# Old Cranbrook Landfill 2021 Groundwater Monitoring Annual Report



# PREPARED FOR:REGIONAL DISTRICT OF EAST KOOTENAY PREPARED BY: SPERLING HANSEN ASSOCIATES

January, 2022

PRJ21063





- 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 for the next five years.

In 2021, sampling events occurred in January, April, July, and November over a week period. 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. Samples taken from each site are recorded below, and water quality analysis discussed in Section 3. 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. Old Cranbrook Landfill Site Location.

### 1.1 Location and Setting

The Cranbrook Landfill is located just north of the city of Cranbrook within the Central Subregion of East Kootenay. The site is situated off of Highway 95A at Corbett Rd. The latitude and longitude are 49.55358 N and -115.75853 W respectively.

Regional District of East Kootenay Solid Waste Facility Monitoring Program 2020-2025 PRJ21063



The site is approximately 7 hectares in size and closure construction was completed in 2007.



Photo 1-2. Old Cranbrook Landfill Site Layout.

### 1.2 Site Operations

The landfill originally functioned as a natural attenuation landfill for 20 years, until the year 2000. The site was finally closed in 2007 and 2008 and revegetated. A passive gas collection system was installed during closure construction and has since been plumbed to a candlestick flare where the RDEK receive carbon offset credits for the methane destruction. The Old Cranbrook Landfill permit, PR-6767, is attached as Appendix A.

#### 2. MONITORING PROGRAM

As per Permit 6767, the RDEK is to undertake groundwater monitoring to assess the impact of approved works on groundwater quality and the renovative capacity of the sub surface environment in the area. The routine groundwater program consists of sampling 6 groundwater monitoring wells. The well locations are identified in Figure 1.

# 2.1 Methodology

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 to groundwater and surface water. In compliance with Landfill Criteria for Municipal Solid Waste, Sperling Hansen Associates (SHA) was retained to conduct the groundwater monitoring for the wells.



BEAR conducts the field sampling at the seven sites. 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 parameters were sampled in 2021.

**Table 2-1. Groundwater Monitoring Parameters.** 

Site	<b>Quarterly Parameters</b>	Yearly Parameters
	Temperature	Temperature
	Conductivity	Conductivity
	рН	pН
	Nitrite (N)	Nitrite (N)
	Nitrate (N)	Nitrate (N)
	Ammonia Nitrogen (NH3)	Ammonia Nitrogen (NH3)
	Fluoride (F)	Fluoride (F)
	Sulphate (SO4)	Sulphate (SO4)
Cranbrook Landfill	Chloride (Cl)	Chloride (Cl)
Crunoroon Eunum	Hardness	Hardness
	Total Alkalinity	Total Alkalinity
	Total Suspended Solids	Total Suspended Solids
	Turbidity	Turbidity
	Dissolved Metals	Dissolved Metals
	* LANDFILL GAS	* LANDFILL GAS
		BTEX
		EPH/VPH

Analysis of the water samples was conducted by ALS Environmental, a CALA accredited laboratory. Samples were sent to ALS in Calgary via courier by BEAR. Certificate of Analysis (COA) are included in Appendix C. SHA reviewed available Laboratory COAs, based on internal laboratory QA/QC, the results are considered reliable.

# 2.2 Regulatory Criteria

In the absence of an OC, Permit or DOCP, SHA determined regulatory criteria based on site and surrounding area water use.

The CSR Protocol 21 indicates that Drinking Water (DW) Standards generally apply where drinking water sources are within 500m of a site, or if a property is situated on an aquifer that could be used in the future for Drinking Water. Information from the BC Water Atlas indicates that mapped Aquifer 524 underlies the Site. The *Aquifer Classification Worksheet* suggests that in areas, a deeper Aquifer 525 underlies Aquifer 524 where a water system exists. A search for water wells revealed approximately 5



water wells within 500m of the Site. Without further investigation, current and future DW standards are assumed to apply.

The BC Contaminated Sites Regulation (CSR) Protocol 21 indicates that Aquatic Life Standards (AW) generally apply to all groundwater located within 500 m of a surface water body containing aquatic life. The Site is located approximately 400m west of Joseph Creek, therefore the Aquatic Life for Freshwater (AW) standards will apply.

BC CSR Schedule 3.2 standards 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);

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

#### 2.3 Groundwater Flow

The Old Cranbrook site is located approximately 3 km south east of the St. Mary River and approximately 400m west of Joseph Creek. A pond/small lake is located 1.5 km south west of the Site.

Based on the regional topography, groundwater is inferred to flow west. Locally, groundwater flow can be affected by building foundations, recharge areas, drainage and subsurface utilities. Depending on their depth, underground structures may significantly influence shallow groundwater flow in the vicinity of the Site. Local groundwater appears to flow towards the north east. Well details are shown in Table 2-2 below.

Table 2-2. 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)
E265127	2" PVC	18.620	14.120	17.260	19.090
E265122	2" PVC	63.475	63.285	63.630	63.750
E265123	2" PVC	62.465	62.315	62.520	62.675
E265124	2" PVC	67.055	54.180	54.625	54.665
E265125	2" PVC	57.305	57.130	57.345	57.540
E265129	2" PVC	56.175	55.975	56.300	56.440

Due to equipment unavailability in October and November 2021, bailers were used for sampling rather than a pump. As a result, purging at the 6 wells was insufficient because of the bailer technique and substantial well depth.



#### 2.4 Nomenclature

The reporting of monitoring wells at the East Kootenay sites has previously been a combination of Environmental Monitoring System Numbers (EMSN) and site number names that are the more common naming convention (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.

### 3. RESULTS

Water quality results are presented in Appendix B, Table B-1. Parameters tested in this event included:

- Quarterly sampling parameters pH, conductivity, alkalinity, hardness, total suspended solids, turbidity, anions and nutrients, and dissolved metals;
- Annual parameters benzene, toluene, ethylbenzene, and xylene (BTEX), volatile petroleum hydrocarbons, (VPH), and extractable petroleum hydrocarbons (EPH).

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

- Lithium (dissolved)
- Fluoride

Table 3-1 presents a summary of exceedances by analyte.

Table 3-1. Exceedances Summary by Analyte

	E265123	E265125
Lab Results		
Dissolved Metals		
Lithium (dissolved)	Х	Х
General and Inorganic Parameters		
Fluoride		Х

Details are provided in the Sections below.



#### 3.1 Exceedances

Fluoride (F)

Table 3-2 below shows which wells sampled exhibited exceedances in select parameters. E265123 and E265125 exceeded the CSR DW limit for dissolved lithium for all quarterly sampling events. Historically, the 2020 and 2019 results for these wells also showed consistent lithium exceedances, when compared to the applicable standards (CSR DW limit =  $8 \mu g/L$ ). The maximum concentration of lithium was detected at E265123 in April 2021 with a concentration of 108  $\mu g/L$ . This is approximately 13.5 times above the DW standard.

Fluoride concentrations at E265125 also exceeded the CSR DW limit in all quarters. Historically, the 2019 and 2020 fluoride results for E265125 also showed concentrations above the applicable DW standard. The maximum concentration of fluoride at E265125 was 2,120  $\mu$ g/L in July 2020 versus the BC CSR DW standard of 1,500  $\mu$ g/L.

All other parameters tested were below applicable BC CSR AW and DW standards.

ParameterStandardMaximum Concentration (mg/L)Well NameLithium (Li)8 μg/L108E265123

2,120

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

### 3.2 Notes on Regional Background Concentrations

 $1,500 \, \mu g/L$ 

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 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  $\mu$ g/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



E265125

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 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. The landfill gas probes monitored in July and October showed to have well below the percent LEL limit. This is particularly important for the Cranbrook site as it is a closed natural attenuation site that is still producing landfill gas. In order to ensure that this requirement is met, these wells are monitored quarterly. As part of the quarterly monitoring program, Bear Environmental completed one round of landfill gas monitoring on July 24<sup>th</sup>, 2020 as the initial round in SHA's contract, and a second in October 2020. 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 2021 monitoring event are presented in Appendix B, Table B-2. As mentioned in the Columbia Valley annual report, due to delayed shipping of the tool used for LFG sampling (Landtec GEM), did not make it to the RDEK in time to be used for the January sampling event. Therefore, data for January 2021 is omitted.

As can be seen in the table, all readings were well below the landfill criteria. 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 RDEK representative must be notified right away as further actions may be required.

#### 4. DISCUSSION

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

#### Lithium and Fluoride

Historically, these parameters show elevated concentrations at wells E265123/E265125 and E265125 respectively. In 2021, the maximum concentration of lithium was found at E265123 at 108  $\mu$ g/L versus the BC CSR DW standard of 8  $\mu$ g/L. The maximum concentration of fluoride was found at E265125 at 2,120  $\mu$ g/L versus the BC CSR DW standard 1,500  $\mu$ g/L. These maximums are calculated as 13.5- and 1.4-times respective standards.

Trends will continue to be monitored. As these parameters occur elevated but without the accompaniment of elevated typical landfill contaminants of concern, SHA considers the impacts to groundwater from the Old Cranbrook Landfill to be low.

Note that there is a history of fluoride loading in the upstream surrounding area as documented in the *BC* Water Quality Ambient Water Quality Criteria for Fluoride.





SHA recommends that as metals parameters, specifically lithium, appear elevated on-site, low flow monitoring methods should be implemented during sampling to minimize the re-suspension of colloidal materials that can be caused during sampling with bailers and/or Waterra inertia pumps.

### 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 analytical results with the applicable criteria limits. These figures are attached to this report in Appendix D.

- Figure 2 Lithium concentrations
- Figure 3 Sulfate concentrations
- Figure 4 Sodium concentrations
- Figure 5 Chloride concentrations
- Figure 6 Nitrate concentrations
- Figure 7 Specific conductance (Conductivity)
- Figure 8 Fluoride concentrations

The red line on each figure represents the limit for that parameter according to the criteria, to show if wells are under or exceeding the maximum allowable concentration at the time of each quarterly sampling event.

Lithium is the parameter with an observable consistent trend above the CSR DW limit. Sulfate, sodium, chloride, nitrate, and conductivity are graphed because they are typical landfill indicators. As shown in the graphs, these parameters are below allowable limits and show the landfill is not impacting groundwater chemistry beyond regulatory standards. There is no limit for conductivity, but the consistently high trend shows that the presence of the landfill does impact groundwater relative to background or upgradient concentrations.

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

Of the six wells sampled, two include concentrations above BC CSR DW limits. Concentrations of lithium and fluoride were above BC CSR DW standards at wells E265123 and E265125. As these elevated parameters, lithium and fluoride, were detected without the accompaniment of elevated typical landfill contaminants of concern, SHA considers the impacts to groundwater from the Old Cranbrook Landfill to be low.



#### 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 resuspension 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 January, 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.

Report prepared by:

Chlor Hetherington

**Chloe Hetherington** 

**Environmental Analyst Assistant** 

Report reviewed by:

Scott Garthwaite, AScT

Sr. Civil Technologist



#### 7. REFERENCES

Eco/Logic Environmental, Cranbrook Post-Closure Groundwater Monitoring 2019, prepared for the Regional District of East Kootenay.

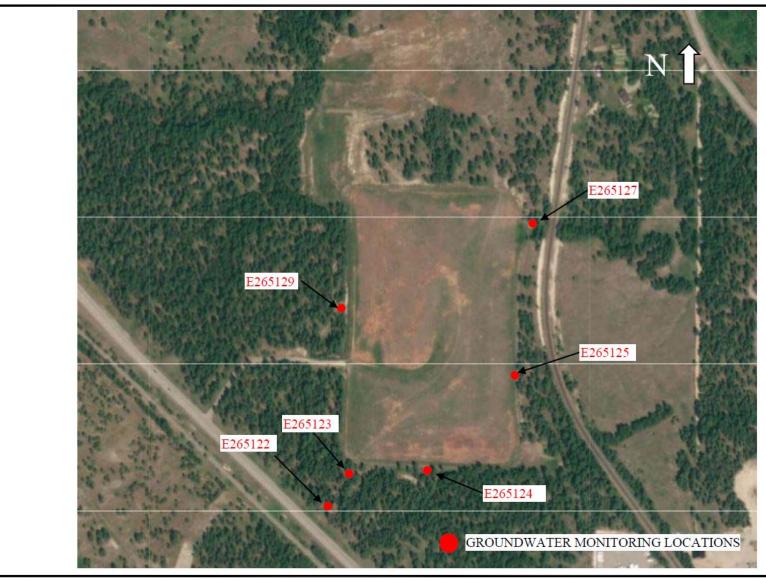
Environmental Management Act, BC Contaminated Sites Regulation Schedule 3.2, 2019 Freshwater Aquatic Life.

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

Bing Maps <a href="https://www.bing.com/maps">https://www.bing.com/maps</a>

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







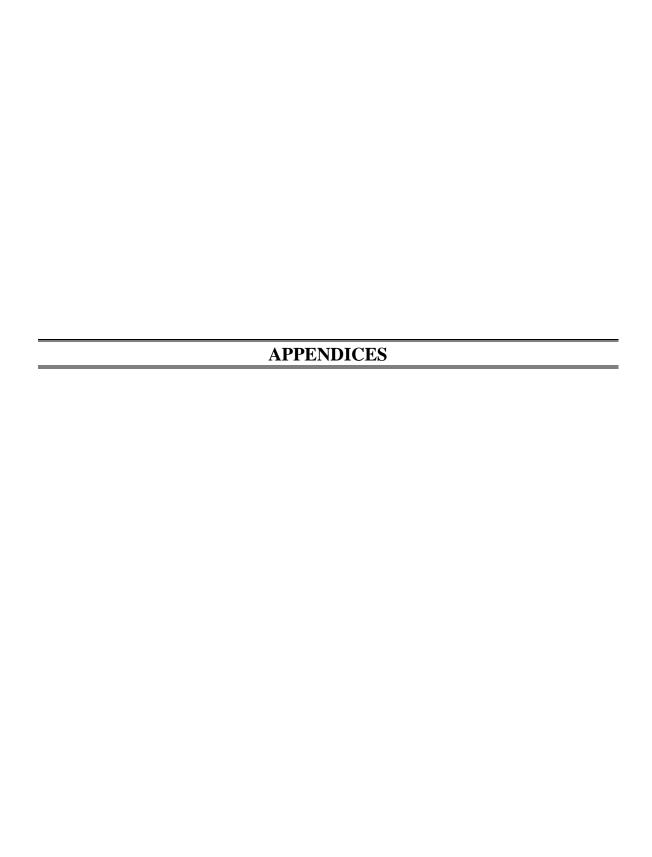


PROJECT:

SOLID WASTE FACILITY MONITORING PROGRAM 2020-2025 TITLE:

OLD CRANBROOK
LANDFILL
MONITORING LOCATIONS

SCALE:	DATE:		PROJECT NO:
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	APPENDIX A
	Permit
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#### BC ENVIRONMENT

#401 -333 Victoria Street Nelson, British Columbia VIL 4K3 Telephone:(604)354-6333 Main Fax: (604)354-6332 EP Fax: (604)354-6367

REGISTERED MAIL

File: PR-6767

May 21, 1996

Regional District of East Kootenay 19-24th Avenue South Cranbrook bc V1C 3H8

Attention: Wayne McNamar

Administrator

Dear Sir:

Re: Cancellation of Permit under the Waste Management Act S.B.C. 1982, c41

As requested in your letter of April 4, 1996 Waste Management Permit PR-6767 in the name of Regional District of East Kootenay is hereby cancelled pursuant to Section 23,(4),(b),(iv) of the Waste Management Act.

Yours truly,

Rick Crozier, R.P.Bio. Regional Waste Manager Kootenay Region

RJC/rp

cc:

Environmental Protection, Victoria Gary Lawrence, EP-Cranbrook



Waste Management Branch Koolenay Region 310 Ward Street Nelson, B.C. V1L 5S4 Phone: 352-2211 Local 273, 305, or 339

YOUR FILE .

PR-6767 OUR FILE ....

APR 1 3 1984

#### REGISTERED MAIL:

Regional District of East Kootenay, 19 - 24th Avenue, South, Cranbrook, British Columbia V1C 3H8

Gentlemen:

#### LETTER OF TRANSMITTAL

Enclosed is a copy of Permit No. PR-6767 issued under the provisions of the Waste Management Act in the name of Regional District of East Kootenay. Your attention is respectfully directed to the terms and conditions outlined in the Permit.

The administration of this Permit will be carried out by staff from our Regional Office located at 310 Ward Street, Nelson, British Columbia, VIL 5S4 (telephone 352-2211). Plans, data and reports pertinent to the Permit are to be submitted to the Regional Waste Manager at this address.

You will note that values have been expressed i $\mathring{h}$  the International Systems of Units (SI). These units are to be used in submitting monitoring results and any other information in connection with this Permit.

This Permit 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 shall rest with the Permittee.

Yours very truly,

M.K. Baillargeon, P.Eng. Regional Waste Manager

Enclosure



# **PERMIT**

Under the Provisions of the Waste Management Act

,	
Regional District of East Kootenay	
19 - 24th Avenue, South, Cranbrook, British Columbi	a V1C 3H8
is hereby authorized to dischargerefuse	
fromfrom	
located within the Regional District of East Koo	tenay
to the ground, approximately 11.3 km northeast of Cran	brook, British
This permit has been issued under the terms and conditions prescribed in the attac	COLUMBIA
01, A-1, B-1, C-1 and C-2	•
	***************************************
	***************************************
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Regional Waste Mána	ger
App	
Date issued APR 1.3.1984, 19 Permi	t No. PR-6767
Amendments dated, 19	
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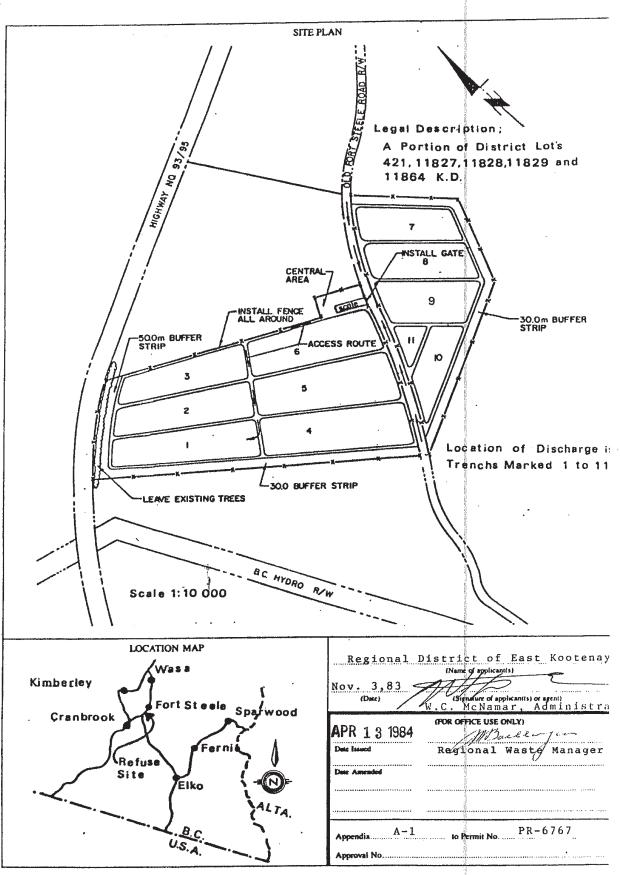
Waste Management Branch

# APPENDIX No.º1

to Permit No. P.R.-6.7.6.7

(a) The discharge of refuse to which this appendix is applicable is to a sit	e located on a
portion of District Lots 421, 11827, 11828, 11829	and 11864,
Kootenay District	
as shown on the attac	hed Appendix A-1
(b) The quantity of refuse which may be discharged is an average of 140	tonnes/day
based on the operating period	
(c) The type of refuse which may be discharged is municipal	
(Municipal, industrial, etc.)	The state of the s
(d) The nature or characteristics of the refuse which may be discharged are ty	pical municipal
refuse, excluding special wastes	
Enc. C. C. C. Company and Comp	
	ineman and a second a second and a second and a second and a second and a second an
a landfill operation with daily	compaction
(c) The works authorized are a landfill operation with daily and covering	
approximately located as shown on the attac	hed Appendix A 1
(f) The land from which the refuse originates and to which this appendix is appurte District of East Kootenay and municipalities withi	nant is
(g) Those works authorized and proposed must be completed and in operation	hen discharge
The state of the s	
	The state of the s
Date APR 1 3 1984 , 19	THE REAL PROPERTY AND ADDRESS OF THE PROPERTY ADDRESS OF THE PROPERTY AND ADDRESS OF THE PROPERTY ADDRESS OF THE PROPERTY AND ADDRESS OF THE PROPERTY ADDRESS OF THE PROPERTY AND ADDRESS OF THE PROPERTY ADDRESS OF THE PROPERTY AND ADDRESS OF THE PROPERTY ADDRESS OF THE PROPERTY AND ADDRESS OF THE PROPERTY ADDRESS OF THE PROPE
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Amended , 19 Regional Waste Man	ager







WASTE MANAGEMENT BRANCH

# APPENDIX No. B-1

to Permit No. PR-6767

#### A. Landfill Operation

The permittee shall maintain the landfill authorized in Appendix 01 as a Level 'A' operation in accordance with the Pollution Control Objectives for Municipal Type Waste Discharges in British Columbia, dated September, 1975, which, in normal conditions, requires that cover material be applied once per day of operation. The Regional Waste Manager may vary the frequency of covering when freezing conditions adversely affect normal operation.

#### B. Site Preparation and Restoration

Provision of fencing, site access, vehicle safety barriers, surface water diversionary works, firebreaks and site restoration as required, shall be carried out to the satisfaction of the Regional Waste Manager.

#### C. Operational Plan

An operational plan of the works authorized in Appendix 01 shall be submitted to the Regional Waste Manager in duplicate and his approval obtained before operation commences. The works shall be operated in accordance with the plan.

#### D. Leachate

Should leachate emanating from the refuse site become detrimental to the groundwater, a means of mitigating the impact of the leachate will be implemented by the permittee.

#### E. Dust Control

If dust created within the landfill area becomes a problem then the permittee shall provide control measures acceptable to the Regional Waste Manager.

Date issued APR 13 1984, 19 Regional Waste Manager

Date amended , 19 Regional Waste Manager



#### MINISTRY OF ENVIRONMENT WASTE MANAGEMENT BRANCH

### APPENDIX No. q-1

to Permit No. PR-6767

The following monitoring program shall be performed by the permittee. Variation may be made as recommended by the Regional Waste Manager.

#### A. Discharge Monitoring

The permittee shall install a suitable weigh scale and weigh and record the weight of all refuse delivered to the landfill site. Records of the total weight of refuse discharged and the average daily weight of refuse discharged shall be submitted quarterly to the Regional Waste Manager. The average weight shall be based on the operating period.

#### B. Groundwater Monitoring

- The permittee shall undertake a program of groundwater sampling to monitor the quality of the groundwater in the vicinity of the landfill site.
- The permittee shall submit details of the proposed monitoring program to the Regional Waste Manager for approval prior to discharge of refuse to the landfill site.
- 3. The groundwater monitoring program shall include but is not limited to the following:
  - 3.1 All sampling well locations, well construction, sampling techniques and equipment are to be approved by the Regional Waste Manager prior to installation or use.
  - 3.2 The permittee shall obtain a grab sample from each well once each quarter. Proper care should be taken in sampling, storing and transporting the samples to adequately control temperature and avoid contamination, breakage, etc.

MBullager
Regional Waste Manager

Date issued	APR	13	1984	19
Date amend	ded			19
	****************		<b>,</b>	19



WASTE MANAGEMENT BRANCH

# APPENDIX No. c-2

to Permit No. PR-6767

3.3 The permittee shall obtain analyses of the samples for the following:

pH, specific conductance, chloride, fluoride, nitrogen and nitrate nitrogen, sulfate, dissolved oxygen, alkalinity, total organic carbon, dissolved organic carbon, orthophosphate, sulphide and phenol, and the following dissolved metals: arsenic, barium, beryllium, boron, cadmium, calcium, chromium, copper, iron, lead, magnesium, mercury, nickel, potassium, selenium, sodium, zinc.

Analyses are to be carried out in accordance with procedures described in the second edition (February, 1976) of "A Laboratory Manual for the Chemical Analysis of Waters, Wastewaters, Sediments and Biological Materials", or by suitable alternative procedures as approved by the Regional Waste Manager.

Copies of the above mentioned manual are available from the Waste Management Branch, 810 Blanshard Street, Victoria, British Columbia, V8V 1X5, at a cost of \$5.00, and are also available for inspection at all Waste Management Branch offices.

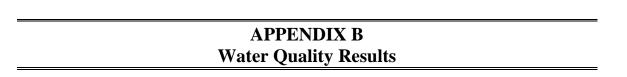
- 3.4 Maintain data of analyses for inspection and submit the data suitably tabulated to the Regional Waste Manager, quarterly.
- 4. The permittee shall have the approved groundwater monitoring program inplace prior to discharge of refuse to the landfill site.

