Appendix C

Site C Clean Energy Project
Water Quality Monitoring for River Road, South Bank Initial Access Road, L3 Creek, Left Bank Debris Boom and L2 Powerhouse
2020 Annual Report



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EXECUTIVE SUMMARY

Tetra Tech Canada Inc. (Tetra Tech) was retained by BC Hydro (the client) to develop and implement a surface water quality monitoring program at midstream and discharge locations along River Road ditch near Blind Corner and below Howe Pit, in proximity to the South Bank Initial Access Road (SBIAR), and along the L3 Creek catchment. These locations have been sampled monthly, except when frozen or dry conditions exist, since initiation of the program in 2017. This water quality sampling program is conducted in accordance with BC Hydro Site C Clean Energy Project Construction Environmental Management Plan (CEMP), App E, Section 5.2.1.7 (Rev 7, Sep 4, 2020) Acid Rock Drainage and Metal Leachate Management Plan(BC Hydro, 2020), which specifies requirements for road cut monitoring. This water quality program is one component of numerous water quality monitoring programs, including regular monitoring in the Peace River receiving environment, reported under separate cover (Ecofish, 2020a).

Additional monitoring locations were added in October 2020 at the L2 Powerhouse Area, for evaluation of effectiveness of mitigations, effectively making the slope non-PAG, and the Left bank Debris Boom (LBDB).

The monitoring program includes locations at the discharge points and at midstream locations as well as locations upstream from the discharge to characterize variation to water chemistry within the catchment due to mixing and inflow of water from multiple sources. Throughout the report the "RB" and "LB" nomenclature refers to right and left riverbanks (when facing downstream), respectively.

In accordance with the CEMP, App E, Section 5.2.1.7 (Rev 7, Sep 4, 2020) Acid Rock Drainage and Metal Leachate Management Plan, results for the monitoring program locations are evaluated against the current British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture (BCAWQG) freshwater short-term (FST) acute values. Evaluation against the dissolved copper concentration guideline utilizes measured Dissolved Organic Carbon (DOC) and the BC Biotic Ligand Model software provided by the BC Ministry of Environment and Climate Change Strategy Water Protection & Sustainability Branch (BCMoE).

Water quality measurements collected at discharge locations along River Road and downstream locations at SBIAR that exceed the BCAWQG-FST are reported to BC Hydro within 24 hours of receiving the results. The complete results of sampling at all locations is presented in a monthly routine memo to BC Hydro. The results of monthly monitoring are compiled and tracked for changes over time with special interest in metals associated with ARD-ML drainage, e.g. iron, aluminum, arsenic, cadmium, cobalt, copper, manganese, silver, and zinc. The results of time series trend analysis are also evaluated against the British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture (BCAWQG) freshwater long-term (FLT) chronic values for trend monitoring over time.

River Road

A total of twelve (12) monitoring locations have been established in the River Road catchment near Blind Corner to monitor the effectiveness of the limestone riprap in the ditch line and on the rock slope, and to observe longer term influences from the Potentially Acid Generating (PAG) outcrop at Blind Corner and potential run-off/seepage from Howe Pit (non-Site C impacted area) on the water collected in the River Road ditch. Sampling was attempted on a routine monthly basis from seven of the River Road catchment locations, 1) in the lower chimney drain (LBRR-LC), 2) the upper chimney drain (LBRR-UC); 3) upstream of the lower chimney drain within the River Road ditch (LBRR-12+500), 4) the end of the diversion pipe (LBRR-EDP) that diverts water down-gradient into the River Road ditch between culverts, 5) at the discharge of culvert RR-11 (LBRR-DD), 6) RR-9 culvert (LBRR-RR9) and 7) RR-8 culvert (LBRR-RR8). In situ testing only is conducted at four additional locations within the River Road ditch at LBRR-12+600, LBRR-12+700, LBRR-12+810 and LBRR-12+920.

During 2020, outside of dry or frozen conditions, lab samples were collected from River Road during eight (8) sampling events resulting in a sum of eighteen samples. Two samples were collected from LBRR-DD (February, April), six samples from LBRR-EDP (February, March, April, June, July, September), one sample from LBRR-LC (April), two samples from LBRR-UC (July, August), six samples from LBRR-12+500 (February, March, April, June, September, October), and one sample from LBRR-RR9 (February). No lab samples were collected from RR8 in 2020. No in situ tests were completed at RR8 or LBRR-12+430 locations during 2020, therefore, in situ testing was conducted in ten of the twelve locations during 2020.

Of the total eighteen samples collected from River Road locations in 2020, exceedances to the BCAWQG-FST were measured for total arsenic (3), total iron (7) and dissolved aluminum (2). These exceedances were not located at discharge locations. No discharge location exceedances were measured in 2020 from River Road.

Water quality measurements along River Road have indicated that run-off water quality is influenced by active acid rock drainage and metal leaching (ARD-ML) processes within the River Road ditch catchment, particularly from the Blind Corner shale slope. Although flows are generally low and ephemeral, and the ditch is lined with limestone, there is some potential for run-off to impact downstream water quality. As per CEMP App E, Section 5.2.1.7 (Rev 7, Sep 4, 2020), it is recommended that water quality monitoring is continued on a monthly basis at the established locations within the River Road catchment. Continuous monitoring will enable the effectiveness of mitigation strategies that are implemented on the shale at Blind Corner.

SBIAR

A total of five (5) monitoring locations are established at the SBIAR location, including the western upstream and downstream SBIAR ditches (RBSBIAR-DS, RBSBIAR-US), eastern upstream and downstream SBIAR ditches (RBSBIAR-EDS and RBSBIAR-EUS), and within a preserved portion of the Peace River side channel down-gradient of the SBIAR facility (RBSC-DS), to monitor for potential long-term influence on water quality from construction of the SBIAR facility. The side channel remains hydraulically connected to the Peace River. Surface water from SBIAR is conveyed to Relocated Surplus Excavation Material (RSEM) R6 for management prior to being discharged to the Peace River. Sampling at the SBIAR monitoring locations was conducted monthly in 2017, 2019 and 2020, and quarterly in 2018.

During 2020, outside of dry or frozen conditions, lab samples were collected from SBIAR during twelve (12) sampling events (January through December) resulting in a sum of forty-five (45) samples. Nine (9) samples were collected from RBSBIAR-DS and ten (10) at RBSBIAR-US (February, April through November, December (US only)), seven (7) samples from RBSBIAR-EUS (May through November), eight (8) samples from RBSBIAR-EDS (April through November) and ten (11) samples from RBSC-DS (January through September, November, December).

In situ testing was completed on a monthly basis with sufficient water available in, at the most, twelve (12) months between January to December 2020.

During 2020, measured BCAWQG-FST exceedances at downstream locations included total iron (April) and dissolved aluminum (April, September) at RBSBIAR-DS, and total iron (April, June), dissolved aluminum (May, June), total arsenic (April) and total zinc (April, June) at RBSBIAR-EDS.

The upstream ditches measured one BCAWQG-FST exceedance in total iron (February) at RBSBIAR-US and no exceedances at RBSBIAR-EUS. The RBSC-DS location measured BCAWQG-FST exceedances in both total and dissolved iron (September), dissolved aluminum (July), and total manganese (May, August, September).

L3 Creek

The catchment for L3 Creek includes RSEM L3 which is currently not considered, nor permitted, for placement of construction related PAG material. Due to the potential influence on L3 Creek discharge water quality from naturally-impacted water originating in the Howe Pit area and naturally impacted inflow from L4 Creek, the water quality within the L3 Creek catchment is being monitored in context of ARD-ML management. A total of five (5) monitoring locations have been established in the L3 Creek catchment, including a baseline location up-gradient of RSEM L3 (LBL3C-3.32), slightly upstream from the L4 Creek confluence, LBL3C-1.65, along L4 Creek, LBL4C-0.18, a midstream location below the confluence of L4 Creek and below the Gulley Road box culvert (LBL3C-1.43), and the discharge LBL3C-0.02.

During 2020, outside of dry or frozen conditions, lab samples were collected from L3 Creek catchment during ten (10) sampling events (February through November) resulting in a sum of thirty-four (34) samples. Eight (8) samples were collected from LBL3C-0.02 (April through November), ten (10) samples from LBL3C-1.43 (February through November), three (3) samples from LBL3C-1.65 (April through June), five samples from LBL3C-3.32 (April through August), and eight (8) samples from LBL4C-0.18 (April through November).

In situ testing was completed on a monthly basis with sufficient water available in, at the most, ten (10) months between February to November 2020.

Of the total thirty-four samples collected from L3 Creek catchment locations in 2020, twenty-six samples were collected from L3 Creek and eight samples were collected above the L3 and L4 Creek confluence, from L4 Creek. In the four sample locations in L3 Creek, occurrences of exceedances to the BCAWQG-FST were measured for total iron (8), dissolved aluminum (9), total zinc (4), dissolved copper (1), total arsenic (3) and total silver (3). In the one L4 Creek location, LBL4C-0.18, occurrences of exceedances to the BCAWQG-FST were measured for total iron (8), dissolved iron (5), dissolved aluminum (7), dissolved cadmium (5), total cobalt (5), total zinc (6), dissolved copper (4), total arsenic (1), total manganese (5), and below the acceptable BCAWQG-FST guideline for pH (5).

Left Bank Debris Boom

Sample locations were established and first sampled on October 8, 2020 to characterize water quality in the LBDB area for ARD-ML monitoring, named LBP Pond and LB Side Channel E and W. The purpose of sampling is to monitor PAG contact water from shale exposed during construction. The LBDB area will convey water at some point to discharge into the river or be collected in a ditch then infiltrate to the river, therefore, water quality sampling at LBDB provides data during subsequent phases of increased elevation of the Peace River and during water diversion through the Diversion Tunnels. The LBDB PAG slope exposures will eventually be completely inundated with the headpond formation.

The three locations were visited on October 8, November 20, and December 14, although in situ and lab sampling only occurred at LBP Pond (October 8 and November 20, 2020) and Side Channel E (October 8, 2020) outside of frozen conditions. The LB Side Channel W location has not been sampled due to back flooding or frozen conditions.

The LBP Pond samples reported elevated levels of iron, manganese, zinc, and aluminum relative to the BCAWQG-FST values. The one sample from the LB Side Channel E location noted eleven exceedances of the BCAWQG-FST values, for total arsenic, boron, cobalt, iron, manganese, zinc and dissolved aluminum, cadmium, copper and iron, and a low acidic pH of 3.01 below the accepted range (6.5-9.0) of the BCAWQG-FST guidelines. Additional monitoring at both locations in 2021 is needed to identify the consistency in these results.

L2 Powerhouse Area

Two sample locations were established in the L2 Powerhouse area adjacent to the powerhouse on the Right Bank and first sampled on October 8, 2020 and sampling continued on November 20, December 4, and December 14, 2020 at the L2 Powerhouse area. The L2 area was identified for sampling due to the exposure of a shale (PAG) slope during excavation for the Powerhouse. The sample locations are established to evaluate water quality related to the area and the potential impact from the PAG slope.

Dissolved aluminum concentrations at the L2-US (non-discharge) station exceeded the BCAWQG-FST guideline value in three of four sample events in 2020.

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ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
ARD	Acid Rock Drainage
ARD-ML	Acid Rock Drainage and Metal Leaching
BCMoE	BC Ministry of Environment and Climate Change Strategy Water Protection & Sustainability Branch
BCAWQG	British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture
°C	Degrees Celsius
CEMP	Construction Environmental Management Plan
DOC	Dissolved Organic Carbon
FB	Field Blank
FST	Freshwater Short-Term Maximum
FLT	Long-term Maximum
L/s	Litres per second
LBDB	Left Bank Debris Boom
LBRR	Left Bank River Road (referring to Sample ID)
Lorax	Lorax Environmental Services Ltd.
mg/L	milligrams per litre
ML	Metal Leaching
PAG	Potentially Acid Generating
PRHP	Peace River Hydro Partners
ppm	parts per million
RBSIBAR	Right bank South Bank Initial Access Road (referring to Sample ID)
RPD	Relative Percent Difference
RSEM	Relocated Surplus Excavation Material
SBIAR	South Bank Initial Access Road
TB	Travel Blank
µg/L	micrograms per litre
WQG	Water Quality Guideline

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of BC Hydro and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than BC Hydro, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix or Contractual Terms and Conditions executed by both parties.

1.0 INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech) was retained by BC Hydro (the client) to develop and implement a surface water quality monitoring program at locations along River Road ditch near Blind Corner and below Howe Pit, in proximity to the South Bank Initial Access Road (SBIAR), and along the L3 Creek catchment. These locations have been sampled monthly, except when frozen or dry conditions exist, since initiation of the program in 2017. Additional monitoring locations were added in October 2020 at the L2 Powerhouse Area and the Left bank Debris Boom (LBDB). The monitoring program includes locations at the discharge points and at midstream locations as well as locations upstream from the discharge to characterize variation to water chemistry within the catchment due to mixing and inflow of water from multiple sources. Water sampling locations are shown in the attached maps in Figures 1 through 3 and summarized with UTM coordinates in attached Table 1.

Monitoring locations were established by Tetra Tech in conjunction with BC Hydro personnel. Where possible, they are coincident with the locations and station names used in 2016 by Lorax Environmental Services Ltd. (Lorax) for water quality monitoring on behalf of Peace River Hydro Partners (PRHP). Photos of the water sampling locations during 2020 are included in the Photographs (1 through 25) section of the Appendix.

This report documents the sampling events conducted monthly between January and December of 2020 and the results of water quality monitoring. Results are discussed in the context of acid rock drainage and metal leaching (ARD-ML) management and mitigation.

The water conveyance facilities at River Road ditch near Blind Corner and SBIAR are identified as having potential for direct ARD-ML impacts due to exposure of shale bedrock during construction related activities. The catchment for L3 Creek includes RSEM L3 which is currently not considered, nor permitted, for placement of construction related PAG material. Due to potential influence on discharge water quality from the Howe Pit area and inflow from L4 Creek, the water quality within the L3 Creek catchment is being monitored in context of ARD-ML management.

The L3 Creek catchment is not identified as a waterway with potential for ARD-ML impacts arising from construction related activities. Water quality monitoring has been conducted within this catchment to monitor discharge water quality and to maintain a record for potential future use. The BCAWQG-FST values were also used as a benchmark for monitoring the water quality at the discharge location (LBL3C-0.02) from L3 Creek.

The Left Bank Debris Boom (LBDB) anchor area commenced water quality sampling on October 8, 2020 to establish upstream (LBP Pond) and downstream (Channel E and W) monitoring of PAG contact water from shale exposed during construction. The LBDB area will convey water at some point to discharge into the river or be collected in a ditch then infiltrate to the river, therefore, water quality sampling at LBDB provides data during subsequent phases of increased elevation of the Peace River during water diversion through the Diversion Tunnels.

The L2 Powerhouse area commenced water quality sampling on October 8, 2020 to establish upstream (L2 US) and downstream (L2 DS) to characterize water quality and for ARD-ML monitoring in the L2 Powerhouse area and adjacent to the powerhouse on the Right Bank.

2.0 MONITORING PROGRAM SET-UP AND PURPOSE

Water quality sampling has been scheduled during the third week of each month during 2017, 2018, 2019 and 2020 to support a continuous monitoring record for reportable water quality compliance. Completion of the sampling event has been conducted monthly except under frozen or dry conditions. The 2020 monitoring period commenced on

January 23, 2020, by Tetra Tech and BC Hydro personnel and was completed on December 20-21, 2020. Each sampling event was documented by field notes and photographs, including during dry and frozen conditions.

2.1 Monitoring Program Requirements and Comparison Criteria

Requirements for the development and implementation of the water quality monitoring programs are mandated under the Environmental Assessment Certificate – Condition 3, and the Federal Decision Statement – Condition 7. Reporting of the program results are required on an annual basis. These requirements were carried forward and presented in the BC Hydro Site C Clean Energy Project Construction Environmental Management Plan (CEMP) Appendix E, Section 5.2.1.7 (Rev 7, Sep 4, 2020) Acid Rock Drainage and Metal Leachate Management Plan. Rev 7 included additions to off-site items, but no changes were made to Appendix E from previous revisions.

In accordance with the CEMP App E, Section 5.2.1.7 (Rev 7, Sep 4, 2020), analytical results for the River Road and SBIAR road cut monitoring locations are evaluated against the British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture (BCAWQG) freshwater short-term maximum (FST) values[1]. Water quality measurements recorded at the discharge or downstream locations with exceedances to the BCAWQG-FST were reported to BC Hydro within 24 hours of receiving lab results, and a Routine Memo prepared on a monthly basis to summarize field in situ and analytical lab results. The monthly results are compiled for long-term trend analysis in trend charts. The long-term trends data is evaluated against the BCAWQG freshwater long-term (FLT) chronic values in Appendices B1 to B5.

The BC Biotic Ligand Model software (BC MoE, 2019) was used during the 2020 monitoring period to acquire the dissolved copper BCAWQG-FST and -FLT guidelines for each sample. Prior to August 2019, the guideline value was for total copper.

2.2 Analytical Program Parameters

An off-site laboratory analytical program was designed to measure a suite of parameters suitable for screening the water quality against the BCAWQG-FST for surface water. The sampling and analytical procedures implemented during 2020 were commensurate with Tetra Tech's 2017, 2018 and 2019 monitoring periods and the program previously implemented in 2016 by Lorax for parameters, analytical methods, and detection limits. Lab analysis was conducted for total and dissolved elements (metals), hardness, pH, alkalinity, acidity, total suspended and total dissolved solids, and anions including sulphate, nitrogen species, chloride, and dissolved organic carbon (DOC). Samples were collected in a set of clean bottles provided by the lab and were submitted for analysis.

Analysis was conducted for the following parameters:

- Total Metals, Low Level (including Hg);
- Dissolved Metals, Low Level (including Hg);
- Hardness;
- pH;

[1] The British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture document has been updated frequently during the course of the monitoring program, and has undergone revisions in March 2016, January 2017, March 2018, and August 2019. Screening of the monthly water quality results are performed against the contemporary guideline values. During the 2020 monitoring program, water quality results were evaluated against the August 2019 guidelines.

- Alkalinity: Total/Species (CO_3^{2-} , HCO_3^-, OH^-);
- Acidity;
- Solids: Total Suspended (TSS) and Total Dissolved (TDS);
- Anions: Nitrogen species (nitrite, nitrate, ammonia), Sulphate, Chloride; and
- Dissolved Organic Carbon (DOC) – not collected prior to the September 24, 2019 event.

2.3 Summary of Parameters of Interest

Some of the key indicators that were monitored during this program are described below. Although some of these parameters do not have BCAWQG-FST guidelines, they can be useful indicators to potential changes in water chemistry related to ARD-ML processes.

Alkalinity and pH are important water quality parameters to indicate the ratio between residual alkalinity and acidity in solution and are key indicators for onset of acidic conditions within neutral to alkaline waters when monitored over time. Neutralization of acidity by carbonate, and to a lesser degree silicate, minerals can temporarily increase alkalinity through release of the bicarbonate ion into solution, thereby buffering pH at a near constant value. Bicarbonate will continue to react, and deplete, with any residual acidity. Once all carbonate and bicarbonate sources are depleted, alkalinity no longer is available to neutralize acidity and pH will drop. An indicator for accelerating acid generating processes is when increasing alkalinity is observed without proportional change to pH. The BCAWQG-FST guideline for pH ranges from 6.5-9.0. There is no guideline for alkalinity or acidity.

Water clarity is measured as turbidity (nephelometric turbidity units, NTU) or as total suspended solids (TSS), which is an indicator of the amount of sediment (generally accepted as silt sized particles and coarser, or >0.45 µm in diameter), contained within the water column. TSS can increase if sediment loading occurs due to erosion, or due to rapid precipitation of secondary minerals from chemical reactions such as neutralization of acidic water. The bulk chemistry of water with high TSS tends to mimic the chemical composition of the source sediment being eroded, or in the case of mineral precipitation tends to be high in iron as iron-oxide minerals are the most common secondary mineral to form. Rapid temporal changes to TSS measurements within a catchment due to formation of secondary minerals can indicate presence of active ARD-ML reactions. The BCAWQG-FST guideline is based on deviations to background TSS.

Measurements such as total dissolved solids (TDS), electrical conductivity (EC) and salinity are indicators for the concentration of dissolved components and/or ions in solution. Sudden or gradual increases in these parameters can indicate changes in water chemistry such as an increase in reactive ions or dissolved metals as a result of potential metal leaching processes. Changes to these parameters in association with changes to pH or alkalinity may also indicate active metal leaching processes. BCAWQG-FST guidelines are not specifically stated for these parameters.

Dissolved sulphate can originate from anthropogenic sources, microbial processes and through chemical processes related to degradation of rock forming minerals in environments with potential for acid generation through the oxidation of primary sulphide (e.g., pyrite) or dissolution of sulphate minerals (e.g., gypsum). Elevated sulphate concentrations may indicate oxidation, or weathering, of potentially acid generating (PAG) materials in proximity to sample collection locations, however, may also indicate influence from regional groundwater sources. Water quality with elevated sulphate and pH > 7.0 may indicate ARD-ML processes with sufficient acid neutralizing materials, whereas sulphate with decreasing pH may indicate a shortage of acid neutralizing materials. Sulphate is commonly

reactive with several cations and metal ions under ambient environmental conditions forming both soluble and non-soluble mineral precipitate.

Marine shales such as the local Shaftsbury Formation commonly contain sulphide minerals (mainly pyrite, FeS_2) and may also have primary sulphate minerals such as anhydrite ($CaSO_4$), gypsum ($CaSO_4 \cdot 2H_2O$), or barite ($BaSO_4$), and/or other sulphate minerals. Preliminary characterization determined that the primary sulphur species in the shale was sulphide with some detectable sulphate (Klohn Crippen Berger, 2015). Based on this mineral association and site observations, it is possible that groundwater contacting fractured bedrock could contain naturally elevated sulphate concentrations. Only one well from the Dam Construction Site was reported in the baseline groundwater sampling conducted as part of the project's Environmental Impact Statement (Hemmera Envirochem Inc. and BGC Engineering Inc., 2012) which did indicate groundwater contained elevated sulphate. Ongoing groundwater monitoring up-gradient and down-gradient of RSEM R5a and R5b measure elevated sulphate concentrations that remain below the BCAWQG-FLT guideline, as reported in The Site C Clean Energy Project, 2020 Q4 Groundwater Quality, Monitoring Report for RSEM R5a and R5b (Lorax, 2020). These results indicate the ongoing presence of sulphate in the groundwater systems. It is noted that the down-gradient monitoring wells at RSEM R5b were screened in overburden materials above the bedrock contact. All wells were removed in September 2020 prior to river diversion. The guideline value for sulphate is not stated in the short-term BCAWQG-FST guideline, however, a long-term average guideline value is stated (variable with hardness) and is referenced in this report.

Water hardness is derived from the total concentration of calcium and magnesium ions in solution, and often reported as mg/L of dissolved $CaCO_3$) is known to mitigate the effect of certain metals on aquatic organisms, and the guidelines are presented with equations derived from experimental data for sulphate and numerous metals (cadmium, copper, fluoride, lead, manganese, silver and zinc that tests a range of hardness specific to each metal or sulphate). Water hardness classification on-site is Hard to Very Hard and is often measured above the guideline threshold used to calculate BCAWQG-FST guideline values. Where the ambient hardness values exceed the guideline limited listed for BCAWQG, the exceedance criteria have been calculated using the upper limit "capped" hardness value instead of the measured ambient hardness. The BC Approved WQG Summary Report (MoE, 2019) states that a site-specific assessment may be necessary when ambient hardness values are outside the range tested in the BCAWQG.

Water quality screening efforts have focused on elements with BCAWQG-FST guidelines, which include pH, ammonia, chloride, nitrite, total concentrations of arsenic, boron, cobalt, iron, lead, manganese, molybdenum, silver, and zinc, and dissolved concentrations of aluminum, cadmium, and iron. Dissolved copper was added, and total copper removed from the BCAWQG-FST guidelines in August 2019, which was implemented immediately and continued through the 2020 monitoring period.

Changes in concentrations of some elements or metals, reported as both total and dissolved, can have various implications for water quality under ARD-ML conditions. The solubility of individual elements can vary with pH. Geochemical modelling completed by Klohn Crippen Berger (2015) identified copper, cobalt, cadmium, and zinc as having high probability of leaching into solution of site water during oxidation of the local shale bedrock under oxic acid rock generating and metal leaching conditions.

Formation of iron-oxide precipitate is a widely recognized indicator of active ARD-ML processes. Total iron concentrations are associated with ARD-ML due to liberation of ferric iron from the oxidation of primary iron bearing sulphides. Subsequent formation of iron-oxide or iron hydroxide minerals can precipitate when acidic waters are neutralized and may be present as suspended solids or can form scaling on reactive surfaces such as limestone.

Aluminum is abundant in rock forming minerals and can be released as part of oxidation and degradation of rocks during ARD-ML processes. Aluminum is soluble in acidic water and is typically not soluble in neutral and alkaline waters. Aluminum, as Al^{3+}, can also contribute to the acidity along with H^+. When concentrations of aluminum are

measured in detectible concentrations in neutral or alkaline water, it is possible that the formation of very fine aluminum hydroxide clays may occur in previously acidic waters that have been neutralized (Javier Sánchez España, 2007). As a result, aluminum hydroxide mineral species (e.g., polymorphs of gibbsite or hydrargillite) can form on rock surfaces and are indicators of acid generating conditions.

Concentrations of aluminum, iron and copper are typically low in neutral pH drainage, however, elements such as antimony, arsenic, cadmium, molybdenum, selenium, and zinc can be present in neutral pH drainage. Neutral pH metal leaching is an important mechanism to be observed on the Site C project as several of these neutral pH soluble elements are prevalent in the shale bedrock. These elements can be concentrated within secondary mineral formation on shale bedrock during prolonged period of low moisture, then released into run-off water in elevated concentration during high precipitation events.

Under BCAWQG, the intention of freshwater long-term (FLT; “chronic”) WQG’s are for the protection of the most sensitive species and life stage against sub-lethal and lethal effects for indefinite explores, and uses an averaging period, whereas the freshwater short-term (FST; “acute”) WQG’s are intended to protect against severe effects, e.g., lethality, to the most sensitive species and life stage over a defined short-term exposure period approach (BC Approved WQG Summary Report, 2019). Working water quality guidelines (WWQG) have not been assessed as part of this monitoring program.Sufficient flowing water permitted monthly samples to be collected during the 2020 monitoring period for ten months at RBSBIAR-US (February, April through December), nine months at RBSBIAR-DS (February; April through November, eight months at RBSBIAR-EDS (April to November), seven months at RBSBIAR-EUS (May to November), and eleven months at RBSC-DS (January through September, November and December). In all twelve months of the 2020 monitoring period, a minimum of one sample location in the SBIAR catchment was sampled outside of frozen and/or dry no flow conditions. Field observations were documented each month. Results for each monthly sampling event were plotted on time series charts for trend analysis.

3.0 SAMPLE LOCATIONS

3.1 Description of River Road Sample Locations

A total of twelve (12) monitoring locations have been established in the River Road catchment near Blind Corner.

Sample locations were initially established in 2017 along the River Road ditch for in situ testing, primarily as a means of monitoring the effectiveness of the limestone riprap and to observe longer term trends related to the PAG outcrop at Blind Corner and run-off/seepage from Howe Pit. Laboratory and in situ testing were conducted at three main locations in 2017, including 1) the lower chimney drain (LBRR-LC), 2) upstream of the lower chimney drain within the River Road ditch (LBRR-12+500), and 2) at the discharge of culvert RR-11 (LBRR-DD). In situ samples from 2017 to 2020 have been conducted at locations LBRR-12+430, LBRR-12+600, LBRR-12+700, LBRR-12+810 and LBRR-12+920.

In April 2018, the establishment of three additional locations: LBRR-EDP, LBRR RR9 and LBRR-RR8 were added to the water quality monitoring program. LBRR-EDP is located at the end of a diversion pipe installed on March 19, 2018; the inlet is within the River Road ditch at station LBRR-12+430 to divert water down-gradient into the River Road ditch towards culverts RR9 and RR8. The pipe bypasses the lower chimney drain (LBRR-LC), which continues to discharge from culvert RR-11, and bypasses L3 Creek, which continues to discharge from culvert RR-10. The purpose of the diversion pipe is to address erosion and sediment control by transport of run-off water into an elongated ditchline to reduce flow velocities and to promote settlement of suspended sediment. Inlets to culverts RR9 and RR8 are slightly elevated from the ditch base which will allow water to pond within the ditch and infiltrate

or discharge via the culverts only if water levels reach sufficient height. Both culverts are made of HDPE materials. The monitoring program includes collection of discharge from these LBRR-RR8 and LBRR-RR9 culverts, however, no discharge was observed during the 2020 sampling events.

Sampling was attempted on a routine monthly basis from six of the River Road catchment locations in 2020, and laboratory analyses were conducted on samples collected when flowing water was observed. The analyses results were used to understand water quality prior to mixing and discharging into the Peace River. These seven locations are located: in the upper chimney (LBRR-UC), lower chimney drain (LBRR-LC), upstream of the lower chimney drain within the River Road ditch (LBRR-12+500), the discharge (LBRR-DD), at the end of the diversion pipe (LBRR-EDP), and at the LBRR-RR8 and LBRR-RR9 culverts.

In situ observations and measurements were routinely collected at eleven locations within the River Road ditch when flowing water was observed.

The established River Road monitoring locations are shown in Figure 1 and photos of the locations are included in the Photographs (Photos 1 to 11) section of the Appendix. Water quality lab data results are provided in Appendix B, Table B1 and discussed in Section 5.3.

3.2 Description of South Bank Initial Access Road Locations

A total of five (5) monitoring locations have been established in and with proximity to the SBIAR catchment. The sample locations have been established to monitor water quality flowing through the SBIAR road cut. The sample locations will also monitor the potential changes to water quality in the side channel down-gradient of the SBIAR construction (RBSC-DS). Sample locations allow for data collection of long-term characterization of SBIAR water management from the upstream location in the west ditch (RBSBIAR-US) and the downstream location in the west ditch (RBSBIAR-DS). Upstream and downstream sampling locations (RBSBIAR-EUS and RBSBIAR-EDS, respectively) were added in 2018 and continue to be monitored. In situ and laboratory analysis are conducted at all five locations.

It is noted that the water flowing from RBSBIAR-DS does not have a direct downstream receptor; the water flows from SBIAR into a limestone armoured spillway into a ditch which conveys to the RSEM R6 pond. There is an intensive water quality monitoring program in the pond (continuous in situ measurements of pH, conductivity; daily lab analysis for all parameters) conducted prior to discharge by Lorax (Lorax, 2020) Ecofish (Ecofish 2020a) and others, as well as Peace River receiving environment monitoring conducted by Ecofish (Ecofish, 2020a) and others.

The RBSC-DS location is sampled as a verification point to check for potential influence from, or direct connectivity with, the PAG contact water that is collected within the SBIAR facility and diverted to the RSEM R6 pond. The RBSC-DS is not a discharge location but may be connected to the Peace River depending on the river level. Groundwater and local surface run-off contribute to the local water quality; however, this location remains hydraulically connected to the Peace River which is interpreted as the primary influence of local water quality, particularly TSS measurements.

The SBIAR sampling locations were monitored on a monthly basis and water quality samples were collected for twelve months between January and December 2020.

The established SBIAR monitoring locations are shown in Figure 2 and photos of the locations are included in the Photographs (Photos 12 to 16) section of the Appendix. Water quality lab data results are provided in Appendix B, Table B2 and discussed in Section 5.4.

3.3 Description of L3 Catchment Sample Locations

The catchment for L3 Creek includes RSEM L3 which is currently not considered, nor permitted, for placement of construction related PAG material. Due to potential influence on discharge water quality from the Howe Pit area and inflow from L4 Creek, the water quality within the L3 Creek catchment is being monitored in context of ARD-ML management.

Five monitoring locations are established within the L3 and L4 Creek catchment to characterize water quality along the creeks and at the discharge location. A baseline location up-gradient of RSEM L3 (LBL3C-3.32) is 3.32 km from the L3 Creek discharge location. One midstream location, LBL3C-1.65, is above and one midstream location, LBL3C-1.43, is below the confluence of L4 Creek and Gulley Road box culvert. The LBL3C-1.65 and LBL3C-1.43 locations are 1.65 km and 1.43 km, respectively, from the L3 Creek discharge location, and are monitored to characterize changes through the drainage towards the downstream discharge location at culvert RR-10 (LBL3C-0.02), located 20 metres from the L3 Creek discharge location.

L4 Creek is a naturally incised gully which is located downstream from the off-site 85th Avenue Industrial Lands gravel quarry work that continued to be conducted significantly during 2020. One monitoring location established in L4 Creek, LBL4C-0.18, is 180 metres upstream from the confluence with L3 Creek. Comparison of the measurements from the L3 and L4 Creek monitoring locations are used to characterize the mixed waters monitored at the L3 Creek midstream location, LBL3C-1.43.

The L3 Catchment monitoring locations are shown in Figure 3 and representative photos are included in the Photographs (Photos 17 to 21) section of the Appendix. Water quality lab data results are provided in Appendix B, Table B3 and discussed in Section 5.5.

3.4 Description of Sampling Locations Added in 2020

3.4.1 Left Bank Debris Boom

Sample locations were established and first sampled on October 8, 2020 to characterize water quality in the LBDB area for ARD-ML monitoring. named LBP Pond and LB Side Channel. The purpose of sampling is to monitor PAG contact water from shale exposed during construction in March 2020, and that drains to the Peace River.

Water quality sampling at LBDB provides data to apply to understanding of water discharge and flooding in subsequent phases of increased elevation of the Peace River and during water diversion through the Diversion Tunnels.

The three locations were visited on October 8, November 20, and December 14, although in situ and lab sampling only occurred at LBP Pond (October 8 and November 20, 2020) and Side Channel E (October 8, 2020) outside of frozen conditions.

A representative photo of the LBDB locations is included in Photographs (Photos 22 and 23) section of the Appendix. Water quality lab data results are provided in Appendix B, Table B4 and discussed in Section 5.6.

3.4.2 L2 Powerhouse

Two sample locations were established in the L2 Powerhouse area adjacent to the powerhouse on the Right Bank and first sampled on October 8, 2020 and sampling continued on November 20, December 4, and December 14, 2020 at the L2 Powerhouse area. The L2 area slope is mitigated by covering of the slope that effectively makes it

a non-PAG contact surface. The water quality monitoring program has been put in place to verify that the mitigation applied is working and that non-PAG contact water is observed in this area. Water conveyed to AFDE RSEM R6 pond from the L2 Powerhouse area is otherwise non-PAG contact.

Water from the L2 Area is pumped to the water treatment plant in the area and then to the sediment ponds in R6, where it is eventually pumped to the Peace River. In the winter, the water is not piped to R6, but rather is recycled from the water treatment plant. water quality samples were collected from the upstream (L2 US) and downstream (L2 DS) in the L2 Area located adjacent to the powerhouse on the Right Bank (Figure 2).

The L2 DS sample location is adjacent to the L2 Powerhouse, specifically collected from the pump tubing on the west side of the culvert and approx. 1-2 m from the south rock ditch wall and 1-2 m from the culvert. The L2 US station is located upstream from the L2 Powerhouse.

A representative photo of the L2 Area is included in the Photographs (Photos 24 and 25) section of the Appendix. Water quality lab data results are provided in Appendix B, Table B5 and discussed in Section 5.7.

4.0 LOCAL CONDITIONS

4.1 Weather Conditions - Temperature and Precipitation

The minimum, maximum, and average daily temperature and the seven-day temperature range preceding each sampling event were summarized in attached Table 2. The total precipitation measured for the seven days preceding each sample event and the precipitation on the day prior to and the day of the sample event were summarized. The temperature and precipitation data was sourced from BC Hydro's Site C Meteorological and Air Quality Station (Figure 4; BC Hydro, 2019), Station 7C Site C North Camp, with results summarized in the attached Table 2.

The range of mean, minimum and maximum temperatures recorded during sampling events is summarized in Table 4-1.

Table 4-1: Range of Temperatures Recorded during Sampling Events in 2020

	Month	Temperature (°C)	Month	Temperature (°C)
	Lowest		Highest	
Mean	14-Dec	-16.5	30-Jul	19.8
Minimum	20-Nov	-19.0	21-Jun	14.7
Maximum	14-Dec	-15.7	30-Jul	25.1

Sampling events in all months during 2020 were conducted on dry days with no precipitation, except for August 24 (2.94 mm), October 8 (3.54 mm), October 20 (0.05 mm), December 20 (0.44 mm) and December 21 (0.06 mm). Precipitation for the Site C area was recorded in the previous seven days for sampling events in January (3.62 mm), February (0.62 mm), March (2.42 mm), April (0.52 mm), May (23.39mm), June (61.11 mm), August (20.54 mm), September (6.41), October (3.04 and 5.14 mm), November (13.11 and 0.25 mm), and December (0.25 mm, 0.34 mm, and 6.17 mm) during the 2020 monitoring period. Sampling events with the most significant precipitation recorded in the previous seven days to sampling events occurred in June (61.11 mm), May (23.39 mm) and August

(20.54 mm). A summary of mean daily temperature recorded on sampling events, and precipitation recorded during both the prior seven (7) days and during the sampling event is provided in Table 4-2.

Table 4-2: Sample Event Temperature and Precipitation

Routine Memo No.	Sample Event No.	Sample Event Date	Mean Daily Temperature (°C)	Precipitation for 7 days prior to Sample Event (mm)	Precipitation on Sample Event (mm)
1	1	23-Jan-20	-7.7	3.62	0.00
	2	27-Feb-20	5.3	0.62	0.00
2	3	25-Mar-20	-1.9	2.42	0.00
3	4	16-Apr-20	9.6	0.52	0.00
		17-Apr-20	7.0		0.00
4	5	27-May-20	13.7	23.39	0.00
		28-May-20	14.4		0.00
5	6	21-Jun-20	18.3	61.11	0.00
		22-Jun-20	16.0		0.00
6	7	29-Jul-20	18.7	0.00	0.00
		30-Jul-20	19.8		0.00
7	8	23-Aug-20	14.5	20.54	0.00
		24-Aug-20	12.6		2.94
8	9	28-Sep-20	13.2	6.41	0.00
		29-Sep-20	10.3		0.00
	10	08-Oct-20	5.6	3.04	3.54
9	11	20-Oct-20	-4.9	5.14	0.05
		21-Oct-20	-7.2		0.00
	12	20-Nov-20	-16.2	13.11	0.00
10	13	30-Nov-20	0.7	0.25	0.00
	14	04-Dec-20	7.1		0.00
11	15	14-Dec-20	-16.5	0.34	0.00
	16	20-Dec-20	-0.3	6.17	0.44
		21-Dec-20	-3.1		0.06

4.2 Classification of Seasonal Flows in Ditch

Residence time for water is low in the SBIAR and River Road ditches due to their small catchment size. The climate data was used to evaluate water availability and potential water source for flows that were observed in the ditches.

The flows in ditches at SBIAR and River Road are susceptible to seasonal change and flow rate is highly influenced by local precipitation events, thus the classification of flow in ditches can assist to interpret the source and subsequent chemical fluctuations in water sampled (attached Table 3). For example, flows in ditches can be attributed to shallow or regional groundwater, spring freshet or surface run-off, dependant on the season and amount of precipitation recorded in the previous 24-hours and 7-days to the sampling event. This association may

be less apparent in L3 Creek due to a larger catchment size and residence time for water within the drainage, however, it is interpreted that similar trends may be observed.

Regional bedrock groundwater in locations sampled are suspected to have elevated concentrations of dissolved sulphates due to groundwater interaction with local pyritic-shale bedrock and local bacteria, and may, to some degree, be responsible for the high sulphate-content pervasive in water samples following minimal precipitation during the previous 7-day and 24-hours to the sampling event (e.g., January 23, February 27, March 25, April 16-17, July 29-30, September 28-29, October 8 and 20-21, November 30 and December 4, 14 and 20-21, 2020).

When significant precipitation has occurred in the previous 7-days, but minimal precipitation within the prior 24-hour period to the sampling event, the flows in ditches can result from shallow groundwater flow, mainly through unconsolidated overburden. Significant precipitation in the preceding seven days to and during the June (61.11 mm), and moderately during the May 27-28 (23.39 mm) and August 23-24 (20.54 mm) sampling event correlates with a spike in TSS and turbidity measured in the Peace River (Table 4) and higher levels of TSS and conductivity measured in water quality samples collected from the SBIAR and L3 Creek monitoring locations.

During spring freshet and snow melt, sampling events (e.g., April and May 2020) can be classified as having a ‘dilution’ effect to the water chemistry, although increased TSS from turbid high flows can counteract this effect. To the contrary, during more arid seasons with little to no precipitation occurring in the previous 7-days and 24-hours (e.g., March, April, July, November, December 2020), flows in ditches can be attributed to regional groundwater baseline seepage. In this event, when precipitation and sampling occur following dry periods, the surface chemistry of the rocks will be washed into the ditches and be concentrated. No significant rainfall events were coincident to sampling events in 2020, and only two events were coincident with minimal 2.94 mm (August) and 3.54 mm (October 8) rainfall. Significant rainfall, however, occurred 5-6 days prior to the June 21-22 event (61.11 mm) and moderate precipitation 2-days prior to the August 23-24 event (20.54 mm) and 4-7 days prior to the May 27-28 event (23.39 mm), no rainfall was coincident on the sampling event. If there had been an occurrence of moderate to significant rainfall prior to and including a sampling event in 2020, this would produce increased turbidity and flow in the ditches, having short-term effects on measurements such as TDS, TSS and potentially total metal concentrations from flushing of exposed slopes and ditch fill material.

The classification of seasonal flows in ditches, therefore, are important to consider when interpreting fluctuations and exceedances in parameters measured in water quality guidelines over the period of one year.

4.3 Peace River Turbidity and TSS

Turbidity of the Peace River is monitored by BC Hydro through a series of data loggers situated both upstream and downstream of the Main Civil Works (MCW) construction area. Time series data of collected on the left and right banks of the Peace River up-gradient of the Moberly River (stations PAM-LB and PAM-RB, respectively) were provided to Tetra Tech by Ecofish Research Ltd (EcoFish, 2020b) to provide general understanding of influence by precipitation on natural sediment within the Peace River upstream from the construction area surrounding sampling events. Turbidity is measured in Nephelometric Turbidity Units (NTU) and Total Suspended Sediment (TSS) is an average (mg/L) determined by converting Left Bank and Right Bank NTU values to TSS using a TSS:Turbidity relationship and then averaging both TSS values. The TSS:Turbidity relationship of 0.73:1 was replaced with 0.72:1 after 6:00 am on November 4, 2020 (EcoFish, 2020b).

Measured turbidity gradually increases during early spring and freshet then decreases and levels off for the remainder of the year with exception to high precipitation events that are related to spikes in turbidity and TSS. In 2020, turbidity and TSS levels spiked concurrent with freshet in the April 16-17 and May 27-28 sampling events, and significant precipitation leading up to the June 21-22 sampling event (Figure 5; Table 4). No sampling events

in 2020 were coincided with a high precipitation event although three events (May, June, and August) had moderate to significant precipitation within the seven days previous to sampling. Figure 5 illustrates the variability in turbidity and TSS during 2020 (Ecofish, 2020b). The Appendix Table 4 and Figure 5 provide the data and graph prepared to illustrate variability in turbidity associating with sampling events.

The daily mean turbidity and TSS that is measured during and following freshet and high rainfall events measures significantly higher values on the Left Bank relative to the Right Bank. This is summarized as the average values for each of the April, May, June, and August 2020 events in Table 4-3.

Table 4-3: Elevated Turbidity and TSS during Sample Events in 2020

Sample Event Date	Related to	NTU		TSS (mg/L)	
		LB	RB	LB	RB
April 16-17	freshet	701.6	39.1	512.2	28.5
May 27-28	freshet	127.4	83.6	93.0	61.0
June 21-22	rainfall, high	667.2	546.8	487.0	399.2
Aug 23-24	rainfall, mod	176.0	32.3	128.5	23.6

NTU: Nephelometric Turbidity Units

The data include turbidity measurements for the seven days prior, day prior, during, and day following the January through December sampling events in 2020 (Table 4). The turbidity data is converted to a value representing total suspended solids (TSS) using a preliminary factor developed by Ecofish using calibration of field measurements with laboratory data. Although the data have undergone initial verification and review for quality assurance, measurements may still have drift corrections applied, therefore, the TSS-turbidity relationship will continue to be updated following sample collection over time and all ranges of river conditions. Subsequent quality assurance and verification procedures may result in differences between what is currently provided and what will become the official record.

5.0 WATER QUALITY MONITORING PROGRAM RESULTS

5.1 Sample Events in 2020

A summary of each water quality sampling event and corresponding analytical results were reported monthly to BC Hydro in a routine memo for sixteen (16) sampling events in 2020, twelve (12) of which were at the RR, SBIAR and L3 Creek catchments (January 23, February 27, March 25, April 16/17, May 27/28, June 21/22, July 29/30, August 23/24, September 28/29, November 30 and December 19), and four (4) at the new LBDB and L2 Area locations (October 8, November 20, December 4 and 14, 2020).

Field notes documented at each monitoring location included date and time of field observations including estimated flow rate and water clarity, and a list of in situ tests completed with record of measurements for water temperature, hardness, alkalinity, pH, and electrical conductivity collected using a hand-held meter. (Tables 6, 8, 11, 13 and 15).

The attached Table 1 presents a summary of the dates of the sampling events and which locations had in situ or lab testing completed.

Laboratory results for all locations are provided in Appendix B (Tables B1 to B5).

5.2 Quality Control and Quality Assurance Program

5.2.1 Overview of QA/QC Program

The Quality Control (QC) program included experienced field staff familiar with the water quality monitoring program adhering to the British Columbia Field Sampling Manual, Part E: Water and Wastewater Sampling (Clark, 2003). New sample containers were acquired from the laboratory the day preceding the sampling event and all handling of the containers, sampling devices and equipment during sample collection was completed wearing new nitrile gloves to minimize potential for contamination of the samples. A new disposable syringe and 0.45 µm filter were used for each sample being submitted for dissolved metals, except when the concentration of TSS was observed as being high and field filtration was not possible. Samples not filtered and preserved in the field were identified and filtered at the laboratory. All samples were stored in a cooler filled with ice packs at a temperature between approximately 4°C and 8°C.

The Quality Assurance (QA) program incorporated use of a Travel Blank (TB), Field Blank (FB) and replicate sample to test for potential contamination during sample collection, handling, or laboratory preparation, and to evaluate the precision of laboratory analysis. Travel Blanks were prepared by the laboratory and field blanks were prepared in the field at sample collection sites by field staff using the same source water as was used for the travel blank.

5.2.2 Laboratory QA/QC

Analytical results were received monthly from ALS Labs. No external lab was contracted during the 2020 monitoring period. The lab implements a detailed QC program into the sample analysis which includes a series of checks and evaluations for consistency in the sample analysis. The QC program includes method blanks, certified reference materials, laboratory control samples and duplicates. The QC Lot reported on Assay Certificates consistently met internal ALS Data Quality Objectives.

5.2.3 Tetra Tech QA/QC

The analytical results of the QA samples were reviewed by Tetra Tech, and if potential contamination or concerns with analytical results were identified, they were discussed with the laboratory and/or the field sampler representatives, with reanalysis of samples completed for verification if necessary. During 2020, Travel and Field Blank data from the April 16-17, 2020 sampling event measured significant concentrations of values above the detection limit, which required a rerun by the lab resulting in the same lab result. After investigation, the lab found that the DI water provided by the lab for the TB and FB was not as deionized as it should have been. Furthermore, the Replicate sample from the same April 16-17 sampling event measured a significant amount (thirty-eight (38)) total and dissolved metals with an unacceptable Relative Percent Difference (RPD) > 30%. The lab re-filtered the samples and it was concluded that the errors had resulted from complications related to filtering procedures in the field and lab with highly elevated turbidity in the samples.

Table 5 lists the results of the QA program, including a summary of the RPD values. Replicate samples were evaluated using RPD, where an RPD value of less than 30% is considered an acceptable threshold for variation of surface waters. Blank samples were considered to ‘fail’ where any measured value was in concentrations above the reported detection limits for that parameter.

Tetra Tech also reviewed the data for more general anomalies and inconsistencies. The total and dissolved concentrations for the full suite of elements were continued to be compared since there are frequent occurrences of dissolved concentrations exceeding total concentrations. The results were screened for analytical error, then assessed for expected natural variability of surface waters. Most instances were due to measurements at or near

the analytical detection limit and could be explained by being within an acceptable range of error up to five times the lower detection limit for the respective element. Here, the total concentrations are considered equal to the dissolved concentrations.

5.2.4 QA/QC Program Results

Elemental concentrations measured at or slightly above the analytical detection limits in travel (TB) and field (FB) blanks occurred at times during the January to December 2020 monitoring period (the month of April 2020 was discussed separately in s. 5.2.3). Specifically, parameters measuring above detection limit were measured for total alkalinity (August TB and December 4 FB), bicarbonate alkalinity (August TB and December FB), ammonia (January FB), total mercury (March TB), total molybdenum (January FB), dissolved aluminum (March and August FB), dissolved barium (March TB) and dissolved mercury (March FB), summarized in Table 5.

The April 16, 2020 sampling event measured anomalous values in both the TB and FB for a significant number of parameters, which was determined to be sourced from an error at the ALS Labs with poor quality of distilled water provided for the TB and FB. Therefore, the TB and FB were not considered acceptable for further contamination checks.

Consistently, an average pH of 5.60 is measured across travel and field blanks collected between January to December 2020; this low pH result is typical for distilled water and is not identified to be an issue. The elemental concentrations measured above detection limit could be attributable to field contamination or calibration of analytical instrumentation. The majority of blank samples with elevated concentrations occurred with field blanks (73%) rather than travel blanks (27%), and similar anomalous elemental concentrations were not observed in their corresponding travel blank. Travel blanks were prepared by the laboratory and field blanks were prepared in the field at sample collection sites by field staff using the same source water as was used for the travel blank. If the source distilled water was contaminated, similar elemental anomalies would be expected in both the TB and the FB. The issues have been communicated with both the analytical laboratories and field personnel. Due to anomalous values being so close to detection limits and that particular elements were not recurring throughout the year; the accumulated error was not interpreted as a concern for this monitoring program.

Field replicate samples with differences of elemental concentrations above the acceptable threshold of RPD > 30% had occurrences for a variable number of parameters measured in January (7), February (0), March (1), April (38), May (1), June (2), July (0), August (2), September (1), 8-Oct (3), 20-Oct (0), 20-Nov (2), 30-Nov (2), 04-Dec (2), 14-Dec (0), and 20-Dec (7). Discrepancies are attributed to sediment disturbance during the collection of the first sample.

The April 17, 2020, sampling event QAQC check found that the replicate samples (LBL3C-1.65 and LBL3C-1.65-R) had significant occurrences of RPD > 30%, calculated for thirty-eight (38) parameters including thirty-three (33) total metals (Al, An, As, Ba, Be, Bi, Cd, Ce, Cr, Co, Cu, Fe, Pb, Li, Mg, Mn, Mo, Ni, P, Rb, Se, Si, Sr, Tl, Th, Sn, U, V, Zn, Zr) with an RPD between 56.6 to 198.6%, and five (5) dissolved metals (Al, Cr, Fe, Pb, Mo) with an RPD between 35.8 to 75.7%. Following communication with the field sampling personnel and ALS Laboratories, this discrepancy was attributed to the replicate sample containing sediment from disturbance during collection of the first sample. The replicate sample was therefore not considered a reliable comparison of the in situ conditions and laboratory analysis, therefore it was not included as a replicate in the statistics and reporting.

Occurrences of dissolved concentrations exceeding total concentrations in samples was calculated below the acceptable threshold of an RPD < 30%, although measurements above the acceptable threshold occurred in the following sampling events: June (aluminum, selenium, zirconium), July (zinc) and October 20 (cadmium, manganese, nickel, sulphur and zinc).

5.3 River Road Water Quality Monitoring

Sufficient flowing water permitted samples to be collected during 2020 from LBRR-DD (February, April, September), LBRR-12+500 (February, March, April, June, September, October), LBRR-EDP (February, March, April, June, July, September), RR9 (February), LBRR-UC (July, August) and LBRR-LC (April). Dry, freezing and/or low or no flow conditions prevented reliable sampling at the River Road monitoring locations for the remaining months of 2020. In situ measurements were not collected from each station consistently every month due to dry or frozen conditions. Field observations were documented each month and results for each monthly sampling event were plotted on time series charts for trend and qualitative correlation analysis.

A summary of water quality exceedances at River Road relative to BCAWQG-FST listed by monitoring location and month are listed in Table 7, and the screening results based on the laboratory data are tabulated in Appendix B1.

5.3.1 In Situ Measurements and Field Observations

The collection ditch on the cut-bank (north) side of River Road between approximately 12+340 and 12+960 (Blind Corner) was lined with limestone riprap in 2017 to assist with mitigating the potential effects of ARD-ML from PAG bedrock that was exposed during the initial road construction in 2015 and early 2016. Limestone was also placed between stations LBRR+920 and LBRR-DD to manage the pH of baseline drainage water at the outflow location. Limestone riprap within the ditch between road stations 12+600 and 12+900 continued to be maintained in 2018, including completion of a hydroseeding program and a limestone buttress as the tow of the shale slope at blind corner to support long-term erosion control and slope stability in March 2018. The hydroseed appeared to remain in place on the slope, however, germination was not successful at year's end. No maintenance activities were completed in 2020.

Potentially acidic leachate generated from the rock cut-slopes reacts with the alkaline limestone to help neutralize water as it passes through the riprap lined ditch. The ditch also serves to convey run-off water and fine sediment shed from River Road through the end-of-diversion pipe between 12+430 and LBRR-EDP where water is pooled and infiltrates or is discharged through culvert RR8 and RR9 into the Peace River if water levels exceed the inlet height of culverts. Water from the lower chimney ditch, LBRR-LC, is conveyed through culvert RR-11 to the discharge location, LBRR-DD, and ultimately to the Peace River.

Location LBRR-12+920 is located immediately up-gradient of the upper cut-off chimney and PAG exposure, whereas LBRR-12+810 is located immediately down-gradient the upper cut-off chimney and sits below the PAG exposure at Blind Corner. Notable decrease in water pH and alkalinity generally occurs between these stations with a gradual recovery from acidic to circumneutral pH and available alkalinity towards location 12+500.

The placed limestone riprap is effective at mitigating the pH of the drainage when there are fresh surfaces of limestone available for chemical reactions. The limestone material used as riprap along this road section has become progressively coated with a mineral precipitate (visually estimated as hydroxides containing calcium, iron and aluminum) due to chemical neutralization reactions and almost entirely encased by sludge due to settlement of suspended solids within the water. Additionally, the roadside portion of the ditch, particularly from LBRR-12+600 downstream to the inlet of the diversion pipe, is being encroached with sand and gravel sediment from grading activities on River Road which covers the limestone, further reducing its exposure to the run-off water. The effectiveness of the limestone to provide the neutralizing potential is considered to be negatively compromised by these coatings.

Values for pH, conductivity, hardness, alkalinity, water temperature, estimated flow and turbidity measured at the River Road monitoring locations are included in Table 6. At River Road during 2020, the range in water temperatures was 0.0 °C to 23.5 °C. Measurements of pH ranged between 7.30 to 8.87, alkalinity ranged between 40 and 240 ppm, hardness ranged between 100 to 800 ppm and conductivity between 183 to 2,518 µS/cm.

Flows within the River Road ditch are ephemeral. During 2020, flow was noted at the LBRR-DD discharge location in February, April, and September 2020, at the LBRR-EDP location in February, March, April, June, and July 2020, at RR9 in February 2020, and no flow noted on RR8. During 2020, flow was observed in February and April at LBRR-LC (Lower Chimney; Midstream) and between April to September at LBRR-UC (Upper Chimney), flow was observed at the LBRR-12+500 and LBRR-LC. Dry or frozen conditions prevailed for the remainder of 2020. Along River Road, in 2020 flow was noted at the LBRR-12+500 location in February, March, April, June, September and October, and further up the LBRR ditch at LBRR-12+600, LBRR-12+700, LBRR-12+810 and LBRR-12+920 during between four to eight months of the 12-month monitoring period.

In the River Road catchment, TSS measurement ranged from <1.0 mg/L (RR9, February; LBRR-12+500, September) to 2,390 mg/L (LBRR-12+500; April). Average TSS for 2020 was 538 mg/L, and each sample location showed variable TSS that was seasonally correlated with highs typically in April, lowest values in the summer months and an increase in early Fall. The source of TSS is primarily from River Road run-off, scouring of sediment deposited within the River Road ditch and washing from the cut-slopes.

5.3.2 Freshwater Short-Term Maximum Exceedances

Of the total eighteen (18) samples collected from River Road during 2020, elevated total metal concentrations above the BCAWQG-FST were measured for total arsenic, total iron, and dissolved aluminum. Neutral to alkaline laboratory pH values were measured during 2020 with pH ranging between 7.78 and 8.32.

At the discharge LBRR-DD location, there was a BCAWQG-FST exceedance in total iron in February and April 2020, and dissolved aluminum in February 2020. Other non-discharge locations along River Road measured BCAWQG-FST exceedances in total arsenic at LBRR-12+500 (March and April) and LBRR-EDP (April), total iron at LBRR-12+500 (February, March, April) and LBRR-EDP (February, April), and dissolved aluminum at LBRR-UC (August). No other exceedances were measured at River Road locations during 2020.The summary of exceedances is presented in Table 7 and summarized below. The complete data results from the samples are summarized in Appendix B1.

