ISKUT LANDFILL

2022 Annual Report

Prepared for:
British Columbia Ministry of
Environment & Climate Change Strategy
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Prepared by:
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Regional District of
Kitimat-Stikine

Executive Summary

During 2022, 3,004 cubic meters of municipal solid waste was deposited in the Iskut landfill. There were no materials diverted offsite during 2022. Materials segregated for diversion will be picked up in 2023 and the volumes recorded then and reported in the 2023 Annual Report.

There were no instances of mammalian wildlife breaching the facility fence observed during 2022 at the Iskut Landfill. There was some vector activity from birds, including raptor species (bald eagles), and corvid species (crows and ravens). The facility was out of compliance in 2022 for the fence and gate being in disrepair.

The two surface water compliance points were sampled and monitored according to their OC prescriptions, and three groundwater wells were drilled at the facility. A DOCP update and landfill conformance review are planned for 2023.

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Regional District of
Kitimat-Stikine

Contents

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1 Introduction

This annual report covers the period from January to December 2021 and has been prepared to fulfill the requirements of Iskut Landfill Operational Certificate (OC) MR-4612 (Appendix A). The Iskut OC was issued in 2012, and last amended in October 2021. The OC authorizes the discharge of municipal solid and liquid wastes and outlines the standards for environmental and human protection at the landfill.

The 2022 Annual Report summarizes the topics presented in Table 1.

Table 1: Report Objectives

Waste Disposal
Quantity of Waste Landfilled
Quantity of Waste Diverted and Recycled
Quantity of Liquid Waste Received
Wildlife Observations
Facility Updates and Maintenance
Operational Certificate Amendments
Airspace Utilization
Facility Maintenance
Environmental Monitoring

Environmental monitoring was conducted in accordance with the OC. The results of the water quality monitoring program, which includes groundwater, surface water, and leachate monitoring, are discussed in the Environmental Effects Monitoring Report by Sperling Hansen and contained in Appendix B of this report.

2 Background

The Iskut Landfill is owned and operated by the Regional District of Kitimat-Stikine (RDKS). It is located two km northwest of Iskut with access from the Stewart-Cassiar Highway, as seen in Figure 1. Iskut Landfill is responsible for the management of municipal solid waste (MSW) and liquid waste generated from commercial, residential, and institutional sources in the Iskut Community in accordance with the Regional District Kitimat-Stikine Solid Waste Management Plan, which was approved by the Minister in 2022. The Iskut Community includes the area along Highway 37 north of Iskut to the Stikine River, and South of Iskut to Kinaskin Lake Provincial Park. The landfill does not accept waste from mining camps or industrial project sites.

The Iskut landfill site is 3.5 ha in size and includes a naturally attenuated landfill that is unlined, a septage receiving lagoon, a borrow area for cover material, and a designated area for the diversion of

metal, tires, and clean wood. The Iskut Landfill is responsible for the management of municipal solid and liquid waste generated by commercial and residential sources in the Iskut Community and surrounding Electoral Area residents in accordance with the RDKS Solid Waste Management Plan.

Landfill operations are regulated by the Ministry of Environment and Climate Change Strategy (ENV) under OC MR-4612 and conducted in accordance with Iskut Landfill Operations and Closure Plan prepared by Sperling HansenAssociates in February 1999.

Figure 1 Location of Iskut Landfill in proximity to the community of Iskut.

2.1 Landfill

The Iskut Landfill footprint occupies 0.9ha of the total 3.5ha of the facility. Landfilling has occurred at this site since about 1979. Most of the site is underlain by sandy soils with some gravel. There is no leachate capture system due to the small size of the facility. Leachate production is managed through the effective utilization of cover material and progressive closure.

3 Waste Disposal

The Iskut Landfill serves the residents and businesses in Iskut and the surrounding area. In 2022, the Iskut Landfill served approximately 478 people between on-reserve and off-reserve residents (data provided by 2022 census). The total volume of landfilled waste recorded at the Iskut Landfill from January to December 2022 is shown in Table 2.

Table 2: Landfilled and Diverted Waste for Iskut Landfill in 2022.

Waste Type	Cubic Metres	Tonnes
Landfilled Waste	**3,004**	**490**
Refuse	3,004	
Diverted Waste	**0**	
Metal	0	
Septage	0	
Tires	0	

3.1 Landfilled Wastes

Refuse

Refuse is defined as discharged materials, substances, or objects, not including Restricted Wastes (metal, tires, and recyclable materials), hazardous or radioactive waste, contaminated soil, smoldering or flammable material, explosive or highly combustible materials, or tires. Refuse is disposed of in the landfill.

In 2022, **3,004 cubic metres** of refuse was disposed in the Iskut Landfill.

3.2 Diverted Wastes

In 2022 none of the segregated material for diversion was picked up. The material is stored on site segregated into piles for diversion. In 2023 materials will be picked up and count as diverted waste and reported in the 2023 report. Due to the distance of Iskut it is only economically feasible to pick up material when the volume is appropriate.

3.3 Diverted Wastes

Diverted metals, tires, and large appliances are collected and held at the landfill until collected by the designated Stewardship or metal salvage company. Clean wood is diverted from the landfill and burned, as outlined in the Operation Certificate.

Metal

Metal, consisting of scrap, propane tanks, and large appliances, is collected from the Iskut Landfill by Terrace-based metal recyclers. In 2022, a total of 0 metric tonnes of metals were removed from the Iskut Landfill site. All ozone depleting substances were removed from applicable appliances prior to being included in the on-site scrap metal storage.

Septage

Septage is defined as septic tank pumpage and treated sewage sludge, but does not include other sewage wastes (wastewater, sewage or slurry, including catch basins, oil water separators, shop floor

drains). Septage haulers authorized to use the Iskut Landfill did not report any tipping at the Iskut Landfill in 2022.

Tires

In 2022, tires were not collected by the Tire Stewardship of BC. No official count or volume was made or tracked for tires.

3.4 Open Burning

There was no open burning of clean wood waste at the Iskut Landfill during 2022.

4 Wildlife Occurrences and Observations

The Iskut Landfill is located in an area with bears, wolves, coyotes, several species of birds of prey, and many other species of mammals that may attempt access to the facility. An electric fence surrounds the landfill area to prevent access and is kept charged from spring until late fall.

Facility operators are required to inspect the fence line weekly, testing for proper voltage, proper tension on fence stands, overall condition of the fence, and signs of wildlife activity. The results of the inspections are recorded on the Daily Operation Inspection Forms.

4.1 Mammals

In 2022, there was no instances of mammalian wildlife breaching the facility.

4.2 Bird and Vector Control

Birds, such as ravens and crows, are a nuisance at landfill sites, as they can scatter litter into the surrounding environment. Bird control at the Iskut landfill is based on thorough and complete cover of waste. The active face is only exposed when a load of waste is delivered to the landfill.

There was some vector activity from birds, including raptor species (bald eagles), and corvid species (crows and ravens). This included the removal of material from the active face and dropped around the facility.

5 Operations and Maintenance

5.1 Complaints Received

There were no complaints received regarding Iskut Landfill in 2022.

5.2 OC Amendments and Authorisations

There were no amendments or authorisations for the Iskut Facility during 2022.

5.3 Non-Compliance Reports

There was one operational non-compliance for the Iskut Facility in 2022. On Wednesday, May 25th, 2022, two Regional District of Kitimat-Stikine (RDKS) employees conducted regularly planned environmental sampling and monitoring at the Iskut Landfill. Upon arrival at the facility, it was noticed that the gates to the facility and septage bay were open during non-operating hours. The landfill gate was not energized and found to be damaged with a bent hinge. The open and deenergized facility gate puts the facility out of compliance with section 4.17.8 of the Operational Certificate (OC). The open gate at the septage bay puts the facility out of compliance with section 9.1 of the OC.

The RDKS employees closed, locked, and re-energized the landfill gate; and closed the septage bay gate. The RDKS has communicated with the contracted operator of the landfill the importance of keeping the gates closed and energized when the facility is not in operation.

5.4 Airspace and Compaction

There were no airspace compaction reports completed for the Iskut Landfill in 2022.

5.5 Landfill Gas Collection

Landfill gas collection and flaring has not been initiated at the Iskut Landfill. According to the *Iskut Landfill-Operations and Closure Plan* produced by Sperling Hansen in 1999, the 16,000 tonnes of total waste predicted to be landfilled at the Iskut Facility is below the 100,000 tonnes landfilled over its lifetime or the 10,000 tonnes landfilled per year threshold, specified by the Landfill Gas Management Regulation for a gas generation assessment or landfill gas disposal system.

5.6 Leachate Collection System

There is no leachate collection system at the Iskut Landfill, as it is not considered an economically viable option due to the size of this very small landfill. Leachate is passively discharged through natural attenuation. The reduction of leachate production is achieved at this facility through effective use of cover material and progressive closure.

5.7 Fence Maintenance

There was no maintenance performed on the Iskut Facility fence in 2022.

5.8 Operational and Maintenance Expenditures

No major operational or maintenance expenditures were done in 2022. Just the basic operations and minor maintenance of the landfill. The spending on the basic operations and maintenance was approximately $115,000.

6 Projected Operational Plan

The projected operational plan outlines the key strategies for the efficient and sustainable operations of the Iskut Landfill (IS) for the next 12 months as require. As a responsible waste management organization, we recognize the significance of managing waste effectively to protect the environment, promote public health, and ensure compliance with relevant regulations.

By implementing this operational plan, we aim to achieve our objectives of meeting the environmental and regulatory requirement, maximizing resource recovery, and maintaining a safe and environmentally responsible operation.

This plan will outline the various projects and improvements intended to be executed in the next 12 months, the processes involved, timeline and expected outcome. It will also outline the various strategies mapped out to reduce contamination and encourage diversion.

By adhering to this operational plan and working collaboratively with our stakeholders, we are confident that we will achieve our goals of efficient waste management, reduced environmental footprint, and a cleaner and healthier community. We are committed to regular evaluation, monitoring, and adaptation of our operations to remain at the forefront of waste management practices and technology.

A list of tasks sated for completion in 2023 is included in Table 3. Tasks are subject to budget approval and may change or be deferred subject to competing priorities following a risk-based approach.

Table 3: Projected Operational Tasks for 2023

2023 Plan	Description	Strategies	Expected Completion Date	Outcome
Issue RFP for Landfill Operations Contractor	Request quotes for operations contractor and make updates to the new operations contract	Updates will be made to the address operational needs at Iskut to ensure that the facility operates in compliance with the OC	Sep-23	New operational contract and potential new contractor
Rebuild Entrance Gate and Repairs to Fence	The entrance gate and fence are in disrepair and require maintenance to bring the facility into compliance, and to electrify the fence	RDKS crew will perform a major walk of the fence and rebuild as required	Aug-23	Fence and gate compliance
Update the Design, Operation and Closure Plan (DOCP)	The DOCP will be updated and will include a review of the Environmental Effects Monitoring Program and a conformance review of the site	Seek input and collaboration with subject experts, stakeholders and audit records to evaluate effectiveness and compliance	Sept-23	Updated DOCP that meets regulatory requirements of the site and provides operational and maintenance planning.

7 Environmental Monitoring

The RDKS performs twice yearly monitoring and sampling of surface water at the Iskut Landfill in accordance with the OC. Three groundwater monitoring wells were installed at the Iskut Facility in 2022 with no monitoring or sampling data collected the same year. The details of the Facility water quality monitoring program, including results of surface water monitoring are discussed in the *Iskut Landfill 2022 Environmental Effects Monitoring Report*, prepared by Sperling Hansen & Associates, and contained in Appendix B of this report.

Surface Water

Two surface water sites were sampled at the facility. One was located to the Northeast of the facility on an unnamed creek and the other was located downgradient to the West of the landfill on the same unnamed creek. The sites were monitored and sampled twice annually during the Spring (April) and Fall (September). In-Situ parameters were monitored using a YSI. Lab samples were collected in sample bottles and shipped in iced coolers to ALS for analysis.

Groundwater

Three groundwater monitoring wells were installed on the facility tenure. The wells were installed by BlueMax using a sonic drill tracked rig. A senior hydrogeologist from Waterline Resources Inc. was retained to oversee the drilling and produce a report, contained in Appendix C. The report summarizes the results of the field program and makes recommendations to the EEMP for the facility. All the wells were found to be dry after installation. The report recommended monitoring the wells in future monitoring events to determine if precipitation and snowpack melt can infiltrate the surficial sediments. If they continue to show no accumulation of water, the report has suggested the monitoring wells may be better suited for vapour monitoring, if required.

Two of the wells are located down gradient of the landfill. One to the south, located across the access road from the facility. This well is also down gradient of the metal pile and sewage lagoon. The second one is located near the Northwest corner of the facility on the south side of the access road. The third well is located up gradient of the landfill near the Northeast corner of the landfill fence, along the North boundary of the facility. In-Situ parameters are to be monitored twice annually, during the Spring and Fall surface water monitoring events, using a YSI and TLC Depth Tape. If water becomes present, lab parameters will be collected in sample bottles and shipped in iced coolers to ALS for analysis.

8 Summary

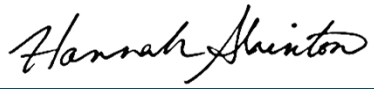
During 2022, **3,004 cubic meters** of municipal solid waste was deposited in the Iskut landfill. There were no materials diverted offsite during 2022. Materials segregated for diversion will be picked up in 2023 and the volumes recorded then and reported in the 2023 Annual Report

There were no instances of mammalian wildlife breaching the facility fence observed during 2022 at the Iskut Landfill. There was some vector activity from birds, including raptor species (bald eagles), and corvid species (crows and ravens). There were no works projects completed at the Iskut Facility in 2022.

The two surface water compliance points were sampled and monitored according to their OC prescriptions. The compiled data, interpretation, and recommendations by Sperling Hansen Associates will be contained in the *Iskut Landfill 2022 Annual Environmental Effects Monitoring (EEM) Report* in Appendix A. Three monitoring wells were installed at the Facility in 2022.

Regional District of
Kitimat-Stikine

Compiled by:



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Appendix A Operational Certificate

BRITISH COLUMBIA
The Best Place on Earth

File: MR-4612

Date: December 20, 2012

REGISTERED MAIL

Regional District of Kitimat-Stikine
300-4545 Lazelle Avenue
Terrace, BC
V8G 4E1

Dear Operational Certificate Holder:

Enclosed is Operational Certificate MR-4612 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the operational certificate.

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

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

Administration of this operational certificate will be carried out by staff from the Skeena Region. Plans, data and reports pertinent to the operational certificate are to be submitted to the Director, Environmental Protection, at Ministry of Environment, Regional Operations, Skeena Region, 3726 Alfred Avenue, Box 5000, Smithers, BC, V0J 2N0.

Yours truly,

M. Love

Mark Love, P. Ag.
for Director, *Environmental Management Act*
Skeena Region

Enclosure

Ministry of Environment
Regional Operations
Skeena Region
Mailing/Location Address
3726 Alfred Avenue
Box 5000
Smithers, BC, V0J 2N0
Telephone: (250) 847-7260
Facsimile: (250) 847-7591
http://www.gov.bc.ca/env

MINISTRY OF ENVIRONMENT

OPERATIONAL CERTIFICATE
MR-4612

for the

ISKUT LANDFILL

Under the Provisions of the Environmental Management Act
and in accordance with the approved
Regional District of Kitimat-Stikine Solid Waste Management Plan, the

Regional District of Kitimat-Stikine

Suite 300-4545 Lazelle Avenue

Terrace, British Columbia

V8G 4E1

is authorized to store, handle, treat and discharge municipal solid waste from Iskut and surrounding area at the Iskut landfill, subject to the conditions listed below. Contravention of any of these conditions is a violation of the *Environmental Management Act* and may result in prosecution.

1. LOCATION OF LANDFILL PROPERTY

The location of the property where discharges are authorized to occur is 350 metres north of the Iskut airstrip, at coordinates 57°51'18.70"/129°59'43.56, Cassiar Land District.

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Mark Love, P.Ag.
For Director, Environmental Management Act

2. AUTHORIZED DISCHARGES

2.1 Discharge of Municipal Solid Waste

This section applies to the discharge of municipal solid waste to ground at the landfill located approximately as shown on the attached site plan. The site reference number for this discharge is E208904. Refer to Section 5 for the operational requirements associated with this discharge.

2.1.1 Subject to Sections 4.2, 4.3 and 4.4, the characteristics of the discharge shall be typical of municipal solid waste.

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

2.1.3 The authorized works are a separate municipal solid waste disposal area and related appurtenances located approximately as shown on the attached site plan.

2.2 Storage and Handling of Wastes for Salvage and Recycling

This section applies to the storage and handling of municipal solid wastes for salvage and recycling. Refer to Section 7 for the operational requirements associated with this discharge.

2.2.1 Subject to Section 4.2, the characteristics of the discharge shall be typical of recyclable municipal solid waste.

2.2.2 The quantity of recyclable wastes stored or handled is indeterminate.

2.2.3 The authorized works are a separate recyclable municipal solid waste storage area and related appurtenances located approximately as shown on the attached site plan.

2.3 Discharge of Air Contaminants from Open Burning

This section applies to the discharge of air contaminants to the atmosphere from the regulated open burning of wood and selected combustibles from a burn pile located approximately as shown on the attached site plan. The site reference number for this discharge is E220154. Refer to Section 8 for the operational requirements associated with this discharge.

2.3.1 The characteristics of the discharge shall be typical of those resulting from the regulated open burning of selected combustibles as per Section 8.3.

2.3.2 The maximum authorized rate of discharge is indeterminate.

2.3.3 The authorized works are a separate burn area associated with a landfill operation and related appurtenances located approximately as shown on the attached site plan.

2.4 Discharge of Liquid Wastes

This section applies to the discharge of septage into a septage lagoon and thence to ground, located approximately as shown on the attached site plan. The site reference number for this discharge is E277450. Refer to Section 9 for the operational requirements associated with this discharge.

2.4.1 Subject to Section 4.2, the characteristics of the discharge shall be typical of septic tank pumpage, holding tank and sewage treatment plant sludges.

2.4.2 The maximum authorized quantity of discharge is 1000 m^3/year.

2.4.3 The authorized works are exfiltration lagoons associated with a landfill operation and related appurtenances.

3 LANDFILL DESIGN

3.1 Design by Qualified Professional(s)

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

3.2 Construction

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

3.3 Engineered Footprint

The landfill design shall include preparation of an engineered final design footprint delineating the maximum extent of solid waste disposal allowable at the facility horizontally (in plan view). The engineered final design footprint shall be clearly shown on a scaled plan of the site and the plan made available in PDF format (see Section 3.6). These details shall be documented in the DOCP.

3.4 Engineered Excavation and Final Grade Contours

The landfill design shall include preparation of engineered excavation grade (if below grade landfilling is to occur) and final grade contours delineating the maximum extent of solid waste disposal allowable at the facility vertically (in cross-sectional view). The engineered excavation and final grade contours shall be clearly shown on scaled drawings (accompanied with typical cross sections to aid in depicting the landfill profile) and the drawings shall be made available in PDF format (see Section 3.6). These details shall be documented in the DOCP.

3.5 Legal Survey

The landfill property shall be legally surveyed on or before June 30, 2016, or a minimum of 6 months prior to closure, whichever is sooner.

3.6 Scaled Drawings

A scaled site plan accurately showing the legal survey (when completed), the engineered final design footprint, and final design contours, shall be included in the DOCP and made available in PDF format upon request by the Director. Additional scaled drawings showing excavation contours (if relevant) and typical cross sectional views of the site shall also be included in the DOCP.

4. GENERAL REQUIREMENTS

4.1 Site Identification

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

4.2 Prohibited Wastes

No wastes as defined by the *Hazardous Waste Regulation* shall be received, stored, treated or disposed of at this site except as authorized by the Director.

Lead-acid batteries shall not be landfilled but may be salvaged/recycled provided they are stored, handled and shipped in compliance with the *Hazardous Waste Regulation* and with Section 8 of this operational certificate. Tires equal to or less than 22" in rim size and autohulks shall not be landfilled.

4.3 Waste Asbestos

Notwithstanding Section 4.2 of this operational certificate, the disposal of waste asbestos under Section 2.1 of this operational certificate and in compliance with the requirements of Section 40 of the *Hazardous Waste Regulation* is hereby authorized.

4.4 Contaminated Soil

Soil that contains contaminants in concentrations less than "Hazardous Waste" as defined by the *Hazardous Waste Regulation* may be disposed at the landfill site. Disposal includes monofilling, co-disposal with other wastes, use as a refuse cell berm material and use as a refuse cell cover material. Disposal must occur within a disposal area as authorized by Section 5 of this operational certificate. Disposal does not include use as final cover material.

4.5 Waste Measurement

The quantity of waste material landfilled at the site shall be measured or estimated by means suitable to the Director. The results shall be submitted in accordance with Section 11.5, once per year on or before June 30 for the previous year, expressed in tonnes/yr and/or m^3/yr.

4.6 Ozone Depleting Substances

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

4.7 Fire Prevention

The operational certificate holder shall make all reasonable efforts to prevent unauthorized fires from occurring at the landfill site. As a minimum, a fire break clear of all combustible materials at least 15 metres wide shall surround all disposal, treatment and individual storage areas which have received or are receiving combustible materials. Disposal areas that have had 30 cm of compacted mineral soil cell cover or final cover applied are exempt. Water supply and pumping capabilities and/or soil and earth moving equipment shall be

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For Director, Environmental Management Act

maintained at a sufficient level to extinguish fires. In addition, reasonable efforts shall include, but are not necessarily limited to, the preparation of a Fire Prevention and Response Plan.

4.8 Extinguishment of Fires

In the event of an unauthorized fire (including any smouldering fire), the operational certificate holder shall immediately make all reasonable efforts to extinguish the fire. The operational certificate holder shall also immediately notify the Provincial Emergency Program (phone: 1-800-663-3456) and any local fire authority of an unauthorized fire.

4.9 Buffer Zone

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

4.10 Litter Control

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

4.11 Water Table Restriction

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

4.12 Surface Water Management

The distance between a natural body of surface water and any stored or buried materials shall be a minimum of 25 metres.

4.13 Inert Materials

Specific inert materials may be exempted from the requirements of Section 4.11 by the Director. The permission of the Director must be obtained in writing prior to any disposal or handling of inert materials on an exemption basis.

4.14 Landfill Gas Lower Explosive Limit

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

4.15 Water Quality and Protection

The landfill shall be operated in a manner such that ground or surface water quality does not decrease beyond that specified by the Director, at the landfill property boundary or other specified location.

If exceedences of the specified criteria occur as a result of landfill operations, the Director may require that leachate management control measures or works be undertaken. Terms of reference for any leachate management study and/or design work shall be submitted to the Director for approval prior to conducting the work.

In addition to requirements specified by the director, groundwater must be managed in accordance with the Contaminated Sites Regulation.

4.16 Maintenance of Works and Emergency Procedures

The operational certificate holder shall inspect the operation regularly and maintain it in good working order. The operational certificate holder shall immediately notify the Director of any circumstance which prevents continuing operation in the approved manner or results in non-compliance with the requirements of this operational certificate.

4.17 Electric Fencing

4.17.1 Design, Construction and Maintenance

Wherever required, electric fencing and gate systems at the landfill shall be designed, constructed, and maintained such that bears are prevented from entering into the landfill through any portion of the fence or gates at any time of the day.

4.17.2 Fence Type

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

A fence fabric may be used instead of high tensile smooth wire. The fence fabric shall: be a minimum of 1.22 metre high; be constructed of a minimum

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

4.17.3 Wire Tension

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

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

where: *Tension* is in lbs force

Temperature is in °C

4.17.4 Post Spacing

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

4.17.5 Grounding System

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

4.17.6 Period of Operation

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

4.17.7 Minimum Voltage

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

4.17.8 Gate(s)

Any access through electric fencing for vehicles, equipment and personnel shall consist of an electrified gate system that is closed during non-operating hours. The gate system shall be electrified to a minimum voltage of 6,000 volts at all times except when being opened or closed. Any gate that is open during operating hours shall be periodically checked by the attendant for bear activity during hours of operation. Gaps between the gate and the fence and ground, and between gate panels (for a double-hung gate), shall not exceed 10 cm.

4.17.9 Fence Inspections

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

Signs of digging or other attempts by bears to penetrate electric fencing shall be recorded in a log book. Any penetrations through electric fencing by bears shall be immediately reported to the Conservation Officer Service at 1-877-952-7277 and to the Director at 250-847-7260.

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

4.18 Other Agency Requirements

This operational certificate does not relieve the operational certificate holder from complying with requirements of federal, provincial, regional district or municipal authorities.

5. OPERATIONAL REQUIREMENTS FOR THE DISPOSAL OF SOLID WASTE

5.1 Location

The operational certificate holder shall identify an area for disposal of solid waste (herein referred to as the solid waste disposal area) that is within the authorized municipal solid waste disposal footprint (see Section 2.1.3). Signs which identify the nature of the waste acceptable at the designated solid waste disposal area shall be erected and maintained. The lettering on the sign shall be such that it is clearly readable by the public upon approach.

5.2 Nature of Wastes

Wastes disposed at the active face of the solid waste disposal area may include any municipal solid waste except liquid wastes and hot ashes or as otherwise restricted by Section 4.2.

5.3 Bear-Proofing

The solid waste disposal area shall be maintained inside an electric fence. The electric fence shall comply with all requirements of Section 4.17.

5.4 Waste Compaction

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

5.5 Maximum Lift Height

The maximum height of any lift of compacted waste in the solid waste disposal area shall be 5 metres.

5.6 Waste Cover

Cover shall be applied to waste in the solid waste disposal area as specified below. The operational certificate holder shall maintain a log book to record all dates of cover application.

5.6.1 Active Face Cover

Except as otherwise stated in Sub-section 5.6.2, the active face of the solid waste disposal area does not normally require cover. Based on information concerning environmental or public health concerns related to exposed waste at the active face, however, the Director may require that

the active face be covered completely at a specified frequency with 0.15 m of soil (or functional equivalent) for a specified period.

5.6.2 Cell Cover

A uniform cover of 30 cm compacted soil shall be applied to all sides of the active waste cell in the solid waste disposal area such that no more than 200 m^2 of waste are exposed at the active face at any time and such that the volume of waste in the cell does not exceed 2000 m^3. Once the maximum volume of waste has been reached in a cell, the active face shall be covered with 30 cm of compacted soil and a new waste cell begun.

5.6.3 Final Cover

Completed portions of the solid waste disposal area shall progressively receive final cover during the active life of the landfill (see Section 12.5).

5.7 Dead Animal Disposal

Dead animals and animal parts shall be disposed of in the solid waste disposal area and covered as soon as practicable with a minimum of 60 centimetres of soil and/or waste material such that flies and scavenging animals are prevented from accessing the carrion. Disposal of Specified Risk Material from cattle shall only be done in accordance with Canadian Food Inspection Agency requirements and procedures.

6. OPERATIONAL REQUIREMENTS FOR COMPOSTING

6.1 Composting

Composting operations shall comply with the requirements of the *Organic Matter Recycling Regulation* and any other relevant legislation.

6.2 Bear-Proofing

If the composting operation is to receive any organic wastes that are potential attractants to bears, then composting shall be completely enclosed by an electric fence or contained in a bear-proof structure (building or composting vessel). The electric fence shall comply with all requirements of Section 4.17.

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

7.1 Location

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

7.2 Nature of Wastes

Wastes to be salvaged/recycled may be any items with potential salvage or recycling value such as tires, lead-acid batteries, auto hulks, white goods, furniture, used lumber, used goods and the like, but shall not include any refuse consisting of or containing putrescibles, any liquid wastes, hot ashes or materials otherwise restricted by Section 4.2.

7.3 Compliance

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

7.4 Contamination

Contamination of any of the designated salvage/recycling storage piles with putrescible wastes shall be cleaned up immediately.

8. OPERATIONAL REQUIREMENTS FOR REGULATED OPEN BURNING

8.1 Location

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

8.2 Quantity, Timing, and Duration of Discharge

The maximum authorized quantity of wood residue to be open burned during each event is that which has accumulated at the time of burn initiation. The pile(s) shall be constructed so as to ensure a rapid and complete burn. The quantity of air contaminants is indeterminate.

The maximum authorized duration of each burn shall be limited to the period between two hours after sunrise on the day of ignition, and sunset on the following day. Each open burn must be completely extinguished at the end of the authorized burn duration.

Should a condition arise which prevents the burn pile(s) from being burned within this period, the Director must be notified in accordance with Section 8.10 of this authorization.

8.3 Nature of Wastes

No wastes shall be burned which are unacceptable to the Director. Acceptable materials for burning may only include dry, unpainted, untreated demolition, construction and packing-related wood residue, clean stumps and brush, but must exclude nuisance-causing combustibles such as glue-containing wood, painted and treated wood, sawdust, yard wastes, mulch, wood chips, rubber, plastics, tars, insulation, roofing material, asphalt shingles, etc.

8.4 Favourable Weather for Smoke Dispersion

Open burning shall not proceed unless weather conditions are such that emissions are dispersed away from populated areas.

The operational certificate holder must also obtain a burn registration number from the Ministry of Forests (1-888-797-1717) prior to ignition.

Open burning of wood residue must not be initiated or continued if the local air flow will cause the smoke to negatively impact a nearby population or cause pollution.

No burning shall occur during periods of fire hazard or when burning is prohibited by other agencies.

8.5 Fire Accelerant

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

8.6 Minimization of Smoke

The burn shall be tended and fed in a manner that ensures minimization of smoke emissions. Measures to minimize smoke shall include, but not necessarily be limited to: stacking of waste in a manner that eliminates dirt; waiting to burn until wastes are reasonably dry after any significant precipitation event; and using adequate equipment and staff.

8.7 Contingency Plan

Prior to burning, a contingency plan must be in place detailing how the open burn will be extinguished in the event of any of the following occurring:

i) Inadequate smoke dispersion in the surrounding environment;

ii) wood residue continues to smoulder after the authorized burn period; and,

iii) the Director requires that the open burn be extinguished for environmental protection reasons.

At a minimum, the plan must detail the actions to be taken to extinguish the open burn should any of the above conditions occur. The plan shall be made available to the Director upon request.

8.8 Extinguishment

All combustion shall be completely extinguished at the end of the authorized period as set out in Section 8.2 "Quantity, Timing and Duration of Discharge."

8.9 Fire Supervision and Suppression

An attendant shall be on-site to supervise the burn. Adequate fire suppression equipment shall be available for the entire duration of the event, and must be capable of extinguishing the fire if necessary. Local fire departments must be notified of the operational certificate holder's intent to burn, prior to ignition.

8.10 Maintenance of Works and Emergency Procedures

The operational certificate holder shall inspect the burn piles regularly and ensure that they are burning well. In the event of an emergency, or condition beyond the control of the operational certificate holder which prevents continuing operation of the approved method of open burning, the operational certificate holder shall notify the Director within two hours. If notification is necessary, it shall be accomplished by contacting the Environmental Protection program at (250) 847 – 7260.

The Director may require additional controls on the burning process and may require that the burn be extinguished at any time based on its impacts on the receiving environment.

8.11 Documentation

Following completion of each burn, notice shall be sent to the Director by fax (250-847-7591) or by e-mail to a Skeena Environmental Protection staff member advising of the following details: time of burn initiation, time of burn cessation, volume of wood residue burned, venting index values obtained for burning, and any extraordinary conditions encountered during the burn.

9. OPERATIONAL REQUIREMENTS FOR LIQUID WASTE DISPOSAL

9.1 Location

The designated septage waste disposal area shall be clearly identified at the landfill site. Septage waste disposal shall be restricted to this area. The location and design of the designated septage waste disposal area shall be to the satisfaction of the Director. This area shall be fenced to restrict access to the sewage lagoons. Signs worded 'Septage Waste Disposal' shall be erected and maintained such that the lagoons are identifiable from any approach.

9.2 Freeboard and Berms

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

9.3 Nature of Wastes

The nature of wastes which may be discharged to the designated lagoons is that of typical septic tank pumpage, holding tank waste and sewage treatment plant sludge. Industrial sludges (including, but not limited to, oil separation sludges and the like) shall not be discharged to the designated lagoons.

9.4 Sludge Removal

Sludge from the septage lagoons shall be disposed in a manner and at a location approved by the Director. If the sludge is to be removed from the lagoon for final disposal on the adjacent landfill, the lagoon must be rested for a sufficient amount of time to allow the wastes to dewater. Once the solidified sludge is deposited on the

landfill, it must be covered immediately with a minimum of 30 centimetres of compacted cover material.

9.5 Lagoon Closure

If the lagoons are to be closed, the sludge must be allowed to dewater to a moisture content that will support final cover. The lagoons must then be covered with a minimum of 1 metre of compacted soil and sloped to promote runoff.

10. MONITORING REQUIREMENTS

The operational certificate holder shall have a qualified professional evaluate whether an environmental effects monitoring program is needed. The assessment and recommended monitoring program, should one be required, shall be submitted for Director's approval on or before June 30, 2013. In addition to surface water sites, the qualified professional should consider the necessity of establishing ground water monitoring locations.

Until June 30, 2013, an interim monitoring program shall be implemented as follows:

Sampling Locations[1] and EMS ID	Frequency[3]	Parameters[3]
Un-named Creek U/S of Iskut Landfill E282678 Un-named Creek D/S of Iskut Landfill E282679	twice annually, in April and September	**Field Measurements:** pH, dissolved oxygen, specific conductance, temperature **Lab Analysis:** BOD, total nitrogen, phosphorous, ammonia, pH, total and dissolved metals[2]

[1] Sampling locations are shown on the site plan
[2] Lab analysis for dissolved metals shall use a low level scan
[3] May be altered in future, depending on results

11. REPORTING REQUIREMENTS

11.1 Reporting

All reports, drawings, data, studies and the like shall be submitted in hardcopy and electronic formats unless otherwise specified by the Director.

11.2 Log Book

As required by Sections 4.17.9 and 5.6 the operational certificate holder

shall maintain a log book. The log book shall be made available for inspection by Ministry staff upon request.

11.3 Non-compliance Reporting

The operational certificate holder shall immediately notify the Director of any non-compliance with the requirements of this operational certificate and take appropriate remedial action. Written confirmation of all non-compliance events, including available test results, is required by facsimile or email to Environmental Protection staff within 24 hours of the original notification unless otherwise directed by the Director.