Regional Waste Manage

Date issued APR 1 3 1984 , 19

Date amended , 19

, 19



#### Old Cranbrook Land

	s	ampling Location Date Sampled Lab Sample ID	25-Jul-20	E265122 19-Oct-20 L2519605-2	E265122 11-Jan-21 L2548154-2	E265122 26-Apr-21 L2581860-2	E265122 28-Jul-21 L2621315-2	07-Nov-21	E265123 25-Jul-20 L2480533-5	E265123 19-Oct-20 L2519605-3	E265123 11-Jan-21 L2548154-3	E265123 26-Apr-21 L2581860-3	E265123 28-Jul-21 L2621315-3	E265123 07-Nov-21 L2660703-3	E265124 25-Jul-20 L2480533-6	E265124 19-Oct-20 L2519605-4	E265124 11-Jan-21 L2548154-4	E265124 26-Apr-21 L2581860-4	E265124 28-Jul-21 L2621315-4	E265124 07-Nov-21 L2660703-4	E265125 25-Jul-20 L2480533-7	E265125 19-Oct-20 L2519605-5	E265125 11-Jan-21 L2548154-5	E265125 26-Apr-21 L2581860-5	E265125 28-Jul-21 L2621315-5	E265125 07-Nov-21 L2660703-5	E265127 19-Oct-20 L2519605-6	E265127 11-Jan-21 L2548154-6	E265127 26-Apr-21 L2581860-6	E265127 28-Jul-21 L2621315-6	E265127 07-Nov-21 L2660703-6	E265129 25-Jul-20 L2480533-8	E265129 19-Oct-20 L2519605-1	E265129 11-Jan-21 L2548154-1	E265129 26-Apr-21 L2581860-1	E265129 28-Jul-21 L2621315-1	E265129 07-Nov-21 L2660703-1
Table B-2 Water Quality	/ Analysis	Sample Type	12400000-4	22010000-2	22040104-2	22001000-2	22021010-2	22000700-2	22400000	120100000	22340104-0	22001000-0	22021010-0	22000700-0	124000000	22010000-4	22340104-4	22001000-4	22021010-4	22000700-4	224000007	22010000-0	22340104-0	22301000-0	22021010-0	22000700-0	22010000-0	22040104-0	22501000-0	22021010-0	22000700-0	22400000	22515005-1	22340104-1		22021010-1	22000100-1
Analyte	Unit CSR AW	Guideline / CSR DW																																			
Lab Results Anions and Cations in meq/L unit Aluminum (meq/L) (calculated) Barium (meq/L) (calculated) Bicarbonate (HCO3) (meq/L) (calculated)	meq/L NG meq/L NG meq/L NG	NG NG NG	0.0010 0.00221 5.77	0.00024 0.00213 5.26	0.00259 0.00207 6.13	0.00020 0.00195 5.38	0.00044 0.00208 11.2	0.00012 0.00214 4.82	0.00021 0.00211 5.51	0.00023 0.00167 5.23	0.00023 0.00195 5.65	<0.00011 0.00163 5.38	0.00012 0.00169 5.49	<0.00011 0.00170 4.61	0.00061 0.00274 7.88	0.00014 0.00266 6.34	0.00041 0.00246 7.03	0.00019 0.00243 6.06	0.00030 0.00285 55.4	0.00017 0.00246	0.0010 0.00309 6.54	0.00030 0.00301 6.24	0.00038 0.00303 6.16	0.00030 0.00277 5.87	0.00034 0.00298 6.59	0.00029 0.00297 5.8	0.00023 0.00590 5.41	0.0002 0.00609 6.21	0.00018 0.00569 5.36	0.00017 0.00568 5.97	0.00020 0.00572 5.26	0.00037 0.00272 6.61	0.00020 0.00268 5.88	0.00039 0.00240 6.38	<0.00011 0.00256 5.67	0.00031 0.00272 6.42	0.00056 0.00262 5.49
Calcium (meq/L) (calculated) Calcium (meq/L) (calculated) Carbonate (CO3) (meq/L) (calculated) Chloride (meq/L) (calculated)	meq/L NG meq/L NG meq/L NG meq/L NG meq/L NG	NG NG NG NG	<0.0028 3.02 <0.17 0.299	<0.0028 2.91 <0.17 0.34	<0.0028 2.91 <0.17 0.344	<0.0028 2.9 <0.17 0.339	<0.0028 2.60 <0.17 0.347	<0.0028 2.92 <0.17 0.361	0.0089 2.42 <0.17 1.29	0.0086 2.37 <0.17	0.0075 2.32 <0.17 0.96	0.0094 2.41 <0.17 0.965	0.0080 2.17 <0.17 0.897	0.0080 2.33 <0.17 0.925	<0.0028 3.2 <0.17 0.465	<0.0028 3.1 <0.17 0.491	<0.0028 3.08 <0.17 0.45	<0.0028 3.11 <0.17 0.499	<0.0028 2.81 <0.17 0.477	<0.0028 2.76 <0.17 0.276	0.027 0.524 <0.17 0.0446	0.027 0.544 0.31 0.0474	0.03 0.519 0.24 0.0477	0.0300 0.519 0.460 0.0409	0.027 0.509 <0.17 0.0482	0.026 0.491 <0.17 0.0539	<0.0028 3.00 <0.17 0.140	<0.0028 2.92 <0.17 0.175	<0.0028 2.58 <0.17 0.150	<0.0028 2.63 <0.17 0.161	<0.0028 2.68 <0.17 0.196	<0.0028 3.2 <0.17 0.618	<0.0028 3.18 <0.17 0.643	<0.0028 2.94 <0.17 0.638	<0.0028 3.22 <0.17 0.646	<0.0028 2.97 <0.17 0.663	0.0028 3.18 <0.17 0.750
Chromium (meq/L) (calculated)  Copper (meq/L) (calculated)  Fluoride (meq/L) (calculated)  Hydroxide (OH) (meq/L) (calculated)  Lead (meq/L) (calculated)	meq/L NG meq/L NG meq/L NG meq/L NG meq/L NG meq/L NG	NG NG NG NG	0.000114 0.0000422 0.0147 <0.29 <0.0000048	0.000197 0.0000098 0.00532 <0.29 0.00000105	0.0000767 0.000024 0.00547 <0.29 <0.00000048	<0.0000058 0.0000371 0.0039 <0.29 <0.00000048	0.000264 0.000016 0.0020 <0.29 <0.00000048	0.0000837 0.000013 0.0047 <0.29 <0.00000048	0.000035 0.0000079 0.00774 <0.29 <0.00000048	0.000020 0.000024 0.00774 <0.29 <0.00000048	<0.0000058 0.000018 0.00695 <0.29 <0.0000048	0.0000081 0.0000371 0.00526 <0.29 <0.00000048	0.000042 0.000144 0.0018 <0.29 <0.0000048	0.000035 0.000125 0.00632 <0.29 <0.00000048	0.000042 0.000021 0.00542 <0.29 <0.0000048	0.0000860 <0.0000063 0.00569 <0.29 <0.00000048	0.000035 0.000021 0.00590 <0.29 <0.00000048	0.0000058 0.0000094 0.0040 <0.29 <0.00000048	0.000028 <0.0000063 0.0020 <0.29 <0.00000048	0.000043 0.000020 0.00569 <0.29 <0.00000048	0.0000739 0.0000478 0.118 <0.29 0.00000074	0.000110 0.000069 0.117 <0.29 0.00000975	0.0000785 0.000015 0.110 <0.29 <0.00000048	0.000010 0.0000098 0.109 <0.29 <0.00000048	0.000056 0.0000349 0.111 <0.29 <0.00000048	0.000015 0.000012 0.112 <0.29 <0.00000048	0.000139 0.000022 0.0017 <0.29 0.0000015	0.000056 0.0000673 0.0015 <0.29 0.00000051	<0.000058 0.0000563 <0.0011 <0.29 <0.0000048	0.000163 0.0000714 <0.0011 <0.29 <0.00000048	0.000174 0.000246 0.0013 <0.29 <0.00000048	0.0000785 0.0000066 0.00532 <0.29 <0.00000048	0.000126 <0.0000063 0.00590 <0.29 <0.00000048	0.0000710 0.000016 0.00563 <0.29 <0.00000048	<0.0000058 0.000028 0.0041 <0.29 <0.00000048	0.000148 0.000023 0.0018 <0.29 <0.00000048	0.0000681 0.000544 0.0014 <0.29 0.0000063
Lithium (meq/L) (calculated)  Magnesium (meq/L) (calculated)  Potassium (meq/L) (calculated)  Sodium (meq/L) (calculated)	meq/L NG meq/L NG meq/L NG meq/L NG meq/L NG	NG NG NG NG	0.00055 2.87 0.0568 0.570	0.00075 2.87 0.056 0.61	0.00069 2.81 0.0560 0.613	0.00078 2.86 0.0573 0.631	0.00072 2.78 0.0601 0.613	0.00078 2.8 0.0578 0.635	0.0170 3.65 0.0647	0.0140 3.52 0.0627 0.879	0.0122 3.35 0.0609 0.87	0.0156 3.55 0.0627 0.827	0.0117 3.42 0.0719 0.831	0.0135 3.36 0.0675 0.848	0.00079 3.36 0.0652 0.892	0.0009 3.15 0.0596 0.840	0.00082 3.12 0.0616 0.861	0.00094 3.32 0.0645 0.909	0.00084 3.04 0.0629 0.827	0.00089 2.69 0.0565 0.670	0.00280 0.668 0.0427 5.61	0.00284 0.626 0.0376 5.66	0.00297 0.612 0.0363 5.61	0.00342 0.607 0.0363 5.52	0.00307 0.595 0.0409 5.57	0.00277 0.584 0.0371 5.44	0.000013 0.00024 3.42 0.0558 0.263	0.00024 3.23 0.0540 0.245	0.00023 3.25 0.0553 0.228	0.00023 3.14 0.0573 0.220	0.0000048 0.00023 3.03 0.0606 0.258	0.00082 3.5 0.0655 0.927	0.0009 3.27 0.0619 0.905	0.00082 3.1 0.0599 0.905	0.000004 0.00094 3.27 0.0622 0.918	0.00084 3.16 0.0650 0.905	0.00091 3.18 0.0831 1.01
Strontium (meg/L) (calculated) Sulfate (meg/L) (calculated) Zinc (meg/L) (calculated)	meq/L NG meq/L NG meq/L NG	NG NG NG	0.00500 0.364 0.00013	0.00514 0.381 0.000098	0.00505 0.366 0.00017	0.00516 0.383 0.000477	0.00537 0.341 0.000061	0.00543 0.393 0.000040	0.00772 0.448 0.00011	0.0073 0.464 0.000572	0.00712 0.443 0.013	0.00728 0.454 0.00123	0.00724 0.412 0.00535	0.00715 0.468 0.00196	0.00596 0.620 0.00009	0.00596 0.633 0.000444	0.00589 0.58 0.000073	0.00655 0.677 0.000052	0.00635 0.570 <0.000031	0.00566 0.452 0.000055	0.0017 0.135 0.00018	0.0017 0.14 0.00027	0.00168 0.125 0.000076	0.00175 0.124 0.000058	0.00174 0.110 0.000067	0.00164 0.137 <0.000031	0.00468 0.264 0.000471	0.00445 0.331 0.000419	0.00416 0.302 0.000361	0.00454 0.266 0.000431	0.00429 0.319 0.000575	0.00587 0.606 0.00015	0.00603 0.612 0.00034	0.00575 0.593 0.00013	0.00630 0.612 0.00016	0.00635 0.562 0.00011	0.00639 0.641 0.000468
Dissolved Metals Aluminum (dissolved) Antimony (dissolved) Arsenic (dissolved) Barium (dissolved)	μg/L NG μg/L 90 μg/L 50 μg/L 10000	9500 <sup>2.1</sup> 6 10 1000	9.2 <0.10 0.17 152	2.2 <0.10 0.12 146	23.3 <0.10 0.16 142	1.8 <0.10 0.19 134	4.0 <0.10 0.41 143	1.1 <0.10 0.15	1.9 <0.10 0.52 145	2.1 0.17 0.43	2.1 0.23 0.27 134	<1.0 0.10 0.48 112	1.1 0.26 0.18 116	<1.0 0.17 <0.10	5.5 <0.10 0.19	1.3 <0.10 0.15	3.7 <0.10 0.24 169	1.7 <0.10 0.28 167	2.7 <0.10 0.29	1.5 <0.10 0.13	9.1 <0.10 0.89 212	2.7 <0.10 0.85 207	3.4 <0.10 0.95 208	2.7 <0.10 0.87	3.1 <0.10 0.90 205	2.6 <0.10 0.90 204	2.1 <0.10 0.14 405	2 <0.10 0.13 418	1.6 <0.10 0.11 391	1.5 <0.10 0.12 390	1.8 0.13 0.59 393	3.3 <0.10 0.15 187	1.8 <0.10 0.16 184	3.5 <0.10 0.2 165	<1.0 <0.10 0.16 176	2.8 <0.10 0.23 187	5.0 0.23 0.86 180
Beryllium (dissolved) Bismuth (dissolved) Boron (dissolved) Cadmium (dissolved)	μg/L 1.5 μg/L NG μg/L 12000 mg/L Calc <sup>1.1</sup>	8 NG 5000 0.005	<0.020 <0.050 <10 0.0000116	<0.020 <0.050 <10 0.0000061	<0.020 <0.050 <10 0.0000134	<0.020 <0.050 <10 0.0000244	<0.020 <0.050 <10 0.0000104	<0.020 <0.050 <10 0.0000061	<0.020 <0.050 32 <0.0000050	<0.020 <0.050 31 0.000023	<0.020 <0.050 27 0.0000405	<0.020 <0.050 34 0.0000232	<0.020 <0.050 29 0.0000790	<0.020 <0.050 29 0.0000562	<0.020 <0.050 <10 <0.000050	<0.020 <0.050 <10 0.0000105	<0.020 <0.050 <10 0.0000177	<0.020 <0.050 <10 <0.000050	<0.020 <0.050 <10 0.000069	<0.020 <0.050 <10 0.000098	<0.020 <0.050 96 0.0000244	<0.020 <0.050 96 0.000094	<0.020 <0.050 100 0.000012	<0.020 <0.050 108 0.0000081	<0.020 <0.050 99 0.0000083	<0.020 <0.050 95 0.0000052	<0.020 <0.050 <10 0.0000215	<0.020 <0.050 <10 0.000133	<0.020 <0.050 <10 0.0000750	<0.020 <0.050 <10 0.0000919	<0.020 <0.050 <10 0.000146	<0.020 <0.050 <10 <0.0000050	<0.020 <0.050 <10 0.0000115	<0.020 <0.050 <10 0.0000196	<0.020 <0.050 <10 <0.000050	<0.020 <0.050 <10 0.0000178	<0.020 <0.050 10 0.0000718
Calcium (dissolved) Chromium (dissolved) Cobalt (dissolved) Copper (dissolved) Hardness Total (dissolved as CaCO3)	μg/L NG μg/L 10 <sup>1.2</sup> μg/L 40 μg/L Calc <sup>1.3</sup> mg/L NG	NG 50 <sup>22</sup> 20 <sup>23</sup> 1500 <sup>24</sup>	1.97 0.42 1.34 295	58400 3.42 0.11 0.31 290	58300 1.33 2.16 0.77 286	58200 <0.10 0.29 1.18 289	52100 4.57 0.79 0.50 269	58600 1.45 <0.10 0.42 286	48500 0.61 0.78 0.25 304	0.35 0.47 0.77	46500 <0.10 1.73 0.58 284	48300 0.14 0.39 1.18 298	43500 0.72 0.69 4.56 280	46700 0.61 <0.10 3.97 285	0.73 0.65 0.67	62100 1.49 0.11 <0.20 313	61700 0.61 1.89 0.66 310	62400 0.10 0.66 0.30 322	0.49 0.23 <0.20 293	55300 0.74 <0.10 0.63 273	10500 1.28 0.16 1.52 59.7	10900 1.91 <0.10 0.22 58.4	10400 1.36 0.39 0.48 56.5	0.18 0.31 0.31	10200 0.97 <0.10 1.11 55.1	9840 0.26 <0.10 0.39 53.8	60200 2.41 <0.10 0.69 321	0.97 0.35 2.14 308	51700 <0.10 0.12 1.79 292	52800 2.82 0.16 2.27 289	53700 3.02 <0.10 7.81 286	64200 1.36 0.25 0.21 333	63800 2.18 0.14 <0.20 323	58900 1.23 0.82 0.51 303	<0.10 <0.10 0.89 325	59500 2.56 0.38 0.72 306	63800 1.18 <0.10 17.3 318
Iron (dissolved) Lead (dissolved) Lithium (dissolved) Magnesium (dissolved)	mg/L NG μg/L NG μg/L Calc <sup>1,4</sup> μg/L NG mg/L NG	6500 <sup>2.5</sup> 10 8 NG	57 <0.050 3.8 34.9	27 0.109 5.2 34.9	68 <0.050 4.8 34.2	27 <0.050 5.4 34.8	11 <0.050 5.0 33.8	<10 <0.050 5.4 34.0	1800 <0.050 118 44.3	365 <0.050 97.2 42.8	909 <0.050 84.7 40.7	347 <0.050 108 43.2	109 <0.050 81.5 41.6	<10 <0.050 93.5 40.8	25 <0.050 5.5 40.8	22 <0.050 6 38.3	14 <0.050 5.7 37.9	<10 <0.050 6.5 40.4	<10 <0.050 5.8 37.0	<10 <0.050 6.2 32.7	21 0.077 19.4 8.12	11 0.101 19.7 7.61	50.5 15 <0.050 20.6 7.44	56.3 83 <0.050 23.7 7.38	<10 <0.050 21.3 7.23	<10 <0.050 19.2 7.10	20 0.16 1.7 41.5	12 0.053 1.7 39.3	25 <0.050 1.6 39.5	25 <0.050 1.6 38.2	<10 <0.050 1.6 36.8	55 <0.050 5.7 42	38 <0.050 6 39.7	54 <0.050 5.7 37.7	22 <0.050 6.5 39.7	87 <0.050 5.8 38.4	<10 0.065 6.3 38.6
Manganese (dissolved) Mercury (dissolved) Molybdenum (dissolved) Nickel (dissolved)	μg/L NG μg/L 0.25 μg/L 10000 μg/L Calc <sup>1.5</sup>	1500 <sup>2.6</sup> 1 250 80	6.23 2.72 8.37	1.62 <0.0050 1.78 3.82	22.3 <0.0050 5.5 17	7.47 <0.0050 3.76 9.11	22.3 <0.0050 9.76 27.4	0.51 <0.0050 0.802 0.56	2.27 7.66	137 <0.0050 3.14 6.11	219 <0.0050 5.19 18.7	134 <0.0050 2.51 4.73	24.3 <0.0050 7.32 21.7	0.13 <0.0050 2.57 3.66	13.2 4.79 16.7	1.79 <0.0050 1.99 3.69	51.9 <0.0050 23.4 61.8	15.6 <0.0050 7.84 11.3	9.70 <0.0050 10.0 18.0	0.14 <0.0050 0.811 <0.50	3.53 1.11 1.46	1.69 <0.0050 1.13 0.81	6.13 <0.0050 1.81 1.78	12.9 <0.0050 2.37 6.52	3.20 <0.0050 1.35 1.14	2.01 <0.0050 0.856 <0.50	1.95 <0.0050 0.815 1.73	2.21 <0.0050 0.66 1.64	1.97 <0.0050 0.593 2.24	4.80 <0.0050 1.75 7.20	1.09 <0.0050 0.979 1.79	6.5 2.51 9.05	2.02 <0.0050 1.98 4.79	9.86 <0.0050 4.23 11.4	0.78 <0.0050 1.13 2.54	7.09 <0.0050 4.63 14.5	4.17 <0.0050 1.29 3.14
Phosphorus (dissolved, by ICPMS/ICPOES) Potassium (dissolved) Selenium (dissolved) Silicon (dissolved, as Si) Silver (dissolved)	μg/L NG μg/L NG μg/L 20 μg/L NG μg/L NG μg/L Calc 1.6	NG NG 10 NG	<50 2220 0.3 7000 <0.010	<50 2200 0.291 6790 <0.010	<50 2190 0.278 7050 0.031	<50 2240 0.262 6950 <0.010	<50 2350 0.211 6970 <0.010	<50 2260 0.264 7020 <0.010	<50 2530 0.157 5830 <0.010	<50 2450 0.436 5670 <0.010	<50 2380 0.385 5610 <0.010	<50 2450 0.430 6210 <0.010	<50 2810 0.580 5800 <0.010	<50 2640 0.574 5820 <0.010	<50 2550 0.528 7280 <0.010	<50 2330 0.596 6960 <0.010	<50 2410 0.626 6970 <0.010	<50 2520 0.587 7180 <0.010	<50 2460 0.568 7180 <0.010	<50 2210 0.303 6640 <0.010	<50 1670 <0.050 4570 <0.010	<50 1470 <0.050 4330 <0.010	<50 1420 <0.050 4250 <0.010	<50 1420 <0.050 4370 <0.010	<50 1600 <0.050 4390 <0.010	<50 1450 <0.050 4230 <0.010	<50 2180 0.241 5220 <0.010	<50 2110 0.207 5150 <0.010	<50 2160 0.210 4950 <0.010	<50 2240 0.203 5230 <0.010	<50 2370 0.189 5050 <0.010	<50 2560 0.436 7410 <0.010	<50 2420 0.453 7070 <0.010	<50 2340 0.48 6970 <0.010	<50 2430 0.477 7220 0.013	<50 2540 0.432 7360 <0.010	<50 3250 0.538 7160 <0.010
Sodium (dissolved) Strontium (dissolved) Sulphur (dissolved) Thallium (dissolved)	mg/L NG μg/L NG μg/L NG μg/L 3	200 <sup>2.7</sup> 2500 NG NG	13.1 219 8290 <0.010	14 225 6410 <0.010	14.1 221 6640 <0.010	14.5 226 7340 <0.010	14.1 235 6590 <0.010	14.6 238 6600 <0.010	26.3 338 9300 <0.010	20.2 320 7940 <0.010	20 312 7980 <0.010	19.0 319 8860 <0.010	19.1 317 8360 0.025	19.5 313 7730 <0.010	20.5 261 12300 <0.010	19.3 261 10800 <0.010	19.8 258 11300 <0.010	20.9 287 12600 0.015	19.0 278 10900 0.014	15.4 248 7190 <0.010	129 74 4290 <0.010	130 73 2340 <0.010	129 73.7 2410 <0.010	127 76.5 2560 <0.010	128 76.0 2400 <0.010	125 72.0 2070 <0.010	6.05 205 6300 <0.010	5.64 195 6060 <0.010	5.23 182 5430 <0.010	5.05 199 5540 <0.010	5.93 188 5110 <0.010	21.3 257 12300 <0.010	20.8 264 10200 <0.010	20.8 252 10700 <0.010	21.1 276 11700 <0.010	20.8 278 10800 <0.010	23.2 280 10900 <0.010
Tin (dissolved) Titanium (dissolved) Uranium (dissolved) Vanadium (dissolved) Zinc (dissolved)	μg/L NG μg/L 1000 μg/L 85 μg/L NG	2500 NG 20 20	0.1 <0.30 3.89 <0.50	<0.10 <0.30 4.11 <0.50	<0.10 0.41 4.07 <0.50 5.4	<0.10 <0.30 4.19 <0.50	<0.10 <0.30 3.83 <0.50	0.86 <0.30 4.18 <0.50	0.11 <0.30 2.69 <0.50 3.6	0.29 <0.30 4.21 <0.50	0.33 <0.30 3.67 <0.50	<0.10 <0.30 4.35 <0.50 40.2	0.23 <0.30 3.70 <0.50	1.03 <0.30 3.90 <0.50 64.1	<0.10 <0.30 5.58 <0.50	<0.10 <0.30 5.8 <0.50 14.5	<0.10 <0.30 5.74 <0.50	<0.10 <0.30 6.31 <0.50	<0.10 <0.30 5.32 0.55 <1.0	1.16 <0.30 5.33 <0.50	<0.10 <0.30 1.16 <0.50	<0.10 <0.30 1.19 <0.50 8.9	<0.10 <0.30 1.17 <0.50 2.5	<0.10 <0.30 1.17 <0.50	<0.10 <0.30 1.18 0.51	0.81 <0.30 1.12 <0.50 <1.0	<0.10 <0.30 3.98 <0.50	<0.10 <0.30 3.92 <0.50 13.7	<0.10 <0.30 3.60 <0.50 11.8	<0.10 <0.30 3.63 <0.50	<0.10 <0.30 3.51 <0.50	<0.10 <0.30 5.13 <0.50	<0.10 <0.30 5.35 <0.50	<0.10 <0.30 5.2 <0.50 4.4	<0.10 <0.30 5.57 <0.50	<0.10 <0.30 5.07 <0.50 3.7	1.27 <0.30 5.26 <0.50 15.3
Zirconium (dissolved)  General and Inorganic Parameters  Alkalinity (total, as CaCO3)	μg/L Calc <sup>1.7</sup> μg/L NG mg/L NG	NG NG	4.3 <0.30	3.2 <0.30	<0.30	15.6 <0.30	2.0 <0.30	<0.30	<0.30	<0.30	<0.30	<0.30 269	<0.30	<0.30	<0.30	<0.30	2.4 <0.30	<0.30	<0.30	<0.30	5.9 <0.30	<0.30	<0.30	<0.30	2.2 <0.30	<0.30	15.4 <0.30	<0.30	<0.30	<0.30	18.8 <0.30	4.9 <0.30	<0.30	<0.30	5.2 <0.30	<0.30 <0.30	<0.30
Ammonia (total, as N) Bicarbonate (HCO3) Carbonate (CO3) Chloride	μg/L Calc <sup>18</sup> mg/L NG mg/L NG μg/L 1500000	NG NG NG 250000 <sup>2.9</sup>	9.3 352 <5.0 10600	321 <5.0 12000	6.6 374 <5.0 12200	33.7 328 <5.0 12000	24.7 684 <5.0 12300	<5.0 294 <5.0 12800	131 336 <5.0 45700	319 <5.0 37600	43.7 345 <5.0 34000	23.3 328 <5.0 34200	8.1 335 <5.0 31800	<5.0 281 <5.0 32800	29.2 481 <5.0 16500	387 <5.0 17400	<5.0 429 <5.0 16000	11.7 370 <5.0 17700	20.7 3380 <5.0 16900	6.7 311 <5.0 9790	25.7 399 <5.0 1580	381 9.4 1680	<5.0 376 7.3 1690	5.3 358 13.8 1450	<5.0 402 <5.0 1710	6.8 354 <5.0 1910	330 <5.0 4980	<5.0 379 <5.0 6190	18.1 327 <5.0 5330	<5.0 364 <5.0 5720	<5.0 321 <5.0 6960	12 403 <5.0 21900	359 <5.0 22800	<5.0 389 <5.0 22600	<5.0 346 <5.0 22900	<5.0 392 <5.0 23500	29.6 335 <5.0 26600
Conductivity Fluoride Hydroxide (OH) Nitrate (as N) Nitrate (as N)	μS/cm NG μg/L Calc <sup>1.9</sup> mg/L NG mg/L 400 <sup>1.10</sup> mg/L 400 <sup>1.11</sup>	NG 1500 NG 10 <sup>2.10</sup>	536 279 <5.0 1.35	502 101 <5.0 1.48	531 104 <5.0 1.47	535 74 <5.0 1.47	515 38 <5.0 1.46	567 90 <5.0 1.54	624 147 <5.0 <0.0050	580 147 <5.0 0.0834	589 132 <5.0 0.083 0.083	598 100 <5.0 0.0684	551 35 <5.0 0.143	608 120 <5.0 0.194 0.194	589 103 <5.0 1.41	559 108 <5.0 1.43	570 112 <5.0 1.35 1.35	595 76 <5.0 1.40	584 38 <5.0 1.35	569 108 <5.0 1.08	571 2250 <5.0 0.0815	578 2230 <5.0 0.0732	572 2090 <5.0 0.0713	581 2070 <5.0 0.0609	551 2100 <5.0 0.0822 0.0822	593 2120 <5.0 0.0764 0.0764	477 32 <5.0 0.154	536 28 <5.0 0.062 0.0635	505 <20 <5.0 0.0659	522 <20 <5.0 0.0748	562 24 <5.0 0.328 0.328	605 101 <5.0 1.71	587 112 <5.0 1.74	605 107 <5.0 1.73 1.73	611 77 <5.0 1.74	597 35 <5.0 1.70	673 27 <5.0 1.83
Nitrate + Nitrite (as N) (calculated) Nitrite (as N) pH Sulphate	mg/L 400 <sup>1.32</sup> μg/L Calc <sup>1.33</sup> NG mg/L Calc <sup>1.34</sup>	10 <sup>2-12</sup> 1000 NG 500 <sup>2-13</sup>	<1.0 8.01 17.5	<1.0 8.07 18.3	<1.0 8.06 17.6	1.47 <1.0 8.02 18.4	1.46 <1.0 7.70 16.4	1.54 <1.0 7.95 18.9	<0.0051 <1.0 8.06 21.5	<1.0 8.33 22.3	<1.0 8.2 21.3	0.0684 <1.0 8.22 21.8	0.143 <1.0 7.57	0.194 <1.0 7.73 22.5	<1.0 7.9 29.8	<1.0 7.99 30.4	<1.0 7.98 28	1.40 1.0 7.91 32.5	1.35 1.5 7.62 27.4	1.08 <1.0 7.98 21.7	<1.0 8.43 6.49	<1.0 8.55 6.5	<1.0 8.52 5.98	0.0609 <1.0 8.60 5.96	0.0822 <1.0 8.08 5.30	0.0764 <1.0 8.21 6.57	3.4 8.38 12.7	1.5 8.2 15.9	0.0659 <1.0 8.15 14.5	0.0748 <1.0 7.64 12.8	0.328 <1.0 7.86 15.3	<1.0 7.88 29.1	<1.0 8.02 29.4	1 7.94 28.5	1.74 <1.0 7.94 29.4	1.70 <1.0 7.59 27.0	1.84 8.9 7.77 30.8
Temperature when received by lab Total suspended solids Turbidity  Petroleum Hydrocarbons	*C NG mg/L NG NTU NG	NG NG NG	109	15.8	1260	20.3 462 288	17.4 3570 3130	20.0 69.2 39.3	191	179	66.7	20.6 63.5 33.8	17.6 50.2 8.77	20.1 31.8 16.7	1240	552	16000	20.4 4790 >4000	18.4 10900 >4000	20.1 79.2 58.6	4.1	6.9	7.6	20.7 5.9 3.59	18.4 20.2 4.45	20.2 19.4 8.18	10.5	6.3	20.6 4.1 3.83	19.3 11.1 2.38	20.4 14.8 8.26	683	337	2950	19.8 57.6 18.0	17.0 760 233	20.0 108 62.8
Petroleum Hydrocarbons Benzene EPHw (10-19) EPHw (19-32) Ethylbenzene	μg/L 400 μg/L 500 <sup>1.15</sup> μg/L NG μg/L 2000	140 2.15				<0.50 <100 160 <0.50						<0.50 <100 <100 <0.50						<0.50 <100 <100 <0.50						<0.50 <100 240 <0.50					<0.50 <100 <100 <0.50						<0.50 <100 <100 <0.50		
Methyl tert-butyl ether (MTBE) Toluene VHw6-10 VPHw	μg/L 34000 μg/L 5 μg/L 15000 <sup>1.14</sup> μg/L 1500 <sup>1.17</sup>	95 <sup>2.16</sup> 60 <sup>2.17</sup> 5 15000 <sup>2.18</sup> NG			***************************************	<0.50 <0.50 <100 <100						<0.50 <0.50 <100 <100	***********************					<0.50 <0.50 <100 <100						<0.50 <0.50 <100 <100					<0.50 <0.50 <100 <100						<0.50 <0.50 <100 <100	***************************************	
m.pXylene o-Xylene Xylenes (total) Volatile Organic Compounds	μg/L NG μg/L NG μg/L 300	NG NG 90				<0.50 <0.50 <0.71						<0.50 <0.50 <0.71						<0.50 <0.50 <0.71						<0.50 <0.50 <0.71			************************		<0.50 <0.50 <0.71						<0.50 <0.50 <0.71		
Styrene Styrene	μg/L 720	800				<0.50						<0.50						<0.50						<0.50					<0.50			-			<0.50		