The exceedances are interpreted to be directly related to washing, or flushing, of sediment and secondary mineral precipitant during freshet (or precipitation following a dry period), as water contacted accumulated sediment within the ditch in addition to the exposed shale, colluvium and overburden cut-banks.

This result suggests active ARD-ML processes on exposed PAG at Blind Corner and within Howe Pit are influencing water quality when there is flowing water.

5.3.3 Trend Monitoring

Data results from 2017 to 2020 at River Road monitoring stations have been compiled and plotted for trend analysis. Please refer to Figures 6 to 17 for time series charts.

Monthly water quality monitoring measures instantaneous ambient conditions at the time of sampling and as discussed in Section 3.1 the measurements are highly susceptible to temporal climate conditions due to the small catchment and short residence time of water within the River Road ditch. Event data characterizes the influences of seasonal conditions at the site.

Time series charts for pH and alkalinity, TSS and TDS, sulphate, total and dissolved aluminum, and total and dissolved iron at River Road were presented in the 2017 and 2018 annual reports (Tetra Tech 2017 and Tetra Tech 2018), but not in the 2019 annual report due to lack of water quality data in 2019 (Tetra Tech 2019). Water quality sampling has been inconsistent at the River Road locations since 2017 due to frequent low flow or frozen conditions. There is minimal data available from mid-2018 to the end of 2019, and variable amounts of data in 2017 and 2020 from different stations and times. The available data makes it challenging to discern seasonal trends at River Road. Additional data collection and ongoing time series trend analysis is needed to develop interpretation of trends.

The measured pH values collected at River Road have remained within an acceptable BCAWQG-FST range (pH 6.5 to 9.0) during 2020 sampling events that show more consistency in 2020 relative to more variability in pH during 2017 and 2018 when pH values varied below and above the acceptable BCAWQG-FST. During 2020, alkalinity and pH remain relatively consistent whereas acidity is more variable, especially at the LBRR-12+500 and LBRR-UC locations. The collection of acidity data is limited to primarily 2020 and will continue to be monitored.

During 2020, TDS and TSS values at River Road sample locations generally remain within range of measurements in 2017 through 2019. Although limited and inconsistent data is available, the LBRR-EDP location shows the highest TDS values in 2020 relative to the other RR locations sampled. During 2020, TSS values measured at LBRR-EDP and LBRR-12+500 locations follow similar and slightly higher concentrations at LBRR-EDP that follow similar trends in 2020, relative to differing concentrations measured from the limited data available in 2020. During 2020, sulphate concentrations measure within range of values collected from 2017 to 2018, which continue to straddle the BCAWQG-FLT guideline value of 429 mg/L (guideline variable based on hardness) at the LBRR-EDP location, whereas other sampled locations in 2020 along River Road, including LBRR-12+500 measured more consistent sulphate values that remained below the BCAWQG-FLT guideline.

During 2020, total and dissolved aluminum are variable and within to slightly below range of measurements in 2017 to 2018. Total aluminum, similar to TSS values, measured at the LBRR-EDP and LBRR-12+500 locations follow similar concentration and trends in 2020, relative to differing total aluminum concentrations measured at other River Road locations from the limited data available in 2020.

During 2020, total iron varies in concentration that measures below and above the BCAWQG-FST guideline and within range of measurements in 2017 to 2018. Total iron, similar to total aluminum and TSS values, measure similarly and follow a similar trend at the LBRR-EDP and LBRR-12+500 locations in 2020, which differs from total iron concentrations measured at other River Road locations from limited data available in 2020. During 2020, dissolved iron remains well below the BCAWQG-FST guideline at values at or just above detection limit, with more consistent values in dissolved iron relative to more variability in total iron at RR locations.

Metal concentrations for a number of elements, including total aluminum, total iron, total arsenic, total cobalt, total and dissolved copper, and total zinc showed a spike during freshet in March and April 2020 coincident with elevated TSS values. In 2020, metals generally measure within to lower than the range of values measured in 2017 and 2018.

5.3.4 Freshwater Long-term Average Exceedances

In addition to BCAWQG-FST (short-term) screening, laboratory results have been screened against the BCAWQG-FLT (long-term) guideline values, shown in Appendix B1 for River Road water quality data that reference results of the eighteen samples collected during the 2020 monitoring period.

5.4 SBIAR Water Quality Monitoring

Sufficient flowing water permitted monthly samples to be collected during the 2020 monitoring period for ten months at RBSBIAR-US (February, April through December), nine months at RBSBIAR-DS (February; April through November, eight months at RBSBIAR-EDS (April to November), seven months at RBSBIAR-EUS (May to November), and eleven months at RBSC-DS (January through September, November and December). In all twelve months of the 2020 monitoring period, a minimum of one sample location in the RBSBIAR catchment was sampled outside of frozen and/or dry no flow conditions. Field observations were documented each month. Results for each monthly sampling event were plotted on time series charts for trend analysis.

A summary of water quality exceedances at SBIAR relative to BCAWQG-FST listed by monitoring location and month are listed in Table 9, and the complete set of screening results based on the laboratory data are tabulated in Appendix B2.

5.4.1 In Situ Measurements and Field Observations

Values for water temperature, pH, total alkalinity and electrical conductivity measured at the SBIAR monitoring locations are included in Table 8.At the SBIAR locations during 2020, the range in water temperatures was 0.0 °C to 21.3 °C. Measurements of pH ranged between 6.80 to 9.03, alkalinity ranged between 40 and 240 ppm, hardness ranged between 250 to 800 ppm and conductivity between 554 to 1,630 µS/cm. The range in water temperatures at the four ditch locations (0.00 to 21.3 °C) and the RBSC-DS side channel (4.2 to 17.2 °C) were recorded in 2020.

Flows in the SBIAR ditch system can vary between upstream (RBSBIAR-US and RBSBIAR-EUS) and downstream (RBSBIAR-DS and RBSBIAR-EDS) locations, with flows of approximately 0.10 L/s to 1.5 L/s, respectively. Seepage in the western cut-slope ditch is received partly from ponded water from Area 21. RBSC-DS is located in the side channel with connectivity to the Peace River where stagnant to minimal “flow” is observed.

Water levels at RBSC-DS are coincident with the actual levels of the Peace River. Table 4 shows the measured upstream turbidity, and converted TSS concentrations, within the Peace River. Increased turbidity measured in the Peace River results from precipitation events which can be correlated with TSS measurements collected from RBSC-DS. Thus, TSS measured at the RBSC-DS location (Figure 22b) are interpreted to be attributable to, or directly influenced by, the in-river turbidity measurements (Table 4).

5.4.2 Freshwater Short-Term Maximum Exceedances

Concentrations of total and dissolved iron, dissolved aluminum, total arsenic, total manganese, and total zinc were measured above the BCAWQG-FST at various locations and months during 2020 within the RBSBIAR catchment. At the downstream RBSBIAR locations, at RBSBIAR-DS occurrences of exceedances were reported for total iron (1) and dissolved aluminum (2); at RBSBIAR-EDS occurrences of exceedances were reported for total iron (2), total arsenic (1), total zinc (2) and dissolved aluminum (2) in 2020. At the upstream locations, one exceedance was reported at RBSBIAR-US for total iron (1), and no exceedance was reported at RBSBIAR-EUS.

The water flowing from RBSBIAR-DS and -EDS do not have a direct downstream receptor. In 2018, exceedances in the metals, total arsenic, copper, and zinc occurred solely at the upstream west ditch location, RBSBIAR-US (March 2018), whereas these same metals measure exceedances primarily in the downstream ditches in 2019 and 2020.

At the RBSC-DS side channel, exceedances to the BCAWQG-FST guidelines were measured for total iron (1), dissolved iron (1), total manganese (3) and dissolved aluminum (1) during 2020. These exceedances are considered to be transported by sediment entrainment from run-off and groundwater inflows and elevated

concentrations may be in association with algal development in the side channel; these concentrations are not interpreted to be directly influenced by construction related PAG contact water.

A summary of water quality exceedances relative to BCAWQG-FST listed by monitoring location in and month are listed in Table 9, and the screening results based on the laboratory data are tabulated in Appendix B, Table B2.

5.4.3 Trend Monitoring

Monthly water quality monitoring measures instantaneous ambient conditions at the time of sampling and, as discussed in Section 3.1, the measurements are highly susceptible to temporal climate conditions due to the small catchment and short residence time of water with the SBIAR ditch. Recurring trends at SBIAR over the 2017, 2018, 2019 and 2020 monitoring periods may be preliminary indications of long-term trends and are discussed below.

Data results from 2017 to 2020 at SBIAR monitoring stations have been compiled and plotted for trend analysis. Please refer to Figures 18 to 29 for time series charts. A comparison of downstream vs. upstream concentrations of zinc in the west SBIAR ditch (Figure 30a) and east SBIAR ditch (Figure 30b) is provided for discussion of observed trends between upstream and downstream sample locations.

5.4.3.1 Alkalinity and pH

Alkalinity and pH values indicate that waters have remained alkaline from 2017 through 2020. Values for pH measured at RBSBIAR-DS range between 8.07 to 8.26 with a mean pH value of 8.13, and at RBSBIAR-EDS range between pH 7.90 to 8.06 with a mean pH value of 7.94 (Table 10). Alkalinity trends between the four ditch locations are variable yet follow relatively similar trends during the 2020 monitoring period; the alkalinity values are similar and higher within the east ditch (RBSBIAR-EUS/-EDS), whereas are similar and lower within the west ditch (RBSBIAR-US/-DS).

There is an overall increasing trend for alkalinity in both upstream and downstream (east and west) ditches between May to November 2020. The highest alkalinity values are measured at the RBSC side channel between January to December 2020 except for the late July 2020 sample when alkalinity was higher in the east ditch (RBSBIAR-EUS/-EDS) than at RBSC-DS. The late July sample also corresponds to a low point in acidity and TDS for the RBSC-DS sample.

Values for alkalinity at RBSBIAR-DS range between 135 mg/L and 242 mg/L $CaCO_3$ equivalent (mean value of 206 mg/L $CaCO_3$ equivalent), and at RBSBIAR-EDS range between 256 mg/L and 324 mg/L $CaCO_3$ equivalent (mean value of 281 mg/L $CaCO_3$ equivalent) (Table 10).

Measured pH at the side channel location RBSC-DS range between 7.76 and 8.26, and alkalinity ranges between 255 and 412 mg/L $CaCO_3$ equivalent. The RBSC-DS location generally measures higher alkalinity values and similar to slightly lower pH values that are more variable relative to the other SBIAR sampled ditch locations. There is low similarity in trends observed for pH and some similarity in an increasing trend between August to November for alkalinity between the side channel and the SBIAR waters.

5.4.3.2 Hardness

Water hardness measured at RBSBIAR-DS ranges between 234 and 331 mg/L, with a mean value of 286 mg/L, and at RBSBIAR-EDS ranges between 246 and 482 mg/L with a mean value of 353 mg/L. The water hardness was commonly above the upper threshold used by the BCAWQG-FST (250 mg/L) to guide calculation and exceedance criteria for various metal or element concentrations (e.g., total sulphate, lead, manganese, silver, zinc; dissolved cadmium). When the maximum hardness value is reached for elements that are hardness-dependent for

BCAWQG-FST guideline calculations, the respective maximum hardness values for the above-mentioned metal or elements are used as capped hardness values in the calculations. Elevated ambient water hardness values are also observed in measurements from other catchments on-site and likely is characteristic of elevated background conditions of hard soils and groundwater.

5.4.3.3 Total Suspended Sediment (TSS) and Total Dissolved Sediment (TDS)

TSS measurements at the downstream RBSBIAR-DS/-EDS and upstream RBSBIAR–US/-EUS locations are variable both between upstream and downstream, and between west and east ditches, thus have different trends during the 2020 sampling period (Figure 22b). The overall variability in TSS is attributable to the relatively small catchment and short residence time of waters within both the west and east RBSBIAR ditches and sensitivity to flux in surface water inputs from precipitation or seepage inputs from Area 21. TSS concentrations measured at RBSBIAR-DS range between <1.0 and 341 mg/L with mean value of 40.3 mg/L, and at RBSBIAR-EDS range between <1.0 and 5,390 mg/L TSS. Measured TDS concentrations ranged between 412 and 572 mg/L with mean value of 473 mg/L at RBSBIAR-DS, and between 495 and 818, with a mean value of 597 mg/L TDS at RBSBIAR-EDS.

During freshet in April 2020, the downstream RBSBIAR-EDS and RBSBIAR-DS locations measured elevated TSS values. TSS is highly variable and sensitive to the local conditions at the time of sampling. The upstream RBSBIAR-EUS and RBSBIAR-US locations measure lower TSS values than the downstream locations.

Measured TSS values within the RBSC-DS ranged between <3.0 and 12.9 mg/L with mean value of 6.28 mg/L, peaking to similar TSS values in April and July 2020 sampling events, and similarly to 2019 shows an increasing trend in early spring that levels off and decreases towards the fall and winter months. TSS values at RBSC appear to occasionally, but not always, have a similar trend as the downstream ditch locations, RBSBIAR-DS and RBSBIAR-EDS, showing an increase and decrease in the same months of April, May, September, but not other months in 2020.

Measured TDS values within the RBSC-DS ranged between 517 and 1,230 mg/L with mean value of 834 mg/L showing a wide variability with peak TDS values measured in May, June, and September 2020. Notably, TDS values also peaked in June and August 2019, June 2018, and July 2017, therefore may occur seasonally during warm and drier months.

In 2019, a trend for total zinc in the east and west SBIAR ditches showed that a potential progressive increase in metals was occurring, but this does not appear to continue during 2020. Conversely, qualitative observations during the 2020 monitoring period rather suggests variable or decreasing trends and lower occurrences of BCAWQG-FST exceedances during 2020 than in 2019. A correlation analysis exercise conducted in 2019 indicated a correlation between TSS levels with some total metal concentrations and increased TSS levels between the upstream and downstream monitoring locations were thought to result from active erosion from the cut-bank above the west and east SBIAR ditches. In 2020, the monitoring results do not indicate a continuance of an increasing trend and will continue to be monitored in the 2020 period.

5.4.3.4 Sulphate

Sulphate values measured at the upstream RBSBIAR-US/–EUS locations are commonly similar and significantly lower than in the downstream RBSBIAR-DS/-EDS locations noticeably during 2018, 2019 and for most, not all, of 2020, indicating a net increase downstream in sulphate from groundwater seepage, and local shale run-off (Figure 21). In July 2020, the upstream locations, RBSBIAR-US and RBSBIAR-EUS, anomalously spiked to higher levels than the downstream RBSBIAR-DS and RBSBIAR-EDS locations, followed by a return to previous lower sulphate values at RBSBIAR-EUS and continuation of elevated values at RBSBIAR-US July to November 2020.

Sulphate concentrations measured at RBSBIAR-DS ranged between 64.2 and 149 mg/L with mean value of 104 mg/L, and at RBSBIAR-EDS ranged between 29.2 and 223 mg/L with mean value of 115 mg/L. There is a seasonal trend of sulphate concentrations peaking in June or July of each year (2017 through 2020), which in 2020 occurred in June (RBSBIAR-EDS) and April (RBSBIAR-DS). The RBSC location commonly measures the highest sulphate concentrations relative to the RBSBIAR ditches between 2017 to 2020 with exception to July 2020.

Measured sulphate concentrations at the RBSC-DS location in 2020 varied widely between 87 and 563 mg/L with mean value of 311 mg/L. A seasonal trend may be evident whereby sulphate concentration peaks in late spring/early summer during June relative to lower sulphate values during the early spring and autumn/winter seasons. Sulphate concentrations at the side channel RBSC-DS location appear to be variable and not follow trends in the RBSBIAR ditches.

The BCAWQG-FLT guideline for sulphate is variable with ambient hardness for each sample location and is plotted on Figure 21 for the RBSBIAR-DS location for reference. The RBSC-DS location is the only sampling location that measures sulphate above the BCAWQG-FLT guideline in some months between 2017 to 2020.

5.4.3.5 Total and Dissolved Aluminum

Total aluminum concentrations during 2020 measured at RBSBIAR-DS ranged from 36.1 to 2,440 µg/L with mean value of 368 µg/L, and at RBSBIAR-EDS ranged from 5.7 to 11,500 µg/L with mean value of 2,001 µg/L. A seasonal trend from trailing four years suggests that total aluminum concentrations at RBSBIAR-DS peak in early freshet (March/April) and can either peak again in summer (June/August) and/or fall (September).

Dissolved aluminum concentrations during 2020 measured at RBSBIAR-DS ranged from 13.2 to 169 µg/L with mean value of 62 µg/L, and at RBSBIAR-EDS ranged from 1.5 to 404 µg/L with mean value of 88 µg/L. At these downstream RBSBIAR-DS and RBSBIAR-EDS locations, dissolved aluminum concentrations fluctuated below and above the BCAWQG-FST guideline value (100 µg/L) during 2019 and 2020, whereas the upstream RBSBIAR-US and RBSBIAR-EUS locations remained below the guideline value. Dissolved aluminum concentration at RBSC-DS exceeded the BCAWQG-FST guideline once in July 2020, the first occurrence since monitoring commenced in 2017 through 2020.

Exceedances to the BCAWQG-FST guideline for dissolved aluminum at RBSBIAR-DS were measured twice during 2020, including April (103 µg/L) and September (169 µg/L) 2020, and twice at RBSBIAR-EDS including May (109 µg/L) and June (404 µg/L) 2020. Although variable, a decreasing trend or ‘dip’ in both total and dissolved aluminum at RBSBIAR-DS and RBSBIAR-EDS was observed in July 2020, which was similarly observed in the month prior of June during 2017 to 2019. Increases in total and dissolved aluminum are most apparent in July 2020 at RBSBIAR-EDS whereas is more variable at RBSBIAR-DS. The east and west downstream ditches RBSBIAR-DS/-EDS follow similar trends in 2019 and between June to November 2020, although differs in trend early 2020 between February to May 2020. The east downstream RBSBIAR-EDS ditch measures slightly higher in dissolved aluminum than the west downstream RBSBIAR-DS ditch from 2018 to June 2020, switching to higher concentrations in the west downstream RBSBIAR-DS ditch from July to November for the remainder of the year.

Although the downstream RBSBIAR-DS and RBSBIAR-EDS locations show similar trends in both total and dissolved aluminum, there is a more significant difference in concentrations between upstream and downstream for dissolved than total aluminum.

The RBSC-DS trends historically from 2017 to June 2020 were more similar to the upstream RBSBIAR-US/-EUS locations in dissolved aluminum values, that commonly measure near or below the detection limit (1.0 µg/L) and significantly below the BCAWQG-FST guideline (100 µg/L). In 2020, an exception to this trend occurred in July

2020 with a spike in dissolved aluminum measured at RBSC-DS to above the BCAWQG-FST guideline, then returning to previous normal range of values.

An overall decrease of total aluminum at RBSBIAR-US is observed to occur between spring and winter of the 2017, 2018 and 2020 monitoring periods, whereas an overall slight increase shows during the 2019 sampling period. Total aluminum measured at the RBSC-DS location is variable yet shows higher values between April to July 2020, and lower values in winter and fall months. The seasonal trends at RBSC-DS appear to differ from the four SBIAR ditch locations during 2020. Furthermore, an inverse trend in total and dissolved aluminum is noted in July by a sharp increase at RBSC-DS coincident with a sharp decrease measured in the RBSBIAR-EDS and RBSBIAR-DS downstream ditches.

Dissolved aluminum is more variable during 2020 than in previous years of 2017 through 2019 at the five RBSBIAR sample locations, whereas total aluminum appears equally as variable in both 2019 and 2020.

5.4.3.6 Total and Dissolved Iron

Total iron concentrations are variable during the 2020 monitoring period with concentrations at the RBSBIAR-DS location ranging between 53 to 7,730 µg/L with mean value 1,005 µg/L. At RBSBIAR-DS, exceedances to the BCAWQG-FST guideline (1,000 µg/L) for total iron concentration were measured once in April (7,730 µg/L) and significantly decreased to below guideline levels in the other sampled months of February to November 2020. At the downstream east ditch RBSBIAR-EDS location, exceedances to the BCAWQG-FST guideline (1000 µg/L) for total iron concentration were measured in April (32,600 µg/L) and June (6,550 µg/L) 2020 and decreased to below guideline levels in the other sampled months of May to November 2020. One exceedance to the BCAWQG-FST guideline for total iron concentration was measured at RBSBIAR-US (February), no exceedances were measured at RBSBIAR-EUS, and one exceedance at RBSC (September).

Dissolved iron concentrations measured well below the BCAWQG-FST guideline (350 µg/L) ranging between < 10 to 63 µg/L at the four ditch locations, RBSBIAR-EDS, RBSBIAR-DS, RBSBIAR-US and RBSBIAR-EUS through the 2020 sampling season. At RBSBIAR-DS, dissolved iron measured below or near detection limit of 10 µg/L in four of the nine months sampled in 2020, ranging between <10 µg/L to 39 µg/L. At RBSBIAR-EDS, dissolved iron measured below detection limit, <10 µg/L, in five of the eight months sampled in 2020, ranging between <10 µg/L to 26 µg/L. At RBSC-DS dissolved iron measured below the BCAWQG-FST guideline in ten of the eleven months sampled in 2020 ranging between 28 to 338 µg/L, and above the BCAWQG-FST guideline once in September 2020 (518 µg/L).

5.4.3.7 Metals: Arsenic, Cadmium, Cobalt, Copper, and Zinc

Metals such as arsenic, cadmium, cobalt, copper, and zinc are important indicators of ARD-ML processes and environmental changes in the water supply. In 2020, nine sampling events (February to November) occurred at the downstream west RBSBIAR-DS location, and eight sampling events (April to November) occurred at the downstream east RBSBIAR-EDS location, discussed below. Table 10 summarizes the minimum, maximum and mean concentrations for the following measurements and water quality data for the RBSBIAR monitoring locations is provided in Appendix Table B2.

At the downstream west RBSBIAR-DS, no exceedances were measured during 2020 for metals, including arsenic, cadmium, cobalt, copper, and zinc. At the downstream east RBSBIAR-EDS, three exceedances for two metals were measured during 2020, including total arsenic (April) and total zinc (April and June). No exceedances for arsenic, cadmium, cobalt, copper, and zinc were measured in February, May, July, August, September, October, and November 2020 sampling events at the downstream RBSBIAR-DS/-EDS ditch locations. No exceedances were

measured at the upstream RBSBIAR-US and -EUS locations in 2020 for the metals: arsenic, cadmium, cobalt, copper, and zinc.

Arsenic

Total arsenic concentrations measured during 2020 at RBSBIAR-DS ranged from 0.20 to 4.48 µg/L with mean value of 0.78 µg/L, and dissolved arsenic ranged from 0.15 to 0.49 µg/L with mean value of 0.25 µg/L. No BCAWQG-FST guideline exceedances in total arsenic occurred at the downstream west RBSBIAR-DS during 2020. One exceedance to the BCAWQG-FST guideline (5.0 µg/L) for total arsenic was measured at the downstream east RBSBIAR-EDS during 2020 in April (14.7 µg/L), whereas in the other seven sampled months total arsenic values ranged between 0.14 to 1.82 µg/L below the BCAWQG-FST guideline. Trends for total arsenic at the downstream ditch locations, RBSBIAR-EDS and RBSBIAR-DS will continue to be observed in the upcoming 2021 monitoring period. Total arsenic concentrations in the upstream and RBSC locations remain within the same general range of total arsenic concentrations measured during 2017, 2018 and 2019.

Cadmium

Total cadmium concentrations measured during 2020 at RBSBIAR-DS ranged from 0.0294 to 0.683 µg/L with mean value of 0.189 µg/L, and dissolved cadmium ranged from 0.0258 to 0.126 µg/L with mean value of 0.0758 µg/L. Total cadmium measured at the downstream east RBSBIAR-EDS ranged from 0.0121 to 3.16 µg/L with mean value of 0.763 µg/L, and dissolved cadmium ranged from 0.0127 to 1.00 µg/L with mean value of 0.205 µg/L. No BCAWQG-FST guideline exceedances in dissolved cadmium occurred at any of the five RBSBIAR sample locations during 2020. Dissolved cadmium concentrations during 2020 at the downstream ditches measure within range of concentrations measured during 2017, 2018 and 2019.

Cobalt

Total cobalt concentrations measured at RBSBIAR-DS during 2020 ranged from 0.39 to 7.85 µg/L with mean value of 2.45 µg/L, and dissolved cobalt ranged from 0.42 to 3.55 µg/L with mean value of 1.80 µg/L. Total cobalt concentrations measured at RBSBIAR-EDS ranged from <0.10 to 43.7 µg/L with mean value of 12.7 µg/L, and dissolved cobalt ranged from <0.10 to 33.7 µg/L with mean value of 8.09 µg/L. No BCAWQG-FST guideline (110 µg/L) exceedances in total cobalt occurred at any of the five RBSBIAR sample locations during 2020. Total cobalt concentrations during 2020 at the downstream ditches measure within range of concentrations measured during 2017, 2018 and 2019.

Copper

Total copper concentrations measured at RBSBIAR-DS during 2020 ranged from 0.99 to 17.42 µg/L with mean value of 3.35 µg/L, whereas dissolved copper ranged from 0.70 to 3.35 µg/L with mean value of 1.28 µg/L. Total copper concentrations measured at RBSBIAR-EDS during 2020 ranged from <0.50 to 69.1 µg/L with mean value of 15.6 µg/L, whereas dissolved copper ranged from 0.38 to 3.20 µg/L with mean value of 1.04 µg/L. No BCAWQG-FST guideline exceedances in dissolved copper occurred at any of the five RBSBIAR sample locations during 2020. Dissolved copper values show within range to slightly decreasing concentrations relative to the previous 2019 monitoring period and within range to slightly higher than the more limited data collected during 2017 and 2018.

Zinc

Total zinc concentrations measured at RBSBIAR-DS during 2020 ranged from 5.4 to 77.0 µg/L with mean value of 23.8 µg/L, whereas dissolved zinc ranged from 4.8 to 26.5 µg/L with mean value of 11.8 µg/L. Total zinc concentrations measured at RBSBIAR-EDS during 2020 ranged from 1.3 to µg/L with mean value of 140.2 µg/L, whereas dissolved zinc ranged from 1.3 to 82.7 µg/L with mean value of 23.8 µg/L. At RBSBIAR-DS, one exceedance to the BCAWQG-FST guideline (hardness-dependent range of 109.5 to 340.5 µg/L) for total zinc was measured on March 22, 2019 (137 µg/L). No exceedances to the BCAWQG-FST guideline in total zinc were measured at RBSBIAR-DS or the upstream RBSBIAR-US and RBSBIAR-EUS locations during 2020, whereas two exceedances in total zinc were measured at RBSBIAR-EDS, in April (474 µg/L) and June (560 µg/L). Total zinc values show within range to slightly decreasing concentrations relative to the previous 2019 monitoring period and within range to slightly higher than the more limited data collected during 2017 and 2018.

The chart shown in Figure 30a (RBSBIAR-DS/-US) and 30b (RBSBIAR-EDS/-EUS) depicts the ratio difference in total zinc concentration between the downstream vs upstream location in the west and east ditch, in order to measure the relative contribution of zinc to water from ARD-ML activity within each RBSBIAR ditch. A possible overall trend in total zinc concentration shows a progressive increase both seasonally in early spring freshet and summer within each of the previous sampling years of 2018 and 2019, and the overall maximum total zinc concentration reached in 2018 and 2019 progressively increased, but this increasing trend and overall maximum for total zinc does not appear to extend into the 2020 monitoring period. This metric will continue to be monitored going forward during the 2021 monitoring period.

5.4.3.8 Ammonia and Nitrogen Species

Ammonia (NH_4 as N) is subject to a temperature and pH-dependent BCAWQG-FST and BCAWQG-FLT guideline. Although no exceedances are measured to the BCAWQG-FST, it is observed that ammonia values measure higher in the downstream RBSBIAR ditches (RBSBIAR-DS/-EDS), with exception to the RBSC-DS location higher in July 2020, than in both the upstream ditches and the RBSC-DS side channel. During 2020, a spike in nitrite (NO_2 as N) and nitrate (NO_3 as N) occurred in June 2020 at the RBSBIAR-DS location, and in February at the RBSBIAR-US location (nitrite only). In previous years, nitrate and nitrite showed seasonal sharp peaks primarily at the RBSBIAR-DS in either June, July or August from 2017 through 2019, and a peak in ammonia in July 2019 coincided with a peak in monitored metals such as copper and cobalt. The source of ammonia and nitrogen species is unknown although it could possibly be related to nearby agricultural inputs into the water supply; no explosives are known on-site. This parameter will continue to be monitored in 2021.

5.4.3.9 Trend Monitoring Summary

Alkalinity and pH values indicate the waters tested in the SBIAR area have remained alkaline since the April 2017 sampling event. Alkalinity is more variable than pH through the 2017 to 2020 sampling periods. In 2020, an overall increase in alkalinity between April and December 2020 is observed in the four SBIAR ditch locations. The alkalinity measured at the RBSC-DS location is commonly the highest alkalinity value relative to the SBIAR ditches and appears more variable than the four SBIAR ditch locations during 2020. Acidity measured during 2020 remains within range of values collected since 2018. Acidity values commonly measure higher in the east ditch (RBSBIAR-EDS and RBSBIAR-EUS) than in the west ditch (RBSBIAR-DS and RBSBIAR-US).

Typically, the SBIAR ditches measure variable TSS and TDS values attributable to the relatively small catchment and short residence time of waters that are subsequently sensitive to flux in surface water inputs from precipitation. In 2020, TDS values have remained relatively constant at the four SBIAR ditch locations and more variable in the RBSC-DS side channel.

During 2020, sulphate measures within range of values collected since 2017. Sulphate values show a more consistent trend between August to December 2020 relative to early 2020 (January to July), and more variability during 2020 than in previous years of 2017 through 2019. At the RBSBIAR-US location, a progressive overall increase in sulphate is observed between April to December 2020. This is anomalous to previous years (2017 to 2019) and prior to June 2020, which measured sulphate at RBSBIAR-US to commonly have the lowest sulphate concentrations. Between August to December 2020, the RBSBIAR-US and RBSC-DS locations measure similarly and the highest sulphate values relative to the other downstream and upstream locations.

During 2020, total and dissolved aluminum measure within range of values collected since 2017 although dissolved aluminum shows more variability at sample locations in 2020. The east ditch commonly measures higher aluminum than in the west ditch sample locations which is in continuation of trends since 2018.

Total and dissolved iron measure within range of values collected since 2017. Overall iron concentrations are observed to be generally lower and with a slight decreasing trend in 2020 in comparison to higher variability and more BCAWQG-FST guideline exceedances measured in 2019. The RBSC-DS location commonly measures the highest dissolved and total iron concentrations compared to the SBIAR ditch locations.

During 2020, the concentrations of metals, such as arsenic, cadmium, cobalt, copper, and zinc measure within range of values in previous years of 2018 and 2019 and show a constant to decreasing trend in 2020.

Monthly sampling in the SBIAR catchment occurred during 2019 and 2020 and will need to continue to be monitored going forward into 2021 for effective observations of trends.

5.4.4 Freshwater Long-term Average Exceedances

Exceedances to the long-term BCAWQG-FLT guidelines (lower values) that do not exceed the short-term BCAWQG-FST (higher value) guidelines were measured at the downstream east and west ditches, RBSBIAR-EDS, and RBSBIAR-DS. Since long-term exceedances are not intended for screening of discreet events, long-term trends relative to the BCAWQG-FLT will be investigated during the 2021 monitoring period with the accumulation of further data.

5.5 L3 Creek Catchment Water Quality Monitoring

Sufficient flowing water through 2020 permitted samples to be collected for eight months (April to November) at the downstream LBL3C-0.02, eleven months (February to December) at the lower midstream LBL3C-1.43 location, three months (April to June) at the upper midstream LBL3C-1.65 location, five months (April to August) at the upstream LBL3C-3.32 location, and eight months (April to November) at the L4 Creek LBL4C-0.18 location. Field observations were documented each month. Results for each monthly sampling event were plotted on time series charts for trend analysis.

The L3 Creek catchment is not being monitored as a construction related PAG waterway. Water quality monitoring has been conducted within this catchment to monitor discharge water quality and to maintain a record for potential future use. The BCAWQG-FST values were also used as a benchmark for monitoring water quality at the discharge location (LBL3C-0.02) from L3 Creek.

A summary of water quality exceedances at SBIAR relative to BCAWQG-FST listed by monitoring location and month are listed in Table 12, and the screening results based on the laboratory data are tabulated in Appendix B3.

5.5.1 In Situ Measurements and Field Observations

Water flow estimated during water sampling events in 2020 range between 1.5 to 3.0 L/s from the LBL3C-0.02 location into the RR-10 culvert. Midstream water flow was estimated to range between 0.04 to 3.0 L/s at the LBL3C-1.43 location (Table 11).

The range in water temperatures at LBL3C-0.02 (0.5-14.6 °C), LBL3C-1.43 (0.4-14.5°C), LBL3C-1.65 (2.4-14.5 °C), LBL3C-3.32 (0.6-16.0 °C), and LBL4C-0.18 (0.6-16.6 °C), with the lowest temperatures recorded in April 2020 and highest temperatures recorded in June and July 2020 (Table 11).

Turbidity was observed as clear within the L3 Creek locations throughout the 2020 monitoring program, except for turbid conditions recorded at LBL3C-0.02 (April), LBL3C-1.43 (April, June), LBL3C-1.65 (April, June), LBL3C-3.32 (April, June), and LBL4C-0.18 (April, June). Stagnant/clear conditions were observed in September 2020 at LBL3C-3.32 and LBL4C-0.18.

5.5.2 Freshwater Short-term Maximum Exceedances

Within the four L3 Creek sample locations during 2020, BCAWQG-FST exceedances were measured a minimum of one occurrence for total iron, dissolved aluminum, total zinc, dissolved copper, total arsenic, and total silver. At the one L4 Creek sample location during 2020, BCAWQG-FST exceedances were measured a minimum of one occurrence for total and dissolved iron, dissolved aluminum, dissolved cadmium, total cobalt, total zinc, dissolved copper, total arsenic, total manganese and pH below the guidelines. A summary of exceedances from BCAWQG-FST guideline screening results are located in Table 12 based on lab data provided in Appendix B, Table B3.

The LBL3C-0.02 discharge location measured exceedances in total iron (two samples) and dissolved aluminum (seven samples) during the eight months of sampling between April to November 2020. The LBL3C-1.43 lower midstream location measured exceedances in total iron (three samples), dissolved aluminum (one sample), and exceedances in one sample from April 2020 for total zinc, total arsenic, and total silver during the eleven months of sampling between February to December 2020. The LBL3C-1.64 upper midstream location measured exceedances in one sample from April 2020 for total iron, total zinc, dissolved copper, total arsenic, and total silver during the three months of sampling between April to June 2020. The LBL3C-3.32 upstream location measured exceedances in total iron (two samples), dissolved aluminum (one sample) and in one sample from April 2020 for total zinc, total arsenic, and total silver during the five months of sampling between April to August 2020.

The total iron exceedances measured in all five L3 and L4 Creek locations during 2020 are interpreted to be directly related to TSS concentrations within the creek. Management of TSS originating from RSEM L3 was more variable and under active monitoring, management, and mitigation from 2017 through 2019, and less variable with a decreasing trend during 2020. Dissolved iron exceeded the BCAWQG-FST guideline (350 µg/L) at the LBL4C-0.18 location for five months between July to November 2020, in contrast to minimal iron measured in the dissolved phase at the discharge, midstream or upstream L3 Creek locations which remained below the BCAWQG-FST guideline.

At LBL3C-0.02, dissolved aluminum was measured to exceed the BCAWQG-FST in seven of the eight months sampled in 2020 (April through November) and are interpreted to be primarily related to water inputs from both L4 Creek and from seepage into L3 Creek between sample location LBL3C-1.43 and LBL3C-0.02. Dissolved aluminum is potentially measurable as concentrations of aluminum hydroxide complexes in solution. Groundwater seepage from natural shale bedrock and the Howe Pit area is interpreted as the main input to this portion of the L3 Creek, with secondary inputs as surface run-off from the Howe Pit area.

5.5.3 Trend Monitoring

Recurring trends within the L3 catchment over the 2017, 2018, 2019 and 2020 monitoring periods may be indicative of long-term trends and are discussed below. Data results from 2017 to 2020 at L3 Creek monitoring stations have been compiled and plotted for trend analysis. Please refer to Figures 31 to 42 for time series charts.

Investigations aim to explain the occurrence of dissolved aluminum and total iron measured above detectible concentrations in the downstream location LBL3C-0.02 but not at comparable concentrations in the upstream L3 Creek locations, LBL3C-1.43 or LBL3C-3.32. Evidence of PAG outcrop in L4 Creek, reduced pH levels, and the occurrence of anomalous metal concentrations at the LBL4C-0.18 location indicate background water quality of local naturally occurring PAG contact waterways. L4 Creek waters are eventually diluted, or attenuated, by L3 Creek waters and PAG related metal concentrations are reduced downstream towards the LBL3C-1.43 location and LBL3C-0.02 discharge location.

5.5.3.1 Alkalinity and pH

Alkalinity and pH values measured in the four L3 Creek sampling locations indicate that the waters have remained alkaline between January and December 2020. In the L4 Creek, the LBL4C-0.18 location measured pH values below the BCAWQG-FST guideline (pH 6.5 – 9.0) for five months (July through November) coupled with low alkalinity and elevated acidity levels.

Measured pH at location LBL3C-0.02 ranged between 7.77 to 8.41 with mean value of 8.20, and alkalinity ranging between 73.5 and 275 mg/L $CaCO_3$ equivalent with mean value of 214 mg/L $CaCO_3$ equivalent. Generally, pH remained consistently neutral (with exception to the above-mentioned occurrences at LBL4C-0.18) in 2020 while alkalinity overall progressively increased between April and December 2020 and acidity was variable at L3 Creek sampling locations. Conversely, at LBL4C-0.18, pH decreased significantly in July 2020, alkalinity decreased significantly in in June 2020 and acidity increased significantly in July 2020.

The trends in pH for 2017 to 2020 show overall consistency in pH in L3 Creek and more variability in pH at LBL4C-0.18 location. A seasonal trend in alkalinity shows a general increase occurs between March and December during 2018, 2019 and 2020 at L3 Creek locations which is not observed at L4 Creek. Acidity remains variable with no season trend observed in the years data was collected for acidity in 2019 and 2020.

5.5.3.2 Hardness

Water hardness measured at LBL3C-0.02 was consistently above the upper bound (250 mg/L) used by the BCAWQG-FST to guide criteria for metal concentrations except for April 17, 2020 (81.8 mg/L), with values ranging between 555 to 1,040 mg/L in May to November 2020, with mean value in 2020 of 774 mg/L (Table 10).

5.5.3.3 Sulphate

Sulphate measurements measured within L3 Creek show an increasing trend between April to December 2020). Although more variability in 2018 and 2019, sulphate shows a similar overall increasing trend in 2018, 2019 and 2020. Sulphate concentrations measured at LBL3C-0.02 during 2020, ranged between 30.2 to 895 mg/L with mean value of 667 mg/L.

Measured sulphate and TDS have similar trends that increase during each year between January to December in the 2017, 2018 2019 and 2020 monitoring periods. The similar trend in sulphate and TDS suggest that possibly elevated sulphate concentrations represent months where groundwater inputs dominate flow in L3 Creek and relate to the transition from freshet early in the season to regional groundwater input throughout the remainder of the year,

especially during the dry or minimal precipitation, e.g., July 2020, or summer and autumn months. Significant precipitation in the preceding seven days to the June 21-22, 2020 likely contributed to increased surface run-off that is related to the decrease in sulphate and TDS.

The BCAWQG-FLT guideline for sulphate is variable with ambient hardness for each sample. The FLT is plotted on Figure 34 at the LBL3C-0.02 location, for reference.

5.5.3.4 Total Suspended Sediment (TSS) and Total Dissolved Sediment (TDS)

TSS concentrations measured within L3 Creek show an overall decreasing trend at all locations between April to December 2020). TSS concentrations measured at LBL3C-0.02 ranged between 3.40 to 1,250 mg/L with a mean value of 166 mg/L. Concentrations were generally observed to be either similar or less at the discharge location (LBL3C-0.02) relative to the immediate upstream location (LBL3C-1.43) except for April 2020 and September 2020. It is believed that the decreasing trend in TSS from upstream to downstream locations is due to settlement.

TDS concentrations measured within L3 Creek show an overall increasing trend at all locations between April to December 2020. TDS concentrations measured at the LBL3C-0.02 location ranged between 282 and 1,720 mg/L with a mean value of 1,176 mg/L. A seasonal trend each year of 2018, 2019 and 2020 shows a sharp increase during freshet, a decrease in TDS in June/July, followed by a consistent to slightly increasing trend for the remainder of the year.

The increasing trend observed for TDS appears to be inverse to the decreasing trend for TSS in the 2018, 2019 and 2020 monitoring periods. As discussed in Section 3.1, the role of dominant input waters to flow conditions in L3 Creek strongly influences the measured water quality. Events resulting in high TSS measurements may be higher flows related to precipitation or recent precipitation in the form of shallow groundwater flow, whereas events resulting with high TDS and low TSS measurements may be related to low precipitation and high regional groundwater baseflow. As spring freshet wanes and the dominant influent water transitions to regional groundwater, trends in TDS and TSS are influenced. In 2018, 2019 and 2020, it is observed that freshet is related to low concentrations of TDS that gradually increase towards May and June then level off with some more minor variability for the remainder of the year.

5.5.3.5 Total and Dissolved Aluminum

Total aluminum concentrations in 2020 measured at the LBL3C-0.02 location ranged between 351 to 3,320 µg/L with mean value of 904 µg/L and shows variability.

Dissolved aluminum concentrations in 2020 measured at the LBL3C-0.02 location ranged between 57.9 to 203 µg/L with mean value of 150.7 µg/L. Seven months (May through November 2020) of a total eight measurements at LBL3C-0.02 exceeded the BCAWQG-FST guideline (100 µg/L).

It is observed that dissolved aluminum concentrations are generally more consistent and higher at the discharge location LBL3C-0.02 relative to the LBL3C-1.43 location, likely due to input from impacted waters in the Howe Pit area related to exposure of shale or prolonged removal of the overburden cover.

During 2020, the upstream LBL3C-3.32 and upper midstream LBL3C-1.65 locations follow a similar trend and concentrations in dissolved aluminum when sampled between April and June 2020. The LBL4C-0.18 location consistently measures the highest dissolved and total aluminum concentrations in the L3 catchment from 2017 through 2020. Water quality measured at the LBL3C-0.02 location commonly measures ARD-ML influence from L4 Creek inflow and other inflow from likely Howe Pit to the downstream waters. The LBL3C-1.43 midstream location commonly measures more variability and lower dissolved aluminum than the LBL3C-0.02 discharge

location, indicating that the high inputs from L4 Creek are diluted at LBL4C-1.43 (downstream of the confluence with L4 Creek), followed by an increase that remains relatively consistent during the year at LBL3C-0.02.

5.5.3.6 Total and Dissolved Iron

Total iron values were measured at elevated concentrations throughout 2020 in continuation from 2017, 2018 and 2019 (with concentrations in 2020 measured at LBL3C-0.02 ranging between 334 to 6,530 µg/L with mean value 1,375 µg/L, resulting in two of eight sampling events measuring above the BCAWQG-FST guideline for total iron. Locations within the L3 catchment that had total iron concentrations measured above the BCAWQG-FST guideline during 2020 were at LBL3C-0.02 (April and June), LBL3-1.43 (April to June), LBL3C-1.65 (April), LBL3C-3.32 (April and June) and LBL4C-0.18 (April to November).

For all sampling events in 2020 at LBL3C-0.02, minimal iron was measured in the dissolved phase ranging between <10.0 to 229 µg/L and mean value of 56.8 µg/L. A trend is observed of an increase in dissolved iron values early (March/April) and late (November) 2019 and 2020 but values remain below the BCAWQG-FST guideline (350 µg/L). Dissolved iron concentrations were measured above the BCAWQG-FST guideline at LBL4C-0.18 (July to November 2020), and no exceedances were measured at LBL3C-3.32, LBL3C-1.65, LBL3C-1.43 or LBL3C-0.02. At LBL4C-0.18, occurrences of exceedances in dissolved iron increased in 2020 (five) relative to 2019 (three), 2018 (three) and 2017 (one).

Throughout the monitoring period, water quality at the LBL3C-0.02 discharge location measures a consistent pH and, with an exception to dissolved aluminum, the dissolved metals remained low. Influence of ARD-ML processes on water within the catchment are limited to natural occurrences within L4 Creek and previous disturbance within Howe Pit. Input volume from L4 Creek is relatively low and generally diluted by L3 Creek water. Influent water volume from the Howe Pit area is uncertain, however, water quality between monitoring locations LBL3C-1.43 and LBL3C-0.02 is believed to be influenced by groundwater that is influenced by Howe Pit.

Investigations aim to explain the occurrence of dissolved aluminum and total iron measured above detectable concentrations in the downstream location LBL3C-0.02 but not at comparable concentrations in the upstream L3 Creek locations, LBL3C-1.43 or LBL3C-3.32. Evidence of PAG outcrop in L4 Creek, reduced pH levels, and the occurrence of anomalous metal concentrations at the LBL4C-0.018 location indicate background water quality of local naturally occurring PAG contact waterways. L4 Creek waters are eventually diluted, or attenuated, by L3 Creek waters and PAG related metal concentrations are significantly reduced towards and at the LBL3C-0.02 discharge location.

5.5.3.7 Metals: Arsenic, Cadmium, Cobalt, Copper, and Zinc

Metals such as arsenic, cadmium, cobalt, copper, and zinc are important indicators of ARD-ML processes and environmental changes in the water supply. Eight sampling events between April and November 2020 occurred during the monthly sampling at the downstream location, LBL3C-0.02, discussed below.

Total arsenic concentrations during 2020 measured at LBL3C-0.02 ranged from 0.46 to 3.75 µg/L with mean value of 1.01 µg/L, and dissolved arsenic ranged from 0.24 to 0.75 µg/L with mean value of 0.44 µg/L. No BCAWQG-FST guideline exceedances in total arsenic were measured in 2020 at LBL3C-0.02, although an exceedance was measured at three locations (LBL3C-1.65, LBL3C-1.43 and LBL4C-0.18) in April 2020. Increased variability in total arsenic occurred in 2019 than in 2020 in L3 Creek and L4 Creek.

Total cadmium concentrations during 2020 measured at LBL3C-0.02 ranged from 0.281 to 0.832 µg/L with mean value of 0.476 µg/L, and dissolved cadmium ranged from 0.076 to 0.473 µg/L with mean value of 0.333 µg/L. No BCAWQG-FST guideline exceedances in dissolved cadmium occurred at LBL3C-0.02 during 2020 (or previous

years of 2017 to 2020), and measure within range of dissolved cadmium measured since 2017. In 2020, dissolved cadmium was measured in exceedance to the BCAWQG-FST at one location in L4 Creek, LBL4C-0.18, from July through November 2020, and whereas exceedances were measured in the L3 Creek sample locations.

Total cobalt concentrations during 2020 measured at LBL3C-0.02 ranged from 3.85 to 12.8 µg/L with mean value of 6.46 µg/L, and dissolved cobalt ranged from 0.76 to 11.40 µg/L with mean value of 4.93 µg/L. No BCAWQG-FST guideline exceedances in total cobalt occurred at LBL3C-0.02 during 2020 (or previous years of 2017 to 2020), and measure within range of total cobalt concentration values since 2017. In 2020, total cobalt was measured in exceedance to the BCAWQG-FST at one location in L4 Creek, LBL4C-0.18, from July through November 2020, and whereas exceedances were measured in the L3 Creek sample locations.

Total copper concentrations during 2020 measured at LBL3C-0.02 ranged from 2.23 to 16.4 µg/L with mean value of 4.35 µg/L, and dissolved copper ranged from 0.76 to 11.4 µg/L with mean value of 4.93 µg/L. No BCAWQG-FST guideline exceedances in dissolved copper occurred at LBL3C-0.02 during 2020 and measures within range of dissolved copper concentration values since 2017. In 2020, dissolved copper was measured in exceedance to the BCAWQG-FST at one location in L4 Creek, LBL4C-0.18, from July through November 2020, whereas no exceedances were measured in the L3 Creek sample locations.

Total zinc concentrations during 2020 measured at LBL3C-0.02 ranged from 34.1 to 75.0 µg/L with mean value of 44.0 µg/L, and dissolved zinc ranged from 1.5 to 2.61 µg/L with mean value of 1.89 µg/L. Within L3 Creek, the discharge LBL3C-0.02 location remains relatively consistent in total zinc whereas the mid and upstream locations are more variable in total zinc values. No BCAWQG-FST guideline exceedances in total occurred at LBL3C-0.02 during 2020 and measures within range of total zinc concentration values since 2017. In 2020, total zinc was measured in exceedance to the BCAWQG-FST at one location in L4 Creek, LBL4C-0.18, from July through November 2020, whereas no exceedances were measured in the L3 Creek sample locations.

The continuation of monthly sampling in the L3 catchment occurred during the 2020 monitoring period, providing a useful reference for observing clearer seasonal trends over four years from 2017 to 2020.

5.5.4 Freshwater Long-term Average Exceedances

At the discharge location, LBL3C-0.02, minimal occurrences of measured concentrations during 2019 exceed the BCAWQG-FLT guidelines and long-term trends do not generally show an increasing trend in metals to be occurring at L3 Creek. During the 2021 monitoring period, long-term trends will be investigated with further data collection.

5.6 Left Bank Debris Boom

Two new sample locations, LBP Pond and LB Side Channel E, were established and first sampled on October 8, 2020 to characterize water quality along the Left Bank Debris Boom (LBDB) area for ARD-ML monitoring. Please see attached map showing the LBP Pond and LB Channel sample locations in Figure 3.

The LBP Pond was sampled on November 20, 2020. The LB side channel W and E were not accessible due to layers of thick ice covering the channel from fluctuating headpond levels, making it unsafe to work and difficult to remove ice to access water, thus no sample was collected on November 20, 2020.

On December 14, 2020, the LBP Pond and LB Side Channel E were visited with no samples collected or in situ measurements taken. The LBP Pond location was not sampled due to frozen conditions and steep slopes preventing access to edge. The LB Side Channel E and W locations could not be sampled due to frozen conditions.

A summary of water quality exceedances at SBIAR relative to BCAWQG-FST listed by monitoring location and month are listed in Table 14, and the screening results based on the laboratory data are tabulated in Appendix B4.

5.6.1 Field Observations and In Situ Measurements

In situ measurements were not collected during the October 8, 2020 or December 14, 2020 sampling.

On November 20, 2020, the LBP Pond sample reported in situ measurements of pH 6.57, electrical conductivity of 4,114 us/cm, hardness of 450 ppm, alkalinity of 240ppm and water temperature of 0.2°C.

During the November 20, 2020 event water levels were noted to be ~ 1.0 m above the present water level during sampling due to accumulations of ice on banks and surrounding vegetation. The LB Side Channel was noted to have probable connectivity to the main channel of the Peace River.

The LB Side Channel is now inaccessible due to the progression of construction and creation of the headpond following full river diversion that occurred on October 3, 2020.

5.6.2 Freshwater Short-term Maximum Exceedances

On October 8, 2020, BCAWQG-FST exceedances were measured, including three exceedances at the LBP Pond (total and dissolved iron, and total manganese) and eleven exceedances at the LB Side Channel E location (total arsenic, boron, cobalt, iron, manganese, zinc and dissolved aluminum, cadmium, copper and iron), and a low acidic pH of 3.01 below the accepted range (6.5-9.0) of the BCAWQG-FST guidelines.

On November 20, 2020, an LBP Pond sample measured five BCAWQG-FST exceedances for total and dissolved iron, total manganese, total zinc, and dissolved aluminum. The LB Side Channel E was not accessible due to layers of thick ice covering the channel from fluctuating headpond levels, making it unsafe to work and difficult to remove ice to access water, thus no sample was collected. Water levels were noted to be ~ 1.0 m above the Present Water Level (PWL) during sampling due to accumulations of ice on banks and surrounding vegetation. The LB side channel was noted to have probable connectivity to the main channel of the Peace River.

5.6.3 Trend Monitoring

Trend monitoring has not been initiated at this location due to limited sampling in 2020. Trend monitoring will be completed in 2021 with the availability of monthly sampling data.

5.7 L2 Powerhouse

The L2 Powerhouse sample locations were sampled on October 8, November 20, December 4, and 14, 2020. Please see attached map showing the L2 Powerhouse area sample locations in Figure 2.

A discrete L2 DS sample location (collected for lab analysis on October 8, November 20 and December 14, 2020) that is located adjacent to the L2 Powerhouse, specifically collected from the pump tubing on the west side of the culvert and approximately 1-2 m from the south rock ditch wall and 1-2 m from the culvert. The December 4, 2020 sample was a composite sample that included one sampling location on west side of culvert (#1), other sampling location on east side of culvert (#2). Sampling location #1 is approx. 1-2 m from south rock ditch wall and 1-2 m from culvert. Sampling location #2 is approximately 5-8 m from east wall, 1-2 m from south rock ditch wall, and approximately 2-3 m from culvert. Sample was approximately ¾ sample location #1 and ¼ sample location #2. Proportion was chosen based on flow to the area (with about ¾ of total flow coming from west side of culvert and

¼ of total flow coming from east side of culvert. Recommendation to field samplers is to maintain a single discrete sample location moving forward.

On December 14, 2020, two sample bottles at the L2 DS location were collected, one for regular-sized 0.45 µm filtering (filtered in the field) and the other filtered with a smaller 0.10 µm filter size at ALS Labs (not filtered in the field). The difference in filter size was to test whether elevated dissolved aluminum measured in the previous November 20 and December 4 sampling events were due to nano or microcrystalline phases of dissolved aluminum.

A summary of water quality exceedances at SBIAR relative to BCAWQG-FST listed by monitoring location and month are listed in Table 16, and the screening results based on the laboratory data are tabulated in Appendix B5.

5.7.1 Field Observations and In Situ Measurements

Field observations on October 8, 2020, indicated that the pump at L2 DS was running at the time of sampling. The liner was observed to be in good condition along the lower slope with water running down the uncovered portion near the pipes at the east end of the rock trap, and it was noted that another small portion of the slope near the outlet pipes where water had access to. On November 20, December 4 and 14, 2020, no further field observation was noted at L2 DS and frozen conditions prevailed at L2 US.

In situ measurements collected on October 8, November 20, December 4 and December 14, 2020 at L2 DS recorded a range of pH (7.11 to 8.20), electrical conductivity (313 to 1,707 us/cm), hardness (100 to 800+ ppm), alkalinity (80 to 240 ppm), water temperature (0.56 to 11.54 °C) and flow (0.05 to 0.50 L/s), with turbidity ranging between clear (November 20) to slightly turbid (October 8 and December 14).

In situ measurements collected on October 8 and December 4, 2020 at L2 US recorded a range of pH (7.68 and 7.60), electrical conductivity (465 and 859 us/cm), hardness (250 ppm), alkalinity (120 to 180 ppm), water temperature (5.5 and 9.7 °C) and flow of 0.10 L/s, with stagnant and cloudy condition on October 8, 2020.

On November 20, 2020, the LBP Pond sample reported in situ measurements of pH 6.57, electrical conductivity of 4,114 us/cm, hardness of 450 ppm, alkalinity of 240ppm and water temperature of 0.2°C.

5.7.2 Freshwater Short-term Maximum Exceedance

Dissolved aluminum was noted to exceed the BCAWQG-FST guideline (100 µg/L) value in multiple sample events. The concentrations measured an initial increasing trend from October 8 (48.3µg/L) to November 20 (258 µg/L) and December 4 (552 µg/L). The December 14 sample event included two filter sizes and reported concentrations of regular 0.45 µm filter (340 µg/L) and 0.10 µm filter (235 µg/L).

The highest concentration of dissolved aluminum at L2 DS was measured from the composite sample on December 4, 2020 and may not be representative of the consistent discrete sample locations with lower dissolved aluminum measured on October 8, November 20, and December 14, 2020. However, dissolved aluminum progressively increased between October 8 to December 14. Aluminum is primarily in the solid phase than in the dissolved phase at both L2 DS and L2 US. The source of the elevated dissolved aluminum at L2 DS sample location is not thought to be related to ARD-ML processes.

5.7.3 Trend Monitoring

Trend monitoring has not been initiated at this location due to limited sampling in 2020. Trend monitoring will be completed in 2021 with the availability of monthly sampling data.

6.0 CONCLUSIONS AND RECOMMENDATIONS

A water quality monitoring program was implemented on behalf of BC Hydro to monitor the water quality at discharge locations from River Road at Blind Corner, SBIAR, L3 Creek, LBDB, and L2 Powerhouse. Upstream and midstream monitoring locations were established to characterize water quality at the discharge location and to maintain a continuous monitoring record commensurate with previous sampling completed in 2016 by Lorax on behalf of PRHP.

The program has incorporated monthly in situ water quality measurements and observations with laboratory analysis throughout 2017, 2018, 2019 and 2020. Field observations were recorded monthly regardless of weather conditions or ability to collect measurements.