11.4 Non-compliance Follow-up

Upon request, the operational certificate holder shall submit to the Director a written report within 30 days of the non-compliance occurrence. The report shall include, but not necessarily be limited to, the following:

i) All relevant information and test results related to the non-compliance;

ii) an explanation of the most probable cause(s) of the non-compliance; and,

iii) remedial action planned and/or taken to prevent similar non-compliance(s) in the future.

11.5 Annual Report

The operational certificate holder shall submit a basic annual report to the Director on or before June 30 each year for the previous calendar year.

The report shall contain, at a minimum:

i) The type and tonnage or volume of waste received, recycled, and landfilled for the year;

ii) occurrences or observations of wildlife attempting to access the facility;

iii) the results of any monitoring programs undertaken by the operational certificate holder for this site. Trend analysis, as well as an evaluation of any identified impacts of the discharges on the

receiving environment in the previous year shall be carried out by a qualified professional, if determined to be necessary by the Director.

12. CLOSURE REQUIREMENTS

12.1 Notification of Closure

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

12.2 Closure Plan

A closure plan shall be submitted to the Director no later than 6 months in advance of scheduled closure. The closure plan shall, at a minimum, include the following:

i) Proposed end-use of the landfill property after closure;

ii) anticipated total waste volume, tonnage, and life remaining of the landfill;

iii) a topographic plan showing the final elevation contours of the landfill and surface water diversion and drainage controls;

iv) design of the final cover suited to the intended end-use of the site, including the thickness and permeability of barrier layers and drainage layers, and information on topsoil, vegetative cover and erosion prevention controls;

v) procedures for notifying the public about the closure and about alternative waste disposal facilities;

vi) rodent and nuisance wildlife control procedures;

vii) a comprehensive monitoring plan, if determined to be necessary by a qualified professional, including groundwater monitoring, surface water monitoring, landfill gas monitoring, leachate monitoring, final cover monitoring, and erosion and settlement monitoring, for a minimum post-closure period of 25 years;

viii) a plan and accompanying design for the collection, storage and treatment/use of landfill gas for a minimum 25 year post-closure period (if required);

ix) a plan for operation of any required pollution abatement engineering works such as leachate collection and treatment systems, for a minimum post-closure period of 25 years; and,

x) an estimated cost, updated annually, to carry out closure and post-closure activities for a minimum period of 25 years.

12.3 Closure Funding

The operational certificate holder shall ensure that sufficient funds will be available to provide for all closure and post-closure requirements as outlined in the closure plan required by Section 12.2, plus a reasonable contingency for any remediation which may be required.

12.4 Final Cover

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

12.5 Progressive Application of Final Cover

Completed portions of the landfill shall progressively receive final cover during the active life of the landfill. The maximum area of disposed refuse that has not yet received final cover shall not exceed 25% of the total final footprint area. Final cover is to be applied according to the specifications identified in Section 12.4.

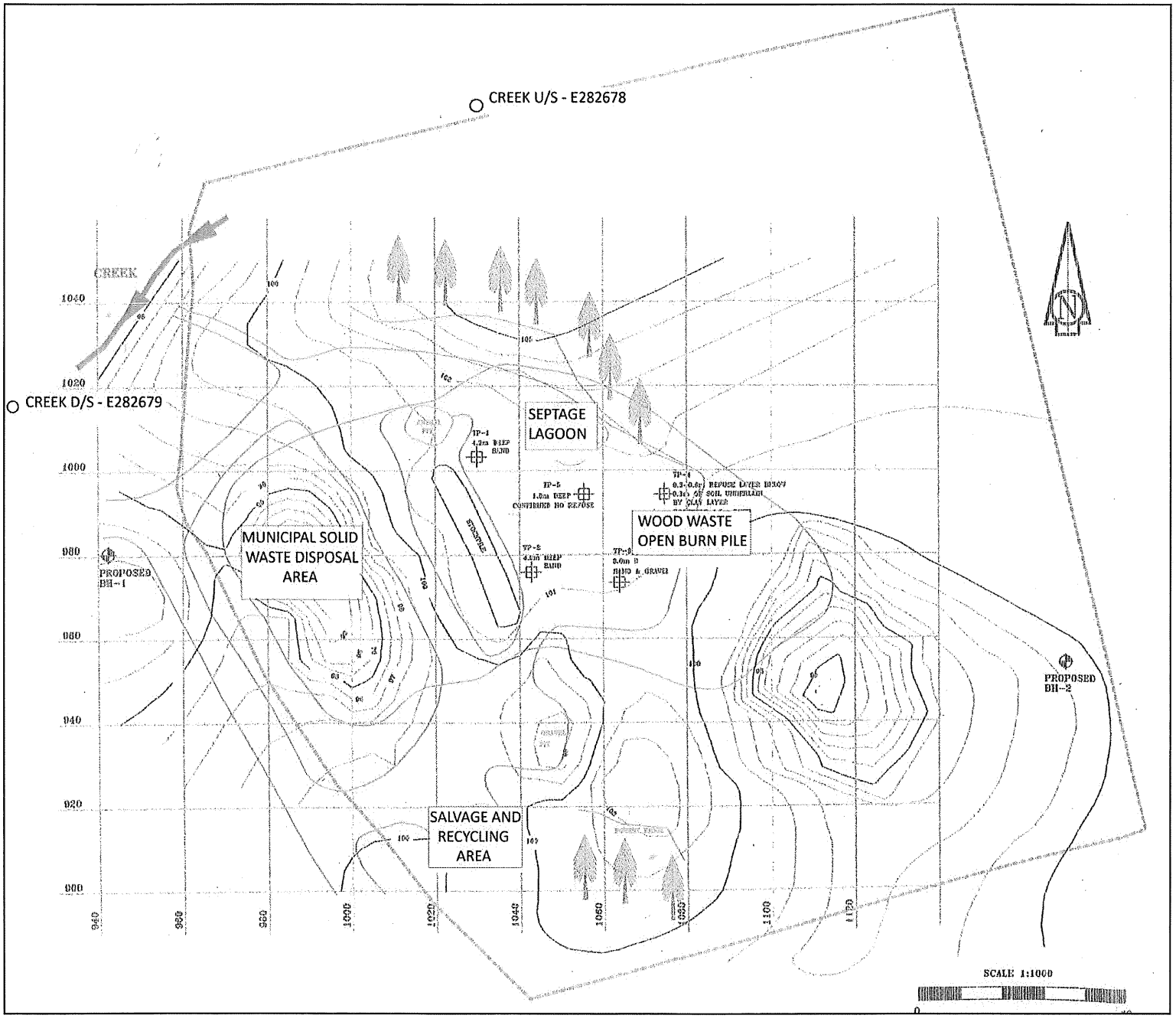
13. ENVIRONMENTAL IMPACT

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

M. Love.

Mark Love, P.Ag.
For Director, Environmental Management Act

SITE PLAN



Date Issued: December 20, 2012
Date Amended:
(most recent)

Mark Love, P.Ag
for Director, *Environmental Management Act*
Skeena Region
Permit Number: MR-4612

Appendix B Environmental Monitoring Report

SPERLING HANSEN ASSOCIATES

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

Regional District of Kitimat-Stikine

Iskut Landfill 2022 Environmental Effects Monitoring Program Annual Report

June, 2023

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Executive Summary

In 2023, Sperling Hansen Associates (SHA) was retained by the Regional District of Kitimat-Stikine (RDKS) to analyze and report on environmental monitoring results for the Iskut Landfill (the Landfill), as per the site's Operational Certificate (OC) MR-4612. As specified in Section 10.5 iii) of the OC, this report contains results of monitoring and sampling events, trend analysis, and evaluation of any identified impacts of discharges on the receiving environment.

The Iskut Landfill is owned and operated by the Regional District of Kitimat-Stikine (RDKS). It is located 2 km northwest of Iskut with access from the Stewart-Cassiar Highway. The Landfill serves the Iskut Community, which includes the area along Highway 37 north of Iskut to the Stikine River, and South of Iskut to Kinaskin Lake Provincial Park. The Landfill does not accept waste from mining camps or industrial project sites.

The Iskut Landfill site is 3.5 ha in size and includes a landfill, a septage receiving lagoon, a borrow area for cover material, and a designated area for the diversion of metal, tires, and clean wood. The Iskut Landfill is responsible for the management of municipal solid and liquid waste generated by commercial and residential premises in the Iskut Community and surrounding Electoral Area residents in accordance with the RDKS Solid Waste Management Plan and associated bylaw.

There is an unnamed creek located northwest of the Landfill, which flows west into Kluachon Lake. Drainage at the site is assumed to flow to the west and southwest along the existing topography. As part of the Environmental Effects Monitoring Program (EEMP), this tributary is monitored and sampled twice annually in May and September for field and lab parameters. Groundwater has not been historically sampled at this site, and no groundwater monitoring infrastructure was in place until August 2022 when the RDKS installed three groundwater wells. These wells are not yet incorporated into the EEMP, however once a formal review of the current EEMP is completed in 2023, these wells will be used to assess potential landfill impacts on groundwater.

Two surface water locations were tested, including one upstream location (Upstream – E278450) and one location downstream (Downstream – E278449). Upstream is assumed to represent background water quality, and Downstream is assumed to represent water quality that may be impacted from the Landfill. Results of 2022 monitoring and sampling events were compared with water quality criteria for the protection of aquatic life. There were no exceedances of these criteria observed in 2022.

Field sampling and Quality Assurance/Quality Control (QA/QC) procedures were found to comply with the *BC Field Sampling Manual*. Trend analysis indicates that Upstream and Downstream locations exhibit similar temporal patterns. Further monitoring is required to determine the extent of the Landfill's influence in the upstream area.

Statement of Limitations

This report has been prepared by Sperling Hansen Associates (SHA) on behalf of the Regional District of Kitimat-Stikine (RDKS) 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, subject to the time limits and financial and physical constraints applicable to the services.

The report, which specifically includes all tables and figures, is based on engineering analysis by SHA staff of data compiled during the course of the project. Except where specifically stated to the contrary, the information on which this study is based has been obtained from the RDKS and its consultants. This 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 RDKS for the management of the Iskut Landfill located north of Iskut, BC. Any use which a third party makes of this report, or any reliance on, or decisions to be made based on it, are the responsibilities of such third 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 as a result 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.

Acronyms and Definitions

Environmental Effects Monitoring Program	EEMP
Hectare	ha
Hazelton Waste Management Facility	HWMF
Kilometre	km
Kitwanga Landfill	KL
Ministry of Environment and Climate Change Strategy	ENV
License of Occupation	LoO
Metre	m
Non-compliance Report	NCR
Operational Certificate	OC
Quality Assurance Quality Control	QAQC
Regional District of Kitimat-Stikine	RDKS
Relative Percent Difference	RPD

Contents

Tables

1 Introduction

In 2023, Sperling Hansen Associates (SHA) was retained by the Regional District of Kitimat-Stikine (RDKS) to analyze and report on environmental monitoring results for the Iskut Landfill (the Landfill), as per the site's Operational Certificate (OC) MR-4612. This report details the results and trends of the Environmental Effects Monitoring Program (EEMP), and assesses the potential impacts of the Landfill on the receiving environment during the reporting period of January 1, 2022 – December 31st, 2022.

Appendix A attached presents Figure 1 – Landfill Site Map.

2 Background

The Iskut Landfill is owned and operated by the Regional District of Kitimat-Stikine (RDKS). It is located 2 km northwest of Iskut with access from the Stewart-Cassiar Highway. Landfill operations are regulated by the Ministry of Environment and Climate Change Strategy (ENV) under OC MR-4612 (Appendix B) and conducted in accordance with Iskut Landfill Operations and Closure Plan prepared by Sperling Hansen Associates in February 1999. The Landfill serves the Iskut Community, which includes the area along Highway 37 north of Iskut to the Stikine River, and South of Iskut to Kinaskin Lake Provincial Park. The landfill does not accept waste from mining camps or industrial project sites.

2.1 Site Description

The Iskut Landfill site is 3.5 ha in size and includes a landfill, a septage receiving lagoon, a borrow area for cover material, and a designated area for the diversion of metal, tires, and clean wood. The Iskut Landfill is responsible for the management of municipal solid and liquid waste generated by commercial and residential premises in the Iskut Community and surrounding Electoral Area residents in accordance with the RDKS Solid Waste Management Plan and associated bylaw.

Located in the Iskut River valley, the Landfill overlies regional igneous bedrock containing andesite and basalt. Historical glaciation in the area has resulted in dense till deposits and outwash deposits of sand and gravel. Borehole logs completed in 2022 indicate the subsurface materials primarily consist of sand with an average depth to water of 10 m below ground surface. There are no identified aquifers beneath, adjacent to, or downgradient of the Landfill.

There is an unnamed creek located northwest of the Landfill, which flows west into Kluachon Lake. Drainage at the site is assumed to flow to the west and southwest along the existing topography. As part of the Environmental Effects Monitoring Program (EEMP), this tributary is monitored and sampled twice annually in May and September for field and lab parameters. The creek is sampled at a location upstream of the Landfill (Upstream, E282678), and downstream (Downstream, E282679), described further in Section 3.

Groundwater has not been historically sampled at this site, and no groundwater monitoring infrastructure was in place until August 2022 when the RDKS installed three groundwater wells.

These wells are not yet incorporated into the EEMP, however once a formal review of the current EEMP is completed in 2023, these wells will be used to assess potential impacts on groundwater.

2.2 Recent Studies and Investigations

2.2.1 Facility Inspections by ENV

There were no facility inspections or visits from ENV during 2022.

2.2.2 Field Studies

In 2022 a hydro-geotechnical program was undertaken to install three groundwater monitoring wells, and to provide an environmental review of the interim EEMP of the OC. A senior hydrogeologist from Waterline Resources Inc. installed three monitoring wells within the landfill tenure on August 9th and 10th of 2022. The locations of these wells are shown on Figure 1. Reporting deliverables for the groundwater well installation and environmental review were not received in 2022 and will be covered in the Iskut Landfill 2023 EEMP annual report.

2.3 Non-Compliance Reporting

There were no EEMP non-compliances for the Iskut Landfill during 2022.

3 Environmental Effects Monitoring Program

As per the site OC, the RDKS is required to conduct environmental monitoring and sampling, and report on the results. Section 10 of the OC details locations, frequency, and parameters in the interim Environmental Effects Monitoring Program (EEMP). This EEMP is an interim way of assessing potential environmental impact and will be reviewed by a Qualified Professional and updated in 2023. Table 3-1 below shows the interim EEMP requirements.

Table 3-1: Interim EEMP Requirements

Sampling Locations	EMS ID	Frequency	Parameters
Un-named Creek Upstream of Iskut Landfill	E282678	Twice annually, in April and September	Field Measurements: pH, dissolved oxygen, specific conductance, temperature
Un-named Creek Downstream of Iskut Landfill	E282679		Lab Analysis: BOD, total nitrogen, phosphorous, ammonia, pH, total and dissolved metals

The current EEMP includes the monitoring and sampling of two surface water locations, an Upstream location (also referred by EMS ID E282678), and Downstream location (E282679). These locations should be monitored and sampled semi-annually in April and September,

however the surface water sites have historically found to be frozen in April, so the spring event is completed in May.

The requirements listed in the OC are an interim EEMP that requires review by a Qualified Professional (QP) to determine if the program is adequately monitoring impact from the Landfill. This review is being undertaken by the RDKS and its consultant in 2023 and will result in recommended changes for the EEMP.

As discussed in Section 2.2.2 above, three groundwater wells were installed in 2022 for the purpose of obtaining groundwater samples and providing an understanding of environmental impacts on local groundwater. These wells are currently part of the EEMP however, they are expected to become part of the program in 2023 and the results analyzed in the next annual EEMP report.

3.1 Monitoring Locations

The location of two surface water sites and three groundwater wells are presented in Figure 1, attached as Appendix A. Table 3-2 summarizes the location details.

Table 3-2: Monitoring Location Summary

Location	EMS ID	Sample Type	Location Coordinates		
			Zone	X	Y
SW-DS	E282679	Surface Water	09V	440755	6413057
SW-US	E282678	Surface Water	09V	440966	6413142

3.2 Regulatory Framework

In accordance with Section 4.15 – Water Quality and Protection – of the Landfill's OC, groundwater is to be managed in compliance with the *Contaminated Sites Regulation* (CSR). Schedule 2 of the CSR lists specified industrial and commercial uses that indicate a site may be deemed contaminated; Subsection H – Waste Disposal and Recycling Operations and Activities describes the types of land use the Iskut Landfill falls under. Schedule 3.2 of the CSR presents generic numerical water standards for four water applications; Aquatic Life (AW), Irrigation (IW), Livestock (LW), and Drinking Water (DW). As per CSR Protocol 21, DW standards are considered to apply where groundwater on or within 500 m of the site is used as a drinking water source. Groundwater is not used for drinking on or within 500 m of the site, however future drinking water use must also be considered, and there is not adequate information to rule out the possibility of a drinking water source aquifer beneath the site. Therefore, the DW standards have been applied. CSR AW standards apply to groundwater due to the proximity of aquatic receiving environments, including wetlands and the unnamed tributary, within 500 m of the site.

Groundwater wells were first installed and the first set of groundwater samples obtained at the site in August 2022. Groundwater sampling requirements are not included in the EEMP currently, so the analysis of these samples is not included in the discussion of this report.

No water quality guidelines for surface water have been specified in the Landfill's OC. For comparison purposes, surface water sample results have been compared with the following BC guidelines:

- BC Approved Water Quality Guidelines for freshwater aquatic life (BC AWQG) long-term (LT) and short-term (ST),
- BC Working Water Quality Guidelines aquatic life (BC WWQG AL)

Table 3-3: Regulatory Framework and Applicable Sites

Criteria or Guideline	Applicable
BC AWQG AL LT & ST, BC WWQG AL	SW-DS (E278449), SW-US (E278450), SW22-01
CSR DW, CSR AW	MW22-01, MW22-02, MW22-03

3.3 Methodology

Monitoring and sampling of environmental media including groundwater and surface water are conducted as per the latest *BC Field Sampling Manual* and *Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills.* Sampling and monitoring are completed in house by the RDKS Environmental Technician, and a field second, and is overseen by the RDKS Environmental Services Coordinator.

Field monitoring is conducted prior to sampling, and these measurements are recorded for compilation with lab results. Sampling includes collecting surface/groundwater, and field filtering if needed, directly into sterile bottles that have been pre-charged with preservatives from the laboratory. The sample kits are packed with ice packs in coolers and sent via courier to ALS Environmental laboratory for analysis.

3.4 QAQC Program

The RDKS includes the following samples in the EEMP to ensure thorough quality assurance/quality control (QAQC) and uncompromised integrity of samples.

Trip Blanks (travel blanks) are used to assess potential contamination of samples during storage and transport. These samples use water that is not from the sample source (de-ionized, carbon free water is recommended).

Field Blanks are intended to detect the effects of ambient and environmental conditions on the sample characteristics. Typically, these are prepared by the laboratory or in the field, with de-ionized water that is exposed to the same conditions as the regular samples i.e., filtering, preservation, open air).

Duplicate Samples are those additional samples collected in the same area and time as regular samples, with the goal to get these as close as possible. Duplicates will provide information on sample handling and laboratory analysis and should show any discrepancies among sample results.

Table 3-4: QAQC Samples

Sample Collection/Monitoring Date	Sample Type	Number of Field Blanks	Number of Duplicates	Number of Travel Blanks	Total Samples
May 25, 2022	Surface Water	1	1	1	5
September 13, 2022	Surface Water	1	1	1	5

4 Results and Discussion

As per the requirements of the OC, monitoring and sampling was completed semi-annually. In 2022, samples were collected in May and September. Additional parameters, including dissolved organic carbon (DOC) and hardness (CaCO3), were added to the required analysis of the OC to assist in comparing the results with the BC WQG AW. Photos obtained during field events on May 25th and September 13th 2022 are attached in Appendix C. The results of these monitoring and sampling events are discussed in the sections below.

4.1 Surface Water

4.1.1 Monitoring

Field measurements from monitoring activities are presented in the table below.

Monitoring results were generally consistent with those observed in 2021, with cooler water temperatures in May and warmer temperatures in September. Similarly, dissolved oxygen (DO) concentrations are typically higher in May than September. However, pH decreased from spring to fall, indicating a more acidity in the warmer water conditions. The Upstream location (E282678) specific conductance measurements increased significantly after May. Stream flow was observed to be much lower in the fall, resulting in less dilution.

Table 4-1: Monitoring Results Summary

Date	Site	Water Temperature (degrees C)	DO mg/L	Specific Conductance (µS/cm)	pH (pH units)
2022-05-25	Upstream E282678	1.5	11.6	358.8	6.52
2022-05-25	Downstream E282679	3.3	12.7	347.7	8.34
2022-09-13	Upstream E282678	7.8	7	415.4	6.29
2022-09-13	Downstream E282679	5.9	11.3	348.8	8.08

4.1.2 Sampling

In 2022, no exceedances of applicable water quality criteria were observed.

4.2 QAQC Results

In 2022, two field blanks, two travel blanks, and two duplicate samples were submitted with the other samples for analysis. The blank sample results are presented in Appendix E Table E-3, and the duplicate results are included in Table E-1.

As outlined in Part A of the BC Field Sampling Manual, the relative percent difference (RPD) between duplicate and its original sample should not exceed 20%. Exceedance of >50% RPD indicates quality assurance issues and should be investigated. In 2022, no parameters were found to have exceeded 20% RPD between sample results.

The samples are analysed at ALS Environmental, which is a certified laboratory through the Canadian Association for Laboratory Accreditation (CALA). Analyses are completed with a quality control report appended to each Certificate of Analysis (COA). The reports contain:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

COA's are attached in Appendix D.

5 Trend Analysis

No leachate indicator parameters were detected above guideline limits upstream or downstream of the Landfill. Following trend analysis of three parameters graphed in previous years, the figures presented in Appendix F visually illustrate current and historical trends as an indicator of potential exceedances.

The graphs show surface water quality results from 2014 – 2022, with parameters including conductivity, iron (total), and aluminum (total). There is a gap in conductivity data for the Upstream location between 2018 and 2019. Results at the Downstream location for the fall 2019 event are missing due to the location being frozen.

Generally, conductivity levels have been increasing since 2013. Aluminum and iron have consistently decreased since 2015. The Downstream (E282679) and Upstream (E282678) locations have remained very close in the aluminum and iron trends, with the Upstream location exhibiting slightly higher concentrations.

6 Conclusion and Recommendations

During both sampling and monitoring events of 2022, no exceedances were observed when results were compared with applicable water quality criteria. Trends in metals indicate a decrease

in trends over the past ten years. Conductivity has fluctuated between the spring and fall sampling events and between the Upstream and Downstream locations over the years.

Recommendations made below are intended to help interpret the water quality of Unnamed Creek and better understand any impact of the Iskut Landfill on the receiving environment.

Based on the findings of this report, the following are recommended for the RDKS's consideration in 2023:

- Consider adding turbidity, total dissolved solids (TDS), and total suspended solids (TSS) to the EEMP to assist in interpretation of the source of elevated specific conductance.
- Complete the planned review and update of the Iskut Landfill EEMP and introduce the groundwater monitoring wells installed in 2022 into the analysis and reporting program.
- Continue to monitor and sample environmental media at the Iskut Landfill and report on results annually in accordance with the OC and latest version of the EEMP.

7 Closure

Please do not hesitate to contact the undersigned with questions regarding the contents of this report.

Sincerely,

SPERLING HANSEN ASSOCIATES

Report by:

Chloe Hetherington, BA
Environmental Analyst

Report reviewed by:

Megan Haley, P. Chem
Sr. Environmental Scientist

References

Ministry of Environment and Climate Change Strategy, 2012. Operational Certificate MR-4612 for the Iskut Landfill.

Tattersfield Consulting, 2022. Iskut Landfill 2021 Environmental Monitoring Report.

Tattersfield Consulting, 2021. Iskut Landfill 2020 Environmental Monitoring Report.

Tattersfield Consulting, 2020. Iskut Landfill 2019 Environmental Monitoring Report.

Tattersfield Consulting, 2019. Iskut Landfill 2018 Environmental Monitoring Report.

Tattersfield Consulting, 2018. Iskut Landfill 2017 Environmental Monitoring Report.

Appendix A: Figure 1 Site Map

Project:

Iskut Landfill
2022 Environmental Effects Monitoring Program

Regional District of
Kitimat-Stikine
Suite 300 - 4545 Lazelle Avenue
Terrace, B.C. V8G 4E1

Legend:

- Monitoring Well
- Surface Water Site
- Field Mapped Skid Trail
- Field Mapped Watercourse
- Watercourse 5k TRIM
- Tenure Lease
- Forceman Ridge Waste Management Facility

Title:

Surface Water, Facility Sites & Groundwater Well Locations

Scale: 1,500	Projection: NAD 1983 UTM Zone 9N
File: 5360-03-02-05	Date: February 13, 2023
Drawn: N. Lavoie Reviewed: E. Blaney	Figure No **Figure 1**

Appendix B: Operational Certificate

ISKUT LANDFILL
5360 03 02

BRITISH COLUMBIA
The Best Place on Earth

File: MR-4612

Date: December 20, 2012

REGISTERED MAIL

Regional District of Kitimat-Stikine
300-4545 Lazelle Avenue
Terrace, BC
V8G 4E1

Dear Operational Certificate Holder:

Enclosed is Operational Certificate MR-4612 issued under the provisions of the *Environmental Management Act*. Your attention is respectfully directed to the terms and conditions outlined in the operational certificate.

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

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

Administration of this operational certificate will be carried out by staff from the Skeena Region. Plans, data and reports pertinent to the operational certificate are to be submitted to the Director, Environmental Protection, at Ministry of Environment, Regional Operations, Skeena Region, 3726 Alfred Avenue, Box 5000, Smithers, BC, V0J 2N0.

Yours truly,

M. Love

Mark Love, P. Ag.
for Director, *Environmental Management Act*
Skeena Region

Enclosure

Ministry of Environment
Regional Operations
Skeena Region
Mailing/Location Address
3726 Alfred Avenue
Box 5000
Smithers, BC, V0J 2N0
Telephone: (250) 847-7260
Facsimile: (250) 847-7591
http://www.gov.bc.ca/env

MINISTRY OF ENVIRONMENT

OPERATIONAL CERTIFICATE
MR-4612

for the

ISKUT LANDFILL

Under the Provisions of the Environmental Management Act
and in accordance with the approved
Regional District of Kitimat-Stikine Solid Waste Management Plan, the

Regional District of Kitimat-Stikine

Suite 300-4545 Lazelle Avenue

Terrace, British Columbia

V8G 4E1

is authorized to store, handle, treat and discharge municipal solid waste from Iskut and surrounding area at the Iskut landfill, subject to the conditions listed below. Contravention of any of these conditions is a violation of the *Environmental Management Act* and may result in prosecution.

1. LOCATION OF LANDFILL PROPERTY

The location of the property where discharges are authorized to occur is 350 metres north of the Iskut airstrip, at coordinates 57°51'18.70"/129°59'43.56, Cassiar Land District.

M. Love

Mark Love, P.Ag.
For Director, Environmental Management Act

Date Issued: December 20, 2012
Date Amended:
(most recent)

2. AUTHORIZED DISCHARGES

2.1 Discharge of Municipal Solid Waste

This section applies to the discharge of municipal solid waste to ground at the landfill located approximately as shown on the attached site plan. The site reference number for this discharge is E208904. Refer to Section 5 for the operational requirements associated with this discharge.

2.1.1 Subject to Sections 4.2, 4.3 and 4.4, the characteristics of the discharge shall be typical of municipal solid waste.

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

2.1.3 The authorized works are a separate municipal solid waste disposal area and related appurtenances located approximately as shown on the attached site plan.

2.2 Storage and Handling of Wastes for Salvage and Recycling

This section applies to the storage and handling of municipal solid wastes for salvage and recycling. Refer to Section 7 for the operational requirements associated with this discharge.

2.2.1 Subject to Section 4.2, the characteristics of the discharge shall be typical of recyclable municipal solid waste.

2.2.2 The quantity of recyclable wastes stored or handled is indeterminate.

2.2.3 The authorized works are a separate recyclable municipal solid waste storage area and related appurtenances located approximately as shown on the attached site plan.

2.3 Discharge of Air Contaminants from Open Burning

This section applies to the discharge of air contaminants to the atmosphere from the regulated open burning of wood and selected combustibles from a burn pile located approximately as shown on the attached site plan. The site reference number for this discharge is E220154. Refer to Section 8 for the operational requirements associated with this discharge.

2.3.1 The characteristics of the discharge shall be typical of those resulting from the regulated open burning of selected combustibles as per Section 8.3.

2.3.2 The maximum authorized rate of discharge is indeterminate.

2.3.3 The authorized works are a separate burn area associated with a landfill operation and related appurtenances located approximately as shown on the attached site plan.

2.4 Discharge of Liquid Wastes

This section applies to the discharge of septage into a septage lagoon and thence to ground, located approximately as shown on the attached site plan. The site reference number for this discharge is E277450. Refer to Section 9 for the operational requirements associated with this discharge.

2.4.1 Subject to Section 4.2, the characteristics of the discharge shall be typical of septic tank pumpage, holding tank and sewage treatment plant sludges.

2.4.2 The maximum authorized quantity of discharge is 1000 m^3/year.

2.4.3 The authorized works are exfiltration lagoons associated with a landfill operation and related appurtenances.

3 LANDFILL DESIGN

3.1 Design by Qualified Professional(s)

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

3.2 Construction

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

3.3 Engineered Footprint

The landfill design shall include preparation of an engineered final design footprint delineating the maximum extent of solid waste disposal allowable at the facility horizontally (in plan view). The engineered final design footprint shall be clearly shown on a scaled plan of the site and the plan made available in PDF format (see Section 3.6). These details shall be documented in the DOCP.

3.4 Engineered Excavation and Final Grade Contours

The landfill design shall include preparation of engineered excavation grade (if below grade landfilling is to occur) and final grade contours delineating the maximum extent of solid waste disposal allowable at the facility vertically (in cross-sectional view). The engineered excavation and final grade contours shall be clearly shown on scaled drawings (accompanied with typical cross sections to aid in depicting the landfill profile) and the drawings shall be made available in PDF format (see Section 3.6). These details shall be documented in the DOCP.

3.5 Legal Survey

The landfill property shall be legally surveyed on or before June 30, 2016, or a minimum of 6 months prior to closure, whichever is sooner.

3.6 Scaled Drawings

A scaled site plan accurately showing the legal survey (when completed), the engineered final design footprint, and final design contours, shall be included in the DOCP and made available in PDF format upon request by the Director. Additional scaled drawings showing excavation contours (if relevant) and typical cross sectional views of the site shall also be included in the DOCP.

4. GENERAL REQUIREMENTS

4.1 Site Identification

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

4.2 Prohibited Wastes

No wastes as defined by the *Hazardous Waste Regulation* shall be received, stored, treated or disposed of at this site except as authorized by the Director.

M. Love

Mark Love, P.Ag.
For Director, Environmental Management Act

Lead-acid batteries shall not be landfilled but may be salvaged/recycled provided they are stored, handled and shipped in compliance with the *Hazardous Waste Regulation* and with Section 8 of this operational certificate. Tires equal to or less than 22" in rim size and autohulks shall not be landfilled.

4.3 Waste Asbestos

Notwithstanding Section 4.2 of this operational certificate, the disposal of waste asbestos under Section 2.1 of this operational certificate and in compliance with the requirements of Section 40 of the *Hazardous Waste Regulation* is hereby authorized.

4.4 Contaminated Soil

Soil that contains contaminants in concentrations less than "Hazardous Waste" as defined by the *Hazardous Waste Regulation* may be disposed at the landfill site. Disposal includes monofilling, co-disposal with other wastes, use as a refuse cell berm material and use as a refuse cell cover material. Disposal must occur within a disposal area as authorized by Section 5 of this operational certificate. Disposal does not include use as final cover material.

4.5 Waste Measurement

The quantity of waste material landfilled at the site shall be measured or estimated by means suitable to the Director. The results shall be submitted in accordance with Section 11.5, once per year on or before June 30 for the previous year, expressed in tonnes/yr and/or m^3/yr.

4.6 Ozone Depleting Substances

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

4.7 Fire Prevention

The operational certificate holder shall make all reasonable efforts to prevent unauthorized fires from occurring at the landfill site. As a minimum, a fire break clear of all combustible materials at least 15 metres wide shall surround all disposal, treatment and individual storage areas which have received or are receiving combustible materials. Disposal areas that have had 30 cm of compacted mineral soil cell cover or final cover applied are exempt. Water supply and pumping capabilities and/or soil and earth moving equipment shall be

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For Director, Environmental Management Act

maintained at a sufficient level to extinguish fires. In addition, reasonable efforts shall include, but are not necessarily limited to, the preparation of a Fire Prevention and Response Plan.

4.8 Extinguishment of Fires

In the event of an unauthorized fire (including any smouldering fire), the operational certificate holder shall immediately make all reasonable efforts to extinguish the fire. The operational certificate holder shall also immediately notify the Provincial Emergency Program (phone: 1-800-663-3456) and any local fire authority of an unauthorized fire.

4.9 Buffer Zone

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

4.10 Litter Control

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

4.11 Water Table Restriction

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

4.12 Surface Water Management

The distance between a natural body of surface water and any stored or buried materials shall be a minimum of 25 metres.

4.13 Inert Materials

Specific inert materials may be exempted from the requirements of Section 4.11 by the Director. The permission of the Director must be obtained in writing prior to any disposal or handling of inert materials on an exemption basis.

4.14 Landfill Gas Lower Explosive Limit

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

4.15 Water Quality and Protection

The landfill shall be operated in a manner such that ground or surface water quality does not decrease beyond that specified by the Director, at the landfill property boundary or other specified location.

If exceedences of the specified criteria occur as a result of landfill operations, the Director may require that leachate management control measures or works be undertaken. Terms of reference for any leachate management study and/or design work shall be submitted to the Director for approval prior to conducting the work.

In addition to requirements specified by the director, groundwater must be managed in accordance with the Contaminated Sites Regulation.

