

# Columbia Valley Regional Landfill

## 2021 Groundwater Monitoring Annual Report



**PREPARED FOR: REGIONAL DISTRICT OF EAST KOOTENAY**

**PREPARED BY: SPERLING HANSEN ASSOCIATES**

**January, 2022**

**PRJ21063**



SPERLING  
HANSEN  
ASSOCIATES



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

## 1. INTRODUCTION

Sperling Hansen Associates (SHA) was retained by the Regional District of East Kootenay (RDEK) in 2020 to develop an updated Groundwater Monitoring Program (GMP) for seven (7) Solid Waste Management facilities located within the RDEK. As part of this GMP update, SHA along with Subconsultant Bear Environmental Limited (BEAR), will conduct four (4) groundwater sampling events per year, and provide one interim report per event for each site. The goal of this program is to provide the RDEK with valuable information regarding the groundwater quality at disposal sites and to assist in developing appropriate monitoring and management measures until 2025.

In 2021, sampling events occurred in January, April, July, and November over a week period. Samples taken from each site are recorded below, and water quality analysis discussed in Section 3. Typically, the fall event is completed in October, however this year BEAR and SHA encountered delays in equipment availability due to supply shortages. As a result, the fall event in 2021 was completed in early November. This report details the sampling notes, lab analysis results, and trends observed at the wells throughout 2021. Section 5 presents recommendations for the next year of monitoring.



**Photo 1-1. Columbia Valley Site Location.**

### 1.1 Location and Setting

The Columbia Valley Landfill is located in the sub-region of Columbia Valley within the RDEK. The site is approximately 1 km from the community of Windermere and 2 km from the municipality of

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Invermere. The civic address of the site is 1875 Windermere Loop Road. The legal description of the property is Parcel A of Lot 4619, Plan 4386. The longitude and latitude are -115.942831 and 50.465430 respectively.



**Photo 1-2. Columbia Valley Landfill Site Layout.**

## 1.2 Site Operations

The landfill operates seven days a week, from 9:00 am to 6:00 pm. The site accepts MSW, recycling, yard and garden waste, and some commercial waste. Due to the nature of waste when it comes into contact with water, it is required to monitor the groundwater on and surrounding the site to observe impacts from the landfill. In compliance with Landfill Criteria for Municipal Solid Waste, SHA was retained to conduct the groundwater and LFG monitoring. The well locations are identified in Figure 1.

The Operational Certificate for the Central Valley Regional Landfill is attached to this report as Appendix A.

## 2. MONITORING PROGRAM

As per the Columbia Valley Landfill Certificate 100134 (OC), the Site monitoring program was required to be developed by a qualified professional to identify potential impacts to the environment and public health and is included in the Site's Design and Operation Plan. Currently, this program includes the quarterly monitoring of five on-site wells and three off-site wells. On-Site wells included are E208726, E208720, E265102, E265103, and MW03-5. Off-site wells in the monitoring program include E20778, E207780, and E207782.

## 2.1 Methodology

BEAR has conducted the field sampling since July, 2020. Each well sampled is tested for a set of parameters that are intended to determine landfill impact. Some parameters are tested quarterly while others are only tested annually. Sampling was conducted in accordance with the BC Field Sampling Manual. Table 2-1 shows which wells were sampled during each quarterly event of 2021.

**Table 2-1. Well Sampling Frequency, 2021**

Event	E265102	E208720	E207780	E207782	E265103	E208726	E207778	MW0-5
January Q1	X		X	X	X			
April Q2	X	X	X	X	X		X	
July Q3	X	X	X	X	X	X	X	X
November Q4	X	X	X	X	X		X	X

It should be noted that in July and October 2020, E207782 was incorrectly sampled from a chlorinated tap rather than the tap inside the shed at the Akisqnuq First Nation.

Several wells at Columbia Valley are equipped with pre-installed pumps. E208720, E208726, and MW03-5 contain these pumps, however they require a specific adapter and generator. It was found through trial and error that E208720 and MW03-5 require a generator capacity is 6,000 watts. E208726 was unable to pump water and made no indication that the pump was running. The adapter required for the pumps is shown below.



**Photo 1-3. Monitoring Well Pump Adapter Type**

Table 2-2 shows which parameters are tested Quarterly and Yearly at the Columbia Valley Landfill.

**Table 2-2. Groundwater Monitoring Parameters.**

Site	Quarterly and Annual Parameters
Columbia Valley Landfill	Temperature
	Conductivity
	pH
	Nitrite (N)
	Nitrate (N)
	Ammonia Nitrogen (NH3)
	Fluoride (F)
	Sulphate (SO4)
	Chloride (Cl)
	Hardness
	Total Alkalinity
	Total Suspended Solids
	Dissolved Metals
	Total Metals
	Landfill Gas (LEL)

Analysis of the water samples was conducted by ALS Environmental, a CALA accredited laboratory. Certificate of Analysis (COA) are included in Appendix C.

## 2.2 Groundwater Flow

According to the 2019 DOCP prepared for the site by SHA, the landfill is located atop 30m of dense gravel and silt, underlain by saturated glaciofluvial sand and gravel. The landfill has been developed on a terrace approximately 3.1 km east of Windermere Lake. Based on the regional topography, groundwater is inferred to flow west toward Windermere Lake. Locally, groundwater appears to flow towards the south west under alluvial sands and gravel deposits.

Wells E207780, E207778, and E207882 are off site domestic monitoring locations. E207778 is a well located west of the landfill on the adjacent golf course property. E207780 and E207882 are sampled from taps at the Leverkus farm residence and C.L.I.B. office, and therefore do not have a measurable water level. All three domestic wells are considered downgradient of the landfill. Well details and depth to water (water level) are shown in Table 2-3 below.

**Table 2-3. Well Details and Water Level**

Well ID	Well Construction	Q1 Water Level (m)	Q2 Water Level (m)	Q3 Water Level (m)	Q4 Water Level (m)
E265103	2" PVC	29.480	29.880	29.850	29.895
E265102	2" PVC	23.475	23.870	23.855	23.890
E208720*	6" metal casing	-	-	-	-
E207780	sink tap	-	-	-	-
E207782	Preinstalled pump and tap	-	-	-	-
E208726*	6" metal casing	-	-	-	-
E207778	Golf course tap	-	-	-	-
03-5*	6" metal casing	-	-	-	-

\*Wells have pre-installed permanent pumps where Depth to Water is not measured.

As shown above, well locations E208720, E208726, and 03-5 contain permanent pumps inside the well casing that prevent a water tape from being inserted. As such, water level/depth to water measurement cannot be obtained at these locations.

### 2.3 Nomenclature

The reporting of monitoring wells at the East Kootenay sites has previously been a combination of Environmental Monitoring System Numbers (EMSN, e.g. E207780) and site number names that are the more common naming convention (e.g. MW-1). The majority of sites have both, but some wells only have the E number. To avoid confusion and the potential of double counting the wells, SHA has decided to use the E numbers when referring to them. This way reports and analyses can be consistent, and can be traced to the OC or Permit for the site. The site maps attached to these Annual Reports as Figure 1 have been updated to reflect this change and now have the EMSN numbers labelled.

### 2.4 Regulatory Criteria

The 2011 OC for the landfill requires the following:

- **Section 2.6 Groundwater Impacts**

- The landfill shall be operated in a manner such that ground or surface water quality does not decrease beyond that specified by the British Columbia Water Quality Guidelines, or other appropriate criteria as may be specified by the Director, at or beyond the landfill property boundary.
- If exceedances to the specified water quality criteria occur as a result of landfill operations, the Director may require that leachate management control measures or works be undertaken. Terms of reference for any leachate management study and/or design work shall be submitted to the Director for review prior to conducting the work.

The Criteria recommends the following performance criteria for groundwater and surface water quality:

- After considering the identified uses of groundwater and surface water, a QP must recommend the appropriate water quality criteria, compliance locations, and provide related rationale and justification.
- The appropriate water quality criteria must be satisfied at and beyond the landfill site boundary, or 150 m from the landfill footprint, whichever is closer.
- Any discharges to surface water considered as potential fish habitat must also comply with the requirements of the federal Fisheries Act.

Recent standards and guidelines have been applied by SHA to include:

- The Schedule 3.2 of the BC CSR with consideration to Aquatic Life (AW) and Drinking Water (DW);
- Ministry of Environment and Climate Change Strategy (BC ENV) Source Drinking Water Quality Guidelines (BC SDWQG) to assess neighboring domestic well water quality.

These standards and guidelines published by BC ENV are the most recent used to assess groundwater at contaminated sites and the quality of drinking water.

### 3. RESULTS

Parameters tested in this event included:

- pH, temperature, conductivity, total suspended solids (TSS), chloride, fluoride, sulphate, bromide, alkalinity (total CaCO<sub>3</sub>), alkalinity (PP as CaCO<sub>3</sub>), bicarbonate (HCO<sub>3</sub>), carbonate (CO<sub>3</sub>), hydroxide (OH), and the lower explosive limit of landfill gas (LEL).

In Appendix B, Table B-1 provides the water quality analysis alongside the applicable water standards.

All parameters tested were below applicable standards and guidelines with the exception of one parameter:

- Lithium (dissolved and total)

Table 3-1 below presents the parameters that were observed to exceed applicable guidelines in 2021.

**Table 3-1. Exceedances by Analyte**

	E207782	E265102
<b>Lab Results</b>		
<b>Dissolved Metals</b>		
Lithium (dissolved)		X
<b>Total Metals</b>		
Lithium (total)	X	

Details are provided in the Sections below.

### 3.1 Exceedances

Table 3-2 below outline the parameters exceeded by the wells monitored. Total lithium was slightly above the CSR-DW limit at E207782 for all four 2021 quarterly monitoring events. Total metals are tested for at domestic wells, such as E207782.

Dissolved lithium was above the CSR DW limit at E265102 in April and November 2021. Dissolved metals are tested for at on site wells to get a representation of metals present in the sample when suspended particles and sediments are removed, which is why onsite dissolved metals samples are field-filtered with a 0.45-micron filter.

**Table 3-2. Maximum Parameter Concentrations Above BC CSR DW Standards**

Parameter	BC CSR DW Standard	Maximum Concentration (mg/L)	Well Name
Total lithium (Li)	8 µg/L	<b>9.4</b>	E207782
Dissolved Lithium (Li)	8 µg/L	<b>9.3</b>	E265102

Note: concentrations listed in the table are all above applicable DW standards. Maximum concentrations are shown in **bold**.

### 3.2 Notes on Regional Background Concentrations

As per the British Columbia Contaminated Sites Regulation (CSR) Schedule 3.2, 2019, the drinking water limit for Lithium (Li) is 8 µg/L or 0.008 mg/L. Many regions in B.C. have background concentrations of lithium that exceed this limit, which poses a complication for monitored sites that are required under Operation Certificates or Permits to avoid exceedances of harmful parameters. In response, the B.C. Ministry of Environment and Climate Change (BC ENV) published a document in 2018 qualifying the limit and providing background concentrations for three regions in the province for five metals, including

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lithium. The limits published in the *Technical Bulletin 3: Regional Background Concentrations for Select Inorganic Substances in Groundwater* account for naturally occurring levels of the five metals, and are therefore higher than the limit within the CSR currently.

However, these three regions only comprise the Lower Mainland, South Vancouver Island, and Thompson-Okanagan. SHA believes the exceedances in lithium observed at the RDEK sites may be attributable to natural background concentrations that are not accounted for in the CSR Schedule 3.2 or *Technical Bulletin 3*. It should be noted that Eco/Logic did not have a limit for lithium, which explains the discrepancy in exceedances despite there being little difference between 2019 and 2020 results.

Note that Thompson-Okanagan, the nearest region to the RDEK with a back ground concentration qualifier for lithium, has a qualified concentration in the Bulletin of 96 µg/L, or 0.096 mg/L . SHA does not believe the RD needs to look into remediation measures at this point, but recommends the RD flag this exceedance history in the case that the Ministry publishes a background concentration for the Kootenay region. SHA recommends that future sampling at the Site be conducted utilizing low flow sampling methods to minimize the re-suspension of colloidal materials that can be caused during sampling with bailers and/or Waterra inertia pumps.

### 3.3 Landfill Gas

The Columbia Valley Landfill has five (5) Landfill Gas monitoring wells, primarily located on the northwest area of the site. These probes were installed in 2004, and are recommended to be monitored as per the DOCP SHA prepared for the site in 2004. LFG monitoring was completed by BEAR at the same time as water sampling.

The landfill criteria stipulate that soil gas concentrations at the landfill site boundary must not exceed the lower explosive limit of methane (5% by volume) at any time. This is particularly important for the Columbia Valley site as there are private residences close to the site. In order to ensure that this requirement is met, SHA installed five (5) nested (one shallow and one deep) probes along the north and west side of the site in 2004. The locations of the probes can be seen in Figure 1. As part of the quarterly monitoring program, a Landtec GEM 2000 Plus landfill gas analyzer was used for the monitoring. Each measurement consisted of reading relative pressure in the probe, and purging the probe until stable readings has been established.

The results from the monitoring events are presented in Table B-2, presented in Appendix B. Please note that due to severe shipping delay in January 2021, the GEM was not available to BEAR and so there are no landfill gas monitoring results for Q1. As can be seen in the table, all readings were well below the landfill criteria. This is consistent with the monitoring events that took place in 2019 and 2020. Given the close proximity to nearby residences, it is recommended landfill gas monitoring continue in its current format. In the event that elevated levels of landfill gas are detected in any of the probes, the RD representative must be notified right away as further actions may be required.

## 4. DISCUSSION

All parameters tested were below applicable standards and guidelines with the exception of the following parameters:

- Lithium (dissolved and total)

The maximum concentration of total lithium was found at E207782 at 9.4 µg/L, where the limit is 8 µg/L. The maximum dissolved lithium concentration was observed at E265102 at 9.3 µg/L where the limit is also 8 µg/L.

### 4.1 Trend Analysis

To illustrate the trends observed in key parameters at the wells sampled, SHA has prepared figures that combine the 2020-2021 groundwater results with the applicable criteria limits. These figures are attached to this report as Appendix D.

- Figure 2 – Dissolved lithium concentrations
- Figure 3 – Total lithium concentrations
- Figure 4 – Sulfate concentrations
- Figure 5 – Sodium concentrations
- Figure 6 – Chloride concentrations
- Figure 7 – Nitrate concentrations
- Figure 8 – Specific conductance (Conductivity)
- Figure 9 – Manganese concentrations

Lithium is the parameter with an observable consistent trend above the CSR DW limit, however the exceedance is typically less than 1.5 times the limit. Sulfate, sodium, chloride, nitrate, and conductivity are graphed because they are typical landfill indicators. As shown in the graphs, these parameters are below applicable standards and guidelines and show the landfill is not impacting groundwater chemistry beyond regulatory standards.

*Please note that the graphs provided are for observing trends, and data less than or equal to the detection limit for a parameter appears on graphs as trace concentrations. If a well shows to have no data on the graph, please refer to the master data table for the exact parameter concentration.*

## 5. CONCLUSIONS AND RECOMMENDATIONS

In 2021, quarterly and annual sampling at the Site occurred in accordance with the OC and most recent DOCP. All parameters generally associated with landfill leachate including, but not limited to, chloride, nitrate, and sulfate were below applicable standards and guidelines. However, one metals parameter, lithium was detected slightly above applicable criteria.

SHA recommends the following:

Parameter concentrations of dissolved metals slightly above applicable standards were detected in the Site groundwater monitoring wells. Based on surrounding land use, and relatively low impact to the immediate environment, SHA does not envision a change to the sampling method is warranted at this time. However, if exceeding parameters begin to form a consistently increasing trend, the RDEK may consider groundwater sampling methods using a low flow technique, where possible, to minimize the re-suspension of colloidal materials that can be caused during sampling with bailers and/or Waterra inertia pumps. If this sampling method is effective in providing a more accurate interpretation of groundwater data and able to show the groundwater exceedances are a result of suspended materials from bailer sampling, then SHA could make a recommendation to the Regional District to implement this sampling method for the monitoring going forward.

The next sampling event is scheduled for early April, 2022.

## **6. STATEMENT OF LIMITATIONS**

This report has been prepared by Sperling Hansen Associates. (SHA) on behalf of the Regional District of East Kootenay (RDEK) in accordance with generally accepted engineering practices to a level of care and skill normally exercised by other members of the engineering and science professions currently practicing under similar conditions in British Columbia.

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

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

The findings and conclusions of this report are valid only as of the date of this report. The interpretations presented in this report and the conclusions and recommendations that are drawn are based on information that was made available to SHA during the course of this project. Should additional new data become available in the future, SHA should be requested to re-evaluate the findings of this report and modify the conclusions and recommendations drawn, as required.

Should you have any questions on this report or require further assistance or information, please feel free to contact the undersigned at 778-471-7088 or 604-986-7723.

**DRAFT Report prepared by:**



**Chloe Hetherington**  
Environmental Analyst Assistant

**DRAFT Report reviewed by:**



**Scott Garthwaite**  
Sr. Civil Technologist

## **7. REFERENCES**

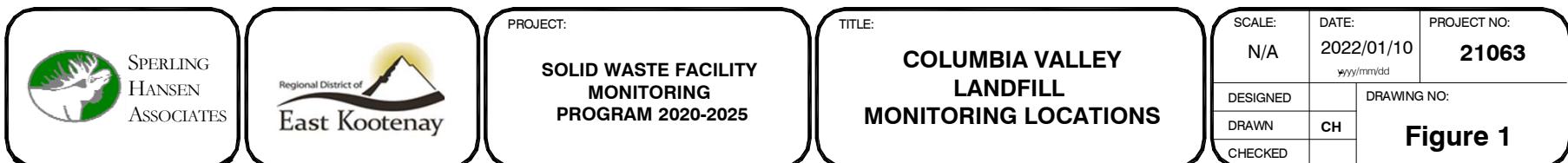
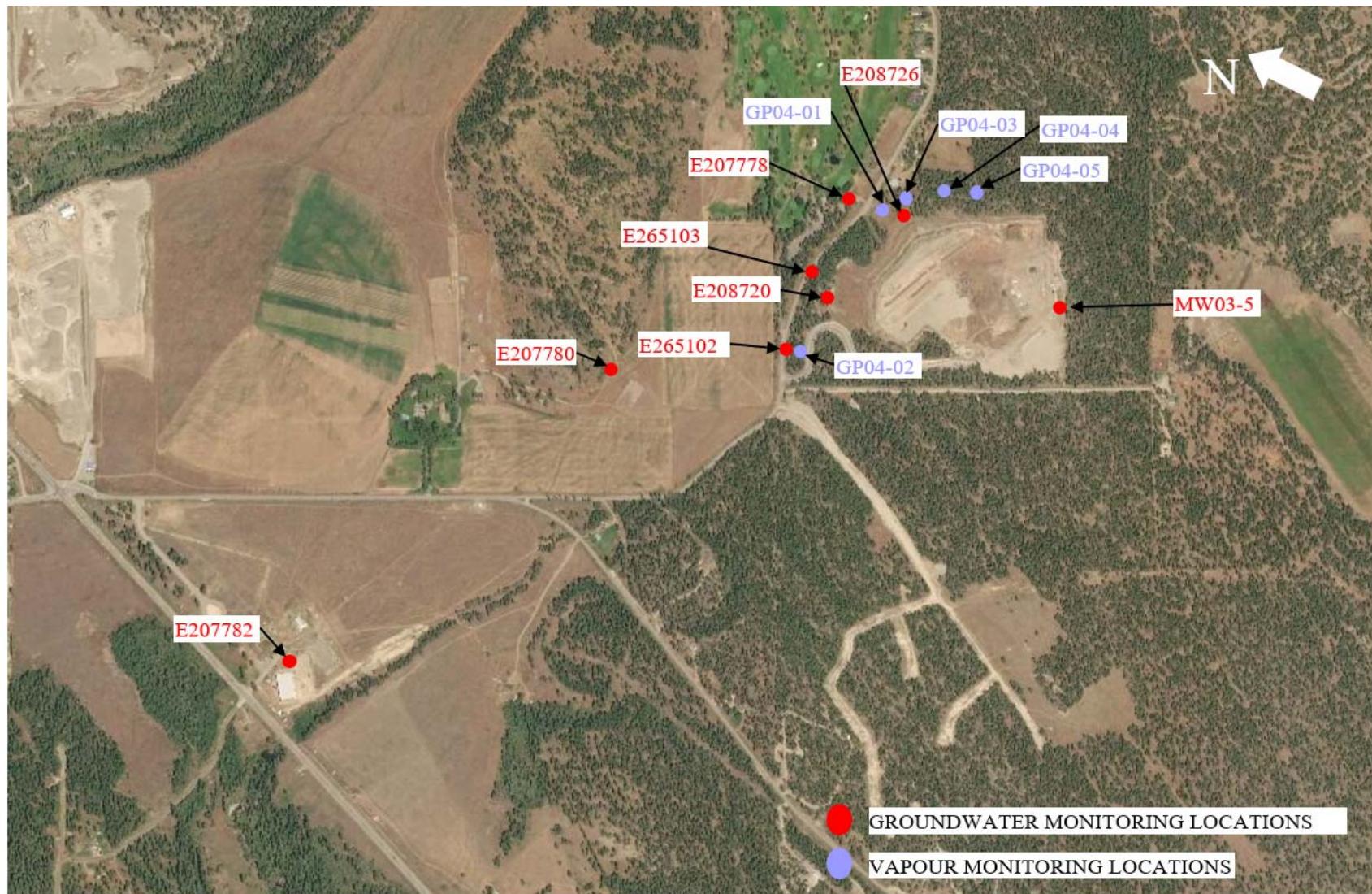
Eco/Logic Environmental, Columbia Valley Subregion Landfill Groundwater Monitoring 2019, prepared for the Regional District of East Kootenay.

Environmental Management Act, BC Contaminated Sites Regulation Schedule 3.2, 2019.

Ministry of Environment, BC Approved Water Quality Guidelines: Source Drinking Water, 2020.

RDEK Public Web Map 2020, retrieved from <https://www.rdek.bc.ca/departments/mapping>

SHA 2004. Columbia Valley Subregion Landfill Design, Operations, and Closure Plan. Sperling Hansen Associates.



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**APPENDICES**

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**APPENDIX A**  
**Operational Certificate**

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March 1, 2011

Tracking Number: 5004

Authorization Number: 100134

**REGISTERED MAIL**

**RECEIVED**

Regional District of East Kootenay  
19-24 Ave S  
Cranbrook BC V1C 3H8

MAR 08 2011

Dear Operational Certificate Holder:

**Regional District of  
East Kootenay**

Enclosed is Operational Certificate 100134 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the operational certificate.

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

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

Administration of this operational certificate will be carried out by staff from the Kootenay-Okanagan Region. Plans, data and reports pertinent to the operational certificate are to be submitted to the Regional Manager, Environmental Protection Division, Ministry of Environment, 401 - 333 Victoria St., Nelson, BC V1L 4K3.

Yours truly,

Chris Stroich, M.Sc., P.Ag.  
for Director, *Environmental Management Act*  
Kootenay-Okanagan Region

Enclosure

cc: Environment Canada

Ministry of Environment

Environmental Protection  
Division

401 - 333 Victoria St.  
Nelson, BC V1L 4K3

Kootenay Region  
Telephone: (250) 354-6333  
Facsimile: (250) 354-6332



MINISTRY OF  
ENVIRONMENT

**OPERATIONAL CERTIFICATE**

100134

*Under the Provisions of the Environmental Management Act,  
and in accordance with the approved  
Regional District of East Kootenay Solid Waste Management Plan, the  
REGIONAL DISTRICT OF EAST KOOTENAY*

**19 - 24 AVE S  
CRANBROOK, BC V1C 3H8**

is authorized to manage municipal solid waste and recyclable material from the Regional District of East Kootenay and environs at the Columbia Valley Subregional landfill located near Windermere, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the *Environmental Management Act* and may result in prosecution.

The Operational Certificate supersedes all previous versions of Permit PR-01475 issued under the authority of the *Waste Management Act*.

**1. AUTHORIZED DISCHARGES**

**1.1 Authorized Source**

This authorization applies to the discharge of municipal solid waste to a sanitary landfill known as the Columbia Valley Subregional landfill. The site reference number for this discharge is E210127.

- 1.1.1 The authorized works are a sanitary landfill and related appurtenances located approximately as shown on Site Plan.
- 1.1.2 The maximum quantity of waste discharged shall not exceed the design capacity of the landfill as specified in the Columbia Valley Subregional Landfill - Design and Operations Plan Update (2006).

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for Director, *Environmental Management Act*  
Kootenay Region

- 1.1.3 The characteristics of the landfilled wastes shall be typical residential, commercial, institutional and light industrial waste.
- 1.1.4 The location of the facilities from which the discharge originates and the point of discharge is Lot 1 of Lot 4619, Plan 8066, Parcel A of Lot 4619, Plan 4386, and an unsurveyed portion of Lot 4619, Kootenay District, as shown on attached Site Plan.

## 1.2 Prohibited Wastes

The disposal of the following types of wastes is prohibited unless approved by the Director in writing:

- a. Hazardous Wastes other than those specifically approved for disposal to authorized landfills in the Hazardous Waste Regulation under the *Environmental Management Act*;
- b. Biomedical wastes as defined in the Guidelines for the Management of Biomedical Wastes in Canada (Canadian Council of Ministers of the Environment, February 1992);
- c. Bulk liquids and semi-solid sludges which contain free liquid, as determined by US EPA Method 9095A Paint Filter Liquids Test, Test Methods for Evaluating Solid Wastes-Physical /Chemical Methods (EPA Publication No. SW-846);
- d. Septic tank effluent, septage black water, holding tank effluent and sewage treatment biosolids;
- e. Discharge of carcasses shall be limited to those of a domestic source, animal road kills, or animals killed as part of the animal control activities of the Conservation Officer Service. Mortalities from agricultural operations may be discharged where the generator has demonstrated to the satisfaction of the Director that the carcasses cannot be disposed of in accordance with the Agricultural Waste Control Regulation under the *Environmental Management Act*. The disposal of solid waste from slaughterhouses and poultry processing is allowed subject to the waste being certified in writing as being free of Specified Risk Materials (SRM) by the Canadian Food Inspection Agency (CFIA) on each occasion that such waste is received at the site. A copy of the document issued by the CFIA certifying that the waste is SRM free must be retained at the site office and made available to the Director upon request. Waste from slaughterhouses and poultry processing must be immediately covered with a minimum of 1.0 m of low permeable soil. Large carcasses (over 200 kg) shall be deposited in a

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separate slit trench and covered immediately.

#### 1.3 Waste Asbestos

The disposal of waste asbestos must be in compliance with the requirements of Section 40 of the Hazardous Waste Regulation under the *Environmental Management Act*.

#### 1.4 Contaminated Soil

Soil that contains contaminants in concentrations less than "hazardous waste" as defined by the Hazardous Waste Regulation may be disposed at the landfill site. Disposal includes monofilling, co-disposal with other wastes, and use as daily or intermediate cover material. Disposal does not include use as final cover material.

#### 1.5 Ozone Depleting Substances

Release of ozone depleting substances from the storage, handling and disposal of used appliances, equipment, or any material containing ozone depleting substances is prohibited in accordance with the requirements of the Ozone Depleting Substances and other Halocarbons Regulation.

#### 1.6 Diverted Waste

This subsection applies to the recovery and storage of reusable/recyclable material.

Reusable material is defined as a product or substance that has been diverted from disposal and has reuse value in its present form.

Recyclable material is defined as a product or substance that has been diverted from disposal, has no reuse value in its present form and satisfies at least one of the following criteria:

- a. is organic material that has been diverted from residential, commercial or institutional sources and is capable of being composted, or is being composted on-site;
- b. is managed as a marketable commodity by the owner or operator of the site;
- c. is being used in the manufacture of a new product that has an established market or is being processed as an intermediate stage of an existing manufacturing process; and

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- d. has been identified as a recyclable material in the Regional District of East Kootenay Solid Waste Management Plan.

## 2. **DESIGN AND PERFORMANCE REQUIREMENTS**

### 2.1 **Design and Operations Plan**

The Operational Certificate holder shall prepare and maintain a current Design and Operations Plan. The Plan shall be developed by a qualified professional and reviewed and updated as needed and at least once every five years. The Plan must address, but not be limited to, each of the subsections in the Landfill criteria for Municipal Solid Waste including performance, siting, design, operational, closure and post-closure criteria. The facilities must be developed, operated and closed in accordance with the Plan. Should there be any inconsistency between the Operational Certificate and the Plan, the Operational Certificate shall take precedence. The Columbia Valley Subregional Landfill – Design and Operations Plan prepared by Sperling Hansen Associates, dated November, 2006 is hereby approved.

Written authorization from the Director shall be obtained prior to implementing any changes to the approved plans. Based on any information obtained in connection with this facility, the Director may require revision of, or addition to the design, operating and closure plans.

### 2.2 **Maintenance of Works and Emergency Procedures**

The Operational Certificate holder shall inspect the landfill, any related pollution prevention works and designated areas for managing recyclable or reusable materials regularly and maintain them in good working order.

In the event of an emergency or condition which prevents continuing operation of the authorized works and/or the continued performance of the prescribed methods of operation, the Operational Certificate holder shall immediately notify the Director and take appropriate remedial action.

The Director may reduce or suspend operations to protect the environment until the authorized works has been restored, and / or corrective steps taken to prevent unauthorized discharges.

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Any activity or construction on the disposal site must be carried out in a manner that protects the integrity of the areas under final cover and without compromising landfill stability or without damage to the authorized works and related appurtenances.

Any settlement of areas under final cover that prevents the authorized works and appurtenances mentioned in Section 1 from functioning as intended in the Design & Operations Plan must be addressed /remedied accordingly to the satisfaction of the Director.

All access roads, within the landfill boundary, used for transporting waste to the landfill for disposal shall be improved and maintained as necessary to assure safe and reliable all-weather access to the tipping face.

#### **2.3 Additional Facilities or Works**

The Director may require investigations, surveys, and the construction of additional facilities or works related to the landfill operation. The Director may also revise the requirements of any of the information required by this Operational Certificate including plans, programs, assessments and reports.