Report

Table B-2

Table b-2																															
	January, 2021					April	, 2021									July,	2021									Noveml	ber, 2021				
Well ID		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	Barometri c Presure	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	Barometri c Presure	CH <sub>4 %</sub>	CO <sub>2</sub> %	O <sub>2</sub> %	BAL %	H <sub>2</sub> ppm	CO ppm	H₂S ppm	LEL %	Relative Pressure	Barometri c Presure
E265122-S		0.5	1.1	15.8	82.6	low	0	0	12	0.36	26.70	0.8	0	17.2	82.0	low	0	0	16	-0.01	26.76	0.2	0.9	15.7	83.2	low	0	0	5	0.00	27.07
E265122-D		0.6	1.1	15.8	82.6	low	0	0	12	0.36	26.70	1.1	0.7	15.1	83.0	low	0	0	23	-0.01	26.76	0.0	0.1	17.6	82.3	low	0	0	0	0.00	27.07
E265123	GEM not	1.7	3.3	14.0	81.1	low	0	0	34	1.79	26.71	2.0	1.6	14.4	81.9	low	0	0	41	-0.01	26.76	0.0	0.0	17.7	82.3	low	0	0	0	0.00	27.06
E265124-S	available. No	0.3	0	18.9	80.8	low	0	0	6	0.00	26.70	0.7	0	17.3	82.1	low	0	0	15	-0.01	26.76	0.0	0.1	17.7	82.2	low	0	0	0	0.00	27.10
E265124-D	data	0.5	0.5	17.9	81.1	low	0	0	10	0.00	26.70	0.7	0.2	16.4	28.8	low	0	0	13	-0.01	26.76	0.0	0.2	17.6	82.2	low	0	0	0	0.00	27.10
TH-4		0.5	0.7	17.1	81.7	low	0	0	10	-0.60	26.74	1.1	0.4	16.0	82.5	low	0	0	23	-0.01	26.76	0.0	0.1	17.4	82.5	low	0	0	0	0.00	27.08
TH4-A		0.3	3.7	12.0	84.1	low	0	0	6	-0.60	26.74	0.9	3	11.5	84.6	low	0	0	18	-0.01	26.76	0.0	0.1	17.4	82.5	low	0	0	0	0.00	27.08
E265127(TH-6)		0.3	1.4	16.0	82.3	low	0	0	6	0.00	26.74	0.6	2.7	16.0	80.8	low	0	0	12	-0.01	26.80	0.0	1.8	16.4	81.8	low	0	0	0	0.00	27.10
TH-1-S		1.1	4.3	11.3	83.3	low	0	0	22	0.01	26.70	1.1	3.9	11.8	83.3	low	0	0	22	-0.01	26.76	0.0	0.1	17.7	82.3	low	0	0	0	0.00	27.09
TH-1-D		0.4	0.1	18.7	80.8	low	0	0	9	0.01	26.70	1.4	0.5	15.6	82.6	low	0	0	28	-0.01	26.76	0.4	5.4	14.5	79.6	low	11	0	10	0.00	27.09

# APPENDIX C Certificates of Analysis



Sperling Hansen Associates Inc.

ATTN: Scott Garthwaite #8 - 1225 East Keith Road North Vancouver BC V7J 1J3 Date Received: 14-JAN-21

Report Date: 20-JAN-21 10:04 (MT)

Version: FINAL

Client Phone: 604-986-7723

# Certificate of Analysis

Lab Work Order #: L2548154

Project P.O. #:

NOT SUBMITTED

Job Reference:

20050 CRANBROOK

C of C Numbers:

Legal Site Desc:

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

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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



L2548154 CONTD.... PAGE 2 of 7

# 20-JAN-21 10:04 (MT)

Version: FINAL

# ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2548154-1 GROUNDWATER 11-JAN-21 12:00 E265129	L2548154-2 GROUNDWATER 11-JAN-21 12:00 E265122	L2548154-3 GROUNDWATER 11-JAN-21 12:00 E265123	L2548154-4 GROUNDWATEF 11-JAN-21 12:00 E265124	L2548154-5 GROUNDWATER 11-JAN-21 12:00 E265125
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	303	286	284	310	56.5
	Total Suspended Solids (mg/L)	2950	1260	66.7	16000	7.6
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	319	307	283	352	321
	Ammonia as N (mg/L)	<0.0050	0.0066	0.0437	<0.0050	<0.0050
	Bicarbonate (HCO3) (mg/L)	389	374	345	429	376
	Carbonate (CO3) (mg/L)	<5.0	<5.0	<5.0	<5.0	7.3
	Chloride (CI) (mg/L)	22.6	12.2	34.0	16.0	1.69
	Conductivity (EC) (uS/cm)	605	531	589	570	572
	Fluoride (F) (mg/L)	0.107	0.104	0.132	0.112	2.09
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Nitrate and Nitrite (as N) (mg/L)	1.73	1.47	0.0830	1.35	0.0713
	Nitrate (as N) (mg/L)	1.73	1.47	0.0830	1.35	0.0713
	Nitrite (as N) (mg/L)	0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	pH (pH)	7.94	8.06	8.20	7.98	8.52
	Sulfate (SO4) (mg/L)	28.5	17.6	21.3	28.0	5.98
<b>Dissolved Metals</b>	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0035	0.0233	0.0021	0.0037	0.0034
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	0.00023	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00020	0.00016	0.00027	0.00024	0.00095
	Barium (Ba)-Dissolved (mg/L)	0.165	0.142	0.134	0.169	0.208
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	0.027	<0.010	0.100
	Cadmium (Cd)-Dissolved (mg/L)	0.0000196	0.0000134	0.0000405	0.0000177	0.0000120
	Calcium (Ca)-Dissolved (mg/L)	58.9	58.3	46.5	61.7	10.4
	Chromium (Cr)-Dissolved (mg/L)	0.00123	0.00133	<0.00010	0.00061	0.00136
	Cobalt (Co)-Dissolved (mg/L)	0.00082	0.00216	0.00173	0.00189	0.00039
	Copper (Cu)-Dissolved (mg/L)	0.00051	0.00077	0.00058	0.00066	0.00048
	Iron (Fe)-Dissolved (mg/L)	0.054	0.068	0.909	0.014	0.015
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0057	0.0048	0.0847	0.0057	0.0206
	Magnesium (Mg)-Dissolved (mg/L)	37.7	34.2	40.7	37.9	7.44
	Manganese (Mn)-Dissolved (mg/L)	0.00986	0.0223	0.219	0.0519	0.00613
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.000050	<0.000050	<0.0000050	<0.0000050
	Molybdenum (Mo)-Dissolved (mg/L)	0.00423	0.00550	0.00519	0.0234	0.00181
	Nickel (Ni)-Dissolved (mg/L)	0.0114	0.0170	0.0187	0.0618	0.00178

 $<sup>^{\</sup>star}$  Please refer to the Reference Information section for an explanation of any qualifiers detected.

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20-JAN-21 10:04 (MT)

# ALS ENVIRONMENTAL ANALYTICAL REPORT

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2548154-6 GROUNDWATER 11-JAN-21 12:00 E265127	
Grouping	Analyte		
WATER			
Physical Tests	Hardness (as CaCO3) (mg/L)	308	
•	Total Suspended Solids (mg/L)	6.3	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	311	
	Ammonia as N (mg/L)	<0.0050	
	Bicarbonate (HCO3) (mg/L)	379	
	Carbonate (CO3) (mg/L)	<5.0	
	Chloride (CI) (mg/L)	6.19	
	Conductivity (EC) (uS/cm)	536	
	Fluoride (F) (mg/L)	0.028	
	Hydroxide (OH) (mg/L)	<5.0	
	Nitrate and Nitrite (as N) (mg/L)	0.0635	
	Nitrate (as N) (mg/L)	0.0620	
	Nitrite (as N) (mg/L)	0.0015	
	pH (pH)	8.20	
	Sulfate (SO4) (mg/L)	15.9	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	
	Dissolved Metals Filtration Location	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0020	
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	
	Arsenic (As)-Dissolved (mg/L)	0.00013	
	Barium (Ba)-Dissolved (mg/L)	0.418	
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	
	Boron (B)-Dissolved (mg/L)	<0.010	
	Cadmium (Cd)-Dissolved (mg/L)	0.000133	
	Calcium (Ca)-Dissolved (mg/L)	58.6	
	Chromium (Cr)-Dissolved (mg/L)	0.00097	
	Cobalt (Co)-Dissolved (mg/L)	0.00035	
	Copper (Cu)-Dissolved (mg/L)	0.00214	
	Iron (Fe)-Dissolved (mg/L)	0.012	
	Lead (Pb)-Dissolved (mg/L)	0.000053	
	Lithium (Li)-Dissolved (mg/L)	0.0017	
	Magnesium (Mg)-Dissolved (mg/L)	39.3	
	Manganese (Mn)-Dissolved (mg/L)	0.00221	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	
	Molybdenum (Mo)-Dissolved (mg/L)	0.000660	
	Nickel (Ni)-Dissolved (mg/L)	0.00164	

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

L2548154 CONTD....

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#### Version: FINAL

# ALS ENVIRONMENTAL ANALYTICAL REPORT

Potassium (K)-Dissolved (mg/L)         2.34         2.19         2.38         2.41         1.42           Selenium (Se)-Dissolved (mg/L)         0.000480         0.000278         0.000385         0.000626         <0.0000           Silicon (Si)-Dissolved (mg/L)         6.97         7.05         5.61         6.97         4.25           Silver (Ag)-Dissolved (mg/L)         <0.000010         0.000031         <0.000010         <0.000010         <0.00001         <0.00001         <0.00001         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <		Sample ID Description Sampled Date Sampled Time Client ID	L2548154-1 GROUNDWATER 11-JAN-21 12:00 E265129	L2548154-2 GROUNDWATEF 11-JAN-21 12:00 E265122	L2548154-3 GROUNDWATER 11-JAN-21 12:00 E265123	L2548154-4 GROUNDWATEF 11-JAN-21 12:00 E265124	L2548154-5 GROUNDWATER 11-JAN-21 12:00 E265125
Dissolved Metals   Phosphorus (P)-Dissolved (mg/L)	Grouping	Analyte					
Potassium (K)-Dissolved (mg/L)         2.34         2.19         2.38         2.41         1.42           Selenium (Se)-Dissolved (mg/L)         0.000480         0.000278         0.000385         0.000626         <0.0000           Silicon (Si)-Dissolved (mg/L)         6.97         7.05         5.61         6.97         4.25           Silver (Ag)-Dissolved (mg/L)         <0.000010         0.000031         <0.000010         <0.000010         <0.000010           Sodium (Na)-Dissolved (mg/L)         20.8         14.1         20.0         19.8         129           Strontium (Sr)-Dissolved (mg/L)         0.252         0.221         0.312         0.258         0.073           Sulfur (S)-Dissolved (mg/L)         10.7         6.64         7.98         11.3         2.41           Thallium (Ti)-Dissolved (mg/L)         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010	WATER						
Potassium (K)-Dissolved (mg/L)         2.34         2.19         2.38         2.41         1.42           Selenium (Se)-Dissolved (mg/L)         0.000480         0.000278         0.000385         0.000626         <0.0000           Silicon (Si)-Dissolved (mg/L)         6.97         7.05         5.61         6.97         4.25           Silver (Ag)-Dissolved (mg/L)         <0.000010         0.000031         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010 <t< th=""><th>Dissolved Metals</th><th>Phosphorus (P)-Dissolved (mg/L)</th><th>&lt;0.050</th><th>&lt;0.050</th><th>&lt;0.050</th><th>&lt;0.050</th><th>&lt;0.050</th></t<>	Dissolved Metals	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
Selenium (Se)-Dissolved (mg/L)         0.000480         0.000278         0.000385         0.000626         <0.0000           Silicon (Si)-Dissolved (mg/L)         6.97         7.05         5.61         6.97         4.25           Silver (Ag)-Dissolved (mg/L)         <0.000010		Potassium (K)-Dissolved (mg/L)				2.41	1.42
Silver (Ag)-Dissolved (mg/L)         <0.000010         0.000031         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.0000		Selenium (Se)-Dissolved (mg/L)	0.000480	0.000278		0.000626	<0.000050
Sodium (Na)-Dissolved (mg/L)         20.8         14.1         20.0         19.8         129           Strontium (Sr)-Dissolved (mg/L)         0.252         0.221         0.312         0.258         0.073           Sulfur (S)-Dissolved (mg/L)         10.7         6.64         7.98         11.3         2.41           Thallium (TI)-Dissolved (mg/L)         <0.000010         <0.000010         <0.000010         <0.000010         <0.000010         <0.00001         <0.00001         <0.00001         <0.00001         <0.00003         <0.00003         <0.000030         <0.000030         <0.000030         <0.00030         <0.000574         0.00017         <0.00050         <0.00050         <0.00050         <0.00050         <0.00050         <0.00050         <0.00050         <0.00050         <0.00050         <0.00050         <0.00050         <0.00024         0.0024 <th></th> <th>Silicon (Si)-Dissolved (mg/L)</th> <th>6.97</th> <th>7.05</th> <th>5.61</th> <th>6.97</th> <th>4.25</th>		Silicon (Si)-Dissolved (mg/L)	6.97	7.05	5.61	6.97	4.25
Strontium (Sr)-Dissolved (mg/L)         0.252         0.221         0.312         0.258         0.073           Sulfur (S)-Dissolved (mg/L)         10.7         6.64         7.98         11.3         2.41           Thallium (TI)-Dissolved (mg/L)         <0.000010		Silver (Ag)-Dissolved (mg/L)	<0.000010	0.000031	<0.000010	<0.000010	<0.000010
Sulfur (S)-Dissolved (mg/L)       10.7       6.64       7.98       11.3       2.41         Thallium (TI)-Dissolved (mg/L)       <0.000010       <0.000010       <0.000010       <0.00001       <0.00001         Tin (Sn)-Dissolved (mg/L)       <0.00010       <0.00010       0.00033       <0.00010       <0.0003         Titanium (Ti)-Dissolved (mg/L)       <0.00030       0.00041       <0.00030       <0.00030       <0.00030         Uranium (U)-Dissolved (mg/L)       0.00520       0.00407       0.00367       0.00574       0.0017         Vanadium (V)-Dissolved (mg/L)       <0.00050       <0.00050       <0.00050       <0.00050       <0.00050         Zinc (Zn)-Dissolved (mg/L)       0.0044       0.0054       0.440       0.0024       0.002		Sodium (Na)-Dissolved (mg/L)	20.8	14.1	20.0	19.8	129
Thallium (TI)-Dissolved (mg/L)		Strontium (Sr)-Dissolved (mg/L)	0.252	0.221	0.312	0.258	0.0737
Tin (Sn)-Dissolved (mg/L)		Sulfur (S)-Dissolved (mg/L)	10.7	6.64	7.98	11.3	2.41
Titanium (Ti)-Dissolved (mg/L)		Thallium (TI)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010		<0.000010
Uranium (U)-Dissolved (mg/L)       0.00520       0.00407       0.00367       0.00574       0.0017         Vanadium (V)-Dissolved (mg/L)       <0.00050       <0.00050       <0.00050       <0.00050       <0.00050       <0.00050       <0.00024       0.0024       0.0024		Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	0.00033	<0.00010	<0.00010
Vanadium (V)-Dissolved (mg/L)		Titanium (Ti)-Dissolved (mg/L)	<0.00030	0.00041	<0.00030	<0.00030	<0.00030
Zinc (Zn)-Dissolved (mg/L) 0.0044 0.0054 0.440 0.0024 0.002		Uranium (U)-Dissolved (mg/L)	0.00520	0.00407	0.00367	0.00574	0.00117
7		Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zirconium (Zr)-Dissolved (mg/L) <0.00030 <0.00030 <0.00030 <0.00030 <0.00030 <0.00030		Zinc (Zn)-Dissolved (mg/L)	0.0044	0.0054	0.440	0.0024	0.0025
		Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

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

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# ALS ENVIRONMENTAL ANALYTICAL REPORT

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	Sample ID Description Sampled Date Sampled Time Client ID	L2548154-6 GROUNDWATER 11-JAN-21 12:00 E265127		
Grouping	Analyte			
WATER				
Dissolved Metals	Phosphorus (P)-Dissolved (mg/L)	<0.050		
	Potassium (K)-Dissolved (mg/L)	2.11		
	Selenium (Se)-Dissolved (mg/L)	0.000207		
	Silicon (Si)-Dissolved (mg/L)	5.15		
	Silver (Ag)-Dissolved (mg/L)	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	5.64		
	Strontium (Sr)-Dissolved (mg/L)	0.195		
	Sulfur (S)-Dissolved (mg/L)	6.06		
	Thallium (TI)-Dissolved (mg/L)	<0.000010		
	Tin (Sn)-Dissolved (mg/L)	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030		
	Uranium (U)-Dissolved (mg/L)	0.00392		
	Vanadium (V)-Dissolved (mg/L)	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	0.0137		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030		

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

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Version:

# **Reference Information**

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)	
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2548154-1, -2, -3, -4, -5, -6	
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2548154-1, -2, -3, -4, -5, -6	
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2548154-1, -2, -3, -4, -5, -6	

**Qualifiers for Individual Parameters Listed:** 

Qualifie	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
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.

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 CaCO3 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.

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.

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)

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:

**Reference Information** 

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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: L2548154 Report Date: 20-JAN-21 Page 1 of 8

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
BE-D-L-CCMS-CL	Water							
Batch R5349898								
WG3474441-3 DUP Beryllium (Be)-Dissolved		<b>L2548154-6</b> <0.000020	<0.000020	RPD-NA	mg/L	N/A	20	16-JAN-21
WG3474441-2 LCS Beryllium (Be)-Dissolved		TMRM	99.2		%		80-120	16-JAN-21
WG3474441-1 MB Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	16-JAN-21
WG3474441-4 MS Beryllium (Be)-Dissolved		L2548154-6	110.7		%		70-130	16-JAN-21
CL-L-IC-N-CL	Water							
Batch R5347978								
WG3473949-10 LCS Chloride (CI)			104.6		%		85-115	14-JAN-21
<b>WG3473949-9 MB</b> Chloride (CI)			<0.10		mg/L		0.1	14-JAN-21
F-L-IC-CL	Water							
Batch R5347978 WG3473949-10 LCS Fluoride (F)			99.0		%		85-115	14-JAN-21
<b>WG3473949-9 MB</b> Fluoride (F)			<0.020		mg/L		0.02	14-JAN-21
HG-D-CVAA-CL	Water				-			
Batch R5353916								
WG3475612-7 DUP Mercury (Hg)-Dissolved		<b>L2548154-1</b> <0.000050	0.0000072	RPD-NA	mg/L	N/A	20	19-JAN-21
WG3475612-2 LCS Mercury (Hg)-Dissolved			101.0		%		80-120	19-JAN-21
WG3475612-6 LCS Mercury (Hg)-Dissolved			99.1		%		80-120	19-JAN-21
WG3475612-1 MB Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	19-JAN-21
WG3475612-8 MS Mercury (Hg)-Dissolved		L2548154-1	103.0		%		70-130	19-JAN-21
MET-D-CCMS-CL	Water							
Batch R5349898								
WG3474441-3 DUP Aluminum (Al)-Dissolved	I	<b>L2548154-6</b> 0.0020	0.0021		mg/L	4.0	20	16-JAN-21
Antimony (Sb)-Dissolved	I	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	16-JAN-21



# **Quality Control Report**

Workorder: L2548154 Report Date: 20-JAN-21 Page 2 of 8

Test Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL Water							
Batch R5349898							
WG3474441-3 DUP	L2548154-6	0.0004.4		4			
Arsenic (As)-Dissolved	0.00013	0.00014		mg/L	7.6	20	16-JAN-21
Barium (Ba)-Dissolved	0.418	0.414		mg/L	1.0	20	16-JAN-21
Bismuth (Bi)-Dissolved	<0.000050	<0.000050	=	mg/L	N/A	20	16-JAN-21
Boron (B)-Dissolved	<0.010	<0.010	RPD-NA	mg/L	N/A	20	16-JAN-21
Cadmium (Cd)-Dissolved	0.000133	0.000134		mg/L	0.9	20	16-JAN-21
Calcium (Ca)-Dissolved	58.6	60.2		mg/L	2.7	20	16-JAN-21
Chromium (Cr)-Dissolved	0.00097	0.00099		mg/L	2.2	20	16-JAN-21
Cobalt (Co)-Dissolved	0.00035	0.00035		mg/L	0.9	20	16-JAN-21
Copper (Cu)-Dissolved	0.00214	0.00213		mg/L	0.3	20	16-JAN-21
Iron (Fe)-Dissolved	0.012	0.012		mg/L	2.4	20	16-JAN-21
Lead (Pb)-Dissolved	0.000053	0.000053		mg/L	0.2	20	16-JAN-21
Lithium (Li)-Dissolved	0.0017	0.0016		mg/L	6.3	20	16-JAN-21
Magnesium (Mg)-Dissolved	39.3	39.0		mg/L	0.9	20	16-JAN-21
Manganese (Mn)-Dissolved	0.00221	0.00215		mg/L	2.7	20	16-JAN-21
Molybdenum (Mo)-Dissolved	0.000660	0.000674		mg/L	2.2	20	16-JAN-21
Nickel (Ni)-Dissolved	0.00164	0.00166		mg/L	1.1	20	16-JAN-21
Phosphorus (P)-Dissolved	< 0.050	< 0.050	RPD-NA	mg/L	N/A	20	16-JAN-21
Potassium (K)-Dissolved	2.11	2.11		mg/L	0.3	20	16-JAN-21
Selenium (Se)-Dissolved	0.000207	0.000220		mg/L	6.3	20	16-JAN-21
Silicon (Si)-Dissolved	5.15	5.16		mg/L	0.2	20	16-JAN-21
Silver (Ag)-Dissolved	<0.000010	0.000010	RPD-NA	mg/L	N/A	20	16-JAN-21
Sodium (Na)-Dissolved	5.64	5.62		mg/L	0.4	20	16-JAN-21
Strontium (Sr)-Dissolved	0.195	0.199		mg/L	2.1	20	16-JAN-21
Sulfur (S)-Dissolved	6.06	6.16		mg/L	1.6	20	16-JAN-21
Thallium (TI)-Dissolved	<0.00010	<0.000010	RPD-NA	mg/L	N/A	20	16-JAN-21
Tin (Sn)-Dissolved	<0.00010	<0.00010	RPD-NA	mg/L	N/A	20	16-JAN-21
Titanium (Ti)-Dissolved	<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	16-JAN-21
Uranium (U)-Dissolved	0.00392	0.00398		mg/L	1.5	20	16-JAN-21
Vanadium (V)-Dissolved	<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	16-JAN-21
Zinc (Zn)-Dissolved	0.0137	0.0137		mg/L	0.2	20	16-JAN-21
Zirconium (Zr)-Dissolved	<0.00030	<0.00030	RPD-NA	mg/L	N/A	20	16-JAN-21
WG3474441-2 LCS	TMRM			-			
Aluminum (Al)-Dissolved		102.3		%		80-120	16-JAN-21
Antimony (Sb)-Dissolved		98.7		%		80-120	16-JAN-21



Workorder: L2548154 Report Date: 20-JAN-21 Page 3 of 8

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	Water							
Batch R5349898	8							
WG3474441-2 LCS		TMRM						
Arsenic (As)-Dissolved			101.2		%		80-120	16-JAN-21
Barium (Ba)-Dissolved			101.5		%		80-120	16-JAN-21
Bismuth (Bi)-Dissolved	1		97.1		%		80-120	16-JAN-21
Boron (B)-Dissolved			99.3		%		80-120	16-JAN-21
Cadmium (Cd)-Dissolv			101.6		%		80-120	16-JAN-21
Calcium (Ca)-Dissolve			98.6		%		80-120	16-JAN-21
Chromium (Cr)-Dissolv	ved		102.7		%		80-120	16-JAN-21
Cobalt (Co)-Dissolved			101.3		%		80-120	16-JAN-21
Copper (Cu)-Dissolved	t		98.9		%		80-120	16-JAN-21
Iron (Fe)-Dissolved			96.7		%		80-120	16-JAN-21
Lead (Pb)-Dissolved			99.7		%		80-120	16-JAN-21
Lithium (Li)-Dissolved			101.1		%		80-120	16-JAN-21
Magnesium (Mg)-Disse	olved		107.6		%		80-120	16-JAN-21
Manganese (Mn)-Disse	olved		103.0		%		80-120	16-JAN-21
Molybdenum (Mo)-Disa	solved		101.6		%		80-120	16-JAN-21
Nickel (Ni)-Dissolved			101.2		%		80-120	16-JAN-21
Phosphorus (P)-Dissol	lved		104.6		%		70-130	16-JAN-21
Potassium (K)-Dissolv	ed		103.4		%		80-120	16-JAN-21
Selenium (Se)-Dissolv	ed		100.3		%		80-120	16-JAN-21
Silicon (Si)-Dissolved			101.7		%		60-140	16-JAN-21
Silver (Ag)-Dissolved			98.0		%		80-120	16-JAN-21
Sodium (Na)-Dissolved	d		105.0		%		80-120	16-JAN-21
Strontium (Sr)-Dissolve	ed		102.9		%		80-120	16-JAN-21
Sulfur (S)-Dissolved			99.0		%		80-120	16-JAN-21
Thallium (TI)-Dissolved	d		98.6		%		80-120	16-JAN-21
Tin (Sn)-Dissolved			100.3		%		80-120	16-JAN-21
Titanium (Ti)-Dissolved	d		95.4		%		80-120	16-JAN-21
Uranium (U)-Dissolved	d		101.5		%		80-120	16-JAN-21
Vanadium (V)-Dissolve	ed		102.1		%		80-120	16-JAN-21
Zinc (Zn)-Dissolved			98.5		%		80-120	16-JAN-21
Zirconium (Zr)-Dissolv	ed		97.0		%		80-120	16-JAN-21
WG3474441-1 MB								
Aluminum (AI)-Dissolv	ed		<0.0010		mg/L		0.001	16-JAN-21
Antimony (Sb)-Dissolv	ed		<0.00010	)	mg/L		0.0001	16-JAN-21