Water chemistry is monitored to identify influence of ARD-ML processes on water quality at River Road from construction related exposed shale at Blind Corner, and from the construction related shale exposed in the east and west ditches within SBIAR. The L3 Creek catchment is monitored for potential influences from non-Site C impacted water originating in the Howe Pit area and naturally impacted inflow from L4 Creek. Influence from construction PAG exposures are being monitored in the LBDB and L2 Powerhouse areas.

Across all sampling events at River Road, SBIAR, and L3 Creek during 2020, moderate to high hardness values were measured at River Road (124 to 1,290 mg/L $CaCO_3$), SBIAR (16.9 to 563 mg/L $CaCO_3$) and L3 Creek (14.1 to 2,050 mg/L $CaCO_3$), were observed in the waters sampled, although more consistently high in the L3 catchment and moderate in the River Road and SBIAR catchments. The River Road ditch and SBIAR catchments are generally ephemeral. Monthly water quality monitoring measures instantaneous water quality and may not be reflective of longer term baseline conditions. Flow volumes are highly susceptible to precipitation, and water quality is influenced by whether flow is derived from precipitation, run-off, shallow groundwater, or regional groundwater flow.

6.1 River Road Water Quality Monitoring

Water quality laboratory data was collected from six locations (LBRR-DD, LBR-EDP, LBRR-LC, LBRR-UC, LBRR-12+500 and RR9) and in situ measurements were collected at twelve locations of a total of twelve water sample locations along the River Road catchment from January to December 2020, in continuation of the 2017, 2018 and 2019 monitoring periods.

Water quality monitoring continues to show that active ARD-ML processes are progressing on shale slopes shown in observed trends, such as elevated concentrations above the BCAWQG-FST for total iron (seven occurrences), dissolved aluminum (two occurrences) and total arsenic (three occurrences), summarized in Table 7. No BCAWQG-FST exceedances were measured at RR9 or LBRR-LC. Samples were not collected consistently due to dry or frozen conditions.

Between February to November 2020, a total of forty-nine (49) in situ field measurements of pH within the River Road ditch indicated a neutral to alkaline pH of between 7.30 and 8.87. Previously during 2018 and 2019, acidic waters were collected in the upper portions of the ditch underlying the exposed shale cut-bank. The pH values progressively returned to circumneutral levels at the discharge location in part due to contact with limestone riprap in the ditch, and potential alkalinity input from groundwater or outflow from the upper cut-off ditch. Orange coating, or mineral precipitate, continued to be observed in the visible limestone. Chemical efficiency of the limestone to buffer acidic water is decreased when coated in precipitate. The formation of mineral scale can concentrate metals from solution as a result of the aqueous acid-base reactions. The mineral scale and sludge are susceptible to scouring and being washed during heavier rain events which has potential to reduce overall water quality conveyed down-gradient.

The diversion pipe has successfully reduced the amount of direct high TSS discharge into the Peace River by allowing the water to be collected and slowly infiltrate into the River Road ditch. It is anticipated that sediment in the ditch may now also be accumulating a small amount of secondary mineral formed by up-gradient ARD-ML processes. These minerals commonly contain an elevated concentration of metals related to ML and mineral precipitation from acid neutralizing reactions.

Recommendations for River Road

The sediment source for elevated TSS is mainly attributed to scouring of accumulated sediment within the ditch from road grading and run-off from previous events, which includes washing, or flushing, of the exposed shale, colluvium, and overburden cut-banks. Continued management of the drainage system is required to reduce the amount of sediment infilling to the ditch from road grading operations as this sediment encases the limestone which reduces chemical efficiency for ARD mitigation and prematurely fills the cistern, which limits its performance to supress TSS.

The limestone contained in the ditch must continue to be regularly maintained through cleaning and descaling. This procedure should include cleaning the limestone riprap material within the River Road ditch in a controlled facility where the sludge can be recovered and relocated to an approved RSEM area, and re-placement of the refreshed limestone into the ditch. Sludge should also be removed from the cistern and transported to an approved RSEM area. Control of sediment erosion was responded to by BC Hydro during 2018; no new maintenance activities occurred during 2020 although further maintenance efforts are planned to occur in 2021.. Continued management of the limestone riprap and mitigation of the active ARD-ML processes from the shale exposure at Blind Corner along River Road are recommended, such as implementing hydroseeding on the shale slope for erosion control, in addition to monitoring the effectiveness of controlling sedimentation into the River Road drainage system by the end-of-diversion pipe (LBRR-EDP). The sediment within the ditch, particularly at the outlet of the diversion pipe should be monitored for accumulation.

The monitoring program includes collection of discharge from the RR8 and RR9 culverts (LBRR-RR8 and LBRR-RR9, respectively), however, since during 2020 discharge was only observed once on February 27, 2020 at RR9, and no discharge at RR8 to be coincident with the scheduled sampling events, it is recommended that in situ water quality measurements are collected from any discharge observed from culvert RR8 and/or RR9 during high flow events.

In 2020, water quality samples collected from LBRR-DD (2), LBRR-12+500 (6), LBRR-EDP (5), LBRR-US (2) and RR9 (1), in addition to previous years of 2019 (minimal water quality samples), 2018 and 2017, indicate that run-off water quality is influenced by active ARD-ML processes within the ditch catchment. Although flows are generally low to no flow and/or ephemeral, there is some potential for run-off to impact downstream water quality. As per CEMP App E, Section 5.2.1.7 (Rev 7, Sep 4, 2020), it is recommended that water quality monitoring is continued on a monthly basis at the established locations within the River Road catchment. Continuous monthly monitoring will evaluate the effectiveness of mitigation strategies that are implemented on the shale at Blind Corner.

6.2 SBIAR Water Quality Monitoring

Water quality data was collected from five established sampling locations, four of which measure water directly from within the SBIAR monitoring locations and one which measures water outside of the SBIAR facility at the closest water receptor as a verification check for potential influence from, or direct connectivity with, the PAG contact water that is collected and conveyed from the SBIAR facility. Water flowing through the SBIAR ditch has no direct downstream receptor, and all water in the east and west ditches is conveyed directly to the RSEM R6 pond which

is an approved PAG contact water management facility. Downstream water quality is monitored by PRHP within the RSEM R6 pond for management prior to discharge into the Peace River.

Based on water quality monitoring results collected within SBIAR and the downstream side channel, there was not an apparent correlation in water quality trends between SBIAR and the side channel during 2017 and 2018, however, during 2019 and 2020 there are some indications from water quality data that there could be some influence on the side channel from the ditches, but this is unconfirmed. Further data and observations collected in 2021 will help to verify a correlation, should one exist.

The increase in sulphate concentrations during 2020 at RBSBIAR-US relative to sulphate values measured during 2017 to 2019, was observed to occur from July to December 2020 which is unusual compared to previous trends. The RBSBIAR-EUS location also spiked in July 2020 followed by a decrease in August 2020 to values within previous range, although the RBSBIAR-US location remained elevated in sulphate values for the remainder of 2020. The reason is not known although could potentially be related to new inputs at RBSBIAR-US and/or increased ARD-ML processes at this upstream location in the west ditch that commenced in July 2020. This location will continue to be monitored during the 2021 monitoring period.

Alkalinity and pH indicate that the waters in RBSBIAR have consistently remained alkaline during the 2017, 2018, 2019 and 2020 monitoring periods. Screening of analytical data during 2020 for the downstream ditch locations resulted in occurrences of BCAWQG-FST guideline exceedances at RBSBIAR-DS (total iron (1) and dissolved aluminum (2)) and RBSBIAR-EDS (total iron (2), dissolved aluminum (2), total arsenic (1) and total zinc (2)).

Evidence of active ARD-ML process are observed on the shale slopes in SBIAR through rinse pH and observation of secondary iron hydroxide mineral formation. Water quality measurements with upward trends in various metal concentrations (i.e., iron, zinc, arsenic, copper and cadmium) and an apparent increase in downstream over upstream metal concentrations noted during 2019 was not observed to continue in 2020, and especially less so following April 2020.

Recommendations for SBIAR Water Quality Monitoring

Recommendations for future sampling include collection of water samples from the pooled water in Area 21. The collection of one up-gradient and one down-gradient water sample from both the western and eastern SBIAR ditch is suggested to continue through 2021 for comparative purposes.

Evidence of active ARD-ML processes were observed in the shale exposed in the east and west ditch within SBIAR. In 2017 and 2018, water quality measured at SBIAR sampling locations did not indicate significant impacts due to these ARD-ML processes, followed by 2019 trends with indications of ARD-ML processes resulting in increased metals that progressively increased especially in the downstream east and west ditches. In 2020, however, elevated metals and increasing trends were reduced or not measured. Downstream water is collected within the RSEM R6 pond for management prior to discharge into the Peace River. As per CEMP App E, Section 5.2.1.7 (Rev 7, Sep 4, 2020). since there is low to moderate risk of negative downstream effects on water quality, monitoring of water quality within SBIAR is recommended to be continued on a monthly basis in 2021. It is recommended that BC Hydro implement a long-term solution for the Site C operations phase for the exposed shale slope due to ARD/ML processes.

6.3 L3 Creek Water Quality Monitoring

Water quality data was collected from five established sampling locations during 2020 in continuation to 2017, 2018 and 2019 monitoring periods within the L3 Creek catchment to maintain a continuous record of water quality within the catchment and to monitor potential changes to water chemistry related to construction related activities within

the catchment. PAG indicator elements have been observed in elevated concentration on occasion from water quality monitoring from 2017 through 2020.

Screening of analytical data for the LBL3C-0.02 location resulted in occurrences of three parameters (total iron (2), dissolved aluminum (7), and total zinc (1)) that exceeded BCAWQG-FST guidelines during 2020.

L3 Creek is not identified as, nor is it being managed as a PAG contact water facility , however, the occurrence of a naturally occurring shale (PAG) outcrop identified in L4 Creek is monitored by sampling at the LBL4C-0.18 location where signatures of ARD-ML processes are prevalent. Elevated metal concentrations (total iron, cobalt, zinc, copper, arsenic, manganese, and dissolved iron, aluminum, and cadmium) and low pH have been measured in routine WQ sampling at LBL4C-0.18 during 2018, 2019 and 2020. Water mixing from L4 Creek with L3 Creek is generally diluted towards the lower midstream LBL3C-1.43 and discharge LBL3C-0.02 locations. Influence from ARD-ML processes at Howe Pit are observed in the lower portions of L3 Creek between locations LBL3C-1.43 and LBL3C-0.02.

Alkalinity and pH values measured in L3 Creek indicate that the waters have remained alkaline, with exception to the highly variable pH at the L4 Creek LBL4C-0.18 location from July to November 2020 measured below the acceptable BCAWQG-FST guideline range (pH 6.5-9.0). Further observation indicates that decreases in pH align with decreased alkalinity and increased acidity levels at LBL4C-0.18. Trends in pH and alkalinity in 2020 are within normal range of measured pH and alkalinity trends from 2017 through 2019. Overall, there is more variability in alkalinity and acidity than pH within the L3 Creek.

Water quality in L3 Creek between LBL3C-1.43 and the discharge LBL3C-0.02 is influenced by influent waters originating in the Howe Pit areas. The LBL3C-0.02 location commonly measures higher concentrations at the discharge than midstream at LBL3C-1.43 for aluminum and cadmium, whereas similar concentrations are measured for copper and arsenic. The LBL3C-1.43 location measures higher than LBL3C-0.02 for cobalt and acidity. Zinc measures relatively consistent concentrations at LBL3C-0.02 but is variable at LBL3C-1.43. Monthly assessment for these metals was conducted as part of the regular monitoring program in 2017 to 2020. This monitoring program is not for compliance purposes and is for tracking potential influences over time. The sampling frequency for this component of the program could be reduced to a quarterly basis in 2021.

Sulphate and TDS concentrations both increase significantly during freshet in May 2020, followed by a consistent to slight increase for the remainder of the year.

Trend observations from sulphate, TDS, and dissolved iron and aluminum data indicate additional water input to L3 Creek between the up-gradient LBL3C-1.43 and LBL3C-0.02 discharge location. These inputs may be related to non-Site C related Howe Pit surface run-off or from locally impacted shallow groundwater seepage in the area.

Recommendations for L3 Creek Water Quality Monitoring

Based on the results from the 2017 through 2020 water quality monitoring programs there is low risk of negative downstream effects on water quality due to ARD-ML processes within the L3 Creek catchment. BC Hydro may choose to continue monitoring water quality on a monthly frequency in order to monitor changing conditions within the L3 Creek due to pre-existing facilities and future construction related activities in and around the catchment area, or move to a quarterly sampling program. The location of the monitoring location LBL3C-1.65 may need to be adjusted in 2021 to accommodate construction activities in the area which has resulted in filling of the L3 Creek Channel with riprap and generally obscures the natural flow of water thus preventing samples from being collected. Continued monitoring of the L3 Creek locations will occur in 2021.

6.4 Left Bank Debris Boom Monitoring

On October 8, 2020, BCAWQG-FST exceedances were measured, including three exceedances at the LBP Pond (total and dissolved iron, and total manganese) and eleven exceedances at the LB Side Channel E location (total arsenic, boron, cobalt, iron, manganese, zinc and dissolved aluminum, cadmium, copper and iron), and a low acidic pH of 3.01 below the accepted range (6.5-9.0) of the BCAWQG-FST guidelines. The numerous exceedances at this location were due to it being stagnant PAG contact water from the exposed shale slope. Mitigation and management controls have been implemented in the LBDB area as discussed in Section 3.4.1.

On November 20, 2020, an LBP Pond sample measured five BCAWQG-FST exceedances for total and dissolved iron, total manganese, total zinc, and dissolved aluminum. The LB Side Channel E was not accessible due to layers of thick ice covering the channel from fluctuating headpond levels, making it unsafe to work and difficult to remove ice to access water, thus no sample was collected. Water levels were noted to be ~ 1.0 m above the Present Water Level (PWL) during sampling due to accumulations of ice on banks and surrounding vegetation. The LB side channel was noted to have probable connectivity to the main channel of the Peace River.

Mitigation measures were implemented at LBDB during 2020, including erosion control and PAG neutralization by the area contractor, AFED, with emplacement of 5a size limestone riprap and check dams in ditches along the western border of the LBDB area and at the toe of the PAG shale slope. These ditches have flow coming from potential PAG slopes. The area below 420 m elevation was flooded by the head pond after construction in early Fall 2020, and therefore that area did not require riprap. The ditch downslope of LBP Pond is not lined with limestone. Slopes have been recontoured readied to accept seed. Limited seeding with ESC mix has occurred only on the disturbed slope bordered by the boom-structure, 420 m highwater mark and ditch below LBP Pond. In early 2021, seeding is planned for completion on all exposed soil areas on the slope. The area above 420 m elevation will be exposed for 3-4 years, prior to flooding to the final river/reservoir elevation of around 460 m elevation.

Recommendations for LBDB Water Quality Monitoring

BC Hydro should continue to monitor water quality on a monthly frequency in order to monitor changing conditions within the LBDB area due to pre-existing facilities and future construction related activities in and around the catchment area.

The LB Side Channel is now inaccessible due to the progression of construction and creation of the headpond following full river diversion since October 3, 2020. It is recommended that this area be reviewed and evaluate if a modification to the sampling locations is necessary in 2021, in addition to monitoring mitigation measures such as the maintenance of limestone-lined ditches and seeding planned on the slope.

6.5 L2 Powerhouse Water Quality Monitoring

The L2-US station was sampled one time on October 8, 2020. This sample reported a total iron concentration that exceeded BCAWQG-FST guidelines. The L2-DS station was sampled four times, between October and December. The November sample and two December samples all reported dissolved aluminum concentrations above the BCAWQG-FST value.

For the December 14, 2020 sampling event a sample was collected at the L2-DS station for testing two filter sizes to investigate the presence of aluminum Aluminum-dissolved was measured to exceed the BCAWQG-FST in both the 0.10 um and 0.45 um filter sizes. Lower value in the 0.10 um filter size may indicate that there is some microcrystalline aluminum contributing to the dissolved numbers. The dissolved aluminum values are similar to those observed at L2-DS in the Nov 20 (258 ug/L) and Dec 4 (552 ug/L) sampling events. Also similar to those events is the alkaline pH and below guideline values of other metals associated with a PAG signature. Therefore,

Tetra Tech infers that the elevated dissolved aluminum values are not representative of a PAG leachate issue and are possibly related to the construction activities/concrete in the Powerhouse area.

It is noted that water quality in the L2 area as well as the adjacent area for the AFDE foundation enhancement trial drilling program, both contained an excess of dissolved aluminum. This was investigated and determined that the most likely source of the dissolved aluminum to be originating from the RCC concrete which contains fly-ash (21.2% aluminum oxide) and GU cement (5% aluminum oxide).

The presence of elevated dissolved aluminum was considered in the context of drilling muds. However, BC Hydro staff confirmed that the drilling being done in the L2 Powerhouse area is not using drill muds.

Recommendations for L2 Powerhouse Water Quality Monitoring

Due to the evolving nature of this area and significant construction activity, it is important to evaluate the potential for changing flow patterns and confirm that the established sampling locations are appropriate for the purpose and collecting the intended waters. Focus on aluminum monitoring and tracking construction activities that may be contributing aluminum. Observe if the aluminum is associated with other metals or pH which may be related to ARD-ML processes.

A composite sample was collected from the LS-DS station during one of the four sampling events in 2020. The recommendation to field staff at the time was to maintain a consistent single sample location rather than collecting a composite. The recommendation applies more generally to the complete water quality monitoring program to allow for consistent interpretation of changes at a monitoring location.

7.0 CLOSURE

We trust this document meets your present requirements. If you have any questions or comments, please contact the undersigned.

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Tetra Tech (2020) Site C Clean Energy Project Water Quality Monitoring for River Road, South Bank Initial Access Road, and L3 Creek 2019 Annual Report. IFU March 31, 2020.

FIGURES

LEGEND

- Water Sample (Insitu Testing Only)
- Water Sample (Insitu Testing & External Lab Testing)
- Culvert
- Ditch
- Ditch Diversion
- Howe Pit
- Blind Corner Outcrop
- Site C Project Boundary

Sample ID	Easting	Northing
LBRR-RR8	632262	6229624
LBRR-RR9	632460	6229680
LBRR-EDP	632715	6229832
LBRR-DD	632853	6229862
LBRR-LC	632856	6229899
LBRR-12+500	632914	6229921
LBRR-12+600	632948	6229983
LBRR-12+700	632992	6230078
LBRR-12+810	633039	6230195
LBRR-12+920	633000	6230282
LBRR-UC	633018	6230253

NOTES
Base data source:
Imagery provided by ESRI; Maxar (2018).

STATUS
ISSUED FOR USE

SITE C WATER QUALITY MONITORING 2020 ANNUAL REPORT

Left Bank - River Road

PROJECTION UTM Zone 10	**DATUM** NAD83				**CLIENT** BC hydro
Scale: 1:3,500 (50 25 0 50 Metres)					TETRA TECH
FILE NO. VMIN03021-03_Fig01_WaterSamplesLBRR.mxd					
OFFICE Tt-VANC	**DWN** SL	**CKD** BB	**APVD** EM	**REV** 0	**Figure 1**
DATE January 27, 2021	**PROJECT NO.** ENG.VMIN03021-03				

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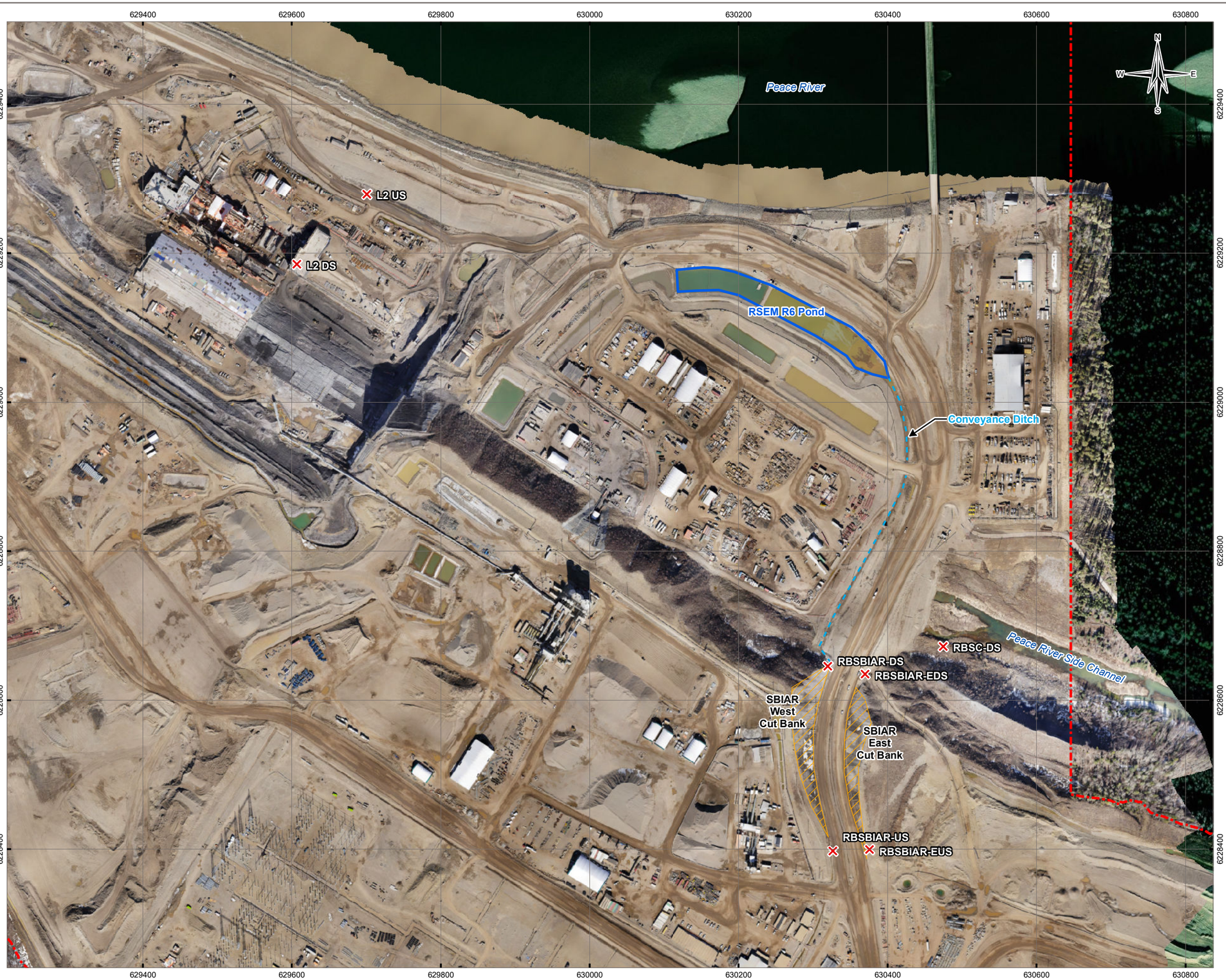

LEGEND

- Water Sample (Insitu Testing & External Lab Testing)
- Ditch
- Cut Bank
- RSEM R6 Pond
- Site C Project Boundary

Sample ID	Easting	Northing
RBSBIAR-US	630327	6228397
RBSBIAR-EUS	630376	6228399
RBSBIAR-DS	630320	6228645
RBSBIAR-EDS	630370	6228635
RBSC-DS	630475	6228672
L2 US	629701	6229279
L2 DS	629607	6229185

NOTES
Base data source:
Imagery provided by the client (April 2019).

STATUS
ISSUED FOR USE

SITE C WATER QUALITY MONITORING 2020 ANNUAL REPORT

Right Bank - South Bank Initial Access Road (RBSBIAR), L2 Powerhouse

PROJECTION UTM Zone 10	**DATUM** NAD83	**CLIENT** BC hydro
Scale: 1:5,000 (100 50 0 100 Metres)		TETRA TECH
FILE NO. VMIN03021-03_Fig02_WaterSamplesRB.mxd		
OFFICE Tt-VANC	**DWN** SL / **CKD** BB / **APVD** JB / **REV** 0	Figure 2
DATE January 29, 2021	**PROJECT NO.** ENG.VMIN03021-03	

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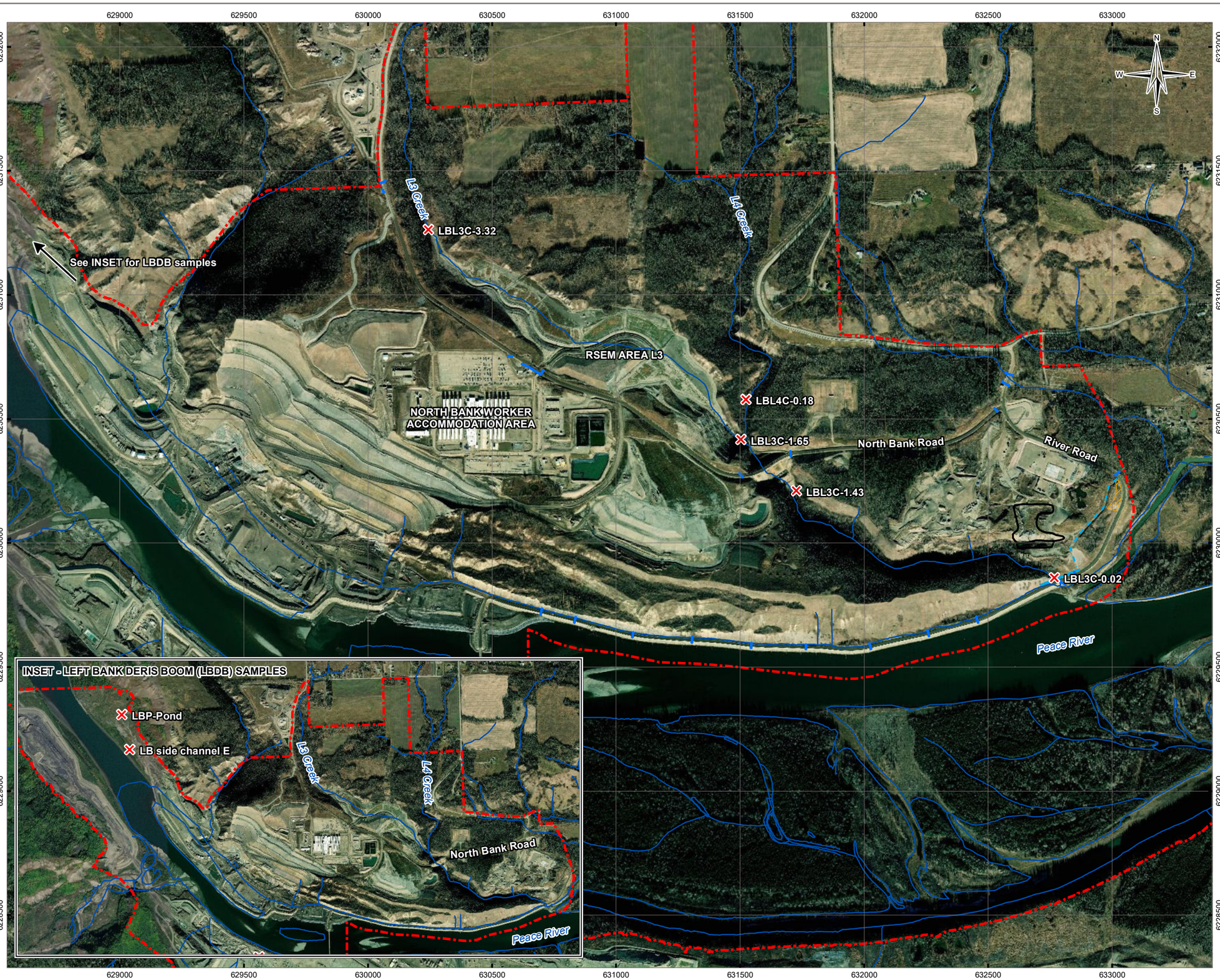

LEGEND

- Water Sample (Insitu Testing & External Lab Testing)
- Culvert
- Ditch
- Ditch Diversion
- Howe Pit
- Blind Corner Outcrop
- Site C Project Boundary
- Original Watercourse

Sample ID	Easting	Northing
LBL3C-0.02	632767	6229860
LBL3C-1.43	631728	6230210
LBL3C-1.65	631504	6230417
LBL3C-3.32	630244	6231263
LBL4C-0.18	631524	6230578
LB side channel E	628311	6231511
LBP-Pond	628227	6231885

NOTES
Base data source:
Imagery provided by ESRI; Maxar (2018).

STATUS
ISSUED FOR USE

SITE C WATER QUALITY MONITORING 2020 ANNUAL REPORT

Left Bank - L3 Creek and Left Bank Debris Boom (LBDB)

PROJECTION	DATUM	CLIENT
UTM Zone 10	NAD83	BC hydro

Scale: 1:15,000
200 100 0 200
Metres

TETRA TECH

FILE NO. VMIN03021-03_Fig03_WaterSamplesLBL3.mxd

OFFICE	DWN	CKD	APVD	REV
Tt-VANC	SL	BB	JB	0

DATE January 27, 2021
PROJECT NO. ENG.VMIN03021-03

Figure 3

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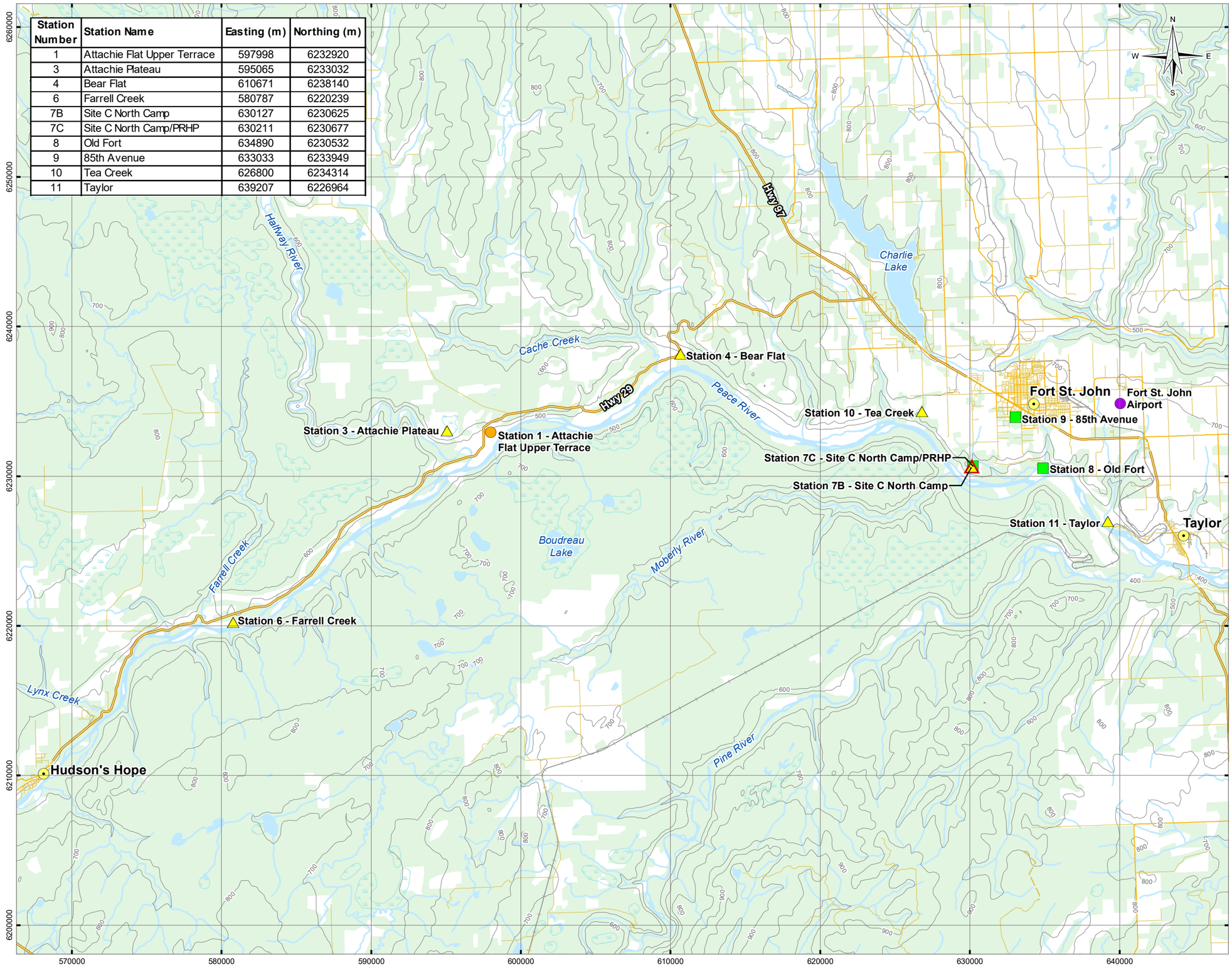
Station Number	Station Name	Easting (m)	Northing (m)
1	Attachie Flat Upper Terrace	597998	6232920
3	Attachie Plateau	595065	6233032
4	Bear Flat	610671	6238140
6	Farrell Creek	580787	6220239
7B	Site C North Camp	630127	6230625
7C	Site C North Camp/PRHP	630211	6230677
8	Old Fort	634890	6230532
9	85th Avenue	633033	6233949
10	Tea Creek	626800	6234314
11	Taylor	639207	6226964



LEGEND

Station Type

- Meteorological Only - used for Temperature and Precipitation data
- Meteorological Only
- Air Quality Only
- Meteorological and Air Quality
- Environment Canada Meteorological Station

Base Features

- City/District Municipality
- Highway
- Main Road
- Local Road
- Resource/Recreational Road
- Railway
- Residential
- Contour (100 m)
- Watercourse
- Waterbody
- Wetland
- Wooded Area

NOTES
Station locations provided by BC Hydro and RWDI (September 2017).
Base data source: CanVec 1:250,000.

STATUS
ISSUED FOR USE

SITE C WATER QUALITY MONITORING 2020 ANNUAL REPORT

Site C Meteorological and Air Quality Stations

PROJECTION	DATUM	CLIENT
UTM Zone 10	NAD83	BC hydro

Scale: 1:250,000
5 2.5 0 5
Kilometres

TETRA TECH

FILE NO.				
VMIN03021-03_Fig04_BCH_ClimateStations.mxd				
OFFICE	**DWN**	**CKD**	**APVD**	**REV**
Tt-VANC	SL	YL	JB	0
DATE	**PROJECT NO.**			
January 27, 2021	ENG.VMIN03021-03			

Figure 4

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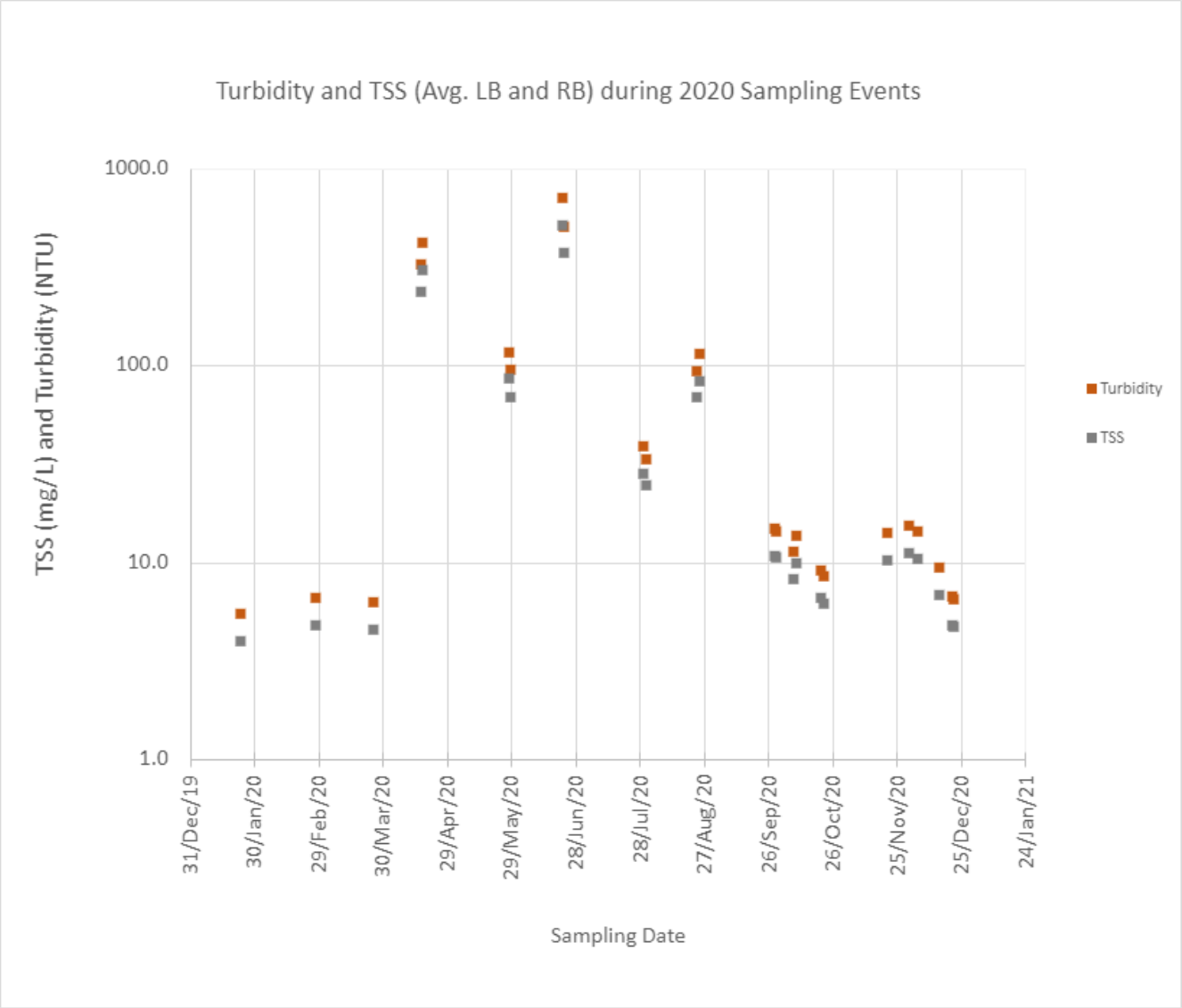
Figure 5: Turbidity and TSS Measured in the Peace River



EcoFish Disclaimer: TSS:turbidity relationship used was the same all year. Note, these relationships are specific to a particular make/model of sensor. Please exercise caution if relationship applied to any data collected.