#### **2.4 Public Health, Safety and Nuisance**

Operation of the landfill shall be carried out in a manner that ensures that the facility does not pose a threat to public health or safety. The potential for creation of public nuisance should be minimized. Restricting unauthorized access, internal access road maintenance, traffic control measures, noise reduction measures, dust suppression, vector control, wildlife attraction reduction measures and other measures should be undertaken as applicable to ensure the same. There shall be no burning of municipal solid waste at the landfill. Site night time lighting shall be minimized. The decibel level on back-up alarms will be kept to a minimum and also satisfy the Worksafe BC requirements.

#### **2.5 Surface Water Diversion**

Discharge of municipal solid waste into water is prohibited. The Operational Certificate holder shall construct adequate surface water and groundwater diversion works to minimize surface water run-off and groundwater seepage

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for Director, *Environmental Management Act*  
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from entering the landfill.

#### 2.6 Groundwater Impacts

The landfill shall be operated in a manner such that ground or surface water quality does not decrease beyond that specified by the British Columbia Water Quality Guidelines, or other appropriate criteria as may be specified by the Director, at or beyond the landfill property boundary. If exceedances to the specified water quality criteria occur as a result of landfill operations, the Director may require that leachate management control measures or works be undertaken. Terms of reference for any leachate management study and/or design work shall be submitted to the Director for review prior to conducting the work.

#### 2.7 Landfill Gas Management

The landfill shall be operated such that combustible gas concentrations do not exceed the lower explosive limit in soils at the property boundary or 25% of the lower explosive limit in any on-site or off-site structure or facility.

#### 2.8 Property Boundary

A 50 metre property boundary setback for the deposit of municipal soil waste shall be maintained around the perimeter of the landfill property. Natural vegetation shall be maintained in the buffer zone except at the point of access and at the storm water retention pond.

### 3. OPERATIONAL REQUIREMENTS

#### 3.1 Authorized Operations

The Regional District of East Kootenay shall maintain the landfill authorized in Section 1 as a Sanitary Landfill operation in accordance with the BC Landfill Criteria and the Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills.

Date issued: March 1, 2011



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for Director, *Environmental Management Act*  
Kootenay Region

### **3.2 Inspections of Authorized Works**

The Operational Certificate holder shall inspect the authorized works to ensure compliance with this Operational Certificate and the BC Landfill Criteria. A record of the inspections and actions recommended or action items shall be maintained in the operating record at the site office and made available to the Director upon request.

The Operational Certificate holder shall inspect the property boundaries regularly and notify the Director of any visual evidence of environmental impacts including significant litter beyond the property boundary.

### **3.3 Waste Deposition and Compaction**

The Operational Certificate holder shall compact and contour the refuse daily. The Operational Certificate holder shall ensure that waste deposition and compaction meets or exceeds the requirements of the BC Landfill Criteria or its most current version. Control must be exercised to ensure keeping freshly deposited refuse in a well defined and small /manageable working face.

#### **3.3.1 Daily Cover**

Application of daily cover shall be in accordance with requirements of the BC Landfill Criteria or its most current version. The use of other alternative cover material may be approved by the Director upon written request.

#### **3.3.2 Intermediate Cover**

The frequency and application of intermediate cover shall be in accordance with requirements of the BC Landfill Criteria or its most current version. The use of functionally equivalent, intermediate cover material may be approved by the Director upon written request.

For areas that have received intermediate cover, the Operational Certificate holder shall maintain the integrity of the cover, identify any breaches in the cover, and repair such breaches in an acceptable manner. The Operational Certificate holder shall address any leachate breaks on the advice of a Qualified Professional.

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### 3.3.3 Final Cover

Completed portions of the landfill are to progressively receive final cover during the active life of the landfill in accordance with the Design and Operations Plan and the most recent version of the BC Landfill Criteria or its most current version.

Final cover shall be installed in accordance with the requirements of the BC Landfill Criteria or its most recent version. Completed portions of the landfill are to progressively receive final cover during the active life of the landfill as specified in the Design & Operational Plan.

For areas that have received final cover, the Operational Certificate holder shall maintain the integrity of the final cover, identify any breaches in the cover, and repair such breaches in an acceptable manner. Soil erosion and standing water should be prevented to the maximum extent practicable. Erosion damage must be repaired and revegetated if applicable to ensure that all waste remains covered. All areas that have settled or where water ponds, must be refilled with soil, graded and seeded. Areas where vegetation has not been fully established must be fertilized, re-seeded, and maintained.

The Operational Certificate holder must record any post-closure repairs performed in the site operating log/records and also report the same to the Director in the Annual Report for the site.

### 3.4 Wildlife and Vector Control

The Operational Certificate holder shall exercise caution/due diligence to ensure that vectors and wildlife attractants are reduced/minimized as a result of routine landfilling operations. Such measures include but are not limited to –

- a. Application of cover material in a timely and consistent manner in compliance with the requirements of the BC Landfill Criteria or by such additional methods as approved by the Director.
- b. Installation of electrified wildlife control fencing around the perimeter of the landfill site and shall be electrified for at least the period of March 15 through November 30 of each year.
- c. Ensuring that the public drop off area is used in a manner that does not contribute to wildlife attraction.

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- d. Preparation of a separate bear management strategy if deemed necessary by the Director.

For the purpose of this section, a “vector” is defined as an organism or carrier capable of transmitting a pathogen from one organism to another including, but not limited to flies and other insects, rodents and birds.

For the purpose of this section, an “attractant” is defined as waste, municipal solid waste, refuse, organic matter, compost, garbage, food or food waste that attracts bears or wildlife.

### **3.5 Site Access and Supervision**

The site should be secured to prevent unauthorized access and use. Security procedures shall be implemented that provide for an effective means of controlling entry and exit at all times. Lockable gates shall be installed at all access routes to the landfill property. Gates, perimeter fencing and/or barriers shall be installed and maintained where necessary to prevent unauthorized access to the Landfill property by vehicles. Gates shall be closed to restrict access during non-operating hours or when supervision is not available.

Where feasible, use of the site by waste haulers must occur during site operational hours. Waste haulers having access after hours must be informed in writing regarding landfill procedures and specifically designated areas for depositing waste.

The Operational Certificate holder shall ensure that the site is assigned sufficient staff to ensure proper, orderly, and safe operation of all materials handling equipment, access control, and, to ensure public safety. Staff shall be present at all times during operating hours.

The Operational Certificate holder shall ensure that any person(s) authorized to work within the landfill boundary is fully cognizant with the requirements of this Operational Certificate and the specifications of the Design and Operations Plan.

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Kootenay Region

### 3.6 Litter Control

Litter shall be controlled and minimized by compacting the waste, minimizing the work face area, applying cover at the required frequencies and good housekeeping practices. A regular litter pick-up program to target windblown litter must be established as part of routine site operations. Litter prevention measures including provision of litter control fences must be undertaken, if necessary. Controls shall prevent the accumulation, or off-site migration, of litter in quantities that create a nuisance or cause other problems.

### 3.7 Waste Reduction and Alternate Disposal

The Operational Certificate holder is encouraged to segregate for recycling and reuse, where possible, materials destined for disposal at this site.

In certain landfill environments, some construction and demolition debris or other wastes may create specific air and water quality concerns. If problems arise at this site that are attributable to these specific wastes, the Director may require that alternate disposal/storage procedures be implemented.

### 3.8 Operator Requirements

The Operational Certificate holder shall ensure that any person(s) designated as a landfill operator is adequately trained. The Operational Certificate holder shall ensure that all landfill operators complete the training program specified within six months of their employment.

For the purpose of this Operational Certificate, “adequately trained” refers to being knowledgeable as a result of completing an industry recognized landfill operator training program such as the BC Qualified Landfill Operator (BCQLO) training program.

Training records for staff shall be maintained and made available to the Director upon request.

### 3.9 Scavenging and Salvaging

Uncontrolled scavenging of waste is prohibited. The controlled separation of salvageable waste stream components by persons authorized by the Operational Certificate holder is allowed in areas designated for separation and storage of these materials.

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Kootenay Region

### **3.10 Sign Requirements**

A sign shall be posted at each entrance gate with the following current information;

- a. Site name;
- b. Contact phone number and address for owner;
- c. Phone number in case of emergency;
- d. Hours and days of operation;
- e. Materials/waste accepted for landfill; and
- f. Tipping fees.

Additional signs which clearly indicate the directions to the active tipping face, public disposal area, recycling and waste separation areas, etc. should also be displayed within the landfill site as deemed necessary.

## **4. MONITORING AND REPORTING REQUIREMENTS**

### **4.1 Environmental Monitoring Program**

A monitoring program shall be developed by a qualified professional to identify potential impacts to the environment and public health from the facility. The monitoring program shall be submitted as part of the Design and Operations Plan and shall address, but not be limited to, subsections 4.1, 4.2, 4.3 and 7.15 of the Landfill Criteria for Municipal Solid Waste and the Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills. Any changes to the Environmental Monitoring Program must be approved in writing by the Director.

Based on the information submitted in the annual report or any other information relevant to the site, the Director may vary the frequency, location and analyses of environmental monitoring as warranted.

The Operational Certificate holder shall ensure that environmental monitoring devices are adequately secured and maintained, including provisions to ensure protection from damage due to vehicles or vandalism.

The Operational Certificate holder shall maintain records of all monitoring program data and analyses and submit them quarterly to the Regional Waste Manager.

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Kootenay Region

#### 4.2 Waste Quantity

The quantity of waste entering the landfill shall be measured using a weigh scale or appropriate volume measurements.

The quantity of waste material diverted and removed from the waste stream shall be measured using methods approved by the Director.

Records of the quantities of waste entering the landfill, quantities of waste landfilled and diverted from landfilling shall be made available to the Director upon request.

#### 4.3 Sampling Techniques

Sampling shall be carried out in accordance with the procedures described in the most recent edition of the "British Columbia Field Sampling Manual for Continuous Monitoring Plus 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).

Proper care should be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination and breakage.

#### 4.4 Analyses

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

A copy of the above manual may be purchased from the Queen's Printer Publication Centre, P.O. Box 9452, Stn. Prov. Gov't. Victoria, British Columbia, V8W 9V7 (1-800-663-6105 or (250) 387-6409).

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Kootenay Region

#### 4.5 Quality Assurance

Where applicable, appropriate minimum analytical detection limits for each parameter listed shall be at the limit of quantitation, which must be at least 1/10th of the DW standard listed in the most recent Approved and Working Water Quality Guidelines prepared by the Water Stewardship Division of the Ministry of Environment, so that analytical error is relatively small compared to the result.

The Operational Certificate holder shall obtain from the analytical laboratory their precision, accuracy and blank data for each sample set submitted as well as an evaluation of the data acceptability, based on the criteria set by the laboratory.

A duplicate sample shall be prepared and submitted for analysis for each parameter sampled at each monitoring site and each monitoring period.

The analytical laboratory shall be registered in accordance with CAEAL (Canadian Association of Environmental Analytical Laboratories) unless otherwise instructed by the Director.

Data generated from the groundwater monitoring program shall be stored in computerized data bases that have the facilities for performing statistical analysis of the data, and for creating time base plots of selected data.

Monitoring data required by the Operational Certificate must be submitted in accordance with the Environmental Data Quality Assurance Regulation.

#### 4.6 Non Compliance Reporting

The Operational Certificate holder shall notify the Director by facsimile or email of any non-compliance with the requirements of this Operational Certificate. The Operational Certificate holder shall identify the non-compliance, the cause of non-compliance, and any remedial action to address the non-compliance.

#### 4.7 Quarterly Reporting

The Operational Certificate holder shall submit to the Regional Waste Manager a quarterly report within 30 days of each quarter, each year. This report shall detail any exceedences to the landfill criteria for surface and ground water and operational certificate requirements.

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Kootenay Region

#### 4.8 Annual Reporting

The Operational Certificate holder shall submit to the Regional Waste Manager an annual report by April 30 each year for the previous calendar year. This report shall be carried out by a qualified professional and it shall include but not be limited to:

- a. an executive summary;
- b. the type and tonnage of waste received, recycled and landfilled for the year;
- c. a current topographic map or aerial photograph showing airspace consumption, on-site borrow pit changes and future developments;
- d. updated estimates for the remaining capacity, site life, closure date for the current phase and closure date for the current landfill footprint;
- e. any proposed changes from the Design and Operations Plan and the environmental monitoring program, with rationale for the changes;
- f. an operations update which summarizes landfill development work completed in the subject reporting year and work planned for the subsequent year;
- g. occurrences or observations of wildlife (medium and large carnivores) at the facility;
- h. a statement regarding the facility's progress in reducing the regional solid waste stream, in accordance with the hierarchy of reduce, reuse and recycle principles;
- i. the results of all monitoring programs as specified in this Operational Certificate. Data interpretation and comparison to the performance criteria in the Landfill Criteria for Municipal Solid Waste and the Guidelines for Environmental Monitoring and Municipal Waste Landfills. Trend analyses, as well as an evaluation of the impacts of the discharges on the receiving environment in the previous year shall be carried out by a qualified professional.
- j. approved design volume;
- k. remaining site life and capacity;
- l. an update of the status of the closure fund and any progressive closure work that was performed for the previous year; calculated non-methane organic compound (NMOC) emission rate; and
- m. any additional information requested by the Director.

All reports must be submitted, suitably formatted and tabulated on a computer storage media, or by prior arrangement, directly to the Ministry of Environment central computer system.

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The conditions of this Operational Certificate are to be reviewed annually by the Regional District of East Kootenay on or before April 30 each year, with the first review to take place on or before April 30, 2011. The need for increased or decreased monitoring or the need to upgrade existing works will be based in part on this review.

#### 4.9 Inspections

The Environmental Protection Program of the Ministry of Environment will carry out inspections of the landfill, as part of routine inspection procedure. Based on these inspections and any other information available to the Director on the effect of the operation on the receiving environment, the Regional District of East Kootenay may be required to undertake additional monitoring and/or install additional pollution abatement works.

### 5. CLOSURE AND POST-CLOSURE REQUIREMENTS

#### 5.1 Closure Plan

Columbia Valley Subregional Landfill - Design and Operations Plan Update (2006), contains sufficient closure planning information for Ministry purposes at this time. A more detailed Closure Plan, that satisfies the information requirements outlined in Section 8.1 of the Landfill Criteria for Municipal Solid Waste, shall be submitted to the Director at least 1 year prior to the anticipated closure date. Based on waste disposal and population growth rate estimates, landfill site closure is currently forecast for 2033.

#### 5.2 Declaration of Landfill

Landfills sited on titled land must register a covenant that the property was used for the purpose of waste disposal as a charge against the title to the property as provided for under Section 215.1 of the *Land Title Act*. Landfills located on Crown land are to have a “notation on file” registered that the property was used for the purpose of waste disposal.

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Kootenay Region

### 5.3 Buildings and Structures

The construction of buildings and other structures on landfills containing putrescible wastes is not recommended for a minimum period of 25 years after closure due to concerns about combustible gas and excessive settlement. Such activity will only be considered and/or authorized after an investigation and report by qualified persons. The report is to be submitted for authorization to the Director prior to initiating construction activities.

### 5.4 Site Decommissioning

In accordance with Section 40 of the *Environmental Management Act* and Part 2 of the Contaminated Sites Regulation, the Operational Certificate holder shall submit a site profile to the Regional Waste Manager at least 10 days prior to decommissioning the facilities authorized in Section 1.

### 5.5 Closure Fund

The Operational Certificate holder shall provide for the funding of progressive closure operations, final closure and beyond closure by maintaining a closure fund. The value of the closure fund shall meet or exceed the estimated closure and post-closure costs as established in the approved Design and Operations Plan and updated in the annual report, plus a reasonable contingency for any remediation which may be required.

The Operational Certificate holder shall determine and ensure that the closure fund is adequate by preparing annually a financial statement of the fund which shall be made available to the Director upon request. The financial statement shall report the accrued capital, interest and additions to the fund for the previous year and review the sufficiency of the fund and the rate of accrual in consideration of the projected costs of closure and post-closure obligations.

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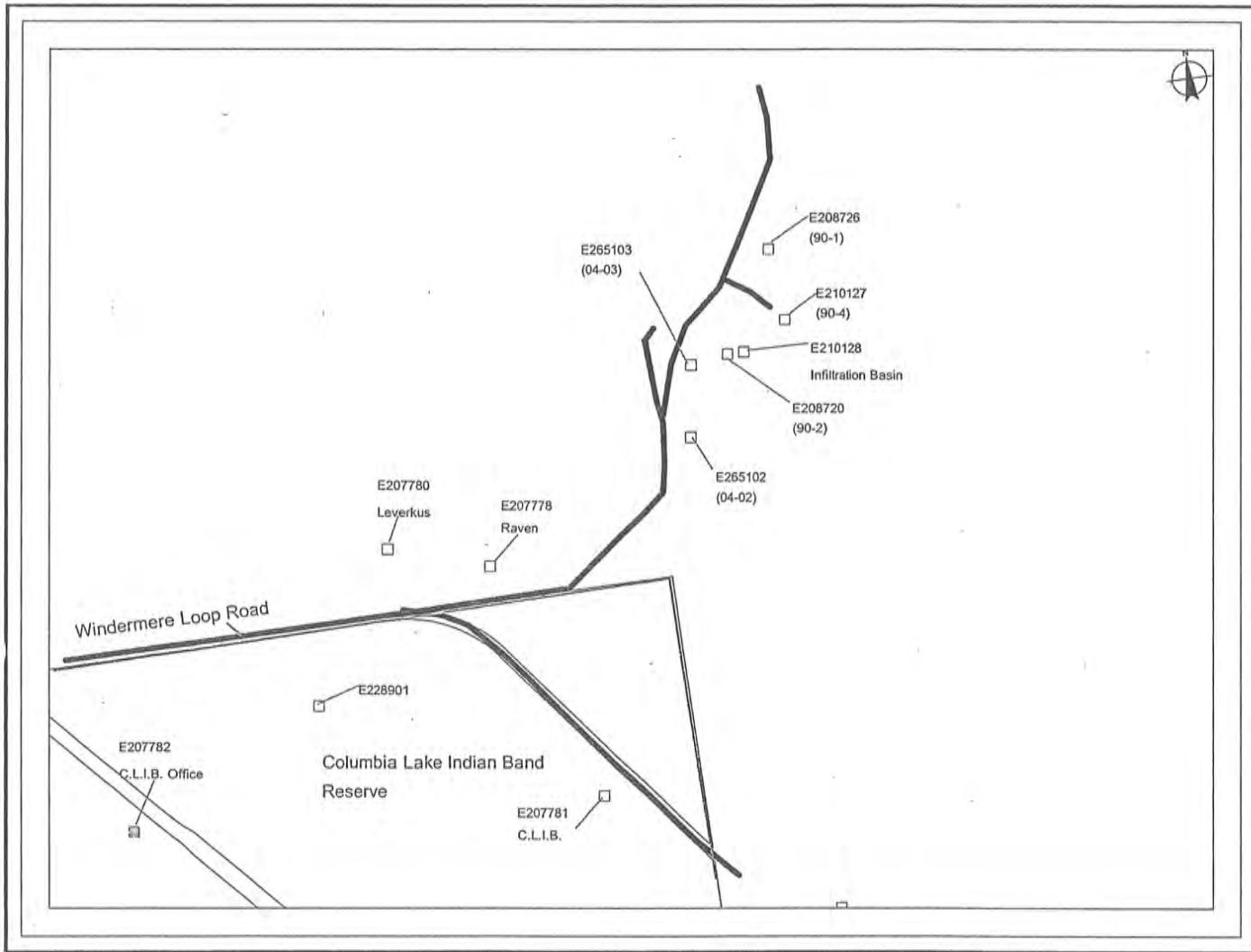
### Location Map



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Site Plan



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**APPENDIX B**  
**Water Quality Results**

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### **Table B-1 Water Quality Analysis**

**Table B-1 Water Quality Analysis**



**Table B-2 Landfill Gas Monitoring Results**

Well ID	01-Jan-21	25-Apr-21										25-Jul-21										04-Nov-21									
		CH <sub>4</sub> %	CO <sub>2</sub> %	O <sub>2</sub> %	BAL %	H <sub>2</sub> ppm	CO ppm	H <sub>2</sub> S ppm	LEL %	Relative Pressure	Barometric Pressure	CO <sub>2</sub> %	O <sub>2</sub> %	BAL %	H <sub>2</sub> ppm	CO ppm	H <sub>2</sub> S ppm	LEL %	Relative Pressure	Barometric Pressure	CH <sub>4</sub> %	CO <sub>2</sub> %	O <sub>2</sub> %	BAL %	H <sub>2</sub> ppm	CO ppm	H <sub>2</sub> S ppm	LEL %	Relative Pressure	Barometric Pressure	
GP04-5-D	GEM not available. No Data.	0.2	0.3	18.7	80.8	low	0	0	4	0	26.67	0.2	18.3	81.1	low	0	0	9	0.02	26.87	0.2	0.0	18.5	81.3	low	0	0	4	0	26.75	
GP04-5-S		0.2	0.2	18.9	80.7	low	0	0	4	0	26.67	0.2	18.3	81.1	low	0	0	9	0.04	26.87	0.2	0.2	18.3	81.3	low	0	0	4	0	26.75	
GP04-4-D		0.1	0.4	18.6	80.9	low	0	0	3	0	26.67	0.5	17.6	81.5	low	0	0	9	0.04	26.87	0.2	0.5	17.4	81.9	low	0	0	4	0	26.78	
GP04-4-S		0.2	0.2	18.8	80.8	low	0	0	4	0	26.67	0.2	18.0	81.3	low	0	0	10	0.04	26.87	0.2	0.1	18.1	81.6	low	0	0	4	0	26.78	
GP04-3-D		0.2	0.6	18.6	80.6	low	0	0	4	0	26.67	0.4	17.8	81.3	low	0	0	10	0.04	26.87	0.2	0.2	17.9	81.7	low	0	0	4	0.04	26.81	
GP04-3-S		0.2	0.3	18.8	80.7	low	0	0	4	0	26.67	0.3	17.9	81.3	low	0	0	11	0.04	26.87	0.2	0.3	17.8	81.7	low	0	0	4	0.04	26.81	
GP04-01-D		0.1	1.1	18.1	80.6	low	0	0	3	0	26.67	1	15.8	82.7	low	0	0	11	0.04	26.67	0.2	0.1	18.2	81.5	low	0	0	4	0	26.81	
GP04-01-S		0.1	0.8	18.2	80.9	low	0	0	3	0	26.67	2.9	17.9	80.5	low	0	0	11	0.04	26.67	0.1	2.7	17.2	80.0	low	0	0	3	0	26.81	
GP04-02-D		0.2	2.8	17.0	79.9	low	0	0	4	0	26.67	3.2	15.3	80.9	low	0	0	12	0.04	26.67	0.1	0.3	18.1	81.5	low	0	0	3	0	26.86	
GP04-02-S		0.2	0.7	18.4	80.7	low	0	0	4	0	26.67	1.1	17.3	81.1	low	0	0	12	0.04	26.67	0.1	0.9	17.6	81.4	low	0	0	3	0	26.86	

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**APPENDIX C**  
**Certificates of Analysis**

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Sperling Hansen Associates Inc.  
ATTN: Scott Garthwaite  
#8 - 1225 East Keith Road  
North Vancouver BC V7J 1J3

Date Received: 12-JAN-21  
Report Date: 19-JAN-21 16:47 (MT)  
Version: FINAL

Client Phone: 604-986-7723

## Certificate of Analysis

Lab Work Order #: L2547213

Project P.O. #: NOT SUBMITTED

Job Reference: 20050 COLUMBIA VALLEY

C of C Numbers:

Legal Site Desc:

A handwritten signature in black ink, appearing to read "Patryk Wojciak".

Patryk Wojciak, B.Sc., P.Chem.  
Account Manager

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

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L2547213 CONTD....

PAGE 2 of 6

19-JAN-21 16:47 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2547213-1 Groundwater 10-JAN-21 12:00 E207782	L2547213-2 Groundwater 10-JAN-21 12:00 E207780	L2547213-3 Groundwater 10-JAN-21 12:00 E265103	L2547213-4 Groundwater 10-JAN-21 12:00 E265102	
Grouping	Analyte					
<b>WATER</b>						
<b>Physical Tests</b>	Hardness (as CaCO <sub>3</sub> ) (mg/L)	568	HTC	588	HTC	726
	Total Suspended Solids (mg/L)	1.5		<1.0		5700
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO <sub>3</sub> ) (mg/L)	199		228		374
	Ammonia as N (mg/L)	<0.0050		<0.0050		0.0105
	Bicarbonate (HCO <sub>3</sub> ) (mg/L)	242		278		456
	Carbonate (CO <sub>3</sub> ) (mg/L)	<5.0		<5.0		<5.0
	Chloride (Cl) (mg/L)	1.57		3.03	DLHC	38.5
	Conductivity (EC) (uS/cm)	920		947	DLHC	1200
	Fluoride (F) (mg/L)	0.195		0.18	DLHC	0.17
	Hydroxide (OH) (mg/L)	<5.0		<5.0		<5.0
	Nitrate and Nitrite (as N) (mg/L)	<0.0051		0.196	DLHC	0.246
	Nitrate (as N) (mg/L)	<0.0050		0.196	DLHC	0.246
	Nitrite (as N) (mg/L)	<0.0010		<0.0050	DLHC	<0.0050
	pH (pH)	7.87		7.95	DLHC	7.36
	Sulfate (SO <sub>4</sub> ) (mg/L)	346		368	DLHC	370
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	0.0033		<0.0030		
	Antimony (Sb)-Total (mg/L)	<0.00010		<0.00010		
	Arsenic (As)-Total (mg/L)	<0.00010		<0.00010		
	Barium (Ba)-Total (mg/L)	0.00947		0.0103		
	Beryllium (Be)-Total (mg/L)	<0.000020		<0.000020		
	Bismuth (Bi)-Total (mg/L)	<0.000050		<0.000050		
	Boron (B)-Total (mg/L)	0.032		0.038		
	Cadmium (Cd)-Total (mg/L)	<0.0000050		0.0000195		
	Calcium (Ca)-Total (mg/L)	147		159		
	Chromium (Cr)-Total (mg/L)	<0.00010		<0.00010		
	Cobalt (Co)-Total (mg/L)	<0.00010		<0.00010		
	Copper (Cu)-Total (mg/L)	0.00156		<0.00050		
	Iron (Fe)-Total (mg/L)	0.026		0.095		
	Lead (Pb)-Total (mg/L)	<0.000050		<0.000050		
	Lithium (Li)-Total (mg/L)	0.0081		0.0072		
	Magnesium (Mg)-Total (mg/L)	48.7		46.1		
	Manganese (Mn)-Total (mg/L)	0.00222		0.00251		
	Mercury (Hg)-Total (mg/L)	<0.0000050		<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	0.000678		0.000753		
	Nickel (Ni)-Total (mg/L)	<0.00050		<0.00050		
	Phosphorus (P)-Total (mg/L)	<0.050		<0.050		
	Potassium (K)-Total (mg/L)	1.07		1.10		

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

L2547213 CONTD....

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19-JAN-21 16:47 (MT)

Version: FINAL

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>	L2547213-1 Groundwater 10-JAN-21 12:00 E207782	L2547213-2 Groundwater 10-JAN-21 12:00 E207780	L2547213-3 Groundwater 10-JAN-21 12:00 E265103	L2547213-4 Groundwater 10-JAN-21 12:00 E265102	
<b>Grouping</b>	<b>Analyte</b>					
<b>WATER</b>						
<b>Total Metals</b>	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Total (mg/L)	3.83	3.92			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	5.81	3.80			
	Strontium (Sr)-Total (mg/L)	1.68 <sup>RRV</sup>	1.82 <sup>RRV</sup>			
	Sulfur (S)-Total (mg/L)	128	125			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Total (mg/L)	0.00157	0.00168			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	0.0045	0.0439			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location			FIELD	FIELD	
	Dissolved Metals Filtration Location			FIELD	FIELD	
	Aluminum (Al)-Dissolved (mg/L)			0.0064	0.0058	
	Antimony (Sb)-Dissolved (mg/L)			<0.00010	0.00011	
	Arsenic (As)-Dissolved (mg/L)			<0.00010	0.00013	
	Barium (Ba)-Dissolved (mg/L)			0.0204	0.0139	
	Beryllium (Be)-Dissolved (mg/L)			<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)			<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)			0.043	0.043	
	Cadmium (Cd)-Dissolved (mg/L)			0.0000050	0.0000089	
	Calcium (Ca)-Dissolved (mg/L)			208	204	
	Chromium (Cr)-Dissolved (mg/L)			<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)			<0.00010	<0.00010	
	Copper (Cu)-Dissolved (mg/L)			0.00081	0.00091	
	Iron (Fe)-Dissolved (mg/L)			<0.010	0.011	
	Lead (Pb)-Dissolved (mg/L)			0.000064	<0.000050	
	Lithium (Li)-Dissolved (mg/L)			0.0070	0.0078	
	Magnesium (Mg)-Dissolved (mg/L)			50.0	43.5	
	Manganese (Mn)-Dissolved (mg/L)			0.0272	0.00415	
	Mercury (Hg)-Dissolved (mg/L)			<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)			0.000672	0.000689	
	Nickel (Ni)-Dissolved (mg/L)			0.00133	0.00090	
	Phosphorus (P)-Dissolved (mg/L)			<0.050	<0.050	
	Potassium (K)-Dissolved (mg/L)			1.19	1.25	

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

L2547213 CONTD....