Workorder: L2548154 Report Date: 20-JAN-21 Page 4 of 8

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	Water							
Batch R5349898	}							
WG3474441-1 MB			0.00040		/I			
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	16-JAN-21
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	16-JAN-21
Bismuth (Bi)-Dissolved			<0.000050	)	mg/L		0.00005	16-JAN-21
Boron (B)-Dissolved			<0.010	_	mg/L		0.01	16-JAN-21
Cadmium (Cd)-Dissolve			<0.000005	OC .	mg/L		0.000005	16-JAN-21
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	16-JAN-21
Chromium (Cr)-Dissolve	ed		<0.00010		mg/L		0.0001	16-JAN-21
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	16-JAN-21
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	16-JAN-21
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	16-JAN-21
Lead (Pb)-Dissolved			<0.000050	)	mg/L		0.00005	16-JAN-21
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	16-JAN-21
Magnesium (Mg)-Disso			<0.0050		mg/L		0.005	16-JAN-21
Manganese (Mn)-Disso	olved		<0.00010		mg/L		0.0001	16-JAN-21
Molybdenum (Mo)-Diss	olved		<0.000050	)	mg/L		0.00005	16-JAN-21
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	16-JAN-21
Phosphorus (P)-Dissolv	/ed		<0.050		mg/L		0.05	16-JAN-21
Potassium (K)-Dissolve	ed		<0.050		mg/L		0.05	16-JAN-21
Selenium (Se)-Dissolve	ed		<0.000050	)	mg/L		0.00005	16-JAN-21
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	16-JAN-21
Silver (Ag)-Dissolved			<0.000010	)	mg/L		0.00001	16-JAN-21
Sodium (Na)-Dissolved			< 0.050		mg/L		0.05	16-JAN-21
Strontium (Sr)-Dissolve	ed		<0.00020		mg/L		0.0002	16-JAN-21
Sulfur (S)-Dissolved			< 0.50		mg/L		0.5	16-JAN-21
Thallium (TI)-Dissolved			<0.000010	)	mg/L		0.00001	16-JAN-21
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	16-JAN-21
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	16-JAN-21
Uranium (U)-Dissolved			<0.000010	)	mg/L		0.00001	16-JAN-21
Vanadium (V)-Dissolve	d		<0.00050		mg/L		0.0005	16-JAN-21
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	16-JAN-21
Zirconium (Zr)-Dissolve	ed		<0.00020		mg/L		0.0002	16-JAN-21
WG3474441-4 MS		L2548154-6						
Aluminum (Al)-Dissolve	ed	_	110.1		%		70-130	16-JAN-21
Antimony (Sb)-Dissolve	ed		106.3		%		70-130	16-JAN-21



Workorder: L2548154 Report Date: 20-JAN-21 Page 5 of 8

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	Water							
Batch R53498	398							
WG3474441-4 MS		L2548154-6	407.0		0/			
Arsenic (As)-Dissolv			107.3	MO D	%		70-130	16-JAN-21
Barium (Ba)-Dissolv			N/A	MS-B	%		-	16-JAN-21
Bismuth (Bi)-Dissolv			102.8		%		70-130	16-JAN-21
Boron (B)-Dissolved			109.4		%		70-130	16-JAN-21
Cadmium (Cd)-Diss			109.5		%		70-130	16-JAN-21
Calcium (Ca)-Dissol			N/A	MS-B	%		-	16-JAN-21
Chromium (Cr)-Diss			108.5		%		70-130	16-JAN-21
Cobalt (Co)-Dissolve			109.8		%		70-130	16-JAN-21
Copper (Cu)-Dissolv	red		105.6		%		70-130	16-JAN-21
Iron (Fe)-Dissolved			108.1		%		70-130	16-JAN-21
Lead (Pb)-Dissolved	I		107.0		%		70-130	16-JAN-21
Lithium (Li)-Dissolve	ed		107.1		%		70-130	16-JAN-21
Magnesium (Mg)-Dis	ssolved		N/A	MS-B	%		-	16-JAN-21
Manganese (Mn)-Di	ssolved		109.5		%		70-130	16-JAN-21
Molybdenum (Mo)-D	issolved		110.2		%		70-130	16-JAN-21
Nickel (Ni)-Dissolved	b		107.6		%		70-130	16-JAN-21
Phosphorus (P)-Diss	solved		110.3		%		70-130	16-JAN-21
Potassium (K)-Disso	olved		111.1		%		70-130	16-JAN-21
Selenium (Se)-Disso	olved		112.2		%		70-130	16-JAN-21
Silicon (Si)-Dissolve	d		109.3		%		70-130	16-JAN-21
Silver (Ag)-Dissolved	d		107.2		%		70-130	16-JAN-21
Sodium (Na)-Dissolv	/ed		113.7		%		70-130	16-JAN-21
Strontium (Sr)-Disso	olved		108.3		%		70-130	16-JAN-21
Thallium (TI)-Dissolv	/ed		104.9		%		70-130	16-JAN-21
Tin (Sn)-Dissolved			106.9		%		70-130	16-JAN-21
Titanium (Ti)-Dissolv	ved		103.3		%		70-130	16-JAN-21
Uranium (U)-Dissolv	red .		110.9		%		70-130	16-JAN-21
Vanadium (V)-Disso	lved		108.0		%		70-130	16-JAN-21
Zinc (Zn)-Dissolved			106.2		%		70-130	16-JAN-21
Zirconium (Zr)-Disso	olved		108.8		%		70-130	16-JAN-21
NH2 L E CL	Water							

NH3-L-F-CL Water



Workorder: L2548154 R

Report Date: 20-JAN-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NH3-L-F-CL	Water							
<b>Batch</b> R5350127 <b>WG3474466-14 LCS</b> Ammonia as N			106.0		%		85-115	16-JAN-21
WG3474466-13 MB Ammonia as N			<0.0050		mg/L		0.005	16-JAN-21
NO2-L-IC-N-CL	Water							
Batch R5347978 WG3473949-10 LCS Nitrite (as N)			101.5		%		90-110	14-JAN-21
WG3473949-9 MB Nitrite (as N)			<0.0010		mg/L		0.001	14-JAN-21
NO3-L-IC-N-CL	Water							
Batch R5347978 WG3473949-10 LCS			105.8		%		00.440	
Nitrate (as N)  WG3473949-9 MB  Nitrate (as N)			<0.0050		mg/L		90-110 0.005	14-JAN-21 14-JAN-21
PH/EC/ALK-CL	Water				-			
Batch R5348677 WG3474168-8 LCS								
Conductivity (EC)			99.2		%		90-110	14-JAN-21
Alkalinity, Total (as CaC	O3)		102.1		%		85-115	14-JAN-21
WG3474168-7 MB Conductivity (EC)			<2.0		uS/cm		2	14-JAN-21
Bicarbonate (HCO3)			<5.0		mg/L		5	14-JAN-21
Carbonate (CO3)			<5.0		mg/L		5	14-JAN-21
Hydroxide (OH)			<5.0		mg/L		5	14-JAN-21
Alkalinity, Total (as CaC	O3)		<2.0		mg/L		2	14-JAN-21
SO4-L-IC-N-CL	Water							
Batch R5347978 WG3473949-10 LCS			101.0		%		05.445	44 1021 04
Sulfate (SO4)  WG3473949-9 MB  Sulfate (SO4)			<0.050		% mg/L		85-115 0.05	14-JAN-21 14-JAN-21
TSS-L-CL	Water				ŭ		0.00	



Workorder: L2548154 Report Date: 20-JAN-21 Page 7 of 8

Test Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TSS-L-CL	Water							
Batch R5349796 WG3474326-2 LCS								
Total Suspended Solids WG3474326-4 LCS	3		105.4		%		85-115	16-JAN-21
Total Suspended Solids WG3474326-1 MB	3		96.3		%		85-115	16-JAN-21
Total Suspended Solids	3		<1.0		mg/L		1	16-JAN-21
WG3474326-3 MB Total Suspended Solids	<b>S</b>		<1.0		mg/L		1	16-JAN-21

Workorder: L2548154 Report Date: 20-JAN-21 Page 8 of 8

#### 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 predetermined data quality objectives to provide confidence in the accuracy of associated test results.

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

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

COC Number: 20 -



Canada Toll Free: 1 800 668 9878

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Report To	Contact and company name below will appear on the fir		Reports / F			▙			<del></del> -			<u> </u>	queste									
Company:	Sperling Hansen Associates Inc.		ort Format:	<del>-</del>		_	-	] if recei					0.01		191					. 11 I <b>117</b>	1111	
Contact:	Scott Garthwaite		/QCI Reports with COA	: 1				if recelv ] if recei					-11111	W	Ш	111		1864	N 1111	. 11   117		1
Phone:	778-471-7088		Results to Criteria on Report					] if recei					-11 111								13 20	
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Street:	1225 East Keith Road	Email 1 or	Fax sgarthwaite@sper	dinghanseh.com		San fee:	ne day   s mav a	[E2] if n pply to r	eceived ush red	i by 10 auests	M ms( on we	-S eken										
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Sperling Hansen Associates Inc.

ATTN: Scott Garthwaite #8 - 1225 East Keith Road North Vancouver BC V7J 1J3 Date Received: 29-APR-21

Report Date: 10-MAY-21 10:07 (MT)

Version: FINAL

Client Phone: 604-986-7723

# Certificate of Analysis

Lab Work Order #: L2581860

Project P.O. #:

NOT SUBMITTED

Job Reference:

20050 CRANBROOK

C of C Numbers: Legal Site Desc:

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

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L2581860 CONTD.... PAGE 2 of 7

Version:

PAGE 2 of 7 10-MAY-21 10:07 (MT)

**FINAL** 

#### ALS ENVIRONMENTAL ANALYTICAL REPORT

L2581860-2 L2581860-3 L2581860-4 L2581860-5 Sample ID L2581860-1 Description WATER WATER WATER WATER WATER 26-APR-21 26-APR-21 Sampled Date 26-APR-21 26-APR-21 26-APR-21 Sampled Time 08:00 08:00 08:00 08:00 08:00 E265122 E265123 E265124 E265125 TH4-A / E265129 Client ID Grouping **Analyte** WATER **Physical Tests** Hardness (as CaCO3) (mg/L) 325 289 298 322 56.3 Temperature (Degree C) 19.8 20.3 20.6 20.4 20.7 Total Suspended Solids (mg/L) 57.6 462 63.5 4790 5.9 Turbidity (NTU) 18.0 288 33.8 >4000 3.59 Alkalinity, Total (as CaCO3) (mg/L) Anions and 284 269 269 304 316 **Nutrients** Ammonia as N (mg/L) < 0.0050 0.0337 0.0233 0.0117 0.0053 Bicarbonate (HCO3) (mg/L) 346 328 328 370 358 Carbonate (CO3) (mg/L) <5.0 <5.0 <5.0 <5.0 13.8 HTD HTD Chloride (CI) (mg/L) 22.9 12.0 34.2 17.7 1.45 Conductivity (EC) (uS/cm) 595 535 598 581 HTD Fluoride (F) (mg/L) 0.077 0.074 0.100 0.076 2.07 Hydroxide (OH) (mg/L) <5.0 <5.0 <5.0 <5.0 <5.0 Nitrate (as N) (mg/L) 1.74 1.47 0.0684 1.40 0.0609 Nitrite (as N) (mg/L) < 0.0010 < 0.0010 < 0.0010 0.0010 < 0.0010 pH (pH) 8.22 7.91 8.60 7.94 8.02 Sulfate (SO4) (mg/L) 29.4 18.4 21.8 32.5 5.96 **Dissolved Metals** Dissolved Mercury Filtration Location **FIELD FIELD FIELD FIELD FIELD** Dissolved Metals Filtration Location **FIELD FIELD FIELD FIELD FIELD** Aluminum (Al)-Dissolved (mg/L) < 0.0010 0.0018 < 0.0010 0.0017 0.0027 Antimony (Sb)-Dissolved (mg/L) < 0.00010 < 0.00010 0.00010 < 0.00010 < 0.00010 Arsenic (As)-Dissolved (mg/L) 0.00016 0.00019 0.00048 0.00028 0.00087 Barium (Ba)-Dissolved (mg/L) 0.176 0.134 0.112 0.167 0.190 Beryllium (Be)-Dissolved (mg/L) < 0.000020 < 0.000020 < 0.000020 < 0.000020 < 0.000020 Bismuth (Bi)-Dissolved (mg/L) < 0.000050 < 0.000050 < 0.000050 < 0.000050 < 0.000050 Boron (B)-Dissolved (mg/L) < 0.010 < 0.010 0.034 < 0.010 0.108 Cadmium (Cd)-Dissolved (mg/L) < 0.0000050 0.0000244 0.0000232 < 0.0000050 0.0000081 Calcium (Ca)-Dissolved (mg/L) 64.6 58.2 48.3 62 4 10 4 Chromium (Cr)-Dissolved (mg/L) < 0.00010 0.00014 0.00010 0.00018 < 0.00010 Cobalt (Co)-Dissolved (mg/L) < 0.00010 0.00029 0.00039 0.00066 0.00031 Copper (Cu)-Dissolved (mg/L) 0.00089 0.00118 0.00118 0.00030 0.00031 Iron (Fe)-Dissolved (mg/L) 0.022 0.027 0.347 < 0.010 0.083 Lead (Pb)-Dissolved (mg/L) < 0.000050 < 0.000050 < 0.000050 < 0.000050 < 0.000050 Lithium (Li)-Dissolved (mg/L) 0.0065 0.0054 0.108 0.0065 0.0237 Magnesium (Mg)-Dissolved (mg/L) 39.7 34.8 43.2 40.4 7.38 Manganese (Mn)-Dissolved (mg/L) 0.00078 0.00747 0.134 0.0156 0.0129 Mercury (Hg)-Dissolved (mg/L) < 0.0000050 < 0.0000050 < 0.0000050 < 0.0000050 < 0.0000050

0.00113

0.00376

0.00251

0.00784

0.00237

Molybdenum (Mo)-Dissolved (mg/L)

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

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### ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2581860-6 WATER 26-APR-21 08:00 E265127		
Grouping	Analyte			
WATER				
Physical Tests	Hardness (as CaCO3) (mg/L)	292		
	Temperature (Degree C)	20.6		
	Total Suspended Solids (mg/L)	4.1		
	Turbidity (NTU)	3.83		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	268		
	Ammonia as N (mg/L)	0.0181		
	Bicarbonate (HCO3) (mg/L)	327		
	Carbonate (CO3) (mg/L)	<5.0		
	Chloride (CI) (mg/L)	5.33		
	Conductivity (EC) (uS/cm)	505		
	Fluoride (F) (mg/L)	<0.020		
	Hydroxide (OH) (mg/L)	<5.0		
	Nitrate (as N) (mg/L)	0.0659		
	Nitrite (as N) (mg/L)	<0.0010		
	pH (pH)	8.15		
	Sulfate (SO4) (mg/L)	14.5		
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD		
	Dissolved Metals Filtration Location	FIELD		
	Aluminum (AI)-Dissolved (mg/L)	0.0016		
	Antimony (Sb)-Dissolved (mg/L)	<0.00010		
	Arsenic (As)-Dissolved (mg/L)	0.00011		
	Barium (Ba)-Dissolved (mg/L)	0.391		
	Beryllium (Be)-Dissolved (mg/L)	<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050		
	Boron (B)-Dissolved (mg/L)	<0.010		
	Cadmium (Cd)-Dissolved (mg/L)	0.0000750		
	Calcium (Ca)-Dissolved (mg/L)	51.7		
	Chromium (Cr)-Dissolved (mg/L)	<0.00010		
	Cobalt (Co)-Dissolved (mg/L)	0.00012		
	Copper (Cu)-Dissolved (mg/L)	0.00179		
	Iron (Fe)-Dissolved (mg/L)	0.025		
	Lead (Pb)-Dissolved (mg/L)	<0.000050		
	Lithium (Li)-Dissolved (mg/L)	0.0016		
	Magnesium (Mg)-Dissolved (mg/L)	39.5		
	Manganese (Mn)-Dissolved (mg/L)	0.00197		
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050		
	Molybdenum (Mo)-Dissolved (mg/L)	0.000593		

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

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### ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2581860-1 WATER 26-APR-21 08:00 TH4-A / E265129	L2581860-2 WATER 26-APR-21 08:00 E265122	L2581860-3 WATER 26-APR-21 08:00 E265123	L2581860-4 WATER 26-APR-21 08:00 E265124	L2581860-5 WATER 26-APR-21 08:00 E265125
Grouping	Analyte					
WATER						
Dissolved Metals	Nickel (Ni)-Dissolved (mg/L)	0.00254	0.00911	0.00473	0.0113	0.00652
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	2.43	2.24	2.45	2.52	1.42
	Selenium (Se)-Dissolved (mg/L)	0.000477	0.000262	0.000430	0.000587	<0.000050
	Silicon (Si)-Dissolved (mg/L)	7.22	6.95	6.21	7.18	4.37
	Silver (Ag)-Dissolved (mg/L)	0.000013	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	21.1	14.5	19.0	20.9	127
	Strontium (Sr)-Dissolved (mg/L)	0.276	0.226	0.319	0.287	0.0765
	Sulfur (S)-Dissolved (mg/L)	11.7	7.34	8.86	12.6	2.56
	Thallium (TI)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	0.000015	<0.00010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00557	0.00419	0.00435	0.00631	0.00117
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0052	0.0156	0.0402	0.0017	0.0019
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Volatile Organic Compounds	Benzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Ethylbenzene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Methyl-tert-Butyl Ether (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Styrene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Toluene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	o-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	m+p-Xylene (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Xylenes (mg/L)	<0.00071	<0.00071	<0.00071	<0.00071	<0.00071
	Volatile Hydrocarbons (VH6-10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Surrogate: 4-Bromofluorobenzene (%)	101.2	101.7	101.0	104.0	102.1
	Surrogate: 3,4-Dichlorotoluene (%)	83.2	87.2	86.2	73.6	83.4
	Surrogate: 1,4-Difluorobenzene (%)	95.9	97.1	97.4	97.7	94.1
Hydrocarbons	EPH10-19 (ug/L)	<100	<100	<100	<100	<100
	EPH19-32 (ug/L)	<100	160	<100	<100	240
	VPH (C6-C10) (mg/L)	<0.10	<0.10	<0.10	<0.10	<0.10
	Surrogate: 2-Bromobenzotrifluoride (%)	82.1	81.2	81.7	82.1	81.2

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

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**FINAL** 

ALS ENVIRONMENTAL ANALYTICAL REPORT

L2581860-6 Sample ID Description WATER 26-APR-21 Sampled Date 08:00 Sampled Time E265127 Client ID Grouping Analyte **WATER Dissolved Metals** Nickel (Ni)-Dissolved (mg/L) 0.00224 Phosphorus (P)-Dissolved (mg/L) < 0.050 Potassium (K)-Dissolved (mg/L) 2.16 Selenium (Se)-Dissolved (mg/L) 0.000210 Silicon (Si)-Dissolved (mg/L) 4.95 Silver (Ag)-Dissolved (mg/L) < 0.000010 Sodium (Na)-Dissolved (mg/L) 5.23 Strontium (Sr)-Dissolved (mg/L) 0.182 Sulfur (S)-Dissolved (mg/L) 5.43 Thallium (TI)-Dissolved (mg/L) < 0.000010 Tin (Sn)-Dissolved (mg/L) < 0.00010 Titanium (Ti)-Dissolved (mg/L) < 0.00030 Uranium (U)-Dissolved (mg/L) 0.00360 Vanadium (V)-Dissolved (mg/L) < 0.00050 Zinc (Zn)-Dissolved (mg/L) 0.0118 Zirconium (Zr)-Dissolved (mg/L) < 0.00030 **Volatile Organic** Benzene (mg/L) < 0.00050 Compounds Ethylbenzene (mg/L) < 0.00050 Methyl-tert-Butyl Ether (mg/L) < 0.00050 Styrene (mg/L) < 0.00050 Toluene (mg/L) < 0.00050 o-Xylene (mg/L) < 0.00050 m+p-Xylene (mg/L) < 0.00050 Xylenes (mg/L) < 0.00071 Volatile Hydrocarbons (VH6-10) (mg/L) < 0.10 Surrogate: 4-Bromofluorobenzene (%) 103.9 Surrogate: 3,4-Dichlorotoluene (%) 73.6 Surrogate: 1,4-Difluorobenzene (%) 95.9 EPH10-19 (ug/L) **Hydrocarbons** <100 EPH19-32 (ug/L) <100 VPH (C6-C10) (mg/L) < 0.10 Surrogate: 2-Bromobenzotrifluoride (%) 83.1

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

# L2581860 CONTD.... PAGE 6 of 7 10-MAY-21 10:07 (MT)

### Reference Information

#### QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2581860-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2581860-1, -2, -3, -4, -5, -6

**Qualifiers for Individual Parameters Listed:** 

Qualifier Description

HTD Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.

MS-B Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

**Test Method References:** 

ALS Test Code Matrix Test Description Method Reference\*\*

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.

BTXSM-HS-MS-CL Water BTEX, Styrene and MTBE EPA 8260C/5021A

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transferred into a gas chromatograph.

BTEX Target compound concentrations are measured using mass spectrometry detection.

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.

EPH-L-ME-FID-CL Water EPH (C10-C19) & EPH (C19-C32) BC Lab manual

EPH is extracted from water using a hexane micro-extraction technique, with analysis by GC-FID, as per the BC Lab Manual. EPH results include

PAHs and are therefore not equivalent to LEPH or HEPH.

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 CaCO3 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.

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.

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

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)

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

TEMP-CLWaterTemperatureAPHA 2550-ThermometerTSS-L-CLWaterTotal Suspended SolidsAPHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids

#### **Reference Information**

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(TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

**TURBIDITY-CL** Water **Turbidity** APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

VH-HS-FID-CL Water VHs BC Env. Lab Manual (VH in Water)

The water sample, with added reagents, is heated in a sealed vial to equilibrium. The headspace from the vial is transfered into a gas chromatograph. Compounds eluting between n-hexane and n-decane are measured and summed together using flame-ionization detection.

**VPH-CALC-CL** VPH Calculation BC MOE LABORATORY MANUAL (2005)

These results are determined according to the British Columbia Ministry of Environment, Lands, and Parks Analytical Method for Contaminated Sites "Calculation of Volatile Petroleum Hydrocarbons in Solids or Water" (Version 2.1, July 20, 1999). According to this method, the concentrations of specific Monocyclic Aromatic Hydrocarbons (Benzene, Toluene, Ethylbenzene, Xylenes and Styrene) are subtracted from the collective concentration of Volatile Hydrocarbons (VH) that elute between n-hexane (nC6) and n-decane (nC10). Analysis of Volatile Hydrocarbons adheres to all prescribed elements of BCMELP method "Volatile Hydrocarbons in Solids by GC/FID" (Version 2.1, July 20, 1999).

XYLENES-CALC-CL Water Sum of Xylene Isomer Concentrations **CALCULATION** 

Calculation of Total Xylenes

Total Xylenes is the sum of the concentrations of the ortho, meta, and para Xylene isomers. Results below detection limit (DL) are treated as zero. The DL for Total Xylenes is set to a value no less than the square root of the sum of the squares of the DLs of the individual Xylenes.

\*\* 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.



Workorder: L2581860 Report Date: 10-MAY-21 Page 1 of 8

Client: Sperling Hansen Associates Inc.

#8 - 1225 East Keith Road North Vancouver BC V7J 1J3

Contact: Scott Garthwaite

Beryllium (Be)-Dissolved  WG3529562-5 MB Beryllium (Be)-Dissolved  BTXSM-HS-MS-CL Water  Batch R5452336  WG3530033-2 LCS Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene  WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 4-Bromofluorobenzene CL-L-IC-N-CL Water  Batch R5449618  WG3529286-3 DUP L29 Chloride (CI)  WG3529286-1 MB Chloride (CI)	eference Result	fier Units RPI	D Limit Analyzed
WG3529562-6 LCS Beryllium (Be)-Dissolved  WG3529562-5 MB Beryllium (Be)-Dissolved  BTXSM-HS-MS-CL Water  Batch R5452336 WG3530033-2 LCS Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water  Batch R5449618 WG3529286-3 DUP Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS L28			
Beryllium (Be)-Dissolved  WG3529562-5 MB Beryllium (Be)-Dissolved  BTXSM-HS-MS-CL Water  Batch R5452336  WG3530033-2 LCS Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene  WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene  WG43530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water  Batch R5449618  WG3529286-3 DUP L29 Chloride (CI)  WG3529286-1 MB Chloride (CI)  WG3529286-1 MB Chloride (CI)  WG3529286-4 MS L29			
WG3529562-5 MB Beryllium (Be)-Dissolved BTXSM-HS-MS-CL Water Batch R5452336 WG3530033-2 LCS Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water Batch R5449618 WG3529286-3 DUP Chloride (CI) WG3529286-1 LCS Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS L28	MRM		
Beryllium (Be)-Dissolved BTXSM-HS-MS-CL Water Batch R5452336 WG3530033-2 LCS Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water Batch R5449618 WG3529286-3 DUP L29 Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS	102.5	%	80-120 05-MAY-21
Batch R5452336 WG3530033-2 LCS Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Styrene Toluene Styrene Toluene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water Batch R5449618 WG3529286-3 DUP L29 Chloride (CI) WG3529286-1 LCS Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS	<0.000020	mg/L	0.00002 05-MAY-21
WG3530033-2 LCS Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water  Batch R5449618 WG3529286-3 DUP L29 Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS			
Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water Batch R5449618 WG3529286-3 DUP L28 Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS			
Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water Batch R5449618 WG3529286-3 DUP L28 Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS	104.0	0/	70.400
Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water Batch R5449618 WG3529286-3 DUP L29 Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS L29	92.2	%	70-130 04-MAY-21
o-Xylene m+p-Xylene Styrene Toluene WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water Batch R5449618 WG3529286-3 DUP L29 Chloride (CI) S33 WG3529286-2 LCS Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS L29		% %	70-130 04-MAY-21
m+p-Xylene Styrene Toluene WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water Batch R5449618 WG3529286-3 DUP L29 Chloride (CI) WG3529286-1 LCS Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS L29	95.2 98.2	%	70-130 04-MAY-21
Styrene Toluene  WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water  Batch R5449618 WG3529286-3 DUP L29 Chloride (CI) 5.3 WG3529286-2 LCS Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS L29	98.1	% %	70-130 04-MAY-21
Toluene  WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water  Batch R5449618 WG3529286-3 DUP L28 Chloride (CI) 5.3 WG3529286-2 LCS Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS	91.9	%	70-130 04-MAY-21
WG3530033-1 MB Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water Batch R5449618 WG3529286-3 DUP L29 Chloride (CI) 5.3 WG3529286-2 LCS Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS	94.3	%	70-130 04-MAY-21
Benzene Ethylbenzene Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water  Batch R5449618 WG3529286-3 DUP L29 Chloride (CI) 5.3 WG3529286-2 LCS Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS	94.3	70	70-130 04-MAY-21
Methyl-tert-Butyl Ether o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water Batch R5449618 WG3529286-3 DUP L29 Chloride (CI) 5.3 WG3529286-2 LCS Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS	<0.00050	mg/L	0.0005 04-MAY-21
o-Xylene m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water Batch R5449618 WG3529286-3 DUP L29 Chloride (CI) 5.3 WG3529286-2 LCS Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS L29	<0.00050	mg/L	0.0005 04-MAY-21
m+p-Xylene Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water Batch R5449618 WG3529286-3 DUP L29 Chloride (CI) 5.3 WG3529286-2 LCS Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS L29	<0.00050	mg/L	0.0005 04-MAY-21
Styrene Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene CL-L-IC-N-CL Water Batch R5449618 WG3529286-3 DUP L29 Chloride (CI) 5.3 WG3529286-2 LCS Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS L29	<0.00050	mg/L	0.0005 04-MAY-21
Toluene Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene  CL-L-IC-N-CL Water  Batch R5449618  WG3529286-3 DUP L29 Chloride (CI) 5.3  WG3529286-2 LCS Chloride (CI)  WG3529286-1 MB Chloride (CI)  WG3529286-4 MS L29	<0.00050	mg/L	0.0005 04-MAY-21
Surrogate: 4-Bromofluorobenzene Surrogate: 1,4-Difluorobenzene  CL-L-IC-N-CL Water  Batch R5449618  WG3529286-3 DUP L29 Chloride (CI) 5.3  WG3529286-2 LCS Chloride (CI)  WG3529286-1 MB Chloride (CI)  WG3529286-4 MS L29	<0.00050	mg/L	0.0005 04-MAY-21
Surrogate: 1,4-Difluorobenzene  CL-L-IC-N-CL Water  Batch R5449618  WG3529286-3 DUP L29 Chloride (Cl) 5.3  WG3529286-2 LCS Chloride (Cl)  WG3529286-1 MB Chloride (Cl)  WG3529286-4 MS L29	<0.00050	mg/L	0.0005 04-MAY-21
Batch R5449618  WG3529286-3 DUP L29 Chloride (CI) 5.3  WG3529286-2 LCS Chloride (CI)  WG3529286-1 MB Chloride (CI)  WG3529286-4 MS L29	105.6	%	70-130 04-MAY-21
Batch R5449618  WG3529286-3 DUP L29 Chloride (Cl) 5.3  WG3529286-2 LCS Chloride (Cl)  WG3529286-1 MB Chloride (Cl)  WG3529286-4 MS L29	97.7	%	70-130 04-MAY-21
WG3529286-3 DUP L29 Chloride (CI) 5.3 WG3529286-2 LCS Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS L29			
Chloride (CI) 5.3  WG3529286-2 LCS Chloride (CI)  WG3529286-1 MB Chloride (CI)  WG3529286-4 MS L29			
WG3529286-2 LCS Chloride (CI) WG3529286-1 MB Chloride (CI) WG3529286-4 MS L29	2581860-6		
Chloride (CI)  WG3529286-1 MB  Chloride (CI)  WG3529286-4 MS L29	.33 5.33	mg/L 0.1	20 01-MAY-21
Chloride (CI) WG3529286-4 MS L29	97.8	%	85-115 01-MAY-21
	<0.10	mg/L	0.1 01-MAY-21
	<b>2581860-6</b> 101.5	%	75-125 01-MAY-21
EPH-L-ME-FID-CL Water			