Figure 6: pH at River Road Locations

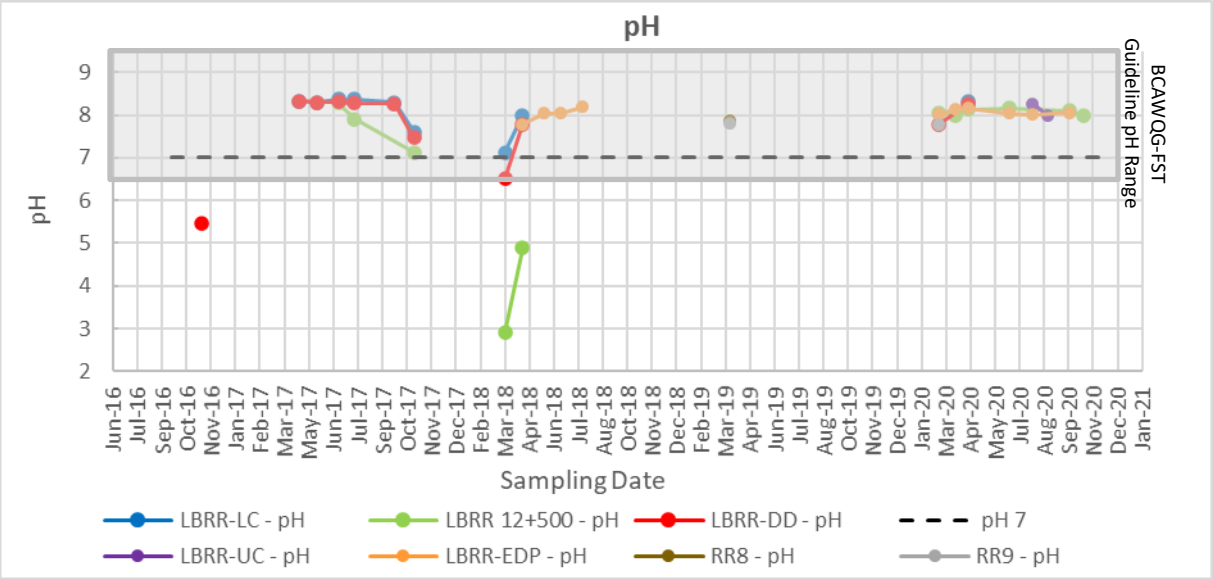


Figure 7: Total Alkalinity at River Road Locations

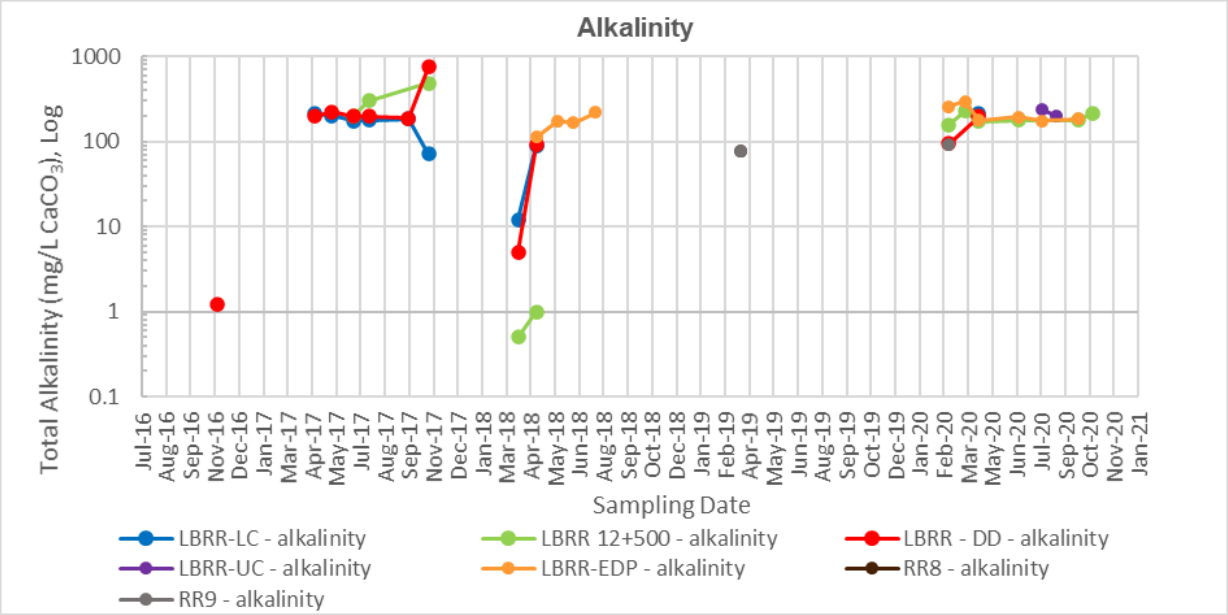


Figure 8: Acidity at River Road Locations

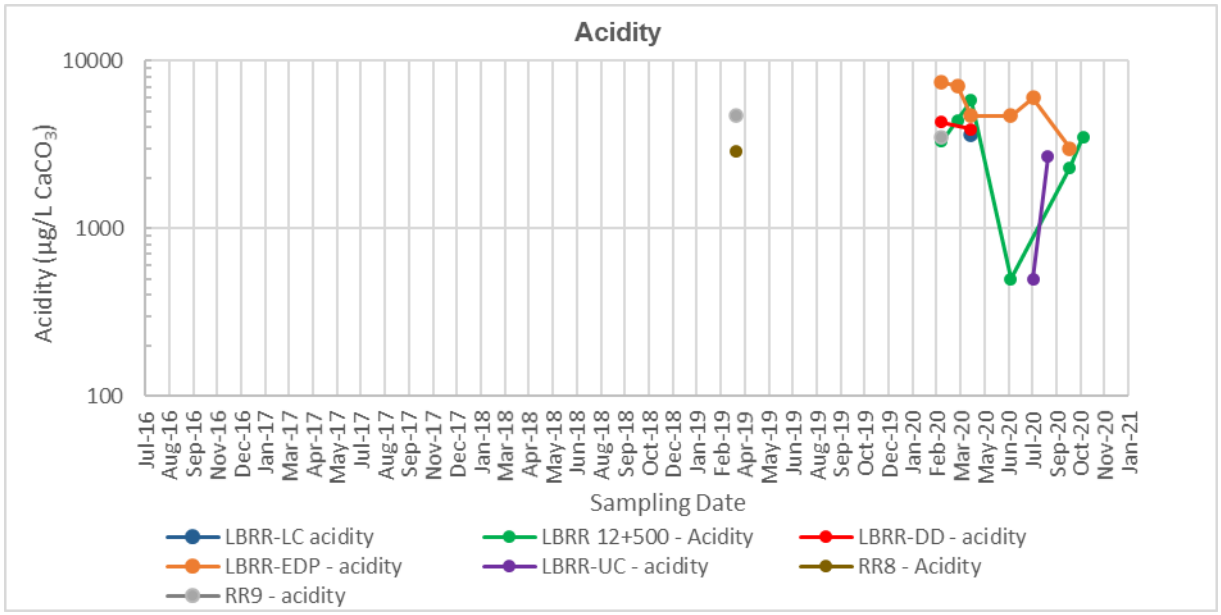


Figure 9: Sulphate at River Road Locations

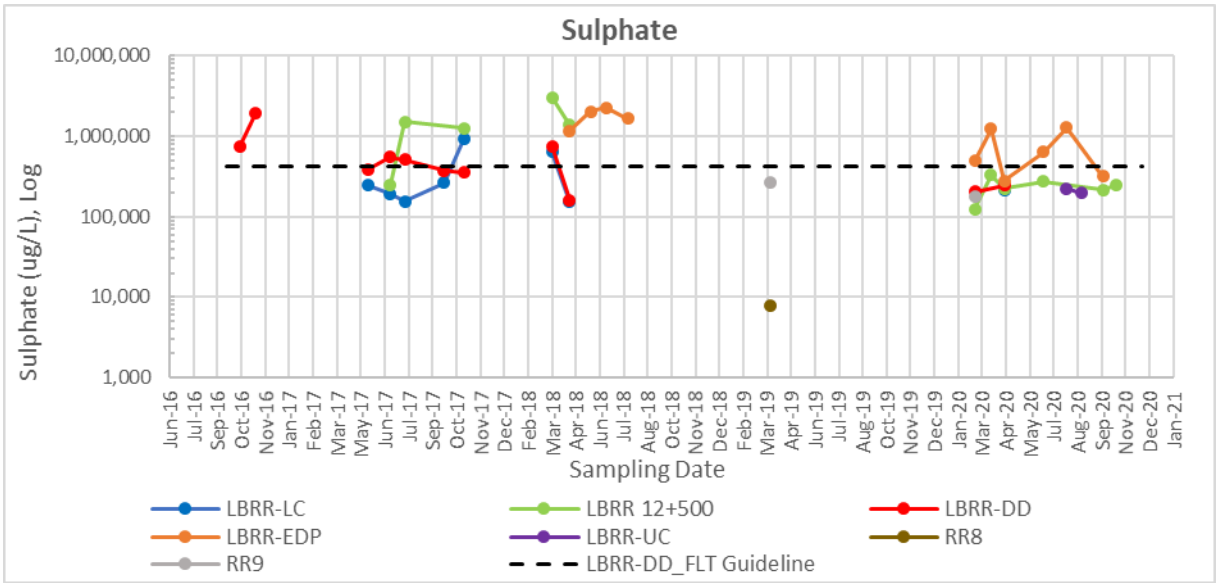


Figure 10a: Total Dissolved Solids at River Road Locations

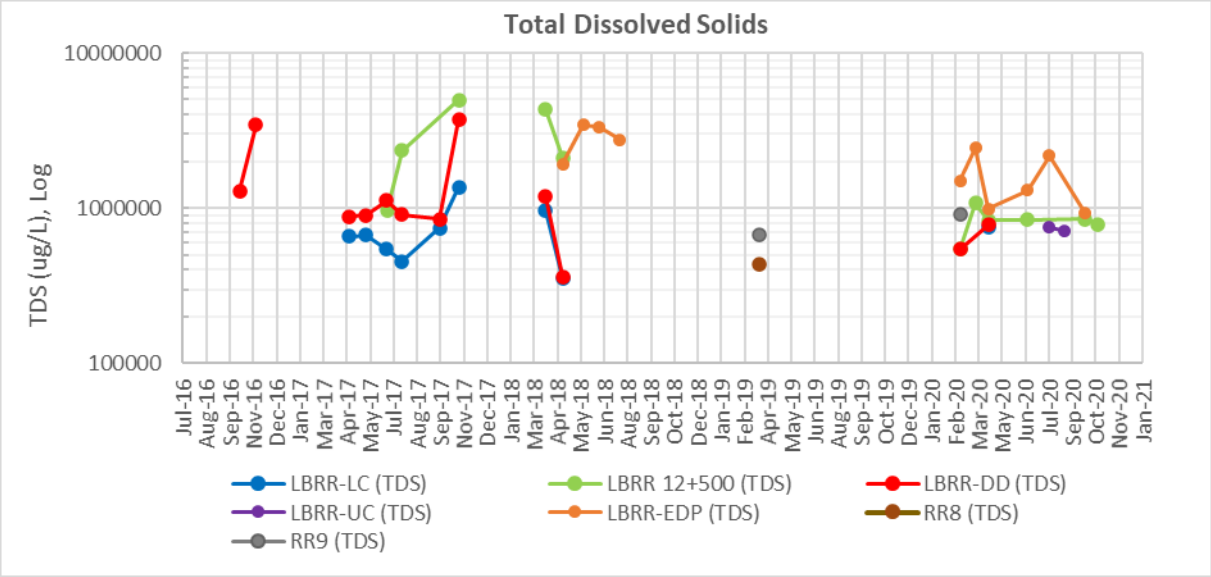


Figure 10b: Total Suspended Solids (TSS) at River Road Locations

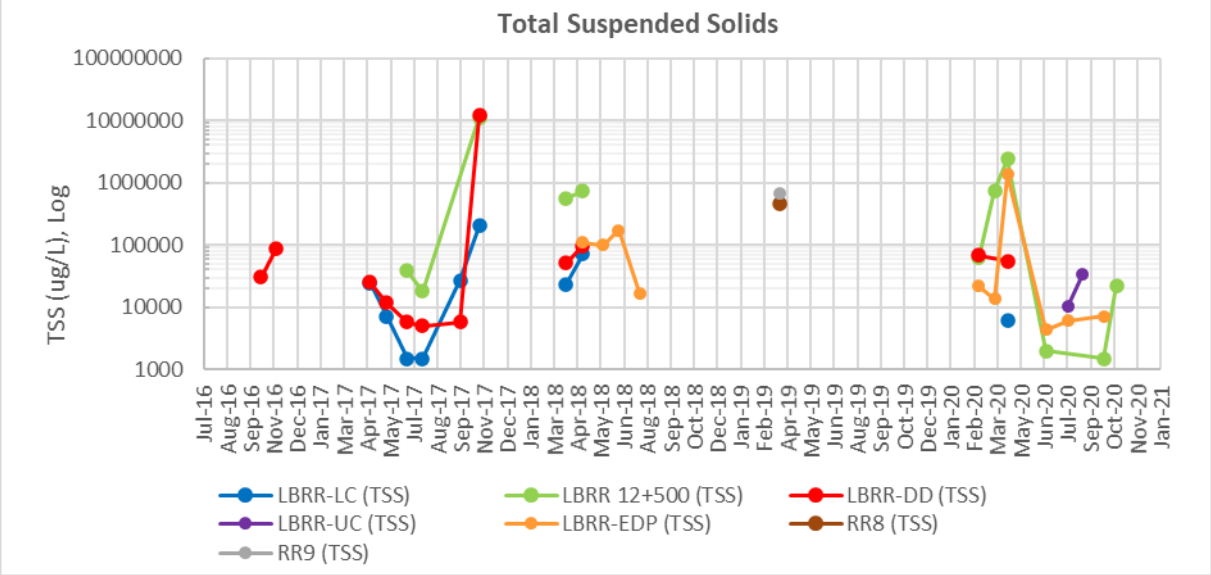


Figure 11a: Total Aluminum at River Road Locations

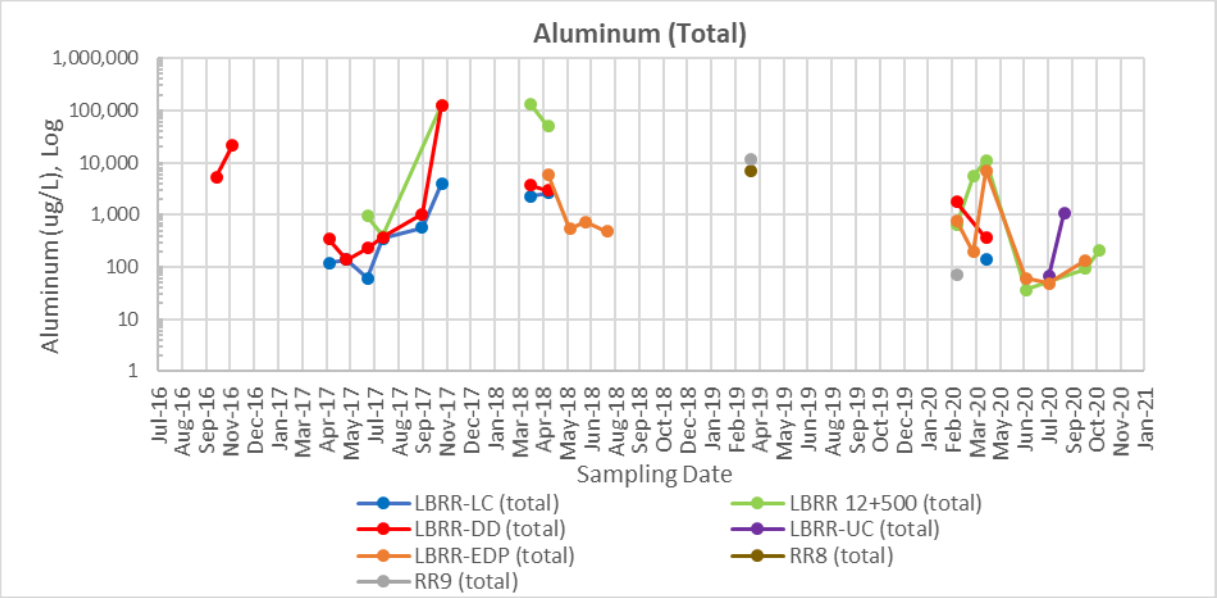


Figure 11b: Dissolved Aluminum at River Road Locations

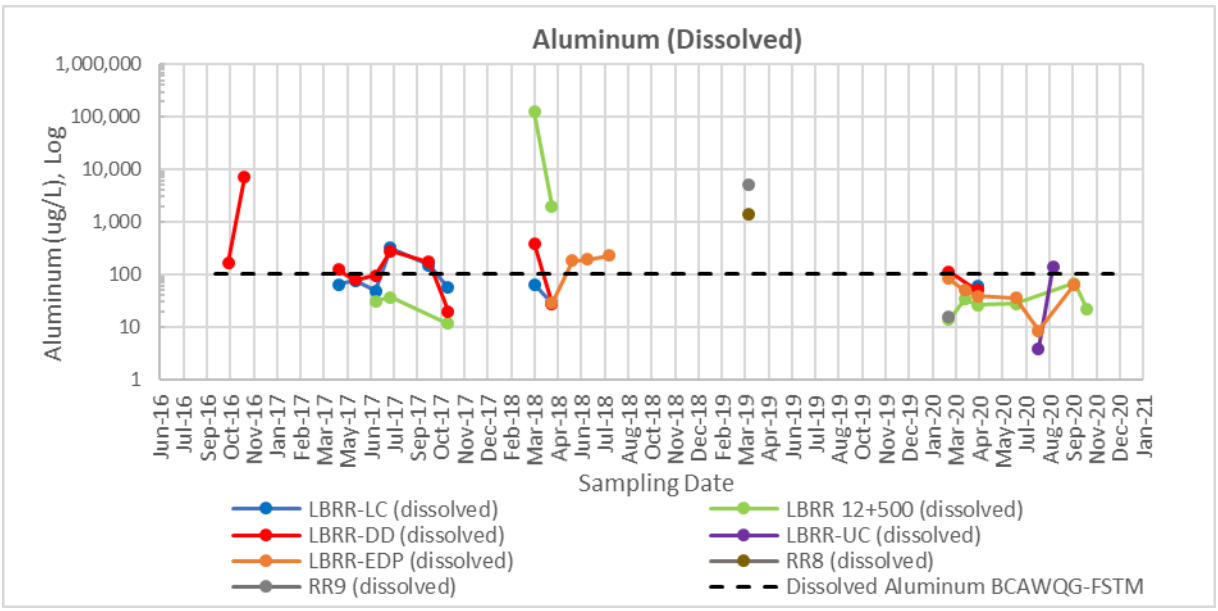


Figure 12a: Total Iron at River Road Locations

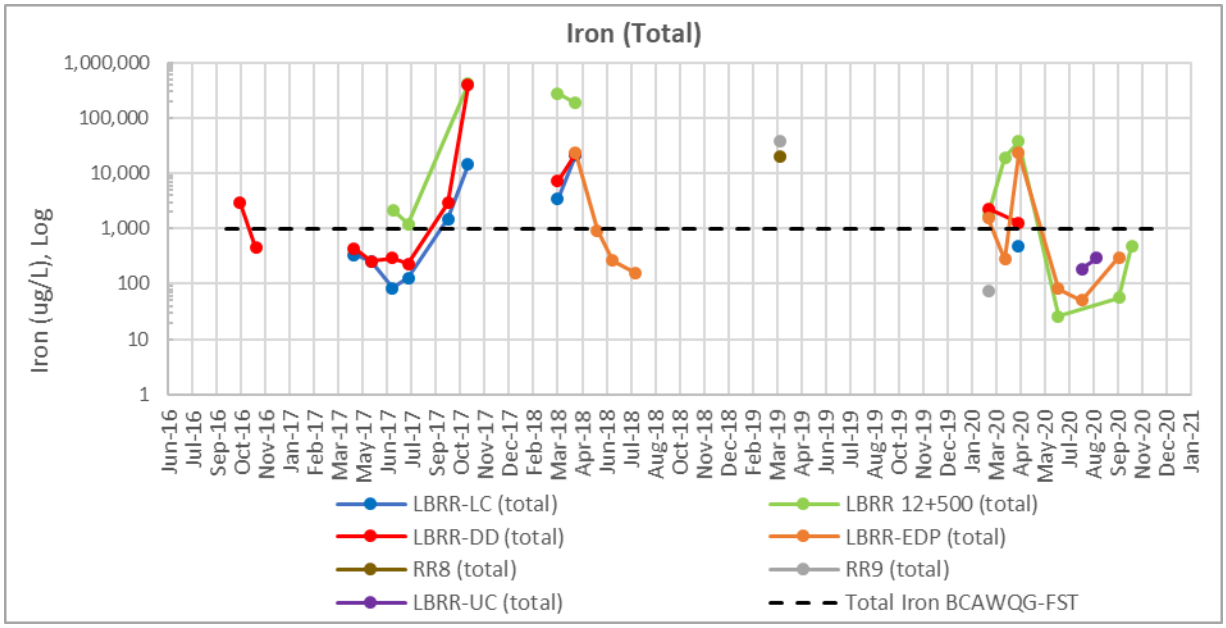


Figure 12b: Dissolved Iron at River Road Locations

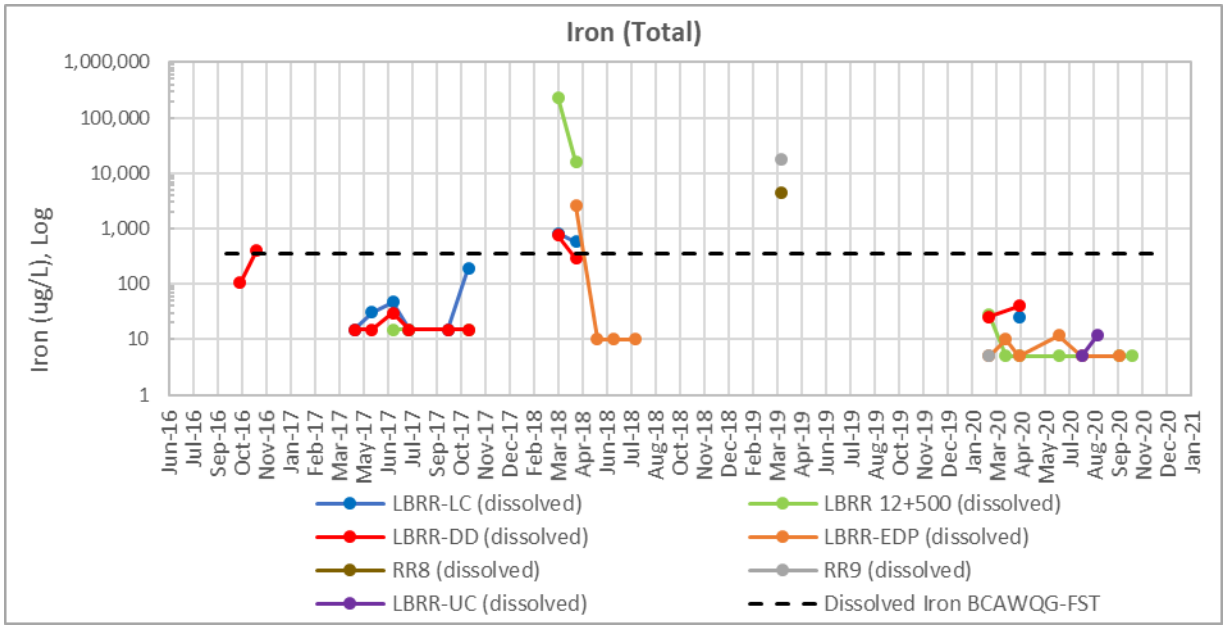


Figure 13a: Total Arsenic at River Road Locations

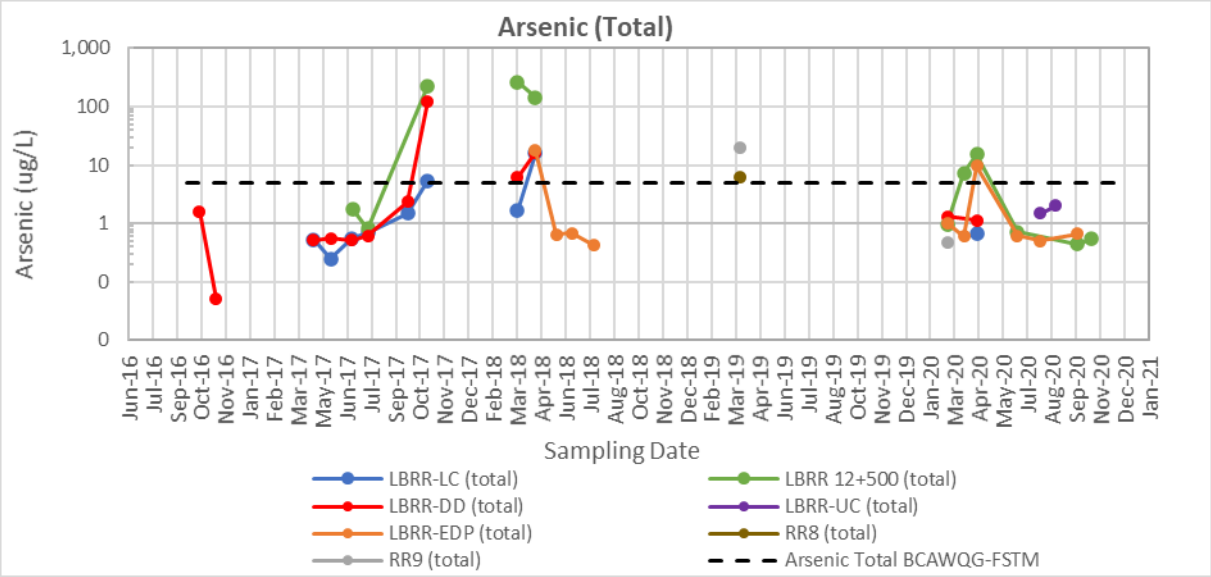


Figure 13b: Dissolved Arsenic at River Road Locations

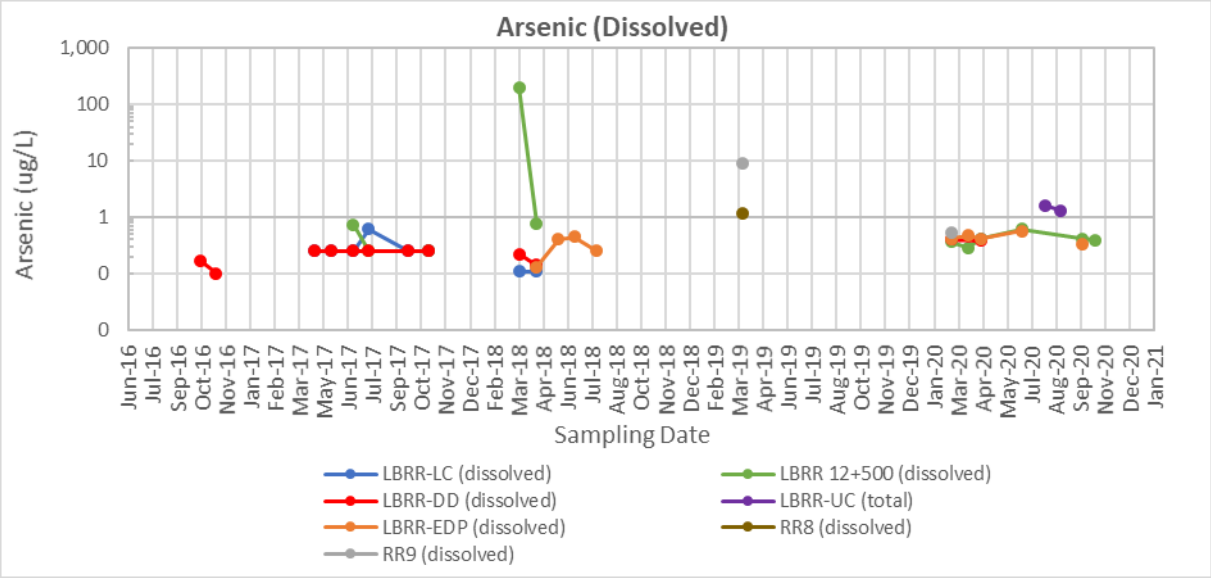


Figure 14a: Total Cadmium at River Road Locations

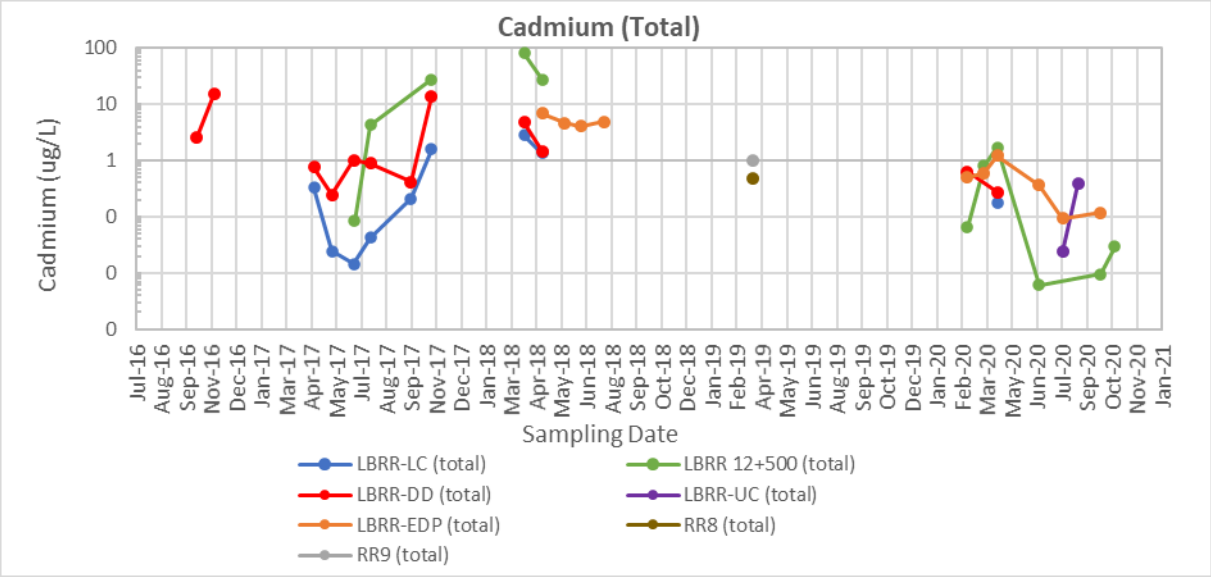


Figure 14b: Dissolved Cadmium at River Road Locations

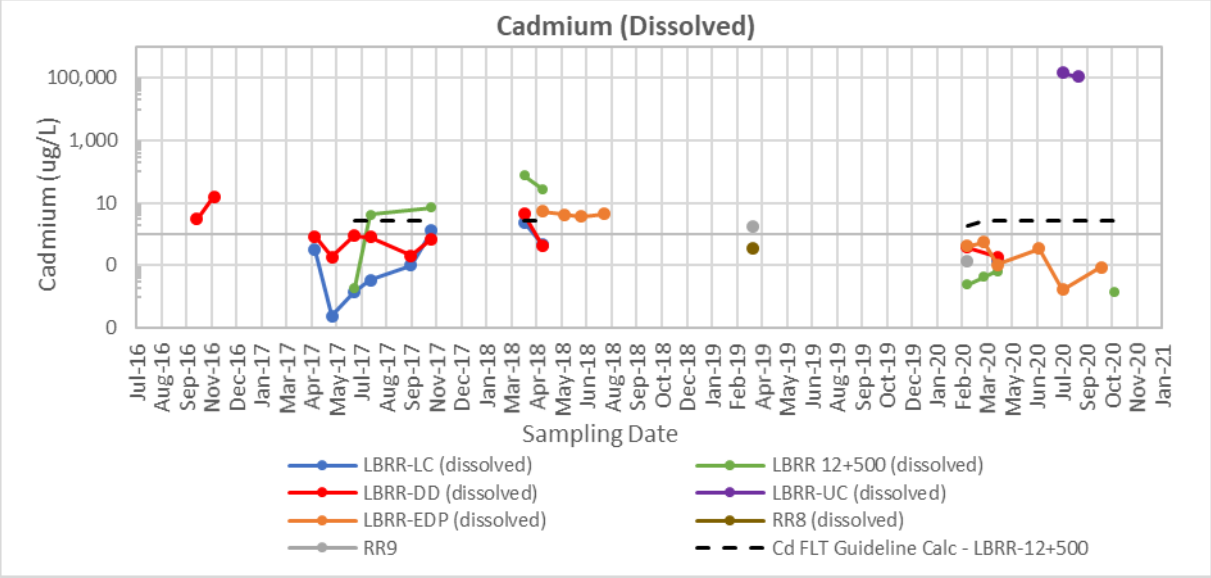


Figure 15a: Total Cobalt at River Road Locations

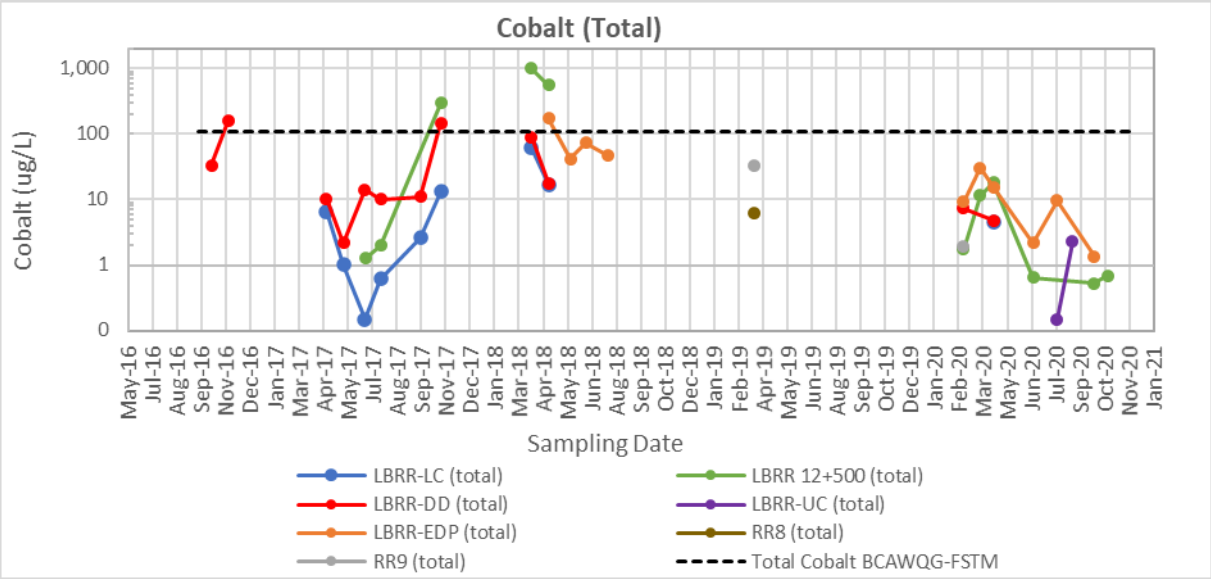


Figure 15b: Dissolved Cobalt at River Road Locations

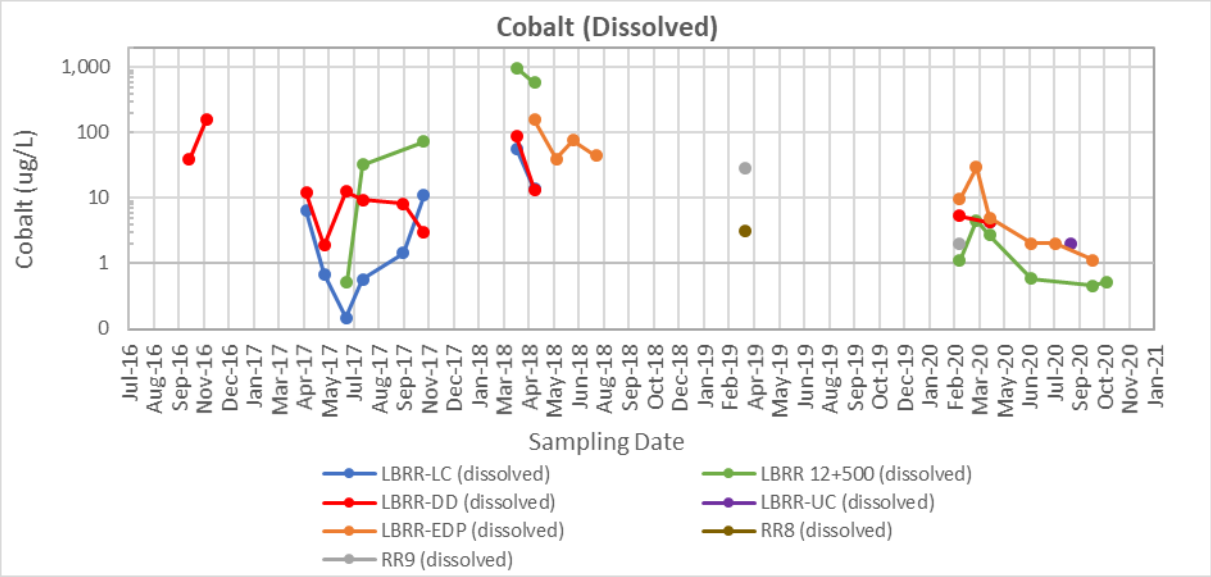


Figure 16a: Dissolved Copper at River Road Locations

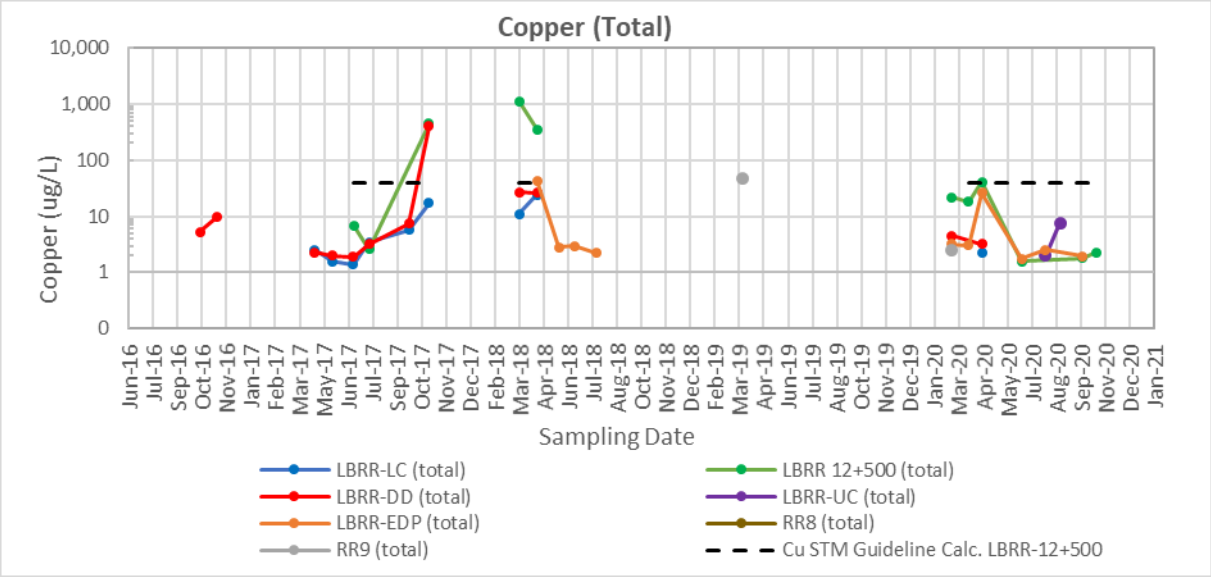


Figure 16b: Dissolved Copper at River Road Locations

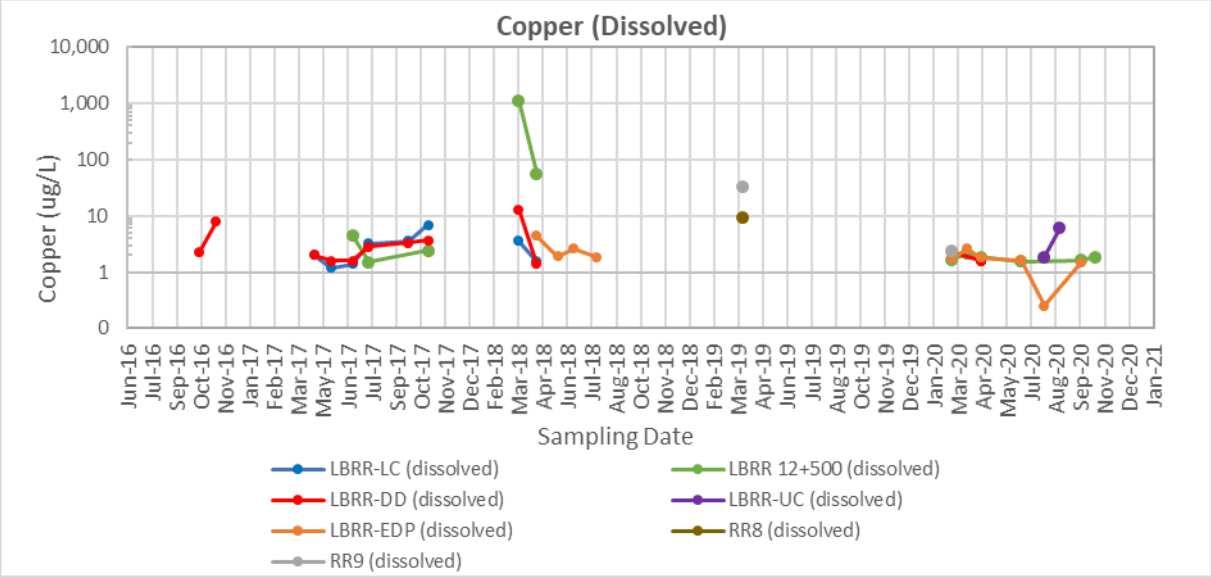


Figure 17a: Dissolved Zinc at River Road Locations

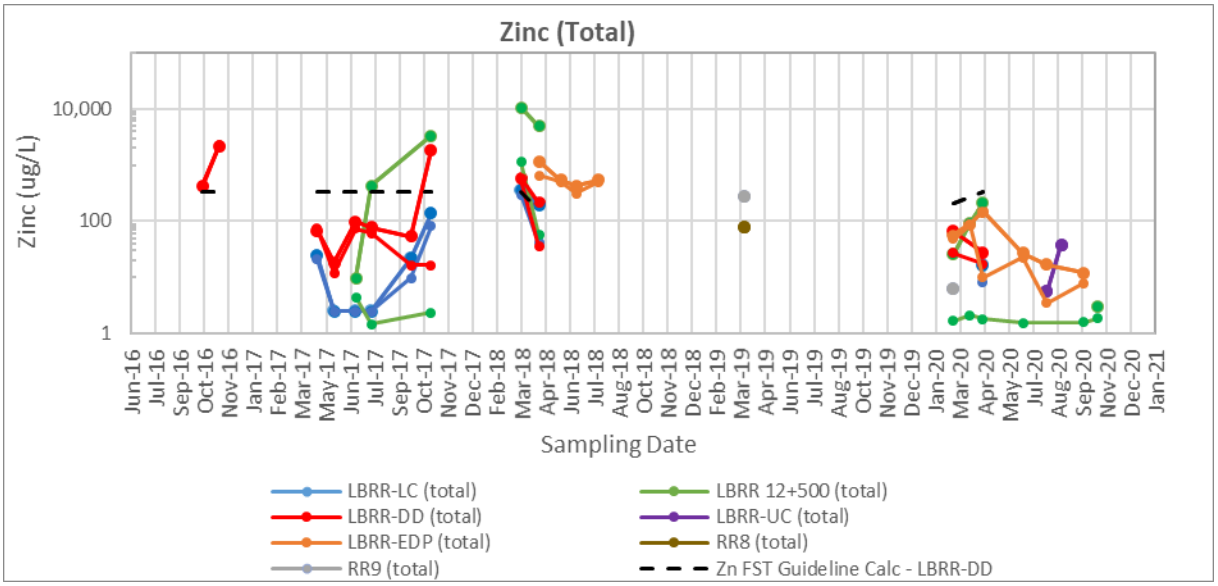


Figure 17b: Total Zinc at River Road Locations

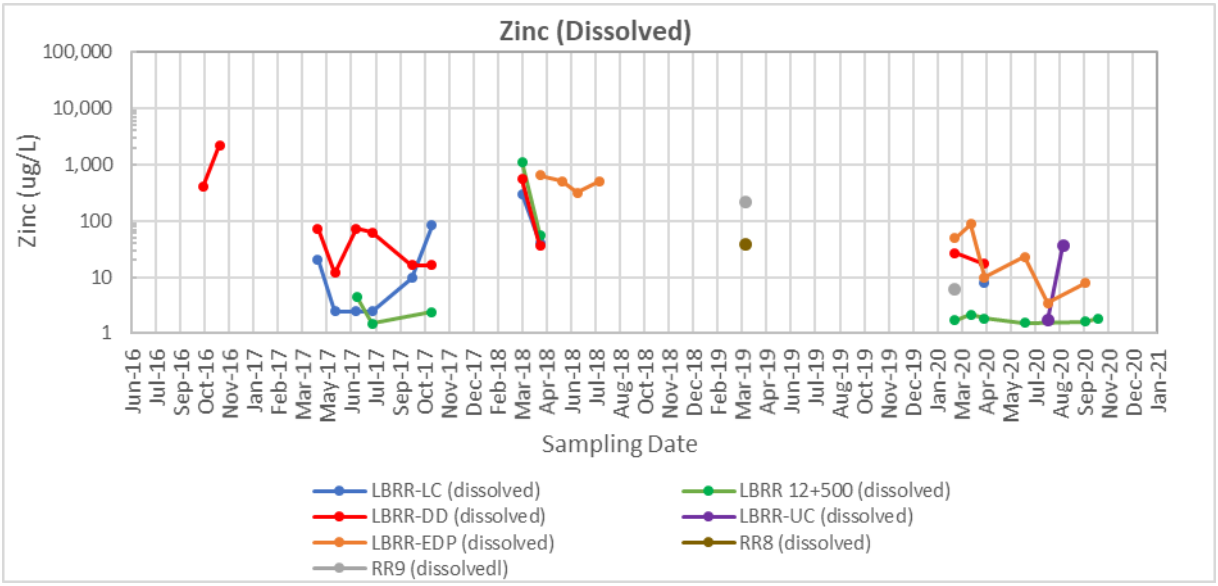


Figure 18: pH at RBSBIAR Locations

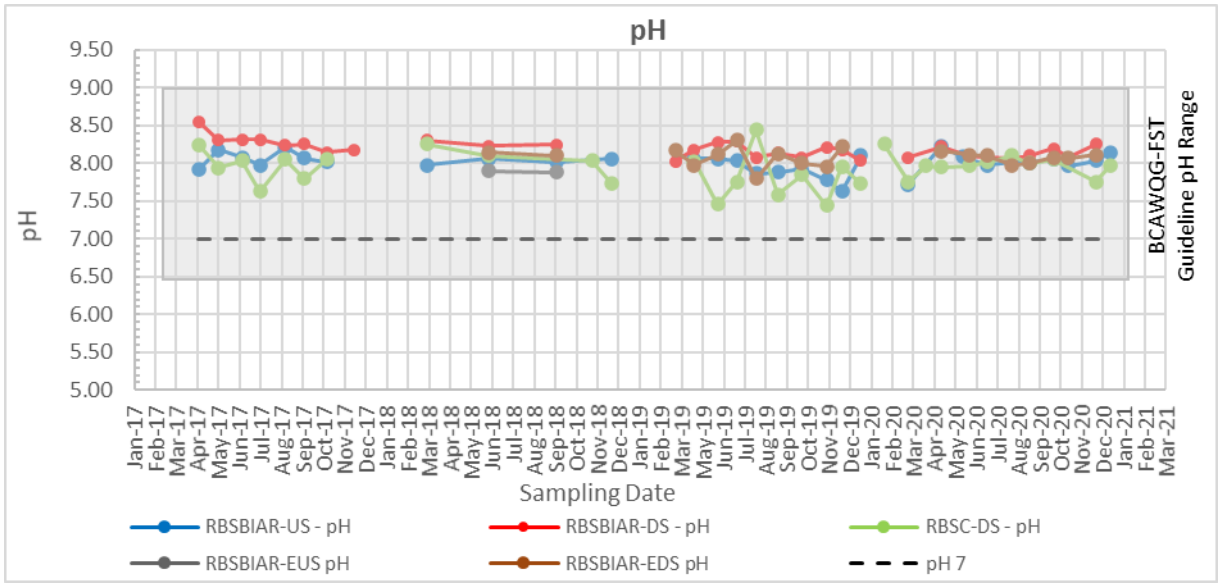


Figure 19: Total Alkalinity at RBSBIAR Locations

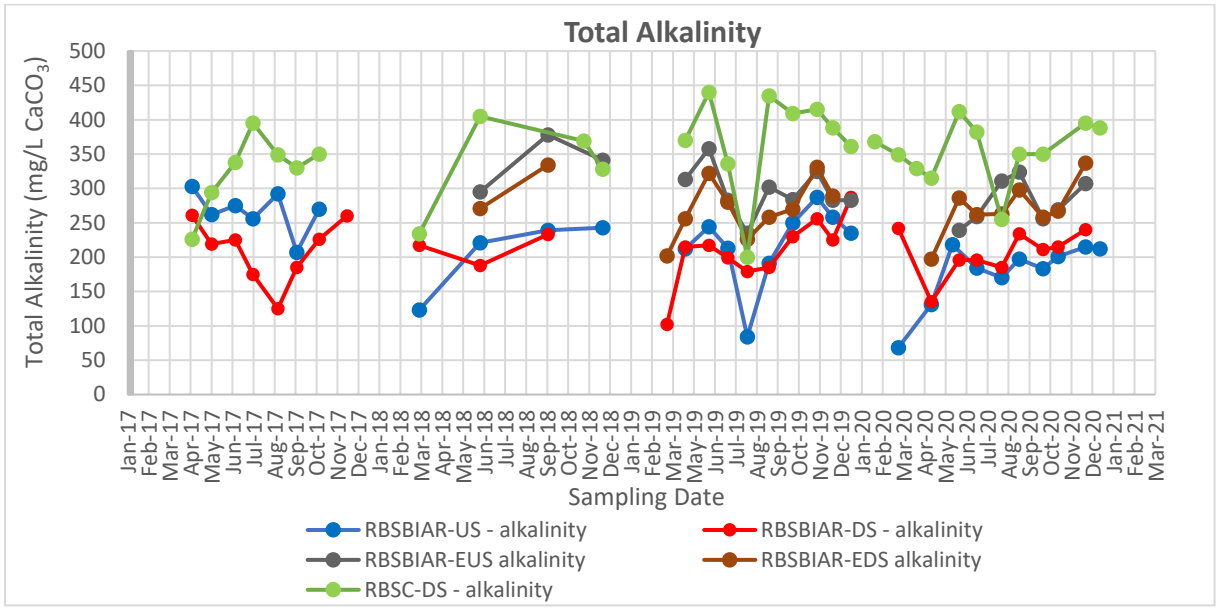


Figure 20: Acidity at RBSBIAR Locations

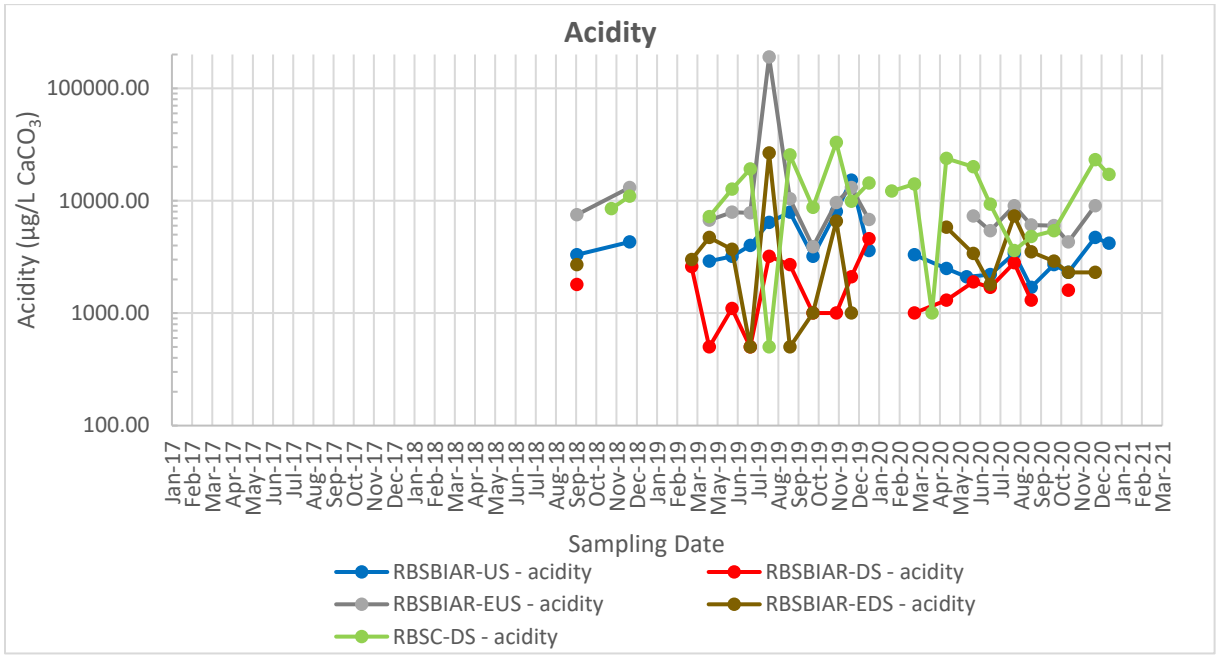


Figure 21: Sulphate at RBSBIAR Locations

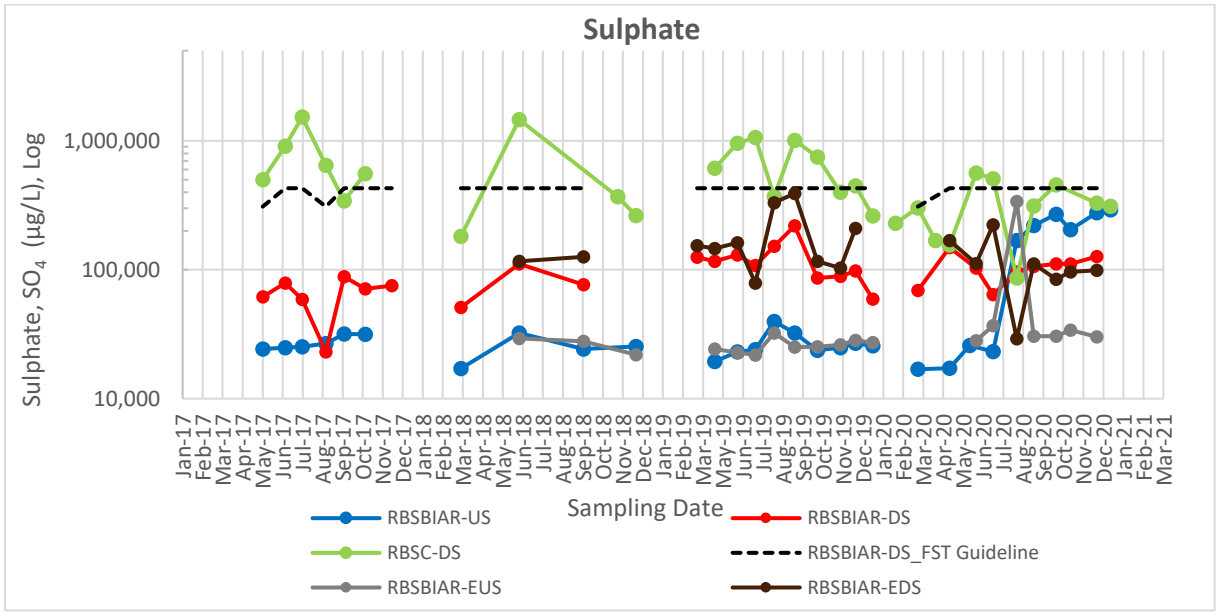


Figure 22a: Total Dissolved Solids at RBSBIAR Locations

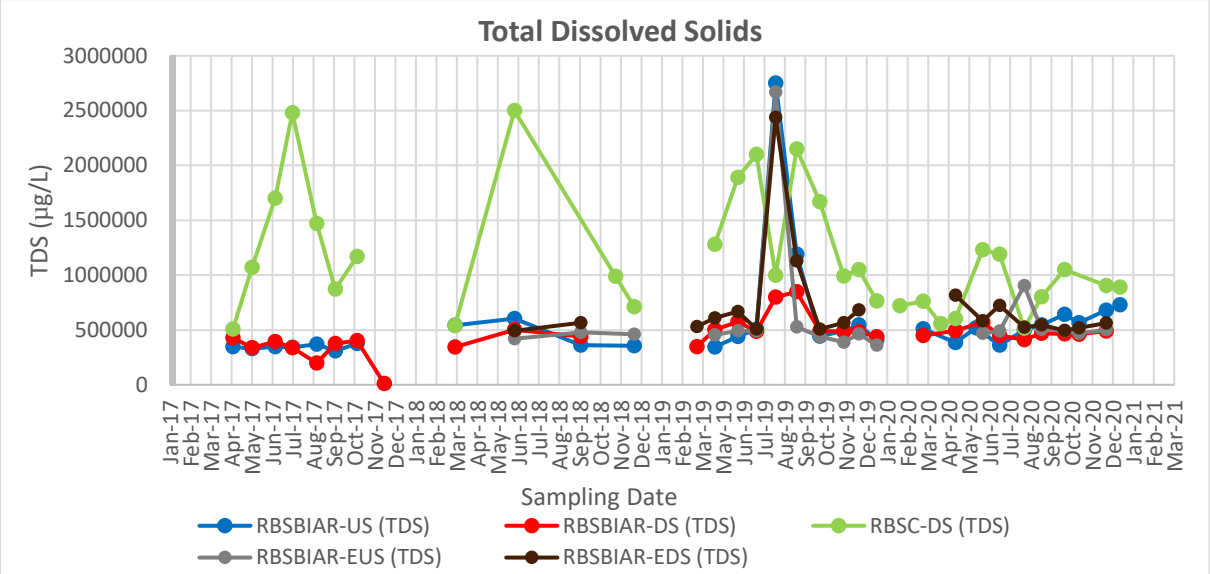


Figure 22b: Total Suspended Solids (TSS) at RBSBIAR Locations

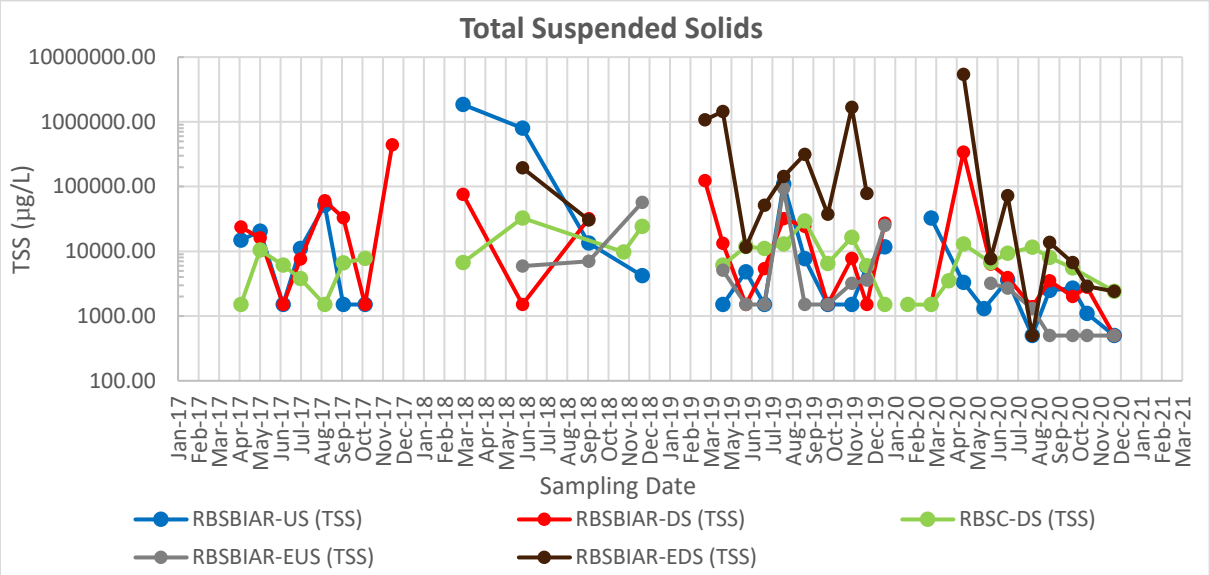


Figure 23a: Total Aluminum at RBSBIAR Locations

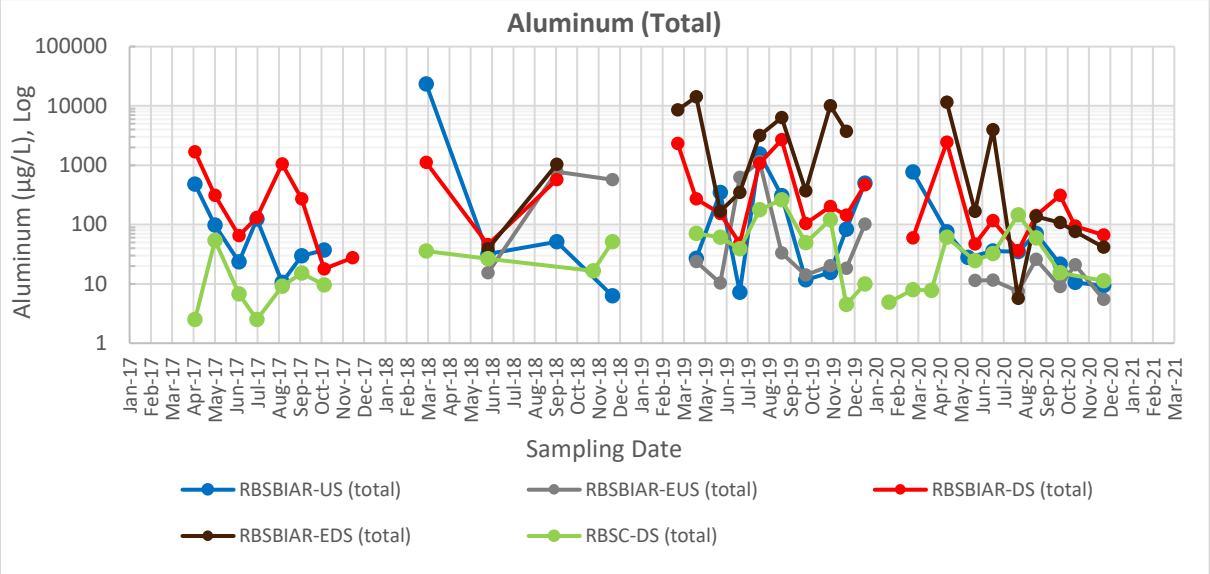


Figure 23b: Dissolved Aluminum at RBSBIAR Locations

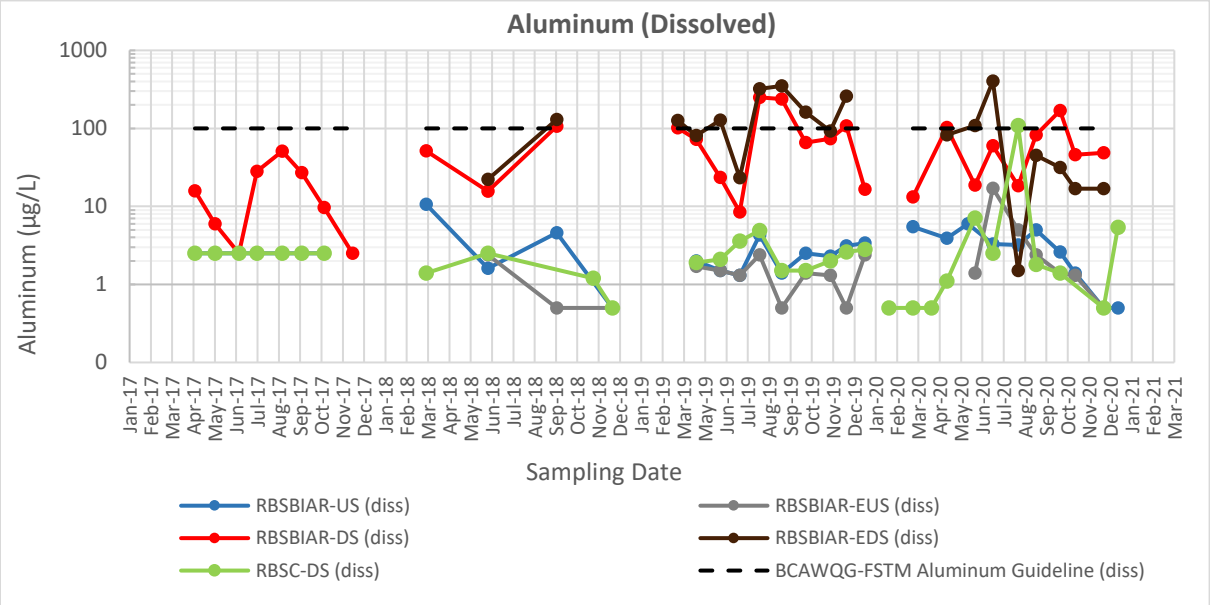


Figure 24a: Total Iron at RBSBIAR Locations

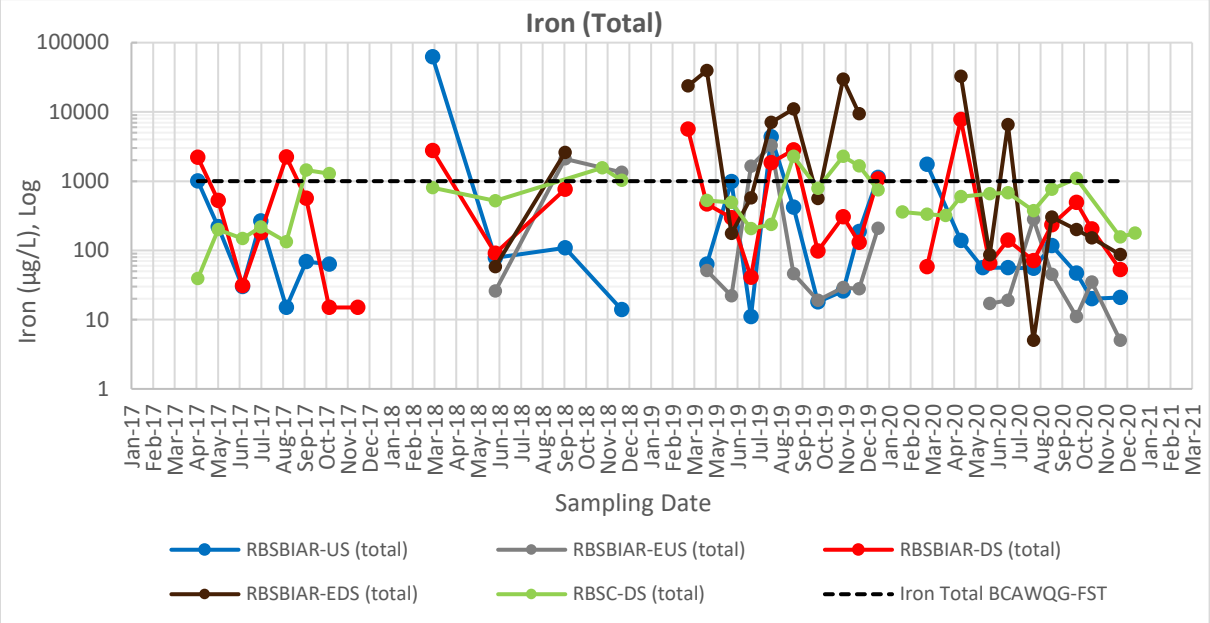


Figure 24b: Dissolved Iron at RBSBIAR Locations

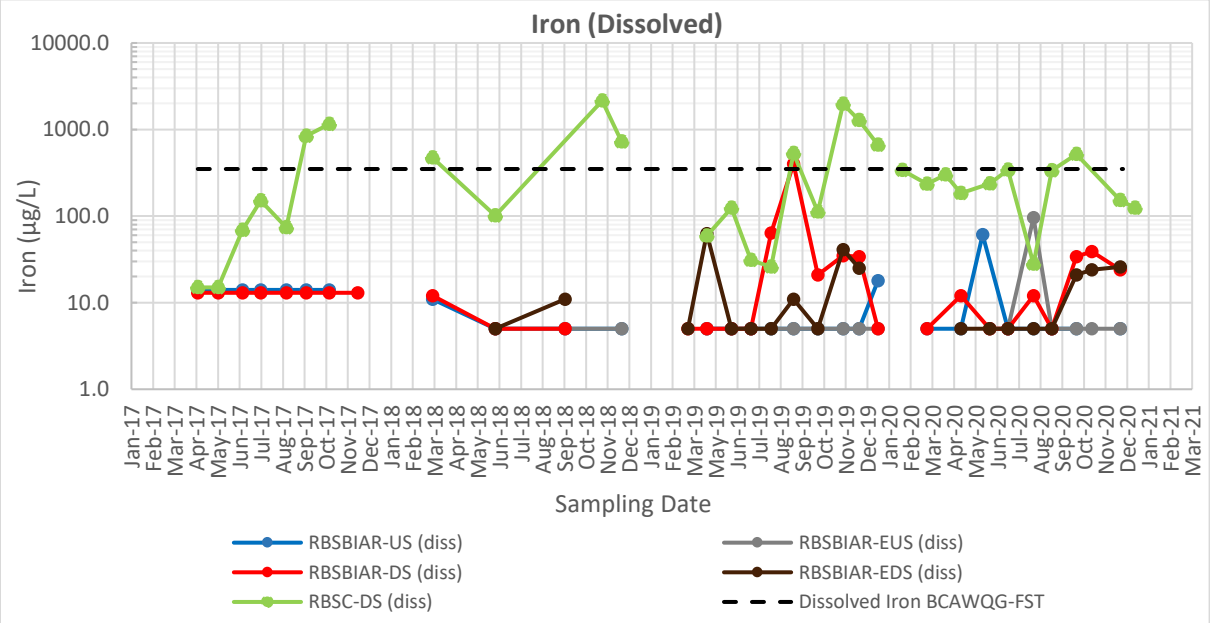


Figure 25a: Total Arsenic at RBSBIAR Locations

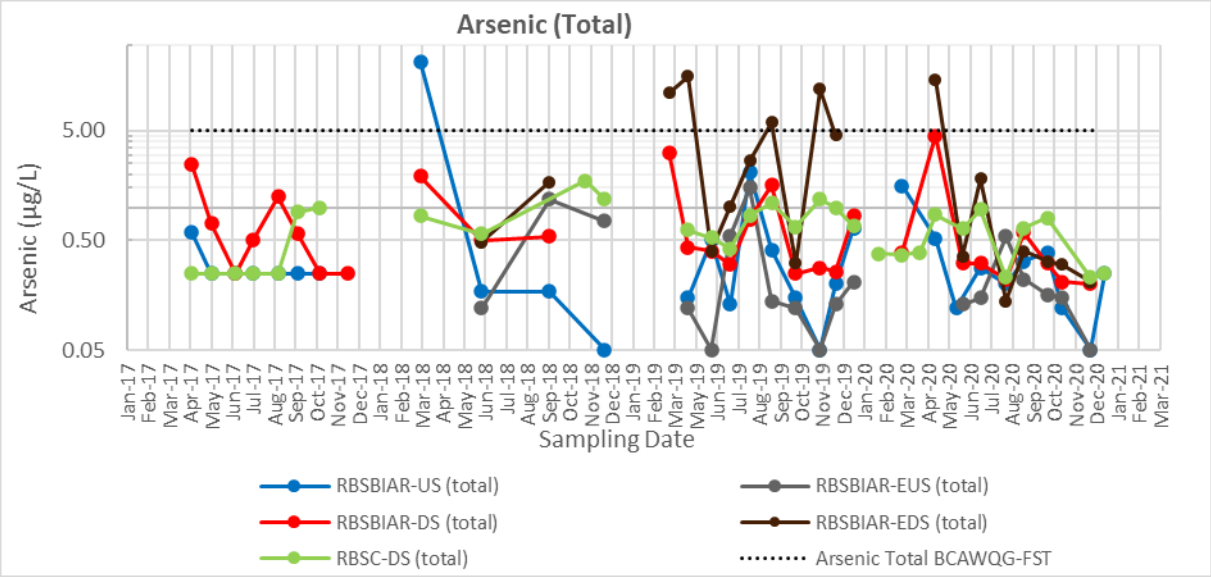


Figure 25b: Dissolved Arsenic at RBSBIAR Locations

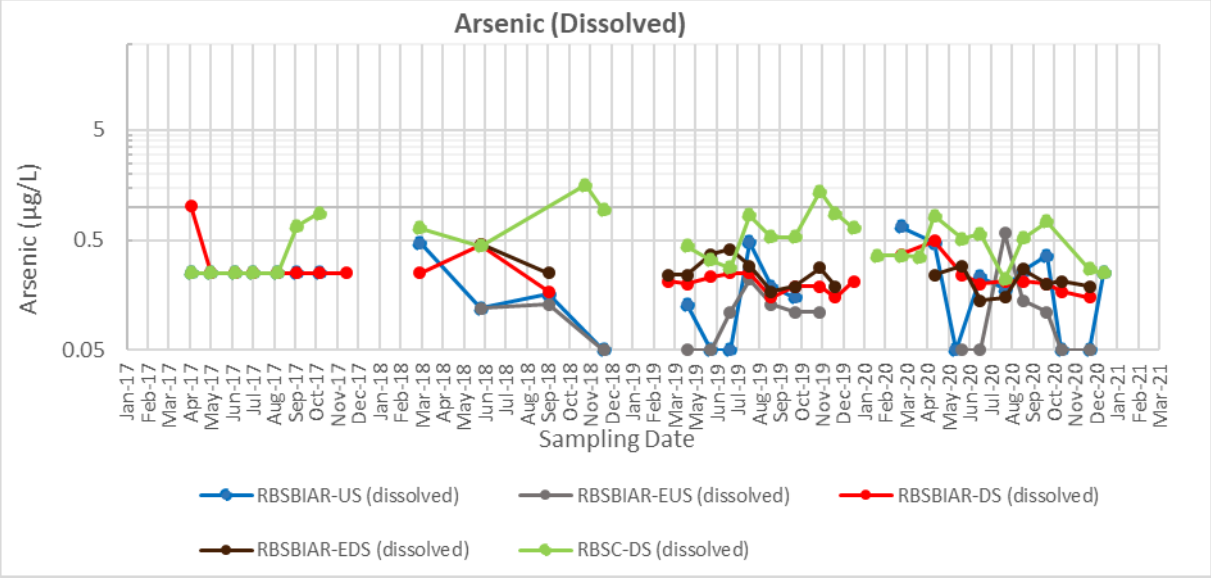


Figure 26a: Total Cadmium at RBSBIAR Locations

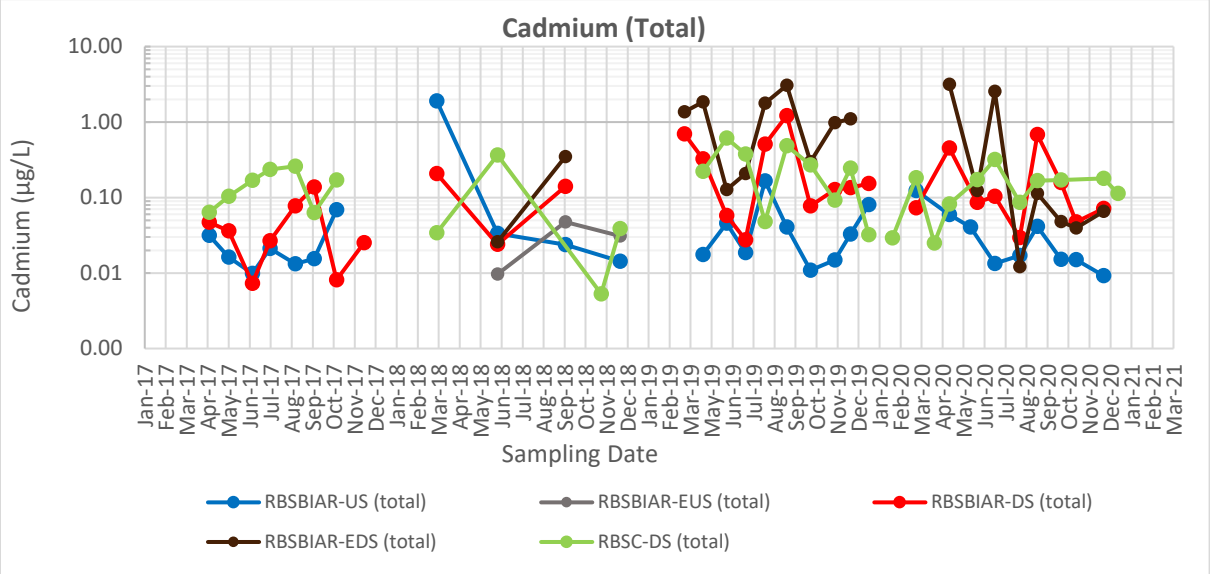


Figure 26b: Dissolved Cadmium at RBSBIAR Locations

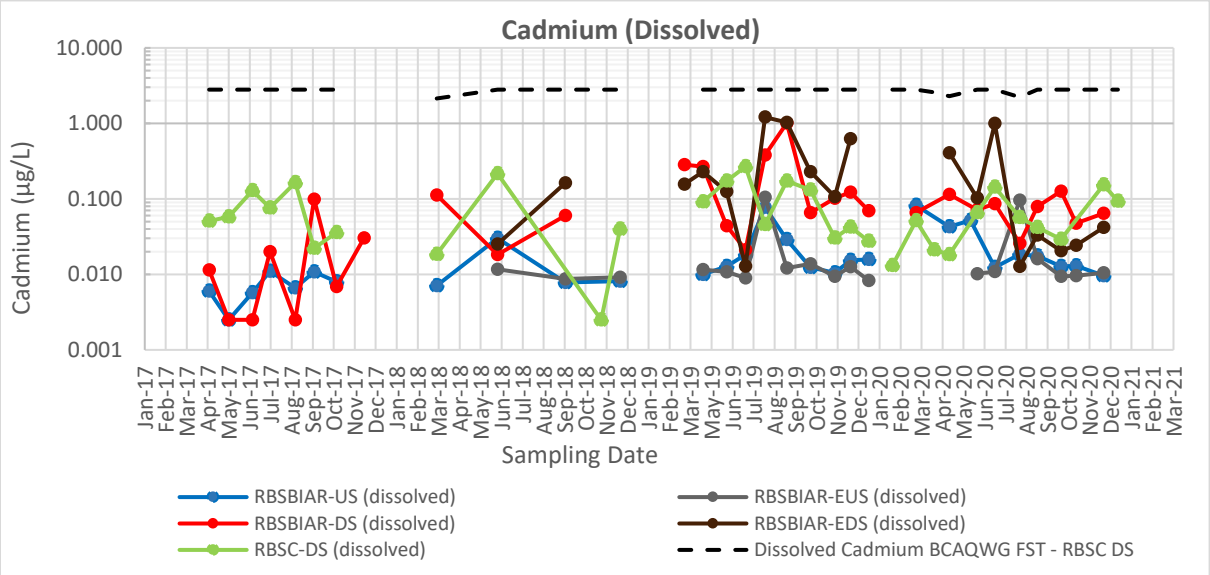


Figure 27a: Total Cobalt at RBSBIAR Locations

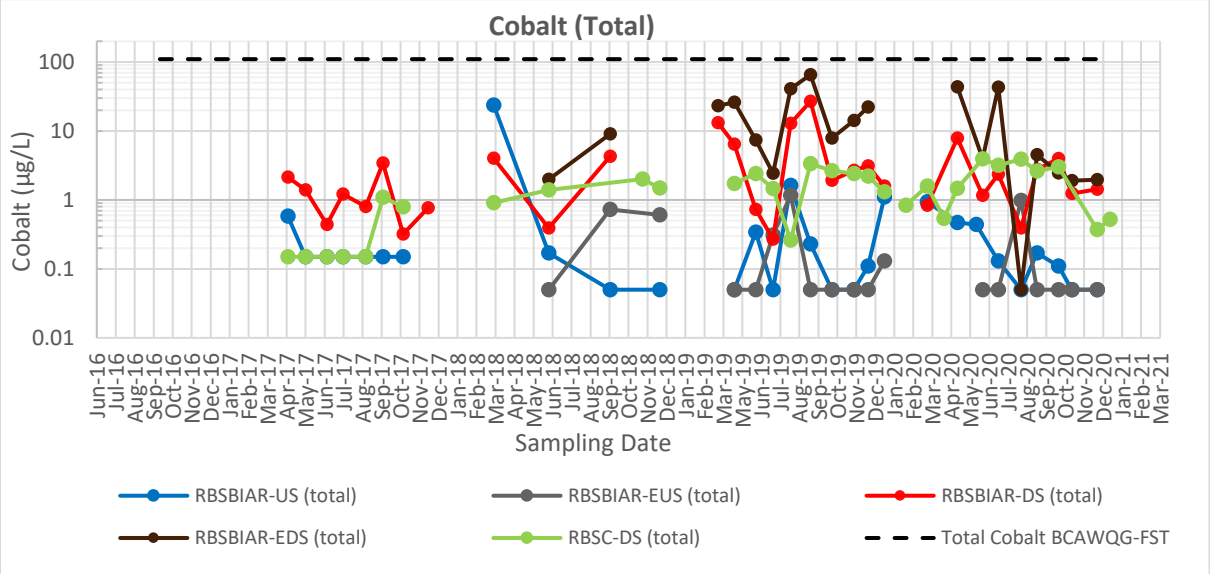


Figure 27b: Dissolved Cobalt at RBSBIAR Locations

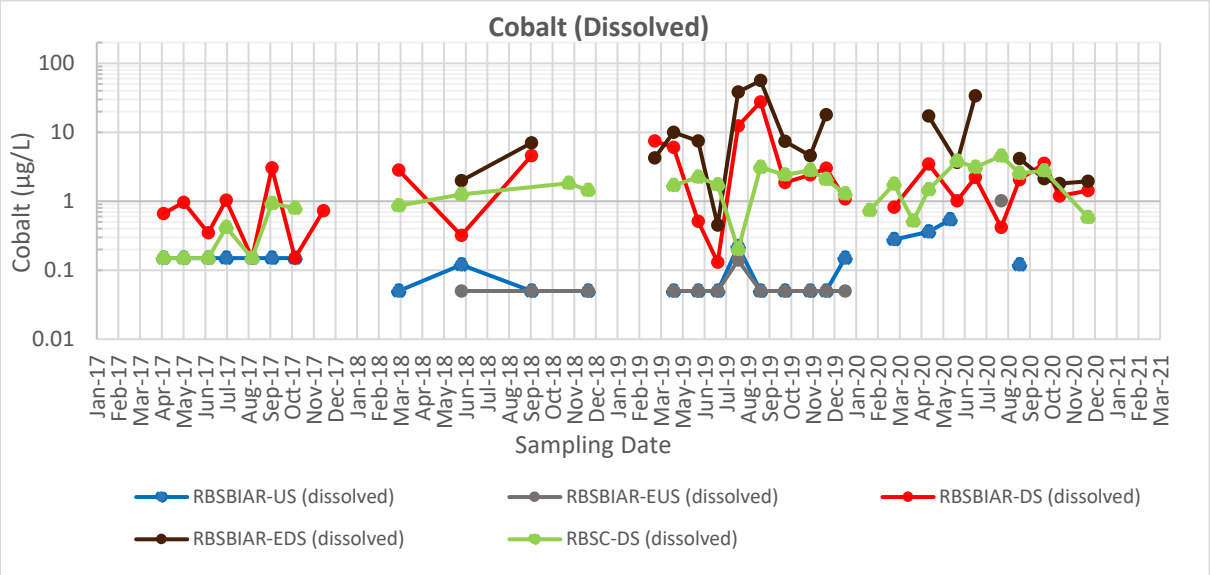


Figure 28a: Total Copper at RBSBIAR Locations

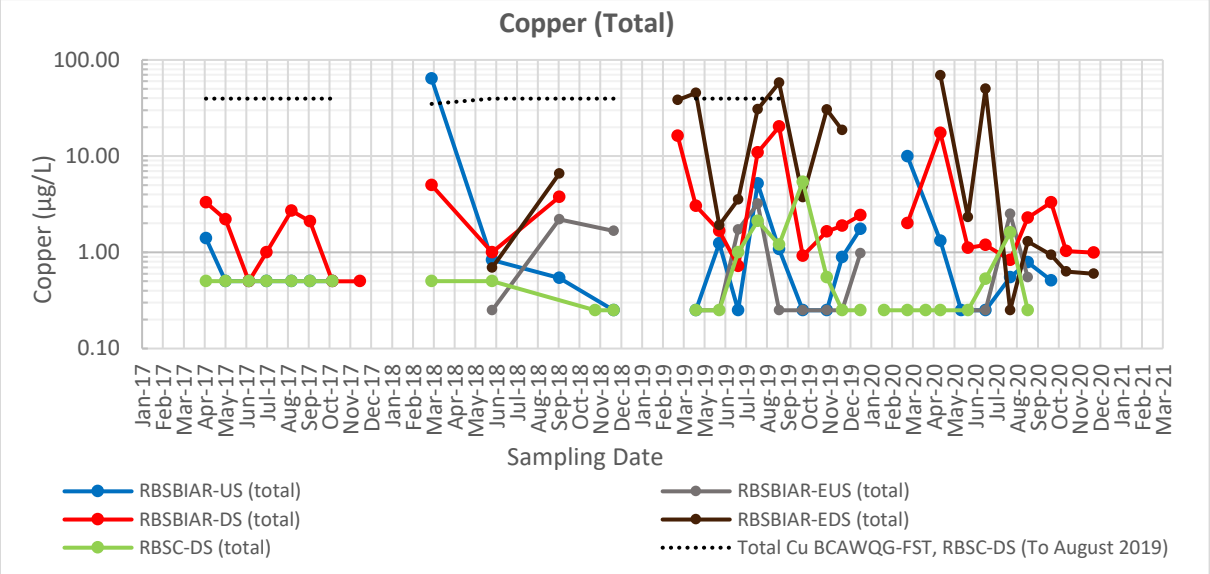


Figure 28b: Dissolved Copper at RBSBIAR Locations

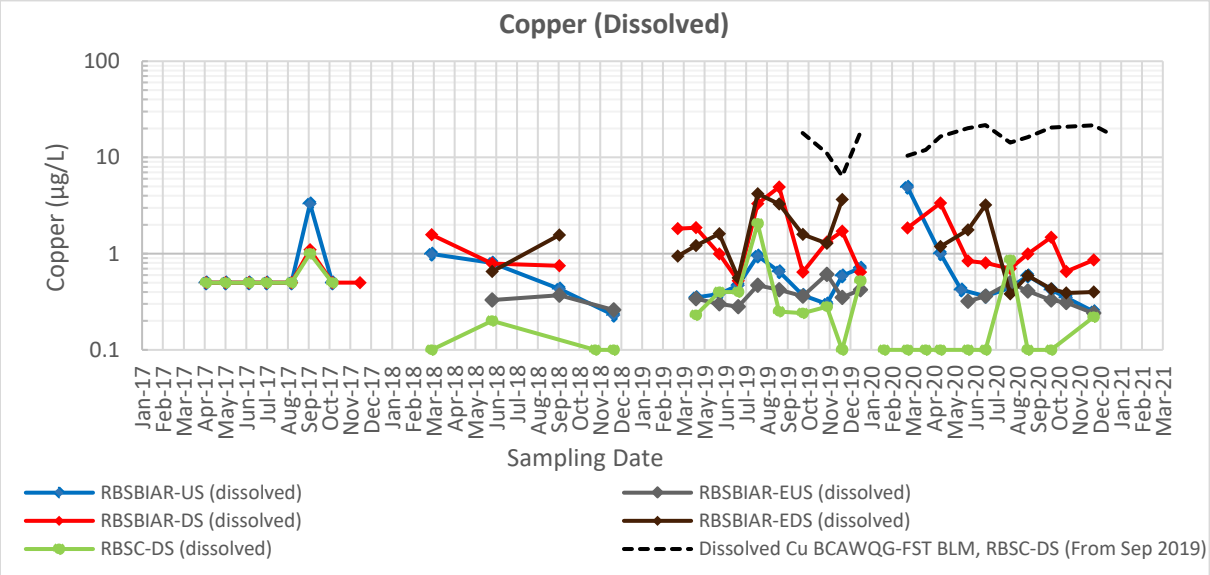


Figure 29a: Total Zinc at RBSBIAR Locations

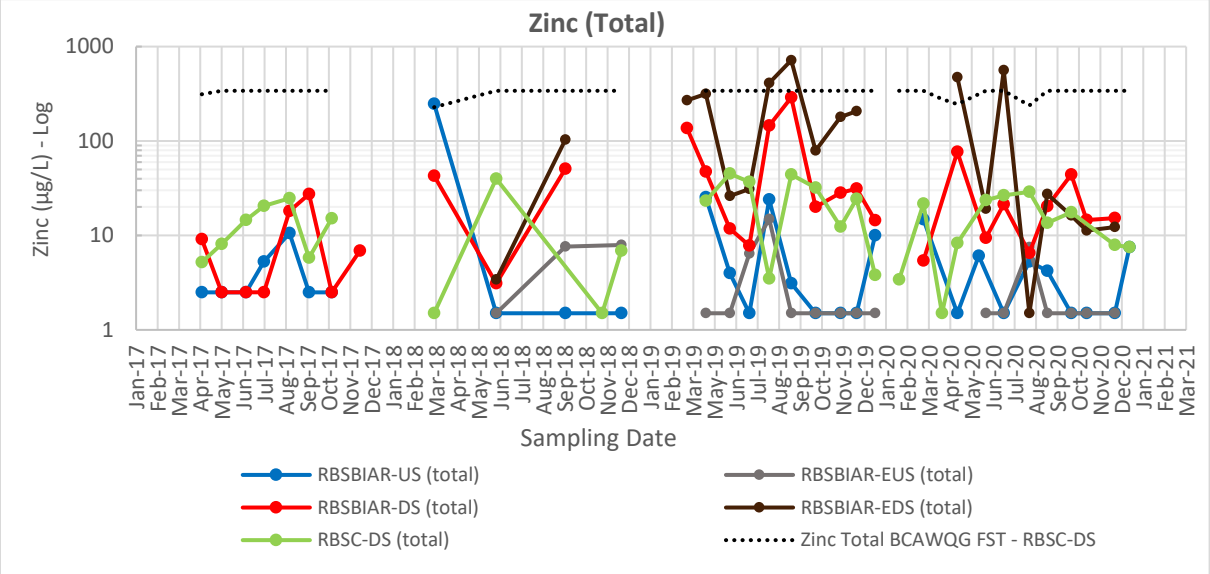


Figure 29b: Dissolved Zinc at RBSBIAR Locations

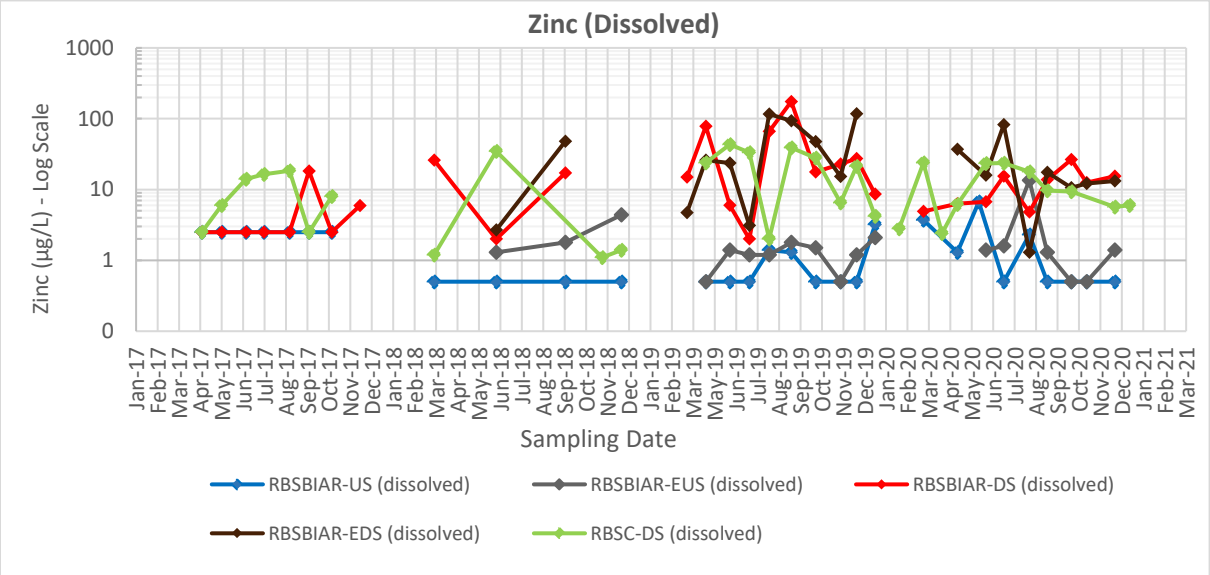


Figure 30a: RBSBIAR West Ditch Downstream (DS), Upstream (US) Ratio - Total Zinc

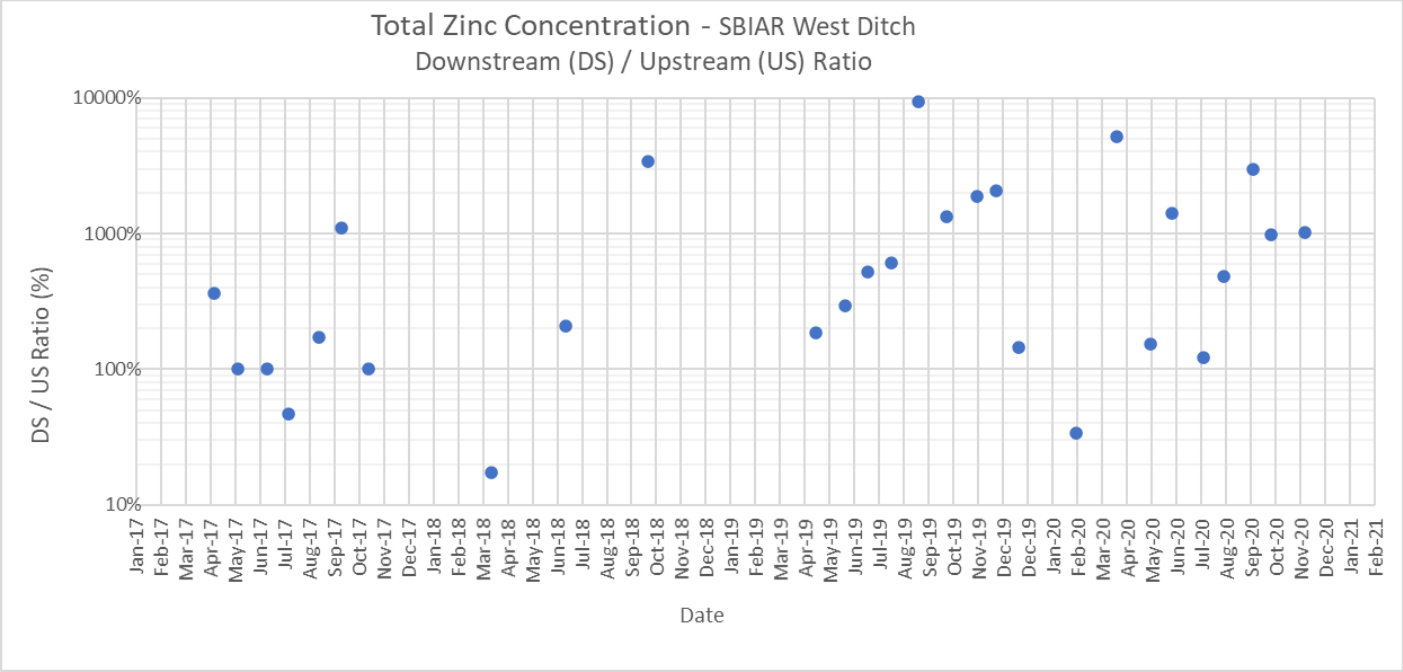


Figure 30b: RBSBIAR East Ditch Downstream (DS), Upstream (US) Ratio - Total Zinc

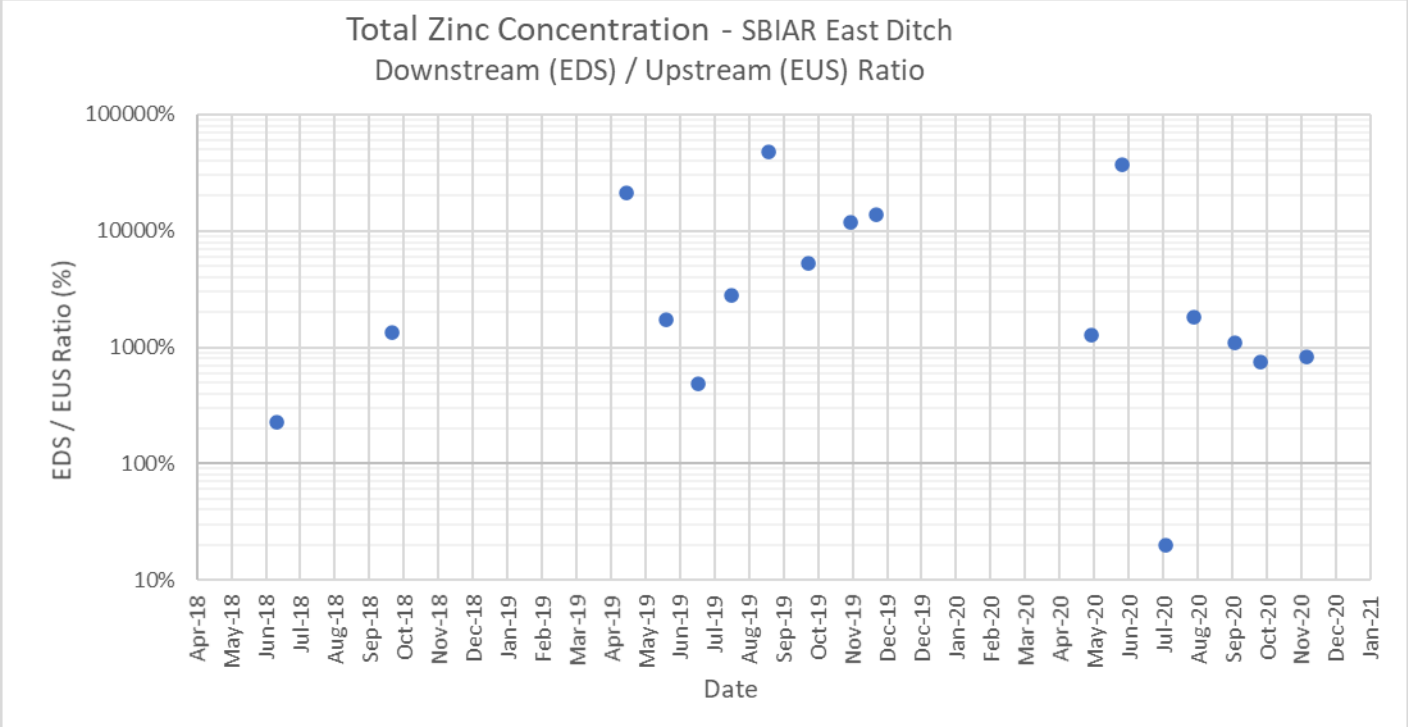


Figure 31: pH at L3 Creek Locations

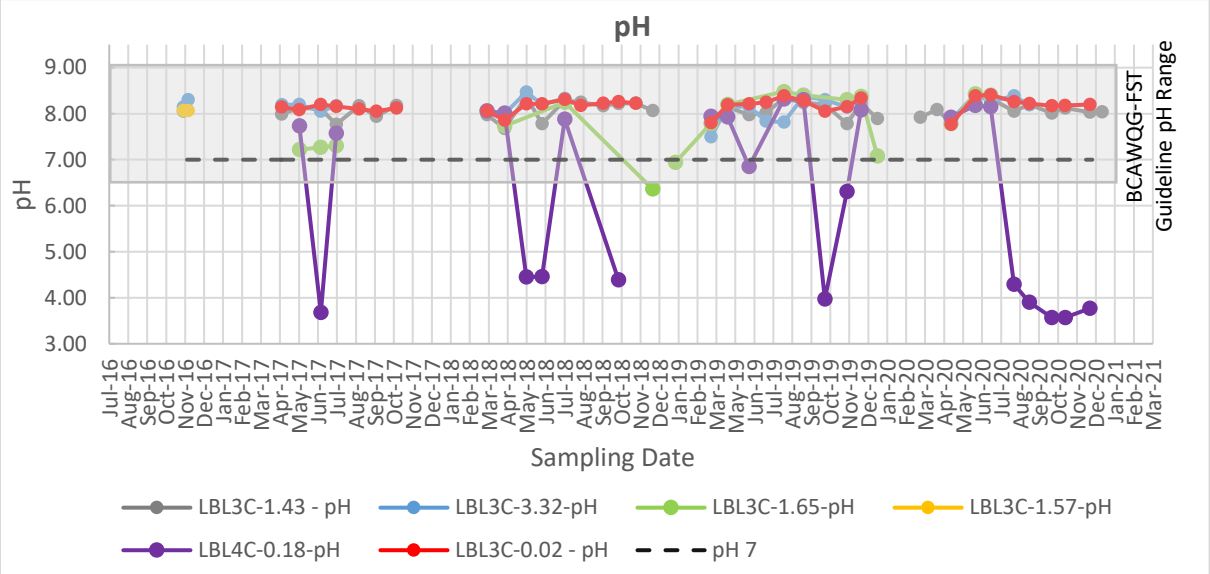


Figure 32: Total Alkalinity at L3 Creek Locations

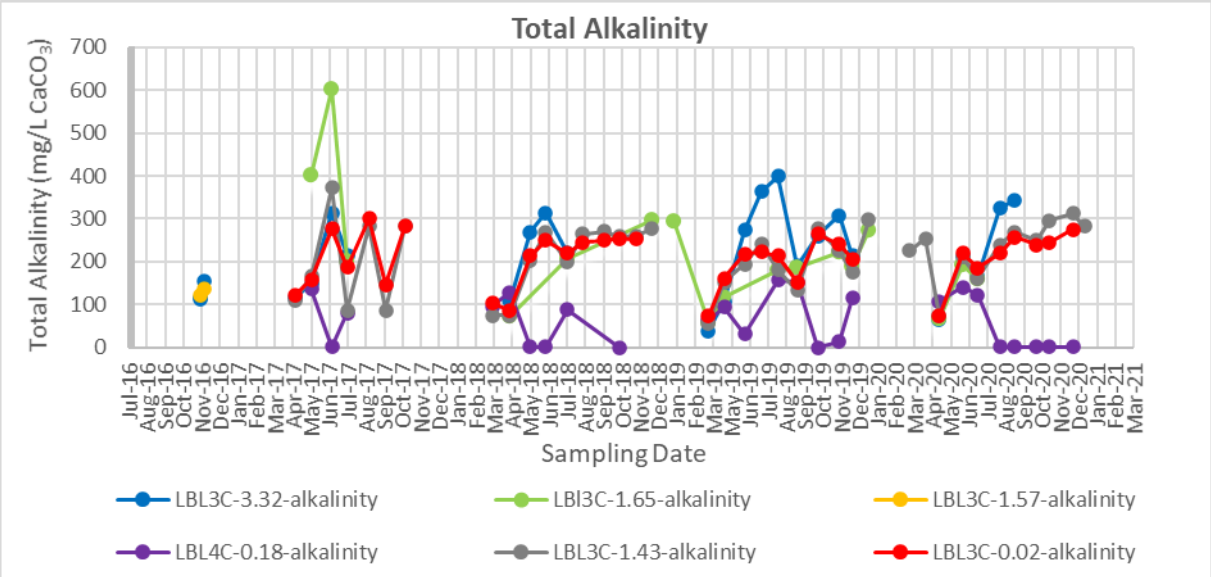


Figure 33: Acidity at L3 Creek Locations

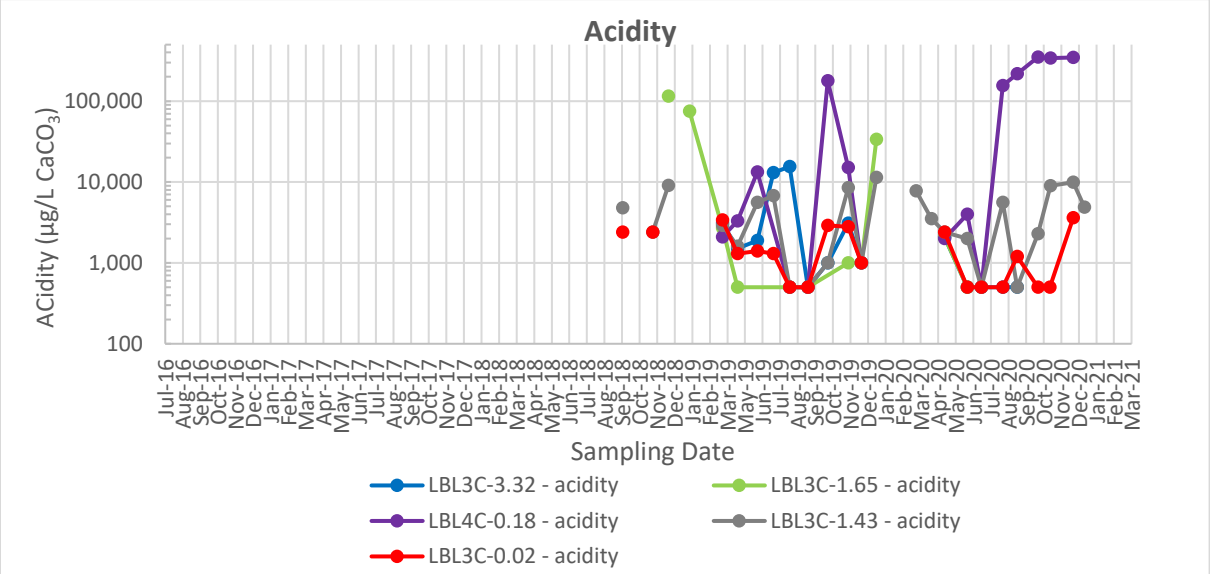


Figure 34: Sulphate at L3 Creek Locations

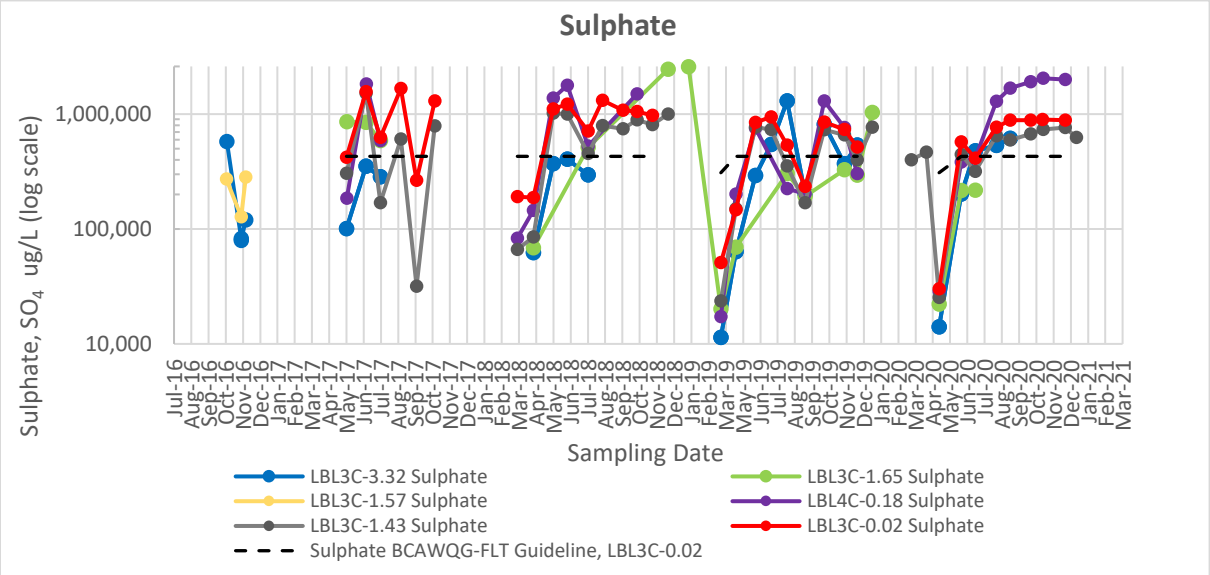


Figure 35a: Total Suspended Solids at L3 Creek Locations

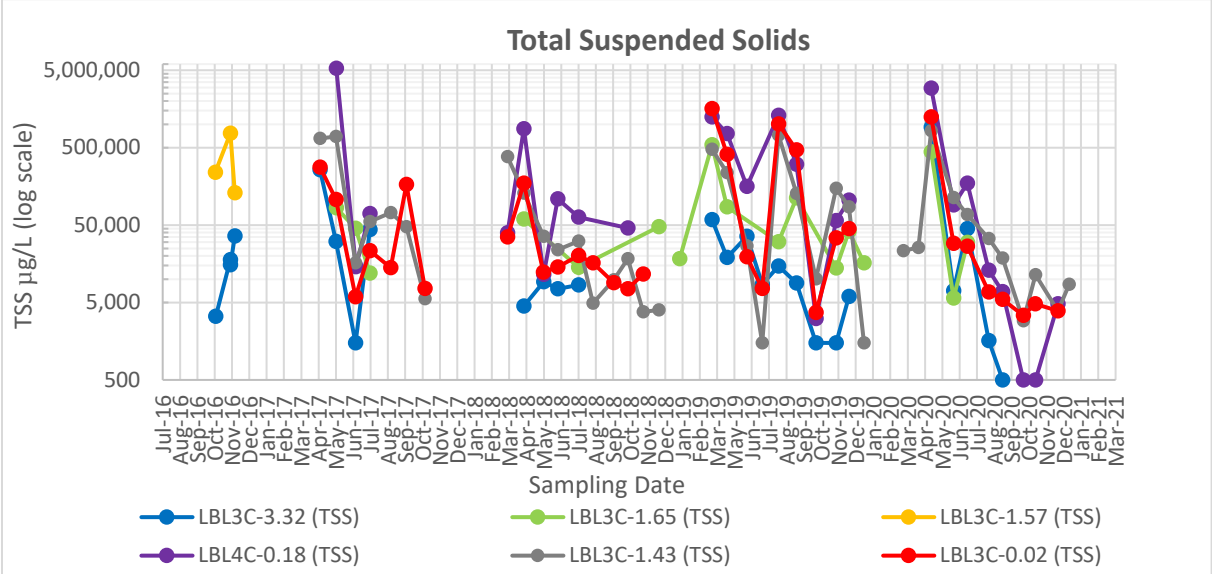


Figure 35b: Total Dissolved Solids at L3 Creek Locations

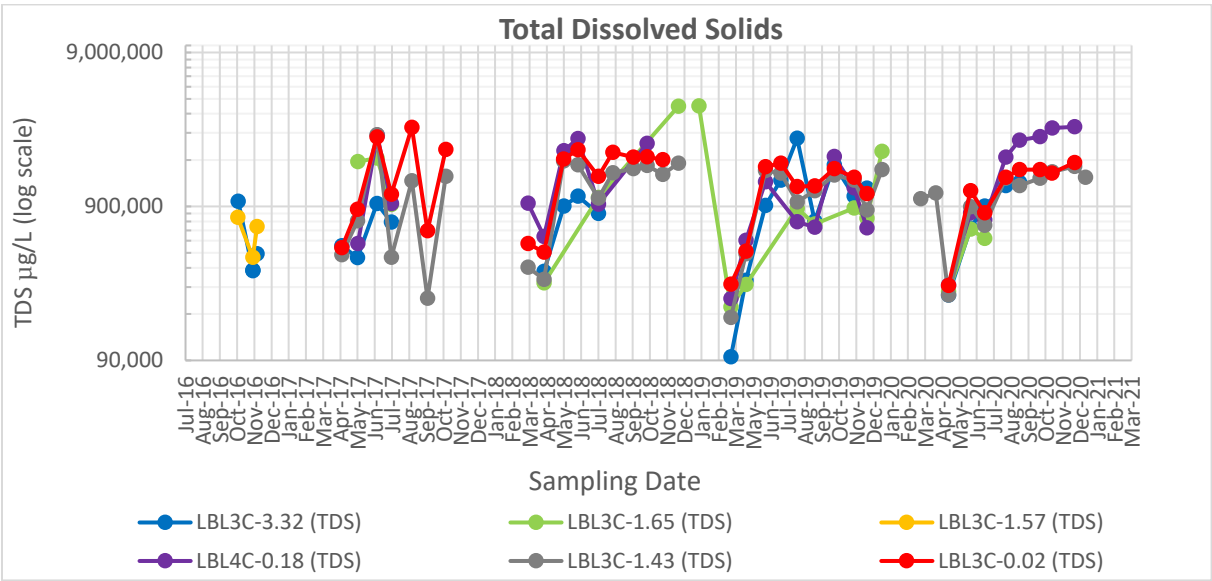


Figure 36a: Total Aluminum at L3 Creek Locations

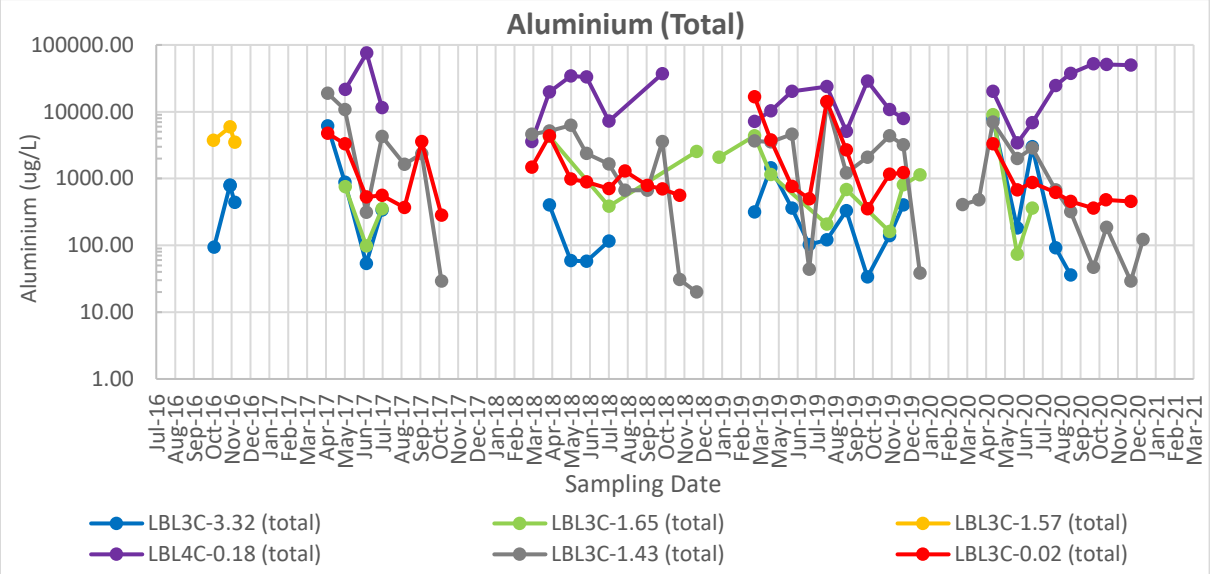


Figure 36b: Dissolved Aluminum at L3 Creek Locations

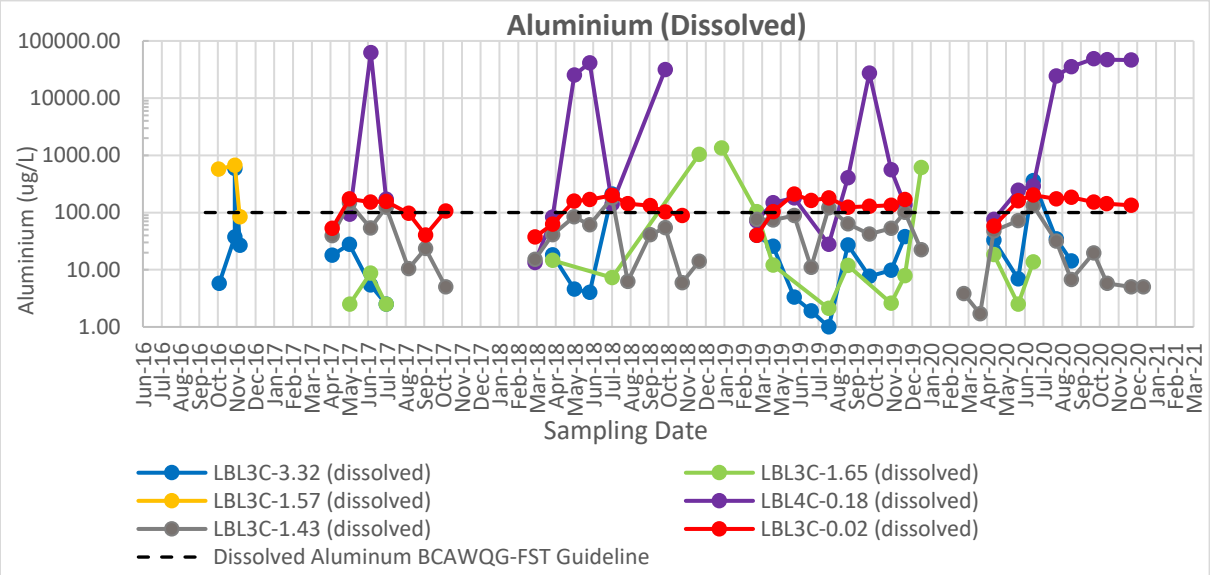


Figure 37a: Total Iron at L3 Creek Locations

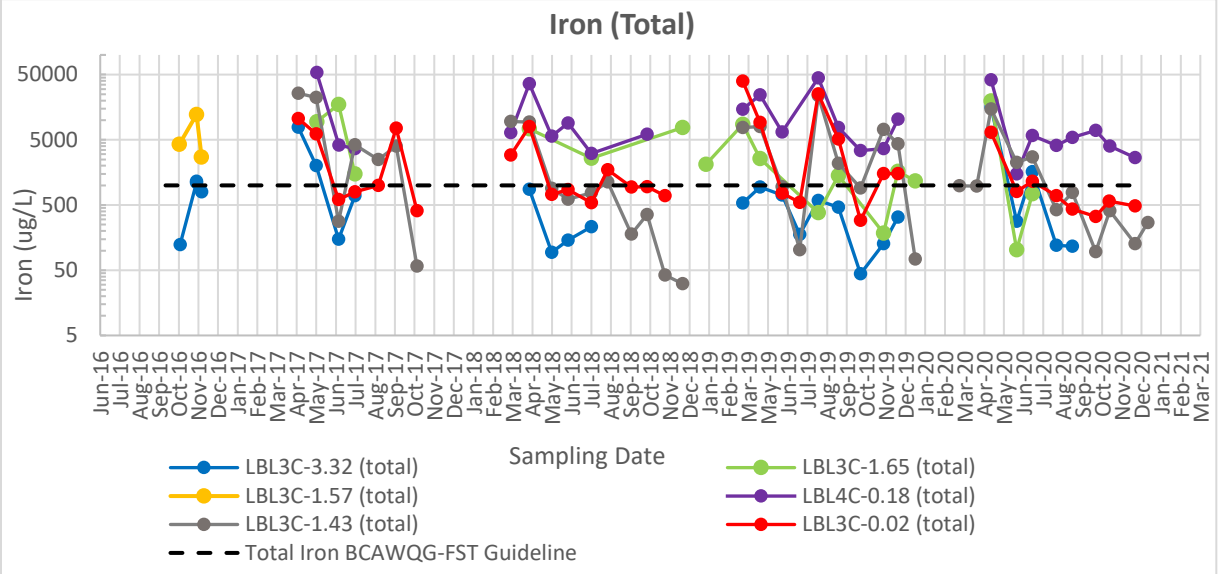


Figure 37b: Dissolved Iron at L3 Creek Locations

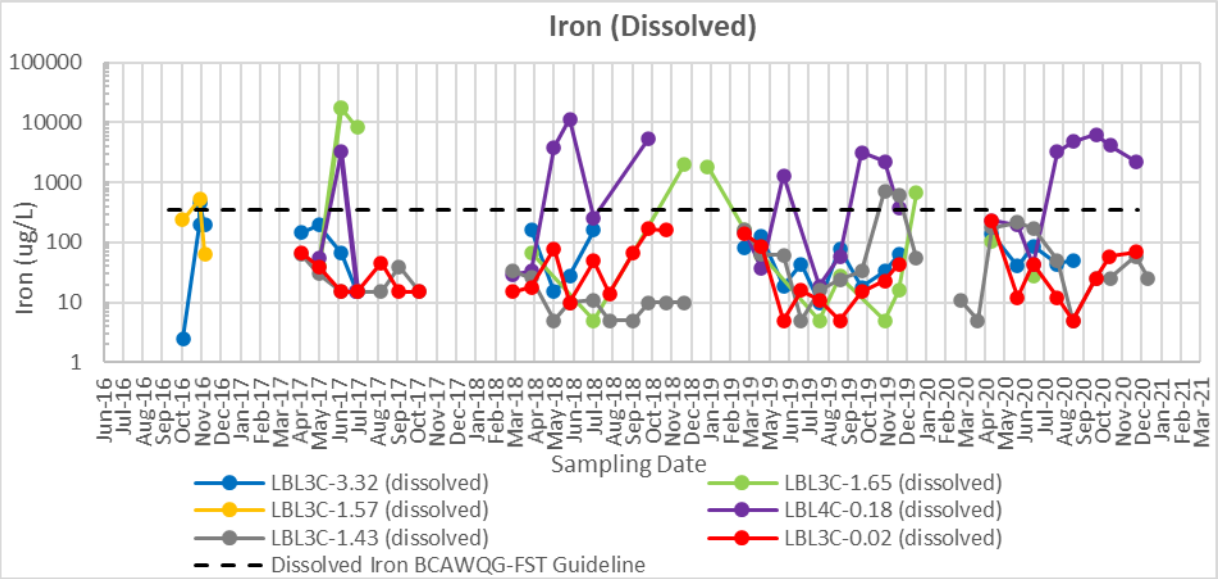


Figure 38a: Total Arsenic at L3 Creek Locations

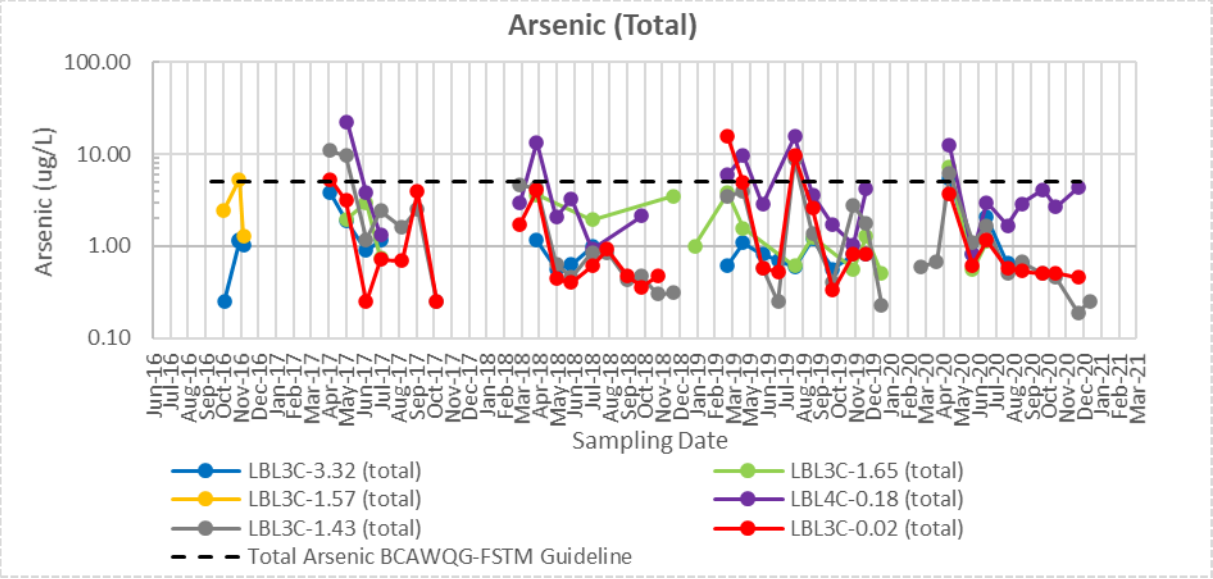


Figure 38b: Dissolved Arsenic at L3 Creek Locations

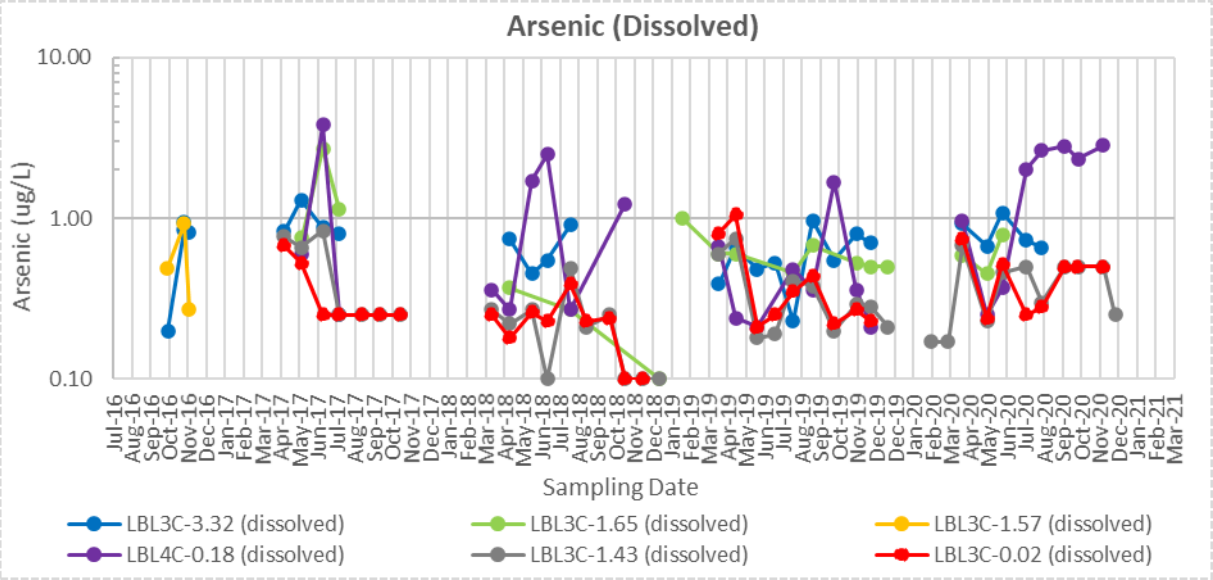


Figure 39a: Total Cadmium at L3 Creek Locations

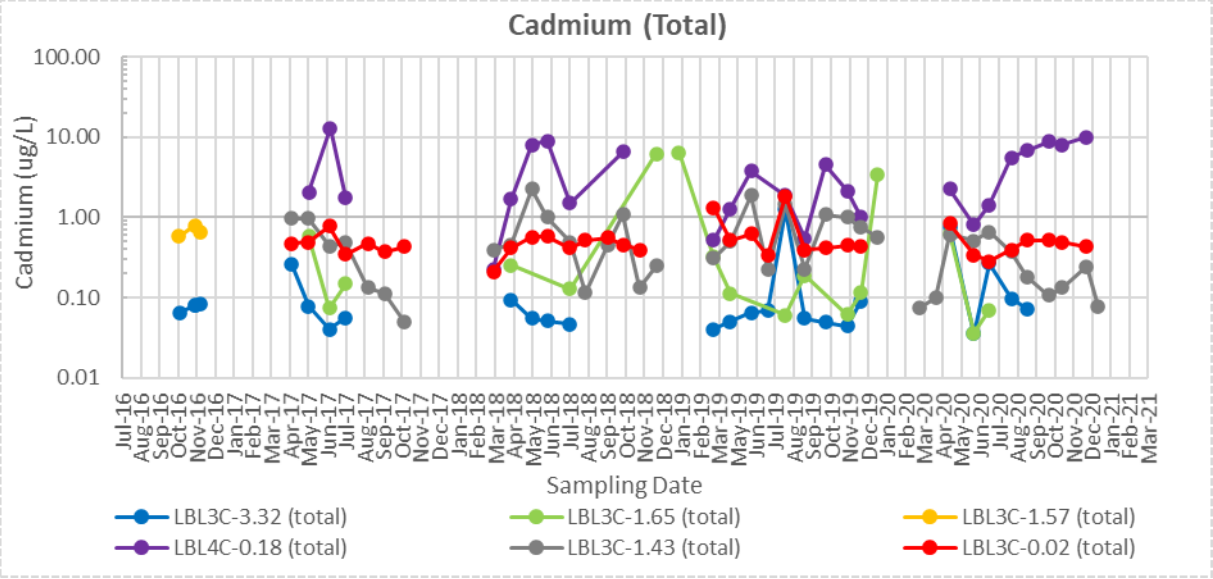


Figure 39b: Dissolved Cadmium at L3 Creek Locations

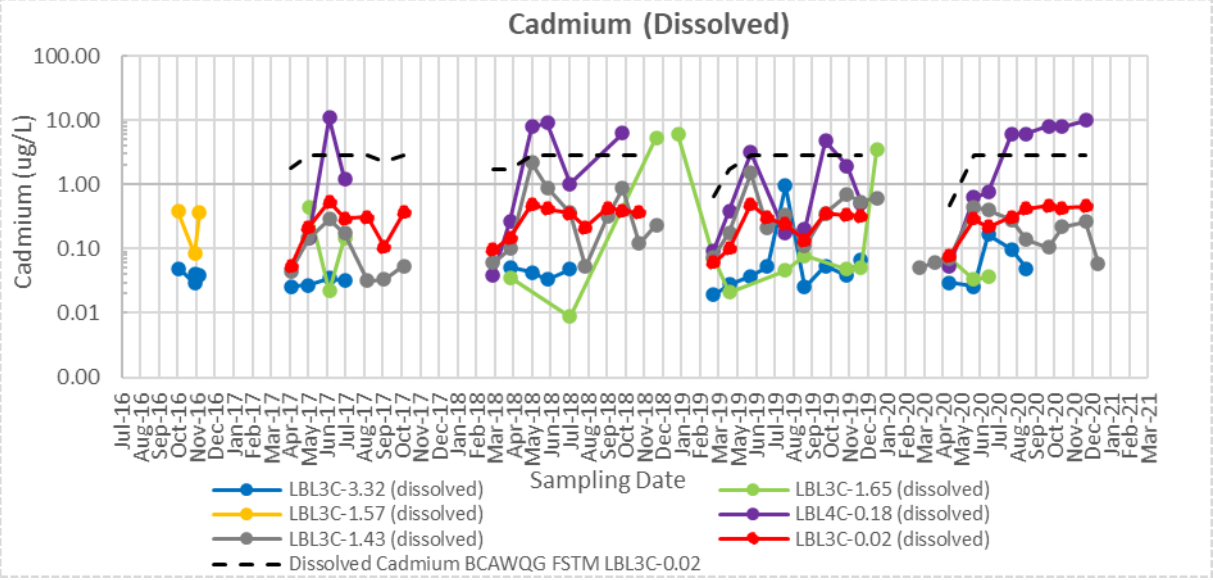


Figure 40a: Total Cobalt at L3 Creek Locations

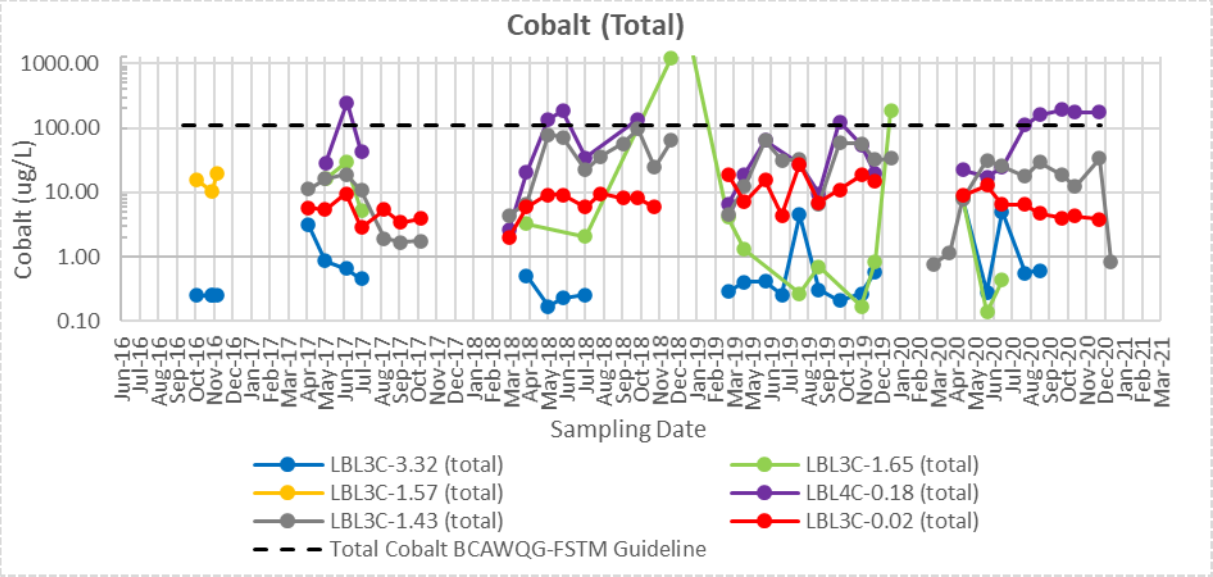


Figure 40b: Dissolved Cobalt at L3 Creek Locations

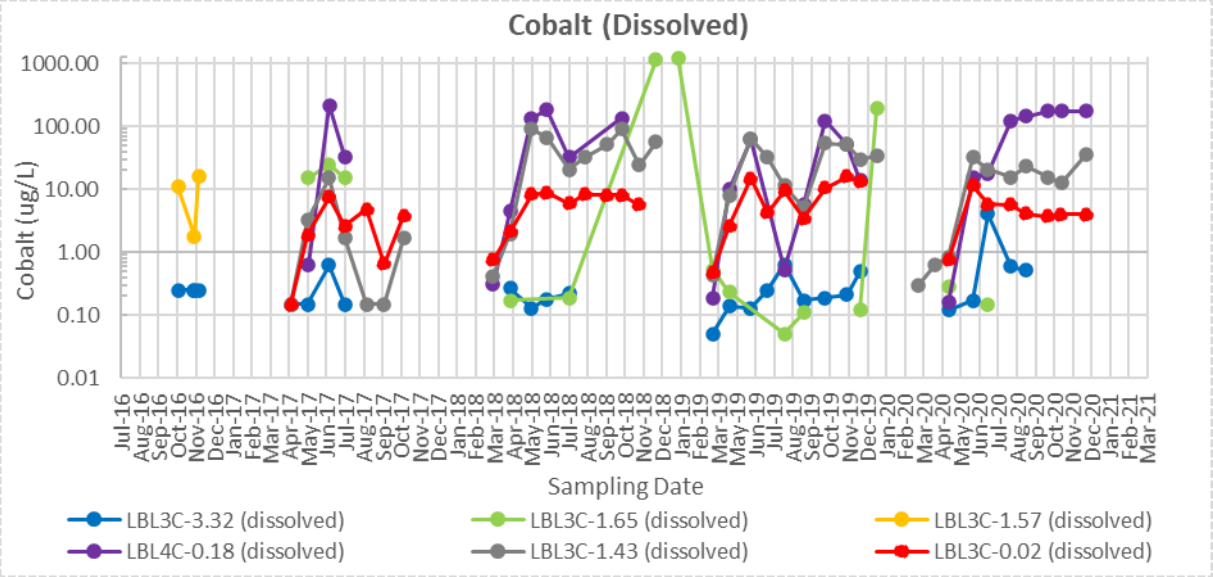


Figure 41a: Total Copper at L3 Creek Locations

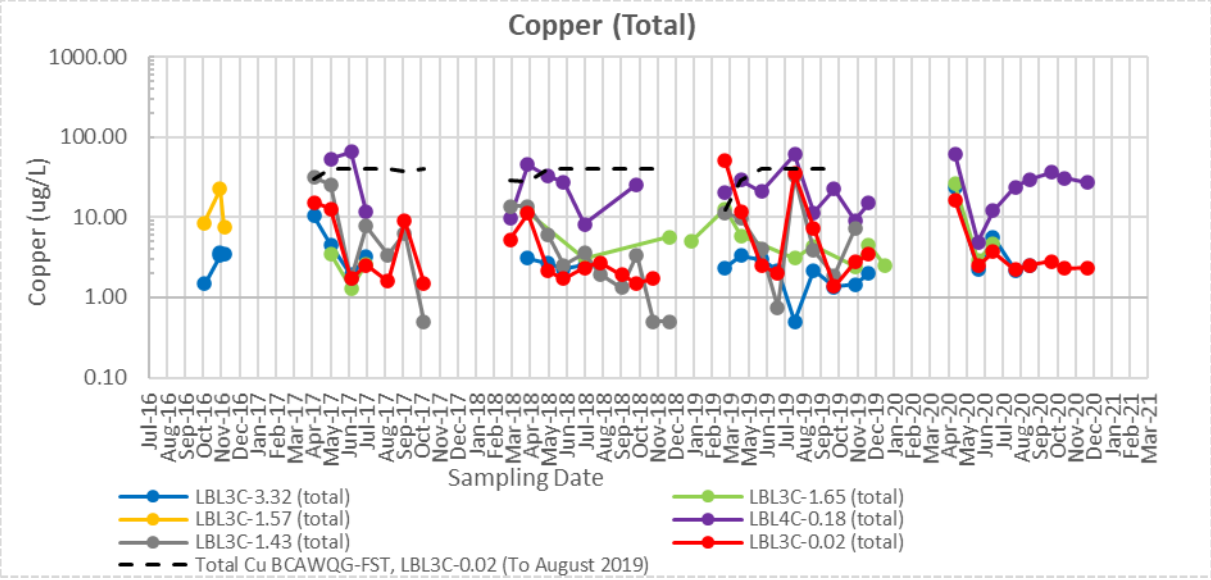


Figure 41b: Dissolved Copper at L3 Creek Locations

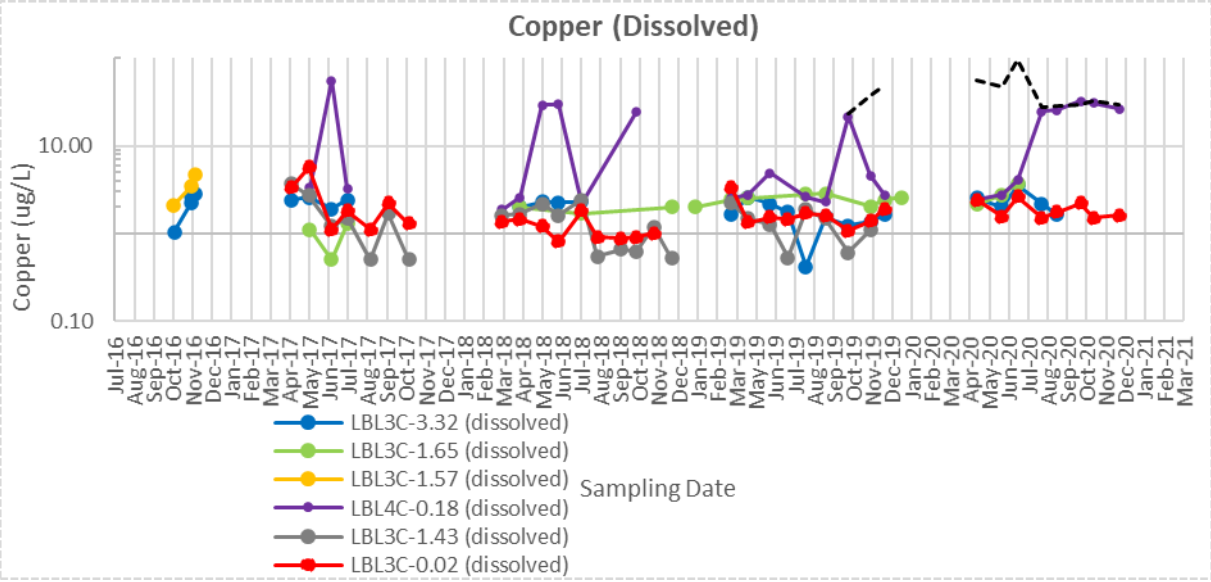


Figure 42a: Total Zinc at L3 Creek Locations

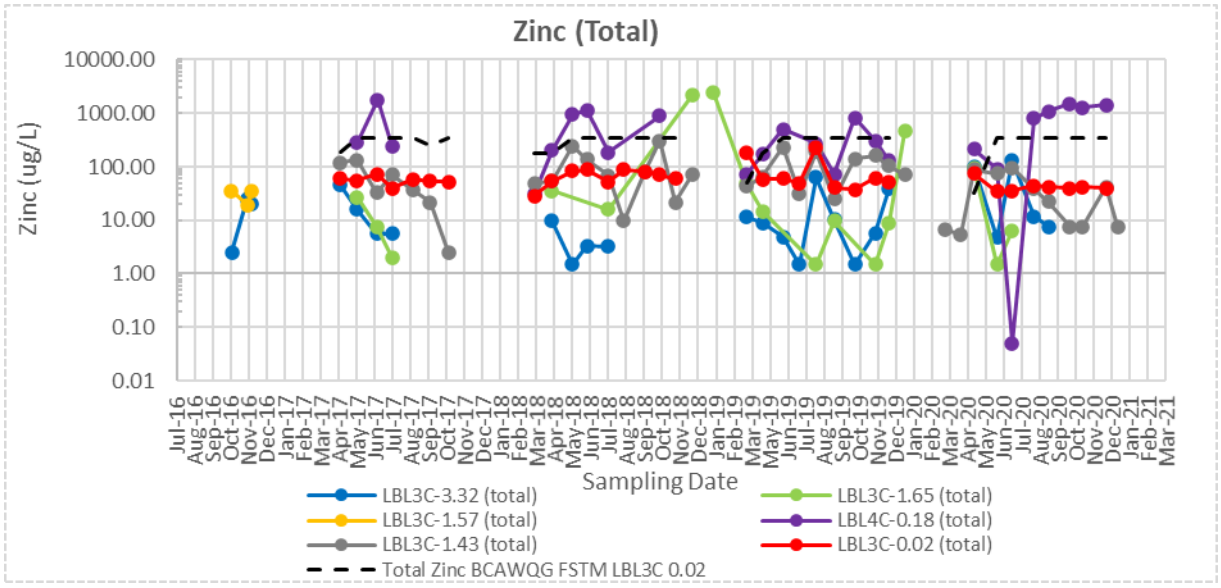
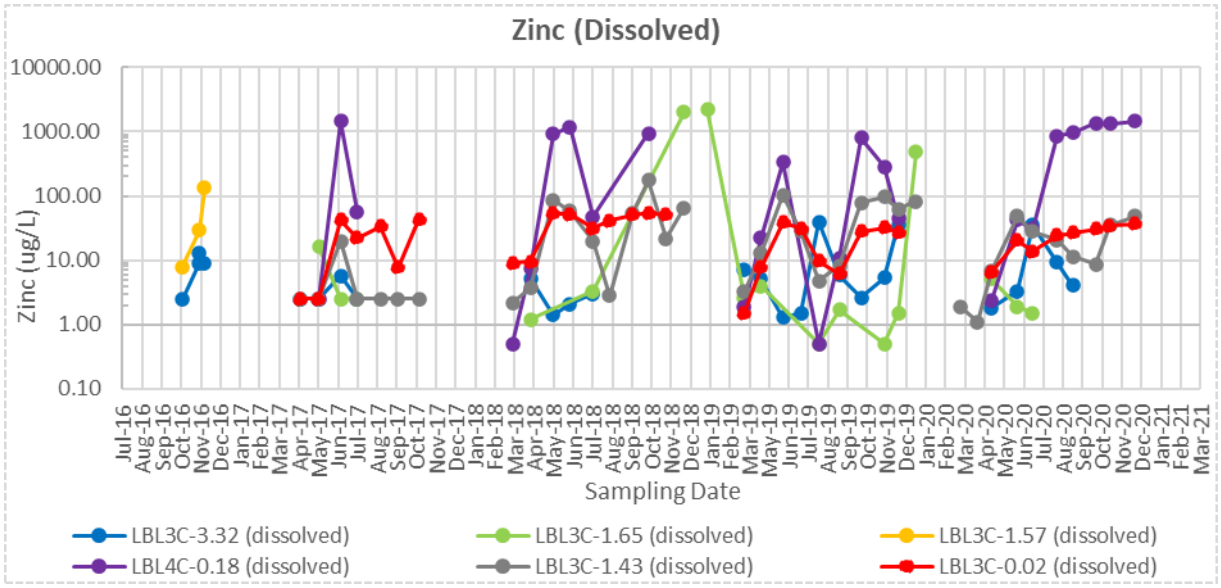


Figure 42b: Dissolved Zinc at L3 Creek Locations



TABLES

Table 1: Water Sampling Locations and In Situ and Lab Events

		Routine Memo Number:			1				2		3		4		5		6		7		8				9				10				11			
		Sampling Event Number:			1		2		3		4		5		6		7		8		9		10		11		12		13		14		15		16	
Catchment	Sample Site	UTM Coordinates Zone 10 (NAD83)		Elevation	2020-Jan-23		2020-Feb-27		2020-Mar-25		2020-Apr-16/17		2020-May-27/28		2020-Jun-21/22		2020-Jul-29/30		2020-Aug-23/24		2020-Sep-28/30		8-Oct-20		2020-Oct-20/21		20-Nov-20		30-Nov-20		4-Dec-20		14-Dec-20		2020-Dec-20-21	
		Easting	Northing		In-Situ	Lab	In-Situ	Lab	In-Situ	Lab	In-Situ	Lab	In-Situ	Lab	In-Situ	Lab	In-Situ	Lab	In-Situ	Lab	In-Situ	Lab	In-Situ	Lab	In-Situ	Lab	In-Situ	Lab	In-Situ	Lab	In-Situ	Lab	In-Situ	Lab	In-Situ	Lab
Right Bank - South Bank Initial Access Road [1]	RBSBIAR-US	630327	6228397	468.0			✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓			✓	✓					✓	✓
	RBSBIAR-DS	630320	6228645	445.2			✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓			✓	✓						
	RBSBIAR-EUS	630376	6228399	464.6	✓		✓				✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓			✓	✓					✓	
	RBSBIAR-EDS	630370	6228635	437.4							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓			✓	✓						
	RBSC-DS	630475	6228672	418.6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							✓	✓					✓	✓
Left Bank River Road [1]	LBRR-DD	632853	6229862	422.0			✓	✓			✓	✓									✓	✓														
	LBRR-EDP	632715	6229832	416.4			✓	✓	✓	✓	✓	✓			✓	✓	✓	✓			✓	✓														
	LBRR-LC	632856	6229899	427.2			✓				✓	✓																								
	LBRR-UC	633018	6230253	463.2							✓		✓		✓		✓	✓	✓	✓	✓				✓											
	LBRR-12+430	632857	6229885	426.0																																
	LBRR-12+500	632914	6229921	432.0			✓	✓	✓	✓	✓	✓			✓	✓					✓	✓			✓	✓										
	LBRR-12+600	632948	6229983	436.0			✓		✓						✓						✓															
	LBRR-12+700	632992	6230078	442.8			✓		✓						✓						✓															
	LBRR-12+810	633039	6230195	454.0			✓		✓				✓		✓		✓		✓		✓				✓											
	LBRR-12+920	633000	6230282	463.0			✓						✓		✓		✓		✓		✓				✓				✓							
	RR8	632262	6229624	412.0																																
	RR9	632460	6229680	412.5			✓	✓																												
L3 Creek [1]	LBL3C-0.02	632767	6229860	418.0							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓			✓	✓						
	LBL3C-1.43	631728	6230210	486.6			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓			✓	✓					✓	✓
	LBL3C-1.65	631504	6230417	493.0							✓	✓	✓	✓	✓	✓																				
	LBL3C-3.32	630248	6231262	579.0							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓										
L4 Creek [1]	LBL4C-0.18	631524	6230578	507.0							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓			✓	✓						
Left Bank Debris Boom [1, 2]	LBP Pond	628227	6231885	-																			✓	✓			✓	✓								
	Channel E	628311	6231511	-																			✓	✓												
	Channel W	-	-	-																																
L2 Powerhouse [1, 2]	L2 DS	629607	6229185	-																			✓	✓			✓	✓			✓	✓	✓	✓		
	L2 US	629701	6229279	-																			✓	✓												

[1] Monthly Sampling.

[2] New Sample Location, 2020

Note: In any months of the calendar year not listed (e.g. January, February, and December), frozen/dry conditions persisted at all sampling locations (verified by field staff).

* Routine Memos can include 1-2 sampling events; shading pattern of columns represents each of the 11 routine memos prepared in 2020

* cells blank with " - " indicates no data received to date.

Table 2: Daily and 7-Day Mean Temperature and Precipitation

Date	Time	Precipitation[1]		Temperature[1]			Summary
Sample Event Date Bolded	**Time Period**	**Precipitation Event**	**Total (mm)**	**Mean (°C)**	**Minimum (°C)**	**Maximum (°C)**	**24 Hr and 7 Day Precipitation**
January 16-22, 2020	7 days	January 16, 17, 19, 21	3.62	-19.3	-32.2	-0.9	Minimal precipitation (1.32 mm) in preceding 7 days
January 22, 2020	24 hrs.	none	0.00	-9.3	-11.4	-7.5	No precipitation
January 23, 2020	**24 hrs.**	**none**	**0.00**	**-7.7**	**-11.4**	**-4.9**	**No precipitation**
February 20-26, 2020	7 days	February 25	0.62	-0.6	-12	6.6	Minimal precipitation (0.62 mm) in preceding 7 days
February 26, 2020	24 hrs.	none	0.00	3.3	0.2	6.6	No precipitation
February 27, 2020	**24 hrs.**	**none**	**0.00**	**5.3**	**3.4**	**7.6**	**No precipitation**
March 18-24, 2020	7 days	March 22, 23	2.42	-4.2	-13.2	5.3	Minimal precipitation (2.42 mm) in preceding 7 days
March 24, 2020	24 hrs.	none	0.00	-8.2	-13.2	-3.2	No precipitation
March 25, 2020	**24 hrs.**	**none**	**0.00**	**-1.9**	**-12.2**	**5.6**	**No precipitation**
April 9-15, 2020	7 days	April 14	0.52	3.0	-6.8	11.2	Minimal precipitation (0.52 mm) in preceding 7 days
April 15, 2020	24 hrs.	none	0.00	6.0	2.8	10.4	No precipitation
April 16, 2020	**24 hrs.**	**none**	**0.00**	**9.6**	**-2.0**	**18.4**	**No precipitation**
April 17, 2020	**24 hrs.**	**none**	**0.00**	**7.0**	**0.6**	**11.4**	**No precipitation**
May 20-26, 2020	7 days	May 20, 21, 22, 23	23.39	11.5	4.9	20.5	Moderate Precipitation (23.39 mm) in preceding 7 days
May 26, 2020	24 hrs.	May 26	0.70	9.9	6.8	13.9	Minimal precipitation (0.70 mm) in previous 24 hrs
May 27, 2020	**24 hrs.**	**May 27**	**0.00**	**13.7**	**7.3**	**19.5**	**No precipitation**
May 28, 2020	**24 hrs.**	**May 28**	**0.00**	**14.4**	**6.7**	**20.1**	**No precipitation**
June 14-20, 2020	7 days	June 14, 15	61.11	15.8	8.7	26.8	Significant Precipitation (61.11 mm) in preceeding 7 days
June 20, 2020	24 hrs.	none	0.00	19.0	15.5	22.1	No Precipitation
June 21, 2020	**24 hrs.**	**none**	**0.00**	**18.3**	**14.7**	**21.9**	**No Precipitation**
June 22, 2020	**24 hrs.**	**none**	**0.00**	**16.0**	**12.5**	**18.8**	**No Precipitation**
July 22-28, 2020	7 days	none	0.00	18.2	10.4	29.7	No precipitation in preceding 7 days
July 28, 2020	24 hrs.	none	0.00	18.8	14.3	22.9	No Precipitation
July 29, 2020	**24 hrs.**	**none**	**0.00**	**18.7**	**12.3**	**24.3**	**No Precipitation**
July 30, 2020	**24 hrs.**	**none**	**0.00**	**19.8**	**13.4**	**25.1**	**No Precipitation**
August 16-22, 2020	7 days	August 20, 21	20.54	17.1	10.8	30.7	Moderate Precipitation (20.54 mm) in preceeding 7 days
August 22, 2020	24 hrs.	none	0.00	13.8	10.1	18.3	No Precipitation
August 23, 2020	**24 hrs.**	**none**	**0.00**	**14.5**	**10.1**	**19.6**	**No Precipitation**
August 24. 2020	**24 hrs.**	**24-Aug**	**2.94**	**12.6**	**9.7**	**17.6**	**Minimal precipitation (2.94 mm)**
September 21-27, 2020	7 days	September 23, 24, 25 ,26, 27	6.41	9.8	1.7	17.1	Minimal precipitation (6.41 mm) in preceding 7 days
September 27, 2020	24 hrs.	September 27	1.80	7.8	2.8	12.7	Minimal precipitation (1.80 mm)
September 28, 2020	**24 hrs.**	**none**	**0.00**	**13.2**	**9.6**	**15.1**	**No Precipitation**
September 29, 2020	**24 hrs.**	**none**	**0.00**	**10.3**	**3.6**	**16.5**	**No Precipitation**
October 1-7, 2020	7 days	October 2, 5, 7	3.04	12.3	0.0	0.91	Minimal Precipitation (3.04 mm) in proceeding 7 days
October 7, 2020	24 hrs.	October 7	2.88	5.1	-1.1	9.9	Minimal precipitation (2.88 mm)
October 8, 2020	**24 hrs.**	**October 8**	**3.54**	**5.6**	**2.1**	**10.7**	**Minimal precipitation (3.54 mm)**
October 13-19, 2020	7 days	October 13, 19	5.14	-2.5	-11.7	7.5	Minimal precipitation (5.14 mm) in preceding 7 days
October 19, 2020	24 hrs.	19-Oct	1.22	-5.9	-8.4	-1.4	Minimal precipitation (1.22 mm)
October 20, 2020	**24 hrs.**	**none**	**0.05**	**-4.9**	**-8.9**	**-0.8**	**Minimal (0.05 mm) Precipitation, evening of event**
October 21, 2020	**24 hrs.**	**none**	**0.00**	**-7.2**	**-8.5**	**-5.5**	**No Precipitation**
November 13-19, 2020	7 days	November 14, 15, 17, 18	13.11	-9.8	-19.1	-0.1	Moderate Precipitation (13.11 mm) in preceeding 7 days
November 19, 2020	24 hrs.	none	0.00	-17.2	-18.6	-15.5	No Precipitation
November 20, 2020	**24 hrs.**	**none**	**0.00**	**-16.2**	**-19.0**	**-13.2**	**No Precipitation**
November 23-29, 2020	7 days	November 27	0.25	-2.8	-11.9	5.4	Minimal precipitation (0.25 mm)
November 29, 2020	24 hrs.	none	0.00	2.2	-2.2	5.1	No Precipitation
November 30, 2020	**24 hrs.**	**none**	**0.00**	**0.7**	**-4.2**	**5.8**	**No Precipitation**
Nov 27 - Dec 3, 2020	7 days	November 27	0.25	1.4	-6.5	7.6	Minimal precipitation (0.25 mm)
December 3, 2020	24 hrs.	none	0.00	2.0	-3.9	7.2	No Precipitation
December 4, 2020	**24 hrs.**	**none**	**0.00**	**7.1**	**4.6**	**8.8**	**No Precipitation**
December 7-13, 2020	7 days	December 12	0.34	-5.0	-19.3	9.6	Minimal precipitation (0.34 mm)
December 13, 2020	24 hrs.	none	0.00	-18.1	-19.3	-16.9	No Precipitation
December 14, 2020	**24 hrs.**	**none**	**0.00**	**-16.5**	**-17.2**	**-15.7**	**No Precipitation**
December 13-19, 2020	7 days	December 12, 15, 16, 17, 18, 19	6.17	-16.0	-22.3	0.6	Minimal precipitation (6.17 mm)
December 19, 2020	24 hrs.	19-Dec	1.32	-7.6	-15.3	0.6	Minimal precipitation (1.32 mm)
December 20, 2020	**24 hrs.**	**December 20**	**0.44**	**-0.3**	**-5.3**	**2.3**	**Minimal precipitation (0.44 mm)**