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19-JAN-21 16:47 (MT)

Version: FINAL

Sample ID Description Sampled Date Sampled Time Client ID	L2547213-1 Groundwater 10-JAN-21 12:00 E207782	L2547213-2 Groundwater 10-JAN-21 12:00 E207780	L2547213-3 Groundwater 10-JAN-21 12:00 E265103	L2547213-4 Groundwater 10-JAN-21 12:00 E265102	
Grouping	Analyte				
<b>WATER</b>					
<b>Dissolved Metals</b>	Selenium (Se)-Dissolved (mg/L)		<0.000050	<0.000050	
	Silicon (Si)-Dissolved (mg/L)		3.82	4.43	
	Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)		9.32	3.77	
	Strontium (Sr)-Dissolved (mg/L)		1.55 <sup>DLHC</sup>	1.80 <sup>DLHC</sup>	
	Sulfur (S)-Dissolved (mg/L)		119	125	
	Thallium (Tl)-Dissolved (mg/L)		<0.000010	<0.000010	
	Tin (Sn)-Dissolved (mg/L)		0.00013	0.00017	
	Titanium (Ti)-Dissolved (mg/L)		<0.00030	<0.00030	
	Uranium (U)-Dissolved (mg/L)		0.00173	0.00199	
	Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)		0.0029	0.0247	
	Zirconium (Zr)-Dissolved (mg/L)		<0.00030	<0.00030	

\* 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	Magnesium (Mg)-Dissolved	MS-B	L2547213-3, -4
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2547213-3, -4
Matrix Spike	Ammonia as N	MS-B	L2547213-1, -2, -3, -4

**Qualifiers for Individual Parameters Listed:**

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
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**
<b>BE-D-L-CCMS-CL</b>	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
<b>BE-T-L-CCMS-CL</b>	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
<b>CL-L-IC-N-CL</b>	Water	Chloride in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
<b>F-L-IC-CL</b>	Water	Fluoride	APHA 4110 B-Ion Chromatography
<b>HARDNESS-CALC-CL</b>	Water	Hardness	APHA 2340 B
		Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.	
<b>HG-D-CVAA-CL</b>	Water	Dissolved Mercury in Water by CVAAS	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.	
<b>HG-T-CVAA-CL</b>	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)
		Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.	
<b>MET-D-CCMS-CL</b>	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
<b>MET-T-CCMS-CL</b>	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
<b>N2N3-CALC-CL</b>	Water	Nitrate+Nitrite	CALCULATION
<b>NH3-L-F-CL</b>	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
		This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.	
<b>NO2-L-IC-N-CL</b>	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
<b>NO3-L-IC-N-CL</b>	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
<b>PH/EC/ALK-CL</b>	Water	pH, Conductivity and Total Alkalinity	APHA 4500H,2510,2320

## Reference Information

All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)  
 pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode.  
 Alkalinity measurement is based on the sample's capacity to neutralize acid  
 Conductivity measurement is based on the sample's capacity to convey an electric current

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

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

**TSS-L-CL** Water Total Suspended Solids 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, and by drying the filter at 104 deg. C.

\*\* 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
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, 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: L2547213

Report Date: 19-JAN-21

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**Client:** Sperling Hansen Associates Inc.  
 #8 - 1225 East Keith Road  
 North Vancouver BC V7J 1J3

**Contact:** Scott Garthwaite

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>BE-D-L-CCMS-CL</b>	<b>Water</b>							
Batch	R5342756							
WG3472472-2	LCS	TMRM						
Beryllium (Be)-Dissolved			100.0		%		80-120	12-JAN-21
WG3472472-1	MB							
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	12-JAN-21
<b>BE-T-L-CCMS-CL</b>	<b>Water</b>							
Batch	R5344899							
WG3472843-2	LCS	TMRM						
Beryllium (Be)-Total			107.9		%		80-120	13-JAN-21
WG3472843-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	13-JAN-21
<b>CL-L-IC-N-CL</b>	<b>Water</b>							
Batch	R5344822							
WG3472980-2	LCS							
Chloride (Cl)			105.0		%		85-115	12-JAN-21
WG3472980-1	MB							
Chloride (Cl)			<0.10		mg/L		0.1	12-JAN-21
<b>F-L-IC-CL</b>	<b>Water</b>							
Batch	R5344822							
WG3472980-2	LCS							
Fluoride (F)			98.4		%		85-115	12-JAN-21
WG3472980-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	12-JAN-21
<b>HG-D-CVAA-CL</b>	<b>Water</b>							
Batch	R5353916							
WG3475612-2	LCS							
Mercury (Hg)-Dissolved			101.0		%		80-120	19-JAN-21
WG3475612-1	MB							
Mercury (Hg)-Dissolved			<0.000005C		mg/L		0.000005	19-JAN-21
<b>HG-T-CVAA-CL</b>	<b>Water</b>							
Batch	R5353916							
WG3475615-3	DUP	L2547213-1						
Mercury (Hg)-Total			<0.0000050	<0.000005C	RPD-NA	mg/L	N/A	20
WG3475615-2	LCS							
Mercury (Hg)-Total			108.0		%		80-120	19-JAN-21
WG3475615-1	MB							
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	19-JAN-21
WG3475615-4	MS	L2547213-1						

## Quality Control Report

Workorder: L2547213

Report Date: 19-JAN-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>HG-T-CVAA-CL</b>	<b>Water</b>							
Batch R5353916								
WG3475615-4 MS		L2547213-1						
Mercury (Hg)-Total			82.2		%		70-130	19-JAN-21
<b>MET-D-CCMS-CL</b>	<b>Water</b>							
Batch R5342756								
WG3472472-2 LCS		TMRM						
Aluminum (Al)-Dissolved			107.7		%		80-120	12-JAN-21
Antimony (Sb)-Dissolved			107.1		%		80-120	12-JAN-21
Arsenic (As)-Dissolved			103.5		%		80-120	12-JAN-21
Barium (Ba)-Dissolved			108.4		%		80-120	12-JAN-21
Bismuth (Bi)-Dissolved			113.0		%		80-120	12-JAN-21
Boron (B)-Dissolved			105.1		%		80-120	12-JAN-21
Cadmium (Cd)-Dissolved			106.0		%		80-120	12-JAN-21
Calcium (Ca)-Dissolved			100.6		%		80-120	12-JAN-21
Chromium (Cr)-Dissolved			106.6		%		80-120	12-JAN-21
Cobalt (Co)-Dissolved			105.6		%		80-120	12-JAN-21
Copper (Cu)-Dissolved			103.4		%		80-120	12-JAN-21
Iron (Fe)-Dissolved			104.3		%		80-120	12-JAN-21
Lead (Pb)-Dissolved			112.3		%		80-120	12-JAN-21
Lithium (Li)-Dissolved			104.0		%		80-120	12-JAN-21
Magnesium (Mg)-Dissolved			108.7		%		80-120	12-JAN-21
Manganese (Mn)-Dissolved			108.1		%		80-120	12-JAN-21
Molybdenum (Mo)-Dissolved			113.1		%		80-120	12-JAN-21
Nickel (Ni)-Dissolved			105.1		%		80-120	12-JAN-21
Phosphorus (P)-Dissolved			109.2		%		70-130	12-JAN-21
Potassium (K)-Dissolved			106.6		%		80-120	12-JAN-21
Selenium (Se)-Dissolved			100.3		%		80-120	12-JAN-21
Silicon (Si)-Dissolved			100.6		%		60-140	12-JAN-21
Silver (Ag)-Dissolved			109.8		%		80-120	12-JAN-21
Sodium (Na)-Dissolved			107.5		%		80-120	12-JAN-21
Strontium (Sr)-Dissolved			114.1		%		80-120	12-JAN-21
Sulfur (S)-Dissolved			105.0		%		80-120	12-JAN-21
Thallium (Tl)-Dissolved			109.7		%		80-120	12-JAN-21
Tin (Sn)-Dissolved			109.6		%		80-120	12-JAN-21
Titanium (Ti)-Dissolved			99.1		%		80-120	12-JAN-21

## Quality Control Report

Workorder: L2547213

Report Date: 19-JAN-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	Water							
Batch	R5342756							
WG3472472-2 LCS		TMRM						
Uranium (U)-Dissolved			110.5		%		80-120	12-JAN-21
Vanadium (V)-Dissolved			106.8		%		80-120	12-JAN-21
Zinc (Zn)-Dissolved			100.4		%		80-120	12-JAN-21
Zirconium (Zr)-Dissolved			110.7		%		80-120	12-JAN-21
WG3472472-1 MB								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	12-JAN-21
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	12-JAN-21
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	12-JAN-21
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	12-JAN-21
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	12-JAN-21
Boron (B)-Dissolved			<0.010		mg/L		0.01	12-JAN-21
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	12-JAN-21
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	12-JAN-21
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	12-JAN-21
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	12-JAN-21
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	12-JAN-21
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	12-JAN-21
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	12-JAN-21
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	12-JAN-21
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	12-JAN-21
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	12-JAN-21
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	12-JAN-21
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	12-JAN-21
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	12-JAN-21
Potassium (K)-Dissolved			<0.050		mg/L		0.05	12-JAN-21
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	12-JAN-21
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	12-JAN-21
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	12-JAN-21
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	12-JAN-21
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	12-JAN-21
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	12-JAN-21
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	12-JAN-21
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	12-JAN-21
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	12-JAN-21

## Quality Control Report

Workorder: L2547213

Report Date: 19-JAN-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-CL</b>	<b>Water</b>							
Batch	R5342756							
WG3472472-1 MB								
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	12-JAN-21
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	12-JAN-21
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	12-JAN-21
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	12-JAN-21
<b>MET-T-CCMS-CL</b>	<b>Water</b>							
Batch	R5344899							
WG3472843-2 LCS		TMRM						
Aluminum (Al)-Total			108.4		%		80-120	13-JAN-21
Antimony (Sb)-Total			113.2		%		80-120	13-JAN-21
Arsenic (As)-Total			115.2		%		80-120	13-JAN-21
Barium (Ba)-Total			107.7		%		80-120	13-JAN-21
Bismuth (Bi)-Total			113.1		%		80-120	13-JAN-21
Boron (B)-Total			104.2		%		80-120	13-JAN-21
Cadmium (Cd)-Total			114.6		%		80-120	13-JAN-21
Calcium (Ca)-Total			117.6		%		80-120	13-JAN-21
Chromium (Cr)-Total			114.9		%		80-120	13-JAN-21
Cobalt (Co)-Total			111.0		%		80-120	13-JAN-21
Copper (Cu)-Total			112.4		%		80-120	13-JAN-21
Iron (Fe)-Total			111.6		%		80-120	13-JAN-21
Lead (Pb)-Total			114.7		%		80-120	13-JAN-21
Lithium (Li)-Total			108.3		%		80-120	13-JAN-21
Magnesium (Mg)-Total			114.2		%		80-120	13-JAN-21
Manganese (Mn)-Total			114.4		%		80-120	13-JAN-21
Molybdenum (Mo)-Total			117.2		%		80-120	13-JAN-21
Nickel (Ni)-Total			110.9		%		80-120	13-JAN-21
Phosphorus (P)-Total			115.3		%		70-130	13-JAN-21
Potassium (K)-Total			117.6		%		80-120	13-JAN-21
Selenium (Se)-Total			105.9		%		80-120	13-JAN-21
Silicon (Si)-Total			112.2		%		60-140	13-JAN-21
Silver (Ag)-Total			116.4		%		80-120	13-JAN-21
Sodium (Na)-Total			113.2		%		80-120	13-JAN-21
Strontium (Sr)-Total			114.6		%		80-120	13-JAN-21
Sulfur (S)-Total			109.4		%		80-120	13-JAN-21
Thallium (Tl)-Total			113.6		%		80-120	13-JAN-21

## Quality Control Report

Workorder: L2547213

Report Date: 19-JAN-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL	Water							
Batch	R5344899							
WG3472843-2	LCS	TMRM						
Tin (Sn)-Total			114.0		%		80-120	13-JAN-21
Titanium (Ti)-Total			113.7		%		80-120	13-JAN-21
Uranium (U)-Total			116.3		%		80-120	13-JAN-21
Vanadium (V)-Total			116.1		%		80-120	13-JAN-21
Zinc (Zn)-Total			116.3		%		80-120	13-JAN-21
Zirconium (Zr)-Total			111.9		%		80-120	13-JAN-21
WG3472843-1	MB							
Aluminum (Al)-Total			<0.0030		mg/L		0.003	13-JAN-21
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	13-JAN-21
Arsenic (As)-Total			<0.00010		mg/L		0.0001	13-JAN-21
Barium (Ba)-Total			<0.00010		mg/L		0.0001	13-JAN-21
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	13-JAN-21
Boron (B)-Total			<0.010		mg/L		0.01	13-JAN-21
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	13-JAN-21
Calcium (Ca)-Total			<0.050		mg/L		0.05	13-JAN-21
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	13-JAN-21
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	13-JAN-21
Copper (Cu)-Total			<0.00050		mg/L		0.0005	13-JAN-21
Iron (Fe)-Total			<0.010		mg/L		0.01	13-JAN-21
Lead (Pb)-Total			<0.000050		mg/L		0.00005	13-JAN-21
Lithium (Li)-Total			<0.0010		mg/L		0.001	13-JAN-21
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	13-JAN-21
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	13-JAN-21
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	13-JAN-21
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	13-JAN-21
Phosphorus (P)-Total			<0.050		mg/L		0.05	13-JAN-21
Potassium (K)-Total			<0.050		mg/L		0.05	13-JAN-21
Selenium (Se)-Total			<0.000050		mg/L		0.00005	13-JAN-21
Silicon (Si)-Total			<0.050		mg/L		0.05	13-JAN-21
Silver (Ag)-Total			<0.000010		mg/L		0.00001	13-JAN-21
Sodium (Na)-Total			<0.050		mg/L		0.05	13-JAN-21
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	13-JAN-21
Sulfur (S)-Total			<0.50		mg/L		0.5	13-JAN-21
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	13-JAN-21

## Quality Control Report

Workorder: L2547213

Report Date: 19-JAN-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-CL</b>	<b>Water</b>							
Batch	R5344899							
WG3472843-1 MB								
Tin (Sn)-Total			<0.00010		mg/L		0.0001	13-JAN-21
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	13-JAN-21
Uranium (U)-Total			<0.000010		mg/L		0.00001	13-JAN-21
Vanadium (V)-Total			<0.000050		mg/L		0.0005	13-JAN-21
Zinc (Zn)-Total			<0.0030		mg/L		0.003	13-JAN-21
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	13-JAN-21
<b>NH3-L-F-CL</b>	<b>Water</b>							
Batch	R5345160							
WG3473038-10 LCS								
Ammonia as N			111.4		%		85-115	12-JAN-21
WG3473038-14 LCS								
Ammonia as N			100.7		%		85-115	12-JAN-21
WG3473038-13 MB								
Ammonia as N			<0.0050		mg/L		0.005	12-JAN-21
WG3473038-9 MB								
Ammonia as N			<0.0050		mg/L		0.005	12-JAN-21
<b>NO2-L-IC-N-CL</b>	<b>Water</b>							
Batch	R5344822							
WG3472980-2 LCS								
Nitrite (as N)			99.8		%		90-110	12-JAN-21
WG3472980-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	12-JAN-21
<b>NO3-L-IC-N-CL</b>	<b>Water</b>							
Batch	R5344822							
WG3472980-2 LCS								
Nitrate (as N)			105.2		%		90-110	12-JAN-21
WG3472980-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	12-JAN-21
<b>PH/EC/ALK-CL</b>	<b>Water</b>							
Batch	R5345177							
WG3473096-14 LCS								
Conductivity (EC)			97.8		%		90-110	12-JAN-21
Alkalinity, Total (as CaCO <sub>3</sub> )			104.2		%		85-115	12-JAN-21
WG3473096-13 MB								
Conductivity (EC)			<2.0		uS/cm		2	12-JAN-21
Bicarbonate (HCO <sub>3</sub> )			<5.0		mg/L		5	12-JAN-21

## Quality Control Report

Workorder: L2547213

Report Date: 19-JAN-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>PH/EC/ALK-CL</b>								
<b>Water</b>								
Batch	R5345177							
<b>WG3473096-13</b>	<b>MB</b>							
Carbonate (CO <sub>3</sub> )			<5.0		mg/L		5	12-JAN-21
Hydroxide (OH)			<5.0		mg/L		5	12-JAN-21
Alkalinity, Total (as CaCO <sub>3</sub> )			<2.0		mg/L		2	12-JAN-21
<b>SO4-L-IC-N-CL</b>								
<b>Water</b>								
Batch	R5344822							
<b>WG3472980-2</b>	<b>LCS</b>							
Sulfate (SO <sub>4</sub> )			102.3		%		85-115	12-JAN-21
<b>WG3472980-1</b>	<b>MB</b>							
Sulfate (SO <sub>4</sub> )			<0.050		mg/L		0.05	12-JAN-21
<b>TSS-L-CL</b>								
<b>Water</b>								
Batch	R5348797							
<b>WG3473868-4</b>	<b>LCS</b>							
Total Suspended Solids			89.8		%		85-115	15-JAN-21
<b>WG3473868-3</b>	<b>MB</b>							
Total Suspended Solids			<1.0		mg/L		1	15-JAN-21

# Quality Control Report

Workorder: L2547213

Report Date: 19-JAN-21

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## 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:

All test results reported with this submission were conducted within ALS recommended hold times.

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.



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## Chain of Custody (COC) / Analytical Request Form



L2547213-COFC

Canada Toll Free: 1 800 668 9878

Report To		Contact and company name below will appear on the final report			Reports / Recipients		Turnaround Time (TAT) Requested									
Company:	Sperling Hansen Associates Inc.			Select Report Format:	<input type="checkbox"/> PDF	<input checked="" type="checkbox"/> EXCEL	<input type="checkbox"/> EDD (DIGITAL)	<input checked="" type="checkbox"/> Routine [R] if received by 3pm M-F - no surcharges apply								
Contact:	Scott-Garthwaite			Merge QC/QCI Reports with COA	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> N/A	<input type="checkbox"/> 4-day [P4] if received by 3pm M-F - 20% rush surcharge minimum								
Phone:	778-471-7088			<input checked="" type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked				<input type="checkbox"/> 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum								
Company address below will appear on the final report				Select Distribution:	<input checked="" type="checkbox"/> EMAIL	<input type="checkbox"/> MAIL	<input type="checkbox"/> FAX	<input type="checkbox"/> 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum								
Street:	1225 East Keith Road			Email 1 or Fax	sgarthwaite@sperlinghansen.com			<input type="checkbox"/> 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum								
City/Province:	North Vancouver, B.C.			Email 2	chetherington@sperlinghansen.com			<input type="checkbox"/> Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests								
Postal Code:	V7J 1J3			Email 3				Date and Time Required for all E&P TATs:	dd-mm-yy hh:mm am/pm							
Invoice To	Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			Invoice Recipients		For all tests with rush TATs requested, please contact your AM to confirm availability.										
Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO				Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX		Analysis Request										
Company:				Email 1 or Fax	rhajafari@sperlinghansen.com			Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below								
Contact:				Email 2												
Project Information						Oil and Gas Required Fields (client use)										
ALS Account # / Quote #:				AFE/Cost Center:	PO# 1											
Job #:	20050 Columbia Valley			Major/Minor Code:	Routing Code:											
PO / AFE:				Requisitioner:	1											
LSD:				Location:												
ALS Lab Work Order # (ALS use only):				ALS Contact:	Dean Watt	Sampler: Tyler McBride										
ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)			Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Anions	Total Alkalinity	TSS	Dissolved Metals (F/P)	Total Metals (P)	Ammonia	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
1	E207782			10-01-21	1	Groundwater	4	x	x	x	xxx	x	y			
2	E207780			10-01-21	1	Groundwater	4	x	y	x	xxx	x	x			
3	E265103			10-01-21		Groundwater	4	x	y	x	x	xx	>			
4	E265102			10-01-21		Groundwater	4	x	y	x	x	xx	x			
	E208720			—		Groundwater	0									
	E208726			—		Groundwater	0									
	E207778			—		Groundwater	0									
	'03-5			—		Groundwater	0									
Drinking Water (DW) Samples <sup>1</sup> (client use)				Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)					SAMPLE RECEIPT DETAILS (ALS use only)							
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO				British Columbia Contaminated Sites Regulation Stage 10 Amendment (NOV, 2017) British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)					Cooling Method: <input type="checkbox"/> NONE <input type="checkbox"/> ICE <input type="checkbox"/> ICE PACKS <input type="checkbox"/> FROZEN <input type="checkbox"/> COOLING INITIATED							
Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO									Submission Comments Identified on Sample Receipt Notification: <input type="checkbox"/> YES <input type="checkbox"/> NO							
SHIPMENT RELEASE (client use)				INITIAL SHIPMENT RECEIPTION (ALS use only)					Cooler Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A Sample Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A							
Released by: Tyler McBride	Date: 11/01/21	Time:	Received by: S	Date: 11/2	Time: 8:00	Received by: S	Date: 11/2	Time: 8:00	Received by: S	Date: 11/2	Time: 8:00	INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C	
FINAL SHIPMENT RECEIPTION (ALS use only)																

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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.

AUG 2020 FRONT

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



Sperling Hansen Associates Inc.  
ATTN: Scott Garthwaite  
#8 - 1225 East Keith Road  
North Vancouver BC V7J 1J3

Date Received: 27-APR-21  
Report Date: 05-MAY-21 13:59 (MT)  
Version: FINAL

Client Phone: 604-986-7723

## Certificate of Analysis

Lab Work Order #: L2580654

Project P.O. #: NOT SUBMITTED

Job Reference: 20050 COLUMBIA VALLEY

C of C Numbers:

Legal Site Desc:

A handwritten signature in black ink, appearing to read "Patryk Wojciak".

Patryk Wojciak, B.Sc., P.Chem.  
Account Manager

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

ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298  
ALS CANADA LTD Part of the ALS Group An ALS Limited Company

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2580654-1 E207782							
Sampled By: TM on 25-APR-21							
Matrix: GROUNDWATER							
<b>Total Metals in Water + Hg (BC MDG)</b>							
<b>Hardness</b>							
Hardness (as CaCO <sub>3</sub> )	537	HTC	0.50	mg/L		29-APR-21	
<b>Total Be (Low) in Water by CRC ICPMS</b>							
Beryllium (Be)-Total	<0.000020		0.000020	mg/L		28-APR-21	R5442555
<b>Total Mercury in Water by CVAAS</b>							
Mercury (Hg)-Total	<0.0000050		0.0000050	mg/L		04-MAY-21	R5449156
<b>Total Metals in Water by CRC ICPMS</b>							
Aluminum (Al)-Total	0.0035		0.0030	mg/L		28-APR-21	R5442555
Antimony (Sb)-Total	<0.00010		0.00010	mg/L		28-APR-21	R5442555
Arsenic (As)-Total	0.00010		0.00010	mg/L		28-APR-21	R5442555
Barium (Ba)-Total	0.00979		0.00010	mg/L		28-APR-21	R5442555
Bismuth (Bi)-Total	<0.000050		0.000050	mg/L		28-APR-21	R5442555
Boron (B)-Total	0.030		0.010	mg/L		28-APR-21	R5442555
Cadmium (Cd)-Total	<0.0000050		0.0000050	mg/L		28-APR-21	R5442555
Calcium (Ca)-Total	136		0.050	mg/L		28-APR-21	R5442555
Chromium (Cr)-Total	<0.00010		0.00010	mg/L		28-APR-21	R5442555
Cobalt (Co)-Total	<0.00010		0.00010	mg/L		28-APR-21	R5442555
Copper (Cu)-Total	0.00168		0.00050	mg/L		28-APR-21	R5442555
Iron (Fe)-Total	0.038		0.010	mg/L		28-APR-21	R5442555
Lead (Pb)-Total	<0.000050		0.000050	mg/L		28-APR-21	R5442555
Lithium (Li)-Total	0.0094		0.0010	mg/L		28-APR-21	R5442555
Magnesium (Mg)-Total	48.2		0.0050	mg/L		28-APR-21	R5442555
Manganese (Mn)-Total	0.00192		0.00010	mg/L		28-APR-21	R5442555
Molybdenum (Mo)-Total	0.000619		0.000050	mg/L		28-APR-21	R5442555
Nickel (Ni)-Total	<0.00050		0.00050	mg/L		28-APR-21	R5442555
Phosphorus (P)-Total	<0.050		0.050	mg/L		28-APR-21	R5442555
Potassium (K)-Total	1.14		0.10	mg/L		28-APR-21	R5442555
Selenium (Se)-Total	<0.000050		0.000050	mg/L		28-APR-21	R5442555
Silicon (Si)-Total	3.86		0.050	mg/L		28-APR-21	R5442555
Silver (Ag)-Total	<0.000010		0.000010	mg/L		28-APR-21	R5442555
Sodium (Na)-Total	8.59		0.050	mg/L		28-APR-21	R5442555
Strontium (Sr)-Total	1.75		0.00020	mg/L		28-APR-21	R5442555
Sulfur (S)-Total	126		0.50	mg/L		28-APR-21	R5442555
Thallium (Tl)-Total	<0.000010		0.000010	mg/L		28-APR-21	R5442555
Tin (Sn)-Total	<0.00010		0.00010	mg/L		28-APR-21	R5442555
Titanium (Ti)-Total	<0.00030		0.00030	mg/L		28-APR-21	R5442555
Uranium (U)-Total	0.00170		0.000010	mg/L		28-APR-21	R5442555
Vanadium (V)-Total	<0.00050		0.00050	mg/L		28-APR-21	R5442555
Zinc (Zn)-Total	0.0065		0.0030	mg/L		28-APR-21	R5442555
Zirconium (Zr)-Total	<0.00030		0.00030	mg/L		28-APR-21	R5442555
<b>Miscellaneous Parameters</b>							
Ammonia as N	<0.0050		0.0050	mg/L		04-MAY-21	R5448846
Chloride (Cl)	1.26		0.10	mg/L		28-APR-21	R5443116
Fluoride (F)	0.172		0.020	mg/L		28-APR-21	R5443116
Nitrate (as N)	0.0084		0.0050	mg/L		28-APR-21	R5443116
Nitrate and Nitrite (as N)	0.0084		0.0051	mg/L		29-APR-21	
Nitrite (as N)	<0.0010		0.0010	mg/L		28-APR-21	R5443116
Sulfate (SO <sub>4</sub> )	331		0.050	mg/L		28-APR-21	R5443116
Temperature	19.5		1.0	Degree C		03-MAY-21	R5446420
Total Suspended Solids	<1.0		1.0	mg/L		01-MAY-21	R5445278
<b>pH, Conductivity and Total Alkalinity</b>							

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2580654-1	E207782							
Sampled By:	TM on 25-APR-21							
Matrix:	GROUNDWATER							
<b>pH, Conductivity and Total Alkalinity</b>								
pH		7.77		0.10	pH		03-MAY-21	R5446420
Conductivity (EC)		937		2.0	uS/cm		03-MAY-21	R5446420
Bicarbonate (HCO3)		253		5.0	mg/L		03-MAY-21	R5446420
Carbonate (CO3)		<5.0		5.0	mg/L		03-MAY-21	R5446420
Hydroxide (OH)		<5.0		5.0	mg/L		03-MAY-21	R5446420
Alkalinity, Total (as CaCO3)		207		2.0	mg/L		03-MAY-21	R5446420
L2580654-2	E207780							
Sampled By:	TM on 25-APR-21							
Matrix:	GROUNDWATER							
<b>Total Metals in Water + Hg (BC MDG)</b>								
<b>Hardness</b>								
Hardness (as CaCO3)		531	HTC	0.50	mg/L		29-APR-21	
<b>Total Be (Low) in Water by CRC ICPMS</b>								
Beryllium (Be)-Total		<0.000020		0.000020	mg/L		28-APR-21	R5442555
<b>Total Mercury in Water by CVAAS</b>								
Mercury (Hg)-Total		<0.000050		0.000050	mg/L		04-MAY-21	R5449156
<b>Total Metals in Water by CRC ICPMS</b>								
Aluminum (Al)-Total		0.0035		0.0030	mg/L		28-APR-21	R5442555
Antimony (Sb)-Total		<0.00010		0.00010	mg/L		28-APR-21	R5442555
Arsenic (As)-Total		0.00011		0.00010	mg/L		28-APR-21	R5442555
Barium (Ba)-Total		0.00958		0.00010	mg/L		28-APR-21	R5442555
Bismuth (Bi)-Total		<0.000050		0.000050	mg/L		28-APR-21	R5442555
Boron (B)-Total		0.029		0.010	mg/L		28-APR-21	R5442555
Cadmium (Cd)-Total		0.0000120		0.000050	mg/L		28-APR-21	R5442555
Calcium (Ca)-Total		141		0.050	mg/L		28-APR-21	R5442555
Chromium (Cr)-Total		0.00020		0.00010	mg/L		28-APR-21	R5442555
Cobalt (Co)-Total		<0.00010		0.00010	mg/L		28-APR-21	R5442555
Copper (Cu)-Total		<0.00050		0.00050	mg/L		28-APR-21	R5442555
Iron (Fe)-Total		0.408		0.010	mg/L		28-APR-21	R5442555
Lead (Pb)-Total		<0.000050		0.000050	mg/L		28-APR-21	R5442555
Lithium (Li)-Total		0.0073		0.0010	mg/L		28-APR-21	R5442555
Magnesium (Mg)-Total		43.2		0.0050	mg/L		28-APR-21	R5442555
Manganese (Mn)-Total		0.00269		0.00010	mg/L		28-APR-21	R5442555
Molybdenum (Mo)-Total		0.000811		0.000050	mg/L		28-APR-21	R5442555
Nickel (Ni)-Total		<0.00050		0.00050	mg/L		28-APR-21	R5442555
Phosphorus (P)-Total		<0.050		0.050	mg/L		28-APR-21	R5442555
Potassium (K)-Total		0.98		0.10	mg/L		28-APR-21	R5442555
Selenium (Se)-Total		<0.000050		0.000050	mg/L		28-APR-21	R5442555
Silicon (Si)-Total		3.71		0.050	mg/L		28-APR-21	R5442555
Silver (Ag)-Total		<0.000010		0.000010	mg/L		28-APR-21	R5442555
Sodium (Na)-Total		2.99		0.050	mg/L		28-APR-21	R5442555
Strontium (Sr)-Total		1.78		0.00020	mg/L		28-APR-21	R5442555
Sulfur (S)-Total		123		0.50	mg/L		28-APR-21	R5442555
Thallium (Tl)-Total		<0.000010		0.000010	mg/L		28-APR-21	R5442555
Tin (Sn)-Total		<0.00010		0.00010	mg/L		28-APR-21	R5442555
Titanium (Ti)-Total		<0.00030		0.00030	mg/L		28-APR-21	R5442555
Uranium (U)-Total		0.00146		0.000010	mg/L		28-APR-21	R5442555
Vanadium (V)-Total		<0.00050		0.00050	mg/L		28-APR-21	R5442555
Zinc (Zn)-Total		0.0445		0.0030	mg/L		28-APR-21	R5442555
Zirconium (Zr)-Total		<0.00030		0.00030	mg/L		28-APR-21	R5442555
<b>Miscellaneous Parameters</b>								