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Test I	Matrix	Reference	Result Qu	ıalifier	Units	RPD	Limit	Analyzed
EPH-L-ME-FID-CL	Water							
Batch R5453956 WG3527874-2 LCS								
EPH10-19			105.0		%		70-130	06-MAY-21
EPH19-32			102.0		%		70-130	06-MAY-21
<b>WG3527874-1 MB</b> EPH10-19			<100		ug/L		100	06-MAY-21
EPH19-32			<100		ug/L		100	06-MAY-21
Surrogate: 2-Bromobenzo	trifluoride		72.7		%		60-140	06-MAY-21
F-L-IC-CL	Water							
Batch R5449618								
<b>WG3529286-3 DUP</b> Fluoride (F)		<b>L2581860-6</b> <0.020	<0.020	RPD-NA	mg/L	N/A	20	01-MAY-21
<b>WG3529286-2 LCS</b> Fluoride (F)			91.6		%		85-115	01-MAY-21
<b>WG3529286-1 MB</b> Fluoride (F)			<0.020		mg/L		0.02	01-MAY-21
<b>WG3529286-4 MS</b> Fluoride (F)		L2581860-6	99.7		%		75-125	01-MAY-21
HG-D-CVAA-CL	Water							
Batch R5452466 WG3529545-10 LCS								
Mercury (Hg)-Dissolved			104.0		%		80-120	05-MAY-21
WG3529545-9 MB Mercury (Hg)-Dissolved			<0.000050		mg/L		0.000005	05-MAY-21
MET-D-CCMS-CL	Water							
Batch R5450760								
WG3529562-6 LCS		TMRM						
Aluminum (Al)-Dissolved			98.0		%		80-120	05-MAY-21
Antimony (Sb)-Dissolved			99.8		%		80-120	05-MAY-21
Arsenic (As)-Dissolved			93.8		%		80-120	05-MAY-21
Barium (Ba)-Dissolved			95.4		%		80-120	05-MAY-21
Bismuth (Bi)-Dissolved			96.3		%		80-120	05-MAY-21
Boron (B)-Dissolved			97.6		%		80-120	05-MAY-21
Cadmium (Cd)-Dissolved			93.5		%		80-120	05-MAY-21
Calcium (Ca)-Dissolved			92.5		%		80-120	05-MAY-21
Chromium (Cr)-Dissolved			93.9		%		80-120	05-MAY-21
Cobalt (Co)-Dissolved			95.0		%		80-120	05-MAY-21



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est Matrix	Reference	Result Qua	lifier Units	RPD	Limit	Analyzed
MET-D-CCMS-CL Water						
Batch R5450760						
WG3529562-6 LCS	TMRM					
Copper (Cu)-Dissolved		95.0	%		80-120	05-MAY-21
Iron (Fe)-Dissolved		102.6	%		80-120	05-MAY-21
Lead (Pb)-Dissolved		93.5	%		80-120	05-MAY-21
Lithium (Li)-Dissolved		108.7	%		80-120	05-MAY-21
Magnesium (Mg)-Dissolved		99.7	%		80-120	05-MAY-21
Manganese (Mn)-Dissolved		96.2	%		80-120	05-MAY-21
Molybdenum (Mo)-Dissolved		94.9	%		80-120	05-MAY-21
Nickel (Ni)-Dissolved		87.0	%		80-120	05-MAY-21
Phosphorus (P)-Dissolved		98.2	%		70-130	05-MAY-21
Potassium (K)-Dissolved		93.7	%		80-120	05-MAY-21
Selenium (Se)-Dissolved		87.7	%		80-120	05-MAY-21
Silicon (Si)-Dissolved		97.4	%		60-140	05-MAY-21
Silver (Ag)-Dissolved		96.3	%		80-120	05-MAY-21
Sodium (Na)-Dissolved		97.1	%		80-120	05-MAY-21
Strontium (Sr)-Dissolved		98.3	%		80-120	05-MAY-21
Sulfur (S)-Dissolved		97.4	%		80-120	05-MAY-21
Thallium (TI)-Dissolved		96.2	%		80-120	05-MAY-21
Tin (Sn)-Dissolved		92.1	%		80-120	05-MAY-21
Titanium (Ti)-Dissolved		92.7	%		80-120	05-MAY-21
Uranium (U)-Dissolved		96.9	%		80-120	05-MAY-21
Vanadium (V)-Dissolved		95.4	%		80-120	05-MAY-21
Zinc (Zn)-Dissolved		94.7	%		80-120	05-MAY-21
Zirconium (Zr)-Dissolved		94.7	%		80-120	05-MAY-21
WG3529562-5 MB						
Aluminum (Al)-Dissolved		<0.0010	mg/L		0.001	05-MAY-21
Antimony (Sb)-Dissolved		<0.00010	mg/L		0.0001	05-MAY-21
Arsenic (As)-Dissolved		<0.00010	mg/L		0.0001	05-MAY-21
Barium (Ba)-Dissolved		<0.00010	mg/L		0.0001	05-MAY-21
Bismuth (Bi)-Dissolved		<0.000050	mg/L		0.00005	05-MAY-21
Boron (B)-Dissolved		<0.010	mg/L		0.01	05-MAY-21
Cadmium (Cd)-Dissolved		<0.0000050	mg/L		0.000005	05-MAY-21
Calcium (Ca)-Dissolved		<0.050	mg/L		0.05	05-MAY-21
Chromium (Cr)-Dissolved		<0.00010	mg/L		0.0001	05-MAY-21
Cobalt (Co)-Dissolved		<0.00010	mg/L		0.0001	05-MAY-21



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est Matr	rix Reference	Result Qua	llifier Units	RPD	Limit	Analyzed
MET-D-CCMS-CL Wat	er					
Batch R5450760						
WG3529562-5 MB		0.00000				
Copper (Cu)-Dissolved		<0.00020	mg/L		0.0002	05-MAY-21
Iron (Fe)-Dissolved		<0.010	mg/L		0.01	05-MAY-21
Lead (Pb)-Dissolved		<0.000050	mg/L		0.00005	05-MAY-21
Lithium (Li)-Dissolved		<0.0010	mg/L		0.001	05-MAY-21
Magnesium (Mg)-Dissolved		<0.0050	mg/L		0.005	05-MAY-21
Manganese (Mn)-Dissolved		<0.00010	mg/L		0.0001	05-MAY-21
Molybdenum (Mo)-Dissolved		<0.000050	mg/L		0.00005	05-MAY-21
Nickel (Ni)-Dissolved		<0.00050	mg/L		0.0005	05-MAY-21
Phosphorus (P)-Dissolved		<0.050	mg/L		0.05	05-MAY-21
Potassium (K)-Dissolved		<0.050	mg/L		0.05	05-MAY-21
Selenium (Se)-Dissolved		<0.000050	mg/L		0.00005	05-MAY-21
Silicon (Si)-Dissolved		<0.050	mg/L		0.05	05-MAY-21
Silver (Ag)-Dissolved		<0.000010	mg/L		0.00001	05-MAY-21
Sodium (Na)-Dissolved		<0.050	mg/L		0.05	05-MAY-21
Strontium (Sr)-Dissolved		<0.00020	mg/L		0.0002	05-MAY-21
Sulfur (S)-Dissolved		<0.50	mg/L		0.5	05-MAY-21
Thallium (TI)-Dissolved		<0.000010	mg/L		0.00001	05-MAY-21
Tin (Sn)-Dissolved		<0.00010	mg/L		0.0001	05-MAY-21
Titanium (Ti)-Dissolved		<0.00030	mg/L		0.0003	05-MAY-21
Uranium (U)-Dissolved		<0.000010	mg/L		0.00001	05-MAY-21
Vanadium (V)-Dissolved		<0.00050	mg/L		0.0005	05-MAY-21
Zinc (Zn)-Dissolved		<0.0010	mg/L		0.001	05-MAY-21
Zirconium (Zr)-Dissolved		<0.00020	mg/L		0.0002	05-MAY-21
IH3-L-F-CL Wat	er					
Batch R5450818						
WG3529618-2 LCS						
Ammonia as N		103.8	%		85-115	05-MAY-21
WG3529618-1 MB Ammonia as N		<0.0050	mg/L		0.005	05-MAY-21
NO2-L-IC-N-CL Wat	er					
Batch R5449618						
WG3529286-3 DUP Nitrite (as N)	<b>L2581860-6</b> < 0.0010	<0.0010	RPD-NA mg/L	N/A	20	01-MAY-21
WG3529286-2 LCS Nitrite (as N)		103.0	%		90-110	01-MAY-21



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-CL	Water							
Batch R54496 WG3529286-1 MB Nitrite (as N)			<0.0010		mg/L		0.001	01-MAY-21
<b>WG3529286-4 MS</b> Nitrite (as N)		L2581860-6	112.7		%		75-125	01-MAY-21
NO3-L-IC-N-CL	Water							
Batch R54496	18							
WG3529286-3 DU Nitrate (as N)	P	<b>L2581860-6</b> 0.0659	0.0663		mg/L	0.6	20	01-MAY-21
WG3529286-2 LC3 Nitrate (as N)	5		97.9		%		90-110	01-MAY-21
WG3529286-1 MB Nitrate (as N)			<0.0050		mg/L		0.005	01-MAY-21
WG3529286-4 MS Nitrate (as N)		L2581860-6	104.6		%		75-125	01-MAY-21
PH/EC/ALK-CL	Water							
Batch R54547	52							
WG3531386-3 DU	•	L2581860-6	0.40					
pH		8.15	8.16	J	pH	0.01	0.2	07-MAY-21
Conductivity (EC)		505	511		uS/cm	1.2	10	07-MAY-21
Bicarbonate (HCO3)		327	335		mg/L	2.5	20	07-MAY-21
Carbonate (CO3)		<5.0	<5.0	RPD-NA	mg/L	N/A	20	07-MAY-21
Hydroxide (OH)	200)	<5.0	<5.0	RPD-NA	mg/L	N/A	20	07-MAY-21
Alkalinity, Total (as C		268	274		mg/L	2.5	20	07-MAY-21
WG3531386-2 LCS Conductivity (EC)	6		102.7		%		90-110	07-MAY-21
Hydroxide (OH)			102.7		mg/L		30-110	07-MAY-21
Alkalinity, Total (as C	aCO3)		104.2		//////////////////////////////////////		85-115	07-MAY-21
WG3531386-1 MB								<u>2</u> 1
Conductivity (EC)			<2.0		uS/cm		2	07-MAY-21
Bicarbonate (HCO3)			<5.0		mg/L		5	07-MAY-21
Carbonate (CO3)			<5.0		mg/L		5	07-MAY-21
Hydroxide (OH)			<5.0		mg/L		5	07-MAY-21
Alkalinity, Total (as C	aCO3)		<2.0		mg/L		2	07-MAY-21
SO4-L-IC-N-CL	Water							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SO4-L-IC-N-CL	Water							
Batch R5449618 WG3529286-3 DUP Sulfate (SO4)		<b>L2581860-6</b> 14.5	14.5		mg/L	0.0	20	01-MAY-21
<b>WG3529286-2 LCS</b> Sulfate (SO4)			99.7		%		85-115	01-MAY-21
<b>WG3529286-1 MB</b> Sulfate (SO4)			<0.050		mg/L		0.05	01-MAY-21
<b>WG3529286-4 MS</b> Sulfate (SO4)		L2581860-6	94.4		%		75-125	01-MAY-21
TEMP-CL	Water							
Batch R5454752 WG3531386-3 DUP Temperature		<b>L2581860-6</b> 20.6	20.6		Degree C	0.0	25	07-MAY-21
SS-L-CL	Water							
Batch R5447581 WG3528101-2 LCS Total Suspended Solids			89.0		%		85-115	03-MAY-21
WG3528101-1 MB Total Suspended Solids			<1.0		mg/L		1	03-MAY-21
TURBIDITY-CL	Water							
Batch R5444060 WG3527067-6 DUP Turbidity		<b>L2581860-6</b> 3.83	3.51		NTU	8.7	15	30-APR-21
WG3527067-5 LCS Turbidity			99.0		%		85-115	30-APR-21
WG3527067-4 MB Turbidity			<0.10		NTU		0.1	30-APR-21
/H-HS-FID-CL	Water							
Batch R5452338 WG3530035-2 LCS			440.7		0/			
Volatile Hydrocarbons ( WG3530035-1 MB			110.7		%		70-130	04-MAY-21
Volatile Hydrocarbons (			<0.10		mg/L		0.1	04-MAY-21
Surrogate: 3,4-Dichloro	toluene		86.3		%		70-130	04-MAY

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#### Legend:

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

Workorder: L2581860 Report Date: 10-MAY-21 Page 8 of 8

#### **Hold Time Exceedances:**

	Sample						
ALS Product Description	ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifie
Physical Tests							
Turbidity							
•	1	26-APR-21 08:00	30-APR-21 09:20	3	4	days	EHTR
	2	26-APR-21 08:00	30-APR-21 09:20	3	4	days	EHTR
	3	26-APR-21 08:00	30-APR-21 09:20	3	4	days	EHTR
	4	26-APR-21 08:00	30-APR-21 09:20	3	4	days	EHTR
	5	26-APR-21 08:00	30-APR-21 09:20	3	4	days	EHTR
	6	26-APR-21 08:00	30-APR-21 09:20	3	4	days	EHTR
Anions and Nutrients							
Nitrate in Water by IC (Low	/ Level)						
	1	26-APR-21 08:00	04-MAY-21 11:19	3	8	days	EHTR
	2	26-APR-21 08:00	04-MAY-21 11:19	3	8	days	EHTR
	3	26-APR-21 08:00	01-MAY-21 09:12	3	5	days	EHTR
	4	26-APR-21 08:00	01-MAY-21 09:12	3	5	days	EHTR
	5	26-APR-21 08:00	01-MAY-21 09:12	3	5	days	EHTR
	6	26-APR-21 08:00	01-MAY-21 09:12	3	5	days	EHTR
Nitrite in Water by IC (Low	Level)						
	1	26-APR-21 08:00	04-MAY-21 11:19	3	8	days	EHTR
	2	26-APR-21 08:00	04-MAY-21 11:19	3	8	days	EHTR
	3	26-APR-21 08:00	01-MAY-21 09:12	3	5	days	EHTR
	4	26-APR-21 08:00	01-MAY-21 09:12	3	5	days	EHTR
	5	26-APR-21 08:00	01-MAY-21 09:12	3	5	days	EHTR
	6	26-APR-21 08:00	01-MAY-21 09:12	3	5	days	EHTR

#### Legend & Qualifier Definitions:

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

EHTR: Exceeded ALS recommended hold time prior to sample receipt.

EHTL: Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.

EHT: Exceeded ALS recommended hold time prior to analysis.

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

#### Notes\*:

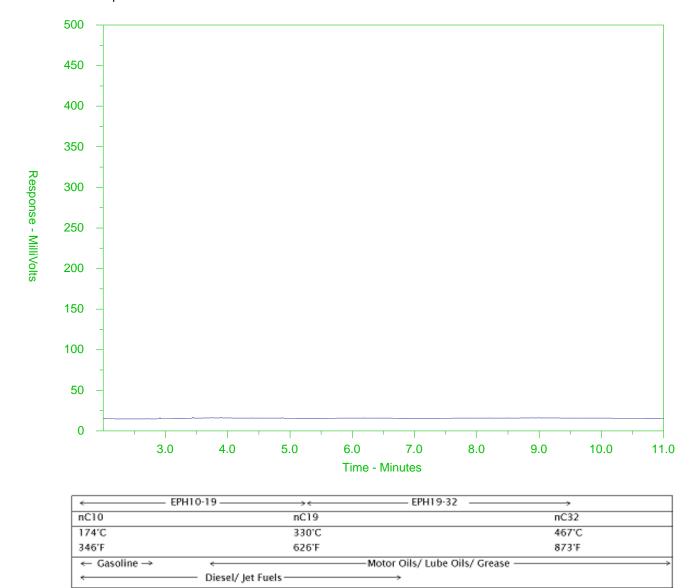
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes. Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2581860 were received on 29-APR-21 08:55.

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 predetermined 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.

ALS Sample ID: L2581860-1 Client Sample ID: TH4-A / E265129



The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

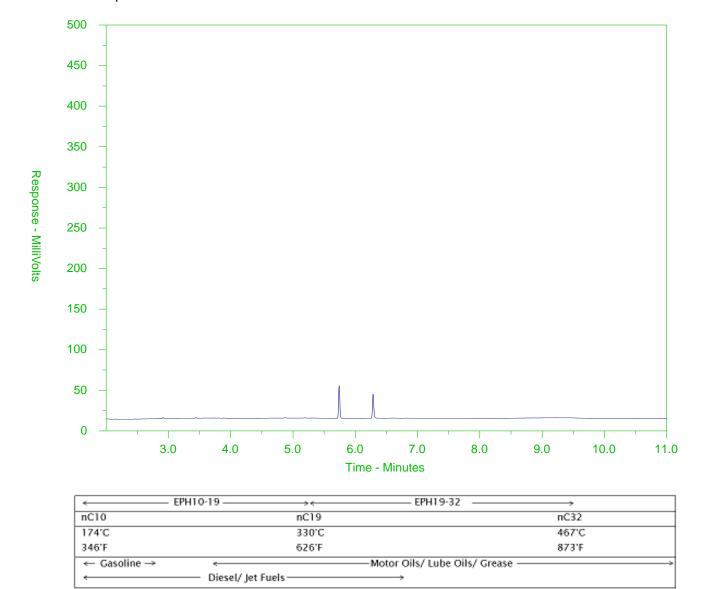
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

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ALS Sample ID: L2581860-2 Client Sample ID: E265122



The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

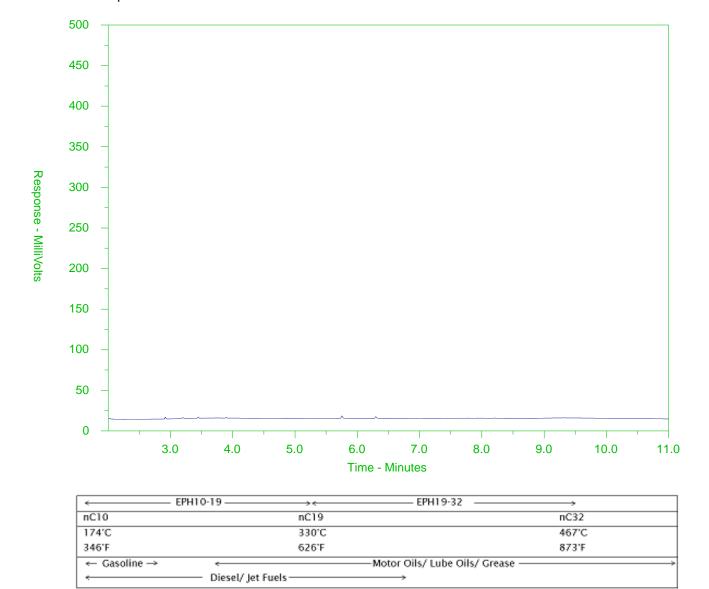
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

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ALS Sample ID: L2581860-3 Client Sample ID: E265123



The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

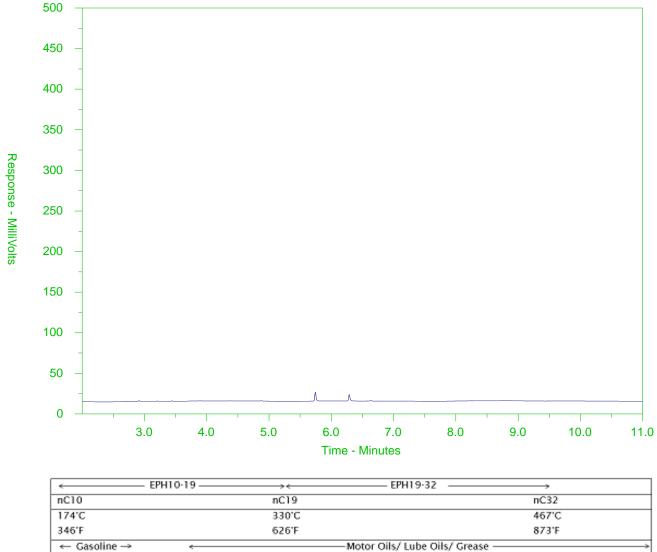
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

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ALS Sample ID: L2581860-4 Client Sample ID: E265124



346'F 626'F 873'F

← Gasoline → ← Motor Oils/ Lube Oils/ Grease → Diesel/ Jet Fuels → The DC FPULL before the Point of th

The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

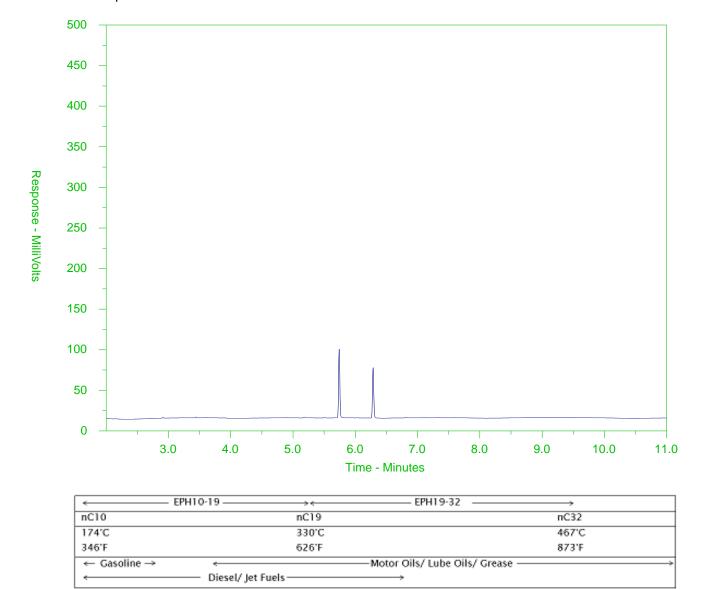
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

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ALS Sample ID: L2581860-5 Client Sample ID: E265125



The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

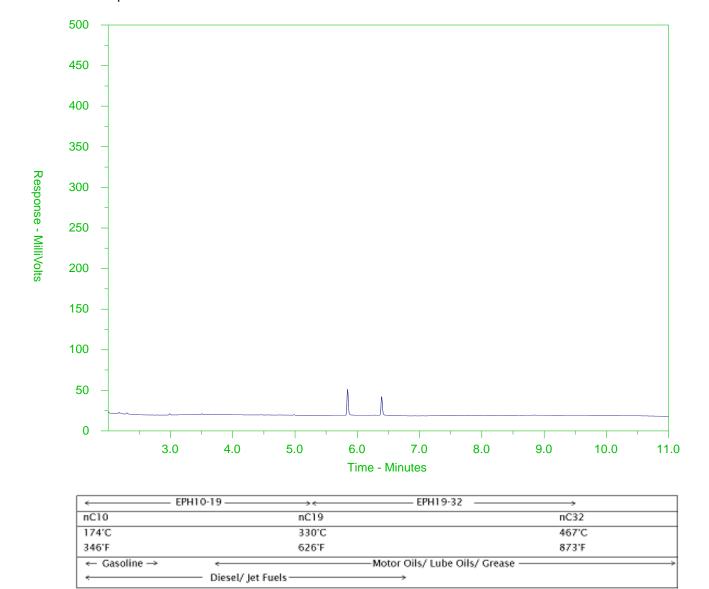
Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

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ALS Sample ID: L2581860-6 Client Sample ID: E265127



The BC EPH Hydrocarbon Distribution Report (HDR) is intended to assist you in characterizing hydrocarbon products that may be present in your sample.

The scale at the bottom of the chromatogram indicates the approximate retention times of common petroleum products and three n-alkane hydrocarbon marker compounds. Retention times may vary between samples, but general patterns and distributions will remain similar.

Peak heights in this report are a function of the sample concentration, the sample amount extracted, the sample dilution factor, and the scale at left.

A "-L-" in the sample ID denotes a low level sample. A "-S-" denotes a silica gel cleaned sample.

Note: This chromatogram was produced using GC conditions that are specific to the ALS Canada EPH method. Refer to the ALS Canada EPH Hydrocarbon Library for a collection of chromatograms from common reference samples (fuels, oils, etc.). The HDR library can be found at www.alsglobal.com.