December 21, 2020	**24 hrs.**	**December 21**	**0.06**	**-3.1**	**-10.1**	**-0.9**	**Minimal precipitation (0.06 mm)**

[1] BC Ministry of Environment, BC Air quality data: Fort St John North Camp C_Met_60 weather station. https://envistaweb.env.gov.bc.ca/.

Table 3: Classification of Flows in Ditch

Sample Event Date Bolded	Time Period	Precipitation Event	Total (mm)	Mean (°C)	24 Hr and 7 Day Precipitation	Classification
January 16-22, 2020	7 days	January 16, 17, 19, 21	3.62	-19.3	Minimal precipitation (3.62 mm) in preceding 7 days	Regional groundwater flow; precipitation as snowfall; frozen to near frozen conditions.
January 22, 2020	24 hrs.	none	0.00	-9.3	No precipitation	
January 23, 2020	**24 hrs.**	**none**	**0.00**	**-7.7**	**No precipitation**	
February 20-26, 2020	7 days	February 25	0.62	-0.6	Minimal precipitation (0.62 mm) in preceding 7 days	Regional groundwater flow; precipitation as snowfall; frozen to near frozen conditions.
February 26, 2020	24 hrs.	none	0.00	3.3	No precipitation	
February 27, 2020	**24 hrs.**	**none**	**0.00**	**5.3**	**No precipitation**	
March 18-24, 2020	7 days	March 22, 23	2.42	-4.2	Minimal precipitation (2.42 mm) in preceding 7 days	Regional groundwater flow; near frozen conditions.
March 24, 2021	24 hrs.	none	0.00	-8.2	No precipitation	
March 25, 2020	**24 hrs.**	**none**	**0.00**	**-1.9**	**No precipitation**	
April 9-15, 2020	7 days	April 14	0.52	3.0	Minimal precipitation (0.52 mm) in preceding 7 days	Regional groundwater flow and early spring freshet.
April 15, 2020	24 hrs.	none	0.00	6.0	No precipitation	
April 16, 2020	**24 hrs.**	**none**	**0.00**	**9.6**	**No precipitation**	
April 17, 2020	**24 hrs.**	**none**	**0.00**	**7.0**	**No precipitation**	
May 20-26, 2020	7 days	May 20, 21, 22, 23	23.39	11.5	Moderate Precipitation (23.39 mm) in preceeding 7 days	Surface runoff and spring freshet.
May 26, 2020	24 hrs.	May 26	0.70	9.9	Minimal precipitation (0.70 mm) in previous 24 hrs	
May 27, 2020	**24 hrs.**	**May 27**	**0.00**	**13.7**	**No precipitation**	
May 28, 2020	**24 hrs.**	**May 28**	**0.00**	**14.4**	**No precipitation**	
June 14-20, 2020	7 days	June 14, 15	61.11	15.8	Significant Precipitation (61.11 mm) in preceeding 7 days	Surface runoff and shallow groundwater flow.
June 20, 2020	24 hrs.	none	0.00	19	No Precipitation	
June 21, 2020	**24 hrs.**	**none**	**0.00**	**18.3**	**No Precipitation**	
June 22, 2020	**24 hrs.**	**none**	**0.00**	**16.0**	**No Precipitation**	
July 22-28, 2020	7 days	none	0.00	18.2	No precipitation in preceding 7 days	Shallow or regional groundwater flow.
July 28, 2020	24 hrs.	none	0.00	19.1	No Precipitation	
July 29, 2020	**24 hrs.**	**none**	**0.00**	**18.7**	**No Precipitation**	
July 30, 2020	**24 hrs.**	**none**	**0.00**	**19.8**	**No Precipitation**	
August 16-22, 2020	7 days	August 20, 21	20.54	17.1	Moderate Precipitation (20.54 mm) in preceeding 7 days	Shallow or regional groundwater flow and surface runoff.
August 22, 2020	24 hrs.	none	0.00	13.8	No Precipitation	
August 23, 2020	**24 hrs.**	**none**	**0.00**	**14.5**	**No Precipitation**	
August 24, 2020	**24 hrs.**	**24-Aug**	**2.94**	**12.6**	**Minimal precipitation (2.94 mm)**	
September 21-27, 2020	7 days	September 23, 24, 25, 26, 27	6.41	9.8	Minimal precipitation (6.41 mm) in preceding 7 days	Regional groundwater flow; relatively dry conditions.
September 27, 2020	24 hrs.	September 27	1.80	7.8	Minimal precipitation (1.80 mm)	
September 28, 2020	**24 hrs.**	**none**	**0.00**	**13.2**	**No Precipitation**	
September 29, 2020	**24 hrs.**	**none**	**0.00**	**10.3**	**No Precipitation**	
October 1-7, 2020	7 days	October 2, 5, 7	3.04	12.3	Minimal precipitation (3.04 mm) in preceding 7 days	Regional groundwater flow; just above frozen conditions.
October 7, 2020	24 hrs.	October 7	2.88	5.1	Minimal precipitation (2.88 mm)	
October 8, 2020	**24 hrs.**	**October 8**	**3.54**	**5.6**	**Minimal precipitation (3.54 mm)**	
October 13-19, 2020	7 days	October 13, 19	5.14	-2.5	Minimal precipitation (5.14 mm)	Regional groundwater flow; near to and frozen conditions.
October 19, 2020	24 hrs.	19-Oct	1.22	-5.9	Minimal precipitation (1.22 mm)	
October 20, 2020	**24 hrs.**	**none**	**0.05**	**-4.9**	**Minimal precipitation (0.05 mm)**	
October 21, 2020	**24 hrs.**	**none**	**0.00**	**-7.2**	**No Precipitation**	
November 13-19, 2020	7 days	November 14, 15, 17, 18	13.11	-9.8	Moderate Precipitation (13.11 mm) in preceeding 7 days	Regional groundwater flow; precipitation as snowfall; frozen conditions.
November 19, 2020	24 hrs.	none	0.00	-17.2	No Precipitation	
November 20, 2020	**24 hrs.**	**none**	**0.00**	**-16.2**	**No Precipitation**	
November 23-29, 2020	7 days	November 27	0.25	-2.8	Minimal precipitation (0.25 mm)	Regional groundwater flow; precipitation as snowfall; frozen to near frozen conditions.
November 29, 2020	24 hrs.	none	0.00	2.2	No Precipitation	
November 30, 2020	**24 hrs.**	**none**	**0.00**	**0.7**	**No Precipitation**	
Nov 27 - Dec 3, 2020	7 days	November 27	0.25	1.4	Minimal precipitation (0.25 mm)	Regional groundwater flow; precipitation as snowfall; frozen to near frozen conditions.
December 3, 2020	24 hrs.	none	0.00	2.0	No Precipitation	
December 4, 2020	**24 hrs.**	**none**	**0.00**	**7.1**	**No Precipitation**	
December 7-13, 2020	7 days	December 12	0.34	-5.0	Minimal precipitation (0.34 mm)	Regional groundwater flow; precipitation as snowfall; frozen to near frozen conditions.
December 13, 2021	24 hrs.	none	0.00	-18.1	No Precipitation	
December 14, 2022	**24 hrs.**	**none**	**0.00**	**-16.5**	**No Precipitation**	
December 13-19, 2020	7 days	December 12, 15, 16, 17, 18, 19	6.17	-16.0	Minimal precipitation (6.17 mm)	Regional groundwater flow; precipitation as snowfall; frozen to near frozen conditions.
December 19, 2020	24 hrs.	19-Dec	1.32	-7.6	Minimal precipitation (1.32 mm)	
December 20, 2020	**24 hrs.**	**December 20**	**0.44**	**-0.3**	**Minimal precipitation (0.44 mm)**	
December 21, 2021	**24 hrs.**	**December 21**	**0.06**	**-3.1**	**Minimal precipitation (0.06 mm)**	

Table 4: Daily Mean Turbidity and TSS Measurements with the Peace River 2020

Date	Turbidity (Daily Mean) and TSS Measurements and Calculations Peace River above Moberly River			
Sampling Event Date Bolded	Left Bank		Right Bank	
	NTU [1]	TSS [1] (mg/L)	NTU [1]	TSS [1] (mg/L)
January 16-22, 2020	5.2	3.8	4.7	3.4
January 22, 2020	5.9	4.3	5.3	3.9
January 23, 2020	**5.5**	**4.0**	**5.5**	**4.0**
January 24, 2020	5.2	3.8	6.4	4.6
February 20-26, 2020	6.7	4.9	8.0	5.8
February 26, 2020	6.4	4.6	7.7	5.6
February 27, 2020	**6.4**	**4.7**	**6.7**	**4.9**
February 28, 2020	6.6	4.8	7.1	5.1
March 18-24, 2020	6.8	5.0	6.6	4.8
March 24, 2020	7.3	5.4	5.7	4.1
March 25, 2020	**7.6**	**5.5**	**4.9**	**3.6**
March 26, 2020	8.7	6.4	6.4	4.7
April 9-15, 2020	25.0	18.3	7.7	5.6
April 15, 2020	79.5	58.1	12.3	9.0
April 16, 2020	**622.4**	**454.4**	**24.1**	**17.6**
April 17, 2020	**780.8**	**570.0**	**54.0**	**39.4**
April 18, 2020	541.6	395.4	54.8	40.0
May 20-26, 2020	295.1	215.4	23.5	17.1
May 26, 2020	186.9	136.5	124.8	91.1
May 27, 2020	**142.5**	**104.0**	**90.8**	**66.3**
May 28, 2020	**112.3**	**82.0**	**76.3**	**55.7**
May 29, 2020	97.3	71.0	60.1	43.9
June 14-20, 2020	2671.9	1950.5	2522.8	1841.6
June 20, 2020	1042.5	761.0	853.4	623.0
June 21, 2020	**774.0**	**565.0**	**637.2**	**465.2**
June 22, 2020	**560.3**	**409.0**	**456.4**	**333.2**
June 23, 2020	394.6	288.1	309.4	225.8
July 22-28, 2020	69.7	50.8	45.0	32.8
July 28, 2020	51.0	37.3	36.9	26.9
July 29, 2020	**43.1**	**31.5**	**33.9**	**24.8**
July 30, 2020	**37.2**	**27.1**	**30.0**	**21.9**
July 31, 2020	35.3	25.5	29.1	21.2
August 16-22, 2020	28.6	20.9	22.6	16.5
August 22, 2020	67.2	49.0	35.4	25.8
August 23, 2020	**155.9**	**113.8**	**31.9**	**23.3**
August 24. 2020	**196.0**	**143.1**	**32.7**	**23.9**
August 25, 2020	73.3	53.5	21.8	15.9
September 21-27, 2020	13.8	10.1	14.1	10.3
September 27, 2020	13.1	9.5	14.2	10.4
September 28, 2020	**16.3**	**11.9**	**13.3**	**9.7**
September 29, 2020	**15.2**	**11.1**	**13.7**	**10.0**
September 30, 2020	20.4	14.9	13.9	10.1
Sep 30 - Oct 6, 2020	20.2	14.8	12.1	8.8
October 7, 2020	19.3	14.1	11.3	8.3
October 8, 2020	**15.0**	**10.9**	**12.2**	**8.9**
October 9, 2020	15.7	11.5	12.5	9.1
October 13-19 2020	13.3	9.7	11.5	8.4
October 19, 2020	7.8	5.7	8.7	6.4
October 20, 2020	**8.6**	**6.3**	**9.4**	**6.9**
October 21, 2020	**8.0**	**5.8**	**8.9**	**6.5**
October 22, 2020	9.1	6.6	9.4	6.9
November 13-19, 2020	15.5	11.2	15.8	11.4
November 19, 2020	19.9	14.3	18.9	13.6
November 20, 2020	**13.2**	**9.5**	**15.0**	**10.8**
November 21, 2020	11.8	8.5	13.6	9.8
November 23-29, 2020	14.0	10.1	12.7	9.2
November 29, 2020	17.9	12.9	14.1	10.1
November 30, 2020	**17.3**	**12.5**	**13.5**	**9.7**
December 1, 2020	16.1	11.6	14.7	10.6
Nov 26 - Dec 3, 2020	14.4	10.4	13.0	9.3
December 3, 2020	11.8	8.5	11.9	8.6
December 4, 2020	**15.1**	**10.9**	**13.6**	**9.8**
December 5, 2020	10.1	7.2	11.0	7.9
December 7-13, 2020	11.9	8.5	12.0	8.7
December 13, 2020	8.8	6.3	9.8	7.1
December 14, 2020	**8.0**	**5.7**	**10.9**	**7.9**
December 15, 2020	7.0	5.1	12.9	9.3
December 13-19, 2020	7.3	5.2	10.2	7.3
December 19, 2020	6.1	4.4	8.2	5.9
December 20, 2020	**6.0**	**4.3**	**7.3**	**5.3**
December 21, 2020	**6.0**	**4.3**	**7.1**	**5.1**
December 22, 2020	5.3	3.8	7.8	5.6

[1] NTU (Nephelometric Turbidity Unit) and TSS (total suspended sediment) data provided by Ecofish Ltd., January 21, 2021.

NTU: to some extent, measures (scattered light at 90 degrees from the incident light beam) how much light reflects for a given amount of particulates dependent upon properties of the particles, e.g. their shape, color, and reflectivity.

Note: 7-day average turbidity values are calculated as the average turbidity measured during the prior seven days to the sampling event.

Table 5: 2020 Quality Assurance/Quality Control for Water Quality Sample Results

Parameter	Unit	RDL	Field Blank	Travel Blank	Field Blank	Travel Blank	Field Blank	Travel Blank	Travel Blank	Field Blank	Travel Blank	Field Blank
			23-Jan-20	23-Jan-20	27-Feb-20	27-Feb-20	25-Mar-20	25-Mar-20	16-Apr-20	17-Apr-20	28-May-20	28-May-20
Physical Parameters												
Acidity (as $CaCO_3$)	µg/L	1000	2100	2100	2500	2500	<2000	<2000	1300	1300	1100	1200
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	<1000	<1000	<1000	<1000	<1000	<1000	69	70	<1	<1
Electrical Conductivity (EC)	µS/cm	2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	169	170	<2	<2
Hardness as $CaCO_3$, dissolved	µg/L	500	<600		<600		<600		82600	80900	<500	<500
Hardness as $CaCO_3$, from total Ca/Mg	µg/L		<600		<600		<600	<600				
pH	pH Units	0.1	5.61	5.48	5.24	5.24	5.32	5.29	8.08	8.08	5.46	5.42
Total Dissolved Solids (TDS)	µg/L	10000	<10000	<10000	<10000	<10000	<10000	<10000	121000	90000	<10000	<10000
Total Suspended Solids (TSS)	µg/L	3000	<3000	<3000	<3000	<3000	<3000	<3000	<1000	<1000	<1000	<1000
Alkalinity (Hydroxide as $CaCO_3$)	µg/L	1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	<1000	<1000	<1000	<1000	<1000	<1000	69000	70000	<1000	<1000
Anions and Nutrients												
Ammonia (NH_4 as N)	µg/L	5.0	11.9	<5	6.3	<5	<5	<5	<50	<50	<5	57.3
Chloride (Cl^-)	µg/L	500	<500	<500	<500	<500	<500	<500	4560	4600	<500	<500
Nitrate (NO_3^- as N)	µg/L	5.0	<5	<5	<5	<5	<5	<5	30.6	35.7	<5	<5
Nitrite (NO_2^- as N)	µg/L	1.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO_4)	µg/L	300	<300	<300	<300	<300	<300	<300	13400	13400	<300	<300
Dissolved Organic Carbon (DOC)	µg/L		<500		<500		<500					
Metals, Total												
Aluminum	µg/L	3.0	<3		<3		<3	<3	13.1	11.7	<3	<3
Antimony	µg/L	0.10	<0.1		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	µg/L	0.10	<0.1		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Barium	µg/L	0.10	<0.1		<0.1		<0.1	<0.1	38.6	37.9	<0.1	<0.1
Beryllium	µg/L	0.10	<0.1		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bismuth	µg/L	0.05	<0.05		<0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10	<10		<10		<10	<10	<10	<10	<10	<10
Cadmium	µg/L	0.005	<0.005		<0.005		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Calcium	µg/L	50	<50		<50		<50	<50	23700	22600	<50	<50
Cesium	µg/L	0.01	<0.01		<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	µg/L	0.10	<0.1		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt	µg/L	0.10	<0.1		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	µg/L	0.50	<0.5		<0.5		<0.5	<0.5	2.18	2.18	<0.5	<0.5
Iron	µg/L	10	<10		<10		<10	<10	<10	<10	<10	<10
Lead	µg/L	0.05	<0.05		<0.05		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lithium	µg/L	1.0	<1		<1		<1	<1	2.1	2.1	<1	<1
Magnesium	µg/L	5.0	<5		<5		<5	<5	5680	5590	<5	<5
Manganese	µg/L	0.10	<0.1		<0.1		<0.1	<0.1	0.12	0.11	<0.1	<0.1
Mercury	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0105	-	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	0.165		<0.05		<0.05	<0.05	0.291	0.264	<0.05	<0.05
Nickel	µg/L	0.5	<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phosphorus	µg/L	50.0	<50		<50		<50	<50	<50	<50	<50	<50
Potassium	µg/L	50.0	<50		<50		<50	<50	364	346	<50	<50
Rubidium	µg/L	0.2	<0.2		<0.2		<0.2	<0.2	0.21	<0.2	<0.2	<0.2
Selenium	µg/L	0.05	<0.05		<0.05		<0.05	<0.05	0.166	0.179	<0.05	<0.05
Silicon	µg/L	100	<100		<100		<100	<100	829	817	<100	<100
Silver	µg/L	0.01	<0.01		<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	µg/L	50.0	<50		<50		<50	<50	4110	4210	<50	<50
Strontium	µg/L	0.2	<0.2		<0.2		<0.2	<0.2	103	100	<0.2	<0.2
Sulfur	µg/L	500	<500		<500		<500	<500	3960	3950	<500	<500
Tellurium	µg/L	0.2	<0.2		<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	<0.01		<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium	µg/L	0.10	<0.1		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	0.10	<0.1		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.30	<0.3		<0.3		<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Tungsten	µg/L	0.10	<0.1		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	<0.01		<0.01		<0.01	<0.01	0.122	0.116	<0.01	<0.01
Vanadium	µg/L	0.50	<0.5		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	µg/L	3.0	<3		<3		<3	<3	7.6	5	<3	<3
Zirconium	µg/L	0.06	<0.2		<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Metals, Dissolved												
Aluminum	µg/L	1.0	<1		<1		<1			9.1		<1
Antimony	µg/L	0.10	<0.1		<0.1		<0.1			<0.1		<0.1
Arsenic	µg/L	0.10	<0.1		<0.1		<0.1			<0.1		<0.1
Barium	µg/L	0.10	<0.1		<0.1		0.29			39.8		<0.1
Beryllium	µg/L	0.10	<0.1		<0.1		<0.1			<0.1		<0.1
Bismuth	µg/L	0.05	<0.05		<0.05		<0.05			<0.05		<0.05
Boron	µg/L	10.0	<10		<10		<10			<10		<10
Cadmium	µg/L	0.005	<0.005		<0.005		<0.005			<0.005		<0.005
Calcium	µg/L	50.0	<50		<50		<50			23300		<50
Cesium	µg/L	0.01	<0.01		<0.01		<0.01			<0.01		<0.01
Chromium	µg/L	0.10	<0.1		<0.1		<0.1			<0.1		<0.1
Cobalt	µg/L	0.10	<0.1		<0.1		<0.1			<0.1		<0.1
Copper	µg/L	0.20	<0.2		<0.2		<0.2			2.18		<0.2
Iron	µg/L	10.0	<10		<10		<10			<10		<10