4.16 Maintenance of Works and Emergency Procedures

The operational certificate holder shall inspect the operation regularly and maintain it in good working order. The operational certificate holder shall immediately notify the Director of any circumstance which prevents continuing operation in the approved manner or results in non-compliance with the requirements of this operational certificate.

4.17 Electric Fencing

4.17.1 Design, Construction and Maintenance

Wherever required, electric fencing and gate systems at the landfill shall be designed, constructed, and maintained such that bears are prevented from entering into the landfill through any portion of the fence or gates at any time of the day.

4.17.2 Fence Type

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

A fence fabric may be used instead of high tensile smooth wire. The fence fabric shall: be a minimum of 1.22 metre high; be constructed of a minimum

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For Director, Environmental Management Act

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

4.17.3 Wire Tension

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

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

where: *Tension* is in lbs force

Temperature is in °C

4.17.4 Post Spacing

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

4.17.5 Grounding System

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

4.17.6 Period of Operation

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

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For Director, Environmental Management Act

4.17.7 Minimum Voltage

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

4.17.8 Gate(s)

Any access through electric fencing for vehicles, equipment and personnel shall consist of an electrified gate system that is closed during non-operating hours. The gate system shall be electrified to a minimum voltage of 6,000 volts at all times except when being opened or closed. Any gate that is open during operating hours shall be periodically checked by the attendant for bear activity during hours of operation. Gaps between the gate and the fence and ground, and between gate panels (for a double-hung gate), shall not exceed 10 cm.

4.17.9 Fence Inspections

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

Signs of digging or other attempts by bears to penetrate electric fencing shall be recorded in a log book. Any penetrations through electric fencing by bears shall be immediately reported to the Conservation Officer Service at 1-877-952-7277 and to the Director at 250-847-7260.

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

4.18 Other Agency Requirements

This operational certificate does not relieve the operational certificate holder from complying with requirements of federal, provincial, regional district or municipal authorities.

M. Love

Mark Love, P.Ag.
For Director, Environmental Management Act

5. OPERATIONAL REQUIREMENTS FOR THE DISPOSAL OF SOLID WASTE

5.1 Location

The operational certificate holder shall identify an area for disposal of solid waste (herein referred to as the solid waste disposal area) that is within the authorized municipal solid waste disposal footprint (see Section 2.1.3). Signs which identify the nature of the waste acceptable at the designated solid waste disposal area shall be erected and maintained. The lettering on the sign shall be such that it is clearly readable by the public upon approach.

5.2 Nature of Wastes

Wastes disposed at the active face of the solid waste disposal area may include any municipal solid waste except liquid wastes and hot ashes or as otherwise restricted by Section 4.2.

5.3 Bear-Proofing

The solid waste disposal area shall be maintained inside an electric fence. The electric fence shall comply with all requirements of Section 4.17.

5.4 Waste Compaction

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

5.5 Maximum Lift Height

The maximum height of any lift of compacted waste in the solid waste disposal area shall be 5 metres.

5.6 Waste Cover

Cover shall be applied to waste in the solid waste disposal area as specified below. The operational certificate holder shall maintain a log book to record all dates of cover application.

5.6.1 Active Face Cover

Except as otherwise stated in Sub-section 5.6.2, the active face of the solid waste disposal area does not normally require cover. Based on information concerning environmental or public health concerns related to exposed waste at the active face, however, the Director may require that

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For Director, Environmental Management Act

the active face be covered completely at a specified frequency with 0.15 m of soil (or functional equivalent) for a specified period.

5.6.2 Cell Cover

A uniform cover of 30 cm compacted soil shall be applied to all sides of the active waste cell in the solid waste disposal area such that no more than 200 m^2 of waste are exposed at the active face at any time and such that the volume of waste in the cell does not exceed 2000 m^3. Once the maximum volume of waste has been reached in a cell, the active face shall be covered with 30 cm of compacted soil and a new waste cell begun.

5.6.3 Final Cover

Completed portions of the solid waste disposal area shall progressively receive final cover during the active life of the landfill (see Section 12.5).

5.7 Dead Animal Disposal

Dead animals and animal parts shall be disposed of in the solid waste disposal area and covered as soon as practicable with a minimum of 60 centimetres of soil and/or waste material such that flies and scavenging animals are prevented from accessing the carrion. Disposal of Specified Risk Material from cattle shall only be done in accordance with Canadian Food Inspection Agency requirements and procedures.

6. OPERATIONAL REQUIREMENTS FOR COMPOSTING

6.1 Composting

Composting operations shall comply with the requirements of the *Organic Matter Recycling Regulation* and any other relevant legislation.

6.2 Bear-Proofing

If the composting operation is to receive any organic wastes that are potential attractants to bears, then composting shall be completely enclosed by an electric fence or contained in a bear-proof structure (building or composting vessel). The electric fence shall comply with all requirements of Section 4.17.

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For Director, Environmental Management Act

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

7.1 Location

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

7.2 Nature of Wastes

Wastes to be salvaged/recycled may be any items with potential salvage or recycling value such as tires, lead-acid batteries, auto hulks, white goods, furniture, used lumber, used goods and the like, but shall not include any refuse consisting of or containing putrescibles, any liquid wastes, hot ashes or materials otherwise restricted by Section 4.2.

7.3 Compliance

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

7.4 Contamination

Contamination of any of the designated salvage/recycling storage piles with putrescible wastes shall be cleaned up immediately.

8. OPERATIONAL REQUIREMENTS FOR REGULATED OPEN BURNING

8.1 Location

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

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For Director, Environmental Management Act

8.2 Quantity, Timing, and Duration of Discharge

The maximum authorized quantity of wood residue to be open burned during each event is that which has accumulated at the time of burn initiation. The pile(s) shall be constructed so as to ensure a rapid and complete burn. The quantity of air contaminants is indeterminate.

The maximum authorized duration of each burn shall be limited to the period between two hours after sunrise on the day of ignition, and sunset on the following day. Each open burn must be completely extinguished at the end of the authorized burn duration.

Should a condition arise which prevents the burn pile(s) from being burned within this period, the Director must be notified in accordance with Section 8.10 of this authorization.

8.3 Nature of Wastes

No wastes shall be burned which are unacceptable to the Director. Acceptable materials for burning may only include dry, unpainted, untreated demolition, construction and packing-related wood residue, clean stumps and brush, but must exclude nuisance-causing combustibles such as glue-containing wood, painted and treated wood, sawdust, yard wastes, mulch, wood chips, rubber, plastics, tars, insulation, roofing material, asphalt shingles, etc.

8.4 Favourable Weather for Smoke Dispersion

Open burning shall not proceed unless weather conditions are such that emissions are dispersed away from populated areas.

The operational certificate holder must also obtain a burn registration number from the Ministry of Forests (1-888-797-1717) prior to ignition.

Open burning of wood residue must not be initiated or continued if the local air flow will cause the smoke to negatively impact a nearby population or cause pollution.

No burning shall occur during periods of fire hazard or when burning is prohibited by other agencies.

8.5 Fire Accelerant

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

8.6 Minimization of Smoke

The burn shall be tended and fed in a manner that ensures minimization of smoke emissions. Measures to minimize smoke shall include, but not necessarily be limited to: stacking of waste in a manner that eliminates dirt; waiting to burn until wastes are reasonably dry after any significant precipitation event; and using adequate equipment and staff.

8.7 Contingency Plan

Prior to burning, a contingency plan must be in place detailing how the open burn will be extinguished in the event of any of the following occurring:

i) Inadequate smoke dispersion in the surrounding environment;

ii) wood residue continues to smoulder after the authorized burn period; and,

iii) the Director requires that the open burn be extinguished for environmental protection reasons.

At a minimum, the plan must detail the actions to be taken to extinguish the open burn should any of the above conditions occur. The plan shall be made available to the Director upon request.

8.8 Extinguishment

All combustion shall be completely extinguished at the end of the authorized period as set out in Section 8.2 "Quantity, Timing and Duration of Discharge."

8.9 Fire Supervision and Suppression

An attendant shall be on-site to supervise the burn. Adequate fire suppression equipment shall be available for the entire duration of the event, and must be capable of extinguishing the fire if necessary. Local fire departments must be notified of the operational certificate holder's intent to burn, prior to ignition.

8.10 Maintenance of Works and Emergency Procedures

The operational certificate holder shall inspect the burn piles regularly and ensure that they are burning well. In the event of an emergency, or condition beyond the control of the operational certificate holder which prevents continuing operation of the approved method of open burning, the operational certificate holder shall notify the Director within two hours. If notification is necessary, it shall be accomplished by contacting the Environmental Protection program at (250) 847 – 7260.

The Director may require additional controls on the burning process and may require that the burn be extinguished at any time based on its impacts on the receiving environment.

8.11 Documentation

Following completion of each burn, notice shall be sent to the Director by fax (250-847-7591) or by e-mail to a Skeena Environmental Protection staff member advising of the following details: time of burn initiation, time of burn cessation, volume of wood residue burned, venting index values obtained for burning, and any extraordinary conditions encountered during the burn.

9. OPERATIONAL REQUIREMENTS FOR LIQUID WASTE DISPOSAL

9.1 Location

The designated septage waste disposal area shall be clearly identified at the landfill site. Septage waste disposal shall be restricted to this area. The location and design of the designated septage waste disposal area shall be to the satisfaction of the Director. This area shall be fenced to restrict access to the sewage lagoons. Signs worded 'Septage Waste Disposal' shall be erected and maintained such that the lagoons are identifiable from any approach.

9.2 Freeboard and Berms

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

9.3 Nature of Wastes

The nature of wastes which may be discharged to the designated lagoons is that of typical septic tank pumpage, holding tank waste and sewage treatment plant sludge. Industrial sludges (including, but not limited to, oil separation sludges and the like) shall not be discharged to the designated lagoons.

9.4 Sludge Removal

Sludge from the septage lagoons shall be disposed in a manner and at a location approved by the Director. If the sludge is to be removed from the lagoon for final disposal on the adjacent landfill, the lagoon must be rested for a sufficient amount of time to allow the wastes to dewater. Once the solidified sludge is deposited on the

landfill, it must be covered immediately with a minimum of 30 centimetres of compacted cover material.

9.5 Lagoon Closure

If the lagoons are to be closed, the sludge must be allowed to dewater to a moisture content that will support final cover. The lagoons must then be covered with a minimum of 1 metre of compacted soil and sloped to promote runoff.

10. MONITORING REQUIREMENTS

The operational certificate holder shall have a qualified professional evaluate whether an environmental effects monitoring program is needed. The assessment and recommended monitoring program, should one be required, shall be submitted for Director's approval on or before June 30, 2013. In addition to surface water sites, the qualified professional should consider the necessity of establishing ground water monitoring locations.

Until June 30, 2013, an interim monitoring program shall be implemented as follows:

Sampling Locations[1] and EMS ID	Frequency[3]	Parameters[3]
Un-named Creek U/S of Iskut Landfill E282678 Un-named Creek D/S of Iskut Landfill E282679	twice annually, in April and September	**Field Measurements:** pH, dissolved oxygen, specific conductance, temperature **Lab Analysis:** BOD, total nitrogen, phosphorous, ammonia, pH, total and dissolved metals[2]
[1] Sampling locations are shown on the site plan [2] Lab analysis for dissolved metals shall use a low level scan [3] May be altered in future, depending on results		

11. REPORTING REQUIREMENTS

11.1 Reporting

All reports, drawings, data, studies and the like shall be submitted in hardcopy and electronic formats unless otherwise specified by the Director.

11.2 Log Book

As required by Sections 4.17.9 and 5.6 the operational certificate holder

shall maintain a log book. The log book shall be made available for inspection by Ministry staff upon request.

11.3 Non-compliance Reporting

The operational certificate holder shall immediately notify the Director of any non-compliance with the requirements of this operational certificate and take appropriate remedial action. Written confirmation of all non-compliance events, including available test results, is required by facsimile or email to Environmental Protection staff within 24 hours of the original notification unless otherwise directed by the Director.

11.4 Non-compliance Follow-up

Upon request, the operational certificate holder shall submit to the Director a written report within 30 days of the non-compliance occurrence. The report shall include, but not necessarily be limited to, the following:

i) All relevant information and test results related to the non-compliance;

ii) an explanation of the most probable cause(s) of the non-compliance; and,

iii) remedial action planned and/or taken to prevent similar non-compliance(s) in the future.

11.5 Annual Report

The operational certificate holder shall submit a basic annual report to the Director on or before June 30 each year for the previous calendar year.

The report shall contain, at a minimum:

i) The type and tonnage or volume of waste received, recycled, and landfilled for the year;

ii) occurrences or observations of wildlife attempting to access the facility;

iii) the results of any monitoring programs undertaken by the operational certificate holder for this site. Trend analysis, as well as an evaluation of any identified impacts of the discharges on the

receiving environment in the previous year shall be carried out by a qualified professional, if determined to be necessary by the Director.

12. CLOSURE REQUIREMENTS

12.1 Notification of Closure

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

12.2 Closure Plan

A closure plan shall be submitted to the Director no later than 6 months in advance of scheduled closure. The closure plan shall, at a minimum, include the following:

i) Proposed end-use of the landfill property after closure;

ii) anticipated total waste volume, tonnage, and life remaining of the landfill;

iii) a topographic plan showing the final elevation contours of the landfill and surface water diversion and drainage controls;

iv) design of the final cover suited to the intended end-use of the site, including the thickness and permeability of barrier layers and drainage layers, and information on topsoil, vegetative cover and erosion prevention controls;

v) procedures for notifying the public about the closure and about alternative waste disposal facilities;

vi) rodent and nuisance wildlife control procedures;

vii) a comprehensive monitoring plan, if determined to be necessary by a qualified professional, including groundwater monitoring, surface water monitoring, landfill gas monitoring, leachate monitoring, final cover monitoring, and erosion and settlement monitoring, for a minimum post-closure period of 25 years;

viii) a plan and accompanying design for the collection, storage and treatment/use of landfill gas for a minimum 25 year post-closure period (if required);

ix) a plan for operation of any required pollution abatement engineering works such as leachate collection and treatment systems, for a minimum post-closure period of 25 years; and,

M. Love

Mark Love, P.Ag.
For Director, Environmental Management Act

x) an estimated cost, updated annually, to carry out closure and post-closure activities for a minimum period of 25 years.

12.3 Closure Funding

The operational certificate holder shall ensure that sufficient funds will be available to provide for all closure and post-closure requirements as outlined in the closure plan required by Section 12.2, plus a reasonable contingency for any remediation which may be required.

12.4 Final Cover

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

12.5 Progressive Application of Final Cover

Completed portions of the landfill shall progressively receive final cover during the active life of the landfill. The maximum area of disposed refuse that has not yet received final cover shall not exceed 25% of the total final footprint area. Final cover is to be applied according to the specifications identified in Section 12.4.

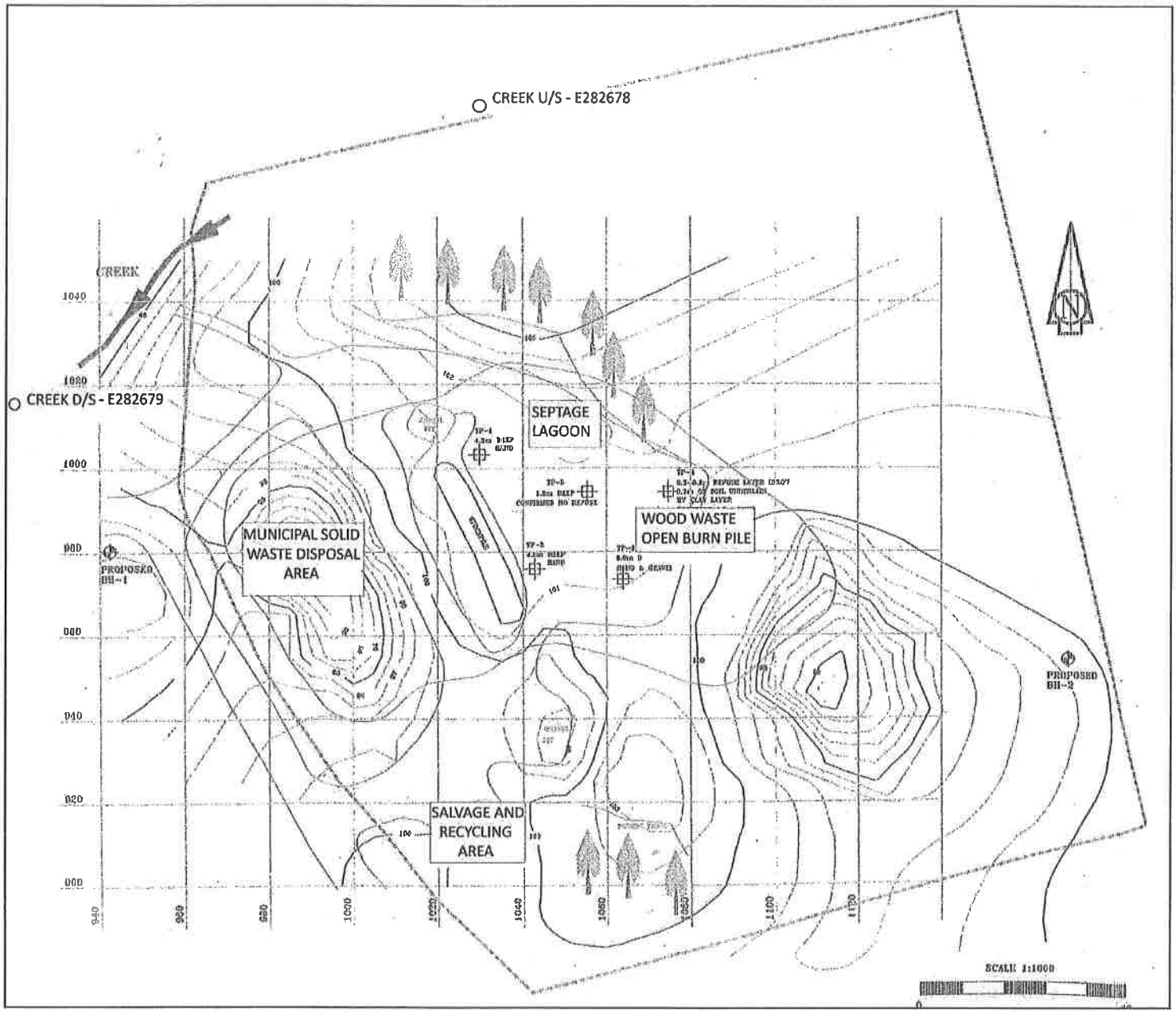
13. ENVIRONMENTAL IMPACT

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

M. Love

Mark Love, P.Ag.
For Director, Environmental Management Act

SITE PLAN



Date Issued: December 20, 2012
Date Amended:
(most recent)

Mark Love, P.Ag
for Director, *Environmental Management Act*
Skeena Region
Permit Number: MR-4612

October 19, 2021

Tracking Number: 407889
Authorization Number: 4612

KITIMAT-STIKINE REGIONAL DISTRICT
#300-4545 LAZELLE AVE
TERRACE, BC
V8G 4E1

Dear KITIMAT-STIKINE REGIONAL DISTRICT,

Your application for an Authorization amendment under the Environmental Management Act

In response to your letter dated August 23, 2021, and pursuant to Section 14(4) of the *Environmental Management Act*, the Director hereby consents to a change of the site plan as the existing site plan does not accurately display current site conditions. The updated site plan shown below.

Site Plan

Please note that although a revised Authorization Document has not been produced at this time a copy of this letter is being placed on the Authorization file, as an addendum to the Authorization, to formally reflect the change.

This Authorization does not authorize entry upon, crossing over, or use for any purpose of private or Crown lands or works, unless and except as authorized by the owner of such lands or works. The responsibility for obtaining such authority rests with the permittee. This Authorization is issued pursuant to the provisions of the Environmental Management Act to ensure compliance with Section 120(3) of that statute, which makes it an offence to discharge waste, from a prescribed industry or activity, without proper authorization. It is also the responsibility of the permittee to ensure that all activities conducted under this authorization are carried out with regard to the rights of third parties, and comply with other applicable legislation that may be in force.

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

Yours truly,

Karen Moores, P.Ag.
Section Head, North Authorizations, Municipal and Smelter Sectors
Environmental Protection Division
Ministry of Environment and Climate Change Strategy
email: Karen.Moores@gov.bc.ca

ENCL: None

Appendix C: Field Photos

Photo 1: Iskut Landfill Upstream Surface Water Site, looking upstream, May 25, 2022

Photo 2: Iskut Landfill Upstream Surface Water Site, looking downstream, May 25, 2022

Photo 3: Iskut Landfill Downstream Surface Water Site, looking upstream, May 25, 2022

Photo 4: Iskut Landfill Downstream Surface Water Site, looking downstream, May 25, 2022

Photo 5: Iskut Landfill Upstream Surface Water Site, looking upstream, September 9, 2022

Photo 6: Iskut Landfill Upstream Surface Water Site, looking downstream, September 9, 2022

Photo 7: Iskut Landfill Downstream Surface Water Site, looking upstream, September 9, 2022

Photo 8: Iskut Landfill Downstream Surface Water Site, looking downstream, September 9, 2022

Appendix D: Lab Reports

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA22B1686**	Page	: 1 of 6
Client	: **Regional District of Kitimat-Stikine**	Laboratory	: Vancouver - Environmental
Contact	: Hannah Shinton	Account Manager	: Amber Springer
Address	: # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Iskut Landfill Surface Water	Date Samples Received	: 26-May-2022 21:00
PO	: ----	Date Analysis Commenced	: 28-May-2022
C-O-C number	: ----	Issue Date	: 17-Jun-2022 11:39
Sampler	: HS		
Site	:		
Quote number	: Default Water Testing (Q62338)		
No. of samples received	: 5		
No. of samples analysed	: 5		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Metals, Burnaby, British Columbia
Elke Tabora		Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Kyle Chang	Lab Assistant	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Parnian Sane	Analsyt	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

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

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

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Qualifiers

Qualifier	*Description*
DTC	*Dissolved concentration exceeds total. Results were confirmed by re-analysis.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	Downstream	SW-21	Upstream	Field Blank	Travel Blank
					Client sampling date / time	25-May-2022 10:55	25-May-2022 12:00	25-May-2022 12:19	25-May-2022 13:11	25-May-2022
						VA22B1686-001	VA22B1686-002	VA22B1686-003	VA22B1686-004	VA22B1686-005
						Result	Result	Result	Result	Result
Physical Tests										
conductivity	----	E100	2.0	µS/cm		356	357	365	<2.0	<2.0
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		170	169	177	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		171	176	174	<0.60	<0.60
pH	----	E108	0.10	pH units		8.32	8.31	8.17	5.26	----
solids, total suspended [TSS]	----	E160	3.0	mg/L		<3.0	<3.0	65.1	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	<0.0050	<0.0050	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		<0.0051	<0.0051	<0.0051	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	----	----
nitrogen, total	7727-37-9	E366	0.030	mg/L		0.189	0.133	0.163	<0.030	<0.030
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0027	0.0027	0.0023	<0.0020	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		3.83	4.60	5.36	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0056	0.0041	0.0053	<0.0030	<0.0030
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00027	0.00028	0.00019	<0.00010	<0.00010
barium, total	7440-39-3	E420	0.00010	mg/L		0.0308	0.0311	0.0253	<0.00010	<0.00010
beryllium, total	7440-41-7	E420	0.000100	mg/L		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000050	0.0000051	0.0000136	<0.0000050	<0.0000050
calcium, total	7440-70-2	E420	0.050	mg/L		54.2	55.8	56.0	<0.050	<0.050
cesium, total	7440-46-2	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
chromium, total	7440-47-3	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
copper, total	7440-50-8	E420	0.00050	mg/L		0.00054	0.00054	<0.00050	<0.00050	<0.00050
iron, total	7439-89-6	E420	0.010	mg/L		<0.010	<0.010	0.015	<0.010	<0.010
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	0.000056	<0.000050	<0.000050

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	Downstream	SW-21	Upstream	Field Blank	Travel Blank
					Client sampling date / time	25-May-2022 10:55	25-May-2022 12:00	25-May-2022 12:19	25-May-2022 13:11	25-May-2022
						VA22B1686-001	VA22B1686-002	VA22B1686-003	VA22B1686-004	VA22B1686-005
						Result	Result	Result	Result	Result
Total Metals										
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
magnesium, total	7439-95-4	E420	0.0050	mg/L		8.59	8.93	8.20	<0.0050	<0.0050
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00029	0.00032	0.00397	<0.00010	<0.00010
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00110	0.00116	0.000995	<0.000050	<0.000050
nickel, total	7440-02-0	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E420	0.050	mg/L		0.412	0.415	0.442	<0.050	<0.050
rubidium, total	7440-17-7	E420	0.00020	mg/L		0.00021	<0.00020	<0.00020	<0.00020	<0.00020
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000508	0.000469	0.000236	<0.000050	<0.000050
silicon, total	7440-21-3	E420	0.10	mg/L		4.28	4.18	4.11	<0.10	<0.10
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		2.30	2.27	2.32	<0.050	<0.050
strontium, total	7440-24-6	E420	0.00020	mg/L		0.170	0.179	0.196	<0.00020	<0.00020
sulfur, total	7704-34-9	E420	0.50	mg/L		11.4	10.8	10.9	<0.50	<0.50
tellurium, total	13494-80-9	E420	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
thorium, total	7440-29-1	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
tungsten, total	7440-33-7	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000226	0.000224	0.000092	<0.000010	<0.000010
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0034	0.0027	0.0018	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00030	0.00028	0.00017	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0366	0.0315	0.0310	----	----
beryllium, dissolved	7440-41-7	E421	0.000100	mg/L		<0.000100	<0.000100	<0.000100	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	Downstream	SW-21	Upstream	Field Blank	Travel Blank
					Client sampling date / time	25-May-2022 10:55	25-May-2022 12:00	25-May-2022 12:19	25-May-2022 13:11	25-May-2022
						VA22B1686-001	VA22B1686-002	VA22B1686-003	VA22B1686-004	VA22B1686-005
						Result	Result	Result	Result	Result
Dissolved Metals										
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	<0.010	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	<0.0000050	0.0000072	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		53.7	53.6	58.1	----	----
cesium, dissolved	7440-46-2	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00273 DTC	0.00062	0.00235 DTC	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.027 DTC	<0.010	0.012	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		0.000072	<0.000050	0.000052	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		8.61	8.51	7.79	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00073 DTC	0.00042	0.00050	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00123	0.00108	0.00106	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		0.482	0.450	0.485	----	----
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		<0.00020	<0.00020	0.00021	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000475	0.000506	0.000214	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.29	4.27	4.20	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		2.41	2.34	2.56	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.169	0.164	0.188	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		10.8	11.0	11.0	----	----
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
thorium, dissolved	7440-29-1	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	Downstream	SW-21	Upstream	Field Blank	Travel Blank
					Client sampling date / time	25-May-2022 10:55	25-May-2022 12:00	25-May-2022 12:19	25-May-2022 13:11	25-May-2022
Analyte	CAS Number	Method	LOR	Unit		VA22B1686-001	VA22B1686-002	VA22B1686-003	VA22B1686-004	VA22B1686-005
						Result	Result	Result	Result	Result
Dissolved Metals										
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000236	0.000232	0.000096	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0033	<0.0010	0.0027	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----
Aggregate Organics										
biochemical oxygen demand [BOD]	----	E550	2.0	mg/L		<2.0	<2.0	2.3	<2.0	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA22B1686**	Page	: 1 of 14
Client	: **Regional District of Kitimat-Stikine**	Laboratory	: Vancouver - Environmental
Contact	: Hannah Shinton	Account Manager	: Amber Springer
Address	: # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Iskut Landfill Surface Water	Date Samples Received	: 26-May-2022 21:00
PO	: ----	Issue Date	: 17-Jun-2022 11:39
C-O-C number	: ----		
Sampler	: HS		
Site	:		
Quote number	: Default Water Testing (Q62338)		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD HT 3d] Downstream	E550	25-May-2022	----	----	----		28-May-2022	3 days	3 days	✓
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD HT 3d] Field Blank	E550	25-May-2022	----	----	----		28-May-2022	3 days	3 days	✓
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD HT 3d] SW-21	E550	25-May-2022	----	----	----		28-May-2022	3 days	3 days	✓
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD HT 3d] Upstream	E550	25-May-2022	----	----	----		28-May-2022	3 days	3 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) Downstream	E298	25-May-2022	10-Jun-2022	----	----		11-Jun-2022	28 days	16 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) Field Blank	E298	25-May-2022	10-Jun-2022	----	----		11-Jun-2022	28 days	16 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) SW-21	E298	25-May-2022	10-Jun-2022	----	----		11-Jun-2022	28 days	16 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
Upstream	E298	25-May-2022	10-Jun-2022	----	----		11-Jun-2022	28 days	16 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
Downstream	E235.NO3-L	25-May-2022	----	----	----		28-May-2022	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
SW-21	E235.NO3-L	25-May-2022	----	----	----		28-May-2022	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
Upstream	E235.NO3-L	25-May-2022	----	----	----		28-May-2022	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
Downstream	E235.NO2-L	25-May-2022	----	----	----		28-May-2022	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
SW-21	E235.NO2-L	25-May-2022	----	----	----		28-May-2022	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
Upstream	E235.NO2-L	25-May-2022	----	----	----		28-May-2022	3 days	3 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid)										
Downstream	E366	25-May-2022	10-Jun-2022	----	----		13-Jun-2022	28 days	19 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid)										
Field Blank	E366	25-May-2022	10-Jun-2022	----	----		13-Jun-2022	28 days	19 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid) SW-21	E366	25-May-2022	10-Jun-2022	----	----		13-Jun-2022	28 days	19 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid) Travel Blank	E366	25-May-2022	10-Jun-2022	----	----		13-Jun-2022	28 days	19 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid) Upstream	E366	25-May-2022	10-Jun-2022	----	----		13-Jun-2022	28 days	19 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) Downstream	E372-U	25-May-2022	10-Jun-2022	----	----		13-Jun-2022	28 days	19 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) Field Blank	E372-U	25-May-2022	10-Jun-2022	----	----		13-Jun-2022	28 days	19 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) SW-21	E372-U	25-May-2022	10-Jun-2022	----	----		13-Jun-2022	28 days	19 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) Upstream	E372-U	25-May-2022	10-Jun-2022	----	----		13-Jun-2022	28 days	19 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) Downstream	E509	25-May-2022	28-May-2022	----	----		28-May-2022	28 days	3 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) SW-21	E509	25-May-2022	28-May-2022	----	----		28-May-2022	28 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) Upstream	E509	25-May-2022	28-May-2022	----	----		28-May-2022	28 days	3 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) Downstream	E421	25-May-2022	09-Jun-2022	----	----		10-Jun-2022	180 days	17 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) SW-21	E421	25-May-2022	09-Jun-2022	----	----		10-Jun-2022	180 days	17 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) Upstream	E421	25-May-2022	09-Jun-2022	----	----		10-Jun-2022	180 days	17 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) Downstream	E358-L	25-May-2022	16-Jun-2022	----	----		16-Jun-2022	28 days	22 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) SW-21	E358-L	25-May-2022	16-Jun-2022	----	----		16-Jun-2022	28 days	22 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) Upstream	E358-L	25-May-2022	16-Jun-2022	----	----		16-Jun-2022	28 days	22 days	✓
Physical Tests : Conductivity in Water										
HDPE Field Blank	E100	25-May-2022	----	----	----		09-Jun-2022	28 days	15 days	✓
Physical Tests : Conductivity in Water										
HDPE Travel Blank	E100	25-May-2022	----	----	----		09-Jun-2022	28 days	15 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE Downstream	E100	25-May-2022	----	----	----		29-May-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE SW-21	E100	25-May-2022	----	----	----		29-May-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE Upstream	E100	25-May-2022	----	----	----		29-May-2022	28 days	4 days	✓
Physical Tests : pH by Meter										
HDPE Downstream	E108	25-May-2022	----	----	----		29-May-2022	0.25 hrs	100 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE Field Blank	E108	25-May-2022	----	----	----		09-Jun-2022	0.25 hrs	359 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE SW-21	E108	25-May-2022	----	----	----		29-May-2022	0.25 hrs	99 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE Upstream	E108	25-May-2022	----	----	----		29-May-2022	0.25 hrs	99 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE Downstream	E160	25-May-2022	----	----	----		28-May-2022	7 days	3 days	✓
Physical Tests : TSS by Gravimetry										
HDPE SW-21	E160	25-May-2022	----	----	----		28-May-2022	7 days	3 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE Upstream	E160	25-May-2022	----	----	----		28-May-2022	7 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) Downstream	E508	25-May-2022	----	----	----		31-May-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) Field Blank	E508	25-May-2022	----	----	----		31-May-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) SW-21	E508	25-May-2022	----	----	----		31-May-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) Travel Blank	E508	25-May-2022	----	----	----		31-May-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) Upstream	E508	25-May-2022	----	----	----		31-May-2022	28 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE - total (lab preserved) Downstream	E420	25-May-2022	----	----	----		09-Jun-2022	180 days	15 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) Field Blank	E420	25-May-2022	----	----	----		09-Jun-2022	180 days	15 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) SW-21	E420	25-May-2022	----	----	----		09-Jun-2022	180 days	15 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
Travel Blank	E420	25-May-2022	----	----	----		09-Jun-2022	180 days	15 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
Upstream	E420	25-May-2022	----	----	----		09-Jun-2022	180 days	15 days	✓