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COC Number: 20

FINAL SHIPMENT RECEPTION (ALS use only)

Received by:

Time:

L2581860-COFC www.alsglobal.com Contact and company name below will appear on the final report Report To Reports / Recipients Turnaround Time (TAT) Requested Company Sperling Hansen Associates Inc. Select Report Format: POF F EXCEL EDO (DIGITAL) Routine (R) if received by 3pm M-F - no surcharges apply Scott Garthwaite Contact: Merge QC/QCI Reports with COA ☐ YES ☐ NO ☐ N/A 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum AFFIX ALS BARCODE LABEL HERE 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum Phone: 778-471-7088 Compare Results to Criteria on Report - provide details below if box checked (ALS use only) 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX Company address below will appear on the final report 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum Same day [E2] if received by 10am M-S - 200% rush surcharge. Addition 1225 East Keith Road Street: Email 1 or Fax sgarthwaite@sperlinghansen.com fees may apply to rush requests on weekends, statutory holidays and non-North Vancouver, B.C. Email 2 chetherington@sperlinghansen.com City/Province: mutine tests V7J 1J3 Date and Time Required for all E&P TATs: Postal Code: Email 3 dd-mmm-yy hh:mm am/pm Invoice To Same as Report To 💪 YES V NO Invoice Recipients For all tests with rush TATs requested, please contact your AM to confirm availability. \*\*\* Select Invoice Distribution: EMAIL MAIL FAX Copy of Invoice with Report ☑ YES □ NO **Analysis Request** Company: Email 1 or Fax chetherington@spedinghansen.com Indicate Filtered (F). Preserved (P) or Filtered and Preserved (F/P) below CONTAINERS STORAGE REQUIRED Contact: Email 2 **Project Information** Oil and Gas Required Fields (client use) SUSPECTED HAZARD (see HOLD HOLD ALS Account # / Quote #: AFE/Cost Center: PO# Job #: 20050 Cranbrook Routing Code: Major/Minor Code PO / AFE: 8 Requisitioner P LSD: Location: Æ SAMPLES ER Sampler: T. McBrid EXTENDED ALS Lab Work Order # (ALS use only): ALS Contact: Dean Watt NUMB Sample Identification and/or Coordinates Date ALS Sample # Time Sample Type (ALS use only) (This description will appear on the report) (dd-mmm-yy) (hh:mm) TH4-A / E265129 પ્ર 26-04-207 R R R R R R Groundwater R R R R R R R E265122 • \_ Groundwater В R R R R R R R R R R E265123 11 R Groundwater R R R R R R R R R 8 E265124 Groundwater R R R R R R R R R R R R R N. Я E265125 R R R R R R R R Groundwater R R R R R ١. E265127 Groundwater В R R R R R R R R R R R \*\*\*\* SAMPLE RECEIPT DETAILS (ALS use only) Notes / Specify Limits for result evaluation by selecting from drop-down below Drinking Water (DW) Samples (client use) (Excel COC only) Cooling Method: NONE ICE ICE PACKS FROZEN COOLING INITIATED Are samples taken from a Regulated DW System? British Columbia Contaminated Sites Regulation Stage 10 Amendment (NOV, 2017) NO Submission Comments identified on Sample Receipt Notification: YES ☐ YES ☑ NO British Columbia Approved and Working Water Quality Guidelines (MAY, 2015) Cooler Custody Seals Intact: TYES TINA Sample Custody Seals Intact: ☐YES ☐N/A INITIAL COOLER TEMPERATURES °C Are samples for human consumption/ use? FINAL COOLER TEMPERATURES C ☐ YES ☑ NO

INITIAL SHIPMENT RECEPTION (ALS use only)

Date

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.

Received by:

Time:

21/008M

28.2021

SHIPMENT RELEASE (client use)

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

Released by:

I McBnd



Sperling Hansen Associates Inc.

ATTN: Scott Garthwaite #8 - 1225 East Keith Road North Vancouver BC V7J 1J3 Date Received: 30-JUL-21

Report Date: 11-AUG-21 15:04 (MT)

Version: FINAL

Client Phone: 604-986-7723

# Certificate of Analysis

Lab Work Order #: L2621315

Project P.O. #:

NOT SUBMITTED

Job Reference:

20050 CRANBROOK

C of C Numbers: Legal Site Desc:

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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### ALS ENVIRONMENTAL ANALYTICAL REPORT

11-AUG-21 15:04 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2621315-1 Groundwater 28-JUL-21 12:00 TH4-A / E265129	L2621315-2 Groundwater 28-JUL-21 12:00 E265122	L2621315-3 Groundwater 28-JUL-21 12:00 E265123	L2621315-4 Groundwater 28-JUL-21 12:00 E265124	L2621315-5 Groundwater 28-JUL-21 12:00 E265125
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	306	269	280	293	55.1
	Temperature (Degree C)	17.0	17.4	17.6	18.4	18.4
	Total Suspended Solids (mg/L)	760	3570	50.2	10900	20.2
	Turbidity (NTU)	233	3130	8.77	>4000	4.45
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	321	561	275	2770	330
	Ammonia as N (mg/L)	<0.0050	0.0247	0.0081	0.0207	<0.0050
	Bicarbonate (HCO3) (mg/L)	392	684	335	3380	402
	Carbonate (CO3) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Chloride (CI) (mg/L)	23.5	12.3	31.8	16.9	1.71
	Conductivity (EC) (uS/cm)	597	515	551	584	551
	Fluoride (F) (mg/L)	0.035	0.038	0.035	0.038	2.10
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Nitrate and Nitrite (as N) (mg/L)	1.70	1.46	0.143	1.35	0.0822
	Nitrate (as N) (mg/L)	1.70	1.46	0.143	1.35	0.0822
	Nitrite (as N) (mg/L)	<0.0010	<0.0010	<0.0010	0.0015	<0.0010
	pH (pH)	7.59	7.70	7.57	7.62	8.08
	Sulfate (SO4) (mg/L)	27.0	16.4	19.8	27.4	5.30
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (AI)-Dissolved (mg/L)	0.0028	0.0040	0.0011	0.0027	0.0031
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010	0.00026	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00023	0.00041	0.00018	0.00029	0.00090
	Barium (Ba)-Dissolved (mg/L)	0.187	0.143	0.116	0.196	0.205
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010	0.029	<0.010	0.099
	Cadmium (Cd)-Dissolved (mg/L)	0.0000178	0.0000104	0.0000790	0.0000069	0.0000083
	Calcium (Ca)-Dissolved (mg/L)	59.5	52.1	43.5	56.4	10.2
	Chromium (Cr)-Dissolved (mg/L)	0.00256	0.00457	0.00072	0.00049	0.00097
	Cobalt (Co)-Dissolved (mg/L)	0.00038	0.00079	0.00069	0.00023	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.00072	0.00050	0.00456	<0.00020	0.00111
	Iron (Fe)-Dissolved (mg/L)	0.087	0.011	0.109	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0058	0.0050	0.0815	0.0058	0.0213
	Magnesium (Mg)-Dissolved (mg/L)	38.4	33.8	41.6	37.0	7.23
	Manganese (Mn)-Dissolved (mg/L)	0.00709	0.0223	0.0243	0.00970	0.00320
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050

L2621315 CONTD.... PAGE 3 of 7

ALS ENVIRONMENTAL ANALYTICAL REPORT

11-AUG-21 15:04 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2621315-6 Groundwater 28-JUL-21 12:00 E265127		
Grouping	Analyte			
WATER				
Physical Tests	Hardness (as CaCO3) (mg/L)	289		
	Temperature (Degree C)	19.3		
	Total Suspended Solids (mg/L)	11.1		
	Turbidity (NTU)	2.38		
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	299		
	Ammonia as N (mg/L)	<0.0050		
	Bicarbonate (HCO3) (mg/L)	364		
	Carbonate (CO3) (mg/L)	<5.0		
	Chloride (CI) (mg/L)	5.72		
	Conductivity (EC) (uS/cm)	522		
	Fluoride (F) (mg/L)	<0.020		
	Hydroxide (OH) (mg/L)	<5.0		
	Nitrate and Nitrite (as N) (mg/L)	0.0748		
	Nitrate (as N) (mg/L)	0.0748		
	Nitrite (as N) (mg/L)	<0.0010		
	pH (pH)	7.64		
	Sulfate (SO4) (mg/L)	12.8		
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD		
	Dissolved Metals Filtration Location	FIELD		
	Aluminum (Al)-Dissolved (mg/L)	0.0015		
	Antimony (Sb)-Dissolved (mg/L)	<0.00010		
	Arsenic (As)-Dissolved (mg/L)	0.00012		
	Barium (Ba)-Dissolved (mg/L)	0.390		
	Beryllium (Be)-Dissolved (mg/L)	<0.000020		
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050		
	Boron (B)-Dissolved (mg/L)	<0.010		
	Cadmium (Cd)-Dissolved (mg/L)	0.0000919		
	Calcium (Ca)-Dissolved (mg/L)	52.8		
	Chromium (Cr)-Dissolved (mg/L)	0.00282		
	Cobalt (Co)-Dissolved (mg/L)	0.00016		
	Copper (Cu)-Dissolved (mg/L)	0.00227		
	Iron (Fe)-Dissolved (mg/L)	0.025		
	Lead (Pb)-Dissolved (mg/L)	<0.000050		
	Lithium (Li)-Dissolved (mg/L)	0.0016		
	Magnesium (Mg)-Dissolved (mg/L)	38.2		
	Manganese (Mn)-Dissolved (mg/L)	0.00480		
	Mercury (Hg)-Dissolved (mg/L)	<0.000050		

L2621315 CONTD....

PAGE 4 of 7 11-AUG-21 15:04 (MT)

Version: FINAL

### ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2621315-1 Groundwater 28-JUL-21 12:00 TH4-A / E265129	L2621315-2 Groundwater 28-JUL-21 12:00 E265122	L2621315-3 Groundwater 28-JUL-21 12:00 E265123	L2621315-4 Groundwater 28-JUL-21 12:00 E265124	L2621315-5 Groundwater 28-JUL-21 12:00 E265125
Grouping	Analyte					
WATER						
Dissolved Metals	Molybdenum (Mo)-Dissolved (mg/L)	0.00463	0.00976	0.00732	0.0100	0.00135
	Nickel (Ni)-Dissolved (mg/L)	0.0145	0.0274	0.0217	0.0180	0.00114
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	2.54	2.35	2.81	2.46	1.60
	Selenium (Se)-Dissolved (mg/L)	0.000432	0.000211	0.000580	0.000568	<0.000050
	Silicon (Si)-Dissolved (mg/L)	7.36	6.97	5.80	7.18	4.39
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	20.8	14.1	19.1	19.0	128
	Strontium (Sr)-Dissolved (mg/L)	0.278	0.235	0.317	0.278	0.0760
	Sulfur (S)-Dissolved (mg/L)	10.8	6.59	8.36	10.9	2.40
	Thallium (TI)-Dissolved (mg/L)	<0.000010	<0.000010	0.000025	0.000014	<0.000010
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010	0.00023	<0.00010	<0.00010
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00507	0.00383	0.00370	0.00532	0.00118
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	0.00055	0.00051
	Zinc (Zn)-Dissolved (mg/L)	0.0037	0.0020	0.175	<0.0010	0.0022
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

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ALS ENVIRONMENTAL ANALYTICAL REPORT

11-AUG-21 15:04 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2621315-6 Groundwater 28-JUL-21 12:00 E265127		
Grouping	Analyte			
WATER				
Dissolved Metals	Molybdenum (Mo)-Dissolved (mg/L)	0.00175		
	Nickel (Ni)-Dissolved (mg/L)	0.00720		
	Phosphorus (P)-Dissolved (mg/L)	<0.050		
	Potassium (K)-Dissolved (mg/L)	2.24		
	Selenium (Se)-Dissolved (mg/L)	0.000203		
	Silicon (Si)-Dissolved (mg/L)	5.23		
	Silver (Ag)-Dissolved (mg/L)	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	5.05		
	Strontium (Sr)-Dissolved (mg/L)	0.199		
	Sulfur (S)-Dissolved (mg/L)	5.54		
	Thallium (TI)-Dissolved (mg/L)	<0.000010		
	Tin (Sn)-Dissolved (mg/L)	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030		
	Uranium (U)-Dissolved (mg/L)	0.00363		
	Vanadium (V)-Dissolved (mg/L)	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	0.0141		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030		

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#### **Reference Information**

**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.

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 CaCO3 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.

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.

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

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)

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

TEMP-CLWaterTemperatureAPHA 2550-ThermometerTSS-L-CLWaterTotal Suspended SolidsAPHA 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.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

\*\* 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:

**Reference Information** 

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#### **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.



Workorder: L2621315 Report Date: 11-AUG-21 Page 1 of 5

Client: Sperling Hansen Associates Inc.

#8 - 1225 East Keith Road North Vancouver BC V7J 1J3

Contact: Scott Garthwaite

Гest	Matrix	Reference	Result Qualifier	Units	RPD	Limit	Analyzed
BE-D-L-CCMS-CL	Water						
Batch R59 WG3593345-2 Beryllium (Be)-D		TMRM	96.0	%		80-120	09-AUG-21
<b>WG3593345-1</b> Beryllium (Be)-D	МВ		<0.000020	mg/L		0.00002	09-AUG-21
CL-L-IC-N-CL	Water						
Batch R59 WG3590662-6 Chloride (CI)	544557 LCS		99.3	%		85-115	31-JUL-21
<b>WG3590662-5</b> Chloride (CI)	МВ		<0.10	mg/L		0.1	31-JUL-21
F-L-IC-CL	Water						
WG3590662-6	544557 LCS		04.0				
Fluoride (F) WG3590662-5 Fluoride (F)	МВ		91.8	% ma//		85-115	31-JUL-21
	<b>M</b> /a4a		<0.020	mg/L		0.02	31-JUL-21
HG-D-CVAA-CL Batch R5	Water 546057						
	LCS		89.1	%		80-120	07-AUG-21
<b>WG3592354-5</b> Mercury (Hg)-Di	MB ssolved		<0.0000050	mg/L		0.000005	07-AUG-21
MET-D-CCMS-CL	Water						
WG3593345-2		TMRM	400.0	0/			<b>-</b>
Aluminum (Al)-D Antimony (Sb)-D			100.2 99.6	%		80-120 80-120	09-AUG-21 09-AUG-21
Arsenic (As)-Dis			99.4	%		80-120	09-AUG-21
Barium (Ba)-Dis			104.2	%		80-120	09-AUG-21
Bismuth (Bi)-Dis			100.6	%		80-120	09-AUG-21
Boron (B)-Disso			91.4	%		80-120	09-AUG-21
Cadmium (Cd)-I			97.1	%		80-120	09-AUG-21
Calcium (Ca)-Di			97.5	%		80-120	09-AUG-21
Chromium (Cr)-			98.8	%		80-120	09-AUG-21
Cobalt (Co)-Diss			97.8	%		80-120	09-AUG-21
	ssolved		95.4			-	



Workorder: L2621315 Report Date: 11-AUG-21 Page 2 of 5

Metro-CCMS-CL   Water	Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MG3583345-2 LCS   TMRM   101.7   %   80.120   09-AUG-21   Lead (Pp)-Dissolved   99.4   %   80.120   09-AUG-21   Lithium (Li)-Dissolved   99.8   %   80.120   09-AUG-21   Magnesium (Mg)-Dissolved   99.1   %   80.120   09-AUG-21   Magnesium (Mg)-Dissolved   98.6   %   80.120   09-AUG-21   Magnese (Mn)-Dissolved   98.6   %   80.120   09-AUG-21   Molybdenum (Mo)-Dissolved   103.8   %   80.120   09-AUG-21   Molybdenum (Mo)-Dissolved   103.8   %   80.120   09-AUG-21   Molybdenum (Mo)-Dissolved   96.7   %   80.120   09-AUG-21   Molybdenum (Mo)-Dissolved   96.7   %   80.120   09-AUG-21   Molybdenum (Mo)-Dissolved   98.2   %   80.120   09-AUG-21   Molybdenum (Mo)-Dissolved   98.2   %   80.120   09-AUG-21   Molybdenum (Sp)-Dissolved   98.2   %   80.120   09-AUG-21   Molybdenum (Sp)-Dissolved   98.5   %   80.120   09-AUG-21   Molybdenum (Sp)-Dissolved   99.5   %   80.120   09-AUG-21   Molybdenum (Sp)-Dissolved   97.9   %   80.120   09-AUG-21   Molybdenum (Sp)-Dissolved   97.9   %   80.120   09-AUG-21   Molybdenum (Sp)-Dissolved   97.9   %   80.120   09-AUG-21   Molybdenum (Sp)-Dissolved   97.0   %   80.120   09-AUG-21   Molybdenum (Sp)-Dissolved   99.3   %   80.120   09-AUG-21   Molybdenum (Sp)-Dissolved   99.3   %   80.120   09-AUG-21   Molybdenum (Sp)-Dissolved   99.8   %   80.120   09-AUG-21   Molybdenum (Sp)-Dissolved   99.5   %   80.120   09-AUG-21   Molybdenum (Sp)-Dissolved   90.0010   mgL   0.0010   09-AUG-21   Molybdenum (S	MET-D-CCMS-CL	Water							
Iron (Fe)-Dissolved	Batch R55469	923							
Lead (Pb)-Dissolved   99.4		s	TMRM						
Lithium (Li)-Dissolved 99.8 % 80.120 09-AUG-21 Magnesium (Mg)-Dissolved 99.1 % 80.120 09-AUG-21 Manganese (Mn)-Dissolved 99.1 % 80.120 09-AUG-21 Manganese (Mn)-Dissolved 98.6 % 80.120 09-AUG-21 Nickel (Ni)-Dissolved 103.8 % 80.120 09-AUG-21 Nickel (Ni)-Dissolved 96.7 % 80.120 09-AUG-21 Phosphorus (P)-Dissolved 102.6 % 70.130 09-AUG-21 Phosphorus (P)-Dissolved 98.2 % 80.120 09-AUG-21 Silver (N)-Dissolved 98.2 % 80.120 09-AUG-21 Silver (N)-Dissolved 95.9 % 80.120 09-AUG-21 Silver (Ag)-Dissolved 98.5 % 80.120 09-AUG-21 Silver (Ag)-Dissolved 98.5 % 80.120 09-AUG-21 Silver (Ag)-Dissolved 98.5 % 80.120 09-AUG-21 Silver (Ag)-Dissolved 97.9 % 80.120 09-AUG-21 Silver (Ag)-Dissolved 97.9 % 80.120 09-AUG-21 Silver (Ag)-Dissolved 97.9 % 80.120 09-AUG-21 Tire (Ag)-Dissolved 97.0 % 80.120 09-AUG-21 Tire (Ag)-Dissolved 97.0 % 80.120 09-AUG-21 Tire (Ag)-Dissolved 99.3 % 80.120 09-AUG-21 Tire (Ag)-Dissolved 99.8 % 80.120 09-AUG-21 Tire (Ag)-Dissolved 99.5 % 90.0000 09.000000 09.000000 09.00000000				-					
Magnesium (Mg)-Dissolved         99.1         %         80-120         09-AUG-21           Manganese (Mn)-Dissolved         98.6         %         80-120         09-AUG-21           Molybdenum (Mo)-Dissolved         103.8         %         80-120         09-AUG-21           Nickel (Ni)-Dissolved         96.7         %         80-120         09-AUG-21           Phosphorus (P)-Dissolved         102.6         %         70-130         09-AUG-21           Potassium (Ky-Dissolved         98.2         %         80-120         09-AUG-21           Selenium (Se)-Dissolved         95.9         %         80-120         09-AUG-21           Silicor (Ag)-Dissolved         98.5         %         80-120         09-AUG-21           Silver (Ag)-Dissolved         98.5         %         80-120         09-AUG-21           Sodium (Na)-Dissolved         97.9         %         80-120         09-AUG-21           Strontium (Sr)-Dissolved         106.8         %         80-120         09-AUG-21           Strintium (Sr)-Dissolved         97.0         %         80-120         09-AUG-21           Thallium (Tl)-Dissolved         99.3         %         80-120         09-AUG-21           Thallium (Tl)-Dissolved         95.	, ,							80-120	
Manganese (Mn)-Dissolved         98.6         %         80-120         09-AUG-21           Molybdenum (Mo)-Dissolved         103.8         %         80-120         09-AUG-21           Nickel (Ni)-Dissolved         96.7         %         80-120         09-AUG-21           Phosphorus (P)-Dissolved         102.6         %         70-130         09-AUG-21           Phosphorus (P)-Dissolved         98.2         %         80-120         09-AUG-21           Selenium (Se)-Dissolved         95.9         %         80-120         09-AUG-21           Silicon (Si)-Dissolved         98.5         %         80-120         09-AUG-21           Silicon (Si)-Dissolved         97.9         %         80-120         09-AUG-21           Strontium (Sr)-Dissolved         97.9         %         80-120         09-AUG-21           Strontium (Sr)-Dissolved         97.0         %         80-120         09-AUG-21           Suffur (S)-Dissolved         99.3         %         80-120         09-AUG-21           Tin (Si)-Dissolved         99.3         %         80-120         09-AUG-21           Tin (Si)-Dissolved         95.8         %         80-120         09-AUG-21           Uranium (U)-Dissolved         95.8								80-120	09-AUG-21
Molybdenum (Mo)-Dissolved         103.8         %         80-120         09-AUG-21           Nickel (Ni)-Dissolved         96.7         %         80-120         09-AUG-21           Phosphorus (P)-Dissolved         102.6         %         70-130         09-AUG-21           Potassium (K)-Dissolved         98.2         %         80-120         09-AUG-21           Selenium (Se)-Dissolved         95.9         %         80-120         09-AUG-21           Silicon (Si)-Dissolved         102.1         %         60-140         09-AUG-21           Silver (Ag)-Dissolved         98.5         %         80-120         09-AUG-21           Sodium (Na)-Dissolved         97.9         %         80-120         09-AUG-21           Strontium (Sr)-Dissolved         97.0         %         80-120         09-AUG-21           Strium (Sr)-Dissolved         97.0         %         80-120         09-AUG-21           Thallium (TI)-Dissolved         97.0         %         80-120         09-AUG-21           Tin (Sn)-Dissolved         97.0         %         80-120         09-AUG-21           Tin (Sn)-Dissolved         97.0         %         80-120         09-AUG-21           Tin (Sn)-Dissolved         99.3         %								80-120	09-AUG-21
Nickel (Ni)-Dissolved 96.7 % 80-120 09-AUG-21 Phosphorus (P)-Dissolved 102.6 % 70-130 09-AUG-21 Phosphorus (P)-Dissolved 98.2 % 80-120 09-AUG-21 Selenium (Sc)-Dissolved 95.9 % 80-120 09-AUG-21 Silicon (Si)-Dissolved 95.9 % 80-120 09-AUG-21 Silicon (Si)-Dissolved 102.1 % 60-140 09-AUG-21 Silicon (Si)-Dissolved 98.5 % 80-120 09-AUG-21 Silicon (Si)-Dissolved 98.5 % 80-120 09-AUG-21 Sodium (Na)-Dissolved 97.9 % 80-120 09-AUG-21 Strontium (Sr)-Dissolved 97.9 % 80-120 09-AUG-21 Strontium (Sr)-Dissolved 97.0 % 80-120 09-AUG-21 Tin (Sn)-Dissolved 97.0 % 80-120 09-AUG-21 Tin (Sn)-Dissolved 99.3 % 80-120 09-AUG-21 Tin (Sn)-Dissolved 99.3 % 80-120 09-AUG-21 Tin (Sn)-Dissolved 99.8 % 80-120 09-AUG-21 Tin (Inj-Dissolved 95.8 % 80-120 09-AUG-21 Uranium (U)-Dissolved 95.8 % 80-120 09-AUG-21 Uranium (U)-Dissolved 99.5 % 80-120 09-AUG-21 Vanadium (V)-Dissolved 99.5 % 80-120 0	• ,							80-120	09-AUG-21
Phosphorus (P)-Dissolved         102.6         %         70.130         09-AUG-21           Potassium (K)-Dissolved         98.2         %         80-120         09-AUG-21           Selenium (Se)-Dissolved         95.9         %         80-120         09-AUG-21           Silicon (Si)-Dissolved         102.1         %         60-140         09-AUG-21           Siliver (Ag)-Dissolved         98.5         %         80-120         09-AUG-21           Sodium (Na)-Dissolved         97.9         %         80-120         09-AUG-21           Strontium (Sr)-Dissolved         106.8         %         80-120         09-AUG-21           Stuffur (S)-Dissolved         97.0         %         80-120         09-AUG-21           Thallium (TI)-Dissolved         99.3         %         80-120         09-AUG-21           Tin (Sn)-Dissolved         95.8         %         80-120         09-AUG-21           Tinalium (TI)-Dissolved         95.8         %         80-120         09-AUG-21           Vanadium (U)-Dissolved         95.8         %         80-120         09-AUG-21           Vanadium (U)-Dissolved         97.1         %         80-120         09-AUG-21           Zinco (Zn)-Dissolved         97.1	Molybdenum (Mo)-D	Dissolved		103.8				80-120	09-AUG-21
Potassium (K)-Dissolved   98.2	Nickel (Ni)-Dissolve	d		96.7		%		80-120	09-AUG-21
Selenium (Se)-Dissolved         95.9         %         80-120         09-AUG-21           Silicon (Si)-Dissolved         102.1         %         60-140         09-AUG-21           Silver (Ag)-Dissolved         98.5         %         80-120         09-AUG-21           Sodium (Na)-Dissolved         97.9         %         80-120         09-AUG-21           Strontium (St)-Dissolved         106.8         %         80-120         09-AUG-21           Sulfur (S)-Dissolved         97.0         %         80-120         09-AUG-21           Thallium (Ti)-Dissolved         99.3         %         80-120         09-AUG-21           Tin (Sn)-Dissolved         100.8         %         80-120         09-AUG-21           Titanium (Ti)-Dissolved         95.8         %         80-120         09-AUG-21           Uranium (U)-Dissolved         95.8         %         80-120         09-AUG-21           Vanadium (V)-Dissolved         97.1         %         80-120         09-AUG-21           Vario (Zn)-Dissolved         97.1         %         80-120         09-AUG-21           WG3593345-1         MB         Aluminum (Al)-Dissolved         <0.001	Phosphorus (P)-Dis	solved		102.6		%		70-130	09-AUG-21
Silicon (Si)-Dissolved         102.1         %         60-140         09-AUG-21           Silver (Ag)-Dissolved         98.5         %         80-120         09-AUG-21           Sodium (Na)-Dissolved         97.9         %         80-120         09-AUG-21           Strontium (Sr)-Dissolved         106.8         %         80-120         09-AUG-21           Sulfur (S)-Dissolved         97.0         %         80-120         09-AUG-21           Thallium (TI)-Dissolved         99.3         %         80-120         09-AUG-21           Tin (Sn)-Dissolved         100.8         %         80-120         09-AUG-21           Tin (Sn)-Dissolved         95.8         %         80-120         09-AUG-21           Uranium (U)-Dissolved         95.8         %         80-120         09-AUG-21           Vanadium (V)-Dissolved         95.8         %         80-120         09-AUG-21           Vanadium (V)-Dissolved         97.1         %         80-120         09-AUG-21           Zinc (Zn)-Dissolved         97.1         %         80-120         09-AUG-21           Zinc (Zn)-Dissolved         97.1         %         80-120         09-AUG-21           WG359345-1         MB         Numinum (R)-Dissolved <td>Potassium (K)-Disso</td> <td>olved</td> <td></td> <td>98.2</td> <td></td> <td>%</td> <td></td> <td>80-120</td> <td>09-AUG-21</td>	Potassium (K)-Disso	olved		98.2		%		80-120	09-AUG-21
Silver (Ag)-Dissolved         98.5         %         80-120         09-AUG-21           Sodium (Na)-Dissolved         97.9         %         80-120         09-AUG-21           Strontium (Sr)-Dissolved         106.8         %         80-120         09-AUG-21           Sulfur (S)-Dissolved         97.0         %         80-120         09-AUG-21           Thallium (TI)-Dissolved         99.3         %         80-120         09-AUG-21           Tin (Sn)-Dissolved         100.8         %         80-120         09-AUG-21           Titanium (TI)-Dissolved         95.8         %         80-120         09-AUG-21           Uranium (U)-Dissolved         95.8         %         80-120         09-AUG-21           Vanadium (V)-Dissolved         99.5         %         80-120         09-AUG-21           Varionium (Zr)-Dissolved         97.1         %         80-120         09-AUG-21           Zirconium (Zr)-Dissolved         104.9         %         80-120         09-AUG-21           WG3593345-1         MB         Aluminum (Al)-Dissolved         <0.0010	Selenium (Se)-Disso	olved		95.9		%		80-120	09-AUG-21
Sodium (Na)-Dissolved         97.9         %         80-120         09-AUG-21           Strontium (Sr)-Dissolved         106.8         %         80-120         09-AUG-21           Sulfur (S)-Dissolved         97.0         %         80-120         09-AUG-21           Thallium (TI)-Dissolved         99.3         %         80-120         09-AUG-21           Tin (Sn)-Dissolved         100.8         %         80-120         09-AUG-21           Titanium (Ti)-Dissolved         95.8         %         80-120         09-AUG-21           Uranium (U)-Dissolved         95.8         %         80-120         09-AUG-21           Vanadium (V)-Dissolved         95.8         %         80-120         09-AUG-21           Vanadium (V)-Dissolved         95.8         %         80-120         09-AUG-21           Zinc (Zn)-Dissolved         97.1         %         80-120         09-AUG-21           Zinc (Zn)-Dissolved         97.1         %         80-120         09-AUG-21           Zirconium (Zi)-Dissolved         97.1         %         80-120         09-AUG-21           WG3593345-1         MB         MB         MILIAR M	Silicon (Si)-Dissolve	d		102.1		%		60-140	09-AUG-21
Strontium (Sr)-Dissolved         106.8         %         80-120         09-AUG-21           Sulfur (S)-Dissolved         97.0         %         80-120         09-AUG-21           Thallium (TI)-Dissolved         99.3         %         80-120         09-AUG-21           Tin (Sn)-Dissolved         100.8         %         80-120         09-AUG-21           Titanium (Ti)-Dissolved         95.8         %         80-120         09-AUG-21           Uranium (U)-Dissolved         95.8         %         80-120         09-AUG-21           Vanadium (V)-Dissolved         99.5         %         80-120         09-AUG-21           Zinc (Zn)-Dissolved         97.1         %         80-120         09-AUG-21           Zirconium (Zr)-Dissolved         97.1         %         80-120         09-AUG-21           WG3593345-1         MB         <	Silver (Ag)-Dissolve	d		98.5		%		80-120	09-AUG-21
Sulfur (S)-Dissolved         97.0         %         80-120         09-AUG-21           Thallium (TI)-Dissolved         99.3         %         80-120         09-AUG-21           Tin (Sn)-Dissolved         100.8         %         80-120         09-AUG-21           Titanium (Ti)-Dissolved         95.8         %         80-120         09-AUG-21           Uranium (U)-Dissolved         95.8         %         80-120         09-AUG-21           Vanadium (V)-Dissolved         99.5         %         80-120         09-AUG-21           Zinc (Zn)-Dissolved         97.1         %         80-120         09-AUG-21           Zirconium (Zr)-Dissolved         97.1         %         80-120         09-AUG-21           Zirconium (Zr)-Dissolved         104.9         %         80-120         09-AUG-21           Zirconium (Zr)-Dissolved         <0.0010	Sodium (Na)-Dissol	ved		97.9		%		80-120	09-AUG-21
Thallium (TI)-Dissolved 99.3 % 80-120 09-AUG-21 Tin (Sn)-Dissolved 100.8 % 80-120 09-AUG-21 Titanium (Ti)-Dissolved 95.8 % 80-120 09-AUG-21 Uranium (U)-Dissolved 95.8 % 80-120 09-AUG-21 Uranium (U)-Dissolved 95.8 % 80-120 09-AUG-21 Vanadium (V)-Dissolved 99.5 % 80-120 09-AUG-21 Zinc (Zn)-Dissolved 97.1 % 80-120 09-AUG-21 Zirconium (Zr)-Dissolved 104.9 % 80-120 09-AUG-21 WG3593345-1 MB Aluminum (Al)-Dissolved <0.0010 mg/L 0.001 09-AUG-21 Antimony (Sb)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21 Arsenic (As)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21 Barium (Ba)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21 Bismuth (Bi)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21 Bismuth (Bi)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21 Cadmium (Cd)-Dissolved <0.000050 mg/L 0.0005 09-AUG-21 Cadmium (Cd)-Dissolved <0.000050 mg/L 0.00005 09-AUG-21 Cadmium (Cd)-Dissolved <0.000050 mg/L 0.00005 09-AUG-21 Calcium (Ca)-Dissolved <0.000050 mg/L 0.00005 09-AUG-21 Calcium (Ca)-Dissolved <0.00010 mg/L 0.00005 09-AUG-21 Calcium (Ca)-Dissolved <0.00010 mg/L 0.00005 09-AUG-21 Calcium (Ca)-Dissolved <0.00010 mg/L 0.000005 09-AUG-21 Calcium (Ca)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21 Cabalt (Co)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21	Strontium (Sr)-Disso	olved		106.8		%		80-120	09-AUG-21
Tin (Sn)-Dissolved 100.8 % 80-120 09-AUG-21 Titanium (Ti)-Dissolved 95.8 % 80-120 09-AUG-21 Uranium (U)-Dissolved 95.8 % 80-120 09-AUG-21 Vanadium (V)-Dissolved 95.8 % 80-120 09-AUG-21 Zinc (Zn)-Dissolved 97.1 % 80-120 09-AUG-21 Zirconium (Zr)-Dissolved 104.9 % 80-120 09-AUG-21 WG3593345-1 MB Aluminum (Al)-Dissolved <0.00010 mg/L 0.001 09-AUG-21 Antimony (Sb)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21 Barium (Ba)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21 Barium (Ba)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21 Bismuth (Bi)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21 Cadmium (Cd)-Dissolved <0.00050 mg/L 0.0005 09-AUG-21 Cadmium (Cd)-Dissolved <0.000050 mg/L 0.0005 09-AUG-21 Cadmium (Cd)-Dissolved <0.000050 mg/L 0.0005 09-AUG-21 Calcium (Ca)-Dissolved <0.000050 mg/L 0.0005 09-AUG-21 Calcium (Ca)-Dissolved <0.000050 mg/L 0.00005 09-AUG-21 Calcium (Ca)-Dissolved <0.000050 mg/L 0.00005 09-AUG-21 Calcium (Ca)-Dissolved <0.00010 mg/L 0.00005 09-AUG-21 Calcium (Ca)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21 Calcium (Ca)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21 Cabalt (Co)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21	Sulfur (S)-Dissolved	I		97.0		%		80-120	09-AUG-21
Titanium (Ti)-Dissolved         95.8         %         80-120         09-AUG-21           Uranium (U)-Dissolved         95.8         %         80-120         09-AUG-21           Vanadium (V)-Dissolved         99.5         %         80-120         09-AUG-21           Zirc (Zn)-Dissolved         97.1         %         80-120         09-AUG-21           Zirconium (Zr)-Dissolved         104.9         %         80-120         09-AUG-21           WG3593345-1         MB         MB         Aluminum (Al)-Dissolved         <0.0010	Thallium (TI)-Dissolv	ved		99.3		%		80-120	09-AUG-21
Uranium (U)-Dissolved         95.8         %         80-120         09-AUG-21           Vanadium (V)-Dissolved         99.5         %         80-120         09-AUG-21           Zinc (Zn)-Dissolved         97.1         %         80-120         09-AUG-21           Zirconium (Zr)-Dissolved         104.9         %         80-120         09-AUG-21           WG3593345-1         MB         MB         MG3593345-1         MB         NB	Tin (Sn)-Dissolved			100.8		%		80-120	09-AUG-21
Vanadium (V)-Dissolved         99.5         %         80-120         09-AUG-21           Zinc (Zn)-Dissolved         97.1         %         80-120         09-AUG-21           Zirconium (Zr)-Dissolved         104.9         %         80-120         09-AUG-21           WG3593345-1         MB         MB         MIMINIUM (Al)-Dissolved         0.0010         mg/L         0.001         09-AUG-21           Antimony (Sb)-Dissolved         <0.00010	Titanium (Ti)-Dissol	ved		95.8		%		80-120	09-AUG-21
Zinc (Zn)-Dissolved         97.1         %         80-120         09-AUG-21           Zirconium (Zr)-Dissolved         104.9         %         80-120         09-AUG-21           WG3593345-1         MB	Uranium (U)-Dissolv	/ed		95.8		%		80-120	09-AUG-21
Zirconium (Zr)-Dissolved       104.9       %       80-120       09-AUG-21         WG3593345-1       MB       Aluminum (Al)-Dissolved       <0.0010       mg/L       0.001       09-AUG-21         Antimony (Sb)-Dissolved       <0.00010	Vanadium (V)-Disso	olved		99.5		%		80-120	09-AUG-21
WG3593345-1         MB           Aluminum (Al)-Dissolved         <0.0010	Zinc (Zn)-Dissolved			97.1		%		80-120	09-AUG-21
Aluminum (Al)-Dissolved       <0.0010	Zirconium (Zr)-Disso	olved		104.9		%		80-120	09-AUG-21
Antimony (Sb)-Dissolved       <0.00010	WG3593345-1 ME	3							
Arsenic (As)-Dissolved       <0.00010	Aluminum (Al)-Disso	olved		<0.0010		mg/L		0.001	09-AUG-21
Barium (Ba)-Dissolved       <0.00010	Antimony (Sb)-Disso	olved		<0.00010		mg/L		0.0001	09-AUG-21
Bismuth (Bi)-Dissolved         <0.000050	Arsenic (As)-Dissolv	/ed		<0.00010		mg/L		0.0001	09-AUG-21
Boron (B)-Dissolved         <0.010         mg/L         0.01         09-AUG-21           Cadmium (Cd)-Dissolved         <0.000005C	Barium (Ba)-Dissolv	red .		<0.00010		mg/L		0.0001	09-AUG-21
Cadmium (Cd)-Dissolved       <0.000005C	Bismuth (Bi)-Dissolv	/ed		<0.000050	1	mg/L		0.00005	09-AUG-21
Calcium (Ca)-Dissolved       <0.050       mg/L       0.05       09-AUG-21         Chromium (Cr)-Dissolved       <0.00010	Boron (B)-Dissolved	I		<0.010		mg/L		0.01	09-AUG-21
Chromium (Cr)-Dissolved         <0.00010         mg/L         0.0001         09-AUG-21           Cobalt (Co)-Dissolved         <0.00010	Cadmium (Cd)-Diss	olved		<0.000005	С	mg/L		0.000005	09-AUG-21
Cobalt (Co)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21	Calcium (Ca)-Dissol	lved		< 0.050		mg/L		0.05	09-AUG-21
Cobalt (Co)-Dissolved <0.00010 mg/L 0.0001 09-AUG-21	Chromium (Cr)-Diss	solved		<0.00010		mg/L		0.0001	09-AUG-21
	Cobalt (Co)-Dissolve	ed		<0.00010		mg/L		0.0001	09-AUG-21
	Copper (Cu)-Dissolv	ved		<0.00020		mg/L		0.0002	