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

# ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters		Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2580654-2	E207780							
Sampled By:	TM on 25-APR-21							
Matrix:	GROUNDWATER							
Ammonia as N	<0.0050		0.0050	mg/L		04-MAY-21	R5448846	
Chloride (Cl)	1.35		0.10	mg/L		28-APR-21	R5443116	
Fluoride (F)	0.171		0.020	mg/L		28-APR-21	R5443116	
Nitrate (as N)	<0.0050		0.0050	mg/L		28-APR-21	R5443116	
Nitrate and Nitrite (as N)	<0.0051		0.0051	mg/L		29-APR-21		
Nitrite (as N)	<0.0010		0.0010	mg/L		28-APR-21	R5443116	
Sulfate (SO4)	328		0.050	mg/L		28-APR-21	R5443116	
Temperature	19.5		1.0	Degree C		03-MAY-21	R5446420	
Total Suspended Solids	<1.0		1.0	mg/L		01-MAY-21	R5445278	
<b>pH, Conductivity and Total Alkalinity</b>								
pH	7.81		0.10	pH		03-MAY-21	R5446420	
Conductivity (EC)	912		2.0	uS/cm		03-MAY-21	R5446420	
Bicarbonate (HCO3)	239		5.0	mg/L		03-MAY-21	R5446420	
Carbonate (CO3)	<5.0		5.0	mg/L		03-MAY-21	R5446420	
Hydroxide (OH)	<5.0		5.0	mg/L		03-MAY-21	R5446420	
Alkalinity, Total (as CaCO3)	196		2.0	mg/L		03-MAY-21	R5446420	
L2580654-3	E265103							
Sampled By:	TM on 25-APR-21							
Matrix:	GROUNDWATER							
<b>Dissolved Metals in Water + Hg (BC MDG)</b>								
<b>Diss. Be (low) in Water by CRC ICPMS</b>								
Beryllium (Be)-Dissolved	<0.000020		0.000020	mg/L		30-APR-21	R5443918	
Dissolved Metals Filtration Location	FIELD					30-APR-21	R5443887	
<b>Dissolved Mercury in Water by CVAAS</b>								
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L		04-MAY-21	R5449156	
Dissolved Mercury Filtration Location	FIELD					04-MAY-21	R5447586	
<b>Dissolved Metals in Water by CRC ICPMS</b>								
Dissolved Metals Filtration Location	FIELD							
Aluminum (Al)-Dissolved	0.0012		0.0010	mg/L		30-APR-21	R5443918	
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L		30-APR-21	R5443918	
Arsenic (As)-Dissolved	0.00010		0.00010	mg/L		30-APR-21	R5443918	
Barium (Ba)-Dissolved	0.0183		0.00010	mg/L		30-APR-21	R5443918	
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L		30-APR-21	R5443918	
Boron (B)-Dissolved	0.042		0.010	mg/L		30-APR-21	R5443918	
Cadmium (Cd)-Dissolved	<0.0000050		0.0000050	mg/L		30-APR-21	R5443918	
Calcium (Ca)-Dissolved	220		0.050	mg/L		30-APR-21	R5443918	
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L		30-APR-21	R5443918	
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L		30-APR-21	R5443918	
Copper (Cu)-Dissolved	0.00046		0.00020	mg/L		30-APR-21	R5443918	
Iron (Fe)-Dissolved	<0.010		0.010	mg/L		30-APR-21	R5443918	
Lead (Pb)-Dissolved	<0.000050		0.000050	mg/L		30-APR-21	R5443918	
Lithium (Li)-Dissolved	0.0080		0.0010	mg/L		30-APR-21	R5443918	
Magnesium (Mg)-Dissolved	43.5		0.0050	mg/L		30-APR-21	R5443918	
Manganese (Mn)-Dissolved	0.00593		0.00010	mg/L		30-APR-21	R5443918	
Molybdenum (Mo)-Dissolved	0.000546		0.000050	mg/L		30-APR-21	R5443918	
Nickel (Ni)-Dissolved	0.00115		0.00050	mg/L		30-APR-21	R5443918	
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L		30-APR-21	R5443918	
Potassium (K)-Dissolved	1.13		0.10	mg/L		30-APR-21	R5443918	
Selenium (Se)-Dissolved	0.000050		0.000050	mg/L		30-APR-21	R5443918	
Silicon (Si)-Dissolved	4.00		0.050	mg/L		30-APR-21	R5443918	
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L		30-APR-21	R5443918	

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2580654-3 E265103							
Sampled By: TM on 25-APR-21							
Matrix: GROUNDWATER							
<b>Dissolved Metals in Water by CRC ICPMS</b>							
Sodium (Na)-Dissolved	4.09		0.050	mg/L		30-APR-21	R5443918
Strontium (Sr)-Dissolved	1.72		0.00020	mg/L		30-APR-21	R5443918
Sulfur (S)-Dissolved	135		0.50	mg/L		30-APR-21	R5443918
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L		30-APR-21	R5443918
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L		30-APR-21	R5443918
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L		30-APR-21	R5443918
Uranium (U)-Dissolved	0.00163		0.000010	mg/L		30-APR-21	R5443918
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L		30-APR-21	R5443918
Zinc (Zn)-Dissolved	0.0018		0.0010	mg/L		30-APR-21	R5443918
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		30-APR-21	R5443918
<b>Hardness</b>							
Hardness (as CaCO <sub>3</sub> )	727		0.50	mg/L		01-MAY-21	
<b>Miscellaneous Parameters</b>							
Ammonia as N	0.0248		0.0050	mg/L		04-MAY-21	R5448846
Chloride (Cl)	6.87	DLHC	0.50	mg/L		28-APR-21	R5443116
Fluoride (F)	<0.10		0.10	mg/L		28-APR-21	R5443116
Nitrate (as N)	0.146	DLHC	0.025	mg/L		28-APR-21	R5443116
Nitrate and Nitrite (as N)	0.146		0.025	mg/L		29-APR-21	
Nitrite (as N)	<0.0050	DLHC	0.0050	mg/L		28-APR-21	R5443116
Sulfate (SO <sub>4</sub> )	363	DLHC	0.25	mg/L		28-APR-21	R5443116
Temperature	19.2		1.0	Degree C		03-MAY-21	R5446420
Total Suspended Solids	3430		3.0	mg/L		01-MAY-21	R5445278
<b>pH, Conductivity and Total Alkalinity</b>							
pH	7.28		0.10	pH		03-MAY-21	R5446420
Conductivity (EC)	1210		2.0	uS/cm		03-MAY-21	R5446420
Bicarbonate (HCO <sub>3</sub> )	429		5.0	mg/L		03-MAY-21	R5446420
Carbonate (CO <sub>3</sub> )	<5.0		5.0	mg/L		03-MAY-21	R5446420
Hydroxide (OH)	<5.0		5.0	mg/L		03-MAY-21	R5446420
Alkalinity, Total (as CaCO <sub>3</sub> )	352		2.0	mg/L		03-MAY-21	R5446420
L2580654-4 E265102							
Sampled By: TM on 25-APR-21							
Matrix: GROUNDWATER							
<b>Dissolved Metals in Water + Hg (BC MDG)</b>							
<b>Diss. Be (low) in Water by CRC ICPMS</b>							
Beryllium (Be)-Dissolved	<0.000020		0.000020	mg/L		30-APR-21	R5443918
Dissolved Metals Filtration Location	FIELD					30-APR-21	R5443887
<b>Dissolved Mercury in Water by CVAAS</b>							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L		04-MAY-21	R5449156
Dissolved Mercury Filtration Location	FIELD					04-MAY-21	R5447586
<b>Dissolved Metals in Water by CRC ICPMS</b>							
Dissolved Metals Filtration Location	FIELD					30-APR-21	R5443887
Aluminum (Al)-Dissolved	0.0019		0.0010	mg/L		30-APR-21	R5443918
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L		30-APR-21	R5443918
Arsenic (As)-Dissolved	0.00013		0.00010	mg/L		30-APR-21	R5443918
Barium (Ba)-Dissolved	0.0142		0.00010	mg/L		30-APR-21	R5443918
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L		30-APR-21	R5443918
Boron (B)-Dissolved	0.042		0.010	mg/L		30-APR-21	R5443918
Cadmium (Cd)-Dissolved	0.0000085		0.0000050	mg/L		30-APR-21	R5443918
Calcium (Ca)-Dissolved	227		0.050	mg/L		30-APR-21	R5443918
Chromium (Cr)-Dissolved	<0.00010		0.00010	mg/L		30-APR-21	R5443918

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2580654-4 E265102 Sampled By: TM on 25-APR-21 Matrix: GROUNDWATER <b>Dissolved Metals in Water by CRC ICPMS</b>							
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L		30-APR-21	R5443918
Copper (Cu)-Dissolved	0.00076		0.00020	mg/L		30-APR-21	R5443918
Iron (Fe)-Dissolved	<0.010		0.010	mg/L		30-APR-21	R5443918
Lead (Pb)-Dissolved	0.000052		0.000050	mg/L		30-APR-21	R5443918
Lithium (Li)-Dissolved	0.0093		0.0010	mg/L		30-APR-21	R5443918
Magnesium (Mg)-Dissolved	42.9		0.0050	mg/L		30-APR-21	R5443918
Manganese (Mn)-Dissolved	0.00375		0.00010	mg/L		30-APR-21	R5443918
Molybdenum (Mo)-Dissolved	0.000578		0.000050	mg/L		30-APR-21	R5443918
Nickel (Ni)-Dissolved	0.00110		0.00050	mg/L		30-APR-21	R5443918
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L		30-APR-21	R5443918
Potassium (K)-Dissolved	1.30		0.10	mg/L		30-APR-21	R5443918
Selenium (Se)-Dissolved	<0.000050		0.000050	mg/L		30-APR-21	R5443918
Silicon (Si)-Dissolved	4.81		0.050	mg/L		30-APR-21	R5443918
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L		30-APR-21	R5443918
Sodium (Na)-Dissolved	3.93		0.050	mg/L		30-APR-21	R5443918
Strontium (Sr)-Dissolved	1.99		0.00020	mg/L		30-APR-21	R5443918
Sulfur (S)-Dissolved	136		0.50	mg/L		30-APR-21	R5443918
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L		30-APR-21	R5443918
Tin (Sn)-Dissolved	0.00015		0.00010	mg/L		30-APR-21	R5443918
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L		30-APR-21	R5443918
Uranium (U)-Dissolved	0.00200		0.000010	mg/L		30-APR-21	R5443918
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L		30-APR-21	R5443918
Zinc (Zn)-Dissolved	0.0153		0.0010	mg/L		30-APR-21	R5443918
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		30-APR-21	R5443918
<b>Hardness</b>							
Hardness (as CaCO <sub>3</sub> )	744		0.50	mg/L		01-MAY-21	
<b>Miscellaneous Parameters</b>							
Ammonia as N	0.0136		0.0050	mg/L		04-MAY-21	R5448846
Chloride (Cl)	6.61	DLHC	0.50	mg/L		28-APR-21	R5443116
Fluoride (F)	<0.10		0.10	mg/L		28-APR-21	R5443116
Nitrate (as N)	<0.025	DLHC	0.025	mg/L		28-APR-21	R5443116
Nitrate and Nitrite (as N)	<0.025		0.025	mg/L		29-APR-21	
Nitrite (as N)	0.0067	DLHC	0.0050	mg/L		28-APR-21	R5443116
Sulfate (SO <sub>4</sub> )	360	DLHC	0.25	mg/L		28-APR-21	R5443116
Temperature	19.3		1.0	Degree C		03-MAY-21	R5446420
Total Suspended Solids	106		1.0	mg/L		01-MAY-21	R5445278
<b>pH, Conductivity and Total Alkalinity</b>							
pH	7.50		0.10	pH		03-MAY-21	R5446420
Conductivity (EC)	1200		2.0	uS/cm		03-MAY-21	R5446420
Bicarbonate (HCO <sub>3</sub> )	438		5.0	mg/L		03-MAY-21	R5446420
Carbonate (CO <sub>3</sub> )	<5.0		5.0	mg/L		03-MAY-21	R5446420
Hydroxide (OH)	<5.0		5.0	mg/L		03-MAY-21	R5446420
Alkalinity, Total (as CaCO <sub>3</sub> )	359		2.0	mg/L		03-MAY-21	R5446420
L2580654-5 E207778 Sampled By: TM on 25-APR-21 Matrix: GROUNDWATER <b>Dissolved Metals in Water + Hg (BC MDG)</b>							
<b>Diss. Be (low) in Water by CRC ICPMS</b>							
Beryllium (Be)-Dissolved	<0.000020		0.000020	mg/L		30-APR-21	R5443918
Dissolved Metals Filtration Location		FIELD				30-APR-21	R5443887

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2580654-5 E207778							
Sampled By: TM on 25-APR-21							
Matrix: GROUNDWATER							
<b>Dissolved Mercury in Water by CVAAS</b>							
Mercury (Hg)-Dissolved	<0.0000050		0.0000050	mg/L		04-MAY-21	R5449156
Dissolved Mercury Filtration Location	FIELD					04-MAY-21	R5447586
<b>Dissolved Metals in Water by CRC ICPMS</b>							
Dissolved Metals Filtration Location	FIELD					30-APR-21	R5443887
Aluminum (Al)-Dissolved	0.0015		0.0010	mg/L		30-APR-21	R5443918
Antimony (Sb)-Dissolved	<0.00010		0.00010	mg/L		30-APR-21	R5443918
Arsenic (As)-Dissolved	<0.00010		0.00010	mg/L		30-APR-21	R5443918
Barium (Ba)-Dissolved	0.0115		0.00010	mg/L		30-APR-21	R5443918
Bismuth (Bi)-Dissolved	<0.000050		0.000050	mg/L		30-APR-21	R5443918
Boron (B)-Dissolved	0.042		0.010	mg/L		30-APR-21	R5443918
Cadmium (Cd)-Dissolved	<0.000050		0.000050	mg/L		30-APR-21	R5443918
Calcium (Ca)-Dissolved	161		0.050	mg/L		30-APR-21	R5443918
Chromium (Cr)-Dissolved	0.00021		0.00010	mg/L		30-APR-21	R5443918
Cobalt (Co)-Dissolved	<0.00010		0.00010	mg/L		30-APR-21	R5443918
Copper (Cu)-Dissolved	0.00921		0.00020	mg/L		30-APR-21	R5443918
Iron (Fe)-Dissolved	0.692		0.010	mg/L		30-APR-21	R5443918
Lead (Pb)-Dissolved	0.000250		0.000050	mg/L		30-APR-21	R5443918
Lithium (Li)-Dissolved	0.0066		0.0010	mg/L		30-APR-21	R5443918
Magnesium (Mg)-Dissolved	37.3		0.0050	mg/L		30-APR-21	R5443918
Manganese (Mn)-Dissolved	0.00616		0.00010	mg/L		30-APR-21	R5443918
Molybdenum (Mo)-Dissolved	0.000539		0.000050	mg/L		30-APR-21	R5443918
Nickel (Ni)-Dissolved	<0.00050		0.00050	mg/L		30-APR-21	R5443918
Phosphorus (P)-Dissolved	<0.050		0.050	mg/L		30-APR-21	R5443918
Potassium (K)-Dissolved	0.87		0.10	mg/L		30-APR-21	R5443918
Selenium (Se)-Dissolved	0.000194		0.000050	mg/L		30-APR-21	R5443918
Silicon (Si)-Dissolved	3.01		0.050	mg/L		30-APR-21	R5443918
Silver (Ag)-Dissolved	<0.000010		0.000010	mg/L		30-APR-21	R5443918
Sodium (Na)-Dissolved	2.74		0.050	mg/L		30-APR-21	R5443918
Strontium (Sr)-Dissolved	1.58		0.00020	mg/L		30-APR-21	R5443918
Sulfur (S)-Dissolved	122		0.50	mg/L		30-APR-21	R5443918
Thallium (Tl)-Dissolved	<0.000010		0.000010	mg/L		30-APR-21	R5443918
Tin (Sn)-Dissolved	<0.00010		0.00010	mg/L		30-APR-21	R5443918
Titanium (Ti)-Dissolved	<0.00030		0.00030	mg/L		30-APR-21	R5443918
Uranium (U)-Dissolved	0.00118		0.000010	mg/L		30-APR-21	R5443918
Vanadium (V)-Dissolved	<0.00050		0.00050	mg/L		30-APR-21	R5443918
Zinc (Zn)-Dissolved	0.0392		0.0010	mg/L		30-APR-21	R5443918
Zirconium (Zr)-Dissolved	<0.00030		0.00030	mg/L		30-APR-21	R5443918
<b>Hardness</b>							
Hardness (as CaCO <sub>3</sub> )	557		0.50	mg/L		01-MAY-21	
<b>Miscellaneous Parameters</b>							
Ammonia as N	<0.0050		0.0050	mg/L		04-MAY-21	R5448846
Chloride (Cl)	1.85		0.10	mg/L		28-APR-21	R5443116
Fluoride (F)	0.174		0.020	mg/L		28-APR-21	R5443116
Nitrate (as N)	0.120		0.0050	mg/L		28-APR-21	R5443116
Nitrate and Nitrite (as N)	0.120		0.0051	mg/L		29-APR-21	
Nitrite (as N)	<0.0010		0.0010	mg/L		28-APR-21	R5443116
Sulfate (SO <sub>4</sub> )	336		0.050	mg/L		28-APR-21	R5443116
Temperature	19.1		1.0	Degree C		03-MAY-21	R5446420
Total Suspended Solids	4.2		1.0	mg/L		01-MAY-21	R5445278
<b>pH, Conductivity and Total Alkalinity</b>							
pH	7.77		0.10	pH		03-MAY-21	R5446420

\* Refer to Referenced Information for Qualifiers (if any) and Methodology.

## ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample Details/Parameters	Result	Qualifier*	D.L.	Units	Extracted	Analyzed	Batch
L2580654-5 E207778 Sampled By: TM on 25-APR-21 Matrix: GROUNDWATER							
<b>pH, Conductivity and Total Alkalinity</b>							
Conductivity (EC)	979		2.0	uS/cm		03-MAY-21	R5446420
Bicarbonate (HCO3)	288		5.0	mg/L		03-MAY-21	R5446420
Carbonate (CO3)	<5.0		5.0	mg/L		03-MAY-21	R5446420
Hydroxide (OH)	<5.0		5.0	mg/L		03-MAY-21	R5446420
Alkalinity, Total (as CaCO3)	236		2.0	mg/L		03-MAY-21	R5446420

## Reference Information

**Sample Parameter Qualifier Key:**

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
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**
BE-D-L-CCMS-CL	Water	Diss. Be (low) 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.			
BE-T-L-CCMS-CL	Water	Total Be (Low) 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.			
CL-L-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
F-L-IC-CL	Water	Fluoride	APHA 4110 B-Ion Chromatography
HARDNESS-CALC-CL	Water	Hardness	APHA 2340 B
Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.			
HG-D-CVAA-CL	Water	Dissolved Mercury in Water by CVAAS	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.			
HG-T-CVAA-CL	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)
Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.			
MET-D-CCMS-CL	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-CL	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.			
N2N3-CALC-CL	Water	Nitrate+Nitrite	CALCULATION
NH3-L-F-CL	Water	Ammonia, Total (as N)	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-CL	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-CL	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/EC/ALK-CL	Water	pH, Conductivity and Total Alkalinity	APHA 4500H,2510,2320
All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)			
pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode.			
Alkalinity measurement is based on the sample's capacity to neutralize acid			
Conductivity measurement is based on the sample's capacity to convey an electric current			
SO4-L-IC-N-CL	Water	Sulfate in Water by IC	EPA 300.1 (mod)

## Reference Information

**Test Method References:**

ALS Test Code	Matrix	Test Description	Method Reference**
Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.			
TEMP-CL	Water	Temperature	APHA 2550-Thermometer
TSS-L-CL	Water	Total Suspended Solids	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, and by drying the filter at 104 deg. C.			

\*\* 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
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA

**Chain of Custody Numbers:**
**GLOSSARY OF REPORT TERMS**

*Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.*

*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*

*mg/L - unit of concentration based on volume, parts per million.*

*< - Less than.*

*D.L. - The reporting limit.*

*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: L2580654

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**Client:** Sperling Hansen Associates Inc.  
 #8 - 1225 East Keith Road  
 North Vancouver BC V7J 1J3

**Contact:** Scott Garthwaite

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
<b>BE-D-L-CCMS-CL</b> Water									
Batch	R5443918								
WG3527246-3 DUP	Beryllium (Be)-Dissolved	L2580654-5	<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	30-APR-21
WG3527246-2 LCS	Beryllium (Be)-Dissolved	TMRM	95.2		%		80-120	30-APR-21	
WG3527246-1 MB	Beryllium (Be)-Dissolved		<0.000020		mg/L		0.00002	30-APR-21	
WG3527246-4 MS	Beryllium (Be)-Dissolved	L2580654-5	93.3		%		70-130	30-APR-21	
<b>BE-T-L-CCMS-CL</b> Water									
Batch	R5442555								
WG3525364-1 LCS	Beryllium (Be)-Total	TMRM	99.2		%		80-120	28-APR-21	
WG3525364-4 MB	Beryllium (Be)-Total		<0.000020		mg/L		0.00002	28-APR-21	
<b>CL-L-IC-N-CL</b> Water									
Batch	R5443116								
WG3526367-3 DUP	Chloride (Cl)	L2580654-1	1.26	1.24		mg/L	1.4	20	28-APR-21
WG3526367-2 LCS	Chloride (Cl)		98.2		%		85-115	28-APR-21	
WG3526367-6 LCS	Chloride (Cl)		98.1		%		85-115	28-APR-21	
WG3526367-9 LCS	Chloride (Cl)		98.4		%		85-115	28-APR-21	
WG3526367-1 MB	Chloride (Cl)		<0.10		mg/L		0.1	28-APR-21	
WG3526367-5 MB	Chloride (Cl)		<0.10		mg/L		0.1	28-APR-21	
WG3526367-8 MB	Chloride (Cl)		<0.10		mg/L		0.1	28-APR-21	
<b>F-L-IC-CL</b> Water									
Batch	R5443116								
WG3526367-3 DUP	Fluoride (F)	L2580654-1	0.172	0.168		mg/L	2.4	20	28-APR-21
WG3526367-2 LCS	Fluoride (F)		94.2		%		85-115	28-APR-21	
WG3526367-6 LCS	Fluoride (F)		96.1		%		85-115	28-APR-21	

## Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-L-IC-CL	Water							
Batch R5443116								
WG3526367-9 LCS	Fluoride (F)		94.3		%		85-115	28-APR-21
WG3526367-1 MB	Fluoride (F)		<0.020		mg/L		0.02	28-APR-21
WG3526367-5 MB	Fluoride (F)		<0.020		mg/L		0.02	28-APR-21
WG3526367-8 MB	Fluoride (F)		<0.020		mg/L		0.02	28-APR-21
HG-D-CVAA-CL	Water							
Batch R5449156								
WG3528667-2 LCS	Mercury (Hg)-Dissolved		106.0		%		80-120	04-MAY-21
WG3528667-1 MB	Mercury (Hg)-Dissolved		<0.0000050		mg/L		0.000005	04-MAY-21
HG-T-CVAA-CL	Water							
Batch R5449156								
WG3528672-2 LCS	Mercury (Hg)-Total		98.8		%		80-120	04-MAY-21
WG3528672-1 MB	Mercury (Hg)-Total		<0.0000050		mg/L		0.000005	04-MAY-21
MET-D-CCMS-CL	Water							
Batch R5443918								
WG3527246-3 DUP	L2580654-5							
Aluminum (Al)-Dissolved	0.0015	0.0017		mg/L	11	20	30-APR-21	
Antimony (Sb)-Dissolved	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	30-APR-21	
Arsenic (As)-Dissolved	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	30-APR-21	
Barium (Ba)-Dissolved	0.0115	0.0111		mg/L	3.4	20	30-APR-21	
Bismuth (Bi)-Dissolved	<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	30-APR-21	
Boron (B)-Dissolved	0.042	0.043		mg/L	0.5	20	30-APR-21	
Cadmium (Cd)-Dissolved	<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	30-APR-21	
Calcium (Ca)-Dissolved	161	160		mg/L	0.8	20	30-APR-21	
Chromium (Cr)-Dissolved	0.00021	0.00019		mg/L	11	20	30-APR-21	
Cobalt (Co)-Dissolved	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	30-APR-21	
Copper (Cu)-Dissolved	0.00921	0.00903		mg/L	2.0	20	30-APR-21	
Iron (Fe)-Dissolved	0.692	0.671		mg/L	3.2	20	30-APR-21	
Lead (Pb)-Dissolved	0.000250	0.000244		mg/L	2.7	20	30-APR-21	

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-CL</b>	<b>Water</b>							
Batch	R5443918							
WG3527246-3 DUP	L2580654-5							
Lithium (Li)-Dissolved	0.0066	0.0065		mg/L	0.3	20	30-APR-21	
Magnesium (Mg)-Dissolved	37.3	36.7		mg/L	1.6	20	30-APR-21	
Manganese (Mn)-Dissolved	0.00616	0.00601		mg/L	2.4	20	30-APR-21	
Molybdenum (Mo)-Dissolved	0.000539	0.000522		mg/L	3.1	20	30-APR-21	
Nickel (Ni)-Dissolved	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-APR-21	
Phosphorus (P)-Dissolved	<0.050	<0.050	RPD-NA	mg/L	N/A	20	30-APR-21	
Potassium (K)-Dissolved	0.87	0.85		mg/L	2.4	20	30-APR-21	
Selenium (Se)-Dissolved	0.000194	0.000151	J	mg/L	0.000043	0.0001	30-APR-21	
Silicon (Si)-Dissolved	3.01	3.00		mg/L	0.4	20	30-APR-21	
Silver (Ag)-Dissolved	<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	30-APR-21	
Sodium (Na)-Dissolved	2.74	2.71		mg/L	0.9	20	30-APR-21	
Strontium (Sr)-Dissolved	1.58	1.56		mg/L	0.7	20	30-APR-21	
Sulfur (S)-Dissolved	122	122		mg/L	0.6	20	30-APR-21	
Thallium (Tl)-Dissolved	<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	30-APR-21	
Tin (Sn)-Dissolved	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	30-APR-21	
Titanium (Ti)-Dissolved	<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	30-APR-21	
Uranium (U)-Dissolved	0.00118	0.00117		mg/L	0.4	20	30-APR-21	
Vanadium (V)-Dissolved	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	30-APR-21	
Zinc (Zn)-Dissolved	0.0392	0.0379		mg/L	3.4	20	30-APR-21	
Zirconium (Zr)-Dissolved	<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	30-APR-21	
WG3527246-2 LCS	TMRM							
Aluminum (Al)-Dissolved	94.2		%		80-120	30-APR-21		
Antimony (Sb)-Dissolved	96.7		%		80-120	30-APR-21		
Arsenic (As)-Dissolved	91.8		%		80-120	30-APR-21		
Barium (Ba)-Dissolved	96.7		%		80-120	30-APR-21		
Bismuth (Bi)-Dissolved	97.0		%		80-120	30-APR-21		
Boron (B)-Dissolved	91.4		%		80-120	30-APR-21		
Cadmium (Cd)-Dissolved	91.5		%		80-120	30-APR-21		
Calcium (Ca)-Dissolved	94.3		%		80-120	30-APR-21		
Chromium (Cr)-Dissolved	91.1		%		80-120	30-APR-21		
Cobalt (Co)-Dissolved	93.8		%		80-120	30-APR-21		
Copper (Cu)-Dissolved	90.6		%		80-120	30-APR-21		
Iron (Fe)-Dissolved	95.1		%		80-120	30-APR-21		
Lead (Pb)-Dissolved	98.6		%		80-120	30-APR-21		

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-CL Water</b>								
<b>Batch R5443918</b>								
<b>WG3527246-2 LCS</b>								
Lithium (Li)-Dissolved	TMRM	99.3		%		80-120	30-APR-21	
Magnesium (Mg)-Dissolved		94.5		%		80-120	30-APR-21	
Manganese (Mn)-Dissolved		95.0		%		80-120	30-APR-21	
Molybdenum (Mo)-Dissolved		97.5		%		80-120	30-APR-21	
Nickel (Ni)-Dissolved		91.4		%		80-120	30-APR-21	
Phosphorus (P)-Dissolved		96.6		%		70-130	30-APR-21	
Potassium (K)-Dissolved		93.8		%		80-120	30-APR-21	
Selenium (Se)-Dissolved		89.4		%		80-120	30-APR-21	
Silicon (Si)-Dissolved		96.4		%		60-140	30-APR-21	
Silver (Ag)-Dissolved		96.4		%		80-120	30-APR-21	
Sodium (Na)-Dissolved		92.2		%		80-120	30-APR-21	
Strontium (Sr)-Dissolved		94.4		%		80-120	30-APR-21	
Sulfur (S)-Dissolved		101.2		%		80-120	30-APR-21	
Thallium (Tl)-Dissolved		96.0		%		80-120	30-APR-21	
Tin (Sn)-Dissolved		92.1		%		80-120	30-APR-21	
Titanium (Ti)-Dissolved		92.6		%		80-120	30-APR-21	
Uranium (U)-Dissolved		98.9		%		80-120	30-APR-21	
Vanadium (V)-Dissolved		94.0		%		80-120	30-APR-21	
Zinc (Zn)-Dissolved		89.7		%		80-120	30-APR-21	
Zirconium (Zr)-Dissolved		91.3		%		80-120	30-APR-21	
<b>WG3527246-1 MB</b>								
Aluminum (Al)-Dissolved		<0.0010		mg/L		0.001	30-APR-21	
Antimony (Sb)-Dissolved		<0.00010		mg/L		0.0001	30-APR-21	
Arsenic (As)-Dissolved		<0.00010		mg/L		0.0001	30-APR-21	
Barium (Ba)-Dissolved		<0.00010		mg/L		0.0001	30-APR-21	
Bismuth (Bi)-Dissolved		<0.000050		mg/L		0.00005	30-APR-21	
Boron (B)-Dissolved		<0.010		mg/L		0.01	30-APR-21	
Cadmium (Cd)-Dissolved		<0.0000050		mg/L		0.000005	30-APR-21	
Calcium (Ca)-Dissolved		<0.050		mg/L		0.05	30-APR-21	
Chromium (Cr)-Dissolved		<0.00010		mg/L		0.0001	30-APR-21	
Cobalt (Co)-Dissolved		<0.00010		mg/L		0.0001	30-APR-21	
Copper (Cu)-Dissolved		<0.00020		mg/L		0.0002	30-APR-21	
Iron (Fe)-Dissolved		<0.010		mg/L		0.01	30-APR-21	
Lead (Pb)-Dissolved		<0.000050		mg/L		0.00005	30-APR-21	

