020
Titanium	1	mg/L	<0.0050	<0.0050
Tungsten	-	mg/L	-	-
Uranium	0.085	mg/L	0.0001050	0.0001040
Vanadium	-	mg/L	<0.0010	<0.0010
Zinc	0.075 - 38.1	mg/L	<0.0040	0.0071
Zirconium	-	mg/L	0.0002	0.0002
Dissolved Metals				
Aluminum	-	mg/L	-	-
Antimony	0.09	mg/L	-	-
Arsenic	0.05	mg/L	-	-
Barium	10	mg/L	-	-
Beryllium	0.0015	mg/L	-	-
Bismuth	-	mg/L	-	-
Boron	12	mg/L	-	-
Cadmium	0.0005 - 0.004	mg/L	-	-
Calcium	-	mg/L	-	-
Cesium	-	mg/L	-	-
Chromium	0.01	mg/L	-	-
Cobalt	0.04	mg/L	-	-
Copper	0.02 - 0.09	mg/L	-	-
Iron	-	mg/L	-	-
Lead	0.04 - 0.16	mg/L	-	-
Lithium	-	mg/L	-	-
Magnesium	-	mg/L	-	-
Manganese	-	mg/L	-	-
Mercury	0.00025	mg/L	-	-
Molybdenum	10	mg/L	-	-
Nickel	0.25 - 1.5	mg/L	-	-
Phosphorus	-	mg/L	-	-
Potassium	-	mg/L	-	-
Rubidium	-	mg/L	-	-
Selenium	0.02	mg/L	-	-
Silicon	-	mg/L	-	-
Silver	0.0005 - 0.015	mg/L	-	-
Sodium	-	mg/L	-	-
Strontium	-	mg/L	-	-
Sulfur	-	mg/L	-	-
Tellerium	-	mg/L	-	-
Thallium	0.003	mg/L	-	-
Thorium	-	mg/L	-	-
Tin	-	mg/L	-	-
Titanium	1	mg/L	-	-
Tungsten	-	mg/L	-	-
Uranium	0.085	mg/L	-	-
Vanadium	-	mg/L	-	-
Zinc	0.075 - 2.4	mg/L	-	-
Zirconium	-	mg/L	-	-

NOTES

BC CSR AW-F — er Quality Guidelines for Protection of Freshwater Aquatic Life
BC CSR LW — on Water Quality Guidelines for Protection of Livestock
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,
QAQC = quality assurance/quality control; FD = field duplicate;

Table F-10: Historic Surface Water Analytical Results
2018 Meziadin Landfill Annual Monitoring Program
Regional District of Kitimat-Stikine

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

NOTES

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

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

Italics indicate that the laboratory detection limit exceeds the applicable standard.
British Columbia Approved and Working (or interim) Water Quality Guidelines (BC WQG),
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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