Workorder: L2621315 Report Date: 11-AUG-21 Page 3 of 5

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	Water							
Batch R554692	3							
WG3593345-1 MB Iron (Fe)-Dissolved			<0.010		~~ ~ /l		0.04	00 4440 04
,				1	mg/L		0.01	09-AUG-21
Lead (Pb)-Dissolved			<0.000050	,	mg/L		0.00005	09-AUG-21
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	09-AUG-21
Magnesium (Mg)-Diss			<0.0050		mg/L		0.005	09-AUG-21
Manganese (Mn)-Diss			<0.00010		mg/L		0.0001	09-AUG-21
Molybdenum (Mo)-Dis	solved		<0.000050	)	mg/L		0.00005	09-AUG-21
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	09-AUG-21
Phosphorus (P)-Disso			<0.050		mg/L		0.05	09-AUG-21
Potassium (K)-Dissolv			<0.050		mg/L		0.05	09-AUG-21
Selenium (Se)-Dissolv	ved .		<0.000050	)	mg/L		0.00005	09-AUG-21
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	09-AUG-21
Silver (Ag)-Dissolved			<0.000010	)	mg/L		0.00001	09-AUG-21
Sodium (Na)-Dissolve	d		< 0.050		mg/L		0.05	09-AUG-21
Strontium (Sr)-Dissolv	red		<0.00020		mg/L		0.0002	09-AUG-21
Sulfur (S)-Dissolved			< 0.50		mg/L		0.5	09-AUG-21
Thallium (TI)-Dissolve	d		<0.000010	)	mg/L		0.00001	09-AUG-21
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	09-AUG-21
Titanium (Ti)-Dissolve	d		<0.00030		mg/L		0.0003	09-AUG-21
Uranium (U)-Dissolved	d		<0.000010	)	mg/L		0.00001	09-AUG-21
Vanadium (V)-Dissolv	ed		<0.00050		mg/L		0.0005	09-AUG-21
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	09-AUG-21
Zirconium (Zr)-Dissolv	red .		<0.00020		mg/L		0.0002	09-AUG-21
NH3-L-F-CL	Water							
Batch R554374	5							
WG3589917-2 LCS								
Ammonia as N			97.8		%		85-115	03-AUG-21
WG3589917-1 MB								
Ammonia as N			<0.0050		mg/L		0.005	03-AUG-21
NO2-L-IC-N-CL	Water							
Batch R554455	7							
WG3590662-6 LCS Nitrite (as N)			99.8		%		90-110	31-JUL-21
<b>WG3590662-5 MB</b> Nitrite (as N)			<0.0010		mg/L		0.001	31-JUL-21
NO3-L-IC-N-CL	Water							



Workorder: L2621315

Report Date: 11-AUG-21 Page 4 of 5

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO3-L-IC-N-CL	Water							
Batch R5544557 WG3590662-6 LCS Nitrate (as N)			99.4		%		90-110	31-JUL-21
WG3590662-5 MB Nitrate (as N)			<0.0050		mg/L		0.005	31-JUL-21
PH/EC/ALK-CL	Water							
Batch R5547726 WG3593972-3 LCS Conductivity (EC)			97.6		%		90-110	09-AUG-21
Alkalinity, Total (as CaC	CO3)		104.9		%		85-115	09-AUG-21
WG3593972-1 MB Conductivity (EC)			<2.0		uS/cm		2	09-AUG-21
Bicarbonate (HCO3)			<5.0		mg/L		5	09-AUG-21
Carbonate (CO3)			<5.0		mg/L		5	09-AUG-21
Hydroxide (OH)			<5.0		mg/L		5	09-AUG-21
Alkalinity, Total (as CaC	CO3)		<2.0		mg/L		2	09-AUG-21
SO4-L-IC-N-CL	Water							
Batch R5544557 WG3590662-6 LCS Sulfate (SO4)			98.6		%		85-115	31-JUL-21
<b>WG3590662-5 MB</b> Sulfate (SO4)			<0.050		mg/L		0.05	31-JUL-21
TSS-L-CL	Water							
Batch R5544649								
WG3588650-2 LCS Total Suspended Solids	3		97.2		%		85-115	03-AUG-21
WG3588650-1 MB Total Suspended Solids	3		<1.0		mg/L		1	03-AUG-21
TURBIDITY-CL	Water							
Batch R5537176								
WG3588163-2 LCS Turbidity			96.0		%		85-115	31-JUL-21
WG3588163-1 MB Turbidity			<0.10		NTU		0.1	31-JUL-21

Workorder: L2621315 Report Date: 11-AUG-21 Page 5 of 5

#### 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

#### **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 predetermined 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.



istody (COC) / Analytical Request Form

COC Number: 20 -

L2621315-COFC

Canada Toll Free: 1 800 668 9878

Report To	Contact and company name below will appear	ar on the final report		Reports / R				<u> </u>	Т	umaro	und Ti	ne (TAT	Requ	sted									
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	Company address below will appear on the final	report	Select Distributio		MAIL	FAX								harge min			]						
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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 16:00 (MT)

Version: FINAL

Client Phone: 604-986-7723

# Certificate of Analysis

Lab Work Order #: L2660703

Project P.O. #:

NOT SUBMITTED

Job Reference:

20050 CRANBROOK

C of C Numbers: Legal Site Desc:

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

Account Manager

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L2660703 CONTD.... PAGE 2 of 7

18-NOV-21 16:00 (MT)

Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2660703-1 Groundwater 07-NOV-21 12:00 TH4-A / E265129	L2660703-2 Groundwater 07-NOV-21 12:00 E265122	L2660703-3 Groundwater 07-NOV-21 12:00 E265123	L2660703-4 Groundwater 07-NOV-21 12:00 E265124	L2660703-5 Groundwater 07-NOV-21 12:00 E265125
Grouping	Analyte					
WATER						
Physical Tests	Hardness (as CaCO3) (mg/L)	318	286	285	273	53.8
	Temperature (Degree C)	20.0	20.0	20.1	20.1	20.2
	Total Suspended Solids (mg/L)	108	69.2	31.8	79.2	19.4
	Turbidity (NTU)	62.8	39.3	16.7	58.6	8.18
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	335	294	281	311	354
	Ammonia as N (mg/L)	0.0296	<0.0050	<0.0050	0.0067	0.0068
	Bicarbonate (HCO3) (mg/L)	335	294	281	311	354
	Carbonate (CO3) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Chloride (CI) (mg/L)	26.6	12.8	32.8	9.79	1.91
	Conductivity (EC) (uS/cm)	673	567	608	569	593
	Fluoride (F) (mg/L)	0.027	0.090	0.120	0.108	2.12
	Hydroxide (OH) (mg/L)	<5.0	<5.0	<5.0	<5.0	<5.0
	Nitrate and Nitrite (as N) (mg/L)	1.84	1.54	0.194	1.08	0.0764
	Nitrate (as N) (mg/L)	1.83	1.54	0.194	1.08	0.0764
	Nitrite (as N) (mg/L)	0.0089	<0.0010	<0.0010	<0.0010	<0.0010
	pH (pH)	7.77	7.95	7.73	7.98	8.21
	Sulfate (SO4) (mg/L)	30.8	18.9	22.5	21.7	6.57
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Dissolved Metals Filtration Location	FIELD	FIELD	FIELD	FIELD	FIELD
	Aluminum (Al)-Dissolved (mg/L)	0.0050	0.0011	<0.0010	0.0015	0.0026
	Antimony (Sb)-Dissolved (mg/L)	0.00023	<0.00010	0.00017	<0.00010	<0.00010
	Arsenic (As)-Dissolved (mg/L)	0.00086	0.00015	<0.00010	0.00013	0.00090
	Barium (Ba)-Dissolved (mg/L)	0.180	0.147	0.117	0.169	0.204
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Boron (B)-Dissolved (mg/L)	0.010	<0.010	0.029	<0.010	0.095
	Cadmium (Cd)-Dissolved (mg/L)	0.0000718	0.0000061	0.0000562	0.0000098	0.0000052
	Calcium (Ca)-Dissolved (mg/L)	63.8	58.6	46.7	55.3	9.84
	Chromium (Cr)-Dissolved (mg/L)	0.00118	0.00145	0.00061	0.00074	0.00026
	Cobalt (Co)-Dissolved (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Dissolved (mg/L)	0.0173	0.00042	0.00397	0.00063	0.00039
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Lead (Pb)-Dissolved (mg/L)	0.000065	<0.000050	<0.000050	<0.000050	<0.000050
	Lithium (Li)-Dissolved (mg/L)	0.0063	0.0054	0.0935	0.0062	0.0192
	Magnesium (Mg)-Dissolved (mg/L)	38.6	34.0	40.8	32.7	7.10
	Manganese (Mn)-Dissolved (mg/L)	0.00417	0.00051	0.00013	0.00014	0.00201
	Mercury (Hg)-Dissolved (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

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

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18-NOV-21 16:00 (MT) Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2660703-6 Groundwater 07-NOV-21 12:00 E265127	
Grouping	Analyte		
WATER			
Physical Tests	Hardness (as CaCO3) (mg/L)	286	
•	Temperature (Degree C)	20.4	
	Total Suspended Solids (mg/L)	14.8	
	Turbidity (NTU)	8.26	
Anions and Nutrients	Alkalinity, Total (as CaCO3) (mg/L)	321	
	Ammonia as N (mg/L)	<0.0050	
	Bicarbonate (HCO3) (mg/L)	321	
	Carbonate (CO3) (mg/L)	<5.0	
	Chloride (CI) (mg/L)	6.96	
	Conductivity (EC) (uS/cm)	562	
	Fluoride (F) (mg/L)	0.024	
	Hydroxide (OH) (mg/L)	<5.0	
	Nitrate and Nitrite (as N) (mg/L)	0.328	
	Nitrate (as N) (mg/L)	0.328	
	Nitrite (as N) (mg/L)	<0.0010	
	pH (pH)	7.86	
	Sulfate (SO4) (mg/L)	15.3	
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	
	Dissolved Metals Filtration Location	FIELD	
	Aluminum (Al)-Dissolved (mg/L)	0.0018	
	Antimony (Sb)-Dissolved (mg/L)	0.0013	
	Arsenic (As)-Dissolved (mg/L)	0.00013	
	Barium (Ba)-Dissolved (mg/L)	0.393	
	Beryllium (Be)-Dissolved (mg/L)	<0.000020	
	Bismuth (Bi)-Dissolved (mg/L)	<0.000020	
	Boron (B)-Dissolved (mg/L)	<0.000	
	Cadmium (Cd)-Dissolved (mg/L)	0.000146	
	Calcium (Ca)-Dissolved (mg/L)	53.7	
	Chromium (Cr)-Dissolved (mg/L)		
	Cobalt (Co)-Dissolved (mg/L)	0.00302	
	Copper (Cu)-Dissolved (mg/L)	<0.00010	
	Iron (Fe)-Dissolved (mg/L)	0.00781	
	Lead (Pb)-Dissolved (mg/L)	<0.010	
	Lithium (Li)-Dissolved (mg/L)	<0.000050	
	Magnesium (Mg)-Dissolved (mg/L)	0.0016	
		36.8	
	Manganese (Mn)-Dissolved (mg/L)	0.00109	
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	

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

L2660703 CONTD....

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Version: FINAL

	Sample ID Description Sampled Date Sampled Time Client ID	L2660703-1 Groundwater 07-NOV-21 12:00 TH4-A / E265129	L2660703-2 Groundwater 07-NOV-21 12:00 E265122	L2660703-3 Groundwater 07-NOV-21 12:00 E265123	L2660703-4 Groundwater 07-NOV-21 12:00 E265124	L2660703-5 Groundwater 07-NOV-21 12:00 E265125
Grouping	Analyte					
WATER						
Dissolved Metals	Molybdenum (Mo)-Dissolved (mg/L)	0.00129	0.000802	0.00257	0.000811	0.000856
	Nickel (Ni)-Dissolved (mg/L)	0.00314	0.00056	0.00366	<0.00050	<0.00050
	Phosphorus (P)-Dissolved (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Potassium (K)-Dissolved (mg/L)	3.25	2.26	2.64	2.21	1.45
	Selenium (Se)-Dissolved (mg/L)	0.000538	0.000264	0.000574	0.000303	<0.000050
	Silicon (Si)-Dissolved (mg/L)	7.16	7.02	5.82	6.64	4.23
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Sodium (Na)-Dissolved (mg/L)	23.2	14.6	19.5	15.4	125
	Strontium (Sr)-Dissolved (mg/L)	0.280	0.238	0.313	0.248	0.0720
	Sulfur (S)-Dissolved (mg/L)	10.9	6.60	7.73	7.19	2.07
	Thallium (TI)-Dissolved (mg/L)	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
	Tin (Sn)-Dissolved (mg/L)	0.00127	0.00086	0.00103	0.00116	0.00081
	Titanium (Ti)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
	Uranium (U)-Dissolved (mg/L)	0.00526	0.00418	0.00390	0.00533	0.00112
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Zinc (Zn)-Dissolved (mg/L)	0.0153	0.0013	0.0641	0.0018	<0.0010
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030

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

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	Sample ID Description Sampled Date Sampled Time Client ID	L2660703-6 Groundwater 07-NOV-21 12:00 E265127		
Grouping	Analyte			
WATER				
Dissolved Metals	Molybdenum (Mo)-Dissolved (mg/L)	0.000979		
	Nickel (Ni)-Dissolved (mg/L)	0.00179		
	Phosphorus (P)-Dissolved (mg/L)	<0.050		
	Potassium (K)-Dissolved (mg/L)	2.37		
	Selenium (Se)-Dissolved (mg/L)	0.000189		
	Silicon (Si)-Dissolved (mg/L)	5.05		
	Silver (Ag)-Dissolved (mg/L)	<0.000010		
	Sodium (Na)-Dissolved (mg/L)	5.93		
	Strontium (Sr)-Dissolved (mg/L)	0.188		
	Sulfur (S)-Dissolved (mg/L)	5.11		
	Thallium (TI)-Dissolved (mg/L)	<0.000010		
	Tin (Sn)-Dissolved (mg/L)	<0.00010		
	Titanium (Ti)-Dissolved (mg/L)	<0.00030		
	Uranium (U)-Dissolved (mg/L)	0.00351		
	Vanadium (V)-Dissolved (mg/L)	<0.00050		
	Zinc (Zn)-Dissolved (mg/L)	0.0188		
	Zirconium (Zr)-Dissolved (mg/L)	<0.00030		

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

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Version:

#### Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2660703-1, -2, -3, -4, -5, -6
Matrix Spike	Sodium (Na)-Dissolved	MS-B	L2660703-1, -2, -3, -4, -5, -6

**Qualifiers for Individual Parameters Listed:** 

Qualifier Description

MS-B Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

**Test Method References:** 

**ALS Test Code** Matrix Method Reference\*\* **Test Description BE-D-L-CCMS-CL** Diss. Be (low) in Water by CRC ICPMS APHA 3030B/6020A (mod) Water

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.

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 CaCO3 equivalents.

Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

Water Dissolved Mercury in Water by CVAAS APHA 3030B/EPA 1631E (mod) **HG-D-CVAA-CL** 

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.

Dissolved Metals in Water by CRC ICPMS MET-D-CCMS-CL Water 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.

N2N3-CALC-CL Water Nitrate+Nitrite **CALCULATION** 

NH3-L-F-CL 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

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 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

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

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

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

**TURBIDITY-CL** Water **Turbidity** APHA 2130 B-Nephelometer

This analysis is carried out using procedures adapted from APHA Method 2130 "Turbidity". Turbidity is determined by the nephelometric method.

<sup>\*\*</sup> ALS test methods may incorporate modifications from specified reference methods to improve performance.

### **Reference Information**

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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.



Workorder: L2660703 Report Date: 18-NOV-21 Page 1 of 6

Client: Sperling Hansen Associates Inc.