Lead	µg/L	0.05	<0.05		<0.05		<0.05			<0.05		<0.05
Lithium	µg/L	1.0	<1		<1		<1			1.9		<1
Magnesium	µg/L	5.0	<5		<5		<5			5540		<5
Manganese	µg/L	0.10	<0.1		<0.1		<0.1			<0.1		<0.1
Mercury	µg/L	0.005	<0.005		<0.005		0.0094			<0.005		<0.005
Molybdenum	µg/L	0.05	<0.05		<0.05		<0.05			0.277		<0.05
Nickel	µg/L	0.50	<0.5		<0.5		<0.5			<0.5		<0.5
Phosphorus	µg/L	50.0	<50		<50		<50			<50		<50
Potassium	µg/L	50.0	<50		<50		<50			350		<50
Rubidium	µg/L	0.20	<0.2		<0.2		<0.2			<0.2		<0.2
Selenium	µg/L	0.05	<0.05		<0.05		<0.05			0.22		<0.05
Silicon	µg/L	50.0	<50		<50		<50			812		<50
Silver	µg/L	0.01	<0.01		<0.01		<0.01			<0.01		<0.01
Sodium	µg/L	50.0	<50		<50		<50			4120		<50
Strontium	µg/L	0.2	<0.2		<0.2		<0.2			109		<0.2
Sulfur	µg/L	500	<500		<500		<500			4530		<500
Tellurium	µg/L	0.20	<0.2		<0.2		<0.2			<0.2		<0.2
Thallium	µg/L	0.01	<0.01		<0.01		<0.01			<0.01		<0.01
Thorium	µg/L	0.10	<0.1		<0.1		<0.1			<0.1		<0.1
Tin	µg/L	0.10	<0.1		<0.1		<0.1			<0.1		<0.1
Titanium	µg/L	0.30	<0.3		<0.3		<0.3			<0.3		<0.3
Tungsten	µg/L	0.10	<0.1		<0.1		<0.1			<0.1		<0.1
Uranium	µg/L	0.01	<0.01		<0.01		<0.01			0.119		<0.01
Vanadium	µg/L	0.50	<0.5		<0.5		<0.5			<0.5		<0.5
Zinc	µg/L	1.0	<1		<1		<1			5.1		<1
Zirconium	µg/L	0.06	<0.2		<0.2		<0.2			<0.2		<0.2
Laboratory Work Order Number			VA20A0816	VA20A0816	VA20A2572	VA20A2572	VA20A4062	VA20A4062	L2438183	L2438183	L2454036	L2454036
Laboratory Identification Number			VA20A0816-002	VA20A0816-00	VA20A2572-01	VA20A2572-01	VA20A4062-007	VA20A4062-006	L2438183-14	L2438183-15	L2454036-4	L2454036-3

Notes:

RDL - Reportable detection limit

RPD - Relative percent difference calculated as (ABS[(difference between two values)]/((sum of two values/2))*100

"-" Indicates RPD not calculated. RPD cannot be calculated if one or more of the analytical results is less than detection limits or within 5 times the RDL.

BOLD - RPD greater than 30%

Blank - not analyzed.

Table 5: 2020 Quality Assurance/Quality Control for Wate

Parameter	Unit	RDL	Travel Blank	Field Blank	Travel Blank	Field Blank	Travel Blank	Field Blank	Travel Blank	Field Blank	Travel Blank	Field Blank
			21-Jun-20	22-Jun-20	30-Jul-20	30-Jul-20	24-Aug-20	24-Aug-20	29-Sep-20	29-Sep-20	8-Oct-20	8-Oct-20
Physical Parameters												
Acidity (as $CaCO_3$)	µg/L	1000	<1000	1100	1600	1400	1400	1300	1800	1900	1600	No Field Blank
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	<1	<1	<1	<1	1.9	<1	<1	<1	<1	Utilized
Electrical Conductivity (EC)	µS/cm	2.0	<2	<2	<2	<2	<2	<2	<2	<2	<2	
Hardness as $CaCO_3$, dissolved	µg/L	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
Hardness as $CaCO_3$, from total Ca/Mg	µg/L											
pH	pH Units	0.1	5.60	5.52	5.56	5.30	6.52	5.53	5.65	5.75	5.64	
Total Dissolved Solids (TDS)	µg/L	10000	<10000	<10000	<10000	<10000	<10000	<10000	<10000	<10000	<10000	
Total Suspended Solids (TSS)	µg/L	3000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	
Alkalinity (Hydroxide as $CaCO_3$)	µg/L	1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	<1000	<1000	<1000	<1000	1900	<1000	<1000	<1000	<1000	
Anions and Nutrients												
Ammonia (NH_4 as N)	µg/L	5.0	<50	<50	<50	<50	<50	<50	<50	<50	<50	
Chloride (Cl^-)	µg/L	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
Nitrate (NO_3^- as N)	µg/L	5.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Nitrite (NO_2^- as N)	µg/L	1.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Sulphate (SO_4)	µg/L	300	<300	<300	<300	<300	<300	<300	<300	<300	<300	
Dissolved Organic Carbon (DOC)	µg/L					<1.0	<1.0	<1.0				
Metals, Total												
Aluminum	µg/L	3.0	<3	<3	<3	<3	<3	<3	<3	<3	<3	
Antimony	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Arsenic	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Barium	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Beryllium	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Bismuth	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Boron	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Cadmium	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Calcium	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	
Cesium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Chromium	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Cobalt	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Copper	µg/L	0.50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Iron	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	
Lead	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Lithium	µg/L	1.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	
Magnesium	µg/L	5.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	
Manganese	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Mercury	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	
Molybdenum	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Nickel	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Phosphorus	µg/L	50.0	<50	<50	<50	<50	<50	<50	<50	<50	<50	
Potassium	µg/L	50.0	<50	<50	<50	<50	<50	<50	<50	<50	<50	
Rubidium	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Selenium	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	
Silicon	µg/L	100	<100	<100	<50	<50	<50	<50	<50	<50	<50	
Silver	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Sodium	µg/L	50.0	<50	<50	<50	<50	<50	<50	<50	<50	<50	
Strontium	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Sulfur	µg/L	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	
Tellurium	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Thallium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Thorium	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Tin	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Titanium	µg/L	0.30	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	
Tungsten	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	
Uranium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	
Vanadium	µg/L	0.50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	
Zinc	µg/L	3.0	<3	<3	<3	<3	<3	<3	<3	<3	<3	
Zirconium	µg/L	0.06	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	
Metals, Dissolved												
Aluminum	µg/L	1.0		<1		<1	<1	2.2	<1	<1		
Antimony	µg/L	0.10		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		
Arsenic	µg/L	0.10		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		
Barium	µg/L	0.10		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		
Beryllium	µg/L	0.10		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		
Bismuth	µg/L	0.05		<0.05		<0.05	<0.05	<0.05	<0.05	<0.05		
Boron	µg/L	10.0		<10		<10	<10	<10	<10	<10		
Cadmium	µg/L	0.005		<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		
Calcium	µg/L	50.0		<50		<53	<50	<50	<50	<50		
Cesium	µg/L	0.01		<0.01		<0.01	<0.01	<0.01	<0.01	<0.01		
Chromium	µg/L	0.10		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		
Cobalt	µg/L	0.10		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		
Copper	µg/L	0.20		<0.2		<0.2	<0.2	<0.2	<0.2	<0.2		
Iron	µg/L	10.0		<10		<10	<10	<10	<10	<10		
Lead	µg/L	0.05		<0.05		<0.05	<0.05	<0.05	<0.05	<0.05		
Lithium	µg/L	1.0		<1		<1	<1	<1	<1	<1		
Magnesium	µg/L	5.0		<5		<5	<5	<5	<5	<5		
Manganese	µg/L	0.10		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		
Mercury	µg/L	0.005		<0.005		<0.005	<0.005	<0.005	<0.005	<0.005		
Molybdenum	µg/L	0.05		<0.05		<0.05	<0.05	<0.05	<0.05	<0.05		
Nickel	µg/L	0.50		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5		
Phosphorus	µg/L	50.0		<50		<50	<50	<50	<50	<50		
Potassium	µg/L	50.0		<50		<50	<50	<50	<50	<50		
Rubidium	µg/L	0.20		<0.2		<0.2	<0.2	<0.2	<0.2	<0.2		
Selenium	µg/L	0.05		<0.05		<0.05	<0.05	<0.05	<0.05	<0.05		
Silicon	µg/L	50.0		<50		<50	<50	<50	<50	<50		
Silver	µg/L	0.01		<0.01		<0.01	<0.01	<0.01	<0.01	<0.01		
Sodium	µg/L	50.0		<50		<50	<50	<50	<50	<50		
Strontium	µg/L	0.2		<0.2		<0.2	<0.2	<0.2	<0.2	<0.2		
Sulfur	µg/L	500		<500		<500	<500	<500	<500	<500		
Tellurium	µg/L	0.20		<0.2		<0.2	<0.2	<0.2	<0.2	<0.2		
Thallium	µg/L	0.01		<0.01		<0.01	<0.01	<0.01	<0.01	<0.01		
Thorium	µg/L	0.10		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		
Tin	µg/L	0.10		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		
Titanium	µg/L	0.30		<0.3		<0.3	<0.3	<0.3	<0.3	<0.3		
Tungsten	µg/L	0.10		<0.1		<0.1	<0.1	<0.1	<0.1	<0.1		
Uranium	µg/L	0.01		<0.01		<0.01	<0.01	<0.01	<0.01	<0.01		
Vanadium	µg/L	0.50		<0.5		<0.5	<0.5	<0.5	<0.5	<0.5		
Zinc	µg/L	1.0		<1		2.5	<1	<1	<1	<1		
Zirconium	µg/L	0.06		<0.2		<0.2	<0.2	<0.2	<0.2	<0.2		
Laboratory Work Order Number			L2464256	L2464256	L2482349	L2482349	L2493339	L2493339	L2510600	L2510600	L2515191	
Laboratory Identification Number			L2464256-13	L2464256-14	L2482349-8	L2482349-9	L2493339-12	L2493339-13	L2510600-5	L2510600-4	L2515191-6	

Notes:

RDL - Reportable detection limit

RPD - Relative percent difference calculated as (ABS[(difference between two values)]/((sum of two values/2))*100

"-" Indicates RPD not calculated. RPD cannot be calculated if one or more of the analytical results is less than detection limits or within 5 times the RDL.

BOLD - RPD greater than 30%

Blank - not analyzed.

Table 5: 2020 Quality Assurance/Quality Control for Wate

Parameter	Unit	RDL	Travel Blank	Field Blank	Travel Blank	Field Blank	Travel Blank	Field Blank	Travel Blank	Field Blank	Travel Blank	Field Blank
			21-Oct-20	20-Oct-20	20-Nov-20	20-Nov-20	30-Nov-20	30-Nov-20	4-Dec-20	4-Dec-20	14-Dec-20	14-Dec-20
Physical Parameters												
Acidity (as $CaCO_3$)	µg/L	1000	1500	<1000	1600	1500	1300	2200	1300	1300	1500	1400
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	<1	<1	<1	<1	<1	<1	<1	1.2	<1	<1
Electrical Conductivity (EC)	µS/cm	2.0	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Hardness as $CaCO_3$, dissolved	µg/L	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Hardness as $CaCO_3$, from total Ca/Mg	µg/L											
pH	pH Units	0.1	5.65	6.08	5.41	5.38	5.42	5.58	5.35	5.56	**5.51**	**5.51**
Total Dissolved Solids (TDS)	µg/L	10000	<10000	<10000	<10000	<10000	<10000	<10000	<10000	<10000	<10000	<10000
Total Suspended Solids (TSS)	µg/L	3000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<3000	<3000
Alkalinity (Hydroxide as $CaCO_3$)	µg/L	1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000	1200	<1000	<1000
Anions and Nutrients												
Ammonia (NH_4 as N)	µg/L	5.0	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Chloride (Cl^-)	µg/L	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Nitrate (NO_3^- as N)	µg/L	5.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Nitrite (NO_2^- as N)	µg/L	1.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sulphate (SO_4)	µg/L	300	<300	<300	<300	<300	<300	<300	<300	<300	<300	<300
Dissolved Organic Carbon (DOC)	µg/L											
Metals, Total												
Aluminum	µg/L	3.0	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Antimony	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Arsenic	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Barium	µg/L	0.10	<0.1	<0.1	0.12	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Beryllium	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.02	<0.02
Bismuth	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Cadmium	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Calcium	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Cesium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Copper	µg/L	0.50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Iron	µg/L	10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Lead	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lithium	µg/L	1.0	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Magnesium	µg/L	5.0	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Manganese	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Mercury	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	µg/L	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Phosphorus	µg/L	50.0	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Potassium	µg/L	50.0	<50	<50	<50	<50	<50	<50	<50	<50	<100	<100
Rubidium	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Selenium	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Silicon	µg/L	100	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Silver	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	µg/L	50.0	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
Strontium	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Sulfur	µg/L	500	<500	<500	<500	<500	<500	<500	<500	<500	<500	<500
Tellurium	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.30	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Tungsten	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	µg/L	0.50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	µg/L	3.0	<3	<3	<3	<3	**<3**	**<3**	<3	<3	<3	<3
Zirconium	µg/L	0.06	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.3	<0.3
Metals, Dissolved												
Aluminum	µg/L	1.0	<1	<1								
Antimony	µg/L	0.10	<0.1	<0.1								
Arsenic	µg/L	0.10	<0.1	<0.1								
Barium	µg/L	0.10	<0.1	<0.1								
Beryllium	µg/L	0.10	<0.1	<0.1								
Bismuth	µg/L	0.05	<0.05	<0.05								
Boron	µg/L	10.0	<10	<10								
Cadmium	µg/L	0.005	<0.005	<0.005								
Calcium	µg/L	50.0	<50	<50								
Cesium	µg/L	0.01	<0.01	<0.01								
Chromium	µg/L	0.10	<0.1	<0.1								
Cobalt	µg/L	0.10	<0.1	<0.1								
Copper	µg/L	0.20	<0.2	<0.2								
Iron	µg/L	10.0	<10	<10								
Lead	µg/L	0.05	<0.05	<0.05								
Lithium	µg/L	1.0	<1	<1								
Magnesium	µg/L	5.0	<5	<5								
Manganese	µg/L	0.10	<0.1	<0.1								
Mercury	µg/L	0.005	<0.005	<0.005								
Molybdenum	µg/L	0.05	<0.05	<0.05								
Nickel	µg/L	0.50	<0.5	<0.5								
Phosphorus	µg/L	50.0	<50	<50								
Potassium	µg/L	50.0	<50	<50								
Rubidium	µg/L	0.20	<0.2	<0.2								
Selenium	µg/L	0.05	<0.05	<0.05								
Silicon	µg/L	50.0	<50	<50								
Silver	µg/L	0.01	<0.01	<0.01								
Sodium	µg/L	50.0	<50	<50								
Strontium	µg/L	0.2	<0.2	<0.2								
Sulfur	µg/L	500	<500	<500								
Tellurium	µg/L	0.20	<0.2	<0.2								
Thallium	µg/L	0.01	<0.01	<0.01								
Thorium	µg/L	0.10	<0.1	<0.1								
Tin	µg/L	0.10	<0.1	<0.1								
Titanium	µg/L	0.30	<0.3	<0.3								
Tungsten	µg/L	0.10	<0.1	<0.1								
Uranium	µg/L	0.01	<0.01	<0.01								
Vanadium	µg/L	0.50	<0.5	<0.5								
Zinc	µg/L	1.0	<1	<1								
Zirconium	µg/L	0.06	<0.2	<0.2								
Laboratory Work Order Number			L2520235	L2520229	L2532220	L2532220	L2535101	L2535101	L2537214	L2537214	L2540107	L2540107-3
Laboratory Identification Number			L2520235-3	L2520229-8	L2532220-4	L2532220-5	L2535101-11	L2535101-10	L2537214-5	L2537214-4	L2540107-4	L2540107-3

Notes:

RDL - Reportable detection limit

RPD - Relative percent difference calculated as (ABS[(difference between two values)]/((sum of two values/2))*100

"-" Indicates RPD not calculated. RPD cannot be calculated if one or more of the analytical results is less than detection limits or within 5 times the RDL.