Legend & Qualifier Definitions

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

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Ammonia by Fluorescence	E298	519618	1	18	5.5	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	502812	1	20	5.0	5.0	✓
Conductivity in Water	E100	502669	2	16	12.5	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	503255	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	514208	1	16	6.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	526971	1	7	14.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	502665	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	502662	1	16	6.2	5.0	✓
pH by Meter	E108	502668	2	33	6.0	5.0	✓
Total Mercury in Water by CVAAS	E508	505875	2	40	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	514229	1	20	5.0	5.0	✓
Total Nitrogen by Colourimetry	E366	519616	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	519617	1	18	5.5	5.0	✓
TSS by Gravimetry	E160	502596	2	29	6.9	5.0	✓
Laboratory Control Samples (LCS)							
Ammonia by Fluorescence	E298	519618	1	18	5.5	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	502812	1	20	5.0	5.0	✓
Conductivity in Water	E100	502669	2	16	12.5	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	503255	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	514208	1	16	6.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	526971	1	7	14.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	502665	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	502662	1	16	6.2	5.0	✓
pH by Meter	E108	502668	2	33	6.0	5.0	✓
Total Mercury in Water by CVAAS	E508	505875	2	40	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	514229	1	20	5.0	5.0	✓
Total Nitrogen by Colourimetry	E366	519616	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	519617	1	18	5.5	5.0	✓
TSS by Gravimetry	E160	502596	2	29	6.9	5.0	✓
Method Blanks (MB)							
Ammonia by Fluorescence	E298	519618	1	18	5.5	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	502812	1	20	5.0	5.0	✓
Conductivity in Water	E100	502669	2	16	12.5	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	503255	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	514208	1	16	6.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	526971	1	7	14.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	502665	1	12	8.3	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Nitrite in Water by IC (Low Level)	E235.NO2-L	502662	1	16	6.2	5.0	✓
Total Mercury in Water by CVAAS	E508	505875	2	40	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	514229	1	20	5.0	5.0	✓
Total Nitrogen by Colourimetry	E366	519616	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	519617	1	18	5.5	5.0	✓
TSS by Gravimetry	E160	502596	2	29	6.9	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	519618	1	18	5.5	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	503255	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	514208	1	16	6.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	526971	1	7	14.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	502665	1	12	8.3	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	502662	1	16	6.2	5.0	✓
Total Mercury in Water by CVAAS	E508	505875	2	40	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	514229	2	20	10.0	5.0	✓
Total Nitrogen by Colourimetry	E366	519616	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	519617	1	18	5.5	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160 Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Nitrogen by Colourimetry	E366 Vancouver - Environmental	Water	APHA 4500-P J (mod)	Total Nitrogen is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508 Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Biochemical Oxygen Demand - 5 day	E550 Vancouver - Environmental	Water	APHA 5210 B (mod)	Samples are diluted and incubated for a specified time period, after which the oxygen depletion is measured using a dissolved oxygen meter. Free chlorine is a negative interference in the BOD method; please advise ALS when free chlorine is present in samples.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), dissolved” is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), from total Ca/Mg” is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Nitrogen in water	EP366 Vancouver - Environmental	Water	APHA 4500-P J (mod)	Samples are heated with a persulfate digestion reagent.
Digestion for Total Phosphorus in water	EP372 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **VA22B1686**	Page	: 1 of 18
Client	: Regional District of Kitimat-Stikine	Laboratory	: Vancouver - Environmental
Contact	: Hannah Shinton	Account Manager	: Amber Springer
Address	: # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Iskut Landfill Surface Water	Date Samples Received	: 26-May-2022 21:00
PO	: ----	Date Analysis Commenced	: 28-May-2022
C-O-C number	: ----	Issue Date	: 17-Jun-2022 11:39
Sampler	: HS		
Site	:		
Quote number	: Default Water Testing (Q62338)		
No. of samples received	: 5		
No. of samples analysed	: 5		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

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

Signatories	*Position*	*Laboratory Department*
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General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 502596)											
VA22B1572-001	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	37.2	40.6	8.74%	20%	----
Physical Tests (QC Lot: 502668)											
FJ2201290-001	Anonymous	pH	----	E108	0.10	pH units	7.88	7.91	0.342%	4%	----
Physical Tests (QC Lot: 502669)											
FJ2201290-001	Anonymous	conductivity	----	E100	2.0	µS/cm	175	177	1.19%	10%	----
Physical Tests (QC Lot: 503147)											
VA22B1671-001	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	93.7	92.9	0.857%	20%	----
Physical Tests (QC Lot: 516805)											
VA22B1686-004	Field Blank	pH	----	E108	0.10	pH units	5.26	5.20	1.16%	4%	----
Physical Tests (QC Lot: 516807)											
VA22B1686-004	Field Blank	conductivity	----	E100	2.0	µS/cm	<2.0	<2.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 502662)											
FJ2201290-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 502665)											
KS2201825-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 519616)											
KS2202046-001	Anonymous	nitrogen, total	7727-37-9	E366	0.150	mg/L	1.97	1.98	0.842%	20%	----
Anions and Nutrients (QC Lot: 519617)											
KS2202046-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0306	0.0319	4.13%	20%	----
Anions and Nutrients (QC Lot: 519618)											
KS2202046-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0250	mg/L	1.97	2.03	2.74%	20%	----
Organic / Inorganic Carbon (QC Lot: 526971)											
CG2207607-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.58	0.56	0.03	Diff <2x LOR	----
Total Metals (QC Lot: 505875)											
VA22B1666-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 505878)											
VA22B1686-002	SW-21	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 514229)											
VA22B1679-001	Anonymous	aluminum, total	7429-90-5	E420	0.0060	mg/L	0.0126	0.0118	0.0008	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00020	mg/L	0.00216	0.00228	5.25%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 514229) - continued											
VA22B1679-001	Anonymous	barium, total	7440-39-3	E420	0.00020	mg/L	0.0177	0.0175	1.09%	20%	----
		beryllium, total	7440-41-7	E420	0.000040	mg/L	<0.000040	<0.000040	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.020	mg/L	1.56	1.50	3.56%	20%	----
		cadmium, total	7440-43-9	E420	0.0000400	mg/L	<0.0000400	<0.0000400	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.100	mg/L	16.8	17.1	1.98%	20%	----
		cesium, total	7440-46-2	E420	0.000020	mg/L	0.000022	0.000022	0.0000002	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0020	mg/L	0.0078	0.0076	0.0002	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0100	mg/L	1.27	1.26	0.290%	20%	----
		manganese, total	7439-96-5	E420	0.00020	mg/L	0.0624	0.0628	0.686%	20%	----
		molybdenum, total	7439-98-7	E420	0.000100	mg/L	0.107	0.106	0.646%	20%	----
		nickel, total	7440-02-0	E420	0.00100	mg/L	0.00236	0.00244	0.00008	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.100	mg/L	0.186	0.167	0.019	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.100	mg/L	2.20	2.23	1.02%	20%	----
		rubidium, total	7440-17-7	E420	0.00040	mg/L	0.00080	0.00099	0.00020	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000100	mg/L	0.000185	0.000174	0.000011	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.20	mg/L	3.79	3.72	1.81%	20%	----
		silver, total	7440-22-4	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.100	mg/L	400	397	0.808%	20%	----
		strontium, total	7440-24-6	E420	0.00040	mg/L	0.483	0.482	0.278%	20%	----
		sulfur, total	7704-34-9	E420	1.00	mg/L	242	240	0.796%	20%	----
		tellurium, total	13494-80-9	E420	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000020	mg/L	0.00112	0.00112	0.0625%	20%	----
		vanadium, total	7440-62-2	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0060	mg/L	<0.0060	<0.0060	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 514229) - continued											
VA22B1679-001	Anonymous	zirconium, total	7440-67-7	E420	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 503255)											
VA22B1648-004	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	0.0831	0.0805	3.19%	20%	----
Dissolved Metals (QC Lot: 514208)											
VA22B1679-004	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00050	mg/L	0.0114	0.0111	2.65%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000250	mg/L	<0.000250	<0.000250	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.050	mg/L	0.494	0.480	0.015	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000250	mg/L	0.0000330	0.0000523	0.0000193	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.250	mg/L	188	184	2.12%	20%	----
		cesium, dissolved	7440-46-2	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00100	mg/L	<0.00100	0.00102	0.00002	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000250	mg/L	<0.000250	<0.000250	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0050	mg/L	0.0166	0.0163	0.0003	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0250	mg/L	335	333	0.546%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00050	mg/L	0.0648	0.0636	1.90%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000250	mg/L	0.00424	0.00399	6.12%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00250	mg/L	0.00278	0.00286	0.00008	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.250	mg/L	<0.250	<0.250	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.250	mg/L	15.3	14.8	3.15%	20%	----
		rubidium, dissolved	7440-17-7	E421	0.00100	mg/L	0.00311	0.00299	0.00011	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.000250	mg/L	0.00736	0.00751	2.11%	20%	----
		silicon, dissolved	7440-21-3	E421	0.250	mg/L	8.42	8.24	2.18%	20%	----
		silver, dissolved	7440-22-4	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.250	mg/L	258	252	2.03%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00100	mg/L	2.48	2.41	2.95%	20%	----
		sulfur, dissolved	7704-34-9	E421	2.50	mg/L	767	760	1.00%	20%	----
		tellurium, dissolved	13494-80-9	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 514208) - continued											
VA22B1679-004	Anonymous	thorium, dissolved	7440-29-1	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00150	mg/L	<0.00150	<0.00150	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E421	0.00050	mg/L	0.00196	0.00201	0.00005	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000050	mg/L	0.00557	0.00545	2.15%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00250	mg/L	<0.00250	<0.00250	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
Aggregate Organics (QC Lot: 502812)											
VA22B1568-002	Anonymous	biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	<2.0	<2.0	0.0%	30%	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 502596)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 502669)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 503147)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 516807)						
conductivity	----	E100	1	µS/cm	<1.0	----
Anions and Nutrients (QCLot: 502662)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 502665)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 519616)						
nitrogen, total	7727-37-9	E366	0.03	mg/L	<0.030	----
Anions and Nutrients (QCLot: 519617)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 519618)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 526971)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 505875)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 505878)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 514229)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 514229) - continued						
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 503255)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 514208)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 514208) - continued						
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	<0.000010	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	<0.00020	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	<0.00020	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	<0.00010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	<0.00010	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Aggregate Organics (QCLot: 502812)						
biochemical oxygen demand [BOD]	----	E550	2	mg/L	<2.0	----

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 502596)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	101	85.0	115	----
Physical Tests (QCLot: 502668)									
pH	----	E108	----	pH units	7 pH units	99.7	98.0	102	----
Physical Tests (QCLot: 502669)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 503147)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	99.2	85.0	115	----
Physical Tests (QCLot: 516805)									
pH	----	E108	----	pH units	7 pH units	99.4	98.0	102	----
Physical Tests (QCLot: 516807)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	98.5	90.0	110	----
Anions and Nutrients (QCLot: 502662)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 502665)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 519616)									
nitrogen, total	7727-37-9	E366	0.03	mg/L	0.5 mg/L	108	75.0	125	----
Anions and Nutrients (QCLot: 519617)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.05 mg/L	95.1	80.0	120	----
Anions and Nutrients (QCLot: 519618)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	103	85.0	115	----
Organic / Inorganic Carbon (QCLot: 526971)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	93.1	80.0	120	----
Total Metals (QCLot: 505875)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	106	80.0	120	----
Total Metals (QCLot: 505878)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	102	80.0	120	----
Total Metals (QCLot: 514229)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	97.2	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	105	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	99.0	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 514229) - continued									
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	96.0	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	86.2	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	98.2	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	98.6	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	96.8	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	98.4	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	97.8	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	96.6	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	96.5	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	96.1	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	96.0	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	96.1	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	98.9	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	97.6	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	99.7	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	96.9	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	107	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	99.2	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	102	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	97.5	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	99.0	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	95.1	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	99.1	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	107	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	93.8	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	93.6	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	97.8	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	83.4	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	94.8	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	97.1	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	91.3	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	94.9	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	98.3	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	94.9	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	95.7	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	103	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 514208)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	102	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	106	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	98.9	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	101	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	95.6	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	94.3	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	98.4	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	99.8	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	99.5	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	100	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	98.2	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	97.5	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	105	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	98.3	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	106	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	102	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	98.1	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	102	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	112	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	99.6	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	97.3	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	106	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	98.7	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	104	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	96.8	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	92.3	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	98.9	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	95.3	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	100	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	94.1	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	95.0	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	95.1	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	100	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 514208) - continued									
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	99.1	80.0	120	----
Aggregate Organics (QCLot: 502812)									
biochemical oxygen demand [BOD]	----	E550	2	mg/L	198 mg/L	106	85.0	115	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 502662)										
FJ2201290-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.499 mg/L	0.5 mg/L	99.8	75.0	125	----
Anions and Nutrients (QCLot: 502665)										
FJ2201320-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.62 mg/L	2.5 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 519616)										
VA22B1686-001	Downstream	nitrogen, total	7727-37-9	E366	0.405 mg/L	0.4 mg/L	101	70.0	130	----
Anions and Nutrients (QCLot: 519617)										
VA22B1686-001	Downstream	phosphorus, total	7723-14-0	E372-U	0.0508 mg/L	0.05 mg/L	102	70.0	130	----
Anions and Nutrients (QCLot: 519618)										
VA22B1686-001	Downstream	ammonia, total (as N)	7664-41-7	E298	0.109 mg/L	0.1 mg/L	109	75.0	125	----
Organic / Inorganic Carbon (QCLot: 526971)										
CG2207607-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	4.97 mg/L	5 mg/L	99.3	70.0	130	----
Total Metals (QCLot: 505875)										
VA22B1666-002	Anonymous	mercury, total	7439-97-6	E508	0.000102 mg/L	0.0001 mg/L	102	70.0	130	----
Total Metals (QCLot: 505878)										
VA22B1686-003	Upstream	mercury, total	7439-97-6	E508	0.000102 mg/L	0.0001 mg/L	102	70.0	130	----
Total Metals (QCLot: 514229)										
VA22B1679-002	Anonymous	aluminum, total	7429-90-5	E420	0.378 mg/L	0.4 mg/L	94.5	70.0	130	----
		antimony, total	7440-36-0	E420	0.0401 mg/L	0.04 mg/L	100	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0415 mg/L	0.04 mg/L	104	70.0	130	----
		barium, total	7440-39-3	E420	0.0406 mg/L	0.04 mg/L	102	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0739 mg/L	0.08 mg/L	92.4	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0182 mg/L	0.02 mg/L	90.8	70.0	130	----
		boron, total	7440-42-8	E420	ND mg/L	0.2 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00793 mg/L	0.008 mg/L	99.1	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	8 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.0193 mg/L	0.02 mg/L	96.6	70.0	130	----
		chromium, total	7440-47-3	E420	0.0778 mg/L	0.08 mg/L	97.2	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0389 mg/L	0.04 mg/L	97.3	70.0	130	----
		copper, total	7440-50-8	E420	0.0385 mg/L	0.04 mg/L	96.2	70.0	130	----
		iron, total	7439-89-6	E420	3.78 mg/L	4 mg/L	94.6	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 514229) - continued										
VA22B1679-002	Anonymous	lead, total	7439-92-1	E420	0.0363 mg/L	0.04 mg/L	90.8	70.0	130	----
		lithium, total	7439-93-2	E420	0.188 mg/L	0.2 mg/L	94.2	70.0	130	----
		magnesium, total	7439-95-4	E420	1.93 mg/L	2 mg/L	96.6	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		nickel, total	7440-02-0	E420	0.0763 mg/L	0.08 mg/L	95.4	70.0	130	----
		potassium, total	7440-09-7	E420	7.71 mg/L	8 mg/L	96.4	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0390 mg/L	0.04 mg/L	97.6	70.0	130	----
		selenium, total	7782-49-2	E420	0.0871 mg/L	0.08 mg/L	109	70.0	130	----
		silicon, total	7440-21-3	E420	19.2 mg/L	20 mg/L	96.0	70.0	130	----
		silver, total	7440-22-4	E420	0.00755 mg/L	0.008 mg/L	94.4	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	40 mg/L	ND	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0798 mg/L	0.08 mg/L	99.8	70.0	130	----
		thallium, total	7440-28-0	E420	0.00723 mg/L	0.008 mg/L	90.4	70.0	130	----
		thorium, total	7440-29-1	E420	0.0361 mg/L	0.04 mg/L	90.2	70.0	130	----
		tin, total	7440-31-5	E420	0.0394 mg/L	0.04 mg/L	98.5	70.0	130	----
		titanium, total	7440-32-6	E420	0.0783 mg/L	0.08 mg/L	97.9	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0382 mg/L	0.04 mg/L	95.6	70.0	130	----
		uranium, total	7440-61-1	E420	0.00738 mg/L	0.008 mg/L	92.2	70.0	130	----
		vanadium, total	7440-62-2	E420	0.201 mg/L	0.2 mg/L	100	70.0	130	----
		zinc, total	7440-66-6	E420	0.804 mg/L	0.8 mg/L	100	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0769 mg/L	0.08 mg/L	96.1	70.0	130	----
VA22B1679-002	Anonymous	phosphorus, total	7723-14-0	E420	20.9 mg/L	20 mg/L	104	70.0	130	----
Dissolved Metals (QCLot: 503255)										
VA22B1648-006	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000743 mg/L	0.0001 mg/L	74.3	70.0	130	----
Dissolved Metals (QCLot: 514208)										
VA22B1679-005	Anonymous	aluminum, dissolved	7429-90-5	E421	0.186 mg/L	0.2 mg/L	92.9	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0199 mg/L	0.02 mg/L	99.6	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0178 mg/L	0.02 mg/L	88.9	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0342 mg/L	0.04 mg/L	85.5	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00849 mg/L	0.01 mg/L	84.9	70.0	130	----
		boron, dissolved	7440-42-8	E421	ND mg/L	0.1 mg/L	ND	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00387 mg/L	0.004 mg/L	96.8	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 514208) - continued										
VA22B1679-005	Anonymous	calcium, dissolved	7440-70-2	E421	3.33 mg/L	4 mg/L	83.2	70.0	130	----
		cesium, dissolved	7440-46-2	E421	0.00953 mg/L	0.01 mg/L	95.3	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0342 mg/L	0.04 mg/L	85.5	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0168 mg/L	0.02 mg/L	83.9	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0166 mg/L	0.02 mg/L	83.0	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.66 mg/L	2 mg/L	82.9	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0188 mg/L	0.02 mg/L	93.9	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0809 mg/L	0.1 mg/L	80.9	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	0.830 mg/L	1 mg/L	83.0	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0330 mg/L	0.04 mg/L	82.4	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	9.00 mg/L	10 mg/L	90.0	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.50 mg/L	4 mg/L	87.6	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0169 mg/L	0.02 mg/L	84.5	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0348 mg/L	0.04 mg/L	87.0	70.0	130	----
		silicon, dissolved	7440-21-3	E421	8.60 mg/L	10 mg/L	86.0	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00622 mg/L	0.008 mg/L	77.8	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	19.0 mg/L	20 mg/L	95.1	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0381 mg/L	0.04 mg/L	95.4	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00377 mg/L	0.004 mg/L	94.2	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0198 mg/L	0.02 mg/L	99.2	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0193 mg/L	0.02 mg/L	96.7	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0351 mg/L	0.04 mg/L	87.6	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	0.0192 mg/L	0.02 mg/L	96.2	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00375 mg/L	0.004 mg/L	93.8	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0878 mg/L	0.1 mg/L	87.8	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.348 mg/L	0.4 mg/L	86.9	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0410 mg/L	0.04 mg/L	102	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 17 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	Regional District of Kitimat-Stikine
Contact:	Hannah Shinton
Phone:	250-641-4141
	Company address below will appear on the final report
Street:	4545 Lazelle Avenue
City/Province:	Terrace/BC
Postal Code:	V8G4E1

Report Format / Distribution	
Select Report Format:	Quality Control (QC) Report with Report
Select Distribution:	
Email 1 or Fax	hshinton@rdks.bc.ca
Email 2	nlavoie@rdks.bc.ca; eblaney@rdks.bc.ca
Email 3	

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

Regular [R]

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

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

Date and Time Required for all E&P TATs:

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

Invoice To	Same as Report To
	Copy of Invoice with Report
Company:	Regional District of Kitimat-Stikine
Contact:	Hannah Shinton

Invoice Distribution	
Select Invoice Distribution:	
Email 1 or Fax	anne-maries@rdks.bc.ca
Email 2	hshinton@rdks.bc.ca

Project Information	
ALS Account # / Quote #:	
Job #:	Iskut Landfill Surface Water
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)	
AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only):

ALS Contact:

Sampler: H. Shinton

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	BOD	Total Nitrogen	Phosphorus	Ammonia	Total Metals	Dissolved Metals	pH	Conductivity	Dissolved Organic Carbon	Nitrate, Nitrite, Nitrate + Nitrite	Total Suspended Solids					SAMPLES ON HOLD	Sample is hazardous (please provide further detail)	NUMBER OF CONTAINERS
					P	P	P	P	P	F/P			F/P	P								
1	Downstream	25-May-22	10:55	Water	R	R	R	R	R	R	R	R	R	R	R							
2	SW-21	25-May-22	12:00	Water	R	R	R	R	R	R	R	R	R	R	R							
3	Upstream	25-May-22	12:19	Water	R	R	R	R	R	R	R	R	R	R	R							
4	Field Blank	25-May-22	13:11	Water	R	R	R	R	R		R	R										
5	Travel Blank	25-May-22	—	Water		R			R			R										

Terrace Shipping
#_2_ Coolers Ground ☐
#____ Carbouys Air ☒
SFX ☐

Environmental Division
Vancouver
Work Order Reference
VA22B1686

Telephone : +1 604 253 4188

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System?	British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)
Are samples for human consumption/ use?	

SAMPLE CONDITION AS R

Frozen ☐ SIF Observations
Ice Packs ☑ Ice Cubes ☐ Custody seal intac
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
3.8	3.2			7.4	6.8		

SHIPMENT RELEASE (client use)		
Released by: Hannah Shinton	Date: May 26th, 2022	Time:

INITIAL SHIPMENT RECEPTION (lab use only)		
Received by: Chris	Date: 26 May 22	Time: 1145

FINAL SHIPMENT RECEPTION (lab use only)		
Received by: JJS	Date: MAY 26	Time: 9.00

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

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

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

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA22C2099**	Page	: 1 of 6
Client	: **Regional District of Kitimat-Stikine**	Laboratory	: Vancouver - Environmental
Contact	: Hannah Shinton	Account Manager	: Amber Springer
Address	: # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Iskut Landfill	Date Samples Received	: 15-Sep-2022 17:30
PO	: ----	Date Analysis Commenced	: 15-Sep-2022
C-O-C number	: ----	Issue Date	: 28-Sep-2022 08:51
Sampler	: HS		
Site	: ----		
Quote number	: Default Water Testing (Q62338)		
No. of samples received	: 5		
No. of samples analysed	: 5		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Caitlin Macey	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Metals, Burnaby, British Columbia
Elke Tabora		Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Kyle Chang	Lab Assistant	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Parnian Sane	Analyst	Metals, Burnaby, British Columbia

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
µS/cm	Microsiemens per centimetre
mg/L	milligrams per litre
pH units	pH units

<: less than.

>: greater than.

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

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

UNLESS OTHERWISE STATED on SRN or QCI Report, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	Upstream	SW-21	Downstream	Field Blank	Travel Blank
					Client sampling date / time	13-Sep-2022 11:49	13-Sep-2022 12:00	13-Sep-2022 10:27	13-Sep-2022 11:14	13-Sep-2022
						VA22C2099-001	VA22C2099-002	VA22C2099-003	VA22C2099-004	VA22C2099-005
						Result	Result	Result	Result	Result
Physical Tests										
conductivity	----	E100	2.0	µS/cm		405	344	344	<2.0	<2.0
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		228	197	201	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		225	185	188	<0.60	<0.60
pH	----	E108	0.10	pH units		8.42	8.40	8.41	5.33	----
solids, total suspended [TSS]	----	E160	3.0	mg/L		<3.0	<3.0	<3.0	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0250 DLDS	<0.0050	<0.0050	----	----
nitrate + nitrite (as N)	----	EC235.N+N	0.0050	mg/L		<0.0255	<0.0051	<0.0051	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	<0.0010	<0.0010	----	----
nitrogen, total	7727-37-9	E366	0.030	mg/L		0.174	0.107	0.107	0.079 RRV	<0.030
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		<0.0020	0.0030	0.0023	<0.0020	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		5.32	2.97	2.82	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0082	0.0090	0.0096	<0.0030	<0.0030
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	0.00010	<0.00010	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00026	0.00031	0.00032	<0.00010	<0.00010
barium, total	7440-39-3	E420	0.00010	mg/L		0.0394	0.0376	0.0369	<0.00010	<0.00010
beryllium, total	7440-41-7	E420	0.000100	mg/L		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
cadmium, total	7440-43-9	E420	0.0000050	mg/L		0.0000078	<0.0000050	<0.0000050	<0.0000050	<0.0000050
calcium, total	7440-70-2	E420	0.050	mg/L		73.2	58.3	58.0	<0.050	<0.050
cesium, total	7440-46-2	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
chromium, total	7440-47-3	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	0.00052	0.00056	<0.00050	<0.00050
iron, total	7439-89-6	E420	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	Upstream	SW-21	Downstream	Field Blank	Travel Blank
					Client sampling date / time	13-Sep-2022 11:49	13-Sep-2022 12:00	13-Sep-2022 10:27	13-Sep-2022 11:14	13-Sep-2022
						VA22C2099-001	VA22C2099-002	VA22C2099-003	VA22C2099-004	VA22C2099-005
						Result	Result	Result	Result	Result
Total Metals										
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0012	<0.0010	<0.0010	<0.0010	<0.0010
magnesium, total	7439-95-4	E420	0.0050	mg/L		10.2	9.63	10.4	<0.0050	<0.0050
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00271	0.00023	0.00025	<0.00010	<0.00010
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00111	0.00119	0.00109	<0.000050	<0.000050
nickel, total	7440-02-0	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E420	0.050	mg/L		0.392	0.261	0.270	<0.050	<0.050
rubidium, total	7440-17-7	E420	0.00020	mg/L		0.00023	<0.00020	<0.00020	<0.00020	<0.00020
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000115	0.000358	0.000319	<0.000050	<0.000050
silicon, total	7440-21-3	E420	0.10	mg/L		5.08	4.72	4.82	<0.10	<0.10
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		3.02	2.22	2.38	<0.050	<0.050
strontium, total	7440-24-6	E420	0.00020	mg/L		0.245	0.175	0.174	<0.00020	<0.00020
sulfur, total	7704-34-9	E420	0.50	mg/L		10.1	10.6	10.6	<0.50	<0.50
tellurium, total	13494-80-9	E420	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
thorium, total	7440-29-1	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
tungsten, total	7440-33-7	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000101	0.000239	0.000241	<0.000010	<0.000010
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
zirconium, total	7440-67-7	E420	0.00020	mg/L		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0062	0.0092	0.0072	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00022	0.00031	0.00031	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0382	0.0362	0.0366	----	----
beryllium, dissolved	7440-41-7	E421	0.000100	mg/L		<0.000100	<0.000100	<0.000100	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	Upstream	SW-21	Downstream	Field Blank	Travel Blank
					Client sampling date / time	13-Sep-2022 11:49	13-Sep-2022 12:00	13-Sep-2022 10:27	13-Sep-2022 11:14	13-Sep-2022
						VA22C2099-001	VA22C2099-002	VA22C2099-003	VA22C2099-004	VA22C2099-005
						Result	Result	Result	Result	Result
Dissolved Metals										
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	<0.010	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000084	<0.0000050	<0.0000050	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		75.3	62.5	63.9	----	----
cesium, dissolved	7440-46-2	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00031	0.00060	0.00055	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0012	<0.0010	<0.0010	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		9.79	9.88	10.0	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00138	0.00015	<0.00010	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00106	0.00109	0.00103	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		0.402	0.299	0.293	----	----
rubidium, dissolved	7440-17-7	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000099	0.000301	0.000353	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.94	4.63	4.60	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		2.91	2.31	2.28	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.244	0.182	0.184	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		8.94	10.2	9.31	----	----
tellurium, dissolved	13494-80-9	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
thorium, dissolved	7440-29-1	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	0.00015	0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
tungsten, dissolved	7440-33-7	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----

Analytical Results

Sub-Matrix: **Water**
(Matrix: **Water**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: Upstream	SW-21	Downstream	Field Blank	Travel Blank
					Client sampling date / time: 13-Sep-2022 11:49	13-Sep-2022 12:00	13-Sep-2022 10:27	13-Sep-2022 11:14	13-Sep-2022
					VA22C2099-001	VA22C2099-002	VA22C2099-003	VA22C2099-004	VA22C2099-005
					Result	Result	Result	Result	Result
Dissolved Metals									
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000095	0.000254	0.000244	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0016	0.0017	0.0013	----	----
zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	<0.00020	----	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	----	----
Aggregate Organics									
biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	<2.0	<2.0	<2.0	<2.0	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA22C2099**	Page	: 1 of 14
Client	: **Regional District of Kitimat-Stikine**	Laboratory	: Vancouver - Environmental
Contact	: Hannah Shinton	Account Manager	: Amber Springer
Address	: # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Iskut Landfill	Date Samples Received	: 15-Sep-2022 17:30
PO	: ----	Issue Date	: 28-Sep-2022 08:51
C-O-C number	: ----		
Sampler	: HS		
Site	: ----		
Quote number	: Default Water Testing (Q62338)		
No. of samples received	: 5		
No. of samples analysed	: 5		

This report is automatically generated by the ALS LIMS (Laboratory Information Management System) through evaluation of Quality Control (QC) results and other QA parameters associated with this submission, and is intended to facilitate rapid data validation by auditors or reviewers. The report highlights any exceptions and outliers to ALS Data Quality Objectives, provides holding time details and exceptions, summarizes QC sample frequencies, and lists applicable methodology references and summaries.

Key

Anonymous: Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number: Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO: Data Quality Objective.
LOR: Limit of Reporting (detection limit).
RPD: Relative Percent Difference.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD HT 3d] Downstream	E550	13-Sep-2022	----	----	----		16-Sep-2022	3 days	3 days	✓
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD HT 3d] Field Blank	E550	13-Sep-2022	----	----	----		16-Sep-2022	3 days	3 days	✓
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD HT 3d] SW-21	E550	13-Sep-2022	----	----	----		16-Sep-2022	3 days	3 days	✓
Aggregate Organics : Biochemical Oxygen Demand - 5 day										
HDPE [BOD HT 3d] Upstream	E550	13-Sep-2022	----	----	----		16-Sep-2022	3 days	3 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) Downstream	E298	13-Sep-2022	23-Sep-2022	----	----		23-Sep-2022	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) Field Blank	E298	13-Sep-2022	23-Sep-2022	----	----		23-Sep-2022	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) SW-21	E298	13-Sep-2022	23-Sep-2022	----	----		23-Sep-2022	28 days	10 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
Upstream	E298	13-Sep-2022	23-Sep-2022	----	----		23-Sep-2022	28 days	10 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
SW-21	E235.NO3-L	13-Sep-2022	15-Sep-2022	3 days	2 days	✓	16-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
Upstream	E235.NO3-L	13-Sep-2022	15-Sep-2022	3 days	2 days	✓	16-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
Downstream	E235.NO3-L	13-Sep-2022	15-Sep-2022	3 days	3 days	✓	16-Sep-2022	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
SW-21	E235.NO2-L	13-Sep-2022	15-Sep-2022	----	----		16-Sep-2022	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
Upstream	E235.NO2-L	13-Sep-2022	15-Sep-2022	----	----		16-Sep-2022	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
Downstream	E235.NO2-L	13-Sep-2022	15-Sep-2022	----	----		16-Sep-2022	3 days	3 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid)										
Downstream	E366	13-Sep-2022	23-Sep-2022	----	----		26-Sep-2022	28 days	13 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid)										
Field Blank	E366	13-Sep-2022	23-Sep-2022	----	----		26-Sep-2022	28 days	13 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid) SW-21	E366	13-Sep-2022	23-Sep-2022	----	----		26-Sep-2022	28 days	13 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid) Travel Blank	E366	13-Sep-2022	23-Sep-2022	----	----		26-Sep-2022	28 days	13 days	✓
Anions and Nutrients : Total Nitrogen by Colourimetry										
Amber glass total (sulfuric acid) Upstream	E366	13-Sep-2022	23-Sep-2022	----	----		26-Sep-2022	28 days	13 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) Downstream	E372-U	13-Sep-2022	23-Sep-2022	----	----		24-Sep-2022	28 days	11 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) Field Blank	E372-U	13-Sep-2022	23-Sep-2022	----	----		24-Sep-2022	28 days	11 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) SW-21	E372-U	13-Sep-2022	23-Sep-2022	----	----		24-Sep-2022	28 days	11 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) Upstream	E372-U	13-Sep-2022	23-Sep-2022	----	----		24-Sep-2022	28 days	11 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) Downstream	E509	13-Sep-2022	19-Sep-2022	----	----		19-Sep-2022	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) SW-21	E509	13-Sep-2022	19-Sep-2022	----	----		19-Sep-2022	28 days	6 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
Upstream	E509	13-Sep-2022	19-Sep-2022	----	----		19-Sep-2022	28 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
Downstream	E421	13-Sep-2022	21-Sep-2022	----	----		22-Sep-2022	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
SW-21	E421	13-Sep-2022	21-Sep-2022	----	----		22-Sep-2022	180 days	9 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
Upstream	E421	13-Sep-2022	21-Sep-2022	----	----		22-Sep-2022	180 days	9 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
Downstream	E358-L	13-Sep-2022	18-Sep-2022	----	----		19-Sep-2022	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
SW-21	E358-L	13-Sep-2022	18-Sep-2022	----	----		19-Sep-2022	28 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
Upstream	E358-L	13-Sep-2022	18-Sep-2022	----	----		19-Sep-2022	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE										
SW-21	E100	13-Sep-2022	15-Sep-2022	----	----		18-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE										
Travel Blank	E100	13-Sep-2022	15-Sep-2022	----	----		18-Sep-2022	28 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE Upstream	E100	13-Sep-2022	15-Sep-2022	----	----		18-Sep-2022	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE Downstream	E100	13-Sep-2022	15-Sep-2022	----	----		18-Sep-2022	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE Field Blank	E100	13-Sep-2022	15-Sep-2022	----	----		18-Sep-2022	28 days	5 days	✓
Physical Tests : pH by Meter										
HDPE Downstream	E108	13-Sep-2022	15-Sep-2022	----	----		18-Sep-2022	0.25 hrs	57.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE Field Blank	E108	13-Sep-2022	15-Sep-2022	----	----		18-Sep-2022	0.25 hrs	57.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE SW-21	E108	13-Sep-2022	15-Sep-2022	----	----		18-Sep-2022	0.25 hrs	57.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE Upstream	E108	13-Sep-2022	15-Sep-2022	----	----		18-Sep-2022	0.25 hrs	57.25 hrs	× EHTR-FM
Physical Tests : TSS by Gravimetry										
HDPE Downstream	E160	13-Sep-2022	----	----	----		17-Sep-2022	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE SW-21	E160	13-Sep-2022	----	----	----		17-Sep-2022	7 days	4 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE Upstream	E160	13-Sep-2022	----	----	----		17-Sep-2022	7 days	4 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) Downstream	E508	13-Sep-2022	19-Sep-2022	----	----		19-Sep-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) Field Blank	E508	13-Sep-2022	19-Sep-2022	----	----		19-Sep-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) SW-21	E508	13-Sep-2022	19-Sep-2022	----	----		19-Sep-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) Travel Blank	E508	13-Sep-2022	19-Sep-2022	----	----		19-Sep-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial total (hydrochloric acid) Upstream	E508	13-Sep-2022	19-Sep-2022	----	----		19-Sep-2022	28 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) Downstream	E420	13-Sep-2022	22-Sep-2022	----	----		23-Sep-2022	180 days	10 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) Field Blank	E420	13-Sep-2022	22-Sep-2022	----	----		23-Sep-2022	180 days	10 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) SW-21	E420	13-Sep-2022	22-Sep-2022	----	----		23-Sep-2022	180 days	10 days	✓

Matrix: **Water**

Evaluation: × = Holding time exceedance ; ✓ = Within Holding Time

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
Travel Blank	E420	13-Sep-2022	22-Sep-2022	----	----		23-Sep-2022	180 days	10 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
Upstream	E420	13-Sep-2022	22-Sep-2022	----	----		23-Sep-2022	180 days	10 days	✓

Legend & Qualifier Definitions

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

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Ammonia by Fluorescence	E298	661438	1	18	5.5	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	650346	1	20	5.0	5.0	✓
Conductivity in Water	E100	649809	1	17	5.8	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	653566	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	658261	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	652895	1	16	6.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	649813	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	649814	1	15	6.6	5.0	✓
pH by Meter	E108	649810	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	653637	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	657221	1	19	5.2	5.0	✓
Total Nitrogen by Colourimetry	E366	661437	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	661436	1	18	5.5	5.0	✓
TSS by Gravimetry	E160	652442	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Ammonia by Fluorescence	E298	661438	1	18	5.5	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	650346	1	20	5.0	5.0	✓
Conductivity in Water	E100	649809	1	17	5.8	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	653566	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	658261	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	652895	1	16	6.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	649813	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	649814	1	15	6.6	5.0	✓
pH by Meter	E108	649810	1	18	5.5	5.0	✓
Total Mercury in Water by CVAAS	E508	653637	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	657221	1	19	5.2	5.0	✓
Total Nitrogen by Colourimetry	E366	661437	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	661436	1	18	5.5	5.0	✓
TSS by Gravimetry	E160	652442	1	20	5.0	5.0	✓
Method Blanks (MB)							
Ammonia by Fluorescence	E298	661438	1	18	5.5	5.0	✓
Biochemical Oxygen Demand - 5 day	E550	650346	1	20	5.0	5.0	✓
Conductivity in Water	E100	649809	1	17	5.8	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	653566	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	658261	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	652895	1	16	6.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	649813	1	14	7.1	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Nitrite in Water by IC (Low Level)	E235.NO2-L	649814	1	15	6.6	5.0	✓
Total Mercury in Water by CVAAS	E508	653637	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	657221	1	19	5.2	5.0	✓
Total Nitrogen by Colourimetry	E366	661437	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	661436	1	18	5.5	5.0	✓
TSS by Gravimetry	E160	652442	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	661438	1	18	5.5	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	653566	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	658261	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	652895	1	16	6.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	649813	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	649814	1	15	6.6	5.0	✓
Total Mercury in Water by CVAAS	E508	653637	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	657221	1	19	5.2	5.0	✓
Total Nitrogen by Colourimetry	E366	661437	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	661436	1	18	5.5	5.0	✓

Methodology References and Summaries

The analytical methods used by ALS are developed using internationally recognized reference methods (where available), such as those published by US EPA, APHA Standard Methods, ASTM, ISO, Environment Canada, BC MOE, and Ontario MOE. Reference methods may incorporate modifications to improve performance (indicated by "mod").