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-CL</b>	<b>Water</b>							
Batch	R5443918							
<b>WG3527246-1 MB</b>								
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	30-APR-21
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	30-APR-21
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	30-APR-21
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	30-APR-21
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	30-APR-21
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	30-APR-21
Potassium (K)-Dissolved			<0.050		mg/L		0.05	30-APR-21
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	30-APR-21
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	30-APR-21
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	30-APR-21
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	30-APR-21
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	30-APR-21
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	30-APR-21
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	30-APR-21
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	30-APR-21
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	30-APR-21
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	30-APR-21
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	30-APR-21
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	30-APR-21
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	30-APR-21
<b>WG3527246-4 MS</b>	<b>L2580654-5</b>							
Aluminum (Al)-Dissolved			91.1		%		70-130	30-APR-21
Antimony (Sb)-Dissolved			99.4		%		70-130	30-APR-21
Arsenic (As)-Dissolved			94.2		%		70-130	30-APR-21
Barium (Ba)-Dissolved			94.0		%		70-130	30-APR-21
Bismuth (Bi)-Dissolved			97.4		%		70-130	30-APR-21
Boron (B)-Dissolved			91.5		%		70-130	30-APR-21
Cadmium (Cd)-Dissolved			94.5		%		70-130	30-APR-21
Calcium (Ca)-Dissolved			N/A	MS-B	%		-	30-APR-21
Chromium (Cr)-Dissolved			94.9		%		70-130	30-APR-21
Cobalt (Co)-Dissolved			93.9		%		70-130	30-APR-21
Copper (Cu)-Dissolved			92.9		%		70-130	30-APR-21
Iron (Fe)-Dissolved			94.2		%		70-130	30-APR-21
Lead (Pb)-Dissolved			99.5		%		70-130	30-APR-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-CL</b> Water								
Batch R5443918								
WG3527246-4 MS		L2580654-5						
Lithium (Li)-Dissolved			103.2		%		70-130	30-APR-21
Magnesium (Mg)-Dissolved			N/A	MS-B	%		-	30-APR-21
Manganese (Mn)-Dissolved			93.4		%		70-130	30-APR-21
Molybdenum (Mo)-Dissolved			100.0		%		70-130	30-APR-21
Nickel (Ni)-Dissolved			93.7		%		70-130	30-APR-21
Phosphorus (P)-Dissolved			96.5		%		70-130	30-APR-21
Potassium (K)-Dissolved			90.2		%		70-130	30-APR-21
Selenium (Se)-Dissolved			96.5		%		70-130	30-APR-21
Silicon (Si)-Dissolved			92.1		%		70-130	30-APR-21
Silver (Ag)-Dissolved			97.8		%		70-130	30-APR-21
Sodium (Na)-Dissolved			95.1		%		70-130	30-APR-21
Strontium (Sr)-Dissolved			N/A	MS-B	%		-	30-APR-21
Thallium (Tl)-Dissolved			98.9		%		70-130	30-APR-21
Tin (Sn)-Dissolved			98.3		%		70-130	30-APR-21
Titanium (Ti)-Dissolved			86.9		%		70-130	30-APR-21
Uranium (U)-Dissolved			104.0		%		70-130	30-APR-21
Vanadium (V)-Dissolved			91.9		%		70-130	30-APR-21
Zinc (Zn)-Dissolved			95.5		%		70-130	30-APR-21
Zirconium (Zr)-Dissolved			100.1		%		70-130	30-APR-21
<b>MET-T-CCMS-CL</b> Water								
Batch R5442555								
WG3525364-1 LCS		TMRM						
Aluminum (Al)-Total			97.3		%		80-120	28-APR-21
Antimony (Sb)-Total			99.8		%		80-120	28-APR-21
Arsenic (As)-Total			95.3		%		80-120	28-APR-21
Barium (Ba)-Total			101.7		%		80-120	28-APR-21
Bismuth (Bi)-Total			97.9		%		80-120	28-APR-21
Boron (B)-Total			93.4		%		80-120	28-APR-21
Cadmium (Cd)-Total			95.0		%		80-120	28-APR-21
Calcium (Ca)-Total			96.6		%		80-120	28-APR-21
Chromium (Cr)-Total			93.8		%		80-120	28-APR-21
Cobalt (Co)-Total			98.2		%		80-120	28-APR-21
Copper (Cu)-Total			93.7		%		80-120	28-APR-21
Iron (Fe)-Total			99.2		%		80-120	28-APR-21

## Quality Control Report

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL	Water							
Batch	R5442555							
WG3525364-1	LCS	TMRM						
Lead (Pb)-Total			98.7	%		80-120	28-APR-21	
Lithium (Li)-Total			103.6	%		80-120	28-APR-21	
Magnesium (Mg)-Total			97.5	%		80-120	28-APR-21	
Manganese (Mn)-Total			99.1	%		80-120	28-APR-21	
Molybdenum (Mo)-Total			101.4	%		80-120	28-APR-21	
Nickel (Ni)-Total			94.4	%		80-120	28-APR-21	
Phosphorus (P)-Total			101.6	%		70-130	28-APR-21	
Potassium (K)-Total			95.9	%		80-120	28-APR-21	
Selenium (Se)-Total			92.1	%		80-120	28-APR-21	
Silicon (Si)-Total			96.0	%		60-140	28-APR-21	
Silver (Ag)-Total			99.4	%		80-120	28-APR-21	
Sodium (Na)-Total			99.1	%		80-120	28-APR-21	
Strontium (Sr)-Total			102.7	%		80-120	28-APR-21	
Sulfur (S)-Total			107.9	%		80-120	28-APR-21	
Thallium (Tl)-Total			96.7	%		80-120	28-APR-21	
Tin (Sn)-Total			98.5	%		80-120	28-APR-21	
Titanium (Ti)-Total			90.4	%		80-120	28-APR-21	
Uranium (U)-Total			103.3	%		80-120	28-APR-21	
Vanadium (V)-Total			98.3	%		80-120	28-APR-21	
Zinc (Zn)-Total			95.5	%		80-120	28-APR-21	
Zirconium (Zr)-Total			97.0	%		80-120	28-APR-21	
WG3525364-4	MB							
Aluminum (Al)-Total			<0.0030	mg/L		0.003	28-APR-21	
Antimony (Sb)-Total			<0.00010	mg/L		0.0001	28-APR-21	
Arsenic (As)-Total			<0.00010	mg/L		0.0001	28-APR-21	
Barium (Ba)-Total			<0.00010	mg/L		0.0001	28-APR-21	
Bismuth (Bi)-Total			<0.000050	mg/L		0.00005	28-APR-21	
Boron (B)-Total			<0.010	mg/L		0.01	28-APR-21	
Cadmium (Cd)-Total			<0.000005C	mg/L		0.000005	28-APR-21	
Calcium (Ca)-Total			<0.050	mg/L		0.05	28-APR-21	
Chromium (Cr)-Total			<0.00010	mg/L		0.0001	28-APR-21	
Cobalt (Co)-Total			<0.00010	mg/L		0.0001	28-APR-21	
Copper (Cu)-Total			<0.00050	mg/L		0.0005	28-APR-21	
Iron (Fe)-Total			<0.010	mg/L		0.01	28-APR-21	

## Quality Control Report

Workorder: L2580654

Report Date: 05-MAY-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-CL</b>	<b>Water</b>							
Batch	R5442555							
<b>WG3525364-4 MB</b>								
Lead (Pb)-Total			<0.000050		mg/L		0.00005	28-APR-21
Lithium (Li)-Total			<0.0010		mg/L		0.001	28-APR-21
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	28-APR-21
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	28-APR-21
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	28-APR-21
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	28-APR-21
Phosphorus (P)-Total			<0.050		mg/L		0.05	28-APR-21
Potassium (K)-Total			<0.050		mg/L		0.05	28-APR-21
Selenium (Se)-Total			<0.000050		mg/L		0.00005	28-APR-21
Silicon (Si)-Total			<0.050		mg/L		0.05	28-APR-21
Silver (Ag)-Total			<0.000010		mg/L		0.00001	28-APR-21
Sodium (Na)-Total			<0.050		mg/L		0.05	28-APR-21
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	28-APR-21
Sulfur (S)-Total			<0.50		mg/L		0.5	28-APR-21
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	28-APR-21
Tin (Sn)-Total			<0.00010		mg/L		0.0001	28-APR-21
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	28-APR-21
Uranium (U)-Total			<0.000010		mg/L		0.00001	28-APR-21
Vanadium (V)-Total			<0.00050		mg/L		0.0005	28-APR-21
Zinc (Zn)-Total			<0.0030		mg/L		0.003	28-APR-21
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	28-APR-21
<b>NH3-L-F-CL</b>	<b>Water</b>							
Batch	R5448846							
<b>WG3528942-3 DUP</b>		<b>L2580654-1</b>						
Ammonia as N		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	04-MAY-21
<b>WG3528942-2 LCS</b>			104.1		%		85-115	04-MAY-21
Ammonia as N								
<b>WG3528942-1 MB</b>			<0.0050		mg/L		0.005	04-MAY-21
Ammonia as N								
<b>WG3528942-4 MS</b>		<b>L2580654-1</b>						
Ammonia as N		98.4			%		75-125	04-MAY-21
<b>NO2-L-IC-N-CL</b>	<b>Water</b>							

## Quality Control Report

Workorder: L2580654

Report Date: 05-MAY-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed	
<b>NO2-L-IC-N-CL</b>									
Water									
Batch R5443116									
WG3526367-3 DUP	Nitrite (as N)	L2580654-1	<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	28-APR-21
WG3526367-2 LCS	Nitrite (as N)		100.7		%		90-110	28-APR-21	
WG3526367-6 LCS	Nitrite (as N)		100.4		%		90-110	28-APR-21	
WG3526367-9 LCS	Nitrite (as N)		101.1		%		90-110	28-APR-21	
WG3526367-1 MB	Nitrite (as N)		<0.0010		mg/L		0.001	28-APR-21	
WG3526367-5 MB	Nitrite (as N)		<0.0010		mg/L		0.001	28-APR-21	
WG3526367-8 MB	Nitrite (as N)		<0.0010		mg/L		0.001	28-APR-21	
<b>NO3-L-IC-N-CL</b>									
Water									
Batch R5443116									
WG3526367-3 DUP	Nitrate (as N)	L2580654-1	0.0084	0.0083		mg/L	1.2	20	28-APR-21
WG3526367-2 LCS	Nitrate (as N)		98.9		%		90-110	28-APR-21	
WG3526367-6 LCS	Nitrate (as N)		98.7		%		90-110	28-APR-21	
WG3526367-9 LCS	Nitrate (as N)		99.1		%		90-110	28-APR-21	
WG3526367-1 MB	Nitrate (as N)		<0.0050		mg/L		0.005	28-APR-21	
WG3526367-5 MB	Nitrate (as N)		<0.0050		mg/L		0.005	28-APR-21	
WG3526367-8 MB	Nitrate (as N)		<0.0050		mg/L		0.005	28-APR-21	
<b>PH/EC/ALK-CL</b>									
Water									
Batch R5446420									
WG3528269-6 DUP	pH	L2580654-1	7.77	7.77	J	pH	0.00	0.2	03-MAY-21
	Conductivity (EC)		937	931		uS/cm	0.6	10	03-MAY-21
	Bicarbonate (HCO3)		253	252		mg/L	0.6	20	03-MAY-21
	Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	20	03-MAY-21
	Hydroxide (OH)		<5.0	<5.0	RPD-NA	mg/L	N/A	20	03-MAY-21



## Quality Control Report

Workorder: L2580654

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-L-CL	Water	Batch R5445278 WG3527440-1 MB Total Suspended Solids	<1.0		mg/L	1		01-MAY-21

# Quality Control Report

Workorder: L2580654

Report Date: 05-MAY-21

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## 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
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

## Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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.



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## **Chair**



L2580654-COFC

COC Number: 20 -

Page \_\_\_\_\_ of \_\_\_\_\_

Report To Contact and company name below will appear on the final report		Reports / Recipients		Turnaround Time (TAT) Requested	
Company:	Sperling Hansen Associates Inc.	Select Report Format:	<input type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL)	<input checked="" type="checkbox"/> Routine [R] if received by 3pm M-F - no surcharges apply	
Contact:	Scott Garthwaite	Merge QC/QCI Reports with COA	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/> 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum	
Phone:	778-471-7088	<input checked="" type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked		<input type="checkbox"/> 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum	
Company address below will appear on the final report		Select Distribution:	<input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX	<input type="checkbox"/> 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum	
Street:	1225 East Keith Road	Email 1 or Fax	sgarthwaite@sperlinghansen.com	<input type="checkbox"/> 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum	
City/Province:	North Vancouver, B.C.	Email 2	chetherington@sperlinghansen.com	Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests	
Postal Code:	V7J 1J3	Email 3		Date and Time Required for all E&P TATs:	dd-mm-yy hh:mm am/pm
Invoice To	Same as Report To <input checked="" type="checkbox"/> YES <input checked="" type="checkbox"/> NO	Invoice Recipients		For all tests with rush TATs requested, please contact your AM to confirm availability.	
	Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	Select Invoice Distribution:	<input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX	Analysis Request	
Company:		Email 1 or Fax	chetherington@sperlinghansen.com	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below	
Contact:		Email 2			
Project Information		Oil and Gas Required Fields (client use)			
ALS Account # / Quota #:		AFE/Cost Center:	PO#		
Job #:	20050 Columbia Valley	Major/Minor Code:	Routing Code:		
PO / AFE:		Requisitioner:			
LSD:		Location:			
ALS Lab Work Order # (ALS use only):		ALS Contact: Dean Watt	Sampler: T. McBride		
ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mm-yy)	Time (hh:mm)	Sample Type	
	E207782	25-04-2021		Groundwater	
	E207780	25-04-2021		Groundwater	
	E265103	25-04-2021		Groundwater	
	E265102	25-04-2021		Groundwater	
	E208720	—		Groundwater	
	E208726	—		Groundwater	
	E207778	25-04-2021		Groundwater	
	03-5	—		Groundwater	
Drinking Water (DW) Samples <sup>1</sup> (client use)		Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)			
Are samples taken from a Regulated DW System?		British Columbia Contaminated Sites Regulation Stage 10 Amendment (NOV, 2017)			
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)			
Are samples for human consumption/ use?					
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO					
SAMPLE RECEIPT DETAILS (ALS use only)					
Cooling Method: <input type="checkbox"/> NONE <input type="checkbox"/> ICE <input type="checkbox"/> ICE PACKS <input type="checkbox"/> FROZEN <input type="checkbox"/> COOLING INITIATED					
Submission Comments identified on Sample Receipt Notification: <input type="checkbox"/> YES <input type="checkbox"/> NO					
Cooler Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A Sample Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A					
INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
6			1		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: <i>T. McBride</i>	Date: April 26, 2021	Time: 12:00 PM	Received by: <i>R.</i>	Date: 4/27	Time: 7:30	Received by <i>R.</i>	Date	Time

**REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION**      **WHITE - LABORATORY COPY**      **YELLOW - CLIENT COPY**

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.**



Sperling Hansen Associates Inc.  
ATTN: Scott Garthwaite  
#8 - 1225 East Keith Road  
North Vancouver BC V7J 1J3

Date Received: 27-JUL-21  
Report Date: 05-AUG-21 08:32 (MT)  
Version: FINAL

Client Phone: 604-986-7723

## Certificate of Analysis

Lab Work Order #: L2619091

Project P.O. #: NOT SUBMITTED

Job Reference: 20050 COLUMBIA VALLEY

C of C Numbers:

Legal Site Desc:

A handwritten signature in black ink, appearing to read "Patryk Wojciak".

Patryk Wojciak, B.Sc., P.Chem.  
Account Manager

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

ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298  
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# ALS ENVIRONMENTAL ANALYTICAL REPORT

**L2619091 CONTD....**  
**PAGE 2 of 9**  
**05-AUG-21 08:32 (MT)**  
**Version: FINAL**

	<b>Sample ID</b> <b>Description</b> <b>Sampled Date</b> <b>Sampled Time</b> <b>Client ID</b>	L2619091-1 WATER 25-JUL-21 E207782	L2619091-2 WATER 25-JUL-21 E207780	L2619091-3 WATER 25-JUL-21 E265103	L2619091-4 WATER 25-JUL-21 E265102	L2619091-5 WATER 25-JUL-21 E208720
<b>Grouping</b>	<b>Analyte</b>					
	<b>WATER</b>					
<b>Physical Tests</b>	Hardness (as CaCO <sub>3</sub> ) (mg/L)	604	HTC	558	HTC	729
	Temperature (Degree C)	20.0		19.0		19.0
	Total Suspended Solids (mg/L)	1.6		<1.0		2240
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO <sub>3</sub> ) (mg/L)	239		200		364
	Ammonia as N (mg/L)	0.0125		0.0181		0.0286
	Bicarbonate (HCO <sub>3</sub> ) (mg/L)	292		243		444
	Carbonate (CO <sub>3</sub> ) (mg/L)	<5.0		<5.0		<5.0
	Chloride (Cl) (mg/L)	2.51		1.59		5.10
	Conductivity (EC) (uS/cm)	922		864		1110
	Fluoride (F) (mg/L)	0.16		0.190		0.11
	Hydroxide (OH) (mg/L)	<5.0		<5.0		<5.0
	Nitrate and Nitrite (as N) (mg/L)	0.291		0.0757		0.229
	Nitrate (as N) (mg/L)	0.291		0.0734		0.229
	Nitrite (as N) (mg/L)	<0.0050	DLDS	0.0023	DLDS	<0.0050
	pH (pH)	7.46		7.65		7.29
	Sulfate (SO <sub>4</sub> ) (mg/L)	377		357		388
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	<0.0030		0.0034		
	Antimony (Sb)-Total (mg/L)	<0.00010		<0.00010		
	Arsenic (As)-Total (mg/L)	0.00010		<0.00010		
	Barium (Ba)-Total (mg/L)	0.0101		0.00975		
	Beryllium (Be)-Total (mg/L)	<0.000020		<0.000020		
	Bismuth (Bi)-Total (mg/L)	<0.000050		<0.000050		
	Boron (B)-Total (mg/L)	0.033		0.031		
	Cadmium (Cd)-Total (mg/L)	<0.0000050		0.0000084		
	Calcium (Ca)-Total (mg/L)	159		150		
	Chromium (Cr)-Total (mg/L)	<0.00010		<0.00010		
	Cobalt (Co)-Total (mg/L)	<0.00010		<0.00010		
	Copper (Cu)-Total (mg/L)	0.00091		<0.00050		
	Iron (Fe)-Total (mg/L)	0.016		0.079		
	Lead (Pb)-Total (mg/L)	<0.000050		<0.000050		
	Lithium (Li)-Total (mg/L)	0.0085		0.0065		
	Magnesium (Mg)-Total (mg/L)	50.3		44.7		
	Manganese (Mn)-Total (mg/L)	0.00354		0.00334		
	Mercury (Hg)-Total (mg/L)	<0.0000050		<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	0.000659		0.000740		
	Nickel (Ni)-Total (mg/L)	0.00059		<0.00050		
	Phosphorus (P)-Total (mg/L)	<0.050		<0.050		

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L2619091-6 WATER 25-JUL-21 E207778	L2619091-7 WATER 25-JUL-21 MW03-5			
Grouping	Analyte						
<b>WATER</b>							
<b>Physical Tests</b>	Hardness (as CaCO <sub>3</sub> ) (mg/L)		578	HTC	590		
	Temperature (Degree C)		20.0		20.0		
	Total Suspended Solids (mg/L)		<1.0		3.0		
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO <sub>3</sub> ) (mg/L)		235		243		
	Ammonia as N (mg/L)		<0.0050		<0.0050		
	Bicarbonate (HCO <sub>3</sub> ) (mg/L)		287		297		
	Carbonate (CO <sub>3</sub> ) (mg/L)		<5.0		<5.0		
	Chloride (Cl) (mg/L)		2.19		1.69		
	Conductivity (EC) (uS/cm)		915		944		
	Fluoride (F) (mg/L)		0.18		0.14		
	Hydroxide (OH) (mg/L)		<5.0		<5.0		
	Nitrate and Nitrite (as N) (mg/L)		0.168		<0.025		
	Nitrate (as N) (mg/L)		0.168	DLDs	<0.025		
	Nitrite (as N) (mg/L)		<0.0050	DLDs	<0.0050	DLDs	
	pH (pH)		7.56		7.65		
	Sulfate (SO <sub>4</sub> ) (mg/L)		359		381		
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)		<0.0030				
	Antimony (Sb)-Total (mg/L)		<0.00010				
	Arsenic (As)-Total (mg/L)		<0.00010				
	Barium (Ba)-Total (mg/L)		0.0124				
	Beryllium (Be)-Total (mg/L)		<0.000020				
	Bismuth (Bi)-Total (mg/L)		<0.000050				
	Boron (B)-Total (mg/L)		0.046				
	Cadmium (Cd)-Total (mg/L)		<0.0000050				
	Calcium (Ca)-Total (mg/L)		166				
	Chromium (Cr)-Total (mg/L)		0.00012				
	Cobalt (Co)-Total (mg/L)		<0.00010				
	Copper (Cu)-Total (mg/L)		0.00288				
	Iron (Fe)-Total (mg/L)		0.052				
	Lead (Pb)-Total (mg/L)		<0.000050				
	Lithium (Li)-Total (mg/L)		0.0056				
	Magnesium (Mg)-Total (mg/L)		39.9				
	Manganese (Mn)-Total (mg/L)		0.00062				
	Mercury (Hg)-Total (mg/L)		<0.0000050				
	Molybdenum (Mo)-Total (mg/L)		0.000817				
	Nickel (Ni)-Total (mg/L)		0.00069				
	Phosphorus (P)-Total (mg/L)		<0.050				

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

**L2619091 CONTD....**  
**PAGE 4 of 9**  
**05-AUG-21 08:32 (MT)**  
**Version: FINAL**

	<b>Sample ID</b>	L2619091-1	L2619091-2	L2619091-3	L2619091-4	L2619091-5
	<b>Description</b>	WATER	WATER	WATER	WATER	WATER
	<b>Sampled Date</b>	25-JUL-21	25-JUL-21	25-JUL-21	25-JUL-21	25-JUL-21
	<b>Sampled Time</b>					
	<b>Client ID</b>	E207782	E207780	E265103	E265102	E208720
<b>Grouping</b>	<b>Analyte</b>					
<b>WATER</b>						
<b>Total Metals</b>	Potassium (K)-Total (mg/L)	1.03	0.93			
	Selenium (Se)-Total (mg/L)	0.000062	<0.000050			
	Silicon (Si)-Total (mg/L)	3.69	3.42			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	6.67	3.10			
	Strontium (Sr)-Total (mg/L)	2.09 <sup>RRV</sup>	1.88 <sup>RRV</sup>			
	Sulfur (S)-Total (mg/L)	107	104			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Total (mg/L)	0.00163	0.00143			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	0.0059	0.0366			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location			FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location			FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)		0.0013	0.0024	<0.0010	
	Antimony (Sb)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Dissolved (mg/L)		0.00039	0.00015	<0.00010	
	Barium (Ba)-Dissolved (mg/L)		0.0188	0.0139	0.0140	
	Beryllium (Be)-Dissolved (mg/L)		<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)		0.045	0.042	0.043	
	Cadmium (Cd)-Dissolved (mg/L)		0.0000103	0.000238	0.0000312	
	Calcium (Ca)-Dissolved (mg/L)		213	219	241	
	Chromium (Cr)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)		0.00022	<0.00010	<0.00010	
	Copper (Cu)-Dissolved (mg/L)		0.00047	0.00310	0.00208	
	Iron (Fe)-Dissolved (mg/L)		0.010	<0.010	0.998	
	Lead (Pb)-Dissolved (mg/L)		0.000061	0.000087	0.000234	
	Lithium (Li)-Dissolved (mg/L)		0.0062	0.0076	0.0065	
	Magnesium (Mg)-Dissolved (mg/L)		47.8	47.7	48.9	
	Manganese (Mn)-Dissolved (mg/L)		0.0362	0.00349	0.0124	
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)		0.000741	0.000599	0.000416	
	Nickel (Ni)-Dissolved (mg/L)		0.00122	0.00132	0.00725	
	Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050	<0.050	

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

L2619091 CONTD....  
 PAGE 5 of 9  
 05-AUG-21 08:32 (MT)  
 Version: FINAL

		Sample ID Description Sampled Date Sampled Time Client ID	L2619091-6 WATER 25-JUL-21 E207778	L2619091-7 WATER 25-JUL-21 MW03-5			
Grouping	Analyte						
<b>WATER</b>							
<b>Total Metals</b>	Potassium (K)-Total (mg/L)		0.82				
	Selenium (Se)-Total (mg/L)		0.000198				
	Silicon (Si)-Total (mg/L)		3.00				
	Silver (Ag)-Total (mg/L)		<0.000010				
	Sodium (Na)-Total (mg/L)		2.74				
	Strontium (Sr)-Total (mg/L)		1.75 <sup>RRV</sup>				
	Sulfur (S)-Total (mg/L)		106				
	Thallium (Tl)-Total (mg/L)		<0.000010				
	Tin (Sn)-Total (mg/L)		<0.00010				
	Titanium (Ti)-Total (mg/L)		<0.00030				
	Uranium (U)-Total (mg/L)		0.00123				
	Vanadium (V)-Total (mg/L)		<0.00050				
	Zinc (Zn)-Total (mg/L)		0.0059				
	Zirconium (Zr)-Total (mg/L)		<0.00030				
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location			FIELD			
	Dissolved Metals Filtration Location			FIELD			
	Aluminum (Al)-Dissolved (mg/L)			<0.0010			
	Antimony (Sb)-Dissolved (mg/L)			<0.00010			
	Arsenic (As)-Dissolved (mg/L)			0.00011			
	Barium (Ba)-Dissolved (mg/L)			0.0118			
	Beryllium (Be)-Dissolved (mg/L)			<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)			<0.000050			
	Boron (B)-Dissolved (mg/L)			0.046			
	Cadmium (Cd)-Dissolved (mg/L)			<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)			170			
	Chromium (Cr)-Dissolved (mg/L)			<0.00010			
	Cobalt (Co)-Dissolved (mg/L)			<0.00010			
	Copper (Cu)-Dissolved (mg/L)			0.00368			
	Iron (Fe)-Dissolved (mg/L)			1.04			
	Lead (Pb)-Dissolved (mg/L)			0.000124			
	Lithium (Li)-Dissolved (mg/L)			0.0056			
	Magnesium (Mg)-Dissolved (mg/L)			40.2			
	Manganese (Mn)-Dissolved (mg/L)			0.0177			
	Mercury (Hg)-Dissolved (mg/L)			<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)			0.000897			
	Nickel (Ni)-Dissolved (mg/L)			<0.00050			
	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

**L2619091 CONTD....**  
**PAGE 6 of 9**  
**05-AUG-21 08:32 (MT)**  
**Version: FINAL**

	<b>Sample ID</b> <b>Description</b>	L2619091-1 WATER	L2619091-2 WATER	L2619091-3 WATER	L2619091-4 WATER	L2619091-5 WATER
	<b>Sampled Date</b> <b>Sampled Time</b>	25-JUL-21	25-JUL-21	25-JUL-21	25-JUL-21	25-JUL-21
	<b>Client ID</b>	E207782	E207780	E265103	E265102	E208720
<b>Grouping</b>	<b>Analyte</b>					
	<b>WATER</b>					
<b>Dissolved Metals</b>	Potassium (K)-Dissolved (mg/L)		1.19	1.32	1.05	
	Selenium (Se)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	
	Silicon (Si)-Dissolved (mg/L)		4.01	4.61	4.35	
	Silver (Ag)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	
	Sodium (Na)-Dissolved (mg/L)		4.54	4.31	3.22	
	Strontium (Sr)-Dissolved (mg/L)		1.74 <small>RRV</small>	2.06 <small>RRV</small>	1.84 <small>RRV</small>	
	Sulfur (S)-Dissolved (mg/L)		115	114	118	
	Thallium (Tl)-Dissolved (mg/L)		<0.000010	<0.000010	<0.000010	
	Tin (Sn)-Dissolved (mg/L)		<0.00010	0.00022	0.00279	
	Titanium (Ti)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	
	Uranium (U)-Dissolved (mg/L)		0.00136	0.00162	0.00154	
	Vanadium (V)-Dissolved (mg/L)		<0.00050	<0.00050	<0.00050	
	Zinc (Zn)-Dissolved (mg/L)		0.0019	0.0236	0.0265	
	Zirconium (Zr)-Dissolved (mg/L)		<0.00030	<0.00030	<0.00030	

# ALS ENVIRONMENTAL ANALYTICAL REPORT

L2619091 CONTD....  
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 Version: FINAL

Sample ID	L2619091-6	Description	WATER	Sampled Date	25-JUL-21	Sampled Time	25-JUL-21	Client ID	E207778	MW03-5		
Grouping	Analyte											
<b>WATER</b>												
<b>Dissolved Metals</b>	Potassium (K)-Dissolved (mg/L)											
	Selenium (Se)-Dissolved (mg/L)											
	Silicon (Si)-Dissolved (mg/L)											
	Silver (Ag)-Dissolved (mg/L)											
	Sodium (Na)-Dissolved (mg/L)											
	Strontium (Sr)-Dissolved (mg/L)											
	Sulfur (S)-Dissolved (mg/L)											
	Thallium (Tl)-Dissolved (mg/L)											
	Tin (Sn)-Dissolved (mg/L)											
	Titanium (Ti)-Dissolved (mg/L)											
	Uranium (U)-Dissolved (mg/L)											
	Vanadium (V)-Dissolved (mg/L)											
	Zinc (Zn)-Dissolved (mg/L)											
	Zirconium (Zr)-Dissolved (mg/L)											

## Reference Information

**QC Samples with Qualifiers & Comments:**

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Ammonia as N	MS-B	L2619091-1, -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.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
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**
<b>BE-D-L-CCMS-CL</b>	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
<b>BE-T-L-CCMS-CL</b>	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
<b>CL-L-IC-N-CL</b>	Water	Chloride in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
<b>F-L-IC-CL</b>	Water	Fluoride	APHA 4110 B-Ion Chromatography
<b>HARDNESS-CALC-CL</b>	Water	Hardness	APHA 2340 B
		Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.	
<b>HG-D-CVAA-CL</b>	Water	Dissolved Mercury in Water by CVAAS	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.	
<b>HG-T-CVAA-CL</b>	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)
		Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.	
<b>MET-D-CCMS-CL</b>	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
<b>MET-T-CCMS-CL</b>	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
<b>N2N3-CALC-CL</b>	Water	Nitrate+Nitrite	CALCULATION
<b>NH3-L-F-CL</b>	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
		This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.	
<b>NO2-L-IC-N-CL</b>	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
<b>NO3-L-IC-N-CL</b>	Water	Nitrate in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
<b>PH/EC/ALK-CL</b>	Water	pH, Conductivity and Total Alkalinity	APHA 4500H,2510,2320
		All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)	
		pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode.	
		Alkalinity measurement is based on the sample's capacity to neutralize acid	

## Reference Information

Conductivity measurement is based on the sample's capacity to convey an electric current

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

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

**TEMP-CL** Water Temperature APHA 2550-Thermometer

**TSS-L-CL** Water Total Suspended Solids 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, and by drying the filter at 104 deg. C.