BOLD - RPD greater than 30%

Blank - not analyzed.

Table 5: 2020 Quality Assurance/Quality Control for Wate

Parameter	Unit	RDL	Travel Blank	Field Blank	RBSC	RBSC-R	RPD	RBSBIAR-DS	RBSBIAR-DS-R	RPD	RBSC-DS	RBSC-DS-R
			21-Dec-20	21-Dec-20	23-Jan-20			27-Feb-20			25-Mar-20	
Physical Parameters												
Acidity (as $CaCO_3$)	µg/L	1000	1200	1300	12200	15400	23.2	<2000	<2000	-	<2000	<2000
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	<1	<1	368	362	1.6	242000	275000	12.77	329000	321000
Electrical Conductivity (EC)	µS/cm	2.0	<2	<2	12200	15400	23.2	742	739	0.41	871	877
Hardness as $CaCO_3$, dissolved	µg/L	500	<500	<500	502000	489000	2.62	234000	232000	0.86	418000	419000
Hardness as $CaCO_3$, from total Ca/Mg	µg/L				580000	558000	3.87	233000	250000	7.04	460000	465000
pH	pH Units	0.1	5.40	5.44	8.26	8.22	0.49	8.08	8.14	0.74	7.97	8.02
Total Dissolved Solids (TDS)	µg/L	10000	<10000	<10000	721000	744000	3.14	449000	427000	5.02	558000	606000
Total Suspended Solids (TSS)	µg/L	3000	<1000	<1000	<3000	4500	40.0	<3000	<3000	-	3500	<3000
Alkalinity (Hydroxide as $CaCO_3$)	µg/L	1000	<1000	<1000	<1000	<1000	0.0	<1000	<1000	-	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	<1000	<1000	<1000	<1000	0.0	<1000	<1000	-	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	<1000	<1000	368000	362000	1.64	242000	275000	12.77	329000	321000
Anions and Nutrients												
Ammonia (NH_4 as N)	µg/L	5.0	<50	<50	29.5	37.1	22.82	548	546	0.37	25.2	24.1
Chloride (Cl^-)	µg/L	500	<500	<500	18600	18400	1.08	57100	56500	1.06	10500	10400
Nitrate (NO_3^- as N)	µg/L	5.0	<5	<5	<25	<25	0.0	843	855	1.41	<25	<25
Nitrite (NO_2^- as N)	µg/L	1.0	<1	<1	<5	<5	0.0	46.5	46.2	0.65	<5	<5
Sulphate (SO_4)	µg/L	300	<300	<300	230000	230000	0.00	69100	68100	1.46	169000	167000
Dissolved Organic Carbon (DOC)	µg/L				2340	2540	8.20	7720	7960	3.06	2190	2300
Metals, Total												
Aluminum	µg/L	3.0	<3	<4	4.9	23.7	131.47	59.4	56	5.89	7.8	10.3
Antimony	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	-	0.42	0.42	0.00	<0.1	<0.1
Arsenic	µg/L	0.10	<0.1	<0.1	0.38	0.93	83.97	0.39	0.38	2.60	0.39	0.38
Barium	µg/L	0.10	<0.1	<0.1	29.2	30.5	4.36	73.2	74.3	1.49	33.5	33.5
Beryllium	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1
Bismuth	µg/L	0.05	<0.05	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Boron	µg/L	10	<10	<11	66	69	4.44	95	88	7.65	54	54
Cadmium	µg/L	0.005	<0.005	<0.006	0.0292	0.02	37.40	0.0729	0.0694	4.92	0.0249	0.0301
Calcium	µg/L	50	<50	<51	168000	160000	4.88	67800	74400	9.28	130000	132000
Cesium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	-	0.11	0.112	1.80	<0.01	<0.01
Chromium	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	-	6.7	6.46	3.65	0.16	<0.1
Cobalt	µg/L	0.10	<0.1	<0.1	0.84	1.11	27.69	0.84	0.88	4.65	0.54	0.54
Copper	µg/L	0.50	<0.5	<0.5	<0.5	<0.5	-	2	2.1	4.88	<0.5	<0.5
Iron	µg/L	10	<10	<11	359	1320	114.47	58	48	18.87	319	313
Lead	µg/L	0.05	<0.05	<0.06	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Lithium	µg/L	1.0	<1	<1	33.1	35.4	6.72	21.8	20.6	5.66	22.8	22.5
Magnesium	µg/L	5.0	<5	<5	39100	38100	2.59	15500	15700	1.28	32900	32900
Manganese	µg/L	0.10	<0.1	<0.1	1860	1630	13.18	16.8	16.7	0.60	1460	1390
Mercury	µg/L	0.005	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	-	0.0192	<0.005
Molybdenum	µg/L	0.05	<0.05	<0.05	1.46	0.912	46.21	19.7	19.4	1.53	3.05	1.63
Nickel	µg/L	0.5	<0.5	<0.5	21.2	15	34.25	7.59	7.63	0.53	11.6	11.3
Phosphorus	µg/L	50.0	<50	<50	<50	<50	-	<50	<50	-	<50	<50
Potassium	µg/L	50.0	<50	<50	1700	1690	0.59	7090	7310	3.06	1460	1450
Rubidium	µg/L	0.2	<0.2	<0.2	1.22	1.08	12.17	14.1	13.8	2.15	0.98	0.94
Selenium	µg/L	0.05	<0.05	<0.05	<0.05	0.06		1.13	0.913	21.24	<0.05	<0.05
Silicon	µg/L	100	<50	<51	4670	4750	1.70	4270	4110	3.82	3860	3830
Silver	µg/L	0.01	<0.01	<0.02	<0.01	<0.01		<0.01	<0.01	-	<0.01	<0.01
Sodium	µg/L	50.0	<50	<51	40800	41900	2.66	55600	55900	0.54	32100	31600
Strontium	µg/L	0.2	<0.2	<0.3	413	416	0.72	505	490	3.02	348	350
Sulfur	µg/L	500	<500	<501	87700	87200	0.57	25500	23800	6.90	58900	58400
Tellurium	µg/L	0.2	<0.2	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2
Thallium	µg/L	0.01	<0.01	<0.01	<0.01	<0.01	-	0.025	0.022	12.77	<0.01	<0.01
Thorium	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1
Tin	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1
Titanium	µg/L	0.30	<0.3	<0.3	<0.3	0.5	-	1.33	1.3	2.28	<0.3	<0.3
Tungsten	µg/L	0.10	<0.1	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1
Uranium	µg/L	0.01	<0.01	<0.01	1.59	1.43	10.60	0.892	0.888	0.45	1.1	1.09
Vanadium	µg/L	0.50	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5
Zinc	µg/L	3.0	<3	<4	3.4	<3	-	5.4	6.2	13.79	<3	<3
Zirconium	µg/L	0.06	<0.2	<0.3	<0.2	<0.2	-	<0.2	<0.2	-	0.23	<0.2
Metals, Dissolved												
Aluminum	µg/L	1.0			<1	1.1	-	13.2	13.3	0.75	<1	<1
Antimony	µg/L	0.10			<0.1	<0.1	-	0.41	0.42	2.41	<0.1	<0.1
Arsenic	µg/L	0.10			0.36	0.42	15.38	0.37	0.35	5.56	0.35	0.42
Barium	µg/L	0.10			28.9	28	3.16	71	70.3	0.99	31.9	31.3
Beryllium	µg/L	0.10			<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1
Bismuth	µg/L	0.05			<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Boron	µg/L	10.0			58	58	0.00	97	88	9.73	51	53
Cadmium	µg/L	0.005			0.0131	0.0145	10.14	0.0658	0.0651	1.07	0.0211	0.0198
Calcium	µg/L	50.0			144000	139000	3.53	68300	67500	1.18	117000	120000
Cesium	µg/L	0.01			<0.01	<0.01	-	0.106	0.106	0.00	<0.01	<0.01
Chromium	µg/L	0.10			<0.1	<0.1	-	6.72	6.22	7.73	<0.1	<0.1
Cobalt	µg/L	0.10			0.74	0.99	28.90	0.82	0.81	1.23	0.52	0.57
Copper	µg/L	0.20			<0.2	<0.2	-	1.85	1.88	1.61	<0.2	<0.2
Iron	µg/L	10.0			338	450	28.43	<10	<10	-	300	355
Lead	µg/L	0.05			<0.05	<0.05	-	0.057	<0.05	-	<0.05	<0.05
Lithium	µg/L	1.0			29.8	30.1	1.00	22.8	21.8	4.48	24.8	24.8
Magnesium	µg/L	5.0			35000	34500	1.44	15500	15300	1.30	30400	28900
Manganese	µg/L	0.10			2030	2000	1.49	16	16.1	0.62	1340	1310
Mercury	µg/L	0.005			<0.005	<0.005	-	<0.005	<0.005	-	0.021	<0.005
Molybdenum	µg/L	0.05			0.846	0.958	12.42	19.8	19.2	3.08	0.914	0.86
Nickel	µg/L	0.50			22.4	20.8	7.41	7.51	7.55	0.53	10.9	10.1
Phosphorus	µg/L	50.0			<50	<50	-	<50	<50	-	<50	<50
Potassium	µg/L	50.0			1790	1750	2.26	7150	7020	1.83	1490	1470
Rubidium	µg/L	0.20			1.26	1.32	4.65	14.6	14	4.20	1	0.98
Selenium	µg/L	0.05			0.07	0.06	15.38	1.01	1.16	13.82	0.092	0.076
Silicon	µg/L	50.0			4030	3940	2.26	4170	4080	2.18	3800	3820
Silver	µg/L	0.01			<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01
Sodium	µg/L	50.0			42200	41500	1.67	54300	53400	1.67	29700	29800
Strontium	µg/L	0.2			403	397	1.50	504	493	2.21	337	340
Sulfur	µg/L	500			79100	78200	1.14	23700	23900	0.84	55200	59800
Tellurium	µg/L	0.20			<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2
Thallium	µg/L	0.01			<0.01	<0.01	-	0.03	0.024	22.22	<0.01	<0.01
Thorium	µg/L	0.10			<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1
Tin	µg/L	0.10			<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1
Titanium	µg/L	0.30			<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3
Tungsten	µg/L	0.10			<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1
Uranium	µg/L	0.01			1.56	1.48	5.26	0.873	0.901	3.16	1.12	1.11
Vanadium	µg/L	0.50			<0.5	<0.5	-	<0.5	<0.5	-	<0.5	<0.5
Zinc	µg/L	1.0			2.8	3.4	19.35	4.9	5.1	4.00	2.4	1.7
Zirconium	µg/L	0.06			<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2
Laboratory Work Order Number			L2542477	L2542477	VA20A0816	VA20A0816		VA20A2572	VA20A2572		VA20A4062	VA20A4062
Laboratory Identification Number			L2542477-5	L2542477-6	VA20A0816-001	VA20A0816-004		VA20A2572-001	VA20A2572-009		VA20A4062-001	VA20A4062-005

Notes:

RDL - Reportable detection limit

RPD - Relative percent difference calculated as (ABS[(difference between two values)]/((sum of two values/2))*100

"-" Indicates RPD not calculated. RPD cannot be calculated if one or more of the analytical results is less than detection limits or within 5 times the RDL.

BOLD - RPD greater than 30%

Blank - not analyzed.

Table 5: 2020 Quality Assurance/Quality Control for Wate

Parameter	Unit	RDL	RPD	LBL3C-1.65	LBL3C-1.65-R	RPD	RBSBIAR-DS	RBSBIAR-DS-R	RPD	LBRR-EDP	LBRR-EDP-R	RPD
				17-Apr-20			27-May-20			21-Jun-20		
Physical Parameters												
Acidity (as $CaCO_3$)	µg/L	1000	-	2100	2100	0.00	1900	1100	53.33	4700	3000	44.16
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	2.46	64.9	65.6	1.07	196	193	1.54	194	189	2.61
Electrical Conductivity (EC)	µS/cm	2.0	0.69	192	197	2.57	903	906	0.33	1630	1660	1.82
Hardness as $CaCO_3$, dissolved	µg/L	500	0.24	72200	72500	0.41	331000	340000	2.68	942000	904000	4.12
Hardness as $CaCO_3$, from total Ca/Mg	µg/L		1.08									
pH	pH Units	0.1	0.63	7.78	7.82	0.51	8.1	8.06	0.50	8.04	8.05	0.12
Total Dissolved Solids (TDS)	µg/L	10000	8.25	252000	286000	12.64	572000	584000	2.08	1300000	1340000	3.03
Total Suspended Solids (TSS)	µg/L	3000	-	440000	559000	23.82	6300	5500	13.56	4300	3200	29.33
Alkalinity (Hydroxide as $CaCO_3$)	µg/L	1000	-	<1000	<1000	-	<1000	<1000	-			
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	-	<1000	<1000	-	<1000	<1000	-			
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	2.46	64900	65600	1.07	196000	193000	1.54	194000	189000	2.61
Anions and Nutrients												
Ammonia (NH_4 as N)	µg/L	5.0	4.46	157	159	1.27	299	290	3.06	<50	<50	-
Chloride (Cl^-)	µg/L	500	0.96	5730	5620	1.94	111000	111000	0.00	115000	111000	3.54
Nitrate (NO_3^- as N)	µg/L	5.0	-	495	483	2.45	4750	4740	0.21	380	110	110.20
Nitrite (NO_2^- as N)	µg/L	1.0	-	13.4	13.2	1.50	45.4	45.8	0.88	<5	<5	-
Sulphate (SO_4)	µg/L	300	1.19	22200	23900	7.38	103000	107000	3.81	641000	672000	4.72
Dissolved Organic Carbon (DOC)	µg/L		4.90									
Metals, Total												
Aluminum	µg/L	3.0	27.62	9050	31.5	198.61	46.7	49.3	5.42	60.8	63.7	4.66
Antimony	µg/L	0.10	-	0.4	0.1	120.00	0.33	0.32	3.08	0.27	0.24	11.76
Arsenic	µg/L	0.10	2.60	7.23	0.69	165.15	0.31	0.3	3.28	0.61	0.65	6.35
Barium	µg/L	0.10	0.00	398	31.1	171.01	139	135	2.92	58.8	55.4	5.95
Beryllium	µg/L	0.10	-	0.57	0.1	140.30	<0.1	<0.1	-	<0.1	<0.1	-
Bismuth	µg/L	0.05	-	0.171	0.05	109.50	<0.05	<0.05	-	<0.05	<0.05	-
Boron	µg/L	10	0.00	32	24	28.57	161	160	0.62	109	105	3.74
Cadmium	µg/L	0.005	18.91	0.639	0.0712	159.90	0.0866	0.0829	4.37	0.361	0.379	4.86
Calcium	µg/L	50	1.53	34100	18100	61.30	97600	95400	2.28	262000	261000	0.38
Cesium	µg/L	0.01	-	1.65	0.01	197.59	0.047	0.045	4.35	0.014	0.013	7.41
Chromium	µg/L	0.10	-	17.3	0.23	194.75	0.27	0.27	0.00	0.18	0.16	11.76
Cobalt	µg/L	0.10	0.00	8.36	0.32	185.25	1.16	1.13	2.62	2.16	2.17	0.46
Copper	µg/L	0.50	-	26.2	2.33	167.33	1.11	1.15	3.54	1.74	1.83	5.04
Iron	µg/L	10	1.90	19600	177	196.42	65	66	1.53	81	84	3.64
Lead	µg/L	0.05	-	11	0.149	194.65	<0.05	<0.05	-	<0.05	<0.05	-
Lithium	µg/L	1.0	1.32	16	1.5	165.71	36.5	34.3	6.21	48.1	48.1	0.00
Magnesium	µg/L	5.0	0.00	11000	6150	56.56	25500	25900	1.56	72800	74700	2.58
Manganese	µg/L	0.10	4.91	332	26.1	170.85	25.7	24.9	3.16	109	113	3.60
Mercury	µg/L	0.005	-	0.0404	0.0373	7.98	<0.005	<0.005	-	<0.005	<0.005	-
Molybdenum	µg/L	0.05	60.68	3.36	1.23	92.81	7.43	7.28	2.04	3.42	3.08	10.46
Nickel	µg/L	0.5	2.62	33	1.94	177.79	9.96	9.83	1.31	37.3	39.5	5.73
Phosphorus	µg/L	50.0	-	965	278	110.54	<50	<50	-	<50	<50	-
Potassium	µg/L	50.0	0.69	13100	11100	16.53	4220	4140	1.91	7260	6950	4.36
Rubidium	µg/L	0.2	4.17	15.1	1.61	161.46	2.46	2.46	0.00	1.84	1.99	7.83
Selenium	µg/L	0.05	-	0.722	0.273	90.25	0.873	0.912	4.37	2.87	2.86	0.35
Silicon	µg/L	100	0.78	15800	2020	154.66	3790	3750	1.06	5440	5450	0.18
Silver	µg/L	0.01	-	0.223	0.01	182.83	<0.01	<0.01	-	<0.01	<0.01	-
Sodium	µg/L	50.0	1.57	3180	2810	12.35	79700	78400	1.64	52100	52300	0.38
Strontium	µg/L	0.2	0.57	125	69	57.73	619	608	1.79	802	788	1.76
Sulfur	µg/L	500	0.85	7500	6750	10.53	40600	40200	0.99	229000	232000	1.30
Tellurium	µg/L	0.2	-	<0.2	<0.2	0.00	<0.2	<0.2	-	0.24	<0.2	-
Thallium	µg/L	0.01	-	0.201	0.01	181.04	0.018	0.018	0.00	0.023	0.02	13.95
Thorium	µg/L	0.10	-	1.53	0.1	175.46	<0.1	<0.1	-	<0.1	<0.1	-
Tin	µg/L	0.10	-	0.29	0.1	97.44	<0.1	<0.1	-	<0.1	<0.1	-
Titanium	µg/L	0.30	-	60.7	3.68	177.14	0.72	0.56	25.00	0.9	1.2	28.57
Tungsten	µg/L	0.10	-	<0.1	<0.1	0.00	<0.1	<0.1	-	<0.1	<0.1	-
Uranium	µg/L	0.01	0.91	1.09	0.288	116.40	1.21	1.16	4.22	5.57	5.49	1.45
Vanadium	µg/L	0.50	-	28.5	0.73	190.01	<0.5	<0.5	-	<0.5	0.54	-
Zinc	µg/L	3.0	-	95.2	5.4	178.53	9.4	11.6	20.95	27	32.3	17.88
Zirconium	µg/L	0.06	-	0.73	0.25	97.96	<0.2	<0.2	-	<0.2	<0.2	-
Metals, Dissolved												
Aluminum	µg/L	1.0	-	18.4	40.8	75.68	18.7	20.1	**7.22**	36	38.5	6.71
Antimony	µg/L	0.10	-	<0.1	<0.1	0.00	0.32	0.32	0.00	0.24	0.24	0.00
Arsenic	µg/L	0.10	18.18	0.59	0.64	8.13	0.24	0.26	8.00	0.57	0.46	21.36
Barium	µg/L	0.10	1.90	31.2	33.4	6.81	131	133	1.52	57.5	56.2	2.29
Beryllium	µg/L	0.10	-	<0.1	<0.1	0.00	<0.1	<0.1	-	<0.1	<0.1	-
Bismuth	µg/L	0.05	-	<0.05	<0.05	0.00	<0.05	<0.05	-	<0.05	<0.05	-
Boron	µg/L	10.0	3.85	22	23	4.44	150	159	5.83	110	108	1.83
Cadmium	µg/L	0.005	6.36	0.0718	0.0698	2.82	0.0719	0.0759	5.41	0.342	0.363	5.96
Calcium	µg/L	50.0	2.53	18400	18900	2.68	92600	96100	3.71	258000	241000	6.81
Cesium	µg/L	0.01	-	<0.01	<0.01	0.00	0.038	0.042	10.00	0.013	0.012	8.00
Chromium	µg/L	0.10	-	0.15	0.23	42.11	0.17	0.19	**11.11**	<0.1	<0.1	-
Cobalt	µg/L	0.10	9.17	0.29	0.32	9.84	1.02	1	1.98	2.03	2.02	0.49
Copper	µg/L	0.20	-	2.14	2.23	4.12	0.84	0.89	5.78	1.62	1.6	1.24
Iron	µg/L	10.0	16.79	105	174	49.46	<10	<10	-	12	15	22.22
Lead	µg/L	0.05	-	0.101	0.145	35.77	<0.05	<0.05	-	<0.05	<0.05	-
Lithium	µg/L	1.0	0.00	1.8	1.8	0.00	30	31.1	3.60	45	45.7	1.54
Magnesium	µg/L	5.0	5.06	6400	6160	3.82	24200	24300	0.41	72600	73600	1.37
Manganese	µg/L	0.10	2.26	25.8	27.1	4.91	22.4	22.3	0.45	102	107	4.78
Mercury	µg/L	0.005	-	<0.005	<0.005	0.00	<0.005	<0.005	-	<0.005	<0.005	-
Molybdenum	µg/L	0.05	6.09	1.73	0.802	73.30	7.36	7.55	2.55	3.08	3.19	3.51
Nickel	µg/L	0.50	7.62	1.49	1.97	27.75	9.32	9.28	0.43	35.7	35.8	0.28
Phosphorus	µg/L	50.0	-	280	342	19.94	<50	<50	-	<50	<50	-
Potassium	µg/L	50.0	1.35	11500	10700	7.21	4290	4340	1.16	6540	6790	3.75
Rubidium	µg/L	0.20	2.02	1.68	1.71	1.77	2.19	2.35	7.05	1.82	1.92	5.35
Selenium	µg/L	0.05	19.05	0.3	0.341	12.79	0.922	0.981	6.20	3.54	2.76	24.76
Silicon	µg/L	50.0	0.52	2040	2030	0.49	3400	3540	4.03	5540	5170	6.91
Silver	µg/L	0.01	-	<0.01	<0.01	0.00	<0.01	<0.01	-	<0.01	<0.01	-
Sodium	µg/L	50.0	0.34	2950	2930	0.68	72500	74000	2.05	50200	46900	6.80
Strontium	µg/L	0.2	0.89	73.4	74.2	1.08	561	578	2.99	848	740	13.60
Sulfur	µg/L	500	8.00	7240	7830	7.83	38900	39700	2.04	242000	220000	9.52
Tellurium	µg/L	0.20	-	<0.2	<0.2	0.00	<0.2	<0.2	-	<0.2	<0.2	-
Thallium	µg/L	0.01	-	<0.01	<0.01	0.00	0.018	0.019	5.41	0.018	0.022	20.00
Thorium	µg/L	0.10	-	0.1	0.11	9.52	<0.1	<0.1	-	<0.1	<0.1	-
Tin	µg/L	0.10	-	<0.1	<0.1	0.00	<0.1	<0.1	-	<0.1	<0.1	-
Titanium	µg/L	0.30	-	0.94	1.16	20.95	<0.3	<0.3	-	<0.3	<0.3	-
Tungsten	µg/L	0.10	-	<0.1	<0.1	0.00	<0.1	<0.1	-	<0.1	<0.1	-
Uranium	µg/L	0.01	0.90	0.243	0.307	23.27	1.2	1.19	0.84	5.08	4.76	6.50
Vanadium	µg/L	0.50	-	0.5	0.64	24.56	<0.5	<0.5	-	<0.5	<0.5	-
Zinc	µg/L	1.0	34.15	5.1	5.7	11.11	6.7	6.8	1.48	22.9	23.8	3.85
Zirconium	µg/L	0.06	-	0.22	0.47	72.46	<0.2	<0.2	-	<0.2	<0.2	-
Laboratory Work Order Number				L2438183	L2438183		L2454036	L2454036		L2464256	L2464256	
Laboratory Identification Number				L2438183-3	L2438183-16		L2454036-7	L2454036-2		L2464256-1	L2464256-15	

Notes:

RDL - Reportable detection limit

RPD - Relative percent difference calculated as (ABS[(difference between two values)]/((sum of two values/2))*100

"-" Indicates RPD not calculated. RPD cannot be calculated if one or more of the analytical results is less than detection limits or within 5 times the RDL.

BOLD - RPD greater than 30%

Blank - not analyzed.

Table 5: 2020 Quality Assurance/Quality Control for Wate

Parameter	Unit	RDL	LBP Pond	LBP Pond-R	RPD	RBSBIAR-DS	RBSBIAR-DS-R	RPD	L2-DS	L2-DS-R	RPD
			8-Oct-20			20-Oct-20			20-Nov-30		
Physical Parameters											
Acidity (as $CaCO_3$)	µg/L	1000	6100	1800	108.86	1600	1200	28.57	<1000	<1000	-
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	295	289	2.05	215	198	8.23	262	256	2.32
Electrical Conductivity (EC)	µS/cm	2.0	3530	3550	0.56	682	630	7.93	1050	1060	0.95
Hardness as $CaCO_3$, dissolved	µg/L	500	1970000	1980000	0.51	303000	309000	1.96	210000	217000	3.28
Hardness as $CaCO_3$, from total Ca/Mg	µg/L										
pH	pH Units	0.1	8.23	8.26	0.36	8.08	8.08	0.00	8.31	8.31	0.00
Total Dissolved Solids (TDS)	µg/L	10000	3380000	3390000	0.30	462000	453000	1.97	672000	661000	1.65
Total Suspended Solids (TSS)	µg/L	3000	13900	15200	8.93	2800	2200	24.00	7900	26200	107.33
Alkalinity (Hydroxide as $CaCO_3$)	µg/L	1000	<1000	<1000	-	<1000	<1000	-	<1000	<1000	-
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	<1000	<1000	-	<1000	<1000	-	5000	4000	22.22
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	295000	289000	2.05	215000	198000	8.23	257000	252000	1.96
Anions and Nutrients											
Ammonia (NH_4 as N)	µg/L	5.0	118	100	16.51	100	98	2.02	218	214	1.85
Chloride (Cl^-)	µg/L	500	6400	6400	0.00	51100	50900	0.39	65600	68100	3.74
Nitrate (NO_3^- as N)	µg/L	5.0	<25	<25	-	1170	1170	0.00	237	244	2.91
Nitrite (NO_2^- as N)	µg/L	1.0	<5	<5	-	<8.1	<8.6	-	19.3	21.8	12.17
Sulphate (SO_4)	µg/L	300	2130000	2110000	0.94	111000	112000	0.90	204000	208000	1.94
Dissolved Organic Carbon (DOC)	µg/L										
Metals, Total											
Aluminum	µg/L	3.0	169	173	2.34	93.8	102	8.38	367	388	5.56
Antimony	µg/L	0.10	0.5	0.5	0.00	0.17	0.18	5.71	1.23	1.25	1.61
Arsenic	µg/L	0.10	0.75	0.76	1.32	0.21	0.24	13.33	1.79	1.83	2.21
Barium	µg/L	0.10	81.7	83.6	2.30	146	151	3.37	56.7	58.1	2.44
Beryllium	µg/L	0.10	0.5	0.5	0.00	<0.1	<0.1	-	<0.1	<0.1	-
Bismuth	µg/L	0.05	0.25	0.25	0.00	<0.05	<0.05	-	<0.05	<0.05	-
Boron	µg/L	10	208	198	4.93	69	70	1.44	177	185	4.42
Cadmium	µg/L	0.005	0.037	0.038	2.67	0.0477	0.0514	7.47	0.0238	0.0265	10.74
Calcium	µg/L	50	419000	395000	5.90	95400	95900	0.52	61800	62300	0.81
Cesium	µg/L	0.01	0.05	0.05	0.00	0.023	0.027	16.00	0.037	0.042	12.66
Chromium	µg/L	0.10	0.5	0.5	0.00	0.25	0.28	11.32	1.14	1.11	2.67
Cobalt	µg/L	0.10	13.5	13.2	2.25	1.24	1.31	5.49	0.22	0.22	0.00
Copper	µg/L	0.50	2.5	2.5	0.00	1.03	1.07	3.81	2.19	2.1	4.20
Iron	µg/L	10	1260	1320	4.65	203	214	5.28	222	223	0.45
Lead	µg/L	0.05	0.25	0.25	0.00	<0.05	<0.05	-	0.29	0.267	8.26
Lithium	µg/L	1.0	81.8	77.6	5.27	20.3	19	6.62	33.5	34.4	2.65
Magnesium	µg/L	5.0	220000	214000	2.76	23100	22600	2.19	18100	18200	0.55
Manganese	µg/L	0.10	6550	6350	3.10	17.8	18.4	3.31	6.99	7.34	4.88
Mercury	µg/L	0.005	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
Molybdenum	µg/L	0.05	1.84	13	150.40	3.99	4	0.25	16.5	17.8	7.58
Nickel	µg/L	0.5	38	36.3	4.58	7.39	7.65	3.46	1.5	1.47	2.02
Phosphorus	µg/L	50.0	<250	<250	-	<50	<50	-	<50	<50	-
Potassium	µg/L	50.0	15300	14800	3.32	3480	3470	0.29	5390	5690	5.42
Rubidium	µg/L	0.2	3.4	3.5	2.90	1.33	1.34	0.75	6.09	6.64	8.64
Selenium	µg/L	0.05	0.43	0.39	9.76	0.841	0.88	4.53	1.8	1.76	2.25
Silicon	µg/L	100	970	1010	4.04	4000	4020	0.50	4480	4550	1.55
Silver	µg/L	0.01	0.05	0.05	0.00	<0.01	<0.01	-	<0.01	<0.01	-
Sodium	µg/L	50.0	250000	238000	4.92	32700	33500	2.42	158000	163000	3.12
Strontium	µg/L	0.2	1030	974	5.59	503	511	1.58	253	257	1.57
Sulfur	µg/L	500	749000	735000	1.89	35500	36200	1.95	67700	67500	0.30
Tellurium	µg/L	0.2	<1	<1	-	<0.2	<0.2	-	<0.2	<0.2	-
Thallium	µg/L	0.01	0.05	0.05	0.00	<0.01	<0.01	-	<0.01	<0.01	-
Thorium	µg/L	0.10	0.5	0.5	0.00	<0.1	<0.1	-	<0.1	<0.1	-
Tin	µg/L	0.10	0.5	0.5	0.00	<0.1	<0.1	-	0.4	0.43	7.23
Titanium	µg/L	0.30	1.5	1.6	6.45	0.68	0.89	26.75	4.21	4.51	6.88
Tungsten	µg/L	0.10	0.5	0.5	0.00	<0.1	<0.1	-	0.53	0.63	17.24
Uranium	µg/L	0.01	5.85	5.63	3.83	1.14	1.16	1.74	1.8	1.8	0.00
Vanadium	µg/L	0.50	2.5	2.5	0.00	<0.5	<0.5	-	3.45	3.6	4.26
Zinc	µg/L	3.0	20	18	10.53	14.6	16.4	11.61	18.1	18	0.55
Zirconium	µg/L	0.06	<1	<1	-	<0.2	<0.2	-	0.27	0.27	0.00
Metals, Dissolved											
Aluminum	µg/L	1.0	25.9	19.8	26.70	46.1	49	6.10	258	272	5.28
Antimony	µg/L	0.10	0.5	0.5	0.00	0.2	0.17	16.22	1.2	1.29	7.23
Arsenic	µg/L	0.10	0.6	0.63	4.88	0.17	0.17	0.00	1.75	1.91	8.74
Barium	µg/L	0.10	77.5	77.1	0.52	138	139	0.72	52.9	52.6	0.57
Beryllium	µg/L	0.10	0.5	0.5	0.00	<0.1	<0.1	-	<0.1	<0.1	-
Bismuth	µg/L	0.05	0.25	0.25	0.00	<0.05	<0.05	-	<0.05	<0.05	-
Boron	µg/L	10.0	202	201	0.50	57	57	0.00	187	212	12.53
Cadmium	µg/L	0.005	0.025	0.03	18.18	0.0475	0.0505	6.12	0.0077	0.0082	6.29
Calcium	µg/L	50.0	419000	422000	0.71	83500	85500	2.37	56300	58400	3.66
Cesium	µg/L	0.01	0.05	0.05	0.00	0.016	0.016	0.00	0.026	0.03	14.29
Chromium	µg/L	0.10	0.5	0.5	0.00	0.11	<0.1	-	0.59	0.62	4.96
Cobalt	µg/L	0.10	13.1	13.1	0.00	1.19	1.24	4.12	0.11	<0.1	-
Copper	µg/L	0.20	<1	<1	-	0.65	0.65	0.00	0.84	0.84	0.00
Iron	µg/L	10.0	416	438	5.15	39	41	5.00	25	19	27.27
Lead	µg/L	0.05	0.25	0.25	0.00	<0.05	<0.05	-	<0.05	<0.05	-
Lithium	µg/L	1.0	85.9	86.8	1.04	20.1	19.8	1.50	34.7	38	9.08
Magnesium	µg/L	5.0	225000	224000	0.45	23000	23300	1.30	16900	17200	1.76
Manganese	µg/L	0.10	6700	6740	0.60	16.4	16.9	3.00	3.49	2.73	24.44
Mercury	µg/L	0.005	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
Molybdenum	µg/L	0.05	1.94	5.79	99.61	4.04	4.06	0.49	16.8	18.3	8.55
Nickel	µg/L	0.50	37.1	36.2	2.46	7.4	7.48	1.08	1.21	1.21	0.00
Phosphorus	µg/L	50.0	<250	<250	-	<50	<50	-	<50	<50	-
Potassium	µg/L	50.0	13600	13500	0.74	3580	3610	0.83	5730	5970	4.10
Rubidium	µg/L	0.20	3.2	3.1	3.17	1.29	1.35	4.55	6.5	6.62	1.83
Selenium	µg/L	0.05	0.34	0.3	12.50	1.03	0.957	7.35	1.79	1.95	8.56
Silicon	µg/L	50.0	800	810	1.24	3980	4060	1.99	4360	4700	7.51
Silver	µg/L	0.01	0.05	0.05	0.00	<0.01	<0.01	-	<0.01	<0.01	-
Sodium	µg/L	50.0	238000	237000	0.42	32900	33900	2.99	155000	163000	5.03
Strontium	µg/L	0.2	1020	1000	1.98	500	514	2.76	234	243	3.77
Sulfur	µg/L	500	774000	752000	2.88	36500	37100	1.63	67300	73000	8.13
Tellurium	µg/L	0.20	<1	<1	-	<0.2	<0.2	-	<0.2	<0.2	-
Thallium	µg/L	0.01	0.05	0.05	0.00	0.012	<0.01	-	<0.01	<0.01	-
Thorium	µg/L	0.10	0.5	0.5	0.00	<0.1	<0.1	-	<0.1	<0.1	-
Tin	µg/L	0.10	0.5	0.5	0.00	<0.1	<0.1	-	0.33	0.36	8.70
Titanium	µg/L	0.30	1.5	1.5	0.00	<0.3	<0.3	-	0.85	0.67	23.68
Tungsten	µg/L	0.10	0.5	0.5	0.00	<0.1	<0.1	-	0.64	0.68	6.06
Uranium	µg/L	0.01	5.07	5.18	2.15	1.15	1.13	1.75	1.75	1.86	6.09
Vanadium	µg/L	0.50	2.5	2.5	0.00	<0.5	<0.5	-	2.91	3.1	6.32
Zinc	µg/L	1.0	16.3	14.9	8.97	12.6	12.7	0.79	4.9	7.1	36.67
Zirconium	µg/L	0.06	<1	<1	-	<0.2	<0.2	-	<0.2	<0.2	-
Laboratory Work Order Number			L2515191	L2515191		L2520229	L2520229		L2532220	L2532220	
Laboratory Identification Number			L2515191-4	L2515191-5		L2520229-1	L2520229-7		L2532220-2	L2532220-3	

Notes:

RDL - Reportable detection limit

RPD - Relative percent difference calculated as (ABS[(difference between two values)]/((sum of two values/2))*100

"-" Indicates RPD not calculated. RPD cannot be calculated if one or more of the analytical results is less than detection limits or within 5 times the RDL.

BOLD - RPD greater than 30%

Blank - not analyzed.

Table 5: 2020 Quality Assurance/Quality Control for Wate

Parameter	Unit	RDL	RBSBIAR-DS	RBSBIAR-DS-R	RPD	L2-US	L2-US-R	RPD	L2-DS	L2-DS-R	RPD	LBL3C-1.43	LBL3C-1.43-R	RPD
			30-Nov-20			4-Dec-20			14-Dec-20			20-Dec-20		
Physical Parameters														
Acidity (as $CaCO_3$)	µg/L	1000	<1000	<1000	-	1400	1300	7.41	<1000	<1000	-	4900	3500	**33.3**
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	240	235	2.11	153	152	0.66	343	343	0.00	283	285	0.7
Electrical Conductivity (EC)	µS/cm	2.0	744	727	2.31	459	454	1.10	1550	1550	0.00	1650	1670	1.2
Hardness as $CaCO_3$, dissolved	µg/L	500	267000	279000	4.40	153000	153000	0.00	291000	291000	0.00	934000	923000	1.2
Hardness as $CaCO_3$, from total Ca/Mg	µg/L													
pH	pH Units	0.1	8.26	8.21	0.61	8.22	8.23	0.12	8.26	8.21	0.61	8.04	8.15	1.4
Total Dissolved Solids (TDS)	µg/L	10000	489000	489000	0.00	302000	248000	19.64	1000000	1000000	0.00	1390000	1430000	2.8
Total Suspended Solids (TSS)	µg/L	3000	<1000	<1000	-	19900	8700	78.32	144000	169000	15.97	8600	5400	**45.7**
Alkalinity (Hydroxide as $CaCO_3$)	µg/L	1000	<1000	<1000	-	<1000	<1000	-	<1000	<1000	-	<1000	<1000	-
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	<1000	<1000	-	<1000	<1000	-	<1000	<1000	-	<1000	<1000	-
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	240000	235000	2.11	153000	152000	0.66	343000	343000	0.00	283000	285000	0.7
Anions and Nutrients														
Ammonia (NH_4 as N)	µg/L	5.0	62	62	0.00	<50	<50	-	334	363	8.32	<50	<50	-
Chloride (Cl^-)	µg/L	500	35400	35400	0.00	6570	6670	1.51	110000	106000	3.70	52500	47700	9.6
Nitrate (NO_3^- as N)	µg/L	5.0	922	924	0.22	316	316	0.00	316	324	2.50	22900	20000	13.5
Nitrite (NO_2^- as N)	µg/L	1.0	<5	6.8	-	<1	<1	-	41	46.7	13.00	<5	<5	-
Sulphate (SO_4)	µg/L	300	127000	126000	0.79	86200	86900	0.81	348000	347000	0.29	627000	613000	2.3
Dissolved Organic Carbon (DOC)	µg/L					1.6	2.4	40.00	2.86	3.3	14.29	2.4	2.8	15.4
Metals, Total														
Aluminum	µg/L	3.0	66.1	71.2	7.43	399	383	4.09	497	479	3.69	122	25	**132.0**
Antimony	µg/L	0.10	0.3	0.21	35.29	0.45	0.43	4.55	1.89	1.83	3.23	<0.5	<0.5	-
Arsenic	µg/L	0.10	0.2	0.18	10.53	0.71	0.66	7.30	2.88	2.6	10.22	<0.5	<0.5	-
Barium	µg/L	0.10	88.8	91.7	3.21	78.7	74.8	5.08	56.4	55.5	1.61	42.4	32.7	25.8
Beryllium	µg/L	0.10	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.04	-	<0.5	<0.5	-
Bismuth	µg/L	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.25	<0.1	-	<0.25	<0.25	-
Boron	µg/L	10	59	66	11.20	80	88	9.52	308	310	0.65	113	118	4.3
Cadmium	µg/L	0.005	0.0719	0.0747	3.82	0.052	0.0396	27.07	<0.025	<0.01	-	0.076	0.077	1.3
Calcium	µg/L	50	85800	93100	8.16	42400	44500	4.83	97200	94200	3.13	219000	231000	5.3
Cesium	µg/L	0.01	0.013	0.015	14.29	0.062	0.056	10.17	0.058	0.056	3.51	<0.05	<0.05	-
Chromium	µg/L	0.10	0.11	<0.1	-	1.09	1.06	2.79	1.59	1.68	5.50	<0.05	<0.05	-
Cobalt	µg/L	0.10	1.43	1.54	7.41	0.38	0.34	11.11	<0.5	0.31	-	0.83	0.51	**47.8**
Copper	µg/L	0.50	0.99	1.51	41.60	1.95	1.74	11.38	<2.5	1.8	-	<2.5	<2.5	-
Iron	µg/L	10	53	62	15.65	963	868	10.38	290	276	4.95	269	<50	**137.3**
Lead	µg/L	0.05	<0.05	<0.05	-	0.493	0.418	16.47	0.27	0.25	7.69	<0.25	<0.25	-
Lithium	µg/L	1.0	18	19.9	10.03	18.4	18.7	1.62	57.3	57.5	0.35	52.4	47.1	10.7
Magnesium	µg/L	5.0	21300	22600	5.92	10600	10600	0.00	27300	27300	0.00	106000	102000	3.8
Manganese	µg/L	0.10	16.2	19.8	20.00	43.4	39.8	8.65	8.45	8.27	2.15	24.5	10.2	**82.4**
Mercury	µg/L	0.005	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
Molybdenum	µg/L	0.05	4.19	4.66	10.62	2.18	2.23	2.27	33.7	33.2	1.49	0.99	0.84	16.4
Nickel	µg/L	0.5	9.99	10.5	4.98	3.7	3.57	3.58	<2.5	2	-	17.9	15.2	16.3
Phosphorus	µg/L	50.0	<50	<50	-	53	55	3.70	250	<100	-	<250	<250	-
Potassium	µg/L	50.0	2860	2970	3.77	1490	1450	2.72	8250	8200	0.61	3920	4460	12.9
Rubidium	µg/L	0.2	1.02	1.14	11.11	1.18	1.25	5.76	8.90	8.85	0.56	<1	<1	-
Selenium	µg/L	0.05	0.989	1.01	2.10	2.32	2.44	5.04	3.43	3.27	4.78	5.4	5.48	1.5
Silicon	µg/L	100	3350	3690	9.66	3540	3740	5.49	5840	5770	1.21	5700	5470	4.1
Silver	µg/L	0.01	<0.01	<0.01	-	<0.01	<0.01	-	<0.05	<0.02	-	<0.05	<0.05	-
Sodium	µg/L	50.0	36900	38800	5.02	36400	37000	1.63	260000	262000	0.77	27600	32500	16.3
Strontium	µg/L	0.2	452	494	8.88	289	286	1.04	363	350	3.65	771	742	3.8
Sulfur	µg/L	500	43100	47600	9.92	30700	31900	3.83	120000	120000	0.00	204000	210000	2.9
Tellurium	µg/L	0.2	<0.2	<0.2	-	<0.2	<0.2	-	<01.0	<0.40	-	<1	<1	-
Thallium	µg/L	0.01	0.02	<0.01	-	0.014	0.014	0.00	<0.05	<0.02	-	<0.05	<0.05	-
Thorium	µg/L	0.10	<0.1	<0.1	-	0.11	<0.1	-	<0.50	<0.20	-	<0.5	<0.5	-
Tin	µg/L	0.10	<0.1	<0.1	-	0.24	0.22	8.70	0.56	0.57	1.77	<0.5	<0.5	-
Titanium	µg/L	0.30	<0.3	<0.3	-	11.5	11.2	2.64	4.7	4.31	8.66	2.9	<1.5	**63.6**
Tungsten	µg/L	0.10	<0.1	<0.1	-	<0.1	<0.1	-	1.03	0.98	-	<0.5	<0.5	-
Uranium	µg/L	0.01	1.18	1.27	7.35	1.23	1.29	4.76	2.98	2.91	2.38	7.57	6.93	8.8
Vanadium	µg/L	0.50	<0.5	<0.5	-	1.79	1.71	4.57	6.6	6.6	0.00	<2.5	<2.5	-
Zinc	µg/L	3.0	15.3	16	4.47	10.2	9.4	8.16	<15	7.5	-	<15	<15	-
Zirconium	µg/L	0.06	<0.2	<0.2	-	0.23	0.21	-	<1	<0.4	-	<1	<1	-
Metals, Dissolved														
Aluminum	µg/L	1.0	48.7	53.1	8.64	9.8	10.2	4.00	**340**	**337**	0.89	5	<5	-
Antimony	µg/L	0.10	0.19	0.19	0.00	0.38	0.38	0.00	1.68	1.63	3.02	<0.5	<0.5	-
Arsenic	µg/L	0.10	0.15	0.18	18.18	0.37	0.33	11.43	2.69	2.56	4.95	<0.5	<0.5	-
Barium	µg/L	0.10	91.8	103	11.50	63.5	58.8	7.69	43.8	43.6	0.46	30.7	30.6	0.3
Beryllium	µg/L	0.10	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-	<0.5	<0.5	-
Bismuth	µg/L	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.25	<0.25	-	<0.25	<0.25	-
Boron	µg/L	10.0	57	55	3.57	91	89	2.22	280	290	3.51	119	116	2.6
Cadmium	µg/L	0.005	0.0647	0.0768	17.10	0.016	0.0119	29.39	<0.025	0.035	-	0.059	0.067	12.7
Calcium	µg/L	50.0	73700	76400	3.60	44700	45100	0.89	73100	73700	0.82	221000	219000	0.9
Cesium	µg/L	0.01	0.012	0.011	8.70	<0.01	<0.01	-	<0.050	<0.050	-	<0.05	<0.05	-
Chromium	µg/L	0.10	<0.1	<0.1	-	0.35	0.35	0.00	1.28	1.23	3.98	<0.5	<0.5	-
Cobalt	µg/L	0.10	1.43	1.54	7.41	<0.1	<0.1	-	<0.5	<0.5	-	<0.5	<0.5	-
Copper	µg/L	0.20	0.86	0.92	6.74	0.67	0.61	9.38	<1	<1	-	<1	<1	-
Iron	µg/L	10.0	24	26	8.00	<10	<10	-	<50	<50	-	<50	<50	-
Lead	µg/L	0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.25	<0.25	-	<0.25	<0.25	-
Lithium	µg/L	1.0	20.2	21.3	5.30	19.4	17.2	12.02	49.6	53.8	8.12	42.2	42.4	0.5
Magnesium	µg/L	5.0	20300	21300	4.81	10000	9710	2.94	26400	25900	1.91	93000	91500	1.6
Manganese	µg/L	0.10	15.1	16.4	8.25	19.4	19.5	0.51	2.55	2.39	6.48	7.28	7.07	2.9
Mercury	µg/L	0.005	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
Molybdenum	µg/L	0.05	4.21	4.3	2.12	2.47	2.33	5.83	30.8	30.5	0.98	0.78	0.82	5.0
Nickel	µg/L	0.50	9.56	10.3	7.45	2.73	2.56	6.43	<2.5	<2.5	-	14.1	13.8	2.2
Phosphorus	µg/L	50.0	<50	<50	-	<50	<50	-	<250	<250	-	<250	<250	-
Potassium	µg/L	50.0	3120	3400	8.59	1320	1290	2.30	8300	8090	2.56	4160	4100	1.5
Rubidium	µg/L	0.20	1.17	1.19	1.69	0.57	0.55	3.57	8.5	8.3	2.38	<1	<1	-
Selenium	µg/L	0.05	1.12	1.07	4.57	2.69	2.25	17.81	3.36	3.52	4.65	5.44	5.41	0.6
Silicon	µg/L	50.0	3600	3500	2.82	2860	2740	4.29	5440	5280	2.99	5090	5090	0.0
Silver	µg/L	0.01	<0.01	<0.01	-	<0.01	<0.01	-	0.05	0.05	0.00	<0.05	<0.05	-
Sodium	µg/L	50.0	38700	40700	5.04	34700	33000	5.02	257000	253000	1.57	29400	29400	0.0
Strontium	µg/L	0.2	456	476	4.29	291	271	7.12	319	316	0.94	704	695	1.3
Sulfur	µg/L	500	40400	38900	3.78	29600	26700	10.30	113000	111000	1.79	196000	195000	0.5
Tellurium	µg/L	0.20	<0.2	<0.2	-	<0.2	<0.2	-	<1.0	<1.1	-	<1	<1	-
Thallium	µg/L	0.01	<0.01	<0.01	-	<0.01	<0.01	-	<0.05	<0.05	-	<0.05	<0.05	-
Thorium	µg/L	0.10	<0.1	<0.1	-	<0.1	<0.1	-	<0.50	<0.50	-	<0.5	<0.5	-
Tin	µg/L	0.10	<0.1	<0.1	-	0.12	0.12	0.00	<0.5	0.55	-	<0.5	<0.5	-
Titanium	µg/L	0.30	<0.3	<0.3	-	<0.3	<0.3	-	<1.5	<1.5	-	<1.5	<1.5	-
Tungsten	µg/L	0.10	<0.1	<0.1	-	<0.1	<0.1	-	0.98	0.98	0.00	<0.5	<0.5	-
Uranium	µg/L	0.01	1.23	1.31	6.30	1.14	1.17	2.60	2.76	2.77	0.36	6.64	6.55	1.4
Vanadium	µg/L	0.50	<0.5	<0.5	-	<0.5	<0.5	-	5.9	5.5	7.02	<2.5	<2.5	-
Zinc	µg/L	1.0	15.4	16.7	8.10	2.8	2.3	19.61	<5	<5	-	<5	<5	-
Zirconium	µg/L	0.06	<0.2	<0.2	-	<0.2	<0.2	-	1	1	0.00	<1	<1	-
Laboratory Work Order Number			L2535101	L2535101		L2537214	L2537214		L2540107	L2540107		L2542477	L2542477	
Laboratory Identification Number			L2535101-1	L2535101-6		L2537214-1	L2537214-3		L2540107-1	L2540107-2		L2542477-1	L2542477-2	

Notes:

RDL - Reportable detection limit

RPD - Relative percent difference calculated as (ABS[(difference between two values)]/((sum of two values/2))*100

"-" Indicates RPD not calculated. RPD cannot be calculated if one or more of the analytical results is less than detection limits or within 5 times the RDL.

BOLD - RPD greater than 30%

Blank - not analyzed.

Table 6: In Situ Water Quality Sampling Along the River Road Ditch

Sample Site	Date	Time	In-Situ Tests - 2020						
			pH	EC (µS/cm)	Hardness (ppm)	Alkalinity (ppm)	Water Temp (°C)	Estimated Flow (L/sec)	Turbidity
LBRR-DD (Discharge)	27/Feb/20	12:59	8.27	892	450	80	4.50	1.0	slightly turbid
	16/Apr/20	15:45	8.31	1043	500	120	8.20	0.8	clear
	28/Sep/20	14:15	8.26	1309	800	240	10.80	0.1	clear
LBRR-LC (Mid-stream)	27/Feb/20	14:00	8.83	500	250	80	0.00	0.1	clear
	16/Apr/20	15:25	8.32	1015	500	120	10.30	1.0	clear
LBRR-UC	16/Apr/20	16:15	8.75	183	100	40	0.10	0.2	cloudy
	27/May/20	12:42	8.55	1060	800	240	12.30	0.1	clear
	21/Jun/20	12:02	8.40	1180	450	240	16.20	0.1	clear
	29/Jul/20	11:40	7.97	1195	450	240	17.06	0.1	clear
	23/Aug/20	13:38	7.30	1131	450	180	15.03	0.1	clear
	28/Sep/20	15:25	8.40	-	450	180	n/a	0.0	clear
LBRR-12+500	27/Feb/20	14:08	8.42	910	450	120	0.00	0.1	clear
	25/Mar/20	12:27	8.67	1256	450	80	0.10	3.0	turbid/brown
	16/Apr/20	14:50	8.57	1156	250	120	6.00	1.0	turbid
	21/Jun/20	11:25	8.40	1119	450	240	21.80	0.2	clear
	28/Sep/20	14:50	8.28	1183	450	180	10.75	0.1	clear
	20/Oct/20	14:46	8.03	1326	450	180	0.37	0.1	clear
LBRR-12+600	27/Feb/20	14:26	8.87	933	450	120	0.00	1.0	clear
	25/Mar/20	12:55	8.55	1300	800	80	0.00	3.0	turbid
	16/Apr/20	16:00	8.52	1240	250	120	3.00	0.8	turbid
	28/Sep/20	15:01	8.26	1189	450	180	11.06	0.1	clear
LBRR-12+700	27/Feb/20	14:32	8.61	763	450	80	0.00	1.0	clear
	25/Mar/20	13:00	8.50	1212	800	80	0.00	2.0	turbid
	16/Apr/20	16:05	8.27	1091	500	120	7.10	0.5	turbid
	21/Jun/20	11:48	8.40	1193	450	240	23.50	0.1	clear
	28/Sep/20	15:08	8.30	1198	450	180	11.18	0.1	clear
LBRR-12+810	27/Feb/20	14:39	8.58	1211	450	120	0.00	0.8	clear
	25/Mar/20	13:03	8.57	1200	450	80	0.00	0.3	turbid
	16/Apr/20	16:10	8.54	947	250	120	3.70	0.5	cloudy
	27/May/20	12:33	7.98	1169	450	240	14.70	0.1	clear
	21/Jun/20	11:55	8.40	1187	450	240	21.90	0.2	clear
	29/Jul/20	11:28	8.27	1200	450	240	22.70	0.1	clear
	23/Aug/20	13:17	8.14	1268	450-800	240	19.93	0.1	clear
	28/Sep/20	15:18	8.23	1234	450	180	11.03	0.1	clear
	20/Oct/20	15:10	8.40	n/a	450-800	120	n/a	0.1	clear
LBRR-12+920	27/Feb/20	14:45	8.34	1260	450	120	0.00	0.8	clear
	16/Apr/20	16:20	8.13	1409	500	180	0.00	0.2	cloudy
	27/May/20	12:50	8.11	1353	450	240	11.50	0.2	clear
	21/Jun/20	12:08	8.40	1237	450	240	21.50	0.1	clear
	29/Jul/20	12:00	8.22	1204	450	240	21.00	0.1	clear
	23/Aug/20	13:43	8.01	1340	450	180	16.81	0.2	clear
	28/Sep/20	15:36	8.18	1295	450	240	11.22	0.1	clear
	30/Nov/20	15:41	8.40	-	800	180	n/a	0.1	clear
RR8	no data collected in 2020								
RR9	27/Feb/20	12:08	8.24	1368	450	80	0.30	0.05	clear
LBRR-EDP	27/Feb/20	12:33	8.51	2.16 m/s	800	120	0.10	0.1	clear
	25/Mar/20	11:48	8.32	276	800	180	0.10	0.05	clear
	16/Apr/20	14:15	8.7	1080	500	120	4.90	1.0	turbid
	21/Jun/20	10:00	8.4	1635	450	240	18.00	0.2	clear
	29/Jul/20	10:10	8.04	2518	450-800	240	16.91	clear	stagnant

UR: Not Read (< 0.0)

Table 7: Summary of Water Quality Exceedances (BCAWQG-FST) Along River Road from Water Sampling Events in 2020

	Sampling Dates	Total Iron (Fe)	Dissolved Aluminum (Al)	Total Arsenic (As)
LBRR-DD	27/Feb/20	✓	✓	
	16/Apr/20	✓		
LBRR-12+500	27/Feb/20	✓		
	25/Mar/20	✓		✓
	16/Apr/20	✓		✓
	21/Jun/20			
	28/Sep/20			
	20/Oct/20			
LBRR-EDP	27/Feb/20	✓		
	25/Mar/20			
	16/Apr/20	✓		✓
	21/Jun/20			
	29/Jul/20			
	28/Sep/20			
RR9	27/Feb/20			
LBRR-UC	29/Jul/20			
	23/Aug/20		✓	
LBRR-LC	16/Apr/20			

[1] British Columbia Ministry of Environment, Water Protection & Sustainability Branch. 2019. British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. Referenced Guidelines are for Freshwater Aquatic Life (F) water use and Short Term Maximum (ST) WQG. Exceedances denoted by a check mark.