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
TSS by Gravimetry	E160 Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
Nitrite in Water by IC (Low Level)	E235.NO2-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Nitrogen by Colourimetry	E366 Vancouver - Environmental	Water	APHA 4500-P J (mod)	Total Nitrogen is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508 Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Biochemical Oxygen Demand - 5 day	E550 Vancouver - Environmental	Water	APHA 5210 B (mod)	Samples are diluted and incubated for a specified time period, after which the oxygen depletion is measured using a dissolved oxygen meter. Free chlorine is a negative interference in the BOD method; please advise ALS when free chlorine is present in samples.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), dissolved” is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), from total Ca/Mg” is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.
Nitrate and Nitrite (as N) (Calculation)	EC235.N+N Vancouver - Environmental	Water	EPA 300.0	Nitrate and Nitrite (as N) is a calculated parameter. Nitrate and Nitrite (as N) = Nitrite (as N) + Nitrate (as N).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Nitrogen in water	EP366 Vancouver - Environmental	Water	APHA 4500-P J (mod)	Samples are heated with a persulfate digestion reagent.
Digestion for Total Phosphorus in water	EP372 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **VA22C2099**	Page	: 1 of 17
Client	: Regional District of Kitimat-Stikine	Laboratory	: Vancouver - Environmental
Contact	: Hannah Shinton	Account Manager	: Amber Springer
Address	: # 300 - 4545 Lazelle Avenue Terrace BC Canada V8G 4E1	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: Iskut Landfill	Date Samples Received	: 15-Sep-2022 17:30
PO	: ----	Date Analysis Commenced	: 15-Sep-2022
C-O-C number	: ----	Issue Date	: 28-Sep-2022 08:51
Sampler	: HS		
Site	: ----		
Quote number	: Default Water Testing (Q62338)		
No. of samples received	: 5		
No. of samples analysed	: 5		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Matrix Spike (MS) Report; Recovery and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives
- Laboratory Control Sample (LCS) Report; Recovery and Data Quality Objectives

Signatories

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

Signatories	*Position*	*Laboratory Department*
Caitlin Macey	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Vancouver Metals, Burnaby, British Columbia
Elke Tabora		Calgary Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Vancouver Metals, Burnaby, British Columbia
Kyle Chang	Lab Assistant	Vancouver Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Vancouver Inorganics, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Parnian Sane	Analyst	Vancouver Metals, Burnaby, British Columbia

General Comments

The ALS Quality Control (QC) report is optionally provided to ALS clients upon request. ALS test methods include comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against predetermined Data Quality Objectives (DQOs) to provide confidence in the accuracy of associated test results. This report contains detailed results for all QC results applicable to this sample submission. Please refer to the ALS Quality Control Interpretation report (QCI) for applicable method references and methodology summaries.

Key :

Anonymous = Refers to samples which are not part of this work order, but which formed part of the QC process lot.
CAS Number = Chemical Abstracts Service number is a unique identifier assigned to discrete substances.
DQO = Data Quality Objective.
LOR = Limit of Reporting (detection limit).
RPD = Relative Percent Difference
# = Indicates a QC result that did not meet the ALS DQO.

Workorder Comments

Holding times are displayed as "---" if no guidance exists from CCME, Canadian provinces, or broadly recognized international references.

Laboratory Duplicate (DUP) Report

A Laboratory Duplicate (DUP) is a randomly selected intralaboratory replicate sample. Laboratory Duplicates provide information regarding method precision and sample heterogeneity. ALS DQOs for Laboratory Duplicates are expressed as test-specific limits for Relative Percent Difference (RPD), or as an absolute difference limit of 2 times the LOR for low concentration duplicates within ~ 4-10 times the LOR (cut-off is test-specific).

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 649809)											
VA22C1980-001	Anonymous	conductivity	----	E100	2.0	µS/cm	1070	1050	1.32%	10%	----
Physical Tests (QC Lot: 649810)											
VA22C1980-001	Anonymous	pH	----	E108	0.10	pH units	8.21	8.18	0.366%	4%	----
Physical Tests (QC Lot: 652442)											
VA22C1945-001	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 649813)											
VA22C1980-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	<0.0250	<0.0250	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 649814)											
VA22C1980-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 661436)											
VA22C2099-001	Upstream	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	0.0022	0.0002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 661437)											
VA22C2099-001	Upstream	nitrogen, total	7727-37-9	E366	0.030	mg/L	0.174	0.178	0.003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 661438)											
VA22C2099-001	Upstream	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 652895)											
VA22C2056-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	2.31	2.56	0.25	Diff <2x LOR	----
Total Metals (QC Lot: 653637)											
VA22C2078-003	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Total Metals (QC Lot: 657221)											
VA22C2099-001	Upstream	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0082	0.0086	0.0003	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00026	0.00025	0.0000004	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0394	0.0406	2.97%	20%	----
		beryllium, total	7440-41-7	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000078	0.0000072	0.0000006	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	73.2	74.9	2.22%	20%	----
		cesium, total	7440-46-2	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 657221) - continued											
VA22C2099-001	Upstream	cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0012	0.0012	0.00006	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	10.2	9.96	2.06%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00271	0.00272	0.163%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00111	0.00115	3.42%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	0.392	0.387	0.006	Diff <2x LOR	----
		rubidium, total	7440-17-7	E420	0.00020	mg/L	0.00023	0.00021	0.00001	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000115	0.000125	0.000010	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	5.08	4.95	2.74%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	3.02	3.01	0.502%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.245	0.259	5.38%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	10.1	10.2	0.104%	20%	----
		tellurium, total	13494-80-9	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, total	7440-29-1	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		tungsten, total	7440-33-7	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000101	0.000095	0.000006	Diff <2x LOR	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		zirconium, total	7440-67-7	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 653566)											
VA22C1814-012	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 658261)											
VA22C2099-001	Upstream	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0062	0.0074	0.0012	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00022	0.00024	0.00002	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0382	0.0385	0.582%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 658261) - continued											
VA22C2099-001	Upstream	beryllium, dissolved	7440-41-7	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.0000084	0.0000084	0.000000002	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	75.3	78.4	4.01%	20%	----
		cesium, dissolved	7440-46-2	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00031	0.00032	0.000009	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0012	0.0012	0.000001	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	9.79	10.1	3.59%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00138	0.00166	18.9%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00106	0.00107	1.07%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.402	0.418	0.016	Diff <2x LOR	----
		rubidium, dissolved	7440-17-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000099	0.000080	0.000019	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.94	4.86	1.56%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	2.91	3.08	5.66%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.244	0.251	2.92%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	8.94	8.67	2.98%	20%	----
		tellurium, dissolved	13494-80-9	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		thorium, dissolved	7440-29-1	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		tungsten, dissolved	7440-33-7	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000095	0.000095	0.0000006	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0016	0.0015	0.00008	Diff <2x LOR	----
		zirconium, dissolved	7440-67-7	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Aggregate Organics (QC Lot: 650346)											
VA22C2093-001	Anonymous	biochemical oxygen demand [BOD]	----	E550	2.0	mg/L	<2.0	<2.0	0.0%	30%	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 649809)						
conductivity	----	E100	1	µS/cm	1.7	----
Physical Tests (QCLot: 652442)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Anions and Nutrients (QCLot: 649813)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 649814)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 661436)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 661437)						
nitrogen, total	7727-37-9	E366	0.03	mg/L	<0.030	----
Anions and Nutrients (QCLot: 661438)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 652895)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 653637)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 657221)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cesium, total	7440-46-2	E420	0.00001	mg/L	<0.000010	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 657221) - continued						
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	<0.00020	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	<0.00020	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
thorium, total	7440-29-1	E420	0.0001	mg/L	<0.00010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	<0.00010	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	<0.00020	----
Dissolved Metals (QCLot: 653566)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 658261)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 658261) - continued						
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	<0.000010	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	<0.00020	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	<0.00020	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	<0.00010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	<0.00010	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	<0.00020	----
Aggregate Organics (QCLot: 650346)						
biochemical oxygen demand [BOD]	----	E550	2	mg/L	<2.0	----

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 649809)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	97.3	90.0	110	----
Physical Tests (QCLot: 649810)									
pH	----	E108	----	pH units	7 pH units	100	98.0	102	----
Physical Tests (QCLot: 652442)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	92.0	85.0	115	----
Anions and Nutrients (QCLot: 649813)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 649814)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	99.2	90.0	110	----
Anions and Nutrients (QCLot: 661436)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.05 mg/L	95.2	80.0	120	----
Anions and Nutrients (QCLot: 661437)									
nitrogen, total	7727-37-9	E366	0.03	mg/L	0.5 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 661438)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	92.7	85.0	115	----
Organic / Inorganic Carbon (QCLot: 652895)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	118	80.0	120	----
Total Metals (QCLot: 653637)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	108	80.0	120	----
Total Metals (QCLot: 657221)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	100	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	103	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	104	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	108	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	98.8	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	94.5	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	95.4	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	101	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	97.4	80.0	120	----
cesium, total	7440-46-2	E420	0.00001	mg/L	0.05 mg/L	103	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	101	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 657221) - continued									
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	99.4	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	99.4	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	108	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	95.6	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	101	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	108	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	98.5	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	99.3	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
rubidium, total	7440-17-7	E420	0.0002	mg/L	0.1 mg/L	102	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	105	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	99.2	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	108	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	101	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	99.7	80.0	120	----
tellurium, total	13494-80-9	E420	0.0002	mg/L	0.1 mg/L	96.3	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	95.3	80.0	120	----
thorium, total	7440-29-1	E420	0.0001	mg/L	0.1 mg/L	88.6	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	97.2	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	92.6	80.0	120	----
tungsten, total	7440-33-7	E420	0.0001	mg/L	0.1 mg/L	99.0	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	100	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	107	80.0	120	----
zirconium, total	7440-67-7	E420	0.0002	mg/L	0.1 mg/L	99.3	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	106	80.0	120	----
Dissolved Metals (QCLot: 658261)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	101	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	104	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	104	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	99.2	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	105	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	98.0	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 658261) - continued									
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	100	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
cesium, dissolved	7440-46-2	E421	0.00001	mg/L	0.05 mg/L	96.3	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	101	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	96.0	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	101	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	104	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	102	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	97.6	80.0	120	----
rubidium, dissolved	7440-17-7	E421	0.0002	mg/L	0.1 mg/L	105	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	101	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	106	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	96.2	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	102	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	91.4	80.0	120	----
tellurium, dissolved	13494-80-9	E421	0.0002	mg/L	0.1 mg/L	101	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	108	80.0	120	----
thorium, dissolved	7440-29-1	E421	0.0001	mg/L	0.1 mg/L	91.4	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	99.5	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	95.0	80.0	120	----
tungsten, dissolved	7440-33-7	E421	0.0001	mg/L	0.1 mg/L	98.4	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	100	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	100	80.0	120	----
zirconium, dissolved	7440-67-7	E421	0.0002	mg/L	0.1 mg/L	95.5	80.0	120	----
Aggregate Organics (QCLot: 650346)									
biochemical oxygen demand [BOD]	----	E550	2	mg/L	198 mg/L	99.5	85.0	115	----

Matrix Spike (MS) Report

A Matrix Spike (MS) is a randomly selected intra-laboratory replicate sample that has been fortified (spiked) with test analytes at known concentration, and processed in an identical manner to test samples. Matrix Spikes provide information regarding analyte recovery and potential matrix effects. MS DQO exceedances due to sample matrix may sometimes be unavoidable; in such cases, test results for the associated sample (or similar samples) may be subject to bias. ND – Recovery not determined, background level >= 1x spike level.

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 649813)										
VA22C2099-001	Upstream	nitrate (as N)	14797-55-8	E235.NO3-L	12.7 mg/L	12.6 mg/L	100	75.0	125	----
Anions and Nutrients (QCLot: 649814)										
VA22C2099-001	Upstream	nitrite (as N)	14797-65-0	E235.NO2-L	2.46 mg/L	2.5 mg/L	98.3	75.0	125	----
Anions and Nutrients (QCLot: 661436)										
VA22C2099-002	SW-21	phosphorus, total	7723-14-0	E372-U	0.0476 mg/L	0.05 mg/L	95.3	70.0	130	----
Anions and Nutrients (QCLot: 661437)										
VA22C2099-002	SW-21	nitrogen, total	7727-37-9	E366	0.400 mg/L	0.4 mg/L	100	70.0	130	----
Anions and Nutrients (QCLot: 661438)										
VA22C2099-002	SW-21	ammonia, total (as N)	7664-41-7	E298	0.0896 mg/L	0.1 mg/L	89.6	75.0	125	----
Organic / Inorganic Carbon (QCLot: 652895)										
VA22C2056-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	5.58 mg/L	5 mg/L	112	70.0	130	----
Total Metals (QCLot: 653637)										
VA22C2099-001	Upstream	mercury, total	7439-97-6	E508	0.000105 mg/L	0.0001 mg/L	105	70.0	130	----
Total Metals (QCLot: 657221)										
VA22C2099-002	SW-21	aluminum, total	7429-90-5	E420	0.191 mg/L	0.2 mg/L	95.7	70.0	130	----
		antimony, total	7440-36-0	E420	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00904 mg/L	0.01 mg/L	90.4	70.0	130	----
		boron, total	7440-42-8	E420	0.098 mg/L	0.1 mg/L	98.1	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00404 mg/L	0.004 mg/L	101	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, total	7440-46-2	E420	0.0103 mg/L	0.01 mg/L	103	70.0	130	----
		chromium, total	7440-47-3	E420	0.0396 mg/L	0.04 mg/L	98.9	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0194 mg/L	0.02 mg/L	97.2	70.0	130	----
		copper, total	7440-50-8	E420	0.0191 mg/L	0.02 mg/L	95.4	70.0	130	----
		iron, total	7439-89-6	E420	1.96 mg/L	2 mg/L	97.8	70.0	130	----
		lead, total	7439-92-1	E420	0.0185 mg/L	0.02 mg/L	92.3	70.0	130	----
		lithium, total	7439-93-2	E420	0.103 mg/L	0.1 mg/L	103	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 657221) - continued										
VA22C2099-002	SW-21	magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0191 mg/L	0.02 mg/L	95.4	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		nickel, total	7440-02-0	E420	0.0389 mg/L	0.04 mg/L	97.3	70.0	130	----
		phosphorus, total	7723-14-0	E420	9.74 mg/L	10 mg/L	97.4	70.0	130	----
		potassium, total	7440-09-7	E420	4.03 mg/L	4 mg/L	101	70.0	130	----
		rubidium, total	7440-17-7	E420	0.0194 mg/L	0.02 mg/L	97.0	70.0	130	----
		selenium, total	7782-49-2	E420	0.0416 mg/L	0.04 mg/L	104	70.0	130	----
		silicon, total	7440-21-3	E420	9.70 mg/L	10 mg/L	97.0	70.0	130	----
		silver, total	7440-22-4	E420	0.00431 mg/L	0.004 mg/L	108	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	19.7 mg/L	20 mg/L	98.5	70.0	130	----
		tellurium, total	13494-80-9	E420	0.0390 mg/L	0.04 mg/L	97.5	70.0	130	----
		thallium, total	7440-28-0	E420	0.00369 mg/L	0.004 mg/L	92.2	70.0	130	----
		thorium, total	7440-29-1	E420	0.0197 mg/L	0.02 mg/L	98.7	70.0	130	----
		tin, total	7440-31-5	E420	0.0193 mg/L	0.02 mg/L	96.4	70.0	130	----
		titanium, total	7440-32-6	E420	0.0392 mg/L	0.04 mg/L	97.9	70.0	130	----
		tungsten, total	7440-33-7	E420	0.0200 mg/L	0.02 mg/L	99.8	70.0	130	----
		uranium, total	7440-61-1	E420	0.00383 mg/L	0.004 mg/L	95.8	70.0	130	----
		vanadium, total	7440-62-2	E420	0.100 mg/L	0.1 mg/L	100	70.0	130	----
		zinc, total	7440-66-6	E420	0.401 mg/L	0.4 mg/L	100	70.0	130	----
		zirconium, total	7440-67-7	E420	0.0432 mg/L	0.04 mg/L	108	70.0	130	----
Dissolved Metals (QCLot: 653566)										
VA22C1822-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.000106 mg/L	0.0001 mg/L	106	70.0	130	----
Dissolved Metals (QCLot: 658261)										
VA22C2099-002	SW-21	aluminum, dissolved	7429-90-5	E421	0.184 mg/L	0.2 mg/L	92.0	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0197 mg/L	0.02 mg/L	98.7	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0207 mg/L	0.02 mg/L	103	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0388 mg/L	0.04 mg/L	96.9	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00894 mg/L	0.01 mg/L	89.4	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.096 mg/L	0.1 mg/L	96.2	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00408 mg/L	0.004 mg/L	102	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cesium, dissolved	7440-46-2	E421	0.00961 mg/L	0.01 mg/L	96.1	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 658261) - continued										
VA22C2099-002	SW-21	chromium, dissolved	7440-47-3	E421	0.0402 mg/L	0.04 mg/L	100	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0196 mg/L	0.02 mg/L	98.0	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0198 mg/L	0.02 mg/L	99.1	70.0	130	----
		iron, dissolved	7439-89-6	E421	2.00 mg/L	2 mg/L	100	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0193 mg/L	0.02 mg/L	96.6	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0982 mg/L	0.1 mg/L	98.2	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0390 mg/L	0.04 mg/L	97.4	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.5 mg/L	10 mg/L	105	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.93 mg/L	4 mg/L	98.2	70.0	130	----
		rubidium, dissolved	7440-17-7	E421	0.0213 mg/L	0.02 mg/L	106	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0410 mg/L	0.04 mg/L	103	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.27 mg/L	10 mg/L	92.7	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00409 mg/L	0.004 mg/L	102	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	18.9 mg/L	20 mg/L	94.7	70.0	130	----
		tellurium, dissolved	13494-80-9	E421	0.0401 mg/L	0.04 mg/L	100	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00394 mg/L	0.004 mg/L	98.6	70.0	130	----
		thorium, dissolved	7440-29-1	E421	0.0215 mg/L	0.02 mg/L	107	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0196 mg/L	0.02 mg/L	97.9	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0400 mg/L	0.04 mg/L	100	70.0	130	----
		tungsten, dissolved	7440-33-7	E421	0.0198 mg/L	0.02 mg/L	98.8	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00388 mg/L	0.004 mg/L	97.0	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.105 mg/L	0.1 mg/L	105	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.399 mg/L	0.4 mg/L	99.8	70.0	130	----
		zirconium, dissolved	7440-67-7	E421	0.0414 mg/L	0.04 mg/L	104	70.0	130	----

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Company:	Regional District of Kitimat-Stikine	Select Report Format:	
Contact:	Hannah Shinton	Quality Control (QC) Report with Report	
Phone:	250-615-6100		
	Company address below will appear on the final report	Select Distribution:	
Street:	4545 Lazelle Avenue	Email 1 or Fax	hshinton@rdks.bc.ca
City/Province:	Terrace/BC	Email 2	enviro.dept@rdks.bc.ca
Postal Code:	V8G4E1	Email 3	
Invoice To	Same as Report To	Invoice Distribution	
	Copy of Invoice with Report	Select Invoice Distribution:	
Company:	Regional District of Kitimat-Stikine	Email 1 or Fax	anne-maries@rdks.bc.ca
Contact:	Hannah Shinton	Email 2	hshinton@rdks.bc.ca; enviro.dept@rdks.bc.ca

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	Iskut Landfill	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):		ALS Contact:	Sampler: H. Shinton

Select Service Level Below - Contact your

Regular [R]

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

EMERGENCY: 1 Bus | Same | (Labo

Date and Time Required for all E&P TATs:

For tests that can not be performed according to the service

Ana

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	BOD	Total Nitrogen	Phosphorus	Ammonia	Total Metals	Dissolved Metals	pH	Conductivity	Dissolved Organic Carbon	Nitrate, Nitrite, Nitrate + Nitrite	Total Suspended Solids	SAMPLES ON HOLD	Sample is hazardous (please provide further deta	NUMBER OF CONTAINERS
						P	P	P	P	F/P			F/P	P				
	Upstream	13-Sept-22	11:49	Water	R	R	R	R	R	R	R	R	R	R	R			
	SW-21	13-Sept-22	12:00	Water	R	R	R	R	R	R	R	R	R	R	R			
	Down Stream	13-Sept-22	10:27	Water	R	R	R	R	R	R	R	R	R	R	R			
	Field Blank	13-Sept-22	11:14	Water	R	R	R	R	R		R	R						
	Travel Blank	13-Sept-22	—	Water		R			R			R						

Terrace Shipping
#1 Coolers — Ground ☐
#___ Carbouys — Air ☒
SFX ☐

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System?	British Columbia Approved and Working Water Quality Guidelines (MAY, 2015)
Are samples for human consumption/ use?	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ — SIF Observations Yes ☐ No ☐

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

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
8.4				5			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: Hannah Shinton	Date: September 14/22	Time:	Received by: Chris	Date: 14 Sep 22	Time: 1530	Received by: RJ	Date: Sept - 15	Time: 1730

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

SEPT 2017 FRONT

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

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

Appendix E: Data Summary Tables

Table E-1
Iskut Landfill
Water Quality Results

Analyte	Unit	Guideline			Sampling Location	Downstream	Downstream	RPD	Downstream	Upstream	Upstream	Upstream	RPD
					Date Sampled	25-May-22	25-May-22		13-Sep-22	25-May-22	13-Sep-22	13-Sep-22	
					Lab Sample ID	VA22B1686-001	VA22B1686-002		VA22C2099-003	VA22B1686-003	VA22C2099-001	VA22C2099-002	
					Sample Type	Normal	Duplicate		Normal	Normal	Normal	Duplicate	
		BCAWQG AL (LT)	BCAWQG AL (ST)	BCWWQG AL									
Lab Results													
Anions and Cations in meq/L unit													
Aluminum (meq/L) (calculated)	meq/L	NG	NG	NG	0.00038	0.0003	23.53	0.0008	0.0002	0.00069	0.001	36.69	
Barium (meq/L) (calculated)	meq/L	NG	NG	NG	0.000533	0.000459	14.92	0.000533	0.000451	0.000556	0.000527	5.36	
Boron (meq/L) (calculated)	meq/L	NG	NG	NG	<0.0028	<0.0028	-	<0.0028	<0.0028	<0.0028	<0.0028	-	
Calcium (meq/L) (calculated)	meq/L	NG	NG	NG	2.68	2.67	0.37	3.19	2.9	3.76	3.12	18.60	
Calcium (total, meq/L) (calculated)	meq/L	NG	NG	NG	2.7	2.78	2.92	2.89	2.79	3.65	2.91	22.56	
Chromium (meq/L) (calculated)	meq/L	NG	NG	NG	<0.000029	<0.000029	-	<0.000029	<0.000029	<0.000029	<0.000029	-	
Copper (meq/L) (calculated)	meq/L	NG	NG	NG	0.0000859	0.00002	124.46	0.000017	0.000074	0.0000098	0.000019	63.89	
Lead (meq/L) (calculated)	meq/L	NG	NG	NG	0.0000007	<0.00000048	-	<0.00000048	0.0000005	<0.00000048	<0.00000048	-	
Lithium (meq/L) (calculated)	meq/L	NG	NG	NG	<0.00014	<0.00014	-	<0.00014	<0.00014	0.00017	<0.00014	-	
Magnesium (meq/L) (calculated)	meq/L	NG	NG	NG	0.709	0.7	1.28	0.823	0.641	0.806	0.813	0.86	
Magnesium (total, meq/L) (calculated)	meq/L	NG	NG	NG	0.707	0.735	3.88	0.856	0.675	0.839	0.792	5.76	
Potassium (meq/L) (calculated)	meq/L	NG	NG	NG	0.0123	0.0115	6.72	0.00749	0.0124	0.0103	0.00765	29.53	
Potassium (total, meq/L) (calculated)	meq/L	NG	NG	NG	0.0105	0.0106	0.95	0.00691	0.0113	0.01	0.00668	39.81	
Sodium (meq/L) (calculated)	meq/L	NG	NG	NG	0.105	0.102	2.90	0.0992	0.111	0.127	0.1	23.79	
Sodium (total, meq/L) (calculated)	meq/L	NG	NG	NG	0.1	0.0987	1.31	0.104	0.101	0.131	0.0966	30.23	
Strontium (meq/L) (calculated)	meq/L	NG	NG	NG	0.00386	0.00374	3.16	0.0042	0.00429	0.00557	0.00416	28.98	
Zinc (meq/L) (calculated)	meq/L	NG	NG	NG	0.0001	<0.000031	-	0.00004	0.000083	0.000049	0.000052	5.94	
Dissolved Metals													
Aluminum (dissolved)	µg/L	Calc [1.1]	Calc [2.1]	NG	3.4	2.7	22.95	7.2	1.8	6.2	9.2	38.96	
Antimony (dissolved)	µg/L	NG	NG	9 [3.1]	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	-	
Arsenic (dissolved)	µg/L	5 [1.2]	NG	NG	0.3	0.28	6.90	0.31	0.17	0.22	0.31	33.96	
Barium (dissolved)	µg/L	NG	NG	1000	36.6	31.5	14.98	36.6	31	38.2	36.2	5.38	
Beryllium (dissolved)	µg/L	NG	NG	0.13	<0.100	<0.100	-	<0.100	<0.100	<0.100	<0.100	-	
Bismuth (dissolved)	µg/L	NG	NG	NG	<0.050	<0.050	-	<0.050	<0.050	<0.050	<0.050	-	
Boron (dissolved)	µg/L	1200 [1.3]	NG	NG	<10	<10	-	<10	<10	<10	<10	-	
Cadmium (dissolved)	µg/L	Calc [1.4]	Calc [2.2]	NG	<0.0050	<0.0050	-	<0.0050	0.0072	0.0084	<0.0050	-	
Calcium (dissolved)	mg/L	NG	NG	N [3.2]	53.7	53.6	0.19	63.9	58.1	75.3	62.5	18.58	
Cesium (dissolved)	µg/L	NG	NG	NG	<0.010	<0.010	-	<0.010	<0.010	<0.010	<0.010	-	
Chromium (dissolved)	µg/L	NG	NG	1 [3.3]	<0.50	<0.50	-	<0.50	<0.50	<0.50	<0.50	-	
Cobalt (dissolved)	µg/L	4 [1.5]	110 [2.3]	NG	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	-	
Copper (dissolved)	µg/L	N [1.6]	N [2.4]	NG	2.73	0.62	125.97	0.55	2.35	0.31	0.6	63.74	
Hardness (as CaCO3), dissolved	mg/L	NG	NG	NG	170	169	0.59	201	177	228	197	14.59	
Iron (dissolved)	µg/L	NG	350 [2.5]	NG	27	<10	-	<10	12	<10	<10	-	
Lead (dissolved)	µg/L	Calc [1.7]	Calc [2.6]	NG	0.072	<0.050	-	<0.050	0.052	<0.050	<0.050	-	
Lithium (dissolved)	µg/L	NG	NG	NG	<1.0	<1.0	-	<1.0	<1.0	1.2	<1.0	-	
Magnesium (dissolved)	mg/L	NG	NG	NG	8.61	8.51	1.17	10	7.79	9.79	9.88	0.92	
Manganese (dissolved)	µg/L	Calc [1.8]	Calc [2.7]	NG	0.73	0.42	53.91	<0.10	0.5	1.38	0.15	160.78	
Mercury (dissolved)	µg/L	0.02 [1.9]	NG	NG	<0.0050	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	-	
Molybdenum (dissolved)	µg/L	7600 [1.10]	46000 [2.8]	NG	1.23	1.08	12.99	1.03	1.06	1.06	1.09	2.79	
Nickel (dissolved)	µg/L	NG	NG	Calc [3.4]	<0.50	<0.50	-	<0.50	<0.50	<0.50	<0.50	-	
Phosphorus (dissolved, by ICPMS/ICPOES)	µg/L	N [1.11]	NG	NG	<50	<50	-	<50	<50	<50	<50	-	
Potassium (dissolved)	µg/L	NG	NG	NG	482	450	6.87	293	485	402	299	29.39	
Rubidium (dissolved)	µg/L	NG	NG	NG	<0.20	<0.20	-	<0.20	0.21	<0.20	<0.20	-	
Selenium (dissolved)	µg/L	2 [1.12]	NG	NG	0.475	0.506	6.32	0.353	0.214	0.099	0.301	101.00	
Silicon (dissolved, as Si)	µg/L	NG	NG	NG	4290	4270	0.47	4600	4200	4940	4630	6.48	
Silver (dissolved)	µg/L	Calc [1.13]	Calc [2.9]	NG	<0.010	<0.010	-	<0.010	<0.010	<0.010	<0.010	-	
Sodium (dissolved)	mg/L	NG	NG	NG	2.41	2.34	2.95	2.28	2.56	2.91	2.31	22.99	
Strontium (dissolved)	µg/L	NG	NG	NG	169	164	3.00	184	188	244	182	29.11	
Sulphur (dissolved)	µg/L	NG	NG	NG	10800	11000	1.83	9310	11000	8940	10200	13.17	
Tellurium (dissolved)	µg/L	NG	NG	NG	<0.20	<0.20	-	<0.20	<0.20	<0.20	<0.20	-	
Thallium (dissolved)	µg/L	NG	NG	0.8 [3.5]	<0.010	<0.010	-	<0.010	<0.010	<0.010	<0.010	-	
Thorium (dissolved)	µg/L	NG	NG	NG	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	-	
Tin (dissolved)	µg/L	NG	NG	NG	<0.10	<0.10	-	0.1	<0.10	<0.10	0.15	-	
Titanium (dissolved)	µg/L	NG	NG	NG	<0.30	<0.30	-	<0.30	<0.30	<0.30	<0.30	-	
Tungsten (dissolved)	µg/L	NG	NG	NG	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	-	
Uranium (dissolved)	µg/L	NG	NG	8.5	0.236	0.232	1.71	0.244	0.096	0.095	0.254	91.12	
Vanadium (dissolved)	µg/L	NG	NG	NG	<0.50	<0.50	-	<0.50	<0.50	<0.50	<0.50	-	
Zinc (dissolved)	µg/L	Calc [1.14]	Calc [2.10]	NG	3.3	<1.0	-	1.3	2.7	1.6	1.7	6.06	
Zirconium (dissolved)	µg/L	NG	NG	NG	<0.20	<0.20	-	<0.20	<0.20	<0.20	<0.20	-	
General and Inorganic Parameters													
Ammonia (total, as N)	µg/L	Calc [1.15]	Calc [2.11]	NG	<5.0	<5.0	-	<5.0	<5.0	<5.0	<5.0	-	
Biochemical oxygen demand	mg/L	NG	NG	NG	<2.0	<2.0	-	<2.0	2.3	<2.0	<2.0	-	
Dissolved organic carbon	mg/L	N [1.16]	NG	NG	3.83	4.6	18.27	2.82	5.36	5.32	2.97	56.69	
Conductivity	µS/cm	NG	NG	NG	356	357	0.28	344	365	405	344	16.29	
Nitrate (as N)	mg/L	3.0 [1.17]	32.8 [2.12]	NG	<0.0050	<0.0050	-	<0.0050	<0.0050	<0.0250	<0.0050	-	
Nitrate + Nitrite (as N)	mg/L	NG	NG	NG	<0.0051	<0.0051	-	<0.0051	<0.0051	<0.0255	<0.0051	-	
Nitrate + Nitrite (as N) (calculated)	mg/L	NG	NG	NG	<0.0051	<0.0051	-	<0.0051	<0.0051	<0.025	<0.0051	-	
Nitrite (as N)	µg/L	Calc [1.18]	Calc [2.13]	NG	<1.0	<1.0	-	<1.0	<1.0	<5.0	<1.0	-	
Nitrogen, total	µg/L	NG	NG	NG	189	133	34.78	107	163	174	107	47.69	
pH		N [1.19]	NG	NG	8.32	8.31	0.12	8.41	8.17	8.42	8.4	0.24	
Total suspended solids	mg/L	N [1.20]	N [2.14]	NG	<3.0	<3.0	-	<3.0	65.1	<3.0	<3.0	-	
Total Metals													
Aluminum (total)	µg/L	NG	NG	NG	5.6	4.1	30.93	9.6	5.3	8.2	9	9.30	
Antimony (total)	µg/L	NG	NG	9 [3.6]	<0.10	<0.10	-	<0.10	<0.10	<0.10	0.1	-	
Arsenic (total)	µg/L	5 [1.21]	NG	NG	0.27	0.28	3.64	0.32	0.19	0.26	0.31	17.54	
Barium (total)	µg/L	NG	NG	1000	30.8	31.1	0.97	36.9	25.3	39.4	37.6	4.68	
Beryllium (total)	µg/L	NG	NG	0.13	<0.100	<0.100	-	<0.100	<0.100	<0.100	<0.100	-	
Bismuth (total)	µg/L	NG	NG	NG	<0.050	<0.050	-	<0.050	<0.050	<0.050	<0.050	-	
Boron (total)	µg/L	1200 [1.22]	NG	NG	<10	<10	-	<10	<10	<10	<10	-	
Cadmium (total)	µg/L	NG	NG	NG	<0.0050	0.0051	-	<0.0050	0.0136	0.0078	<0.0050	-	
Calcium (total)	mg/L	NG	NG	NG	54.2	55.8	2.91	58	56	73.2	58.3	22.66	
Cesium (total)	µg/L	NG	NG	NG	<0.010	<0.010	-	<0.010	<0.010	<0.010	<0.010	-	
Chromium (total)	µg/L	NG	NG	1 [3.7]	<0.50	<0.50	-	<0.50	<0.50	<0.50	<0.50	-	
Cobalt (total)	µg/L	4 [1.23]	110 [2.15]	NG	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	-	
Copper (total)	µg/L	NG	NG	NG	0.54	0.54	0.00	0.56	<0.50	<0.50	0.52	-	
Hardness (as CaCO3), from total Ca/Mg	mg/L	NG	NG	NG	171	176	2.88	188	174	225	185	19.51	
Iron (total)	µg/L	NG	1000 [2.16]	NG	<10	<10	-	<10	15	<10	<10	-	
Lead (total)	µg/L	Calc [1.24]	Calc [2.17]	NG	<0.050	<0.050	-	<0.050	0.056	<0.050	<0.050	-	
Lithium (total)	µg/L	NG	NG	NG	<1.0	<1.0	-	<1.0	<1.0	1.2	<1.0	-	
Magnesium (total)	mg/L	NG	NG	NG	8.59	8.93	3.88	10.4	8.2	10.2	9.63	5.75	
Manganese (total)	µg/L	Calc [1.25]	Calc [2.18]	NG	0.29	0.32	9.84	0.25	3.97	2.71	0.23	168.71	
Mercury (total)	µg/L	0.02 [1.26]	NG	NG	<0.0050	<0.0050	-	<0.0050	<0.0050	<0.0050	<0.0050	-	
Molybdenum (total)	µg/L	7600 [1.27]	46000 [2.19]	NG	1.1	1.16	5.31	1.09	0.995	1.11	1.19	6.96	
Nickel (total)	µg/L	NG	NG	Calc [3.8]	<0.50	<0.50	-	<0.50	<0.50	<0.50	<0.50	-	
Phosphorus (total, by ICPMS/ICPOES)	µg/L	N [1.28]	NG	NG	<50	<50	-	<50	<50	<50	<50	-	
Phosphorus (total, APHA 4500-P)	µg/L	N [1.29]	NG	NG	2.7	2.7	0.00	2.3	2.3	<2.0	3	-	
Potassium (total)	µg/L	NG	NG	NG	412	415	0.73	270	442	392	261	40.12	
Rubidium (total)	µg/L	NG	NG	NG	0.21	<0.20	-	<0.20	<0.20	0.23	<0.20	-	
Selenium (total)	µg/L	2 [1.30]	NG	NG	0.508	0.469	7.98	0.319	0.236	0.115	0.358	102.75	
Silicon (total, as Si)	µg/L	NG	NG	NG	4280	4180	2.36	4820	4110	5080	4720	7.35	