\*\* 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
----------------------------	---------------------

CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, 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: L2619091

Report Date: 05-AUG-21

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**Client:** Sperling Hansen Associates Inc.  
 #8 - 1225 East Keith Road  
 North Vancouver BC V7J 1J3

**Contact:** Scott Garthwaite

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>BE-D-L-CCMS-CL</b>	Water							
Batch	R5543847							
WG3590193-2	LCS	TMRM						
Beryllium (Be)-Dissolved			98.4	%		80-120	04-AUG-21	
WG3590193-1	MB							
Beryllium (Be)-Dissolved			<0.000020	mg/L		0.00002	04-AUG-21	
<b>BE-T-L-CCMS-CL</b>	Water							
Batch	R5543847							
WG3585922-6	LCS	TMRM						
Beryllium (Be)-Total			100.5	%		80-120	04-AUG-21	
WG3585922-5	MB							
Beryllium (Be)-Total			<0.000020	mg/L		0.00002	04-AUG-21	
<b>CL-L-IC-N-CL</b>	Water							
Batch	R5531009							
WG3585837-2	LCS							
Chloride (Cl)			100.1	%		85-115	27-JUL-21	
WG3585837-1	MB							
Chloride (Cl)			<0.10	mg/L		0.1	27-JUL-21	
<b>F-L-IC-CL</b>	Water							
Batch	R5531009							
WG3585837-2	LCS							
Fluoride (F)			100.1	%		85-115	27-JUL-21	
WG3585837-1	MB							
Fluoride (F)			<0.020	mg/L		0.02	27-JUL-21	
<b>HG-D-CVAA-CL</b>	Water							
Batch	R5543463							
WG3589795-3	DUP	L2619091-7						
Mercury (Hg)-Dissolved		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	04-AUG-21
WG3589795-2	LCS							
Mercury (Hg)-Dissolved			96.1	%		80-120	04-AUG-21	
WG3589795-1	MB							
Mercury (Hg)-Dissolved			<0.0000050	mg/L		0.000005	04-AUG-21	
WG3589795-4	MS	L2619091-7						
Mercury (Hg)-Dissolved		103.0	%			70-130	04-AUG-21	
<b>HG-T-CVAA-CL</b>	Water							
Batch	R5543463							
WG3589797-2	LCS							
Mercury (Hg)-Total			100.0	%		80-120	04-AUG-21	
WG3589797-1	MB							

## Quality Control Report

Workorder: L2619091

Report Date: 05-AUG-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>HG-T-CVAA-CL</b>	<b>Water</b>							
Batch	R5543463							
WG3589797-1 MB								
Mercury (Hg)-Total			<0.000005C		mg/L		0.000005	04-AUG-21
<b>MET-D-CCMS-CL</b>	<b>Water</b>							
Batch	R5543847							
WG3590193-2 LCS		TMRM						
Aluminum (Al)-Dissolved			95.3	%		80-120	04-AUG-21	
Antimony (Sb)-Dissolved			101.2	%		80-120	04-AUG-21	
Arsenic (As)-Dissolved			94.4	%		80-120	04-AUG-21	
Barium (Ba)-Dissolved			98.6	%		80-120	04-AUG-21	
Bismuth (Bi)-Dissolved			99.0	%		80-120	04-AUG-21	
Boron (B)-Dissolved			105.2	%		80-120	04-AUG-21	
Cadmium (Cd)-Dissolved			97.2	%		80-120	04-AUG-21	
Calcium (Ca)-Dissolved			99.8	%		80-120	04-AUG-21	
Chromium (Cr)-Dissolved			96.1	%		80-120	04-AUG-21	
Cobalt (Co)-Dissolved			95.4	%		80-120	04-AUG-21	
Copper (Cu)-Dissolved			94.6	%		80-120	04-AUG-21	
Iron (Fe)-Dissolved			97.7	%		80-120	04-AUG-21	
Lead (Pb)-Dissolved			97.1	%		80-120	04-AUG-21	
Lithium (Li)-Dissolved			107.2	%		80-120	04-AUG-21	
Magnesium (Mg)-Dissolved			106.3	%		80-120	04-AUG-21	
Manganese (Mn)-Dissolved			94.3	%		80-120	04-AUG-21	
Molybdenum (Mo)-Dissolved			94.9	%		80-120	04-AUG-21	
Nickel (Ni)-Dissolved			94.6	%		80-120	04-AUG-21	
Phosphorus (P)-Dissolved			95.8	%		70-130	04-AUG-21	
Potassium (K)-Dissolved			96.5	%		80-120	04-AUG-21	
Selenium (Se)-Dissolved			93.4	%		80-120	04-AUG-21	
Silicon (Si)-Dissolved			91.3	%		60-140	04-AUG-21	
Silver (Ag)-Dissolved			89.6	%		80-120	04-AUG-21	
Sodium (Na)-Dissolved			98.0	%		80-120	04-AUG-21	
Strontium (Sr)-Dissolved			97.3	%		80-120	04-AUG-21	
Sulfur (S)-Dissolved			93.7	%		80-120	04-AUG-21	
Thallium (Tl)-Dissolved			96.6	%		80-120	04-AUG-21	
Tin (Sn)-Dissolved			98.4	%		80-120	04-AUG-21	
Titanium (Ti)-Dissolved			90.7	%		80-120	04-AUG-21	

## Quality Control Report

Workorder: L2619091

Report Date: 05-AUG-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-CL</b>	<b>Water</b>							
<b>Batch</b>	<b>R5543847</b>							
<b>WG3590193-2 LCS</b>		<b>TMRM</b>						
Uranium (U)-Dissolved			90.3		%		80-120	04-AUG-21
Vanadium (V)-Dissolved			97.3		%		80-120	04-AUG-21
Zinc (Zn)-Dissolved			94.5		%		80-120	04-AUG-21
Zirconium (Zr)-Dissolved			91.5		%		80-120	04-AUG-21
<b>WG3590193-1 MB</b>								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	04-AUG-21
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	04-AUG-21
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	04-AUG-21
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	04-AUG-21
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	04-AUG-21
Boron (B)-Dissolved			<0.010		mg/L		0.01	04-AUG-21
Cadmium (Cd)-Dissolved			<0.000005C		mg/L		0.000005	04-AUG-21
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	04-AUG-21
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	04-AUG-21
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	04-AUG-21
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	04-AUG-21
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	04-AUG-21
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	04-AUG-21
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	04-AUG-21
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	04-AUG-21
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	04-AUG-21
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	04-AUG-21
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	04-AUG-21
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	04-AUG-21
Potassium (K)-Dissolved			<0.050		mg/L		0.05	04-AUG-21
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	04-AUG-21
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	04-AUG-21
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	04-AUG-21
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	04-AUG-21
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	04-AUG-21
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	04-AUG-21
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	04-AUG-21
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	04-AUG-21
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	04-AUG-21

## Quality Control Report

Workorder: L2619091

Report Date: 05-AUG-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-CL</b>	<b>Water</b>							
Batch	R5543847							
<b>WG3590193-1 MB</b>								
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	04-AUG-21
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	04-AUG-21
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	04-AUG-21
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	04-AUG-21
<b>MET-T-CCMS-CL</b>	<b>Water</b>							
Batch	R5543847							
<b>WG3585922-6 LCS</b>		<b>TMRM</b>						
Aluminum (Al)-Total			96.1		%		80-120	04-AUG-21
Antimony (Sb)-Total			109.9		%		80-120	04-AUG-21
Arsenic (As)-Total			95.0		%		80-120	04-AUG-21
Barium (Ba)-Total			105.5		%		80-120	04-AUG-21
Bismuth (Bi)-Total			117.0		%		80-120	04-AUG-21
Boron (B)-Total			97.3		%		80-120	04-AUG-21
Cadmium (Cd)-Total			102.3		%		80-120	04-AUG-21
Calcium (Ca)-Total			100.3		%		80-120	04-AUG-21
Chromium (Cr)-Total			96.7		%		80-120	04-AUG-21
Cobalt (Co)-Total			95.4		%		80-120	04-AUG-21
Copper (Cu)-Total			93.4		%		80-120	04-AUG-21
Iron (Fe)-Total			96.5		%		80-120	04-AUG-21
Lead (Pb)-Total			102.3		%		80-120	04-AUG-21
Lithium (Li)-Total			107.5		%		80-120	04-AUG-21
Magnesium (Mg)-Total			103.6		%		80-120	04-AUG-21
Manganese (Mn)-Total			94.7		%		80-120	04-AUG-21
Molybdenum (Mo)-Total			101.0		%		80-120	04-AUG-21
Nickel (Ni)-Total			97.6		%		80-120	04-AUG-21
Phosphorus (P)-Total			100.2		%		70-130	04-AUG-21
Potassium (K)-Total			98.6		%		80-120	04-AUG-21
Selenium (Se)-Total			97.2		%		80-120	04-AUG-21
Silicon (Si)-Total			91.2		%		60-140	04-AUG-21
Silver (Ag)-Total			94.6		%		80-120	04-AUG-21
Sodium (Na)-Total			95.4		%		80-120	04-AUG-21
Strontium (Sr)-Total			114.8		%		80-120	04-AUG-21
Sulfur (S)-Total			101.4		%		80-120	04-AUG-21
Thallium (Tl)-Total			101.3		%		80-120	04-AUG-21

## Quality Control Report

Workorder: L2619091

Report Date: 05-AUG-21

Page 5 of 8

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-CL</b>	<b>Water</b>							
<b>Batch</b>	<b>R5543847</b>							
<b>WG3585922-6 LCS</b>		<b>TMRM</b>						
Tin (Sn)-Total			109.6		%		80-120	04-AUG-21
Titanium (Ti)-Total			94.5		%		80-120	04-AUG-21
Uranium (U)-Total			97.7		%		80-120	04-AUG-21
Vanadium (V)-Total			96.2		%		80-120	04-AUG-21
Zinc (Zn)-Total			97.8		%		80-120	04-AUG-21
Zirconium (Zr)-Total			97.5		%		80-120	04-AUG-21
<b>WG3585922-5 MB</b>								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	04-AUG-21
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	04-AUG-21
Arsenic (As)-Total			<0.00010		mg/L		0.0001	04-AUG-21
Barium (Ba)-Total			<0.00010		mg/L		0.0001	04-AUG-21
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	04-AUG-21
Boron (B)-Total			<0.010		mg/L		0.01	04-AUG-21
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	04-AUG-21
Calcium (Ca)-Total			<0.050		mg/L		0.05	04-AUG-21
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	04-AUG-21
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	04-AUG-21
Copper (Cu)-Total			<0.00050		mg/L		0.0005	04-AUG-21
Iron (Fe)-Total			<0.010		mg/L		0.01	04-AUG-21
Lead (Pb)-Total			<0.000050		mg/L		0.00005	04-AUG-21
Lithium (Li)-Total			<0.0010		mg/L		0.001	04-AUG-21
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	04-AUG-21
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	04-AUG-21
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	04-AUG-21
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	04-AUG-21
Phosphorus (P)-Total			<0.050		mg/L		0.05	04-AUG-21
Potassium (K)-Total			<0.050		mg/L		0.05	04-AUG-21
Selenium (Se)-Total			<0.000050		mg/L		0.00005	04-AUG-21
Silicon (Si)-Total			<0.050		mg/L		0.05	04-AUG-21
Silver (Ag)-Total			<0.000010		mg/L		0.00001	04-AUG-21
Sodium (Na)-Total			<0.050		mg/L		0.05	04-AUG-21
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	04-AUG-21
Sulfur (S)-Total			<0.50		mg/L		0.5	04-AUG-21
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	04-AUG-21

## Quality Control Report

Workorder: L2619091

Report Date: 05-AUG-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-CL</b>	<b>Water</b>							
Batch R5543847								
<b>WG3585922-5 MB</b>								
Tin (Sn)-Total			<0.00010		mg/L		0.0001	04-AUG-21
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	04-AUG-21
Uranium (U)-Total			<0.000010		mg/L		0.00001	04-AUG-21
Vanadium (V)-Total			<0.000050		mg/L		0.0005	04-AUG-21
Zinc (Zn)-Total			<0.0030		mg/L		0.003	04-AUG-21
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	04-AUG-21
<b>NH3-L-F-CL</b>	<b>Water</b>							
Batch R5537382								
<b>WG3588117-7 DUP</b>		<b>L2619091-7</b>						
Ammonia as N		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	30-JUL-21
<b>WG3588117-2 LCS</b>			93.2		%		85-115	30-JUL-21
Ammonia as N								
<b>WG3588117-6 LCS</b>			101.0		%		85-115	30-JUL-21
Ammonia as N								
<b>WG3588117-1 MB</b>			<0.0050		mg/L		0.005	30-JUL-21
Ammonia as N								
<b>WG3588117-5 MB</b>			<0.0050		mg/L		0.005	30-JUL-21
Ammonia as N								
<b>WG3588117-8 MS</b>		<b>L2619091-7</b>						
Ammonia as N			103.2		%		75-125	30-JUL-21
<b>NO2-L-IC-N-CL</b>	<b>Water</b>							
Batch R5531009								
<b>WG3585837-2 LCS</b>								
Nitrite (as N)			100.4		%		90-110	27-JUL-21
<b>WG3585837-1 MB</b>								
Nitrite (as N)			<0.0010		mg/L		0.001	27-JUL-21
<b>NO3-L-IC-N-CL</b>	<b>Water</b>							
Batch R5531009								
<b>WG3585837-2 LCS</b>								
Nitrate (as N)			100.6		%		90-110	27-JUL-21
<b>WG3585837-1 MB</b>								
Nitrate (as N)			<0.0050		mg/L		0.005	27-JUL-21
<b>PH/EC/ALK-CL</b>	<b>Water</b>							

## Quality Control Report

Workorder: L2619091

Report Date: 05-AUG-21

Page 7 of 8

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>PH/EC/ALK-CL</b>								
<b>Water</b>								
<b>Batch R5540579</b> <b>WG3589092-3 DUP</b> <b>L2619091-7</b>								
pH	7.65	7.60	J	pH	0.05	0.2	31-JUL-21	
Conductivity (EC)	944	945		uS/cm	0.1	10	31-JUL-21	
Bicarbonate (HCO3)	297	303		mg/L	2.0	20	31-JUL-21	
Carbonate (CO3)	<5.0	<5.0	RPD-NA	mg/L	N/A	20	31-JUL-21	
Hydroxide (OH)	<5.0	<5.0	RPD-NA	mg/L	N/A	20	31-JUL-21	
Alkalinity, Total (as CaCO3)	243	248		mg/L	2.0	20	31-JUL-21	
<b>WG3589092-2 LCS</b>								
Conductivity (EC)		95.8		%		90-110	31-JUL-21	
Alkalinity, Total (as CaCO3)		108.2		%		85-115	31-JUL-21	
<b>WG3589092-1 MB</b>								
Conductivity (EC)		<2.0		uS/cm		2	31-JUL-21	
Bicarbonate (HCO3)		<5.0		mg/L		5	31-JUL-21	
Carbonate (CO3)		<5.0		mg/L		5	31-JUL-21	
Hydroxide (OH)		<5.0		mg/L		5	31-JUL-21	
Alkalinity, Total (as CaCO3)		<2.0		mg/L		2	31-JUL-21	
<b>SO4-L-IC-N-CL</b>								
<b>Water</b>								
<b>Batch R5531009</b> <b>WG3585837-2 LCS</b>								
Sulfate (SO4)		102.3		%		85-115	27-JUL-21	
<b>WG3585837-1 MB</b>								
Sulfate (SO4)		<0.050		mg/L		0.05	27-JUL-21	
<b>TEMP-CL</b>								
<b>Water</b>								
<b>Batch R5540579</b> <b>WG3589092-3 DUP</b> <b>L2619091-7</b>								
Temperature	20.0	20.0		Degree C	0.0	25	31-JUL-21	
<b>TSS-L-CL</b>								
<b>Water</b>								
<b>Batch R5534796</b> <b>WG3586182-2 LCS</b>								
Total Suspended Solids		96.3		%		85-115	29-JUL-21	
<b>WG3586182-1 MB</b>								
Total Suspended Solids		<1.0		mg/L		1	29-JUL-21	

# Quality Control Report

Workorder: L2619091

Report Date: 05-AUG-21

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

## Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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.



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## Chain of Custody (COC) / Analytical Request Form



L2619091-COFC

Canada Toll Free: 1 800 668 9878

Report To		Contact and company name below will appear on the final report		Reports / Recipients		Turnaround Time (TAT) Requested										AFFIX ALS BARCODE LABEL HERE (ALS use only)																																					
Company:	Sperling Hansen Associates Inc.			Select Report Format:	<input type="checkbox"/> PDF	<input checked="" type="checkbox"/> EXCEL	<input type="checkbox"/> EDD (DIGITAL)	<input checked="" type="checkbox"/> Routine [R] if received by 3pm M-F - no surcharges apply	<input type="checkbox"/> 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum	<input type="checkbox"/> 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum	<input type="checkbox"/> 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum	<input type="checkbox"/> 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum	<input type="checkbox"/> Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests	Date and Time Required for all E&P TATs:	dd-mm-yy hh:mm am/pm																																						
Contact:	Scott Garthwaite			Merge QC/QCI Reports with COA	<input checked="" type="checkbox"/> YES	<input type="checkbox"/> NO	<input type="checkbox"/> N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																								
Phone:	778-471-7088			Compare Results to Criteria on Report - provide details below if box checked																																																	
Company address below will appear on the final report																																																					
Street:	1225 East Keith Road			Email 1 or Fax	sgarthwaite@sperlinghansen.com																																																
City/Province:	North Vancouver, B.C.			Email 2	chetherington@sperlinghansen.com																																																
Postal Code:	V7J 1J3			Email 3																																																	
Invoice To	Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			Invoice Recipients																																																	
	Copy of Invoice with Report <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			Select Invoice Distribution:	<input checked="" type="checkbox"/> EMAIL	<input type="checkbox"/> MAIL	<input type="checkbox"/> FAX	For all tests with rush TATs requested, please contact your AM to confirm availability.																																													
Company:				Email 1 or Fax	chetherington@sperlinghansen.com																																																
Contact:				Email 2																																																	
Project Information				Oil and Gas Required Fields (client use)																																																	
ALS Account # / Quote #:	Q80923			AFE/Cost Center:	PO# /																																																
Job #:	20050 Columbia Valley			Major/Minor Code:	Routing Code:																																																
PO / AFE:				Requisitioner:																																																	
LSD:				Location:																																																	
ALS Lab Work Order # (ALS use only):				ALS Contact: Dean Watt	Sampler: TM		NUMBER OF CONTAINERS										Analysis Request Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																																				
* ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)			Date (dd-mm-yy)	Time (hh:mm)	Sample Type														Anions	Total Alkalinity	TSS	Dissolved Metals (F/P)	Total Metals (P)	Ammonia	fluoride	sulfate	chloride	hardness	nitrate	pH, conductivity, temperature																						
1	E207782 ✓			25-07-2021	-	Groundwater														R	R	R	R	R	R	R	R	R	R	R	R																						
2	E207780 ✓			"	-	Groundwater														R	R	R	R	R	R	R	R	R	R	R	R																						
3	E265103 ✓			"	-	Groundwater														R	R	R	R	R	R	R	R	R	R	R	R																						
4	E265102 ✓			"	-	Groundwater														R	R	R	R	R	R	R	R	R	R	R	R																						
5	E208720 ✓			"	-	Groundwater														R	R	R	R	R	R	R	R	R	R	R	R																						
6	E208726 ✓			"	-	Groundwater														R	R	R	R	R	R	R	R	R	R	R	R																						
7	E207778 ✓			"	-	Groundwater	R	R	R	R	R	R	R	R	R	R	R	R																																			
Drinking Water (DW) Samples <sup>1</sup> (client use)				Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)																																																	
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO				British Columbia Contaminated Sites Regulation Stage 10 Amendment (NOV, 2017) British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)																																																	
Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO				SAMPLE RECEIPT DETAILS (ALS use only)																																																	
				<table border="1"> <tr> <td>Cooling Method:</td> <td><input type="checkbox"/> NONE</td> <td><input type="checkbox"/> ICE</td> <td><input type="checkbox"/> ICE PACKS</td> <td><input type="checkbox"/> NONE</td> <td><input type="checkbox"/> FROZEN</td> <td><input type="checkbox"/> COOLING INITIATED</td> </tr> <tr> <td colspan="7">Submission Comments identified on Sample Receipt Notification:</td> </tr> <tr> <td colspan="7"> <input type="checkbox"/> YES <input type="checkbox"/> NO            Cooler Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A Sample Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A         </td> </tr> <tr> <td colspan="7">INITIAL COOLER TEMPERATURES °C</td> </tr> <tr> <td colspan="7">FINAL COOLER TEMPERATURES °C</td> </tr> </table>															Cooling Method:	<input type="checkbox"/> NONE	<input type="checkbox"/> ICE	<input type="checkbox"/> ICE PACKS	<input type="checkbox"/> NONE	<input type="checkbox"/> FROZEN	<input type="checkbox"/> COOLING INITIATED	Submission Comments identified on Sample Receipt Notification:							<input type="checkbox"/> YES <input type="checkbox"/> NO Cooler Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A Sample Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A							INITIAL COOLER TEMPERATURES °C							FINAL COOLER TEMPERATURES °C						
Cooling Method:	<input type="checkbox"/> NONE	<input type="checkbox"/> ICE	<input type="checkbox"/> ICE PACKS	<input type="checkbox"/> NONE	<input type="checkbox"/> FROZEN	<input type="checkbox"/> COOLING INITIATED																																															
Submission Comments identified on Sample Receipt Notification:																																																					
<input type="checkbox"/> YES <input type="checkbox"/> NO Cooler Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A Sample Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A																																																					
INITIAL COOLER TEMPERATURES °C																																																					
FINAL COOLER TEMPERATURES °C																																																					
SHIPMENT RELEASE (client use)				INITIAL SHIPMENT RECEIPTION (ALS use only)							FINAL SHIPMENT RECEIPTION (ALS use only)																																										
Released by:	TM	Date:	July 26	Time:	1:00 PM	Received by:	DR	Date:	2021	Time:	1:00 PM	Received by:	DR	Date:	2021	Time:	1:00 PM																																				

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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.

AUG 2020 FRONT



Sperling Hansen Associates Inc.  
ATTN: Scott Garthwaite  
#8 - 1225 East Keith Road  
North Vancouver BC V7J 1J3

Date Received: 09-NOV-21  
Report Date: 18-NOV-21 18:32 (MT)  
Version: FINAL

Client Phone: 604-986-7723

## Certificate of Analysis

Lab Work Order #: L2660664

Project P.O. #: NOT SUBMITTED

Job Reference: 20050 COLUMBIA VALLEY

C of C Numbers:

Legal Site Desc:

A handwritten signature in black ink, appearing to read "Patryk Wojciak".

Patryk Wojciak, B.Sc., P.Chem.  
Account Manager

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

ADDRESS: 2559 29 Street NE, Calgary, AB T1Y 7B5 Canada | Phone: +1 403 291 9897 | Fax: +1 403 291 0298  
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# ALS ENVIRONMENTAL ANALYTICAL REPORT

L2660664 CONTD....

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18-NOV-21 18:32 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2660664-1 Groundwater 06-NOV-21 E207782	L2660664-2 Groundwater 06-NOV-21 E207780	L2660664-3 Groundwater 06-NOV-21 E265103	L2660664-4 Groundwater 06-NOV-21 E265102	L2660664-5 Groundwater 06-NOV-21 E208720
Grouping	Analyte					
<b>WATER</b>						
<b>Physical Tests</b>	Hardness (as CaCO <sub>3</sub> ) (mg/L)	556	HTC	543	HTC	690
	Temperature (Degree C)	20.2		20.3		20.6
	Total Suspended Solids (mg/L)	<1.0		<1.0		3510
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO <sub>3</sub> ) (mg/L)	237		215		421
	Ammonia as N (mg/L)	<0.0050		<0.0050		0.0227
	Bicarbonate (HCO <sub>3</sub> ) (mg/L)	237		215		421
	Carbonate (CO <sub>3</sub> ) (mg/L)	<5.0		<5.0		<5.0
	Chloride (Cl) (mg/L)	1.92		7.89		11.2
	Conductivity (EC) (uS/cm)	975		946		1240
	Fluoride (F) (mg/L)	0.20		0.22		0.16
	Hydroxide (OH) (mg/L)	<5.0		<5.0		<5.0
	Nitrate and Nitrite (as N) (mg/L)	<0.025		<0.025		0.185
	Nitrate (as N) (mg/L)	<0.025	DLDS	<0.025	DLDS	0.067
	Nitrite (as N) (mg/L)	<0.0050	DLDS	<0.0050	DLDS	<0.0050
	pH (pH)	7.71		7.64		7.47
	Sulfate (SO <sub>4</sub> ) (mg/L)	353		349		346
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)	<0.0030		<0.0030		
	Antimony (Sb)-Total (mg/L)	<0.00010		<0.00010		
	Arsenic (As)-Total (mg/L)	0.00013		<0.00010		
	Barium (Ba)-Total (mg/L)	0.00973		0.00962		
	Beryllium (Be)-Total (mg/L)	<0.000020		<0.000020		
	Bismuth (Bi)-Total (mg/L)	<0.000050		<0.000050		
	Boron (B)-Total (mg/L)	0.031		0.028		
	Cadmium (Cd)-Total (mg/L)	<0.0000050		0.0000153		
	Calcium (Ca)-Total (mg/L)	140		142		
	Chromium (Cr)-Total (mg/L)	<0.00010		<0.00010		
	Cobalt (Co)-Total (mg/L)	<0.00010		<0.00010		
	Copper (Cu)-Total (mg/L)	0.00056		0.00054		
	Iron (Fe)-Total (mg/L)	0.019		0.041		
	Lead (Pb)-Total (mg/L)	<0.000050		<0.000050		
	Lithium (Li)-Total (mg/L)	0.0093		0.0072		
	Magnesium (Mg)-Total (mg/L)	49.8		45.4		
	Manganese (Mn)-Total (mg/L)	0.00227		0.00309		
	Mercury (Hg)-Total (mg/L)	<0.0000050		<0.0000050		
	Molybdenum (Mo)-Total (mg/L)	0.000649		0.000598		
	Nickel (Ni)-Total (mg/L)	<0.00050		<0.00050		
	Phosphorus (P)-Total (mg/L)	<0.050		<0.050		

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

## ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L2660664-6 Groundwater 06-NOV-21 E207778	L2660664-7 Groundwater 06-NOV-21 MW03-5			
Grouping	Analyte						
<b>WATER</b>							
<b>Physical Tests</b>	Hardness (as CaCO <sub>3</sub> ) (mg/L)		553	HTC	549		
	Temperature (Degree C)		20.1		20.0		
	Total Suspended Solids (mg/L)		2.2		14.2		
<b>Anions and Nutrients</b>	Alkalinity, Total (as CaCO <sub>3</sub> ) (mg/L)		236		259		
	Ammonia as N (mg/L)		<0.0050		0.0055		
	Bicarbonate (HCO <sub>3</sub> ) (mg/L)		236		259		
	Carbonate (CO <sub>3</sub> ) (mg/L)		<5.0		<5.0		
	Chloride (Cl) (mg/L)		2.10		2.05		
	Conductivity (EC) (uS/cm)		976		1010		
	Fluoride (F) (mg/L)		0.23		0.18		
	Hydroxide (OH) (mg/L)		<5.0		<5.0		
	Nitrate and Nitrite (as N) (mg/L)		0.149		<0.025		
	Nitrate (as N) (mg/L)		0.149	DLDs	<0.025		
	Nitrite (as N) (mg/L)		<0.0050	DLDs	<0.0050	DLDs	
	pH (pH)		7.69		7.79		
	Sulfate (SO <sub>4</sub> ) (mg/L)		349		353		
<b>Total Metals</b>	Aluminum (Al)-Total (mg/L)		<0.0030				
	Antimony (Sb)-Total (mg/L)		<0.00010				
	Arsenic (As)-Total (mg/L)		<0.00010				
	Barium (Ba)-Total (mg/L)		0.0108				
	Beryllium (Be)-Total (mg/L)		<0.000020				
	Bismuth (Bi)-Total (mg/L)		<0.000050				
	Boron (B)-Total (mg/L)		0.044				
	Cadmium (Cd)-Total (mg/L)		<0.0000050				
	Calcium (Ca)-Total (mg/L)		155				
	Chromium (Cr)-Total (mg/L)		0.00017				
	Cobalt (Co)-Total (mg/L)		<0.00010				
	Copper (Cu)-Total (mg/L)		0.00543				
	Iron (Fe)-Total (mg/L)		0.857				
	Lead (Pb)-Total (mg/L)		0.000077				
	Lithium (Li)-Total (mg/L)		0.0058				
	Magnesium (Mg)-Total (mg/L)		40.1				
	Manganese (Mn)-Total (mg/L)		0.0267				
	Mercury (Hg)-Total (mg/L)		<0.0000050				
	Molybdenum (Mo)-Total (mg/L)		0.000656				
	Nickel (Ni)-Total (mg/L)		<0.00050				
	Phosphorus (P)-Total (mg/L)		<0.050				