#8 - 1225 East Keith Road North Vancouver BC V7J 1J3

Contact: Scott Garthwaite

Test	Matrix	Reference	Result Qu	ıalifier	Units	RPD	Limit	Analyzed
BE-D-L-CCMS-CL	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
CL-L-IC-N-CL	Water							
Batch R5643976 WG3657216-6 LCS Chloride (CI)			101.4		%		85-115	09-NOV-21
<b>WG3657216-5 MB</b> Chloride (CI)			<0.10		mg/L		0.1	09-NOV-21
F-L-IC-CL	Water							
Batch R5643976								
<b>WG3657216-6 LCS</b> Fluoride (F)			102.2		%		85-115	09-NOV-21
<b>WG3657216-5 MB</b> Fluoride (F)			<0.020		mg/L		0.02	09-NOV-21
HG-D-CVAA-CL	Water							
Batch R5640916								
WG3656315-7 DUP Mercury (Hg)-Dissolved		<b>L2660703-1</b> <0.0000050	<0.0000050	RPD-NA	mg/L	N/A	20	10-NOV-21
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
WG3656315-8 MS Mercury (Hg)-Dissolved		L2660703-1	100.0		%		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	t		92.0		%		80-120	12-NOV-21
Calcium (Ca)-Dissolved			90.1		%		80-120	12-NOV-21



Workorder: L2660703 Report Date: 18-NOV-21 Page 2 of 6

Test M	latrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL V	Vater							
Batch R5645697								
WG3657367-2 LCS								
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
Magnesium (Mg)-Dissolved	t		93.3		%		80-120	12-NOV-21
Manganese (Mn)-Dissolved	t		92.8		%		80-120	12-NOV-21
Molybdenum (Mo)-Dissolve	ed		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 (TI)-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
WG3657367-1 MB								
Aluminum (AI)-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			<0.00005	0	mg/L		0.00005	12-NOV-21
Boron (B)-Dissolved			<0.010		mg/L		0.01	12-NOV-21
Cadmium (Cd)-Dissolved			<0.00000	5C	mg/L		0.000005	12-NOV-21
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	12-NOV-21



Workorder: L2660703 Report Date: 18-NOV-21 Page 3 of 6

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-CL	Water							
Batch R564569	97							
WG3657367-1 MB								
Chromium (Cr)-Disso			<0.00010		mg/L		0.0001	12-NOV-21
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Copper (Cu)-Dissolve	ed		<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	1	mg/L		0.00005	12-NOV-21
Lithium (Li)-Dissolved	I		<0.0010		mg/L		0.001	12-NOV-21
Magnesium (Mg)-Diss	solved		< 0.0050		mg/L		0.005	12-NOV-21
Manganese (Mn)-Dis	solved		<0.00010		mg/L		0.0001	12-NOV-21
Molybdenum (Mo)-Dis	ssolved		<0.000050	)	mg/L		0.00005	12-NOV-21
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	12-NOV-21
Phosphorus (P)-Disso	olved		< 0.050		mg/L		0.05	12-NOV-21
Potassium (K)-Dissol	ved		< 0.050		mg/L		0.05	12-NOV-21
Selenium (Se)-Dissol	ved		<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)-Dissolve	ed		< 0.050		mg/L		0.05	12-NOV-21
Strontium (Sr)-Dissol	ved		<0.00020		mg/L		0.0002	12-NOV-21
Sulfur (S)-Dissolved			< 0.50		mg/L		0.5	12-NOV-21
Thallium (TI)-Dissolve	ed		<0.000010	)	mg/L		0.00001	12-NOV-21
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	12-NOV-21
Titanium (Ti)-Dissolve	ed		<0.00030		mg/L		0.0003	12-NOV-21
Uranium (U)-Dissolve	ed		<0.000010	)	mg/L		0.00001	12-NOV-21
Vanadium (V)-Dissolv	/ed		<0.00050		mg/L		0.0005	12-NOV-21
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	12-NOV-21
Zirconium (Zr)-Dissol	ved		<0.00020		mg/L		0.0002	12-NOV-21
NH3-L-F-CL	Water							
Batch R565386 WG3660823-2 LCS Ammonia as N			100.0		%		85-115	17-NOV-21
WG3660823-1 MB Ammonia as N			<0.0050		mg/L		0.005	17-NOV-21
NO2-L-IC-N-CL	Water							



Workorder: L2660703

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
NO2-L-IC-N-CL	Water							
Batch R5643976 WG3657216-6 LCS Nitrite (as N)			105.3		%		90-110	09-NOV-21
<b>WG3657216-5 MB</b> Nitrite (as N)			<0.0010		mg/L		0.001	09-NOV-21
NO3-L-IC-N-CL	Water							
Batch R5643976 WG3657216-6 LCS Nitrate (as N)			101.5		%		90-110	09-NOV-21
WG3657216-5 MB Nitrate (as N)			<0.0050		mg/L		0.005	09-NOV-21
PH/EC/ALK-CL	Water							
Batch R5641081								
WG3656090-8 LCS Conductivity (EC)			102.0		%		90-110	09-NOV-21
Alkalinity, Total (as CaC	O3)		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 CaC	O3)		<2.0		mg/L		2	09-NOV-21
SO4-L-IC-N-CL	Water							
Batch R5643976								
<b>WG3657216-6 LCS</b> Sulfate (SO4)			101.0		%		85-115	09-NOV-21
<b>WG3657216-5 MB</b> Sulfate (SO4)			<0.050		mg/L		0.05	09-NOV-21
TSS-L-CL	Water							
Batch R5648777								
WG3657247-2 LCS Total Suspended Solids			93.8		%		85-115	13-NOV-21
WG3657247-1 MB Total Suspended Solids			<1.0		mg/L		1	13-NOV-21
TURBIDITY-CL	Water							



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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL	Water							
Batch R564025 WG3656088-2 LCS Turbidity			92.0		%		85-115	10-NOV-21
WG3656088-1 MB Turbidity			<0.10		NTU		0.1	10-NOV-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

#### **Sample Parameter Qualifier Definitions:**

LCSD Laboratory Control Sample Duplicate

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 predetermined data quality objectives to provide confidence in the accuracy of associated test results.

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

### Chain of Custody (COC) / Analytical Reque



Canada Toll Free: 1 800 668 9878



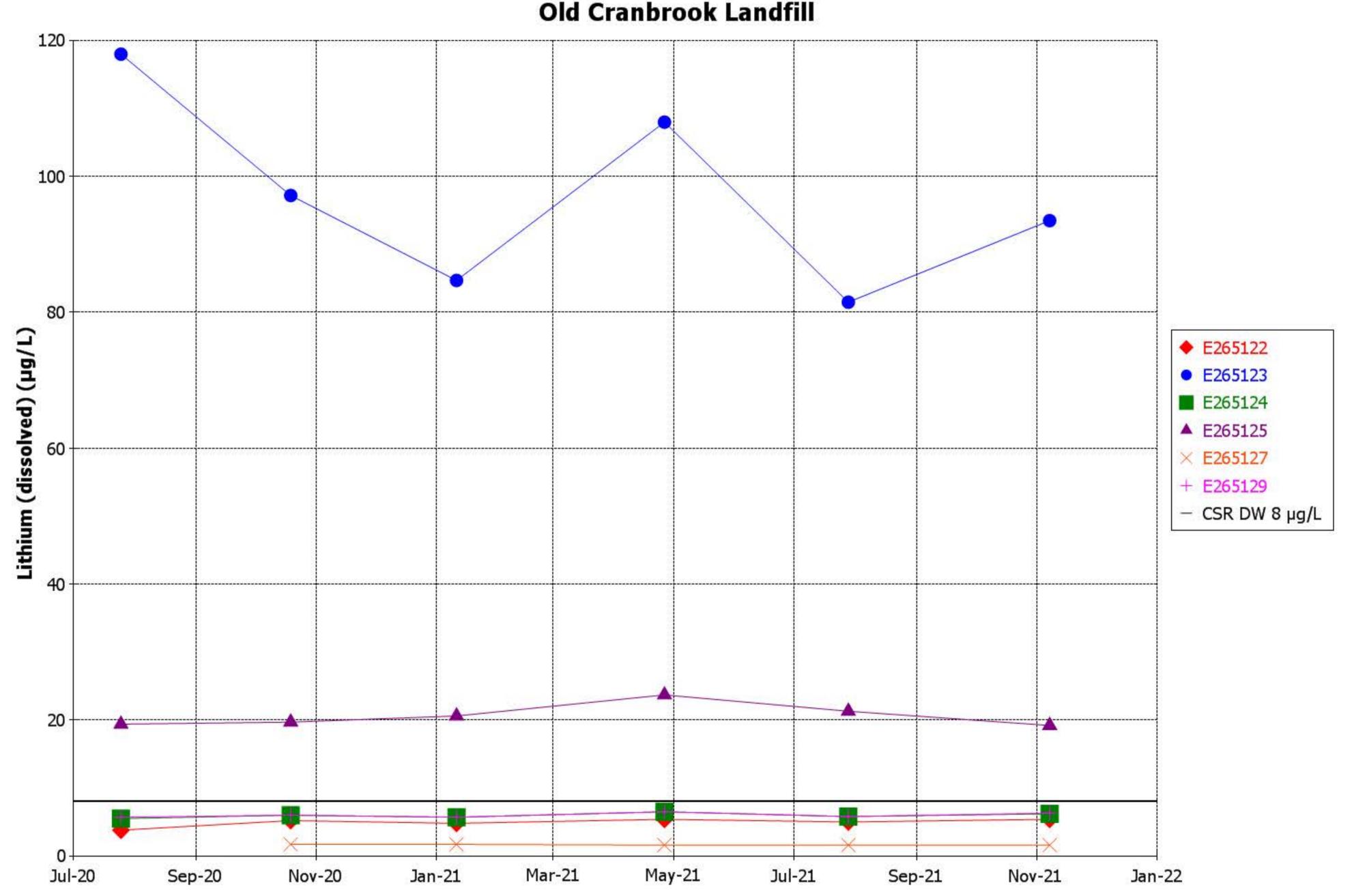
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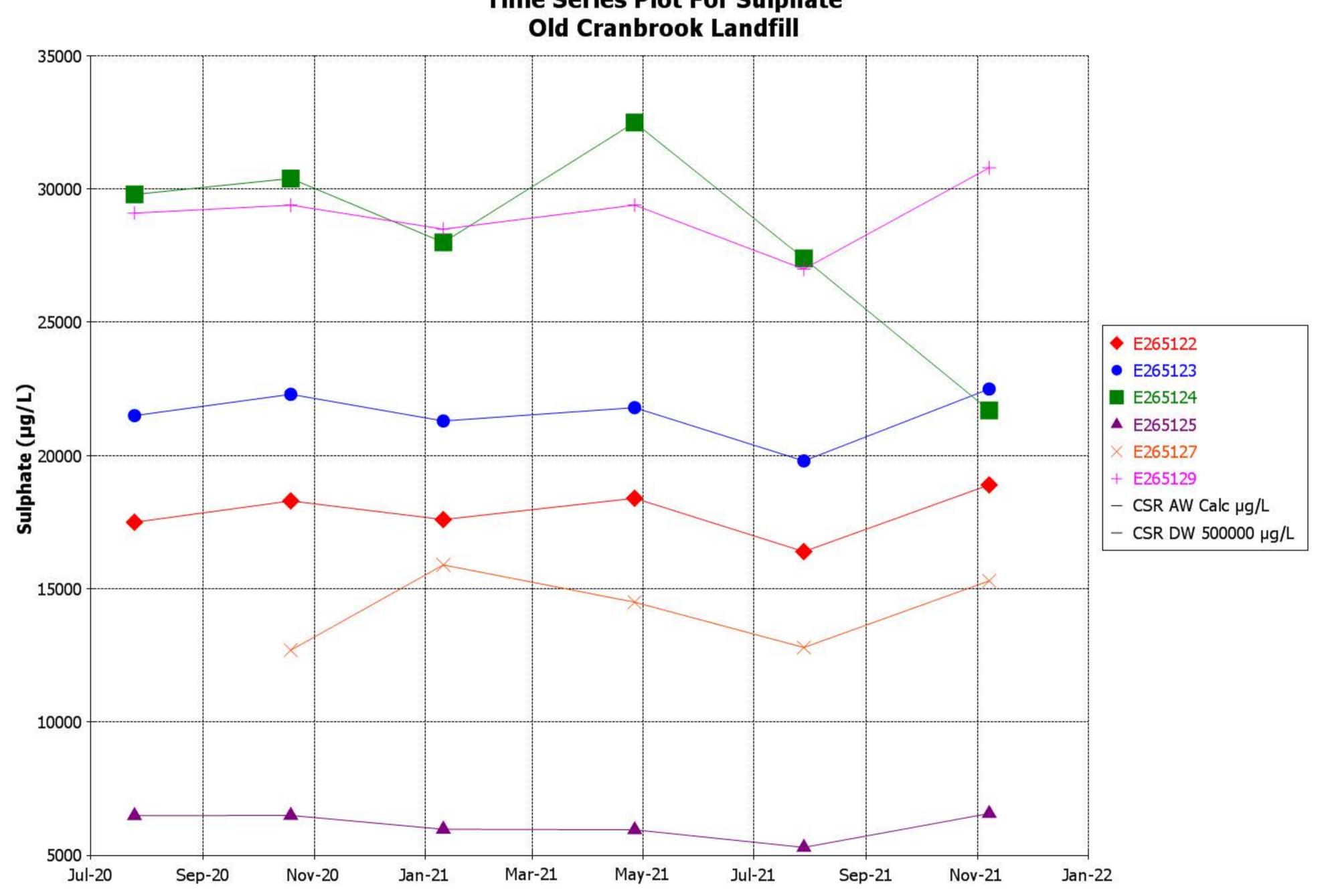
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	Company address below will appear on the final report IDERCT DISTRIBUTION: IVI EMAIL I I PAL I FAX I								1 day [E] if received by 3pm M-F - 100% rush surcharge minimum Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional																		
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City/Province:	North Vancouver, B.C.				Email 2 chetherington@sperlinghansen.com				fees may apply to rush requests on weekends, statutory holidays and nor routine tests																		
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□ Y	ES 🔃 NO		British Columbi	ia Appro	ved and Working	Water Quality Guid	delines (MAY, 20	15)	Cooler Custody Seals Intact: YES N/A Sample Custody Seals Intact: YES N/A											i/A							
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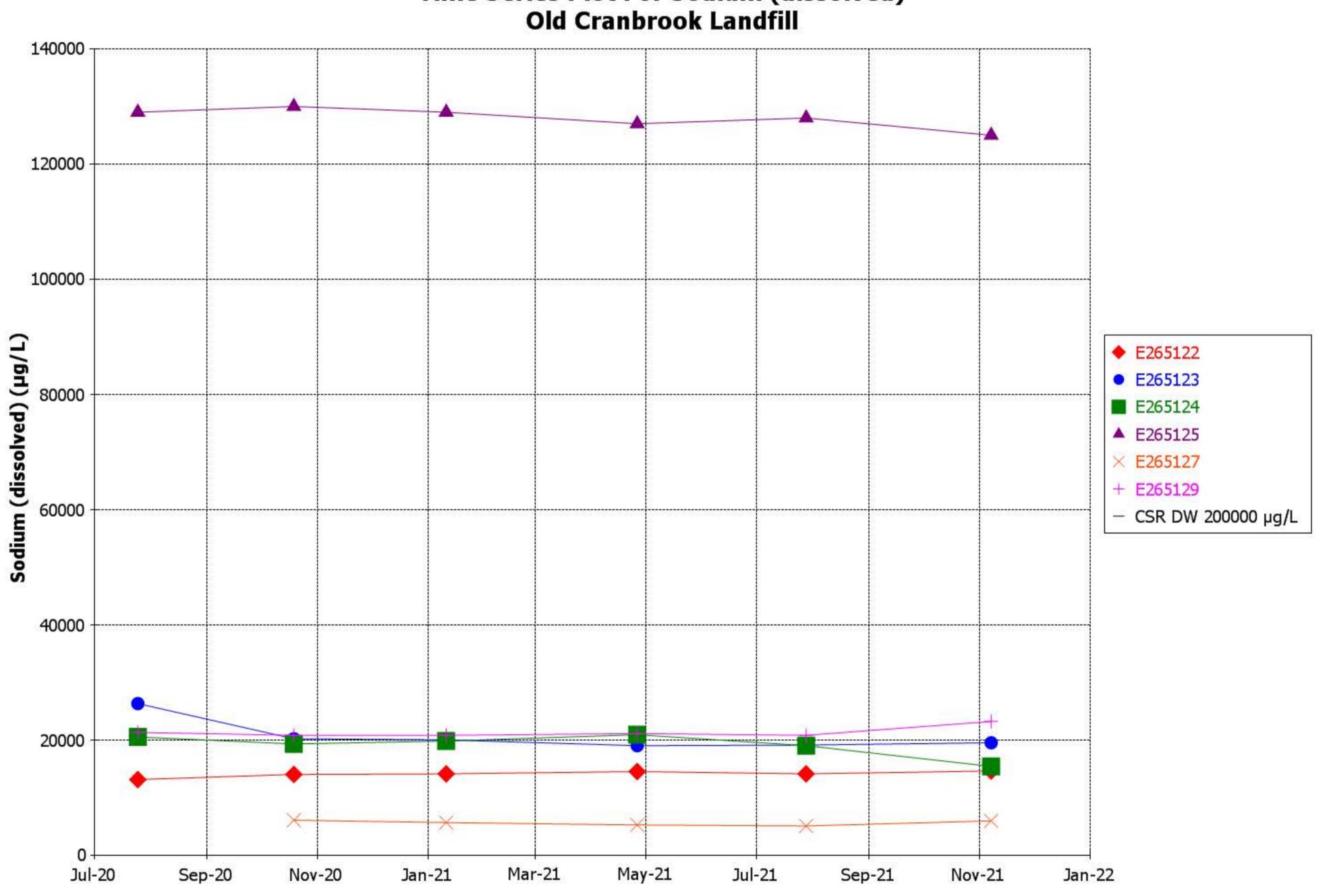
# Time Series Plot For Lithium (dissolved) Old Cranbrook Landfill



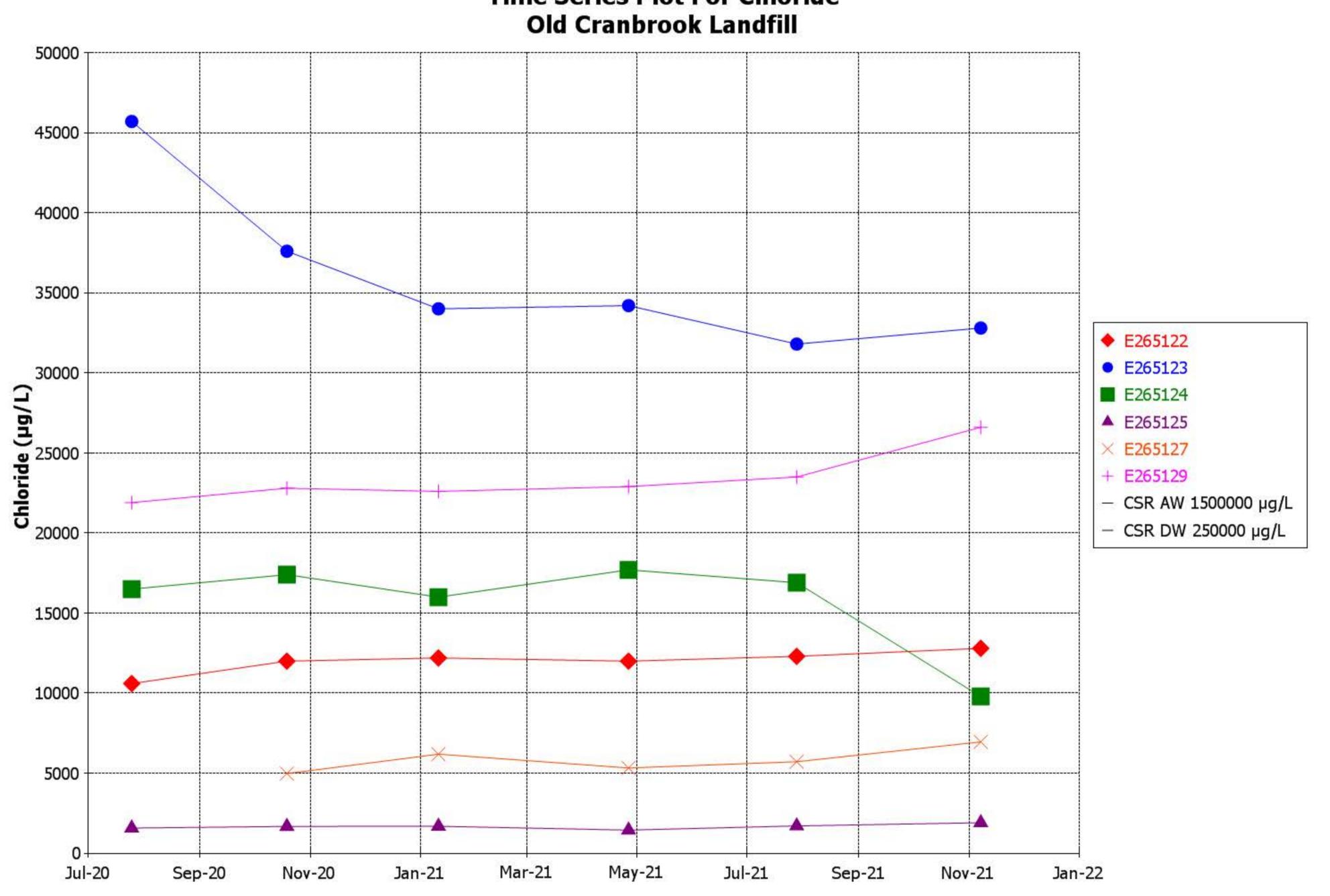
# **Time Series Plot For Sulphate**



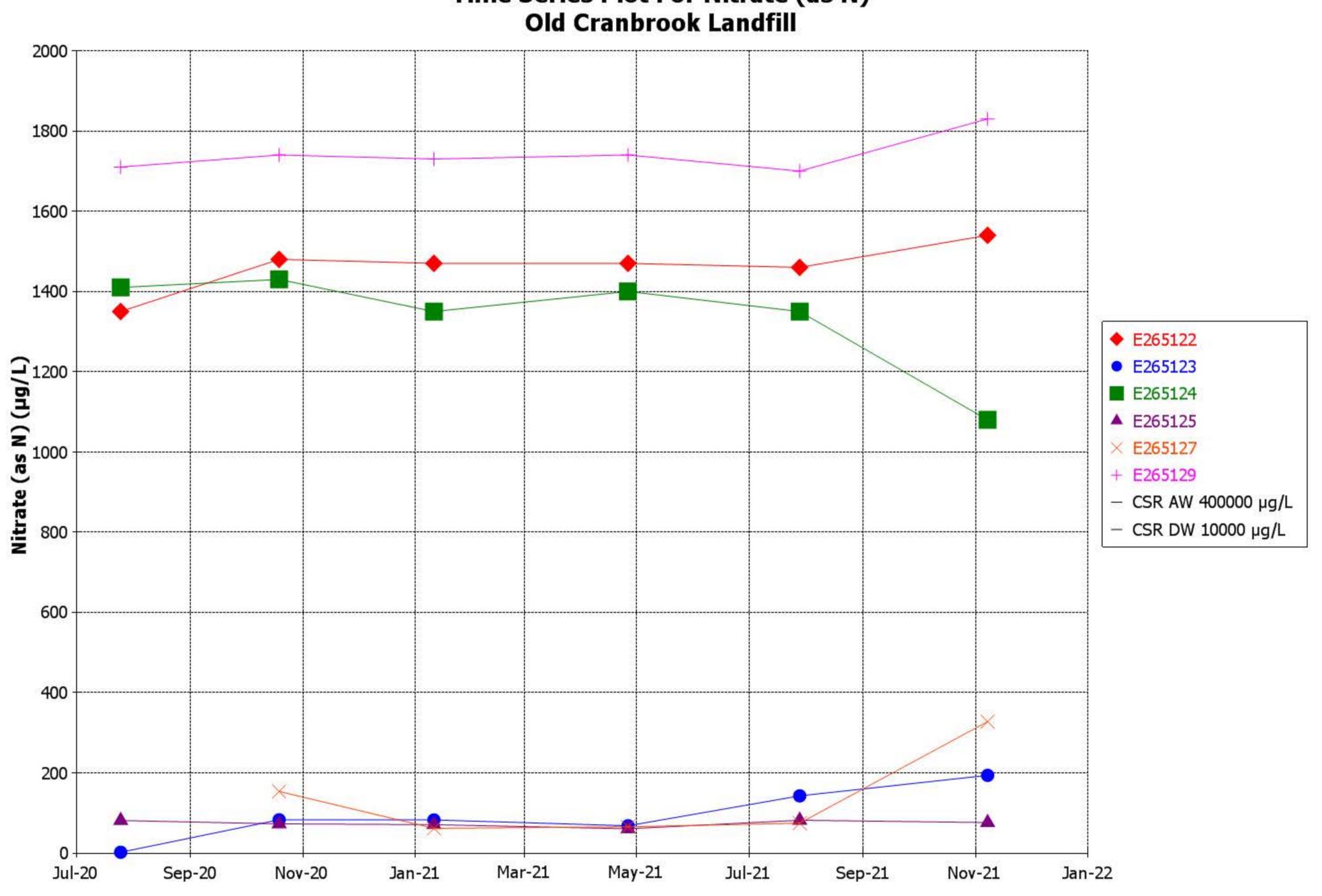
# Time Series Plot For Sodium (dissolved)



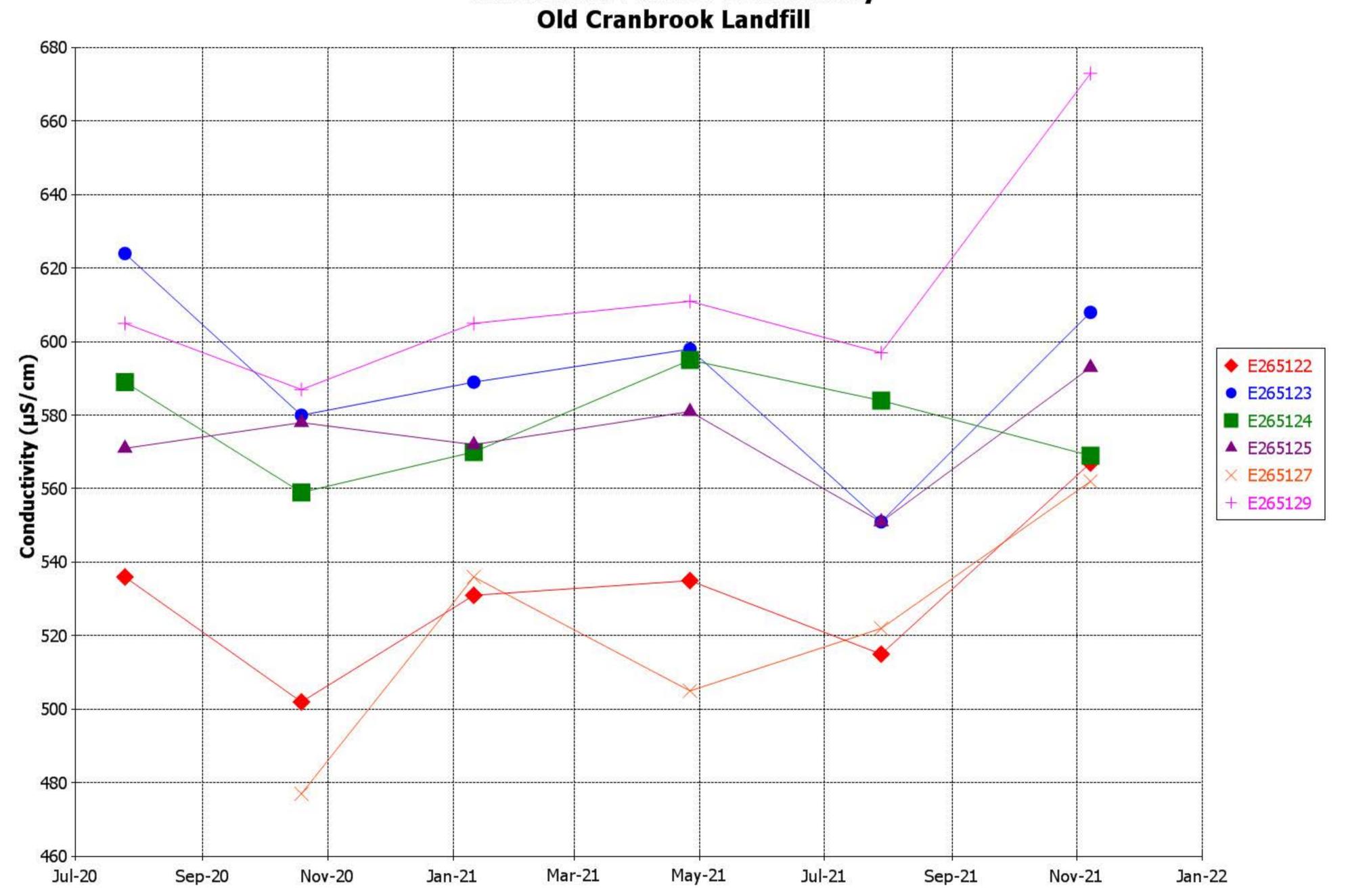
# **Time Series Plot For Chloride**



# Time Series Plot For Nitrate (as N)



# **Time Series Plot For Conductivity**



# **Time Series Plot For Fluoride**