Table E-1
Iskut Landfill
Water Quality Results

				Sampling Location	Downstream	Downstream	RPD	Downstream	Upstream	Upstream	Upstream	RPD
				Date Sampled	25-May-22	25-May-22		13-Sep-22	25-May-22	13-Sep-22	13-Sep-22	
				Lab Sample ID	VA22B1686-001	VA22B1686-002		VA22C2099-003	VA22B1686-003	VA22C2099-001	VA22C2099-002	
				Sample Type	Normal	Duplicate		Normal	Normal	Normal	Duplicate	
Analyte	**Unit**	**Guideline**										
		BCAWQG AL (LT)	BCAWQG AL (ST)	BCWWQG AL								
Silver (total)	µg/L	Calc [1.31]	Calc [2.20]	NG	<0.010	<0.010	-	<0.010	<0.010	<0.010	<0.010	-
Sodium (total)	mg/L	NG	NG	NG	2.3	2.27	1.31	2.38	2.32	3.02	2.22	30.53
Strontium (total)	µg/L	NG	NG	NG	170	179	5.16	174	196	245	175	33.33
Sulphur (total)	µg/L	NG	NG	NG	11400	10800	5.41	10600	10900	10100	10600	4.83
Tellurium (total)	µg/L	NG	NG	NG	<0.20	<0.20	-	<0.20	<0.20	<0.20	<0.20	-
Thallium (total)	µg/L	NG	NG	0.8 [3.9]	<0.010	<0.010	-	<0.010	<0.010	<0.010	<0.010	-
Thorium (total)	µg/L	NG	NG	NG	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	-
Tin (total)	µg/L	NG	NG	NG	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	-
Titanium (total)	µg/L	NG	NG	NG	<0.30	<0.30	-	<0.30	<0.30	<0.30	<0.30	-
Tungsten (total)	µg/L	NG	NG	NG	<0.10	<0.10	-	<0.10	<0.10	<0.10	<0.10	-
Uranium (total)	µg/L	NG	NG	8.5	0.226	0.224	0.89	0.241	0.092	0.101	0.239	81.18
Vanadium (total)	µg/L	NG	NG	NG	<0.50	<0.50	-	<0.50	<0.50	<0.50	<0.50	-
Zinc (total)	µg/L	Calc [1.32]	Calc [2.21]	NG	<3.0	<3.0	-	<3.0	<3.0	<3.0	<3.0	-
Zirconium (total)	µg/L	NG	NG	NG	<0.20	<0.20	-	<0.20	<0.20	<0.20	<0.20	-

Table E-2
Iskut Landfill
Compiled Water Quality Results

Water Quality Results, SW-1 Un-named creek U/S of Iskut Landfill (E282678)																
Client Sample ID										Up Stream Iskut	Up Stream Iskut	Up Stream Iskut	Up Stream Iskut	Upstream	Upstream	SW-21 (DUP-Upstream)
Date Sampled		26-Jun-13	30-Jul-14	20-May-15	18-Jul-16	15-May-18	5-Sep-18	14-May-19	16-Oct-19	20-May-2020	23-Sep-2020	20-May-21	29-Sep-21	25-May-2022	13-Sep-2022	13-Sep-2022
Time Sampled										12:20	11:40	9:16	11:10	12:19	11:49	12:00
ALS Sample ID										VA20A6953-001	VA20B6353-001	VA21B0033-001	VA21C1769-001	VA22B1686-003	VA22C2099-001	VA22C2099-002
QA/QC										MT	MT	HS				
Field	**Units**															
Conductivity (SPC)	uS/cm				252	122	235.0	171.0	-	240.8	376.6	328.6	244.8	358.8	415.4	-
pH	pH				8.1	7.37	7.14	7.44	-	7.47	7.33	8.43	7.5	6.52	6.29	-
Temperature	°C				8.1	0.7	6.0	0.7	-	3	6.3	0.7	5.9	1.5	7.8	-
Dissolved Oxygen	mg/L					15	9.0	14.0	-	20.2	11.4	11.4	9.4	11.6	7	-
Dissolved Oxygen	%								-	169	105.0	89	85	93	65	-
Analyte	Units															
Conductivity	uS/cm	284	160	216	351						374	333	403	365	405	344
Hardness (as CaCO3), diss	mg/L									127	223	174	204	177	228	197
Hardness (as CaCO3)	mg/L	154	169	118	208	115		165		122	205	182	213	174	225	185
pH	pH	7.9	8	8	8					8.07	7.79	8.08	8.31	8.17	8.42	8.4
Anions and Nutrients																
Ammonia, Total (as N)	mg/L	0.09	ND	<0.03	0.03	0.0066	<0.0050	<0.0050		<0.0050	<0.0050	0.0064	<0.0050	<0.0050	<0.0050	<0.0050
Total Nitrogen as N	mg/L					0.158	0.128	0.12		0.148	0.199	0.351	0.199	0.163	0.174	0.107
Phosphorus (P)-Total	mg/L					0.0069	0.0088	0.0042		0.0054	0.0024	0.0149	0.003	0.0023	<0.0020	0.003
Total Metals																
Aluminum (Al)-Total	mg/L	0.0104	0.0057	0.157	0.028	0.0206	0.0138	0.0105		0.0234	0.0078	0.0510	<0.0030	0.0053	0.0082	0.009
Antimony (Sb)-Total	mg/L	ND	ND	<0.0001	0.0001	0.0001	<0.00010	0.00013		0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001
Arsenic (As)-Total	mg/L	0.00026	0.00028	0.0005	<0.0005	0.00029	0.00039	0.00030		0.00032	0.00024	0.00031	0.00024	0.00019	0.00026	0.00031
Barium (Ba)-Total	mg/L	0.0294	0.0335	0.025	0.036	0.0229	0.0372	0.0314		0.0234	0.0317	0.0267	0.0332	0.0253	0.0394	0.0376
Beryllium (Be)-Total	mg/L	ND	ND	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Bismuth	mg/L	ND	ND	<0.0001	<0.0001	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	ND	ND	0.042	0.006	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	ND	ND	0.00001	0.00003	0.0000073	0.000006	<0.0000050		<0.0000050	0.0000130	0.0000280	0.0000068	0.0000136	0.0000078	<0.0000050
Calcium (Ca)-Total	mg/L	48.1	53.0	35.5	65.1	34.6	57.3	54.3		37.9	66.7	60.0	70.2	56	73.2	58.3
Cessium (Cs) - Total	mg/L					<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	0.000018	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Total	mg/L	ND	ND	<0.0005	<0.0005	0.00011	<0.00010	<0.00010		<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Total	mg/L	ND	ND	0.00013	0.00005	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.00075	0.00064	0.0013	0.0017	0.00092	0.00058	0.00107		0.00089	<0.00050	0.00081	<0.00050	<0.00050	<0.00050	0.00052
Iron (Fe)-Total	mg/L	0.0148	0.012	0.22	0.04	0.031	0.023	0.013		0.036	0.023	0.122	<0.010	0.015	<0.010	<0.010
Lead (Pb)-Total	mg/L	ND	ND	<0.0001	<0.0001	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	0.000056	<0.000050	<0.000050
Lithium (Li)-Total	mg/L	ND	ND	0.0004	0.0006	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	0.0011	<0.0010	0.0012	<0.0010
Magnesium (Mg)-Total	mg/L	8.32	8.97	7.05	10.9	6.41	10.1	10.3		6.57	9.24	7.94	9.14	8.2	10.2	9.63
Manganese (Mn)-Total	mg/L	0.0012	0.0015	0.0118	0.0037	0.00215	0.00184	0.00172		0.00300	0.0108	0.0415	0.00193	0.00397	0.00271	0.00023
Mercury (Hg)-Total	mg/L	ND	ND	<0.00002	<0.00002	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000100	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	mg/L	0.0012	0.0011	0.0013	0.0012	0.000938	0.000969	0.00105		0.00128	0.00129	0.00120	0.00113	0.000995	0.00111	0.00119
Nickel (Ni)-Total	mg/L	ND	ND	0.0012	<0.0002	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus - Total	mg/L	ND	ND	<0.020	<0.02	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L	0.282	0.219	0.49	0.28	0.563	0.242	0.430		0.450	0.610	0.562	0.439	0.442	0.392	0.261
Rubidium (Rb) - Total	mg/L					<0.00020	<0.00020	<0.00020		<0.00020	0.00030	0.00038	0.00022	<0.00020	0.00023	<0.00020
Selenium (Se)-Total	mg/L	0.00062	0.00033	0.0012	<0.0005	0.000655	0.000385	0.00113		0.000802	0.000167	0.000504	0.000104	0.000236	0.000115	0.000358
Silicon - Total	mg/L	4.37	4.26	4.4	4.6	3.58	4.54	4.16		3.76	5.31	4.51	4.74	4.11	5.08	4.72
Silver (Ag)-Total	mg/L	ND	ND	<0.00005	<0.00005	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Total	mg/L	1.89	2.04	3.14	2.75	1.53	2.28	2.34		1.63	2.97	2.37	2.99	2.32	3.02	2.22
Strontium - Total	mg/L	0.128	0.156	0.082	0.155	0.0941	0.166	0.149		0.113	0.221	0.188	0.223	0.196	0.245	0.175
Sulfur - Total	mg/L	9.5	9.5	8	12	7.39	11.9	13.1		9.58	13.2	10.7	9.85	10.9	10.1	10.6
Tellurium - Total	mg/L			<0.0002	<0.0002	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	ND	ND	<0.00002	<0.00002	<0.000010	<0.000010	<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium - Total	mg/L			<0.0001	<0.0001	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	ND	ND	<0.0002	0.0006	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	ND	ND	0.01	<0.005	0.00112	0.00069	0.00035		0.00132	0.00080	0.00240	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W) - Total	mg/L					<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	mg/L	0.00022	0.00018	0.00015	0.00023	0.000144	0.000326	0.000347		0.000145	0.000098	0.000108	0.000100	0.000092	0.000101	0.000239
Vanadium (V)-Total	mg/L	ND	ND	<0.001	<0.001	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	mg/L	ND	ND	0.006	<0.004	<0.0030	<0.0030	0.0075		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium - Total	mg/L	ND	ND	<0.0001	<0.0001	0.000074	<0.000060	<0.000060		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals																
Aluminum (Al)-Dissolved	mg/L					0.0035		0.0021		0.0022	0.0033	0.0053	<0.0010	0.0018	0.0062	0.0092
Antimony (Sb)-Dissolved	mg/L					<0.00010		0.00012		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L					0.00026		0.00025		0.00030	0.00017	0.00018	0.00026	0.00017	0.00022	0.00031
Barium (Ba)-Dissolved	mg/L					0.0242		0.0286		0.0232	0.0328	0.0253	0.0344	0.031	0.0382	0.0362
Beryllium (Be)-Dissolved	mg/L					<0.00010		<0.00010		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Bismuth	mg/L					<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L					<0.010		<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L					<0.0000050		<0.0000050		<0.0000050	0.000119	0.0000071	0.0000082	0.0000072	0.0000084	<0.0000050
Calcium (Ca)-Dissolved	mg/L					34.8		51.5		38.7	73.5	57.0	66.0	58.1	75.3	62.5
Cesium (Cs)	mg/L					<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Chromium (Cr)-Dissolved	mg/L					<0.00010		<0.00010		<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Dissolved	mg/L					<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L					0.00081		0.00096		0.00084	0.00043	0.00052	0.00033	0.00235	0.00031	0.0006
Iron (Fe)-Dissolved	mg/L					<0.010		<0.010		<0.010	<0.010	<0.010	<0.010	0.012	<0.010	<0.010
Lead (Pb)-Dissolved	mg/L					<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	0.000052	<0.000050	<0.000050
Lithium (Li)-Dissolved	mg/L					<0.0010		<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0012	<0.0010
Magnesium (Mg)-Dissolved	mg/L					6.8		8.96		7.47	9.53	7.79	9.50	7.79	9.79	9.88
Manganese (Mn)-Dissolved	mg/L					0.00035		0.00040		0.00014	0.00102	0.00028	0.00132	0.0005	0.00138	0.00015
Mercury (Hg)-Dissolved	mg/L					<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolve	mg/L					0.000958		0.000988		0.00110	0.00121	0.00113	0.00113	0.00106	0.00106	0.00109
Nickel (Ni)-Dissolved	mg/L					<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved	mg/L					<0.050		<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L					0.6		0.354		0.462	0.560	0.622	0.423	0.485	0.402	0.299
Rubidium (Rb) - Dissolved	mg/L					<0.00020		<0.00020		<0.00020	0.00029	0.00032	0.00025	0.00021	<0.00020	<0.00020
Selenium (Se)-Dissolved	mg/L					0.000612		0.00116		0.000929	0.000134	0.000417	0.000139	0.000214	0.000099	0.000301
Silicon (Si) - Dissolved	mg/L					3.36		3.73		3.74	5.26	4.36	4.83	4.2	4.94	4.63
Silver (Ag)-Dissolved	mg/L					<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Sodium (Na)-Dissolved	mg/L					1.6		1.79		1.66	2.88	2.42	2.91	2.56	2.91	2.31
Strontium (Sr) - Dissolved	mg/L					0.1		0.142		0.116	0.228	0.175	0.213	0.188	0.244	0.182
Sulfur	mg/L					6.3		12.1		8.48	11.9	10.1	9.35	11	8.94	10.2
Tellerium (Te)-Dissolved	mg/L					<0.00020		<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L					<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L					<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L					<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00015
Titanium (Ti)-Dissolved	mg/L					<0.00030		<0.00030		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W) - Dissolved	mg/L					<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L					0.000148		0.000355		0.000149	0.000096	0.000084	0.000088	0.000096	0.000095	0.000254
Vanadium (V)-Dissolved	mg/L					<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L					<0.0010		0.0071		<0.0010	<0.0010	<0.0010	<0.0010	0.0027	0.0016	0.0017
Zirconium (Zr)-Dissolved	mg/L					<0.000060		<0.000060		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location										Field	Field	Field	Field	Field	Field	Field
dissolved metals filtration location										Field	Field	Field	Field	Field	Field	Field
Aggregate Organics																
BOD	mg/L	ND	ND	<4.0	<4.0	2	<2.0	<2.0		<2.0	<2.0	<2.0	<2.0	2.3	<2.0	<2.0

Table E-2
Iskut Landfill
Compiled Water Quality Results

Water Quality Results, SW-2 Un-named Creek D/S of Iskut Landfill (E282679)																					
Client Sample ID										Down Steam Iskut	DUP	Down Stream Iskut	DUP	Down Stream Iskut	DUP	Down Stream Iskut	DUP	Downstream	SW-21 (DUP-Downstream)	Downstream
Date Sampled		26-Jun-2013	30-Jul-2014	20-May-2015	18-Jul-2016	15-May-2018	5-Sep-2018	14-May-2019	16-Oct-2019	20-May-2020	20-May-20	23-Sep-2020	23-Sep-20	20-May-21	20-May-21	29-Sep-21	29-Sep-21	25-May-2022	25-May-2022	13-Sep-2022
Time Sampled										13:30	12:00	12:20	12:00	12:47	12:00	11:40	12:00	10:55	12:00	10:27
ALS Sample ID										VA20A6953-002	VA20A6953-003	VA20B6353-002	VA20B6353-003	VA21B0033-002	VA21B0033-003	VA21B0033-002	VA21C1769-003	VA22B1686-001	VA22B1686-002	VA22C2099-003
QA/QC										MT				HS	HS	HS	HS			
Field	**Units**																			
Conductivity (SPC)	uS/cm				257	123.4	237.1	180.4	-	249.2	-	329.1	-	300.6	-	214.4	-	347.7	-	348.8
pH	pH				7.8	7.61	7.65	7.83	-	7.94	-	7.97	-	8.29	-	8.15	-	8.34	-	8.08
Temperature	°C				9.1	1.00	6.2	1.30	-	3.00	-	6.4	-	2.3	-	5.2	-	3.3	-	5.9
Dissolved Oxygen	mg/L					14	9.1	14.2	-	18	-	9.8	-	12.6	-	12.2	-	12.7	-	11.3
Dissolved Oxygen	%									150	-	9.1	-	102	-	108	-	107	-	100
Analyte	Units																			
Conductivity	uS/cm	281	162	216	348						-	328	329	307	308	360	359	356	357	344
Hardness (as CaCO3), dissolved	mg/L									132	131	189	191	157	153	187	188	170	169	201
Hardness (as CaCO3)	mg/L	153	171	116	208	117		160		129	127	180	186	172	166	186	186	171	176	188
pH	pH	8.1	8.3	8	8.2					8.11	8.12	8.11	8.14	8.16	8.16	8.37	8.37	8.32	8.31	8.41
Anions and Nutrients (Matrix: Water)																				
Ammonia, Total (as N)	mg/L	0.03	ND	<0.03	0.03	0.0050	<0.0050	0.0059		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Total Nitrogen as N (Nitrate + Nitrite)	mg/L					0.158	0.092	0.126		0.183	0.168	0.2	0.163	0.133	0.135	0.122	0.130	0.189	0.133	0.107
Phosphorus (P)-Total	mg/L					0.0071	0.0027	0.0058		0.0045	0.0045	0.0061	0.0219	0.0053	0.0046	0.0231	0.0038	0.0027	0.0027	0.0023
Total Metals																				
Aluminum (Al)-Total	mg/L	0.003	0.0031	0.015	<0.005	0.0194	0.0035	0.0038		0.0300	0.0366	0.0063	0.0067	0.0190	0.0214	0.0050	0.0047	0.0056	0.0041	0.0096
Antimony (Sb)-Total	mg/L	0.0005	ND	<0.0001	0.0001	<0.00010	<0.00010	<0.00010		0.0001	0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Total	mg/L	0.0001	0.00030	<0.0005	<0.0005	0.00029	0.00039	0.00031		0.00032	0.00032	0.00035	0.00033	0.00030	0.00029	0.00032	0.00028	0.00027	0.00028	0.00032
Barium (Ba)-Total	mg/L	0.001	0.0334	0.022	0.036	0.0238	0.0363	0.0305		0.0228	0.0244	0.0342	0.0344	0.0269	0.0263	0.0346	0.0357	0.0308	0.0311	0.0369
Beryllium (Be)-Total	mg/L	0.0001	ND	<0.0001	<0.0001	<0.00010	<0.00010	<0.00010		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Bismuth	mg/L	0.001	ND	<0.0001	<0.0001	<0.000050	<0.000050	<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Total	mg/L	0.05	ND	0.008	0.006	<0.010	<0.010	<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Total	mg/L	0.00001	ND	<0.00001	0.00002	0.0000122	<0.0000050	<0.0000050		0.0000078	0.0000072	0.0000053	<0.0000050	0.0000062	<0.0000050	0.0000056	<0.0000050	<0.0000050	0.0000051	<0.0000050
Calcium (Ca)-Total	mg/L	0.05	54.4	35.4	65.3	35.3	56.2	54.0		40.5	39.9	56.4	58.8	55.5	52.4	58.8	58.0	54.2	55.8	58
Cessium (Cs) - Total	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
Chromium (Cr)-Total	mg/L	0.001	ND	<0.0005	<0.0005	0.00012	<0.00010	<0.00010		<0.00010	0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Total	mg/L	0.0005	ND	<0.00005	<0.00005	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Total	mg/L	0.0002	0.00063	0.0006	0.001	0.00122	0.00055	0.00063		0.00234	0.00098	0.00070	0.00071	0.00067	0.00069	0.00060	0.00061	0.00054	0.00054	0.00056
Iron (Fe)-Total	mg/L	0.005	ND	0.02	<0.01	0.03	<0.010	<0.010		0.048	0.056	<0.010	0.011	0.026	0.028	<0.010	<0.010	<0.010	<0.010	<0.010
Lead (Pb)-Total	mg/L	0.0002	ND	<0.0001	<0.0001	<0.000050	<0.000050	<0.000050		0.000076	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Lithium (Li)-Total	mg/L	0.005	ND	0.0003	0.0006	<0.0010	<0.0010	<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Total	mg/L	0.05	8.46	6.76	10.9	6.44	10.1	9.85		6.74	6.58	9.45	9.48	8.13	8.53	9.58	10.1	8.59	8.93	10.4
Manganese (Mn)-Total	mg/L	0.001	ND	0.0007	0.0002	0.00226	0.00022	0.00062		0.00406	0.00457	0.00076	0.00083	0.00195	0.00222	0.00045	0.00044	0.00029	0.00032	0.00025
Mercury (Hg)-Total	mg/L	0.00001	ND	<0.00002	<0.00002	<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Total	mg/L	0.001	0.0011	0.0013	0.0013	0.000896	0.00094	0.00103		0.00124	0.00119	0.00130	0.00132	0.00152	0.00149	0.00108	0.00110	0.0011	0.00116	0.00109
Nickel (Ni)-Total	mg/L	0.001	ND	0.0002	<0.0002	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus - Total	mg/L	0.01	ND	<0.020	<0.02	<0.050	<0.050	<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Total	mg/L	0.05	0.235	0.38	0.23	0.568	0.226	0.416		0.467	0.470	0.501	0.498	0.452	0.451	0.427	0.431	0.412	0.415	0.27
Rubidium (Rb) -Total	mg/L					0.0002	<0.00020	<0.00020		0.00025	<0.00020	0.00022	0.00024	<0.00020	0.00020	<0.00020	<0.00020	0.00021	<0.00020	<0.00020
Selenium (Se)-Total	mg/L	0.0001	0.00033	<0.0005	<0.0005	0.000789	0.00039	0.00124		0.000948	0.000891	0.000506	0.000535	0.000777	0.000710	0.000397	0.000445	0.000508	0.000469	0.000319
Silicon - Total	mg/L	0.1	4.40	4	4.5	3.6	4.54	4.59		3.95	4.02	4.9	4.89	4.04	4.06	4.77	4.86	4.28	4.18	4.82
Silver (Ag)-Total	mg/L	0.00002	ND	<0.00005	<0.00005	<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
Sodium (Na)-Total	mg/L	0.05	2.07	1.55	2.67	1.56	2.21	2.26		1.69	1.68	2.45	2.46	2.17	2.21	2.42	2.40	2.3	2.27	2.38
Strontium - Total	mg/L	0.001	0.151	0.084	0.157	0.0957	0.162	0.157		0.119	0.120	0.174	0.175	0.150	0.151	0.167	0.171	0.17	0.179	0.174
Sulfur - Total	mg/L	3	9.1	8	9	7.69	12.8	15.2		9.83	9.76	13.3	13.1	10.6	10.9	10.9	11.3	11.4	10.8	10.6
Tellurium - Total	mg/L			<0.0002	<0.0002	<0.00020	<0.00020	<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Total	mg/L	0.00005	ND	<0.00002	<0.00002	<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
Thorium - Total	mg/L			<0.0001	<0.0001	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Total	mg/L	0.005	ND	<0.0002	0.0003	<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Titanium (Ti)-Total	mg/L	0.005	ND	<0.005	<0.005	0.00097	<0.00030	<0.00030		0.00169	0.00210	0.00035	0.00038	0.00105	0.00142	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W) - Total	mg/L					<0.00010	<0.00010	<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Total	mg/L	0.0001	0.00019	0.00013	0.00023	0.000149	0.000324	0.000310		0.000143	0.000140	0.000242	0.000240	0.000291	0.000288	0.000241	0.000249	0.000226	0.000224	0.000241
Vanadium (V)-Total	mg/L	0.005	ND	<0.001	<0.001	<0.00050	<0.00050	<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Total	mg/L	0.005	ND	<0.004	<0.004	<0.0030	<0.0030	<0.0030		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
Zirconium - Total	mg/L	0.0005	ND	<0.0001	<0.0001	0.000066	<0.000060	<0.000060		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Dissolved Metals																				
Aluminum (Al)-Dissolved	mg/L					0.0028		<0.0010		0.0028	0.0024	0.0042	0.0029	0.0018	0.0020	0.0019	0.0023	0.0034	0.0027	0.0072
Antimony (Sb)-Dissolved	mg/L					<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Arsenic (As)-Dissolved	mg/L					0.00028		0.00028		0.00030	0.00030	0.00028	0.00031	0.00028	0.00028	0.00032	0.00033	0.0003	0.00028	0.00031
Barium (Ba)-Dissolved	mg/L					0.0235		0.0291		0.0236	0.0238	0.0344	0.0339	0.0265	0.0264	0.0364	0.0364	0.0366	0.0315	0.0366
Beryllium (Be)-Dissolved	mg/L					<0.00010		<0.00010		<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100	<0.000100
Bismuth	mg/L					<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Boron (B)-Dissolved	mg/L					<0.010		<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Dissolved	mg/L					<0.0000050		<0.0000050		<0.0000050	<0.0000050	0.0000099	0.0000063	<0.0000050	<0.0000050	0.0000058	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Calcium (Ca)-Dissolved	mg/L					35.8		49.6		40.4	40.2	59.9	60.7	49.3	47.8	57.6	58.4	53.7	53.6	63.9
Cesium (Cs)	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
Chromium (Cr)-Dissolved	mg/L					<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Dissolved	mg/L					<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Dissolved	mg/L					0.00082		0.00063		0.00084	0.00082	0.00066	0.00064	0.00065	0.00064	0.00062	0.00063	0.00273	0.00062	0.00055
Iron (Fe)-Dissolved	mg/L					<0.010		<0.010		<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.027	<0.010	<0.010
Lead (Pb)-Dissolved	mg/L					<0.000050		<0.000050		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000072	<0.000050	<0.000050

Table E-2
Iskut Landfill
Compiled Water Quality Results

Water Quality Results, SW-2 Un-named Creek D/S of Iskut Landfill (E282679)																					
Client Sample ID										Down Steam Iskut	DUP	Down Stream Iskut	DUP	Down Stream Iskut	DUP	Down Stream Iskut	DUP	Downstream	SW-21 (DUP-Downstream)	Downstream
Date Sampled		26-Jun-2013	30-Jul-2014	20-May-2015	18-Jul-2016	15-May-2018	5-Sep-2018	14-May-2019	16-Oct-2019	20-May-2020	20-May-20	23-Sep-2020	23-Sep-20	20-May-21	20-May-21	29-Sep-21	29-Sep-21	25-May-2022	25-May-2022	13-Sep-2022
Time Sampled										13:30	12:00	12:20	12:00	12:47	12:00	11:40	12:00	10:55	12:00	10:27
ALS Sample ID										VA20A6953-002	VA20A6953-003	VA20B6353-002	VA20B6353-003	VA21B0033-002	VA21B0033-003	VA21B0033-002	VA21C1769-003	VA22B1686-001	VA22B1686-002	VA22C2099-003
QA/QC										MT				HS	HS	HS	HS			
Lithium (Li)-Dissolved	mg/L							<0.0010		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Magnesium (Mg)-Dissolved	mg/L					6.7		8.72		7.48	7.43	9.62	9.69	8.19	8.24	10.5	10.2	8.61	8.51	10
Manganese (Mn)-Dissolved	mg/L					0.00034		0.00043		0.00017	0.00014	0.00030	0.00033	0.00011	0.00014	0.00023	0.00024	0.00073	0.00042	<0.00010
Mercury (Hg)-Dissolved	mg/L					<0.0000050	<0.0000050	<0.0000050		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
Molybdenum (Mo)-Dissolved	mg/L					0.000941		0.000991		0.00113	0.00111	0.00119	0.00121	0.00232	0.00221	0.00106	0.00107	0.00123	0.00108	0.00103
Nickel (Ni)-Dissolved	mg/L					<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Phosphorus (P)-Dissolved	mg/L					<0.050		<0.050		<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
Potassium (K)-Dissolved	mg/L					0.6		0.368		0.480	0.469	0.474	0.487	0.496	0.481	0.428	0.424	0.482	0.45	0.293
Rubidium (Rb) - Dissolved	mg/L					<0.00020		<0.00020		<0.00020	0.00020	<0.00020	0.00020	0.00022	0.00020	0.00022	<0.00020	<0.00020	<0.00020	<0.00020
Selenium (Se)-Dissolved	mg/L					0.000606		0.00108		0.000807	0.000877	0.000461	0.000490	0.000815	0.000776	0.000403	0.000485	0.000475	0.000506	0.000353
Silicon (Si) - Dissolved	mg/L					3.45		3.82		3.87	3.98	4.68	4.76	3.80	3.95	4.86	4.90	4.29	4.27	4.6
Silver (Ag)-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
Sodium (Na)-Dissolved	mg/L					1.6		2.01		1.75	1.68	2.39	2.58	2.05	2.02	2.38	2.41	2.41	2.34	2.28
Strontium (Sr) - Dissolved	mg/L					0.1		0.152		0.124	0.124	0.169	0.176	0.143	0.138	0.156	0.158	0.169	0.164	0.184
Sulfur	mg/L					6.4		12.3		8.94	8.88	12.1	10.9	10.4	11.0	10.8	10.8	10.8	11	9.31
Tellerium (Te)-Dissolved	mg/L					<0.00020		<0.00020		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
Thallium (Tl)-Dissolved	mg/L					<0.000010		<0.000010		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
Thorium (Th)-Dissolved	mg/L					<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Tin (Sn)-Dissolved	mg/L					<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0001
Titanium (Ti)-Dissolved	mg/L					<0.00030		<0.00030		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
Tungsten (W) - Dissolved	mg/L					<0.00010		<0.00010		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Uranium (U)-Dissolved	mg/L					0.00015		0.000292		0.000141	0.000140	0.000229	0.000226	0.000275	0.000264	0.000228	0.000230	0.000236	0.000232	0.000244
Vanadium (V)-Dissolved	mg/L					<0.00050		<0.00050		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Zinc (Zn)-Dissolved	mg/L					<0.0010		<0.0010		<0.0010	<0.0010	0.0017	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.0033	<0.0010	0.0013
Zirconium (Zr)-Dissolved	mg/L					<0.000060		<0.000060		<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020	<0.00020
dissolved mercury filtration location										Field	Field	Field	Field	Field	Field	Field	Field	Field	Field	Field
dissolved metals filtration location										Field	Field	Field	Field	Field	Field	Field	Field	Field	Field	Field
Aggregate Organics (Matrix: Water)																				
BOD	mg/L	ND	ND	<4.0	<4.0	<2.0		<2.0		<2.0	<2.0	<2.0		<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0