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

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	Sample ID Description Sampled Date Sampled Time Client ID	L2660664-1 Groundwater 06-NOV-21 E207782	L2660664-2 Groundwater 06-NOV-21 E207780	L2660664-3 Groundwater 06-NOV-21 E265103	L2660664-4 Groundwater 06-NOV-21 E265102	L2660664-5 Groundwater 06-NOV-21 E208720
Grouping	Analyte					
<b>WATER</b>						
<b>Total Metals</b>	Potassium (K)-Total (mg/L)	1.14	1.02			
	Selenium (Se)-Total (mg/L)	<0.000050	<0.000050			
	Silicon (Si)-Total (mg/L)	4.07	3.95			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	7.16	3.05			
	Strontium (Sr)-Total (mg/L)	1.83 <sup>RRV</sup>	1.81 <sup>RRV</sup>			
	Sulfur (S)-Total (mg/L)	121	121			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.00030	<0.00030			
	Uranium (U)-Total (mg/L)	0.00153	0.00120			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	0.0047	0.0604			
	Zirconium (Zr)-Total (mg/L)	<0.00030	<0.00030			
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location			FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location			FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)		0.0011	0.0026	<0.0010	
	Antimony (Sb)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	
	Arsenic (As)-Dissolved (mg/L)		0.00020	0.00014	<0.00010	
	Barium (Ba)-Dissolved (mg/L)		0.0177	0.0140	0.0136	
	Beryllium (Be)-Dissolved (mg/L)		<0.000020	<0.000020	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)		<0.000050	<0.000050	<0.000050	
	Boron (B)-Dissolved (mg/L)		0.046	0.042	0.042	
	Cadmium (Cd)-Dissolved (mg/L)		<0.0000050	0.0000325	0.0000062	
	Calcium (Ca)-Dissolved (mg/L)		201	209	216	
	Chromium (Cr)-Dissolved (mg/L)		<0.00010	<0.00010	<0.00010	
	Cobalt (Co)-Dissolved (mg/L)		0.00015	<0.00010	<0.00010	
	Copper (Cu)-Dissolved (mg/L)		0.00024	0.00697	0.00028	
	Iron (Fe)-Dissolved (mg/L)		0.028	<0.010	0.458	
	Lead (Pb)-Dissolved (mg/L)		<0.000050	0.000108	0.000169	
	Lithium (Li)-Dissolved (mg/L)		0.0071	0.0084	0.0073	
	Magnesium (Mg)-Dissolved (mg/L)		45.7	43.9	44.1	
	Manganese (Mn)-Dissolved (mg/L)		0.0196	0.00403	0.0126	
	Mercury (Hg)-Dissolved (mg/L)		<0.0000050	<0.0000050	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)		0.000613	0.000591	0.000476	
	Nickel (Ni)-Dissolved (mg/L)		0.00087	0.00095	0.00137	
	Phosphorus (P)-Dissolved (mg/L)		<0.050	<0.050	<0.050	

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

# ALS ENVIRONMENTAL ANALYTICAL REPORT

L2660664 CONTD....  
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		Sample ID	L2660664-6	L2660664-7			
		Description	Groundwater	Groundwater			
		Sampled Date	06-NOV-21	06-NOV-21			
		Sampled Time					
		Client ID	E207778	MW03-5			
Grouping	Analyte						
<b>WATER</b>							
<b>Total Metals</b>	Potassium (K)-Total (mg/L)		0.92				
	Selenium (Se)-Total (mg/L)		0.000153				
	Silicon (Si)-Total (mg/L)		2.91				
	Silver (Ag)-Total (mg/L)		<0.000010				
	Sodium (Na)-Total (mg/L)		2.94				
	Strontium (Sr)-Total (mg/L)		1.61 <sup>RRV</sup>				
	Sulfur (S)-Total (mg/L)		115				
	Thallium (Tl)-Total (mg/L)		<0.000010				
	Tin (Sn)-Total (mg/L)		<0.00010				
	Titanium (Ti)-Total (mg/L)		<0.00030				
	Uranium (U)-Total (mg/L)		0.000922				
	Vanadium (V)-Total (mg/L)		<0.00050				
	Zinc (Zn)-Total (mg/L)		0.0157				
	Zirconium (Zr)-Total (mg/L)		<0.00030				
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location			FIELD			
	Dissolved Metals Filtration Location			FIELD			
	Aluminum (Al)-Dissolved (mg/L)			<0.0010			
	Antimony (Sb)-Dissolved (mg/L)			<0.00010			
	Arsenic (As)-Dissolved (mg/L)			0.00013			
	Barium (Ba)-Dissolved (mg/L)			0.0123			
	Beryllium (Be)-Dissolved (mg/L)			<0.000020			
	Bismuth (Bi)-Dissolved (mg/L)			<0.000050			
	Boron (B)-Dissolved (mg/L)			0.042			
	Cadmium (Cd)-Dissolved (mg/L)			<0.0000050			
	Calcium (Ca)-Dissolved (mg/L)			157			
	Chromium (Cr)-Dissolved (mg/L)			<0.00010			
	Cobalt (Co)-Dissolved (mg/L)			<0.00010			
	Copper (Cu)-Dissolved (mg/L)			0.00036			
	Iron (Fe)-Dissolved (mg/L)			1.83			
	Lead (Pb)-Dissolved (mg/L)			0.000053			
	Lithium (Li)-Dissolved (mg/L)			0.0068			
	Magnesium (Mg)-Dissolved (mg/L)			38.3			
	Manganese (Mn)-Dissolved (mg/L)			0.0241			
	Mercury (Hg)-Dissolved (mg/L)			<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)			0.000754			
	Nickel (Ni)-Dissolved (mg/L)			<0.00050			
	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

L2660664 CONTD....

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Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2660664-1 Groundwater 06-NOV-21 E207782	L2660664-2 Groundwater 06-NOV-21 E207780	L2660664-3 Groundwater 06-NOV-21 E265103	L2660664-4 Groundwater 06-NOV-21 E265102	L2660664-5 Groundwater 06-NOV-21 E208720
Grouping	Analyte					
<b>WATER</b>						
<b>Dissolved Metals</b>	Potassium (K)-Dissolved (mg/L)			1.10	1.33	1.14
	Selenium (Se)-Dissolved (mg/L)			<0.000050	<0.000050	0.000057
	Silicon (Si)-Dissolved (mg/L)			4.12	4.69	4.35
	Silver (Ag)-Dissolved (mg/L)			<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)			5.12	4.11	3.09
	Strontium (Sr)-Dissolved (mg/L)			1.74	2.04	1.66
	Sulfur (S)-Dissolved (mg/L)			124	136	127
	Thallium (Tl)-Dissolved (mg/L)			<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)			<0.00010	0.00011	0.00343
	Titanium (Ti)-Dissolved (mg/L)			<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)			0.00145	0.00173	0.00150
	Vanadium (V)-Dissolved (mg/L)			<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)			<0.0010	0.0118	0.0064
	Zirconium (Zr)-Dissolved (mg/L)			<0.00030	<0.00030	<0.00030

# ALS ENVIRONMENTAL ANALYTICAL REPORT

L2660664 CONTD....  
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 Version: FINAL

Sample ID	L2660664-6	Description	Groundwater	Sampled Date	06-NOV-21	Sampled Time	06-NOV-21	Client ID	E207778	MW03-5		
Grouping	Analyte											
<b>WATER</b>												
<b>Dissolved Metals</b>	Potassium (K)-Dissolved (mg/L)											
	Selenium (Se)-Dissolved (mg/L)											
	Silicon (Si)-Dissolved (mg/L)											
	Silver (Ag)-Dissolved (mg/L)											
	Sodium (Na)-Dissolved (mg/L)											
	Strontium (Sr)-Dissolved (mg/L)											
	Sulfur (S)-Dissolved (mg/L)											
	Thallium (Tl)-Dissolved (mg/L)											
	Tin (Sn)-Dissolved (mg/L)											
	Titanium (Ti)-Dissolved (mg/L)											
	Uranium (U)-Dissolved (mg/L)											
	Vanadium (V)-Dissolved (mg/L)											
	Zinc (Zn)-Dissolved (mg/L)											
	Zirconium (Zr)-Dissolved (mg/L)											

## Reference Information

**QC Samples with Qualifiers & Comments:**

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2660664-3, -4, -5, -7
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2660664-3, -4, -5, -7
Matrix Spike	Calcium (Ca)-Total	MS-B	L2660664-1, -2, -6
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2660664-1, -2, -6
Matrix Spike	Strontium (Sr)-Total	MS-B	L2660664-1, -2, -6
Matrix Spike	Sulfate (SO <sub>4</sub> )	MS-B	L2660664-1, -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.
HTC	Hardness was calculated from Total Ca and/or Mg concentrations and may be biased high (dissolved Ca/Mg results unavailable).
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**
<b>BE-D-L-CCMS-CL</b>	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
<b>BE-T-L-CCMS-CL</b>	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
<b>CL-L-IC-N-CL</b>	Water	Chloride in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
<b>F-L-IC-CL</b>	Water	Fluoride	APHA 4110 B-Ion Chromatography
<b>HARDNESS-CALC-CL</b>	Water	Hardness	APHA 2340 B
		Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO <sub>3</sub> equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.	
<b>HG-D-CVAA-CL</b>	Water	Dissolved Mercury in Water by CVAAS	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.	
<b>HG-T-CVAA-CL</b>	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)
		Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.	
<b>MET-D-CCMS-CL</b>	Water	Dissolved Metals in Water by CRC ICPMS	APHA 3030B/6020A (mod)
		Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
<b>MET-T-CCMS-CL</b>	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)
		Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.	
		Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.	
<b>N2N3-CALC-CL</b>	Water	Nitrate+Nitrite	CALCULATION
<b>NH3-L-F-CL</b>	Water	Ammonia, Total (as N)	J. ENVIRON. MONIT., 2005, 7, 37-42, RSC
		This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.	
<b>NO2-L-IC-N-CL</b>	Water	Nitrite in Water by IC (Low Level)	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
<b>NO3-L-IC-N-CL</b>	Water	Nitrate 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.

**PH/EC/ALK-CL** Water pH, Conductivity and Total Alkalinity APHA 4500H,2510,2320

All samples analyzed by this method for pH will have exceeded the 15 minute recommended hold time from time of sampling (field analysis is recommended for pH where highly accurate results are needed)

pH measurement is determined from the activity of the hydrogen ions using a hydrogen electrode and a reference electrode.

Alkalinity measurement is based on the sample's capacity to neutralize acid

Conductivity measurement is based on the sample's capacity to convey an electric current

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

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

**TEMP-CL** Water Temperature APHA 2550-Thermometer

**TSS-L-CL** Water Total Suspended Solids 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, and by drying the filter at 104 deg. C.

\*\* 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
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, 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: L2660664

Report Date: 18-NOV-21

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**Client:** Sperling Hansen Associates Inc.  
 #8 - 1225 East Keith Road  
 North Vancouver BC V7J 1J3

**Contact:** Scott Garthwaite

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>BE-D-L-CCMS-CL</b> Water								
Batch	R5645697							
WG3657367-2	LCS							
Beryllium (Be)-Dissolved			89.4		%		80-120	12-NOV-21
WG3657367-1	MB							
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	12-NOV-21
<b>BE-T-L-CCMS-CL</b> Water								
Batch	R5645697							
WG3656107-3	DUP	L2660664-1						
Beryllium (Be)-Total		<0.000020	<0.000020	RPD-NA	mg/L	N/A	20	12-NOV-21
WG3656107-2	LCS	TMRM			%		80-120	12-NOV-21
Beryllium (Be)-Total			92.1					
WG3656107-1	MB							
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	12-NOV-21
<b>CL-L-IC-N-CL</b> Water								
Batch	R5643976							
WG3657216-3	DUP	L2660664-7						
Chloride (Cl)		2.05	2.09		mg/L	1.9	20	09-NOV-21
WG3657216-2	LCS							
Chloride (Cl)			100.8		%		85-115	09-NOV-21
WG3657216-6	LCS							
Chloride (Cl)			101.4		%		85-115	09-NOV-21
WG3657216-1	MB							
Chloride (Cl)			<0.10		mg/L		0.1	09-NOV-21
WG3657216-5	MB							
Chloride (Cl)			<0.10		mg/L		0.1	09-NOV-21
WG3657216-4	MS	L2660664-7						
Chloride (Cl)			99.9		%		75-125	09-NOV-21
<b>F-L-IC-CL</b> Water								
Batch	R5643976							
WG3657216-3	DUP	L2660664-7						
Fluoride (F)		0.18	0.19		mg/L	2.8	20	09-NOV-21
WG3657216-2	LCS							
Fluoride (F)			101.8		%		85-115	09-NOV-21
WG3657216-6	LCS							
Fluoride (F)			102.2		%		85-115	09-NOV-21
WG3657216-1	MB							
Fluoride (F)			<0.020		mg/L		0.02	09-NOV-21
WG3657216-5	MB							
Fluoride (F)			<0.020		mg/L		0.02	09-NOV-21

## Quality Control Report

Workorder: L2660664

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
F-L-IC-CL	Water							
Batch R5643976								
WG3657216-4 MS	L2660664-7							
Fluoride (F)			97.7		%		75-125	09-NOV-21
HG-D-CVAA-CL	Water							
Batch R5640916								
WG3656315-6 LCS								
Mercury (Hg)-Dissolved			103.0		%		80-120	10-NOV-21
WG3656315-5 MB								
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	10-NOV-21
HG-T-CVAA-CL	Water							
Batch R5640916								
WG3656318-3 DUP	L2660664-1							
Mercury (Hg)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	10-NOV-21
WG3656318-2 LCS								
Mercury (Hg)-Total			102.0		%		80-120	10-NOV-21
WG3656318-1 MB								
Mercury (Hg)-Total			<0.0000050		mg/L		0.000005	10-NOV-21
WG3656318-4 MS	L2660664-1							
Mercury (Hg)-Total			102.0		%		70-130	10-NOV-21
MET-D-CCMS-CL	Water							
Batch R5645697								
WG3657367-2 LCS								
Aluminum (Al)-Dissolved			94.5		%		80-120	12-NOV-21
Antimony (Sb)-Dissolved			97.3		%		80-120	12-NOV-21
Arsenic (As)-Dissolved			93.0		%		80-120	12-NOV-21
Barium (Ba)-Dissolved			92.0		%		80-120	12-NOV-21
Bismuth (Bi)-Dissolved			93.9		%		80-120	12-NOV-21
Boron (B)-Dissolved			89.0		%		80-120	12-NOV-21
Cadmium (Cd)-Dissolved			92.0		%		80-120	12-NOV-21
Calcium (Ca)-Dissolved			90.1		%		80-120	12-NOV-21
Chromium (Cr)-Dissolved			92.7		%		80-120	12-NOV-21
Cobalt (Co)-Dissolved			92.8		%		80-120	12-NOV-21
Copper (Cu)-Dissolved			91.2		%		80-120	12-NOV-21
Iron (Fe)-Dissolved			104.9		%		80-120	12-NOV-21
Lead (Pb)-Dissolved			91.7		%		80-120	12-NOV-21
Lithium (Li)-Dissolved			92.8		%		80-120	12-NOV-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-CL</b>		Water						
<b>Batch R5645697</b>								
<b>WG3657367-2 LCS</b>								
Magnesium (Mg)-Dissolved			93.3		%		80-120	12-NOV-21
Manganese (Mn)-Dissolved			92.8		%		80-120	12-NOV-21
Molybdenum (Mo)-Dissolved			97.6		%		80-120	12-NOV-21
Nickel (Ni)-Dissolved			91.3		%		80-120	12-NOV-21
Phosphorus (P)-Dissolved			96.0		%		70-130	12-NOV-21
Potassium (K)-Dissolved			93.7		%		80-120	12-NOV-21
Selenium (Se)-Dissolved			87.5		%		80-120	12-NOV-21
Silicon (Si)-Dissolved			92.0		%		60-140	12-NOV-21
Silver (Ag)-Dissolved			88.4		%		80-120	12-NOV-21
Sodium (Na)-Dissolved			94.6		%		80-120	12-NOV-21
Strontium (Sr)-Dissolved			94.8		%		80-120	12-NOV-21
Sulfur (S)-Dissolved			91.0		%		80-120	12-NOV-21
Thallium (Tl)-Dissolved			93.9		%		80-120	12-NOV-21
Tin (Sn)-Dissolved			90.3		%		80-120	12-NOV-21
Titanium (Ti)-Dissolved			93.9		%		80-120	12-NOV-21
Uranium (U)-Dissolved			86.3		%		80-120	12-NOV-21
Vanadium (V)-Dissolved			91.6		%		80-120	12-NOV-21
Zinc (Zn)-Dissolved			91.8		%		80-120	12-NOV-21
Zirconium (Zr)-Dissolved			90.1		%		80-120	12-NOV-21
<b>WG3657367-1 MB</b>								
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	12-NOV-21
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	12-NOV-21
Boron (B)-Dissolved			<0.010		mg/L		0.01	12-NOV-21
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	12-NOV-21
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	12-NOV-21
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	12-NOV-21
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	12-NOV-21
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	12-NOV-21
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	12-NOV-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-D-CCMS-CL</b> Water								
Batch R5645697								
<b>WG3657367-1 MB</b>								
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	12-NOV-21
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	12-NOV-21
Nickel (Ni)-Dissolved			<0.000050		mg/L		0.0005	12-NOV-21
Phosphorus (P)-Dissolved			<0.050		mg/L		0.05	12-NOV-21
Potassium (K)-Dissolved			<0.050		mg/L		0.05	12-NOV-21
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	12-NOV-21
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	12-NOV-21
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	12-NOV-21
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	12-NOV-21
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	12-NOV-21
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	12-NOV-21
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	12-NOV-21
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	12-NOV-21
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	12-NOV-21
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	12-NOV-21
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	12-NOV-21
Zirconium (Zr)-Dissolved			<0.00020		mg/L		0.0002	12-NOV-21
<b>MET-T-CCMS-CL</b> Water								
Batch R5645697								
<b>WG3656107-3 DUP</b>								
Aluminum (Al)-Total	L2660664-1	<0.0030	<0.0030	RPD-NA	mg/L	N/A	20	12-NOV-21
Antimony (Sb)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-NOV-21
Arsenic (As)-Total		0.00013	0.00013		mg/L	4.5	20	12-NOV-21
Barium (Ba)-Total		0.00973	0.0101		mg/L	3.4	20	12-NOV-21
Bismuth (Bi)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	12-NOV-21
Boron (B)-Total		0.031	0.030		mg/L	1.9	20	12-NOV-21
Cadmium (Cd)-Total		<0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	12-NOV-21
Calcium (Ca)-Total		140	139		mg/L	0.9	20	12-NOV-21
Chromium (Cr)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-NOV-21
Cobalt (Co)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-NOV-21
Copper (Cu)-Total		0.00056	0.00060		mg/L	6.7	20	12-NOV-21
Iron (Fe)-Total		0.019	0.019		mg/L	0.8	20	12-NOV-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-CL</b>	<b>Water</b>							
<b>Batch</b>	<b>R5645697</b>							
<b>WG3656107-3 DUP</b>		<b>L2660664-1</b>						
Lead (Pb)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	12-NOV-21
Lithium (Li)-Total		0.0093	0.0088		mg/L	5.2	20	12-NOV-21
Magnesium (Mg)-Total		49.8	49.6		mg/L	0.6	20	12-NOV-21
Manganese (Mn)-Total		0.00227	0.00222		mg/L	2.3	20	12-NOV-21
Molybdenum (Mo)-Total		0.000649	0.000664		mg/L	2.3	20	12-NOV-21
Nickel (Ni)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	12-NOV-21
Phosphorus (P)-Total		<0.050	<0.050	RPD-NA	mg/L	N/A	20	12-NOV-21
Potassium (K)-Total		1.14	1.14		mg/L	0.1	20	12-NOV-21
Selenium (Se)-Total		<0.000050	<0.000050	RPD-NA	mg/L	N/A	20	12-NOV-21
Silicon (Si)-Total		4.07	4.07		mg/L	0.1	20	12-NOV-21
Silver (Ag)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	12-NOV-21
Sodium (Na)-Total		7.16	7.15		mg/L	0.1	20	12-NOV-21
Strontium (Sr)-Total		1.83	1.83		mg/L	0.2	20	12-NOV-21
Sulfur (S)-Total		121	121		mg/L	0.1	20	12-NOV-21
Thallium (Tl)-Total		<0.000010	<0.000010	RPD-NA	mg/L	N/A	20	12-NOV-21
Tin (Sn)-Total		<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	12-NOV-21
Titanium (Ti)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	12-NOV-21
Uranium (U)-Total		0.00153	0.00154		mg/L	0.5	20	12-NOV-21
Vanadium (V)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	12-NOV-21
Zinc (Zn)-Total		0.0047	0.0048		mg/L	1.1	20	12-NOV-21
Zirconium (Zr)-Total		<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	12-NOV-21
<b>WG3656107-2 LCS</b>		<b>TMRM</b>						
Aluminum (Al)-Total		96.3		%		80-120	12-NOV-21	
Antimony (Sb)-Total		99.6		%		80-120	12-NOV-21	
Arsenic (As)-Total		93.8		%		80-120	12-NOV-21	
Barium (Ba)-Total		93.7		%		80-120	12-NOV-21	
Bismuth (Bi)-Total		95.6		%		80-120	12-NOV-21	
Boron (B)-Total		87.7		%		80-120	12-NOV-21	
Cadmium (Cd)-Total		94.4		%		80-120	12-NOV-21	
Calcium (Ca)-Total		92.3		%		80-120	12-NOV-21	
Chromium (Cr)-Total		96.5		%		80-120	12-NOV-21	
Cobalt (Co)-Total		96.4		%		80-120	12-NOV-21	
Copper (Cu)-Total		93.2		%		80-120	12-NOV-21	
Iron (Fe)-Total		105.2		%		80-120	12-NOV-21	

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-CL	Water							
Batch	R5645697							
WG3656107-2 LCS		TMRM						
Lead (Pb)-Total			92.8	%		80-120	12-NOV-21	
Lithium (Li)-Total			95.1	%		80-120	12-NOV-21	
Magnesium (Mg)-Total			96.3	%		80-120	12-NOV-21	
Manganese (Mn)-Total			94.9	%		80-120	12-NOV-21	
Molybdenum (Mo)-Total			99.5	%		80-120	12-NOV-21	
Nickel (Ni)-Total			94.8	%		80-120	12-NOV-21	
Phosphorus (P)-Total			95.7	%		70-130	12-NOV-21	
Potassium (K)-Total			94.5	%		80-120	12-NOV-21	
Selenium (Se)-Total			89.0	%		80-120	12-NOV-21	
Silicon (Si)-Total			92.5	%		60-140	12-NOV-21	
Silver (Ag)-Total			90.7	%		80-120	12-NOV-21	
Sodium (Na)-Total			97.2	%		80-120	12-NOV-21	
Strontium (Sr)-Total			95.9	%		80-120	12-NOV-21	
Sulfur (S)-Total			86.3	%		80-120	12-NOV-21	
Thallium (Tl)-Total			96.3	%		80-120	12-NOV-21	
Tin (Sn)-Total			91.7	%		80-120	12-NOV-21	
Titanium (Ti)-Total			94.6	%		80-120	12-NOV-21	
Uranium (U)-Total			87.9	%		80-120	12-NOV-21	
Vanadium (V)-Total			93.9	%		80-120	12-NOV-21	
Zinc (Zn)-Total			96.5	%		80-120	12-NOV-21	
Zirconium (Zr)-Total			90.9	%		80-120	12-NOV-21	
WG3656107-1 MB								
Aluminum (Al)-Total			<0.0030	mg/L		0.003	12-NOV-21	
Antimony (Sb)-Total			<0.00010	mg/L		0.0001	12-NOV-21	
Arsenic (As)-Total			<0.00010	mg/L		0.0001	12-NOV-21	
Barium (Ba)-Total			<0.00010	mg/L		0.0001	12-NOV-21	
Bismuth (Bi)-Total			<0.000050	mg/L		0.00005	12-NOV-21	
Boron (B)-Total			<0.010	mg/L		0.01	12-NOV-21	
Cadmium (Cd)-Total			<0.000005C	mg/L		0.000005	12-NOV-21	
Calcium (Ca)-Total			<0.050	mg/L		0.05	12-NOV-21	
Chromium (Cr)-Total			<0.00010	mg/L		0.0001	12-NOV-21	
Cobalt (Co)-Total			<0.00010	mg/L		0.0001	12-NOV-21	
Copper (Cu)-Total			<0.00050	mg/L		0.0005	12-NOV-21	
Iron (Fe)-Total			<0.010	mg/L		0.01	12-NOV-21	

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-CL</b>	<b>Water</b>							
Batch	R5645697							
<b>WG3656107-1 MB</b>								
Lead (Pb)-Total			<0.000050		mg/L		0.00005	12-NOV-21
Lithium (Li)-Total			<0.0010		mg/L		0.001	12-NOV-21
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	12-NOV-21
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	12-NOV-21
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	12-NOV-21
Nickel (Ni)-Total			<0.000050		mg/L		0.0005	12-NOV-21
Phosphorus (P)-Total			<0.050		mg/L		0.05	12-NOV-21
Potassium (K)-Total			<0.050		mg/L		0.05	12-NOV-21
Selenium (Se)-Total			<0.000050		mg/L		0.00005	12-NOV-21
Silicon (Si)-Total			<0.050		mg/L		0.05	12-NOV-21
Silver (Ag)-Total			<0.000010		mg/L		0.00001	12-NOV-21
Sodium (Na)-Total			<0.050		mg/L		0.05	12-NOV-21
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	12-NOV-21
Sulfur (S)-Total			<0.50		mg/L		0.5	12-NOV-21
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	12-NOV-21
Tin (Sn)-Total			<0.00010		mg/L		0.0001	12-NOV-21
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	12-NOV-21
Uranium (U)-Total			<0.000010		mg/L		0.00001	12-NOV-21
Vanadium (V)-Total			<0.00050		mg/L		0.0005	12-NOV-21
Zinc (Zn)-Total			<0.0030		mg/L		0.003	12-NOV-21
Zirconium (Zr)-Total			<0.00020		mg/L		0.0002	12-NOV-21
<b>WG3656107-4 MS</b>	<b>L2660664-1</b>							
Aluminum (Al)-Total			97.5		%		70-130	12-NOV-21
Antimony (Sb)-Total			94.9		%		70-130	12-NOV-21
Arsenic (As)-Total			96.5		%		70-130	12-NOV-21
Barium (Ba)-Total			96.4		%		70-130	12-NOV-21
Bismuth (Bi)-Total			91.0		%		70-130	12-NOV-21
Boron (B)-Total			95.3		%		70-130	12-NOV-21
Cadmium (Cd)-Total			101.5		%		70-130	12-NOV-21
Calcium (Ca)-Total			N/A	MS-B	%		-	12-NOV-21
Chromium (Cr)-Total			100.1		%		70-130	12-NOV-21
Cobalt (Co)-Total			99.3		%		70-130	12-NOV-21
Copper (Cu)-Total			97.1		%		70-130	12-NOV-21
Iron (Fe)-Total			99.8		%		70-130	12-NOV-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>MET-T-CCMS-CL</b> Water								
Batch	R5645697							
WG3656107-4	MS	L2660664-1						
Lead (Pb)-Total			92.3		%		70-130	12-NOV-21
Lithium (Li)-Total			97.9		%		70-130	12-NOV-21
Magnesium (Mg)-Total			N/A	MS-B	%		-	12-NOV-21
Manganese (Mn)-Total			99.2		%		70-130	12-NOV-21
Molybdenum (Mo)-Total			98.9		%		70-130	12-NOV-21
Nickel (Ni)-Total			98.8		%		70-130	12-NOV-21
Phosphorus (P)-Total			101.0		%		70-130	12-NOV-21
Potassium (K)-Total			95.6		%		70-130	12-NOV-21
Selenium (Se)-Total			100.5		%		70-130	12-NOV-21
Silicon (Si)-Total			92.9		%		70-130	12-NOV-21
Silver (Ag)-Total			94.4		%		70-130	12-NOV-21
Sodium (Na)-Total			99.9		%		70-130	12-NOV-21
Strontium (Sr)-Total			N/A	MS-B	%		-	12-NOV-21
Thallium (Tl)-Total			90.1		%		70-130	12-NOV-21
Tin (Sn)-Total			94.5		%		70-130	12-NOV-21
Titanium (Ti)-Total			96.9		%		70-130	12-NOV-21
Uranium (U)-Total			93.4		%		70-130	12-NOV-21
Vanadium (V)-Total			96.4		%		70-130	12-NOV-21
Zinc (Zn)-Total			101.5		%		70-130	12-NOV-21
Zirconium (Zr)-Total			97.3		%		70-130	12-NOV-21
<b>NH3-L-F-CL</b> Water								
Batch	R5653860							
WG3660828-14	LCS							
Ammonia as N			106.5		%		85-115	17-NOV-21
WG3660828-13	MB							
Ammonia as N			<0.0050		mg/L		0.005	17-NOV-21
<b>NO2-L-IC-N-CL</b> Water								
Batch	R5643976							
WG3657216-3	DUP	L2660664-7						
Nitrite (as N)			<0.0050	<0.0050	RPD-NA	mg/L	N/A	20
WG3657216-2	LCS							
Nitrite (as N)			103.3		%		90-110	09-NOV-21
WG3657216-6	LCS							
Nitrite (as N)			105.3		%		90-110	09-NOV-21
WG3657216-1	MB							

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
<b>NO2-L-IC-N-CL</b>								
	Water							
Batch	R5643976							
WG3657216-1	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	09-NOV-21
WG3657216-5	MB							
Nitrite (as N)			<0.0010		mg/L		0.001	09-NOV-21
WG3657216-4	MS	L2660664-7						
Nitrite (as N)			102.0		%		75-125	09-NOV-21
<b>NO3-L-IC-N-CL</b>								
	Water							
Batch	R5643976							
WG3657216-3	DUP	L2660664-7						
Nitrate (as N)		<0.025	<0.025	RPD-NA	mg/L	N/A	20	09-NOV-21
WG3657216-2	LCS							
Nitrate (as N)			100.7		%		90-110	09-NOV-21
WG3657216-6	LCS							
Nitrate (as N)			101.5		%		90-110	09-NOV-21
WG3657216-1	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	09-NOV-21
WG3657216-5	MB							
Nitrate (as N)			<0.0050		mg/L		0.005	09-NOV-21
WG3657216-4	MS	L2660664-7						
Nitrate (as N)			100.4		%		75-125	09-NOV-21
<b>PH/EC/ALK-CL</b>								
	Water							
Batch	R5641081							
WG3656090-8	LCS							
Conductivity (EC)			102.0		%		90-110	09-NOV-21
Alkalinity, Total (as CaCO3)			108.6		%		85-115	09-NOV-21
WG3656090-7	MB							
Conductivity (EC)			<2.0		uS/cm		2	09-NOV-21
Bicarbonate (HCO3)			<5.0		mg/L		5	09-NOV-21
Carbonate (CO3)			<5.0		mg/L		5	09-NOV-21
Hydroxide (OH)			<5.0		mg/L		5	09-NOV-21
Alkalinity, Total (as CaCO3)			<2.0		mg/L		2	09-NOV-21
<b>SO4-L-IC-N-CL</b>								
	Water							
Batch	R5643976							
WG3657216-3	DUP	L2660664-7						
Sulfate (SO4)		353	357		mg/L	1.0	20	09-NOV-21
WG3657216-2	LCS							
Sulfate (SO4)			100.4		%		85-115	09-NOV-21

## Quality Control Report

Workorder: L2660664

Report Date: 18-NOV-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-L-IC-N-CL	Water							
Batch	R5643976							
WG3657216-6	LCS							
Sulfate (SO4)			101.0		%		85-115	09-NOV-21
WG3657216-1	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	09-NOV-21
WG3657216-5	MB							
Sulfate (SO4)			<0.050		mg/L		0.05	09-NOV-21
WG3657216-4	MS	L2660664-7		N/A	MS-B	%	-	09-NOV-21
Sulfate (SO4)								
TSS-L-CL	Water							
Batch	R5644458							
WG3655911-4	LCS							
Total Suspended Solids			93.3		%		85-115	10-NOV-21
WG3655911-3	MB							
Total Suspended Solids			<1.0		mg/L		1	10-NOV-21

# Quality Control Report

Workorder: L2660664

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## 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
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

## Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

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.