Table E-3
Iskut Landfill - QAQC Blanks
Water Quality Results

		Sampling Location	Field Blank	Field Blank	Travel Blank	Travel Blank
		Date Sampled	25-May-22	13-Sep-22	25-May-22	13-Sep-22
		Lab Sample ID	VA22B1686-004	VA22C2099-004	VA22B1686-005	VA22C2099-005
		Sample Type	Field Blank	Field Blank	Trip Blank	Trip Blank
Analyte	**Unit**	**Guideline**				
		No Guideline				
Lab Results						
Anions and Cations in meq/L unit						
Calcium (total, meq/L) (calculated)	meq/L	NG	<0.0025	<0.0025	<0.0025	<0.0025
Magnesium (total, meq/L) (calculated)	meq/L	NG	<0.00041	<0.00041	<0.00041	<0.00041
Potassium (total, meq/L) (calculated)	meq/L	NG	<0.0013	<0.0013	<0.0013	<0.0013
Sodium (total, meq/L) (calculated)	meq/L	NG	<0.0022	<0.0022	<0.0022	<0.0022
General and Inorganic Parameters						
Ammonia (total, as N)	µg/L	NG	<5.0	<5.0		
Biochemical oxygen demand	mg/L	NG	<2.0	<2.0		
Conductivity	µS/cm	NG	<2.0	<2.0	<2.0	<2.0
Nitrogen, total	µg/L	NG	<30	79	<30	<30
pH		NG	5.26	5.33		
Total Metals						
Aluminum (total)	µg/L	NG	<3.0	<3.0	<3.0	<3.0
Antimony (total)	µg/L	NG	<0.10	<0.10	<0.10	<0.10
Arsenic (total)	µg/L	NG	<0.10	<0.10	<0.10	<0.10
Barium (total)	µg/L	NG	<0.10	<0.10	<0.10	<0.10
Beryllium (total)	µg/L	NG	<0.100	<0.100	<0.100	<0.100
Bismuth (total)	µg/L	NG	<0.050	<0.050	<0.050	<0.050
Boron (total)	µg/L	NG	<10	<10	<10	<10
Cadmium (total)	µg/L	NG	<0.0050	<0.0050	<0.0050	<0.0050
Calcium (total)	mg/L	NG	<0.050	<0.050	<0.050	<0.050
Cesium (total)	µg/L	NG	<0.010	<0.010	<0.010	<0.010
Chromium (total)	µg/L	NG	<0.50	<0.50	<0.50	<0.50
Cobalt (total)	µg/L	NG	<0.10	<0.10	<0.10	<0.10
Copper (total)	µg/L	NG	<0.50	<0.50	<0.50	<0.50
Hardness (as CaCO3), from total Ca/Mg	mg/L	NG	<0.60	<0.60	<0.60	<0.60
Iron (total)	µg/L	NG	<10	<10	<10	<10
Lead (total)	µg/L	NG	<0.050	<0.050	<0.050	<0.050
Lithium (total)	µg/L	NG	<1.0	<1.0	<1.0	<1.0
Magnesium (total)	mg/L	NG	<0.0050	<0.0050	<0.0050	<0.0050
Manganese (total)	µg/L	NG	<0.10	<0.10	<0.10	<0.10
Mercury (total)	µg/L	NG	<0.0050	<0.0050	<0.0050	<0.0050
Molybdenum (total)	µg/L	NG	<0.050	<0.050	<0.050	<0.050
Nickel (total)	µg/L	NG	<0.50	<0.50	<0.50	<0.50
Phosphorus (total, by ICPMS/ICPOES)	µg/L	NG	<50	<50	<50	<50
Phosphorus (total, APHA 4500-P)	µg/L	NG	<2.0	<2.0		
Potassium (total)	µg/L	NG	<50	<50	<50	<50
Rubidium (total)	µg/L	NG	<0.20	<0.20	<0.20	<0.20
Selenium (total)	µg/L	NG	<0.050	<0.050	<0.050	<0.050
Silicon (total, as Si)	µg/L	NG	<100	<100	<100	<100
Silver (total)	µg/L	NG	<0.010	<0.010	<0.010	<0.010
Sodium (total)	mg/L	NG	<0.050	<0.050	<0.050	<0.050
Strontium (total)	µg/L	NG	<0.20	<0.20	<0.20	<0.20
Sulphur (total)	µg/L	NG	<500	<500	<500	<500
Tellurium (total)	µg/L	NG	<0.20	<0.20	<0.20	<0.20
Thallium (total)	µg/L	NG	<0.010	<0.010	<0.010	<0.010
Thorium (total)	µg/L	NG	<0.10	<0.10	<0.10	<0.10
Tin (total)	µg/L	NG	<0.10	<0.10	<0.10	<0.10
Titanium (total)	µg/L	NG	<0.30	<0.30	<0.30	<0.30
Tungsten (total)	µg/L	NG	<0.10	<0.10	<0.10	<0.10
Uranium (total)	µg/L	NG	<0.010	<0.010	<0.010	<0.010
Vanadium (total)	µg/L	NG	<0.50	<0.50	<0.50	<0.50
Zinc (total)	µg/L	NG	<3.0	<3.0	<3.0	<3.0
Zirconium (total)	µg/L	NG	<0.20	<0.20	<0.20	<0.20

Legend for Reports for RDKS Environmental Reporting Water Quality Results

<	Less than reported detection limit
>	Greater than reported upper detection limit
>=	Greater than or equal to
A	Absent
BCAWQG AL (LT)	BC Approved Water Quality Guidelines for freshwater aquatic life (Long-term chronic)
BCAWQG AL (ST)	BC Approved Water Quality Guidelines for freshwater aquatic life (Short-term acute)
BCWWQG AL	BC Working Water Quality Guidelines for Freshwater Aquatic Life
Calc	Calculated guideline or standard. The guideline or standard is dependent on the value of one or more other analytes, and is calculated from a formula or table.
L	Laboratory reading type (Lab result)
m asl	metres above sea level
N	Narrative type of guideline or standard, or Result Note.
ND	Non-detect. Result is less than lower detection limit.
NG	No Guideline
NR	No Result
NS	No Standard
NT	Not Tested
OG	Overgrown
P	Present
PR	Presumptive
TK	Test kit reading type (Field result)
TNTC	Too numerous to count
	Highlighted value has a lower detection limit that is greater than the guideline/standard maximum and/or the guideline/standard minimum, or has an upper detection limit that is less than the guideline/standard maximum and/or the guideline/standard minimum.
100	The maximum guideline/standard value cannot be determined because a result for a dependent analyte is not available for the sample.
BCAWQG AL (LT)	Highlighted value exceeds BCAWQG AL (LT)
BCAWQG AL (ST)	Highlighted value exceeds BCAWQG AL (ST)
BCWWQG AL	Highlighted value exceeds BCWWQG AL
SL Criteria Override	Highlighted value exceeds sampling location criteria override

Guideline Notes for Reports for RDKS Environmental Reporting Water Quality Results

1. Notes for BC Approved Water Quality Guidelines for freshwater aquatic life (Long-term chronic) (BCAWQG AL (LT))

General Notes:

References: British Columbia Ministry of Environment and Climate Change Strategy. 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture - Guideline Summary; and B.C. Guideline Overview and Technical Reports. / There are two types of water quality guidelines: the short-term acute guideline (i.e. maximum), and the long-term chronic guideline (i.e. average). Only the long-term chronic guidelines are included in this criteria set.

Note 1.1 for Aluminum (dissolved):

Freshwater aquatic life long-term chronic guideline: the 30-day average concentration of dissolved aluminum (based on a minimum of 5 approximately weekly samples) should not exceed:

1. 0.05 mg/L when the median pH over 30 days is greater than or equal to 6.5
2. the value determined by the following relationship at median pH less than 6.5

Dissolved Aluminum = e (1.6-3.327 (median pH) + 0.402 (median pH)^2) / The lab pH results were used for determining the maximum aluminum (dissolved) concentration for this report. If a lab pH result was not available then the field pH result was used.

Note 1.2 for Arsenic (dissolved):

Freshwater aquatic life long-term chronic guideline for total arsenic.

Note 1.3 for Boron (dissolved):

Aquatic life long-term chronic guideline for total boron.

Note 1.4 for Cadmium (dissolved):

Freshwater aquatic life long-term chronic guideline: The guideline for cadmium is determined on a site-specific basis according to the local water hardness. The guideline for cadmium (dissolved) in µg/L is determined by the following equations for long term exposure:

1. If hardness (as CaCO3) is less than 3.4 mg/L then maximum is 0.0176 µg/L
2. If hardness (as CaCO3) is from 3.4 to 285 mg/L then maximum is based on equation:

e raised to the power of {0.736[ln(hardness)] - 4.943}

3. If hardness (as CaCO3) is greater than 285 mg/L then maximum is 0.457 µg/L.

When water hardness is greater than the upper bound (i.e., highest water hardness tested), a site-specific assessment may be required.

Note 1.5 for Cobalt (dissolved):

Freshwater aquatic life long-term chronic guideline.

Note 1.6 for Copper (dissolved):

The freshwater aquatic life long-term chronic guideline is for dissolved copper and is dependent on the specific chemistry of the water body and can only be calculated using the British Columbia Biotic Ligand Model (BC BLM) software.

Note 1.7 for Lead (dissolved):

The freshwater aquatic life long-term chronic guideline for total lead in water is: when water hardness exceeds 8 mg/L as CaCO3, the guideline is less than or equal to 3.31 + exp (1.273 ln (mean hardness) - 4.704). In addition, no more than 20% (e.g. 1 in 5) of values in a 30-day period should exceed 1.5 times the long-term chronic guideline.

The guideline applies to water hardness between 8 – 360 mg/L (as CaCO3). If natural levels exceed the guideline, then any allowed increase in total lead above natural levels should be based on site-specific data. When water hardness exceeds highest hardness tested (i.e. upper bound), a site-specific assessment may be required.

For hardness less than or equal to 8 mg/L there is no long-term chronic guideline. The short-term acute guideline of 3.0 µg/L is used for this case.

Note 1.8 for Manganese (dissolved):

The freshwater aquatic life long-term chronic guideline for total manganese in mg/L is determined by the following relationship:

0.0044 hardness + 0.605

where water hardness is reported as mg/L of CaCO3.

The guideline applies to water hardness between 37 – 450 mg/L CaCO3. When water hardness is outside hardness range tested (i.e. lower or upper bound), a site-specific assessment may be required.

Note 1.9 for Mercury (dissolved):

The aquatic life long-term chronic guideline for total mercury for aquatic life is based on the formula 0.0001 / (MeHg/total Hg), where MeHg is mass (or concentration) of methyl mercury and total Hg is total mass (or concentration) of mercury in a given water volume.

The guideline is 0.02 µg/L when the methyl mercury (MeHg) constitutes less than or equal to 0.5% of the total mercury concentration. When the proportion of MeHg is greater than 0.5%, the guideline should be adjusted. Reference: Ambient Water Quality Guidelines for Mercury: Overview Report – First Update (2001).

Note 1.10 for Molybdenum (dissolved):

Freshwater aquatic life long-term chronic guideline for total molybdenum.

Note 1.11 for Phosphorus (dissolved, by ICPMS/ICPOES):

Streams: None proposed for streams.
Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives.

Note 1.12 for Selenium (dissolved):
Aquatic life long-term chronic guideline. The 30-day average water quality guideline for protection of aquatic life is 2 µg/L determined as the mean concentration of 5 evenly spaced samples collected over 30 days, and measured as total selenium.

Note 1.13 for Silver (dissolved):
The freshwater aquatic life long-term chronic guideline for total silver is:
0.05 µg/L as 30-day mean if hardness less than or equal to 100 mg/L
1.5 µg/L as 30-day mean if hardness greater than 100 mg/L.

Note 1.14 for Zinc (dissolved):
The freshwater aquatic life long-term chronic guideline for total zinc (µg/L) at any time should not exceed 7.5 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3.
When water hardness is less than or equal to 90 mg/L as CaCO3 the guideline is 7.5 µg/L;
When water hardness exceeds 90 mg/L CaCO3, the guideline in µg/L for total zinc is the value determined by the following relationship:
7.5 + 0.75 * (hardness - 90)
where water hardness is reported as mg/L of CaCO3.
The long-term chronic guideline formula applies to water hardness between 90 – 330 mg/L CaCO3.

Note 1.15 for Ammonia (total, as N):
The freshwater aquatic life long-term chronic guideline for ammonia varies as a function of pH and temperature. See Table 4 in Overview Report Update September 2009. / The lab pH and field temperature results were used for determining the maximum ammonia concentration for this report. If a lab pH result was not available then the field pH result was used.

Note 1.16 for Dissolved organic carbon:
The freshwater aquatic life long-term chronic guideline for dissolved organic carbon (DOC) is 30-day median ± 20% of the median background concentration.
The 30-day median shall be within 20% of seasonally-adjusted median background levels as measured historically or at appropriate reference sites. The 30-day median calculation should be based on a minimum of 5 weekly samples taken over a period of 30 days.

Note 1.17 for Nitrate (as N):
Freshwater aquatic life long-term chronic guideline.

Note 1.18 for Nitrite (as N):
The freshwater aquatic life long-term chronic guideline for nitrite as N is:
0.02 mg/L if chloride less than 2 mg/L
0.04 mg/L if chloride is 2 to 4 mg/L
0.06 mg/L if chloride is 4 to 6 mg/L
0.08 mg/L if chloride is 6 to 8 mg/L
0.10 mg/L if chloride is 8 to 10 mg/L
0.20 mg/L if chloride is greater than 10 mg/L.

Note 1.19 for pH:
The freshwater aquatic life long-term chronic guideline is:
pH less than 6.5: No statistically significant decrease in pH from background;
pH from 6.5 to 9.0: Unrestricted change permitted within this range;
pH over 9.0: No statistically significant increase in pH from background.
See BC MOE Overview Report for additional details.

Note 1.20 for Total suspended solids:
Aquatic life guidelines for total suspended solids are:
Change from background of 25 mg/L at any one time for a duration of 24 h in all waters during clear flows or in clear waters;
Change from background of 5 mg/L at any one time for a duration of 30 d in all waters during clear flows or in clear waters;
Change from background of 10 mg/L at any time when background is 25 - 100 mg/L during high flows or in turbid waters;
Change from background of 10% when background is > 100 mg/L at any time during high flows or in turbid waters.

Note 1.21 for Arsenic (total):
Freshwater aquatic life long-term chronic guideline.

Note 1.22 for Boron (total):
Aquatic life long-term chronic guideline.

Note 1.23 for Cobalt (total):
Freshwater aquatic life long-term chronic guideline.

Note 1.24 for Lead (total):

The freshwater aquatic life long-term chronic guideline for total lead in water is: when water hardness exceeds 8 mg/L as CaCO3, the guideline is less than or equal to 3.31 + exp (1.273 ln (mean hardness) - 4.704). In addition, no more than 20% (e.g. 1 in 5) of values in a 30-day period should exceed 1.5 times the long-term chronic guideline.
The guideline applies to water hardness between 8 – 360 mg/L (as CaCO3). If natural levels exceed the guideline, then any allowed increase in total lead above natural levels should be based on site-specific data. When water hardness exceeds highest hardness tested (i.e. upper bound), a site-specific assessment may be required.
For hardness less than or equal to 8 mg/L there is no long-term chronic guideline. The short-term acute guideline of 3.0 µg/L is used for this case.

Note 1.25 for Manganese (total):
The freshwater aquatic life long-term chronic guideline for total manganese in mg/L is determined by the following relationship:
0.0044 hardness + 0.605
where water hardness is reported as mg/L of CaCO3.
The guideline applies to water hardness between 37 – 450 mg/L CaCO3. When water hardness is outside hardness range tested (i.e. lower or upper bound), a site-specific assessment may be required.

Note 1.26 for Mercury (total):
The aquatic life long-term chronic guideline for total mercury for aquatic life is based on the formula 0.0001 / (MeHg/total Hg), where MeHg is mass (or concentration) of methyl mercury and total Hg is total mass (or concentration) of mercury in a given water volume.
The guideline is 0.02 µg/L when the methyl mercury (MeHg) constitutes less than or equal to 0.5% of the total mercury concentration. When the proportion of MeHg is greater than 0.5%, the guideline should be adjusted. Reference: Ambient Water Quality Guidelines for Mercury: Overview Report – First Update (2001).

Note 1.27 for Molybdenum (total):
Freshwater aquatic life long-term chronic guideline.

Note 1.28 for Phosphorus (total, by ICPMS/ICPOES):
Streams: None proposed for streams.
Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives.

Note 1.29 for Phosphorus (total, APHA 4500-P):
Streams: None proposed for streams.
Lakes: It is not possible to specify a single phosphorous concentration to achieve protection of aquatic life in lakes. A range of total phosphorous concentrations (5-15 µg/L) is suggested as the criterion which can be used as the basis for site specific water quality objectives.

Note 1.30 for Selenium (total):
Aquatic life long-term chronic guideline. The 30-day average water quality guideline for protection of aquatic life is 2 µg/L determined as the mean concentration of 5 evenly spaced samples collected over 30 days, and measured as total selenium.

Note 1.31 for Silver (total):
The freshwater aquatic life long-term chronic guideline for total silver is:
0.05 µg/L as 30-day mean if hardness less than or equal to 100 mg/L
1.5 µg/L as 30-day mean if hardness greater than 100 mg/L.

Note 1.32 for Zinc (total):
The freshwater aquatic life long-term chronic guideline for total zinc (µg/L) at any time should not exceed 7.5 µg/L when water hardness is less than or equal to 90 mg/L as CaCO3.
When water hardness is less than or equal to 90 mg/L as CaCO3 the guideline is 7.5 µg/L;
When water hardness exceeds 90 mg/L CaCO3, the guideline in µg/L for total zinc is the value determined by the following relationship:
7.5 + 0.75 * (hardness - 90)
where water hardness is reported as mg/L of CaCO3.
The long-term chronic guideline formula applies to water hardness between 90 – 330 mg/L CaCO3.

2. Notes for BC Approved Water Quality Guidelines for freshwater aquatic life (Short-term acute) (BCAWQG AL (ST))

General Notes:
References: British Columbia Ministry of Environment and Climate Change Strategy. 2021. British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture - Guideline Summary; and B.C. Guideline Overview and Technical Reports. / There are two types of water quality guidelines: the short-term acute guideline (i.e. maximum), and the long-term chronic guideline (i.e. average). Only the short-term acute guidelines are included in this criteria set.

Note 2.1 for Aluminum (dissolved):

Freshwater aquatic life short-term acute guideline: the maximum concentration of dissolved aluminum at any time should not exceed:
1. 0.10 mg/L when the pH is greater than or equal to 6.5
2. The value (in mg/L) determined by the following relationship if pH less than 6.5
Dissolved Aluminum = e (1.209-2.426 (pH) + 0.286 $(pH)^2$)

Note 2.2 for Cadmium (dissolved):
Freshwater aquatic life short-term acute guideline: The guideline for cadmium is determined on a site-specific basis according to the local water hardness. The guideline for cadmium (dissolved) in µg/L is determined by the following equations for short term exposure:
1. If hardness (as CaCO3) is less than 7 mg/L then maximum is 0.0380 µg/L
2. If hardness (as CaCO3) is from 7 to 45 mg/L then maximum is based on equation:
e to the power of {1.03[ln(hardness)] - 5.274}
3. If hardness (as CaCO3) is greater than 455 mg/L then maximum is 2.8 µg/L.
When water hardness is greater than the upper bound (i.e., highest water hardness tested), a site-specific assessment may be required.

Note 2.3 for Cobalt (dissolved):
Freshwater aquatic life short-term acute guideline.

Note 2.4 for Copper (dissolved):
The freshwater aquatic life short-term acute guideline is for dissolved copper and is dependent on the specific chemistry of the water body and can only be calculated using the British Columbia Biotic Ligand Model (BC BLM) software.

Note 2.5 for Iron (dissolved):
Freshwater aquatic life short-term acute guideline.

Note 2.6 for Lead (dissolved):
The freshwater aquatic life short-term acute guideline for total lead in water, at a water hardness less than or equal to 8 mg/L as CaCO3 is 3 µg/L. When water hardness exceeds 8 mg/L (as CaCO3) the short-term acute guideline (µg/L) is given by the following equation: exp (1.273 ln(hardness) - 1.460).
The guideline applies to water hardness up to 360 mg/L (as CaCO3). If natural levels exceed the guideline, then any allowed increase in total lead above natural levels should be based on site-specific data. When water hardness exceeds highest hardness tested (i.e. upper bound), a site-specific assessment may be required.

Note 2.7 for Manganese (dissolved):
The freshwater aquatic life short-term acute guideline for total manganese in mg/L is determined by the following relationship:
0.01102 hardness + 0.54
where water hardness is reported as mg/L of CaCO3.
The guideline applies to water hardness between 25 – 259 mg/L CaCO3. When water hardness is outside hardness range tested (i.e. lower or upper bound), a site-specific assessment may be required.

Note 2.8 for Molybdenum (dissolved):
Freshwater aquatic life short-term acute guideline for total molybdenum.

Note 2.9 for Silver (dissolved):
The freshwater aquatic life short-term acute guideline for total silver is:
0.1 µg/L maximum if hardness less than or equal to 100 mg/L
3.0 µg/L maximum if hardness greater than 100 mg/L.

Note 2.10 for Zinc (dissolved):
The freshwater aquatic life short-term acute guideline for total zinc (µg/L) is:
When water hardness is less than or equal to 90 mg/L as CaCO3 the guideline is 33 µg/L;
When water hardness exceeds 90 mg/L CaCO3, the guideline in µg/L for total zinc is the value determined by the following relationship:
33 + 0.75 * (hardness - 90)
where water hardness is reported as mg/L of CaCO3.
The short-term acute guideline formula applies to water hardness between 90 – 500 mg/L CaCO3.

Note 2.11 for Ammonia (total, as N):
The freshwater aquatic life short-term acute guideline for ammonia varies as a function of pH and temperature. See Table 3 in Overview Report Update September 2009. / The lab pH and field temperature results were used for determining the maximum ammonia for this report. If a lab pH result was not available then the field pH result was used.

Note 2.12 for Nitrate (as N):
Freshwater aquatic life short-term acute guideline.

Note 2.13 for Nitrite (as N):

The freshwater aquatic life short-term acute guideline for nitrite as N is:
0.06 mg/L if chloride less than 2 mg/L
0.12 mg/L if chloride is 2 to 4 mg/L
0.18 mg/L if chloride is 4 to 6 mg/L
0.24 mg/L if chloride is 6 to 8 mg/L
0.30 mg/L if chloride is 8 to 10 mg/L
0.60 mg/L if chloride is greater than 10 mg/L.

Note 2.14 for Total suspended solids:
Aquatic life guidelines for total suspended solids are:
Change from background of 25 mg/L at any one time for a duration of 24 h in all waters during clear flows or in clear waters;
Change from background of 5 mg/L at any one time for a duration of 30 d in all waters during clear flows or in clear waters;
Change from background of 10 mg/L at any time when background is 25 - 100 mg/L during high flows or in turbid waters;
Change from background of 10% when background is > 100 mg/L at any time during high flows or in turbid waters.

Note 2.15 for Cobalt (total):
Freshwater aquatic life short-term acute guideline.

Note 2.16 for Iron (total):
Freshwater aquatic life short-term acute guideline.

Note 2.17 for Lead (total):
The freshwater aquatic life short-term acute guideline for total lead in water, at a water hardness less than or equal to 8 mg/L as CaCO3 is 3 µg/L. When water hardness exceeds 8 mg/L (as CaCO3) the short-term acute guideline (µg/L) is given by the following equation: exp (1.273 ln(hardness) - 1.460).
The guideline applies to water hardness up to 360 mg/L (as CaCO3). If natural levels exceed the guideline, then any allowed increase in total lead above natural levels should be based on site-specific data. When water hardness exceeds highest hardness tested (i.e. upper bound), a site-specific assessment may be required.

Note 2.18 for Manganese (total):
The freshwater aquatic life short-term acute guideline for total manganese in mg/L is determined by the following relationship:
0.01102 hardness + 0.54
where water hardness is reported as mg/L of CaCO3.
The guideline applies to water hardness between 25 – 259 mg/L CaCO3. When water hardness is outside hardness range tested (i.e. lower or upper bound), a site-specific assessment may be required.

Note 2.19 for Molybdenum (total):
Freshwater aquatic life short-term acute guideline.

Note 2.20 for Silver (total):
The freshwater aquatic life short-term acute guideline for total silver is:
0.1 µg/L maximum if hardness less than or equal to 100 mg/L
3.0 µg/L maximum if hardness greater than 100 mg/L.

Note 2.21 for Zinc (total):
The freshwater aquatic life short-term acute guideline for total zinc (µg/L) is:
When water hardness is less than or equal to 90 mg/L as CaCO3 the guideline is 33 µg/L;
When water hardness exceeds 90 mg/L CaCO3, the guideline in µg/L for total zinc is the value determined by the following relationship:
33 + 0.75 * (hardness - 90)
where water hardness is reported as mg/L of CaCO3.
The short-term acute guideline formula applies to water hardness between 90 – 500 mg/L CaCO3.

3. Notes for BC Working Water Quality Guidelines for Freshwater Aquatic Life (BCWWQG AL)

General Notes:
Reference: B.C. Ministry of Environment and Climate Change Strategy. 2021. Working Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture.
WWQG values are long-term (i.e. average) concentrations unless identified as a short-term maximum in the “Notes” for a specific analyte. Long-term WWQGs represent average substance concentrations calculated from 5 samples in 30 days.
WWQG are given for total substance concentrations unless otherwise noted.

Note 3.1 for Antimony (dissolved):
The guideline is for antimony (III).

Note 3.2 for Calcium (dissolved):
The guideline for dissolved calcium in mg/L is as follows:
- Less than 4, highly sensitive to acid inputs
- 4 to 8, moderately sensitive
- Greater than 8, low sensitivity.

Note 3.3 for Chromium (dissolved):

The guideline for Cr(VI) is 1 µg/L (total). The guideline for Cr(III) is 8.9 µg/L (total). The guideline of 1 µg/L for Cr(VI) was used, in this report, to identify exceedances for dissolved chromium, and total chromium as a means for determining the potential for exceeding the Cr(VI) and/or Cr(III) guidelines.

Note 3.4 for Nickel (dissolved):

The guideline for nickel in µg/L is determined as follows:
When the water hardness is 0 to ≤ 60 mg/L, the maximum is 25 µg/L
At hardness > 60 to ≤ 180 mg/L the maximum is calculated using the equation:
e raised to the power of {0.76[ln(hardness)] + 1.06}
At hardness >180 mg/L, the maximum is 150 µg/L
Where water hardness is reported as mg/L CaCO3.
If the water hardness is unknown, the maximum is 25 µg/L.

Note 3.5 for Thallium (dissolved):

30-day average, site-specific objective for the lower Columbia River, BC

Note 3.6 for Antimony (total):

The guideline is for antimony (III).

Note 3.7 for Chromium (total):

The guideline for Cr(VI) is 1 µg/L (total). The guideline for Cr(III) is 8.9 µg/L (total). The guideline of 1 µg/L for Cr(VI) was used, in this report, to identify exceedances for dissolved chromium, and total chromium as a means for determining the potential for exceeding the Cr(VI) and/or Cr(III) guidelines.

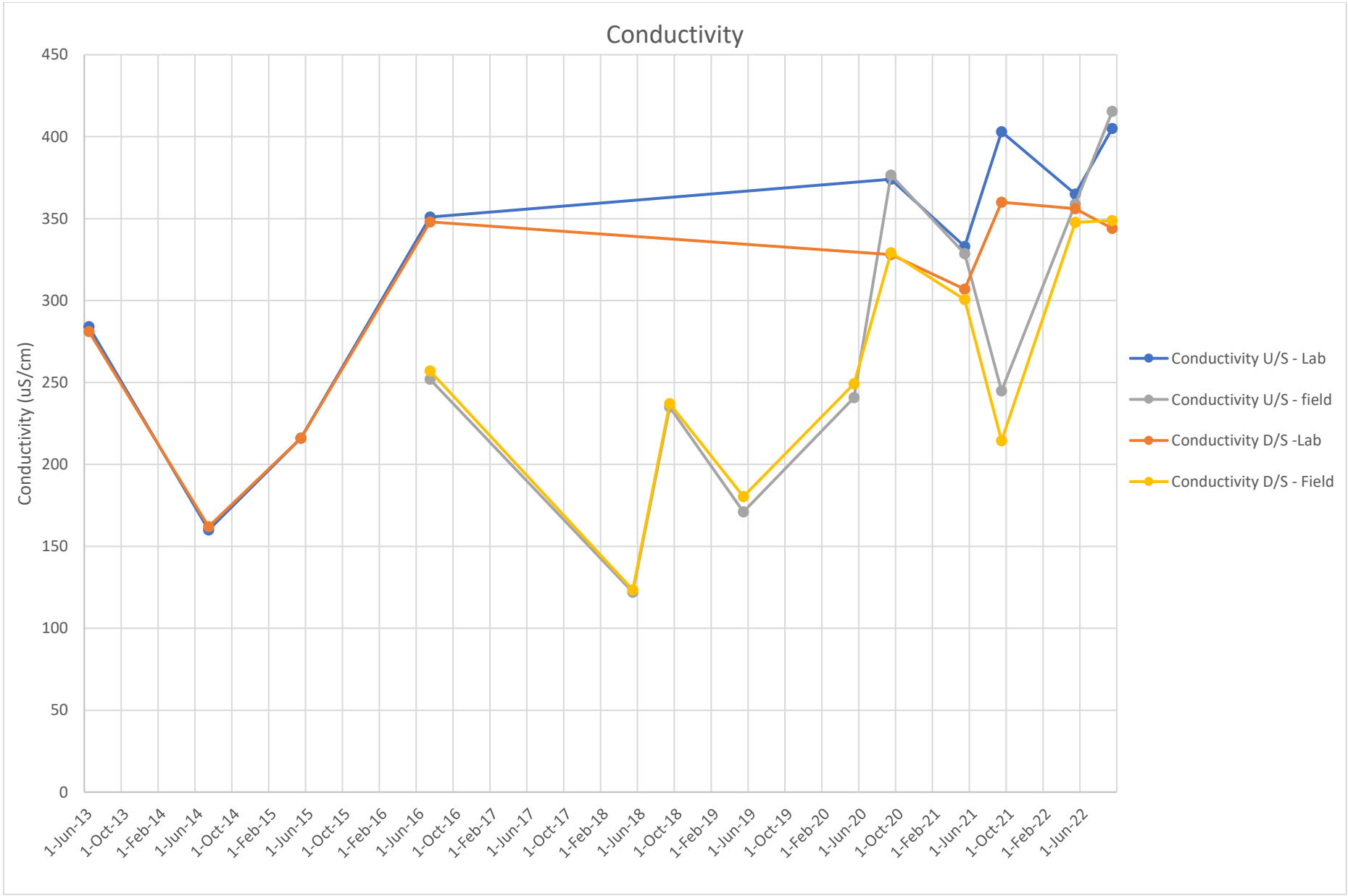
Note 3.8 for Nickel (total):

The guideline for nickel in µg/L is determined as follows:
When the water hardness is 0 to ≤ 60 mg/L, the maximum is 25 µg/L
At hardness > 60 to ≤ 180 mg/L the maximum is calculated using the equation:
e raised to the power of {0.76[ln(hardness)] + 1.06}
At hardness >180 mg/L, the maximum is 150 µg/L
Where water hardness is reported as mg/L CaCO3.
If the water hardness is unknown, the maximum is 25 µg/L.

Note 3.9 for Thallium (total):

30-day average, site-specific objective for the lower Columbia River, BC

Appendix F: Water Quality Trending Graphs


Conductivity
Conductivity (uS/cm)
450
400
350
300
250
200
150
100
50
0
1-Jun-13
1-Oct-13
1-Feb-14
1-Jun-14
1-Oct-14
1-Feb-15
1-Jun-15
1-Oct-15
1-Feb-16
1-Jun-16
1-Oct-16
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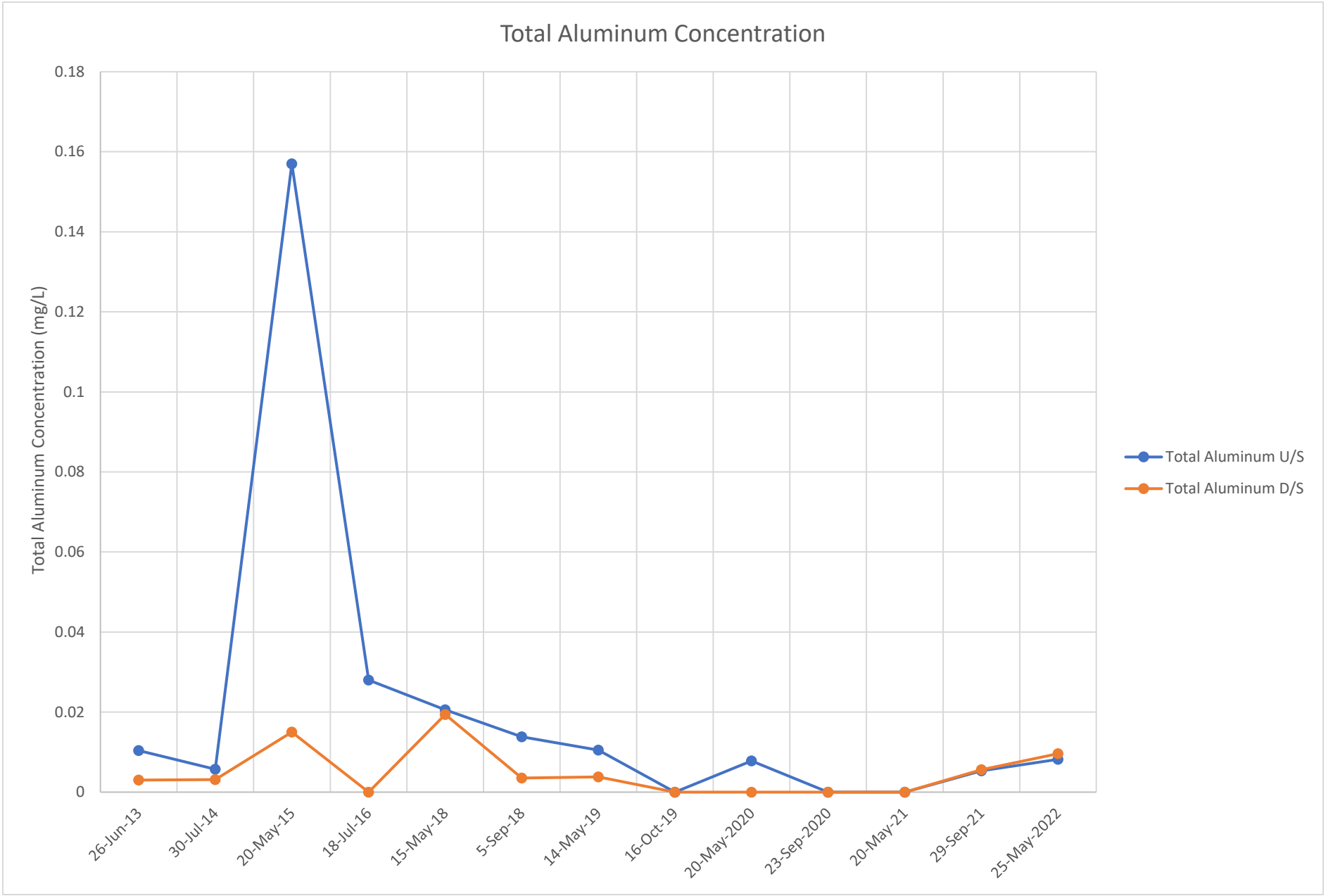
1-Oct-19
1-Feb-20
1-Jun-20
1-Oct-20
1-Feb-21
1-Jun-21
1-Oct-21
1-Feb-22
1-Jun-22
Conductivity U/S - Lab
Conductivity U/S - field
Conductivity D/S -Lab
Conductivity D/S - Field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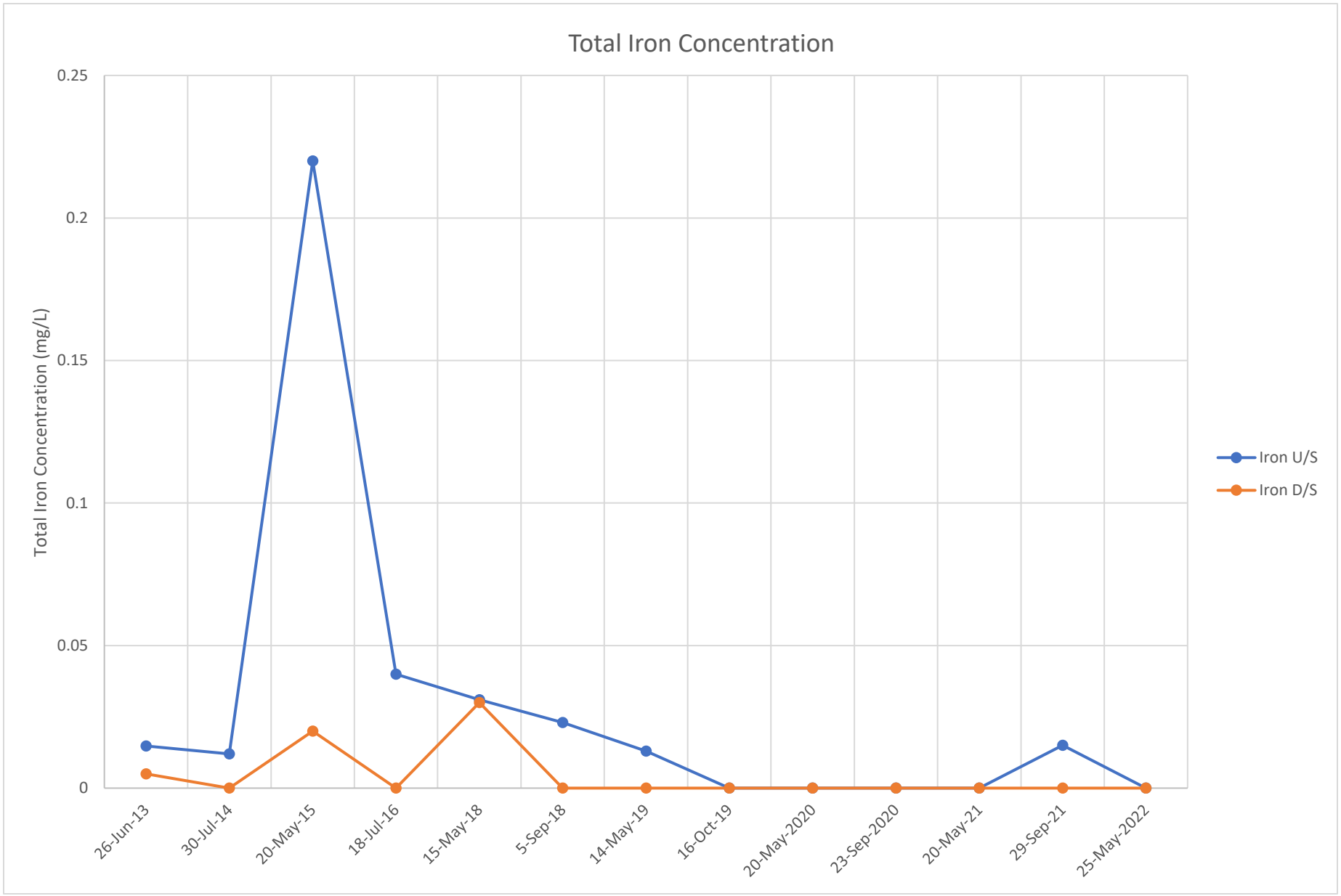
Total Aluminum Concentration (mg/L)
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
26-Jun-13
30-Jul-14
20-May-15
18-Jul-16
15-May-18
5-Sep-18
14-May-19
16-Oct-19
20-May-2020
23-Sep-2020
20-May-21
29-Sep-21
25-May-2022
Total Aluminum U/S
Total Aluminum D/S


Total Iron Concentration
Total Iron Concentration (mg/L)
0.25
0.2
0.15
0.1
0.05
0
26-Jun-13
30-Jul-14
20-May-15
18-Jul-16
15-May-18
5-Sep-18
14-May-19
16-Oct-19
20-May-2020
23-Sep-2020
20-May-21
29-Sep-21
25-May-2022
Iron U/S
Iron D/S

Appendix C Groundwater Well Installation Report

GROUNDWATER MONITORING WELL DRILLING PROGRAM
ISKUT LANDFILL
NEAR ISKUT, BRITISH COLUMBIA

Submitted To:

Regional District of **Kitimat-Stikine**

Regional District of Kitimat-Stikine
300 – 4545 Lazelle Ave
Terrace, British Columbia
V8G 4E1

Submitted By:

Waterline Resources Inc.
Smithers, British Columbia
February 1, 2023
3478-22-003

Waterline

TABLE OF CONTENTS

LIST OF TABLES (TABLES SECTION)

LIST OF FIGURES (FIGURES SECTION)

LIST OF APPENDICES

1.0 INTRODUCTION

The Regional District of Kitimat-Stikine (RDKS) operates the Iskut Landfill (the Site) located approximately 2 km north of Iskut, British Columbia (Figure 1). The British Columbia Ministry of Environment and Climate Change Strategy (BC MOE) has issued RDKS an operational certificate for the Site. The Guidelines for Environmental Monitoring at Municipal Solid Waste Landfills (the Guidelines) prescribe a requirement to conduct groundwater monitoring at the Site.

RDKS retained Waterline Resources Inc. (Waterline) to provide hydrogeological support for the design and construction of a groundwater monitoring network at the Site (the Program) which can be used to support a detailed EMP for the Site.

2.0 OBJECTIVE AND SCOPE OF WORK

The objective of the Program was to install a groundwater monitoring network compliant with the Guidelines and the operational certificate for the Site. To achieve the above objective, Waterline completed the following scope of work:

- Conduct a desktop assessment of publicly available information to identify proposed groundwater monitoring locations at the Site.
- Coordinate with RDKS to retain a qualified drilling contractor to drill and install three groundwater monitoring wells at the Site.
- Conduct a field program that included the drilling, installation, development, K-testing and water samples of the new groundwater monitoring wells at the Site.
    - Assumptions were made at the budgeting stage to drill monitoring wells to a depth of 6 metres below ground level (mbgl).
- Prepare a brief report (this document), summarizing the results of the field program and provide recommendations for future groundwater monitoring efforts.

3.0 SITE HISTORY

In 2012, RDKS was issued operational certificate MR-4612 by BC MOE to operate a municipal solid and liquid waste landfill at the Site. The Site includes a landfill, a septage receiving lagoon, a borrow area for cover material and a designated area for the diversion of metal, tires and clean wood.

4.0 METHODS

Waterline field staff visited the Site on August 9 and 10, 2022, for the drilling and installation of three monitoring wells. Descriptions of Waterline's standard methods for soil investigations and monitoring well installation are provided in Appendix A.

4.1 Monitoring Well Installation

Bluemax Drilling was contracted to drill and install three 51 mm inside diameter PVC monitoring wells at the Site. The monitoring well locations are shown on Figure 2.

Bluemax Drilling used a tracked sonic core rig to advance to the total depth prior to installing the monitoring wells. Monitoring well MW22-01 is located along the west perimeter of the site, located southwest (downgradient) of the landfill at the Site. MW22-02 is located along the southern perimeter of the site, southwest of the metals pile and sewage lagoon present at the Site. MW22-03 is intended to be a background monitoring well located along the north perimeter, upgradient of the Site.

Each borehole was completed with a monitoring well. The construction and completion details of the monitoring wells are summarized in Table 1. Borehole logs are presented in Appendix B. All three groundwater monitoring wells were observed to be dry immediately after installation.

5.0 RESULTS

5.1 Site Setting

The site is located within the Iskut River watershed, approximately 700 m northeast of Kluachon Lake. There are two unnamed surface water drainages in the vicinity of the Site; one located northwest of the site and the second located southeast of the Site. Both surface water drainages generally flow to the southwest, draining towards Kluachon Lake. Both surface water drainages were observed to be dry during the drill program.

The ground elevation at the site is approximately 920 metres above sea level (masl). The site is located on hill sloping down towards Kluachon Lake at an elevation of approximately 835 masl.

5.2 Geology

The Geological Survey of Canada (Fulton, 1995) has regionally mapped the surficial deposits beneath the site as glacial till. Regional bedrock mapped by Cui et al (2005) suggests the surficial deposits are underlain by Lower to Upper Jurassic-aged volcanic andesite breccia belonging to the Klastline Formation.

Surficial sediments encountered during drilling at the site are differentiated based on location:

- At MW22-01, located downgradient of the landfill, sand dominated sediments were observed from surface to a depth of 10.06 mbgl, where an increase in silt was observed present to the total depth of 14.32 mbgl.
- At MW22-02, located downgradient of the metal pile and sewage lagoon, sand dominated sediments were observed from surface to the total depth of 11.58 mbgl.

- At MW22-03, located at an upgradient location adjacent to the landfill cell, the surficial sediments consisted of sand-dominated sediments to a depth of 3.35 mbgl, underlain by firm to hard silt and clay dominated sediments to a total depth of 15.25 mbgl.

Bedrock sediments were not encountered during the drilling program. The unconsolidated sediments encountered during the drilling program are likely associated with the glacial deposits regionally mapped as present at the site.

5.3 Hydrogeology

5.3.1 Regional Aquifers

The British Columbia Groundwater Wells and Aquifers database (BC MoE, 2023) was searched, and no regional aquifers are mapped as present within the area of the site. A search of the British Columbia Groundwater Wells and Aquifers database (BC MoE, 2023) returned zero water wells within a 1.6 km radius of the site[1] and three water wells within a 5 km radius of the site. Two of the water well records are located approximately 4.25 km from the Site and contain details regarding the well completion and aquifer materials, summarized below:

- Well Tag 90008:
  - Well Depth: 27.13 mbgl
  - Water Level: 10.97 mbgl
  - Aquifer Lithology: Unconsolidated (Sand and Gravel)
  - Use: Domestic
  - Date: July 16, 1996
- Well Tag 107474
  - Well Depth: 21.64 mbgl
  - Water Level: 12.19 mbgl
  - Aquifer Lithology: Unconsolidated (Sand and Gravel)
  - Use: Domestic
  - Date: May 9, 2012

5.3.2 Local Groundwater Conditions

All three monitoring wells completed at the site were dry upon completion. Observations collected during drilling do not indicate any groundwater bearing internals or sediments within any of the boreholes drilling during the program (maximum depth: 15.24 mbgl). Due to the remote nature of the site and the sediments encountered during drilling, the field program did not achieve the objective of completing groundwater monitoring wells within the water table the program.

[1] RDKS is aware of a RV resort located approximately 1.4 km from site that advertises water hook-ups. A field verified survey will be required to determine if an unregistered water source well is present at the RV resort and the distance from the landfill.

6.0 DISCUSSION

Based on Waterline's investigation the preliminary hydrogeological conceptual model for the site can be characterized as follows:

- Unsaturated sand-dominated sediments were present at surface in all three boreholes to depths ranging from 3.35 mbgl on the upgradient side of the site, to beyond 11.58 mbgl on the downgradient side of the site.
- The sand-dominated sediments appear to be underlain by silt-dominated sediments.
- All sediments encountered during drilling appear to be unsaturated.

The total depth of drilling and monitoring well installation completed during the drilling program were limited by the sediments encountered and drilling capabilities available on-site during the field program. Shallow groundwater to a depth of 15.25 mbgl was not encountered, which is likely well below the base of the landfill.

There are two apparent surface water drainage features present in the vicinity of the site. Water was not observed flowing through either drainage feature during the drilling program.

7.0 SUMMARY AND CONCLUSIONS

The results of the Phase 1 hydrogeological assessment completed at the site, based on the review of relevant public information, and supported by the data gathered during the monitoring well installation program, are summarized as follows:

- The site is located within Iskut River watershed within the Regional District of Kitimat-Stikine in Northern British Columbia and topography slopes southwest, towards the Kluachon Lake located approximately 700 m southwest of the site.
- Geology observed at the site is characterized as upper unconsolidated and unsaturated sand-dominated sediments and a lower silt-dominated unit which was observed as consolidated and unsaturated at the upgradient drilling location. Bedrock was not observed in any of the boreholes.

If groundwater is encountered during future monitoring events, Waterline recommends collecting groundwater samples for the following analytical schedule: major anions and cations, general chemistry, dissolved metals, hydrocarbons, and polycyclic aromatic hydrocarbons.

In conclusion, groundwater is not present in the upper sand-dominated sediments present at the site, nor is groundwater present in the lower silt-dominated sediments that were drilled as part of the field program. Waterline recommends conducting a groundwater monitoring program on the monitoring wells in the late spring or early summer, after the snowpack has melted to determine if water originating as precipitation infiltrates into the surficial sediments, forming a seasonal water-bearing aquifer beneath the site. If the monitoring wells continue to not contain groundwater, these monitoring wells may be suitable for vapour monitoring in the future, if required.

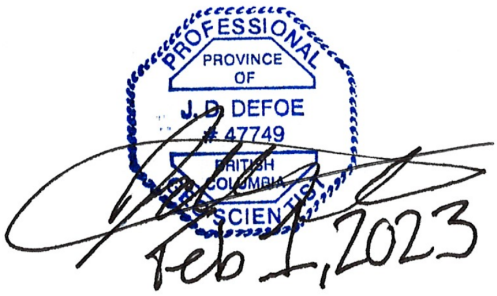
8.0 CERTIFICATION

This document was prepared under the direction of a professional geoscientist registered in the Province of British Columbia.

Waterline Resources Inc. trusts that the information provided in this document is sufficient for your requirements. Should you have any questions or concerns, please do not hesitate to contact the undersigned.

Respectfully submitted,

Waterline Resources Inc.
EGBC Permit No. 1000669



Joel Defoe, P.Geo.
Senior Hydrogeologist

Reviewed By:

Darren David, P.Geo.
Principal Hydrogeologist

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Golder Associates Ltd. (Golder), 2020. 2020 Environmental Review of the Iskut Landfill, Iskut, British Columbia. Technical Memorandum prepared for the Regional District of Kitimat-Stikine. November 19, 2020.

10.0 LIMITATIONS AND USE

The information presented in this document was compiled exclusively for the Regional District of Kitimat-Stikine (the Client) by Waterline Resources Inc. (Waterline). This work was completed in accordance with the scope of work for this project that was agreed between Waterline and the Client. Waterline exercised reasonable skill, care and diligence to assess the information acquired during the preparation of this document, but makes no guarantees or warranties as to the accuracy or completeness of this information. The information contained in this document is based upon, and limited by, the circumstances and conditions acknowledged herein, and upon information available at the time of the preparation of this document. Any information provided by others is believed to be accurate but cannot be guaranteed. No other warranty, expressed or implied, is made as to the professional services provided to the Client.

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TABLES

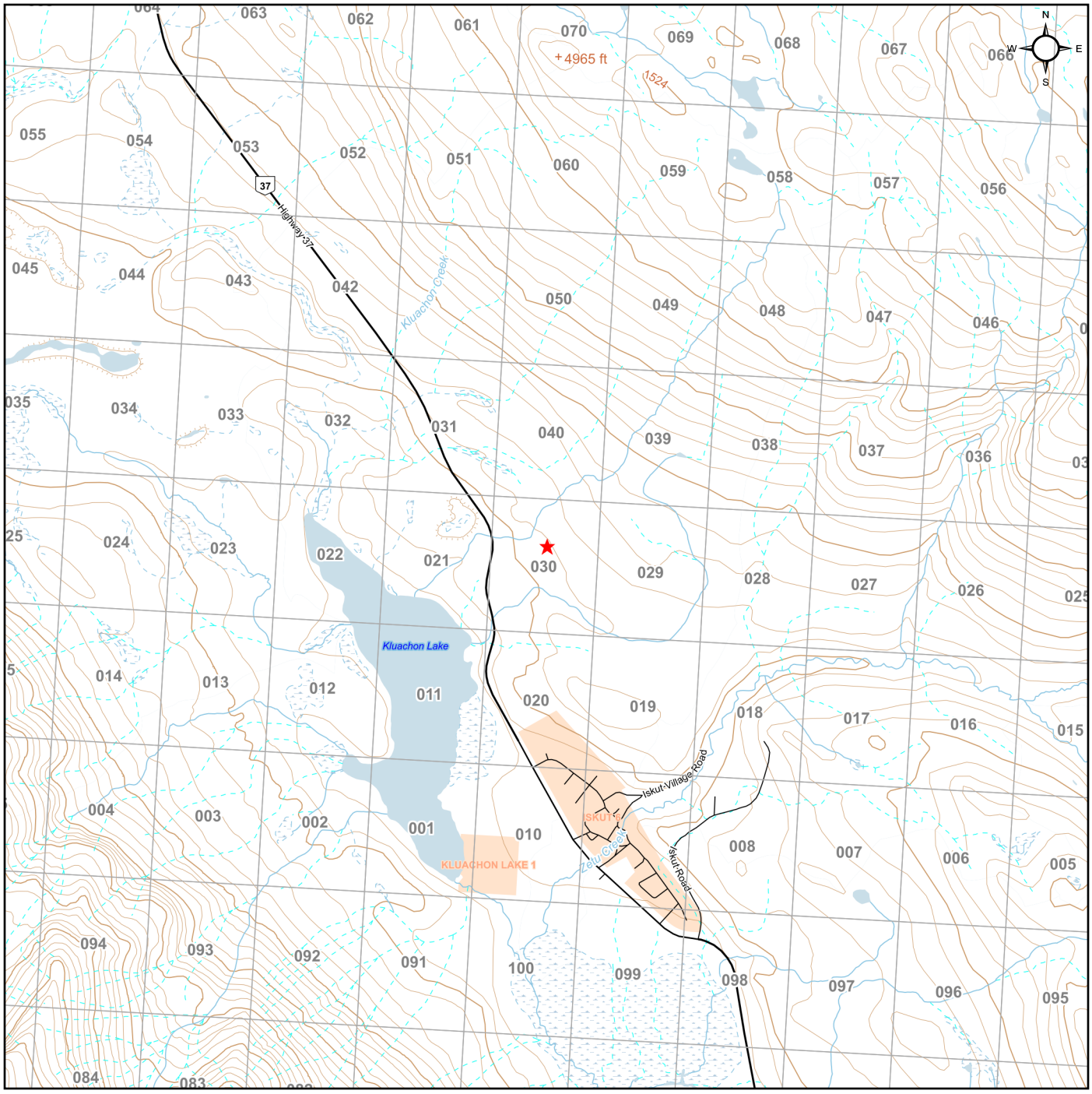
Table 1: Investigation Location Details

Table 1: Investigation Location Details **Iskut Landfill**

Location	UTM Coordinates			Depth		Elevation (masl)						Hydraulic Conduct. (m/s)	Formation Screened	Installation Date	Comments
	Grid Zone	Easting	Northing	Borehole (mbgl)	Well (mbtoc)	Ground	Top of Casing	Sand Pack		Screen					
								Top	Bottom	Top	Bottom				
MW22-01	9	440808	6412976	14.3	15.01	913.00	913.68	902.33	898.67	900.20	898.67	-	Surficial Sediments	2022-08-10	
MW22-02	9	440838	6412915	11.6	12.29	912.00	912.71	902.86	900.42	901.94	900.42	-	Surficial Sediments	2022-08-10	
MW22-03	9	440922	6413026	15.2	16.15	922.00	922.91	912.86	906.76	911.64	908.59	-	Surficial Sediments	2022-08-10	

Notes:
mbgl indicates metres below ground level.
mbtoc indicates metres below top of casing.
masl indicates metres above sea level.
UTM Coordinates NAD 83.

FIGURES



0 250 500 750 1000
metres

Coordinate System: NAD83 / BC Albers

- Approximate Site Location
- Lake/Reservoir - Definite
- Stream - Definite
- Stream - Indefinite
- Stream - Intermittent
- Wetlands
- Ground Surface Contour
- Ground Surface Depression Contour
- Ground Surface Index Contour (masl)
- Highway
- Arterial Road
- Local Road

Groundwater Monitoring Well Drilling Program
Iskut Landfill
Submitted to Regional District of Kitimat-Stikine

LOCATION PLAN

Waterline

Prepared By:	Waterline Resources Inc.
Project Number:	3478-22-003
Compiled By:	GIS
Date Issued:	January 20, 2023

FIGURE 1

Waterline

Figure 2 - Site Plan

Landfill Features and Groundwater Monitoring Network

N
W E
S
50 m

Data Locations

- Generic Data Location
- Borehole
- Borehole (Excavated)
- Monitoring Well
- Monitoring Well (Inactive/Abandoned)
- Test Pit
- Test Pit (Excavated)
- Surface Water
- Pore Water
- Excavation
- Other

Appendix A

Waterline Standard Methods

Standard Methods - Monitoring Well Installation, Development, and Surveying

Standard Methods
Soil Investigation- Drilling, Test Pitting, Trenching, and Hand Augering

1.0 SOIL SAMPLING

Soil sampling (if applicable) was conducted as follows:

- Soil samples were handled using clean nitrile gloves;
- Soil sampling procedures for specific soil investigation methods included:
    - For auger drilling, the outer surface smeared against the borehole and the inner surface smeared against the augers was avoided.
    - For direct push drilling methods, the outer surface potentially smeared against the drive shoe and sampler casing were avoided.
    - For air rotary or ODEX drilling methods, disturbed soil or rock samples were collected from the air return.
    - For test pitting and trenching, samples were collected directly from the bucket of the excavator.
- Hand tools and hand augers were cleaned between samples;
- Soil samples were collected at pre-established regular intervals or based on field observations (e.g. ATH vapour, staining, lithology changes);
- The soil samples were placed in laboratory supplied jars or bags, suited to the required analyses;
- Soil samples for organic analyses (if collected) were filled with minimal headspace to reduce the potential loss of volatile organics;
- The samples were stored in coolers with ice for transport to the analytical laboratory to further limit volatilization and potential microbial degradation; and
- The soil samples were shipped to the project laboratory under standard Chain-of-Custody procedures.

2.0 GEOLOGICAL LOGGING AND AMBIENT TEMPERATURE HEADSPACE (ATH) VAPOURS MEASUREMENT

Waterline logged the geological conditions according to the Unified Soil Classification system. Other observations were recorded, such as: field moisture content, colour or staining, presence of salt precipitates, structure, etc. Soil samples for ATH combustible vapour concentration screening were: collected in a Ziploc™ or similar sealed bag; allowed to normalize to a consistent ambient temperature; and the ATH vapour concentrations were measured using a RKI™ Eagle combustible vapour meter that was calibrated to a hexane standard and had the methane response turned off. Under warm weather conditions, samples were allowed to normalize to ambient outdoor temperatures. Under dynamic or colder weather conditions, samples were warmed in the truck or an indoor workspace to approximate room temperature, prior to measuring the ATH vapour concentrations.

The coordinates of each investigation location were determined with a handheld GPS and/or surveyed. The investigation locations were noted on a site plan, aerial photograph or site sketch, relative to site infrastructure and features.

3.0 BACKFILLING

Boreholes, when not completed with monitoring wells, were backfilled with bentonite chips, pellets or grout, or according to client-specific requirements, and the surface was restored to its pre-disturbance state. Professional judgment was used to ensure that potential pathways for the vertical migration of groundwater or potential pathways for contaminant migration were eliminated.

During test pitting and trenching, topsoil was conserved (if present) and major horizons (e.g., topsoil, fill, clay, sand, etc.) were separated. Depending on the nature of the project, the test pits or trenches were backfilled either with the material excavated, maintaining the sequential order of the horizons. The backfilled material was compacted to satisfy site-specific restoration requirements. Topsoil (if present) was replaced, taking care not to mix topsoil and subsoil. The ground surface was restored to pre-disturbance conditions or to meet client-specific requirements.

Rev.	Date	Description	Authored/ Reviewed by	Approved by
	Oct. 2, 2012		Brent Lennox	Jan Michaelian/Eric Pringle

Standard Methods
Monitoring Well Installation, Development, and Surveying

1.0 MONITORING WELL INSTALLATION

Unless otherwise specified on the log, each well installation (if applicable) generally comprised a 5 cm inside diameter, machine slotted (No. 10 or 20 Slot), Schedule 40 PVC screen and well casing. A silica sand filter pack was placed surrounding, and generally extending at least 0.3 m above the screened interval. A bentonite seal was placed above the top of the filter sand to the ground surface. A well completed with an above ground stickup was controlled with a locking protective steel casing. If the top of the PVC well casing was completed as a flush mount, the well was protected with a metal road box with bolts on the lid, just below ground surface.

2.0 WELL DEVELOPMENT

The installed well(s) were developed to remove disturbed fines or foreign influences from drilling and well installation. This involved removing approximately ten casing volumes of water from the well and surrounding formation, or until dried once for wells completed in low permeability formations. All development activities were completed using dedicated bailers or Waterra tubing and foot valves. When manual purging was not practical due to the depth or volume of water to be purged, mechanical assistance may have been used (e.g. Waterra Power Pack II). Clean nylon string was used for all bailers. Disposable nitrile gloves were worn during all development activities and were changed between wells.

3.0 SURVEYING AND WELL DETAILS

The top of the PVC casing and ground elevations of any installed wells were surveyed by Waterline using a laser level, rod and laser receiver, unless specified otherwise. Elevations were either surveyed relative to a known or assumed datum and a local reference. The location of each borehole or monitoring well was determined using a handheld GPS. In addition, the distance from investigation locations to available site infrastructure and/or features were measured with a tape or approximated, and added to aerial photographs, site plans or sketches.

Rev.	Date	Description	Authored/ Reviewed by	Approved by
0	Oct. 2, 2012		Brent Lennox	Jan Michaelian/Eric Pringle

Appendix B

Borehole Logs

MW22-01
MW22-02
MW22-03

Iskut Landfill		BOREHOLE: MW22-01
INSTALLED BY: Regional District of Kitimat-Stikine	ATS:	SITE: 3478-22-003
DRILL TYPE: Sonic	EAST: 440808 NORTH: 6412976	ELEVATION: 927.00 (masl)

FILL TYPE: Backfill | Bentonite | Grout | Open Hole | Cement | Sand | Slough | Unknown

SAMPLE TYPE: Shelby Tube | No Recovery | Split Spoon | Disturbed | Dynamic Cone | Core | Grab Sample

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	WELL INSTALLATION (Borehole diam. = 0.150 m)
0	0.0 mbgl SAND (f-c), trace Gravel (f-c), s.rnd, well graded, non plastic, brown, loose, massive, moist (glacialfluvial; 0-14.3m)			Stickup = 0.91 m
5	… and GRAVEL, moist-dry (4.6-6.7 m)			Bentonite chips from 0 to 10.67 mbgl
7	… SAND (f-m), s.rnd-s.ang, dry at 6.7 m			
10	10.1 mbgl Silty SAND (f-m), s.rnd-s.ang, well graded, non plastic, brown, hard, massive, dry			Filter sand from 14.32 to 10.67 mbgl PVC screen from 14.32 to 12.80 mbgl (0.01 slot screen)
14	END OF HOLE AT 14.3 m			

	TYPE: Groundwater Monitoring Well	COMPLETION DEPTH: 14.3 (m)
	LOGGED BY: JD	COMPLETION DATE: 10-Aug-22
	CHECKED BY:	Date printed: 20-Dec-2022

Iskut Landfill		BOREHOLE: MW22-02
INSTALLED BY: Regional District of Kitimat-Stikine	ATS:	SITE: 3478-22-003
DRILL TYPE: Sonic	EAST: 440838 NORTH: 6412915	ELEVATION: 922.00 (masl)

FILL TYPE: Backfill | Bentonite | Grout | Open Hole | Cement | Sand | Slough | Unknown

SAMPLE TYPE: Shelby Tube | No Recovery | Split Spoon | Disturbed | Dynamic Cone | Core | Grab Sample

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	WELL INSTALLATION (Borehole diam. = 0.150 m)
0	Silty SAND (f-c) and GRAVEL (f-c), s.rnd-s.ang, well graded, non plastic, brown, loose, massive, dry-moist (glacialfluvial; 0-11.6m)			Stickup = 0.91 m
3	… trace Cobbles at 3.0 m			
5				Bentonite chips from 0 to 9.14 mbgl
7	… some Silt at 7.0 m			
10				Filter sand from 11.58 to 9.14 mbgl PVC screen from 11.58 to 10.06 mbgl (0.01 slot screen)
11.6	END OF HOLE AT 11.6 m			

	TYPE: Groundwater Monitoring Well	COMPLETION DEPTH: 11.6 (m)
	LOGGED BY: JD	COMPLETION DATE: 10-Aug-22
	CHECKED BY:	Date printed: 20-Dec-2022

Iskut Landfill		BOREHOLE:	MW22-03
INSTALLED BY: Regional District of Kitimat-Stikine	ATS:	SITE:	3478-22-003
DRILL TYPE: Sonic	EAST: 440922 NORTH: 6413026	ELEVATION:	928.00 (masl)

FILL TYPE: Backfill | Bentonite | Grout | Open Hole | Cement | Sand | Slough | Unknown

SAMPLE TYPE: Shelby Tube | No Recovery | Split Spoon | Disturbed | Dynamic Cone | Core | Grab Sample

Depth (m)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	WELL INSTALLATION Borehole diam. = 0.150 m
0	Clayey SAND (f-m)., some silt, s.rnd-s.ang, well graded, medium plastic, brown, loose, massive, moist (GLU; 0-11.3m)			Stickup = 0.91 m
3.4	Clayey SILT, some Sand (f-c), trace Gravel (f-c), s. rnd-s.ang, well graded, medium plastic, brown, firm, massive, moist			
5	… SAND (f-m), s.ang, dark brown/grey at 4.9 m			Bentonite chips from 0 to 9.14 mbgl
6	… hard, dry (6.1-7.6 m)			
7	… hard, moist at 7.6 m			
11.3	Sandy (f-m) SILT, trace Gravel (f-c), s.ang, well graded, non plastic, dark brown/grey, hard, massive, dry			PVC screen from 13.40 to 10.36 mbgl (0.01 slot screen) Filter sand from 15.24 to 9.14 mbgl
15.2	END OF HOLE AT 15.2 m			

TYPE: Groundwater Monitoring Well	COMPLETION DEPTH:	15.2 (m)
LOGGED BY: JD	COMPLETION DATE:	10-Aug-22
CHECKED BY:	Date printed: 20-Dec-2022	