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## Chain of Custody (COC) / Analytical Request Form



L2660664-COFC

Canada Toll Free: 1 800 668 9878

Report To		Contact and company name below will appear on the final report		Reports / Recipients		Turnaround Time (TAT) Requested															
Company:	Sperling Hansen Associates Inc.			Select Report Format: <input type="checkbox"/> PDF <input checked="" type="checkbox"/> EXCEL <input type="checkbox"/> EDD (DIGITAL)	<input type="checkbox"/> Routine [R] if received by 3pm M-F - no surcharges apply				AFFIX ALS BARCODE LABEL HERE (ALS use only)												
Contact:	Scott Garthwaite			Merge QC/QCI Reports with COA <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A	<input type="checkbox"/> 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum																
Phone:	778-471-7088			<input checked="" type="checkbox"/> Compare Results to Criteria on Report - provide details below if box checked	<input type="checkbox"/> 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum																
Company address below will appear on the final report					Select Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX	<input type="checkbox"/> 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum															
Street:	1225 East Keith Road			Email 1 or Fax sgarthwaite@sperlinghansen.com	<input type="checkbox"/> 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum																
City/Province:	North Vancouver, B.C.			Email 2 chetherington@sperlinghansen.com	Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests																
Postal Code:	V7J 1J3			Email 3	Date and Time Required for all EXP TATs: dd-mm-yy hh:mm am/pm																
Invoice To	Same as Report To <input checked="" type="checkbox"/> YES <input type="checkbox"/> NO			Invoice Recipients		For all tests with rush TATs requested, please contact your AM to confirm availability.															
					Select Invoice Distribution: <input checked="" type="checkbox"/> EMAIL <input type="checkbox"/> MAIL <input type="checkbox"/> FAX	Analysis Request															
Company:				Email 1 or Fax chetherington@sperlinghansen.com	Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below																
Contact:				Email 2					SAMPLES ON HOLD												
Project Information					Oil and Gas Required Fields (client use)				EXTENDED STORAGE REQUIRED												
ALS Account # / Quote #:	Q80925			AFE/Cost Center:	PO#				SUSPECTED HAZARD (see notes)												
Job #:	20050 Columbia Valley			Major/Minor Code:	Routing Code:																
PO / AFE:				Requisitioner:																	
LSD:				Location:																	
ALS Lab Work Order # (ALS use only):		ALS Contact: Dean Watt		Sampler: TM																	
ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)			Date (dd-mm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS														
	1	E207782			06-11-21	4	Groundwater	Anions	R	R	R	TSS	R	R	R	R	R	R	R	R	pH, conductivity, temperature
	2	E207780			"	4	Groundwater	Dissolved Metals (F/P)	R	R	R	Total Metals (P)	R	R	R	R	R	R	R	R	R
	3	E265103			"	4	Groundwater	Ammonia	R	R	R	fluoride	R	R	R	R	R	R	R	R	R
	4	E265102			"	4	Groundwater	sulfate	R	R	R	chloride	R	R	R	R	R	R	R	R	R
	5	E208720			"	4	Groundwater	hardness	R	R	R	nitrile	R	R	R	R	R	R	R	R	R
	6	E208726			"	4	Groundwater	nitrite	R	R	R	pH	R	R	R	R	R	R	R	R	R
	7	E207778			"	4	Groundwater	conductivity	R	R	R	temperature	R	R	R	R	R	R	R	R	R
Drinking Water (DW) Samples <sup>1</sup> (client use)		Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)						SAMPLE RECEIPT DETAILS (ALS use only)													
Are samples taken from a Regulated DW System? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO		British Columbia Contaminated Sites Regulation Stage 10 Amendment (NOV, 2017) British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)						Cooling Method: <input type="checkbox"/> NONE <input type="checkbox"/> ICE <input type="checkbox"/> ICE PACKS <input type="checkbox"/> FROZEN <input type="checkbox"/> COOLING INITIATED													
Are samples for human consumption/ use? <input type="checkbox"/> YES <input checked="" type="checkbox"/> NO								Submission Comments identified on Sample Receipt Notification: <input type="checkbox"/> YES <input type="checkbox"/> NO													
SHIPMENT RELEASE (client use)		INITIAL SHIPMENT RECEIPTION (ALS use only)						Cooler Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A Sample Custody Seals Intact: <input type="checkbox"/> YES <input type="checkbox"/> N/A													
Released by:		Date:	Received by:	Date:	Time:	Received by:	Date:	Time:	Received by:	Date:	Time:	INITIAL COOLER TEMPERATURES °C FINAL COOLER TEMPERATURES °C									

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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.

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

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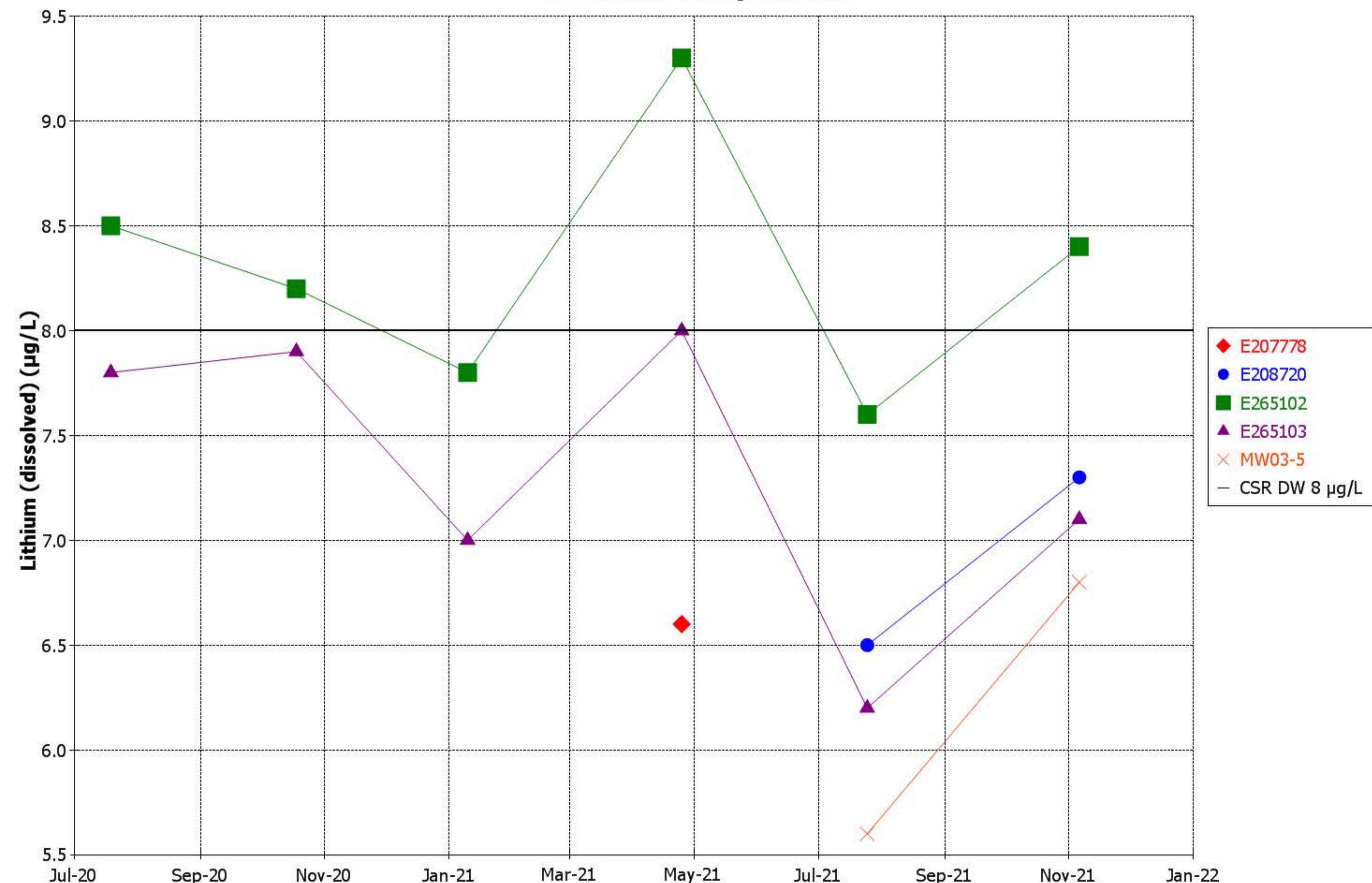
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**APPENDIX D**  
**Trending Figures**

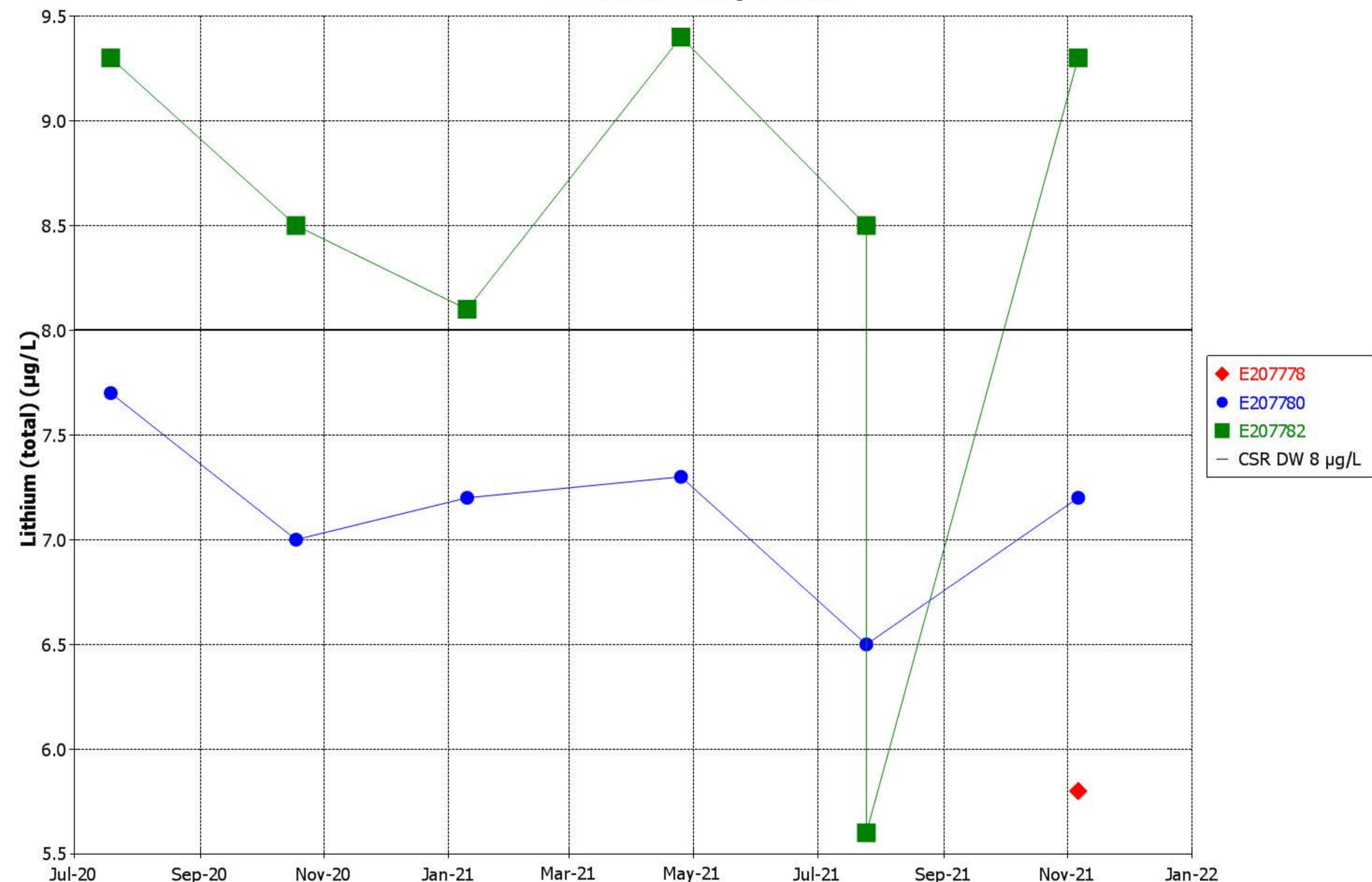
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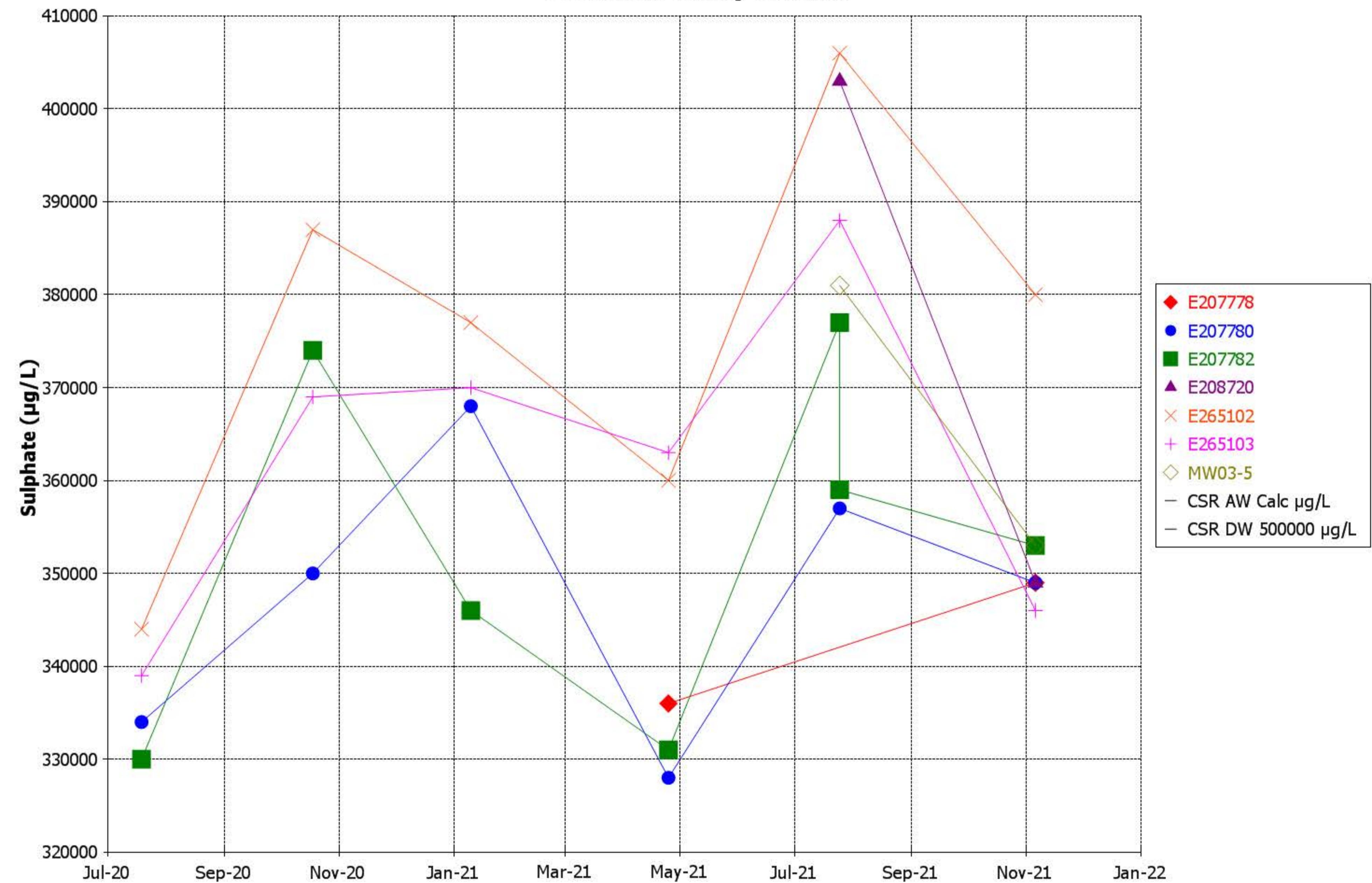
# Time Series Plot For Lithium (dissolved) Columbia Valley Landfill



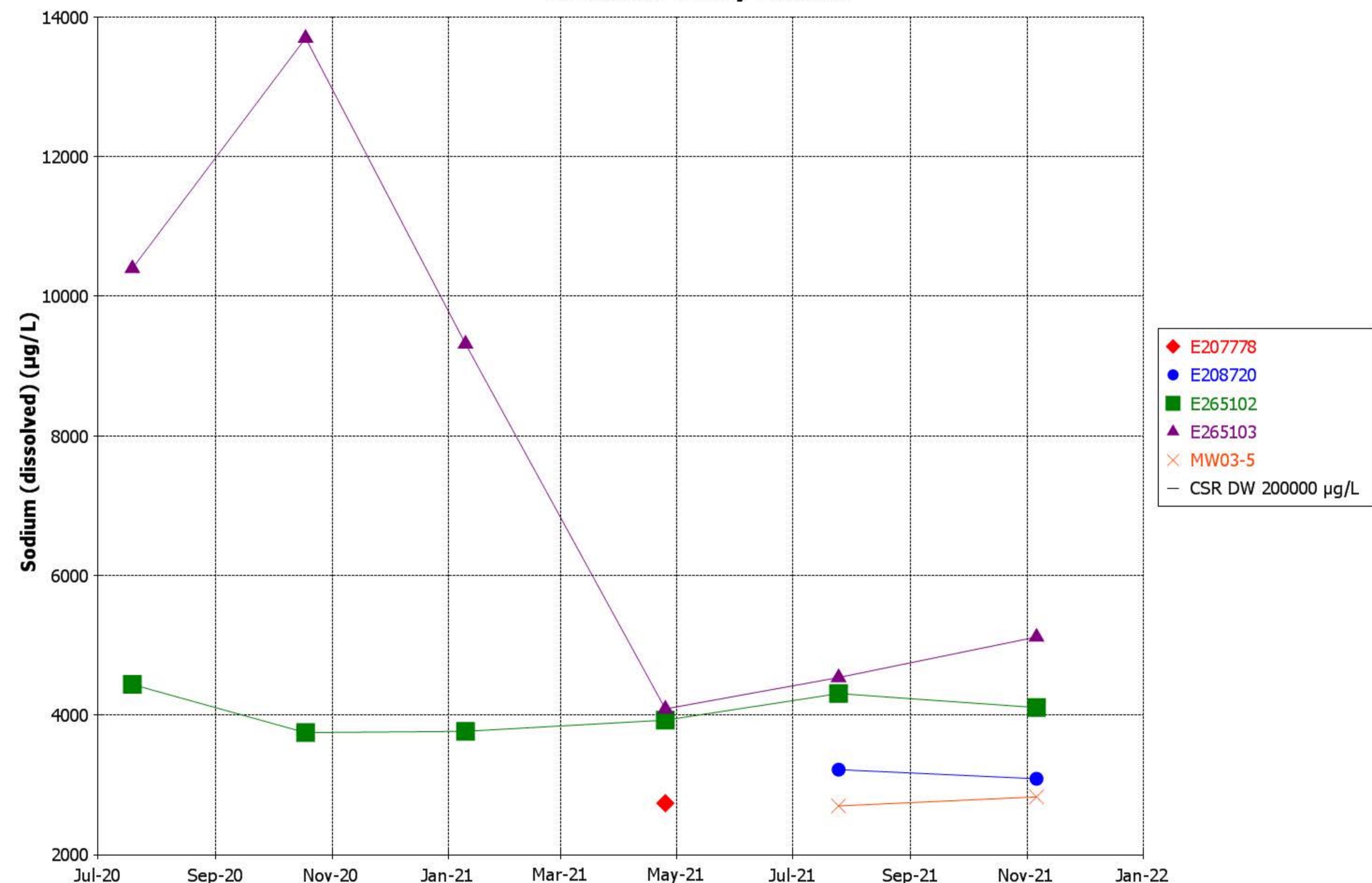
# Time Series Plot For Lithium (total) Columbia Valley Landfill



# Time Series Plot For Sulphate Columbia Valley Landfill



# Time Series Plot For Sodium (dissolved) Columbia Valley Landfill

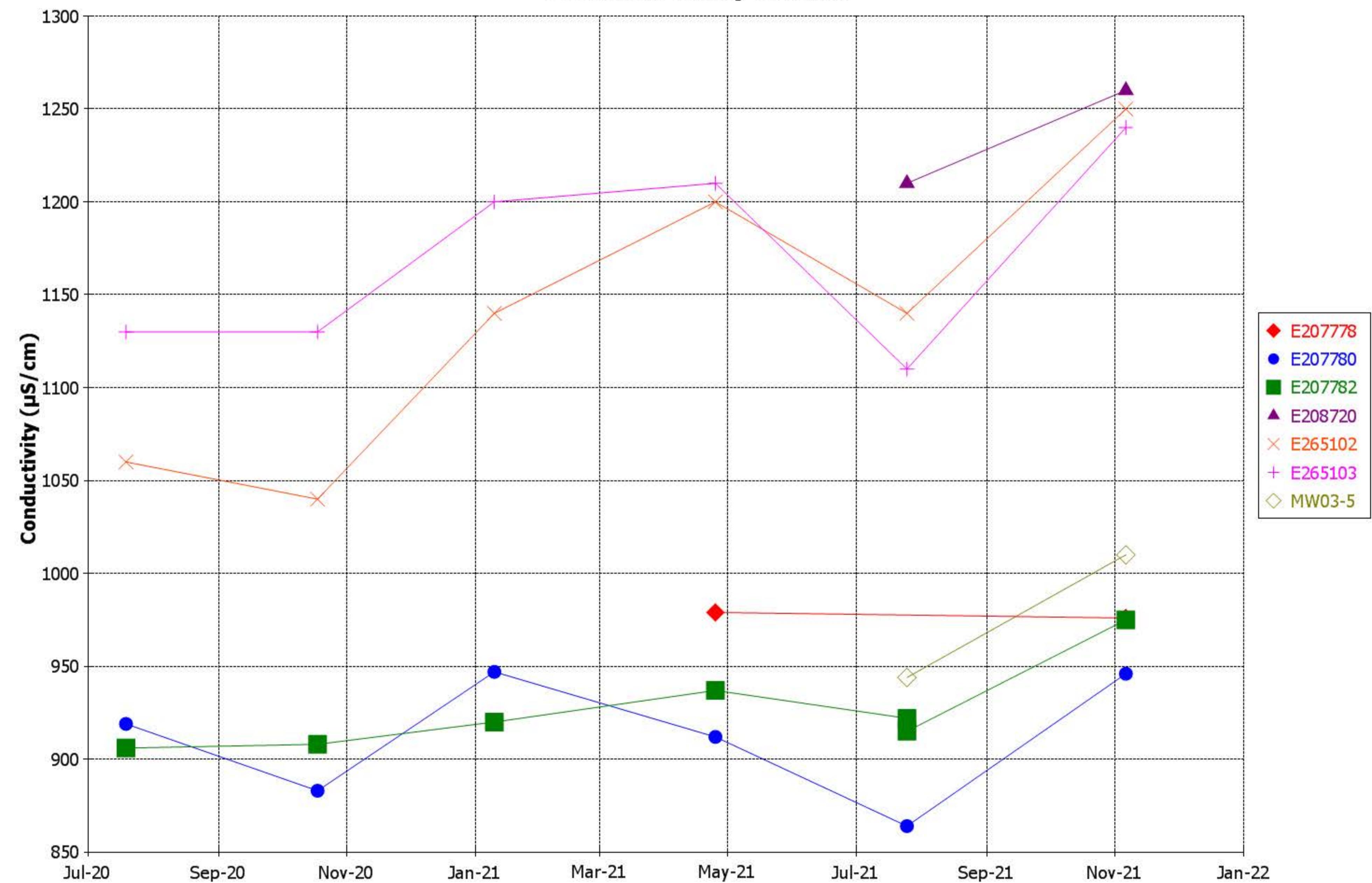


# Time Series Plot For Chloride Columbia Valley Landfill

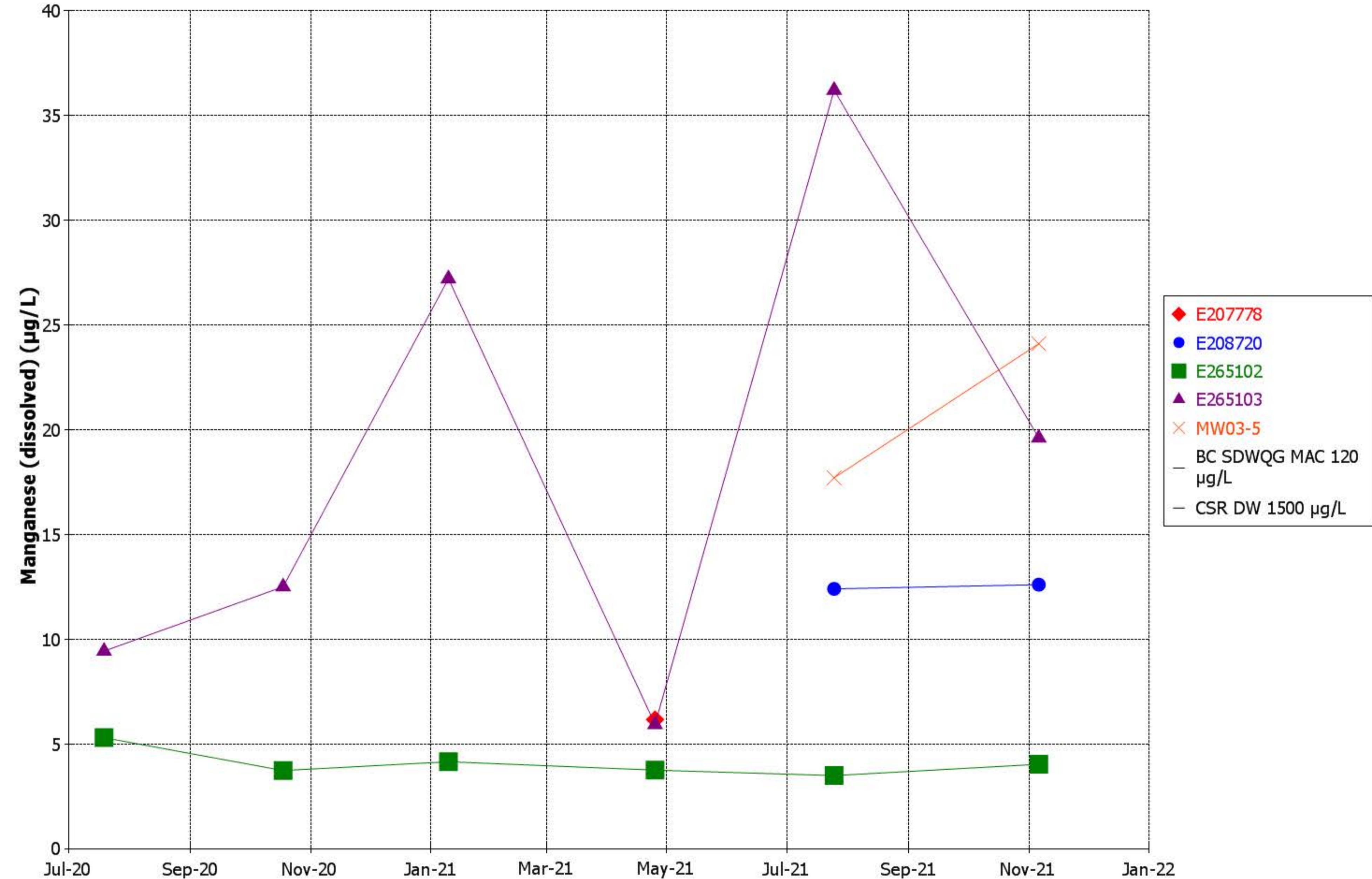


# Time Series Plot For Conductivity

## Columbia Valley Landfill



# Time Series Plot For Manganese (dissolved) Columbia Valley Landfill



# Time Series Plot For Nitrate (as N) Columbia Valley Landfill