Calculated guideline is pH dependent for dissolved Aluminum.

Table 8: In Situ Water Quality Measurements Along the South Bank Initial Access Road

Sample Site	Date	Time	In-Situ Tests - 2020						
			pH	EC (µS/cm)	Hardness (ppm)	Alkalinity (ppm)	Water Temp (°C)	Estimated Flow (L/sec)	Turbidity
RBSBIAR-DS	27/Feb/20	9:40	8.40	7.5	450	180	0.10	0.1	clear
	16/Apr/20	10:50	8.96	733	250	40	3.50	1.0	turbid
	27/May/20	9:35	7.83	989	450	180	12.20	1.0	clear
	21/Jun/20	9:50	8.40	700	250	240	13.90	0.5	clear
	29/Jul/20	11:20	8.16	761	450	240	18.75	1.5	clear
	23/Aug/20	10:12	8.14	800	250	180	13.92	0.4	clear
	28/Sep/20	10:00	7.95	760	450	180	11.11	0.5	clear
	20/Oct/20	11:35	7.04	810	450	180	5.58	0.4	clear
	30/Nov/20	9:40	7.29	807	450	120	0.52	0.4	clear
RBSBIAR-EDS	16/Apr/20	12:10	9.03	1097	250	120	0.00	1.0	highly turbid
	27/May/20	0:00	8.44	998	250	180	15.70	0.2	clear
	21/Jun/20	11:10	8.4	1012	450	240	15.10	0.4	slightly turbid
	29/Jul/20	12:04	8.25	923	450	240	21.30	1.3	clear
	23/Aug/20	11:15	8.18	990	450	240	13.60	0.2	clear
	28/Sep/20	11:50	8.23	895	450	240	10.55	0.2	clear
	20/Oct/20	13:10	7.84	982	450	180	4.15	0.2	clear
	30/Nov/20	11:20	8.12	976	450	120	0.45	0.2	clear
RBSBIAR-US	27/Feb/20	10:04	8.34	794	450	40	0.10	0.1	clear
	16/Apr/20	11:20	8.31	588	250	80	4.30	0.1	clear
	27/May/20	10:20	8.37	805	450	180	8.40	0.1	clear
	21/Jun/20	10:06	8.40	554	250	240	13.90	0.2	clear
	29/Jul/20	11:33	7.86	768	250	180	15.37	1.5	clear
	23/Aug/20	10:30	8.01	863	450	180	13.15	0.1	clear
	28/Sep/20	11:00	7.96	939	450	180	10.67	0.1	clear
	20/Oct/20	12:15	7.06	909	450	120	8.72	0.1	clear
	30/Nov/20	10:25	7.46	991	450	180	3.22	0.1	clear
	21/Dec/20	10:15	7.00	1016	800	120	1.40	0.2	clear
RBSBIAR-EUS	23/Jan/20	10:35	8.07	620	250	120	0.70	0.8	clear
	27/Feb/20	10:25	8.27	764	450	180	0.00	0.1	clear
	16/Apr/20	11:50	7.74	1275	250	120	1.10	0.0	clear
	27/May/20	10:40	8.45	831	450	180	9.00	0.1	clear
	21/Jun/20	10:50	7.8	785	450	240	8.40	0.2	clear
	29/Jul/20	11:48	7.27	853	250	180	14.80	1.0	clear
	23/Aug/20	10:45	7.33	867	450	240	14.91	0.1	clear
	28/Sep/20	11:25	7.28	792	450	240	12.58	0.1	clear
	20/Oct/20	12:40	7.03	846	450	180	8.74	0.1	clear
	30/Nov/20	10:50	7.51	861	450	180	2.54	0.1	clear
	21/Dec/20	10:39	7.2	-	800	120	-	0.8	clear
RBSC-DS	23/Jan/20	11:45	8.3	910	800	240	5.10	n/a	clear
	27/Feb/20	10:45	7.59	1202	800	240	4.20	n/a	clear
	25/Mar/20	10:30	7.6	906	450	180	5.30	n/a	clear
	16/Apr/20	13:00	7.54	685	250	120	8.30	n/a	clear
	27/May/20	11:40	7.65	1630	450-800	240	16.20	n/a	clear
	21/Jun/20	11:38	6.8	1508	450	240	12.70	n/a	clear
	29/Jul/20	10:57	7.11	1360	450	240	17.20	n/a	clear
	23/Aug/20	12:10	6.96	1213	450	240	12.63	n/a	clear
	28/Sep/20	12:40	6.97	1522	450	240	8.62	n/a	clear
	30/Nov/20	11:50	7.07	1384	450	180	6.03	n/a	clear
	21/Dec/20	11:15	7.18	-	800	180	5.52	n/a	clear

UR: Not Read(< 0.0)
n/a: not available

Table 9: Summary of Water Quality Exceedances (BCAWQG-FST) RBSBIAR from Water Sampling Events in 2020

	Sampling Dates	Total Iron (Fe)	Dissolved Iron (Fe)	Dissolved Aluminum (Al)	Total Arsenic (As)	Total Zinc (Zn)	Total Manganese (Mn)
RBSBIAR-DS (West ditch; downstream)	27/Feb/20						
	16/Apr/20	✓		✓			
	27/May/20						
	22/Jun/20						
	29/Jul/20						
	24/Aug/20						
	28/Sep/20			✓			
	20/Oct/20						
	30/Nov/20						
RBSBIAR-US (West ditch; upstream)	27/Feb/20	✓					
	16/Apr/20						
	17/May/20						
	22/Jun/20						
	29/Jul/20						
	24/Aug/20						
	28/Sep/20						
	20/Oct/20						
	30/Nov/20						
	21/Dec/20						
RBSBIAR-EDS (East ditch; downstream)	16/Apr/20	✓			✓	✓	
	27/May/20			✓			
	22/Jun/20	✓		✓		✓	
	29/Jul/20						
	24/Aug/20						
	28/Sep/20						
	20/Oct/20						
	30/Nov/20						
RBSBIAR-EUS (East ditch; upstream)	27/May/20						
	22/Jun/20						
	29/Jul/20						
	24/Aug/20						
	28/Sep/20						
	20/Oct/20						
	30/Nov/20						
RBSC-DS (side channel)	23/Jan/20						
	27/Feb/20						
	25/Mar/20						
	16/Apr/20						
	27/May/20						✓
	22/Jun/20						
	29/Jul/20			✓			
	24/Aug/20						✓
	28/Sep/20	✓	✓				✓
	30/Nov/20						
	21/Dec/20						

[1] British Columbia Ministry of Environment, Water Protection & Sustainability Branch. 2019. British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. Referenced Guidelines are for Freshwater Aquatic Life (F) water use and Short Term Maximum (ST) WQG. Exceedances denoted by a check mark.

Table 10: Minimum, Maximum and Mean Values for Measurements at Discharge and Downstream Locations in 2020

Discharge/Downstream Locations	Unit	LBRR-DD [a]			RBSBIAR-DS [b]			RBSBIAR-EDS [c]			LBL3C-0.02 [c]		
		Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean
Hardness as CaCO3	mg/L	324	552	438	234	331	286	246	482	353	82	1,040	774
pH	pH Units	7.78	8.27	8.03	8.07	8.26	8.13	7.98	8.16	8.08	7.77	8.41	8.20
Acidity (Total as CaCO3)	mg/L	3.9	4.3	4.1	0.5	2.8	1.4	0.2	0.3	0.3	0.5	3.6	1.2
Alkalinity (Total as CaCO3)	mg/L	94.6	196	145.3	135	242	206	1,800	7,300	3,663	73.5	275	214
Total Dissolved Solids (TDS)	mg/L	543	783	663	412	572	473	495	818	597	276	1,730	1,244
Total Suspended Solids (TSS)	mg/L	55.5	68.8	62.2	0.5	341.0	40.3	0.5	5390.0	687.0	3.4	1,250	166
Anions and Nutrients													
Chloride (Cl-)	µg/L	77,100	83,100	80,100	35,200	111,000	54,089	50,700	121,000	65,463	7,870	53,100	35,859
Sulphate (SO4) 3	µg/L	309,000	429,000	369,000	64,200	149,000	104,089	29,200	223,000	115,425	30,200	895,000	666,650
Metals, Total													
Aluminum	µg/L	363	1790	1076.5	36.1	2440	368	5.7	11500	2001	361	3320	904
Iron	µg/L	1260	2310	1785	53	7730	1005	5.0	32600	4998	334	6530	1375
Arsenic	µg/L	1.14	1.31	1.225	0.2	4.48	0.78	0.140	14.7	2.3	0.460	3.75	1.01
Cadmium	µg/L	0.271	0.63	0.4505	0.0294	0.683	0.19	0.01	3.16	0.8	0.281	0.832	0.476
Cobalt	µg/L	4.79	7.38	6.085	0.39	7.85	2.45	0.05	43.7	12.7	3.85	12.8	6.46
Copper	µg/L	3.18	4.49	3.835	0.83	17.4	3.35	0.25	69.1	15.6	2.23	16.4	4.35
Zinc	µg/L	28.3	66.7	47.5	5.4	77	23.78	1.50	560	140	34.1	75.0	44.0
Metals, Dissolved													
Aluminum 5	µg/L	50.6	114	82.3	13.2	169	62.18	1.5	404	88.41	57.9	203.0	150.7
Iron	µg/L	26	40	33	5.0	39	15.67	5.0	26	12.00	5.0	229.00	56.8
Arsenic	µg/L	0.38	0.4	0.39	0.15	0.49	0.25	0.140	0.29	0.21	0.24	0.750	0.44
Cadmium	µg/L	0.185	0.384	0.285	0.026	0.126	0.076	0.013	1.000	0.205	0.076	0.473	0.333
Cobalt	µg/L	4.26	5.32	4.79	0.42	3.55	1.80	0.05	33.7	8.08	0.76	11.40	4.93
Copper	µg/L	1.6	2.28	1.94	0.65	3.35	1.28	0.38	3.2	1.04	0.76	11.4	4.93
Zinc	µg/L	17.3	27	22.15	4.8	26.5	11.82	0.05	33.7	8.08	1.5	2.61	1.89

[a] Samples collected in February and April only, outside of dry or frozen conditions.

[b] Monthly sampling February through November, except March (nine sampling events).

[c] Monthly sampling April through November 2020 (eight sampling events).

[d] Mean value calculated between half the detection limit and all other values for dissolved iron (all locations) and TSS (RBSBIAR-DS only).

Values in red font are half the detection limit.

Table 11: In Situ Water Quality Measurements Along L3 Creek

Sample Site	Date	Time	In-Situ Tests - 2020						
			pH	EC (µS/cm)	Hardness (ppm)	Alkalinity (ppm)	Water Temp (°C)	Estimated Flow (L/sec)	Turbidity
LBL3C-0.02 (Discharge)	16/Apr/20	9:40	9.10	233	100	40	0.5	high	turbid
	27/May/20	10:20	8.32	1407	450	180	9.3	2.0	clear
	21/Jun/20	10:55	7.20	1025	250	180	14.4	3.00	clear
	29/Jul/20	10:32	8.07	1744	450	240	14.6	2.00	clear
	23/Aug/20	12:30	7.45	2056	450	240	13.7	1.50	clear
	28/Sep/20	12:20	8.05	1961	450	180	8.7	2.0	clear
	20/Oct/20	14:20	7.76	2019	450-800	120	2.3	2.00	clear
	30/Nov/20	15:07	7.03	2053	800	120	1.4	1.50	clear
LBL3C-1.43	27/Feb/20	15:44	8.17	1283	450	180	3.3	2.00	clear
	25/Mar/20	14:40	8.22	1496	800	180	3.4	3.00	clear
	16/Apr/20	11:10	8.83	224	100	40	0.4	0.40	turbid
	27/May/20	11:10	7.77	1243	450	180	9.2	2.00	clear
	21/Jun/20	14:15	7.80	910	450	180	14.5	3.00	slightly turbid
	29/Jul/20	12:55	7.60	1662	450	240	13.2	2.0	clear
	23/Aug/20	14:45	7.63	1844	450-800	240	10.8	1.50	clear
	28/Sep/20	15:00	6.56	1875	450	180	7.4	2.00	clear
	20/Oct/20	13:00	7.55	1970	800	120	4.4	2.0	clear
	30/Nov/20	13:20	7.75	1954	800	180	3.9	1.0	clear
	20/Dec/20	14:00	6.89	1792	800	120	3.5	1.50	clear
LBL3C-1.65	16/Apr/20	12:20	8.68	182	100	40	2.4	high	turbid
	27/May/20	11:50	8.33	967	450	180	6.0	1.50	clear
	21/Jun/20	13:14	7.80	755	250	180	14.5	2.00	slightly turbid
LBL3C-3.32	16/Apr/20	13:!0	8.33	174	100	40	0.6	high	turbid
	27/May/20	0:00	8.34	932	450	120-180	11.4	1.00	clear
	21/Jun/20	15:05	7.20	1144	450	180	16.0	1.50	slightly turbid
	29/Jul/20	15:00	7.23	1715	750	240	14.8	0.08	clear
	23/Aug/20	16:07	7.17	1840	450	240	10.9	0.02	clear
	28/Sep/20	15:25	7.80	-	450	240	-	-	stagnant/clear
	20/Oct/20	14:00	7.20	-	800	180	-	0.00	clear
LBL4C-0.18	16/Apr/20	12:45	9.24	245	100	40	0.6	high	turbid
	27/May/20	12:20	7.88	1176	450	80-120	8.4	1.00	clear
	21/Jun/20	13:40	7.20	1005	450	120	13.2	1.00	slightly turbid
	29/Jul/20	13:59	4.86	2262	450	30	16.6	0.12	clear
	23/Aug/20	15:28	4.82	2759	450	0-40	13.7	0.02	clear
	28/Sep/20	14:15	3.54	3100	450	0	9.8	-	stagnant/clear
	20/Oct/20	13:26	3.42	3202	450-800	0-40	2.9	0.05	clear
	30/Nov/30	13:50	4.06	3491	800	0	1.0	0.05	clear

UR: Not Read (< 0.0)

Table 12: Summary of Water Quality Exceedances (BCAWQG-FST) Along L3 Creek From Water Sampling Events in 2020

	Sampling Dates	Total Iron (Fe)	Dissolved Iron (Fe)	Dissolved Aluminum (Al)	Dissolved Cadmium (Cd)	Total Cobalt (Co)	Total Zinc (Zn)	Dissolved Copper (Cu)	Total Arsenic (As)	Total Manganese (Mn)	Total Silver (Ag)	pH
LBL3C-0.02 (discharge)	17/Apr/20	✓					✓					
	27/May/20			✓								
	21/Jun/20	✓		✓								
	29/Jul/20			✓								
	23/Aug/20			✓								
	29/Sep/20			✓								
	20/Oct/20			✓								
	30/Nov/20			✓								
LBL3C-1.43 (midstream)	27/Feb/20											
	25/Mar/20											
	17/Apr/20	✓					✓		✓		✓	
	27/May/20	✓										
	21/Jun/20	✓		✓								
	29/Jul/20											
	23/Aug/20											
	29/Sep/20											
	21/Oct/20											
	30/Nov/20											
	20/Dec/20											
LBL3C-1.65	17/Apr/20	✓					✓	✓	✓		✓	
	27/May/20											
	21/Jun/20											
LBL3C-3.32 (upstream)	17/Apr/20	✓					✓		✓		✓	
	27/May/20											
	21/Jun/20	✓		✓								
	29/Jul/20											
	23/Aug/20											
LBL4C-0.18	17/Apr/20	✓					✓		✓			
	27/May/20	✓		✓								
	21/Jun/20	✓		✓								
	29/Jul/20	✓	✓	✓	✓	✓	✓	✓		✓		✓
	23/Aug/20	✓	✓	✓	✓	✓	✓	✓		✓		✓
	29/Sep/20	✓	✓	✓	✓	✓	✓			✓		✓
	21/Oct/20	✓	✓	✓	✓	✓	✓	✓		✓		✓
	30/Nov/20	✓	✓	✓	✓	✓	✓	✓		✓		✓

[1] British Columbia Ministry of Environment, Water Protection & Sustainability Branch. 2019. British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. Referenced Guidelines are for Freshwater Aquatic Life (F) water use and Short Term Maximum (ST) WQG. Exceedances denoted by a check mark.

Note: L3 and L4 Creek are not considered a construction-related PAG management facility and are not monitored under requirement of the CEMP.

Table 13: In Situ Water Quality Sampling - Left Bank Debris Boom

Sample Site	Date	Time	In-Situ Tests - 2020							
			pH	EC (µS/cm)	Hardness (ppm)	Alkalinity (ppm)	Water Temp (°C)	Estimated Flow (L/sec)	Turbidity	Notes
LBP Pond	08/Oct/20	-	-	-	-	-	-	-	-	
	20/Nov/20	12:59	6.57	4114	450	240	0.2	-	-	
LB Channel E	08/Oct/20	-	-	-	-	-	-	-	-	

UR / Or: Not Read (< 0.0)

Table 14: Summary of Water Quality Exceedances (BCAWQG-FST) at the Left Bank Debris Boom From Water Sampling Events in 2020

	Sampling Dates	Total Iron (Fe)	Dissolved Iron (Fe)	Dissolved Aluminum (Al)	Total Arsenic (As)	Total Boron (B)	Total Cobalt (Co)	Total Manganese (Mn)	Total Zinc (Zn)	Dissolved Cadmium (Cd)	Dissolved Copper (Cu)	pH
LBP Pond	08/Oct/20	✓	✓					✓				
	20/Nov/20	✓	✓	✓				✓	✓			
LB Side Channel E	08/Oct/20	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

[1] British Columbia Ministry of Environment, Water Protection & Sustainability Branch. 2019. British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. Referenced Guidelines are for Freshwater Aquatic Life (F) water use and Short Term Maximum (ST) WQG. Exceedances denoted by a check mark.

Hardness-dependent parameters (Cu, Pb, Mn, Zn, Cd) use capped hardness values in guideline calculations.

Copper-dissolved guideline is DOC-dependent (Dissolved Organic Carbon)

Calculated guideline is pH dependent for dissolved Aluminum.

Table 15: In Situ Water Quality Sampling - L2 Powerhouse

Sample Site	Date	Time	In-Situ Tests - 2020							
			pH	EC (µS/cm)	Hardness (ppm)	Alkalinity (ppm)	Water Temp (°C)	Estimated Flow (L/sec)	Turbidity	Notes
L2 DS	08/Oct/20	11:27	7.11	313	100	80-120	11.54	0.5	slightly cloudy	
	20/Nov/20	11:30	8.20	1131	450	240	0.56	0.05	clear	
	04/Dec/20	12:24	7.44	922	250	180	7.09	0.50	-	Composite sample
	14/Dec/20	12:19	7.50	1707	800+	120-180	0.64	0.50	slightly turbid	
L2 US	08/Oct/20	**12:28**	**7.68**	**859**	**250**	**120-180**	**9.7**	**-**	stagnant, cloudy	
	04/Dec/20	12:47	7.60	465	250	180	5.5	0.10		

UR: Not Read (< 0.0)

n/a: not available

Table 16: Summary of Water Quality Exceedances (BCAWQG-FST) at the L2 Powerhouse Area From Water Sampling Events in 2020

	Sampling Dates	Total Iron (Fe)	Dissolved Aluminum (Al)
L2 DS	08/Oct/20		
	20/Nov/20		✓
	04/Dec/20		✓
	14/Dec/20		✓
L2 US	08/Oct/20	✓	

[1] British Columbia Ministry of Environment, Water Protection & Sustainability Branch. 2019. British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. Referenced Guidelines are for Freshwater Aquatic Life (F) water use and Short Term Maximum (ST) WQG. Exceedances denoted by a check mark.

Hardness-dependent parameters (Cu, Pb, Mn, Zn, Cd) use capped hardness values in guideline calculations.

Copper-dissolved guideline is DOC-dependent (Dissolved Organic Carbon)

Calculated guideline is pH dependent for dissolved Aluminum.

PHOTOGRAPHS

Photo 1: River Road discharge location, LBRR-DD, October 20, 2020.

Photo 2: River Road LBRR-EDP location, June 21, 2020.

Photo 3: River Road LBRR-LC location, October 20, 2020.

Photo 4: River Road LBRR-UC location, May 27, 2020.

Photo 5: River Road LBRR-12+500 location, June 21, 2020.

Photo 6: River Road LBRR-12+600 location, October 20, 2020.

Photo 7: River Road LBRR-12+700 location, May 27, 2020.

Photo 8: River Road LBRR-12+810 location, October 20, 2020.

Photo 9: River Road LBRR-12+920 location, June 21, 2020.

Photo 10: River Road RR8 location, June 21, 2020.

Photo 11: River Road RR9 location, May 27, 2020.

Photo 12: RBSBIAR-US upstream west ditch, June 22, 2020.

Photo 13: RBSBIAR-DS downstream west ditch, June 22, 2020.

Photo 14: RBSBIAR-EUS upstream east ditch, October 20, 2020.

Photo 15: RBSBIAR-EDS downstream east ditch, September 28, 2020.

Photo 16: RBSC-DS side channel location, June 22, 2020.

Photo 17: L3 Creek LBL3C-0.02 discharge location, June 21, 2020.

Photo 18: L3 Creek LBL3C-1.43 lower midstream location, May 28, 2020.

Photo 19: L3 Creek LBL3C-1.65 upper midstream location, June 21, 2020.

Photo 20: L3 Creek LBL3C-3.32 upstream location, October 21, 2020.

Photo 21: L4 Creek LBL4C-0.18 location, June 21, 2020.

Photo 22: Left Bank Debris Boom LBP-Pond location, December 14, 2020.

Photo 23: Left Bank Debris Boom Side Channel E location, December 14, 2020.

Photo 24: Right Bank L2 Powerhouse Area L2 DS downstream location, October 8, 2020.

Photo 25: Right Bank L2 Powerhouse Area L2 US upstream location, October 8, 2020.

APPENDIX A

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOENVIRONMENTAL

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1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by persons other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage.

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In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

APPENDIX B

SURFACE WATER ANALYTICAL LABORATORY RESULT TABLES

B1 – 2020 Surface Water Laboratory Analytical Results from River Road Monitoring Locations Evaluated against the BCAWQG-FST Guidelines

B2 – 2020 Surface Water Laboratory Analytical Results from RBSBIAR Monitoring Locations Evaluated against the BCAWQG-FST Guidelines

B3 – 2020 Surface Water Laboratory Analytical Results from L3 Creek Monitoring Locations Evaluated against the BCAWQG-FST Guidelines

B4 – 2020 Surface Water Laboratory Analytical Results from Left Bank Debris Boom Monitoring Locations Evaluated against the BCAWQG-FST Guidelines

B5 – 2020 Surface Water Laboratory Analytical Results from L2 Powerhouse Monitoring Locations Evaluated against the BCAWQG-FST Guidelines

Appendix B1: LBRR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBRR-DD	LBRR-DD	LBRR-LC	LBRR-12+500	LBRR-12+500	LBRR-12+500	LBRR-12+500
					27-Feb-20	16-Apr-20	16-Apr-20	27-Feb-20	25-Mar-20	16-Apr-20	21-Jun-20
Physical Parameters											
Temperature (°C)	°C										
Flow Rate (L/sec)	L/s										
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	4300	3900	3600	3300	4400	5800	500
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	94.6	196	216	158	227	172	178
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	838	1040	999	851	1560	1110	1190
Hardness as CaCO3, dissolved	µg/L	500	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn)	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn)	324000	552000	487000	317000	574000	529000	550000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L	500			364000			358000	849000		
pH	pH Units	0.10	6.5 - 9	6.5-9.0	7.78	8.27	8.32	8.06	8.00	8.14	8.17
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	543000	783000	750000	544000	1080000	837000	842000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	68800	55500	6200	63200	744000	2390000	2000
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	<1000	4800	<1000	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	94600	196000	211000	158000	227000	172000	178000
Anions and Nutrients (Matrix: Water)											
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	366	58	50	272	157	428	<50
Ammonia FST Guideline	µg/L		pH dependent (at Temp 4 °C or in situ T)		8770	3150	3150	4950	6220	4950	3950
Ammonia FLT Guideline	µg/L			pH dependent (at Temp 4 °C or in situ T)	1690	606	606	952	1200	952	759
Chloride (Cl^-)	µg/L	500	600,000	150,000	77100	83100	83000	102000	227000	137000	145000
Nitrate (NO_3^- as N)	µg/L	5.0-100	NG	NG	438	24.7	16.8	388	322	150	116
Nitrite (NO_2^- as N)	µg/L	1.0-20	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	21.5	1.2	1.3	20.9	13.1	8.3	<5
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	204000	246000	212000	124000	329000	225000	274000
SO4 FLT Guideline Calc	µg/L		NG	Hardness 76,000-180,000 = 309,000 Hardness 181,000-250,000 = 429,000 Hardness > 250,000 site-specific	309000	429000	429000	309000	429000	429000	429000
Dissolved Organic Carbon (DOC)	mg/L		NG	NG	9.18	4.70	4.30	9.68	5.42	11.3	6.0
Metals, Total											
Aluminum	µg/L	3.00	NG	NG	1790	363	141	646	5440	11200	37.1
Antimony	µg/L	0.1-0.2	NG	NG	0.21	0.14	0.12	0.23	0.62	0.87	0.26
Arsenic	µg/L	0.10	5.0	5.0	1.31	1.14	0.67	0.97	**7.31**	**15.4**	0.72
Barium	µg/L	0.10	NG	NG	79.3	46.3	45.6	80.2	378	668	68
Beryllium	µg/L	0.10	NG	NG	0.128	<0.1	<0.1	<0.1	0.374	0.81	<0.1
Bismuth	µg/L	0.05-0.10	NG	NG	<0.05	<0.05	<0.05	<0.05	0.083	0.17	<0.05
Boron	µg/L	10.0	1200	1200	34	33	30	33	48	60	67
Cadmium	µg/L	0.005	NG	NG	0.63	0.271	0.176	0.0637	0.788	1.71	0.006
Calcium	µg/L	50	NG	NG	104000	148000	142000	102000	234000	223000	141000
Cesium	µg/L	0.01		NG	0.136	0.057	0.023	0.085	0.87	1.37	0.013
Chromium [4]	µg/L	0.1-0.7	NG	NG	1.74	0.61	0.16	1.81	14.8	26.8	0.12
Cobalt	µg/L	0.10	110	4.0	7.38	4.79	4.55	1.75	11.6	18.1	0.64
Copper [3]	µg/L	0.50	Calc. based on Hardness	2 to 10	4.49	3.18	2.28	21.6	18.1	40.7	1.6
Cu STM Guideline Calc.	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness > 400,000 is Capped Value of 400,000		32.5	39.6	39.6	31.8	39.6	39.6	39.6
Cu LTA Guideline Calc.	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Iron	µg/L	10	1000	NG	**2310**	**1260**	480	**1730**	**19200**	**37200**	26
Lead [3]	µg/L	0.05-0.1	Calc. based on Hardness	Calc. based on Hardness	0.995	0.371	0.069	1.52	6.67	15.4	<0.05
Pb FST Guideline Calc (Based on Hardness as CaCO3), applies to water hardness 8000-360,000 µg/L	µg/L		Hardness ≤ 8000 is 3; Hardness 8000-360,000: calc. Hardness>360,000 is Capped Value of 360,000		365	417	417	355	417	417	417
Pb FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Hardness 8000-360,000: calc. Hardness > 360,000 is Capped Value of 360,000	18	20	20	17	20	20	20
Lithium	µg/L	1.0	NG	NG	29.2	29.8	19.9	12.7	30.3	37.9	31.9
Magnesium	µg/L	5.0	NG	NG	25000	41800	41000	24900	64000	53200	46000
Manganese [3]	µg/L	0.10	Calc. based on hardness	Calc. based on Hardness	162	275	346	78.6	490	1280	7.97
Mn FST Guideline Calc (Based on Hardness as CaCO3)	µg/L		Hardness 25,000 - 259,000 : calc.; Hardness > 259,000 is Capped Value of 259,000		3394.2	3394.2	3394.2	3394.2	3394.2	3394.2	3394.2
Mn FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Hardness 37,000 - 450,000: calc.; Hardness > 450,000 is Capped Value of 450,000	2030.6	2585.0	2585.0	1999.8	2585.0	2585.0	2585.0
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	0.0054	0.0134	<0.005	0.0051	0.0168	<0.005	<0.005
Molybdenum	µg/L	0.05	2000	≤ 1000	2.87	3.56	3.89	2.81	6.14	5.53	4.16
Nickel	µg/L	0.5	NG		32.5	35	18	9.78	41	61.1	9.08
Phosphorus	µg/L	50-100	NG	NG	306	74	<50	363	865	1740	<50
Potassium	µg/L	50.0	NG	NG	7970	6490	6390	8930	7960	11400	6820
Rubidium	µg/L	0.2	NG	NG	4.24	2.01	1.31	2.66	9.99	18.7	1.77
Selenium	µg/L	0.05	NG	2.0	1.24	0.599	0.543	0.552	1.88	1.55	0.66
Silicon	µg/L	100		NG	3640	3320	3380	4250	10200	16700	5080
Silver [3]	µg/L	0.01-0.02	0.10 - 3.0	0.05 - 1.5	0.026	<0.012	<0.01	0.016	0.14	0.326	<0.01
Ag FST Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0
Ag FLT Guideline Calc				Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Sodium	µg/L	50.0	NG	NG	22400	25100	26200	30400	57400	36400	52400
Strontium	µg/L	0.2	NG	NG	361	348	325	422	716	1180	601
Sulfur	µg/L	500	NG	NG	74300	88300	79100	46400	110000	83400	93200
Tellerium	µg/L	0.2-0.4	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	0.27	<0.2
Thallium	µg/L	0.01-0.055	NG	NG	0.04	0.023	0.012	0.024	0.17	0.366	0.02
Thorium	µg/L	0.1-0.2	NG	NG	0.2	0.16	<0.1	0.12	2.46	4.85	<0.1
Tin	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	0.13	0.16	0.35	<0.1
Titanium	µg/L	0.3-1.2	NG	NG	16.8	4.85	0.74	18.2	122	156	0.32
Tungsten	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	0.11	0.18	0.19	<0.1
Uranium	µg/L	0.01	NG	NG	1.46	2.14	2.52	1.73	5.48	4.32	5.53
Vanadium	µg/L	0.5-1.0	NG	NG	2.66	1.07	<0.5	2.52	19.9	36.9	0.62
Zinc [3]	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	66.7	28.3	16.4	26	93.7	209	1.5
Zn FST Guideline Calc.	µg/L		Hardness < 90,000 = 33.0 Hardness 90,000 - 500,000, Calc. Hardness > 500,000, Capped Value		208.5	340.5	330.8	203.3	340.5	340.5	340.5
Zn FLT Guideline Calc.				Hardness < 90,000 = 7.5 Hardness 90,000 - 330,000, Calc. Hardness > 330,000, Capped Value	183.0	187.5	187.5	177.8	187.5	187.5	187.5
Zirconium	µg/L	0.06-0.12	NG	NG	<0.2	<0.2	<0.2	<0.2	0.27	0.8	<0.2
Metals, Dissolved											
Aluminum [5]	µg/L	1.0	100	50	**114**	50.6	58.7	13.7	34.2	26.4	28.1
Al FST Guideline Calc (based on pH)	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100	100	100	100	100	100	100
Al FLT Guideline Calc (based on median pH)				median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50	50	50	50	50	50	50
Antimony	µg/L	0.1-0.2	NG	NG	0.14	0.12	<0.1	0.16	0.18	0.28	0.24
Arsenic	µg/L	0.10	NG	NG	0.4	0.38	0.4	0.36	0.29	0.41	0.62
Barium	µg/L	0.10	NG	NG	46.6	35.2	41.9	56.8	47.6	56.5	68.1
Beryllium	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bismuth	µg/L	0.05-0.1	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10.0	NG	NG	34	32	26	33	34	46	74
Cadmium [3]	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.384	0.185	0.144	0.025	0.0436	0.0669	0.0025
Cd FST Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		1.97	2.80	2.80	1.93	2.80	2.80	2.80
Cd FLT Guideline Calc.	µg/L			Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.46	0.46	0.46	0.46	0.46	0.46	0.46
Calcium	µg/L	50.0	NG	NG	92600	153000	132000	89400	154000	148000	142000
Cesium	µg/L	0.01	NG	NG	<0.01	0.012	0.014	<0.01	0.015	0.018	0.014
Chromium	µg/L	0.10	NG	NG	0.18	<0.1	<0.1	0.26	0.14	<0.1	0.11
Cobalt	µg/L	0.10	NG	NG	5.32	4.26	4.24	1.11	4.55	2.75	0.59
Copper [6]	µg/L	0.20	Calc. based on BLM Model	Calc. based on BLM Model	2.28	1.6	1.6	1.69	2.14	1.85	1.56
Cu FST Guideline Value (Acute)	µg/L		BLM Ligand Model value		36.3	31.1	29.8	50.1	30.8	71.2	41.7
Cu FLT Guideline Value (Chronic)	µg/L			BLM Ligand Model value	6.8	6.0	5.8	10.4	5.10	13.7	8.1
Iron	µg/L	10.0-20.0	350	NG	26.0	40.0	25.0	28.0	5.0	5.0	5.0
Lead	µg/L	0.05-0.1	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lithium	µg/L	1.0	NG	NG	27	30.8	18.1	12.9	23.7	23.1	31.2
Magnesium	µg/L	5.0	NG	NG	22500	41400	38000	22700	45700	38600	47300
Manganese	µg/L	0.10	NG	NG	112	268	334	42.5	83.3	434	6.68
Mercury	µg/L	0.005	NG	NG	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	<0.005
Molybdenum	µg/L	0.05	NG	NG	2.51	3.56	3.38	2.44	3.6	3.54	4.02
Nickel	µg/L	0.50	NG	NG	23.9	34.1	17.3	5.24	21.3	12.8	8.47
Phosphorus	µg/L	50.0-100.0	NG	NG	<50	<50	<50	211	<50	<50	<50
Potassium	µg/L	50.0	NG	NG	7210	6510	6300	8640	5570	9280	6250
Rubidium	µg/L	0.20	NG	NG	2.24	1.47	1.14	1.56	1.22	3.64	1.72

TETRA TECH

Appendix B1: LBRR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBRR-12+500	LBRR-12+500	LBRR-EDP	LBRR-EDP	LBRR-EDP	LBRR-EDP
					28-Sep-20	20-Oct-20	27-Feb-20	25-Mar-20	16-Apr-20	21-Jun-20
Physical Parameters										
Temperature (°C)	°C									
Flow Rate (L/sec)	L/s									
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	2300	3500	7400	7100	4700	4700
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	179	214	256	298	179	194
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	1120	1030	1900	2910	1200	1630
Hardness as CaCO3, dissolved	µg/L	500	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn)	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn)	481000	527000	878000	1600000	598000	942000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L	500					744000	1640000		
pH	pH Units	0.10	6.5 - 9	6.5-9.0	8.1	7.99	8.03	8.13	8.16	8.04
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	849000	790000	1510000	2440000	993000	1300000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	1500	22100	21800	13500	1350000	4300
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	179000	214000	256000	298000	179000	194000
Anions and Nutrients (Matrix: Water)										
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	<50	<50	196	183	367	<50
Ammonia FST Guideline	µg/L		pH dependent (at Temp 4 °C or in situ T)		4950	6220	6220	4950	3950	6220
Ammonia FLT Guideline	µg/L			pH dependent (at Temp 4 °C or in situ T)	952	1430	1200	952	759	1200
Chloride (Cl^-)	µg/L	500	600,000	150,000	136000	155000	222000	268000	138000	115000
Nitrate (NO_3^- as N)	µg/L	5.0-100	NG	NG	<25	251	667	621	160	380
Nitrite (NO_2^- as N)	µg/L	1.0-20	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	<5	<5	31.1	28.8	8	<5
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	218000	244000	496000	1230000	281000	641000
SO4 FLT Guideline Calc	µg/L		NG	Hardness 76,000-180,000 = 309,000 Hardness 181,000-250,000 = 429,000 Hardness > 250,000 site-specific	429000	429000	429000	429000	429000	429000
Dissolved Organic Carbon (DOC)	mg/L		NG	NG	4.9	6.2	7.45	7.63	10.0	6.5
Metals, Total										
Aluminum	µg/L	3.00	NG	NG	93.4	207	783	196	7100	60.8
Antimony	µg/L	0.1-0.2	NG	NG	0.18	0.16	0.24	0.31	0.78	0.27
Arsenic	µg/L	0.10	5.0	5.0	0.44	0.54	1.01	0.6	**9.67**	0.61
Barium	µg/L	0.10	NG	NG	57.9	56.4	99.1	77.3	393	58.8
Beryllium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.2	0.52	<0.1
Bismuth	µg/L	0.05-0.10	NG	NG	<0.05	<0.05	<0.05	<0.1	0.096	<0.05
Boron	µg/L	10.0	1200	1200	73	67	60	152	58	109
Cadmium	µg/L	0.005	NG	NG	0.0095	0.0292	0.492	0.592	1.22	0.361
Calcium	µg/L	50	NG	NG	127000	160000	209000	402000	217000	262000
Cesium	µg/L	0.01		NG	<0.01	0.023	0.11	0.035	0.828	0.014
Chromium [4]	µg/L	0.1-0.7	NG	NG	0.14	0.46	1.02	0.39	17.5	0.18
Cobalt	µg/L	0.10	110	4.0	0.53	0.69	9.16	30.4	15.4	2.16
Copper [3]	µg/L	0.50	Calc. based on Hardness	2 to 10	1.79	2.31	3.18	3.07	26.4	1.74
Cu STM Guideline Calc.	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness > 400,000 is Capped Value of 400,000		39.6	39.6	39.6	39.6	39.6	39.6
Cu LTA Guideline Calc.	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	10.0	10.0	10.0	10.0	10.0	10.0
Iron	µg/L	10	1000	NG	57	485	1540	275	**23300**	81
Lead [3]	µg/L	0.05-0.1	Calc. based on Hardness	Calc. based on Hardness	<0.05	0.147	0.673	<0.1	8.04	<0.05
Pb FST Guideline Calc (Based on Hardness as CaCO3), applies to water hardness 8000-360,000 µg/L	µg/L		Hardness ≤ 8000 is 3; Hardness 8000-360,000: calc. Hardness>360,000 is Capped Value of 360,000		417	417	417	417	417	417
Pb FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Hardness 8000-360,000: calc. Hardness > 360,000 is Capped Value of 360,000	20	20	20	20	20	20
Lithium	µg/L	1.0	NG	NG	24.2	22.7	43.2	113	36.1	48.1
Magnesium	µg/L	5.0	NG	NG	43400	42500	53700	156000	52000	72800
Manganese [3]	µg/L	0.10	Calc. based on hardness	Calc. based on Hardness	5.24	25.1	220	702	1030	109
Mn FST Guideline Calc (Based on Hardness as CaCO3)	µg/L		Hardness 25,000 - 259,000 : calc.; Hardness > 259,000 is Capped Value of 259,000		3394.2	3394.2	3394.2	3394.2	3394.2	3394.2
Mn FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Hardness 37,000 - 450,000: calc.; Hardness > 450,000 is Capped Value of 450,000	2585.0	2585.0	2585.0	2585.0	2585.0	2585.0
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	<0.005	<0.005	<0.005	0.016	0.0075	<0.005
Molybdenum	µg/L	0.05	2000	≤ 1000	2.9	2.75	3.33	4.78	4.55	3.42
Nickel	µg/L	0.5	NG		3.85	4.68	47.8	248	60.6	37.3
Phosphorus	µg/L	50-100	NG	NG	<50	<50	120	<100	1120	<50
Potassium	µg/L	50.0	NG	NG	6560	5980	10100	15400	10200	7260
Rubidium	µg/L	0.2	NG	NG	1.34	1.56	3.99	3.33	11.8	1.84
Selenium	µg/L	0.05	NG	2.0	0.376	0.48	1.56	2.28	1.23	2.87
Silicon	µg/L	100		NG	4520	4650	5100	5190	11800	5440
Silver [3]	µg/L	0.01-0.02	0.10 - 3.0	0.05 - 1.5	<0.01	<0.01	0.022	<0.02	0.156	<0.01
Ag FST Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		3.0	3.0	3.0	3.0	3.0	3.0
Ag FLT Guideline Calc				Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	1.5	1.5	1.5	1.5	1.5	1.5
Sodium	µg/L	50.0	NG	NG	46200	45600	53000	92800	35100	52100
Strontium	µg/L	0.2	NG	NG	481	657	807	1280	1180	802
Sulfur	µg/L	500	NG	NG	78100	79300	156000	454000	102000	229000
Tellerium	µg/L	0.2-0.4	NG	NG	<0.2	<0.2	<0.2	<0.4	0.25	0.24
Thallium	µg/L	0.01-0.055	NG	NG	0.013	0.015	0.038	0.025	0.19	0.023
Thorium	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	0.23	<0.2	2.76	<0.1
Tin	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	<0.2	0.29	<0.1
Titanium	µg/L	0.3-1.2	NG	NG	0.51	5.97	9.28	3	146	0.9
Tungsten	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	<0.2	0.19	<0.1
Uranium	µg/L	0.01	NG	NG	3.86	3.66	2.78	6.07	3.66	5.57
Vanadium	µg/L	0.5-1.0	NG	NG	<0.5	0.85	1.68	<1	23.8	<0.5
Zinc [3]	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	1.5	3.1	58.2	88.1	152	27
Zn FST Guideline Calc.	µg/L		Hardness < 90,000 = 33.0 Hardness 90,000 - 500,000, Calc. Hardness > 500,000, Capped Value		326.3	340.5	340.5	340.5	340.5	340.5
Zn FLT Guideline Calc.				Hardness < 90,000 = 7.5 Hardness 90,000 - 330,000, Calc. Hardness > 330,000, Capped Value	187.5	187.5	187.5	187.5	187.5	187.5
Zirconium	µg/L	0.06-0.12	NG	NG	<0.2	<0.2	<0.2	<0.4	0.7	<0.2
Metals, Dissolved										
Aluminum [5]	µg/L	1.0	100	50	69	21.6	82.2	49.8	39.1	36
Al FST Guideline Calc (based on pH)	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100	100	100	100	100	100
Al FLT Guideline Calc (based on median pH)				median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50	50	50	50	50	50
Antimony	µg/L	0.1-0.2	NG	NG	0.14	0.15	0.23	0.3	0.26	0.24
Arsenic	µg/L	0.10	NG	NG	0.41	0.39	0.41	0.47	0.42	0.57
Barium	µg/L	0.10	NG	NG	56.9	49	91.2	70.7	56.4	57.5
Beryllium	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1
Bismuth	µg/L	0.05-0.1	NG	NG	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05
Boron	µg/L	10.0	NG	NG	68	55	74	145	49	110
Cadmium [3]	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.0025	0.0145	0.412	0.56	0.108	0.342
Cd FST Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		2.80	2.80	2.80	2.80	2.80	2.80
Cd FLT Guideline Calc.	µg/L			Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.46	0.46	0.46	0.46	0.46	0.46
Calcium	µg/L	50.0	NG	NG	124000	143000	243000	384000	170000	258000
Cesium	µg/L	0.01	NG	NG	<0.01	<0.01	<0.01	0.026	0.017	0.013
Chromium	µg/L	0.10	NG	NG	<0.1	<0.1	0.2	<0.2	<0.1	<0.1
Cobalt	µg/L	0.10	NG	NG	0.46	0.53	9.68	29.7	5	2.03
Copper [6]	µg/L	0.20	Calc. based on BLM Model	Calc. based on BLM Model	1.61	1.87	1.72	2.60	1.82	1.62
Cu FST Guideline Value (Acute)	µg/L		BLM Ligand Model value		31.1	36.2	41.4	51.2	63.3	37.9
Cu FLT Guideline Value (Chronic)	µg/L			BLM Ligand Model value	5.8	6	7.1	7.50	12.2	6.0
Iron	µg/L	10.0-20.0	350	NG	5.0	5.0	5.0	10.0	5.0	12.0
Lead	µg/L	0.05-0.1	NG	NG	<0.05	<0.05	<0.05	<0.1	<0.05	<0.05
Lithium	µg/L	1.0	NG	NG	21.7	24.4	50	110	27.3	45
Magnesium	µg/L	5.0	NG	NG	41500	41400	65900	154000	42500	72600
Manganese	µg/L	0.10	NG	NG	4.22	15.5	234	679	459	102
Mercury	µg/L	0.005	NG	NG	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	NG	NG	2.9	2.77	3.74	5.02	3.44	3.08
Nickel	µg/L	0.50	NG	NG	3.43	4.19	56.1	257	27.2	35.7
Phosphorus	µg/L	50.0-100.0	NG	NG	<50	<50	<50	<100	<50	<50
Potassium	µg/L	50.0	NG	NG	6080	6200	11800	15300	8990	6540
Rubidium	µg/L	0.20	NG	NG	1.18	1.44	2.83	3.23	3.53	1.82

Appendix B1: LBRR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBRR-EDP 29-Jul-20	LBRR-EDP 28-Sep-20	LBRR-UC 29-Jul-20	LBRR-UC 23-Aug-20	RR9 27-Feb-20
Physical Parameters									
Temperature (°C)	°C								
Flow Rate (L/sec)	L/s								
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	6000	3000	500	2700	3500
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	176	185	238	198	92
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	2350	1240	1090	981	1340
Hardness as CaCO3, dissolved	µg/L	500	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn)	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn)	299000	570000	551000	414000	514000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L	500							474000
pH	pH Units	0.10	6.5 - 9	6.5-9.0	8.02	8.06	8.27	7.98	7.78
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	2170000	929000	754000	716000	911000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	6000	7100	10100	34400	<3000
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	176000	185000	238000	198000	92000
Anions and Nutrients (Matrix: Water)									
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	<50	95	<50	54	226
Ammonia FST Guideline	µg/L		pH dependent (at Temp 4 °C or in situ T)		6220	4950	3150	6220	8770
Ammonia FLT Guideline	µg/L			pH dependent (at Temp 4 °C or in situ T)	1200	9520	6060	1200	1690
Chloride (Cl^-)	µg/L	500	600,000	150,000	51900	124000	101000	120000	254000
Nitrate (NO_3^- as N)	µg/L	5.0-100	NG	NG	<25	<25	<25	74	582
Nitrite (NO_2^- as N)	µg/L	1.0-20	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	<5	<5	<5	<5	80.2
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	1290000	315000	224000	198000	179000
SO4 FLT Guideline Calc	µg/L		NG	Hardness 76,000-180,000 = 309,000 Hardness 181,000-250,000 = 429,000 Hardness > 250,000 site-specific	429000	429000	429000	429000	309000
Dissolved Organic Carbon (DOC)	mg/L		NG	NG	3.9	4.2	6.5	8.9	8720
Metals, Total									
Aluminum	µg/L	3.00	NG	NG	48	133	66.4	1100	72.80
Antimony	µg/L	0.1-0.2	NG	NG	0.5	0.18	0.25	0.3	0.28
Arsenic	µg/L	0.10	5.0	5.0	0.5	0.67	1.5	2.01	0.46
Barium	µg/L	0.10	NG	NG	20.1	52	67.8	43.4	167
Beryllium	µg/L	0.10	NG	NG	0.5	<0.1	<0.1	0.15	<0.1
Bismuth	µg/L	0.05-0.10	NG	NG	0.25	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10.0	1200	1200	152	84	49	48	72
Cadmium	µg/L	0.005	NG	NG	0.092	0.118	0.0235	0.384	0.124
Calcium	µg/L	50	NG	NG	434000	157000	138000	127000	137000
Cesium	µg/L	0.01		NG	0.05	<0.01	0.056	0.07	<0.01
Chromium [4]	µg/L	0.1-0.7	NG	NG	0.5	0.24	0.21	0.57	0.72
Cobalt	µg/L	0.10	110	4.0	9.74	1.35	0.15	2.26	1.93
Copper [3]	µg/L	0.50	Calc. based on Hardness	2 to 10	2.5	1.97	1.98	7.63	2.46
Cu STM Guideline Calc.	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness > 400,000 is Capped Value of 400,000		30.1	39.6	39.6	39.6	
Cu LTA Guideline Calc.	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	10.0	10.0	10.0	10.0	
Iron	µg/L	10	1000	NG	50	299	185	294	76.00
Lead [3]	µg/L	0.05-0.1	Calc. based on Hardness	Calc. based on Hardness	0.25	<0.05	0.152	0.155	<0.05
Pb FST Guideline Calc (Based on Hardness as CaCO3), applies to water hardness 8000-360,000 µg/L	µg/L		Hardness ≤ 8000 is 3; Hardness 8000-360,000: calc. Hardness>360,000 is Capped Value of 360,000		329	417	417	417	417
Pb FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Hardness 8000-360,000: calc. Hardness > 360,000 is Capped Value of 360,000	16	20	20	20	20
Lithium	µg/L	1.0	NG	NG	75.2	33.3	19.6	14.4	31.8
Magnesium	µg/L	5.0	NG	NG	113000	50500	40800	39200	32100
Manganese [3]	µg/L	0.10	Calc. based on hardness	Calc. based on Hardness	401	19.8	4.04	20	110
Mn FST Guideline Calc (Based on Hardness as CaCO3)	µg/L		Hardness 25,000 - 259,000 : calc.; Hardness > 259,000 is Capped Value of 259,000		3394.2	3394.2	3394.0	3394.0	3394
Mn FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Hardness 37,000 - 450,000: calc.; Hardness > 450,000 is Capped Value of 450,000	1920.6	2585.0	2585.0	2427.0	2585
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	2000	≤ 1000	1.24	2.68	6.41	7.35	4.19
Nickel	µg/L	0.5	NG		129	16.5	3.35	12	12.4
Phosphorus	µg/L	50-100	NG	NG	<250	<50	<50	<63	62
Potassium	µg/L	50.0	NG	NG	8210	6910	5570	5420	15200
Rubidium	µg/L	0.2	NG	NG	2.9	1.55	2.21	3	3.34
Selenium	µg/L	0.05	NG	2.0	1.15	0.639	0.834	1.2	1.01
Silicon	µg/L	100		NG	5040	4590	3260	5930	2950
Silver [3]	µg/L	0.01-0.02	0.10 - 3.0	0.05 - 1.5	0.05	<0.01	<0.01	<0.01	<0.01
Ag FST Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		3.0	3.0	3.0	3.0	3.0
Ag FLT Guideline Calc				Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	1.5	1.5	1.5	1.5	1.5
Sodium	µg/L	50.0	NG	NG	41900	45600	35700	35500	58400
Strontium	µg/L	0.2	NG	NG	973	557	410	331	1600
Sulfur	µg/L	500	NG	NG	425000	113000	73100	65500	70100
Tellerium	µg/L	0.2-0.4	NG	NG	1	<0.2	<0.2	<0.2	0.21
Thallium	µg/L	0.01-0.055	NG	NG	0.05	0.017	0.025	0.029	0.021
Thorium	µg/L	0.1-0.2	NG	NG	0.5	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	0.1-0.2	NG	NG	0.5	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.3-1.2	NG	NG	1.5	1.23	1.45	1.85	1.6
Tungsten	µg/L	0.1-0.2	NG	NG	0.5	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	3.33	3.72	4.95	4.23	1.42
Vanadium	µg/L	0.5-1.0	NG	NG	2.5	<0.5	0.78	1.26	<0.5
Zinc [3]	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	17	12.1	5.6	38.5	6.3
Zn FST Guideline Calc.	µg/L		Hardness < 90,000 = 33.0 Hardness 90,000 - 500,000, Calc. Hardness > 500,000, Capped Value		189.8	340.5	340.5	276.0	340.5
Zn FLT Guideline Calc.				Hardness < 90,000 = 7.5 Hardness 90,000 - 330,000, Calc. Hardness > 330,000, Capped Value	164.3	187.5	187.5	187.5	187.5
Zirconium	µg/L	0.06-0.12	NG	NG	<1.0	<0.2	<0.2	<0.2	0.21
Metals, Dissolved									
Aluminum [5]	µg/L	1.0	100	50	8.6	64.6	3.9	**137**	15.80
Al FST Guideline Calc (based on pH)	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100	100	100	100	100
Al FLT Guideline Calc (based on median pH)				median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50	50	50	50	50
Antimony	µg/L	0.1-0.2	NG	NG	<0.1	0.14	0.21	0.28	0.28
Arsenic	µg/L	0.10	NG	NG	<0.1	0.34	1.62	1.32	0.54
Barium	µg/L	0.10	NG	NG	4.06	49.9	70.3	37.6	183
Beryllium	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1
Bismuth	µg/L	0.05-0.1	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10.0	NG	NG	29	82	54	46	65
Cadmium [3]	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.0173	0.0905	0.016	0.33	0.139
Cd FST Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		1.82	2.80	2.80	2.54	2.80
Cd FLT Guideline Calc.	µg/L			Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.46	0.46	0.46	0.46	0.46
Calcium	µg/L	50.0	NG	NG	81200	154000	145000	107000	150000
Cesium	µg/L	0.01	NG	NG	<0.01	<0.01	0.029	0.038	<0.01
Chromium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	0.2	0.67
Cobalt	µg/L	0.10	NG	NG	2.05	1.12	<0.1	1.97	1.97
Copper [6]	µg/L	0.20	Calc. based on BLM Model	Calc. based on BLM Model	0.25	1.52	1.86	5.98	2.43
Cu FST Guideline Value (Acute)	µg/L		BLM Ligand Model value		14.1	24.9	46.7	48.6	35.2
Cu FLT Guideline Value (Chronic)	µg/L			BLM Ligand Model value	2.4	4.4	9.2	8.9	8.5
Iron	µg/L	10.0-20.0	350	NG	5.0	5.0	5.0	12.0	5.00
Lead	µg/L	0.05-0.1	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05
Lithium	µg/L	1.0	NG	NG	14.6	30.5	21.5	14.5	30.7
Magnesium	µg/L	5.0	NG	NG	23400	45000	45900	35400	33500
Manganese	µg/L	0.10	NG	NG	78.5	16.8	0.78	16.5	110
Mercury	µg/L	0.005	NG	NG	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	NG	NG	0.238	2.61	6.24	6.65	4.23
Nickel	µg/L	0.50	NG	NG	24.4	14.4	3.29	10.8	13
Phosphorus	µg/L	50.0-100.0	NG	NG	<50	<50	<50	<50	59
Potassium	µg/L	50.0	NG	NG	1490	6140	6010	5270	15800
Rubidium	µg/L	0.20	NG	NG	0.65	1.44	2.28	2.72	3.27

Appendix B1: LBRR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBRR-DD	LBRR-DD	LBRR-LC	LBRR-12+500	LBRR-12+500	LBRR-12+500	LBRR-12+500
					27-Feb-20	16-Apr-20	16-Apr-20	27-Feb-20	25-Mar-20	16-Apr-20	21-Jun-20
Selenium	µg/L	0.05	NG	2.0	1.39	0.63	0.559	0.566	1.29	0.739	0.857
Silicon	µg/L	50.0	NG	NG	2620	3120	3220	3240	2250	2520	5020
Silver	µg/L	0.01-0.02	NG	NG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	µg/L	50.0	NG	NG	20300	25600	25600	27300	42800	35900	50600
Strontium	µg/L	0.20	NG	NG	354	368	315	409	506	1060	664
Sulfur	µg/L	500	NG	NG	67300	98200	82000	43800	103000	93200	98200
Tellerium	µg/L	0.2-0.4	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	0.013	0.012	<0.01	0.013	<0.01	0.027	0.019
Thorium	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.3-0.6	NG	NG	1.68	<0.3	<0.3	0.7	<0.3	<0.3	<0.3
Tungsten	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	1.43	2.01	2.26	1.72	4.22	1.85	5.27
Vanadium	µg/L	0.5-1.0	NG	NG	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	µg/L	1.00	NG	NG	27	17.3	8.1	3.8	2.1	3	<1
Zirconium	µg/L	0.06-0.12	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Laboratory Work Order Number					VA20A2572	L2438183	L2438183	VA20A2572	VA20A4062	L2438183	L2464256
Laboratory Identification Number					VA20A2572-007	L2438183-10	L2438183-11	VA20A2572-005	VA20A4062-003	L2438183-12	L2464256-2

Notes:

Screening completed on BCAWQG-FST [1] and FLT [2] guideline values.

[1] BC Ministry of Environment, Water Protection & Sustainability Branch (2019). British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. 36 pp. Referenced for Freshwater Aquatic Life (F) water use and Short Term Maximum (ST) guidelines.

[2] BC Ministry of Environment, Water Protection & Sustainability Branch (2018). British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. 36 pp. Referenced for Freshwater Aquatic Life (F) water use and Long Term Average (LT) guidelines.

[3] Guideline is hardness dependant. Where results are above laboratory reportable detection limits, guideline limits have been evaluated based on individual sample hardness. Sample-specific guideline values are listed in parentheses after the laboratory result, where applicable.

[4] Guideline is for Chromium (IV) cation. Analytical results are for unspeciated Chromium. Where analytical results exceed the guideline, speciated analysis may be warranted.

[5] Guideline is pH dependant.

NG - No Guideline

Detection limit can vary as described in the COA. Detection limit can be raised when dilutation is required due to high Dissolved Solids/Electrical Conductivity (DLDS), e.g. nitrite.

BOLD and shaded dark gray: Exceeds BCAWQG-FST (Freshwater Short Term) guideline.

Shaded Light Gray: Exceeds BCAWQG-FLT (Freshwater Long Term) guideline.

RED - Measured value is below detection limit (DL); value shown is 50% of DL

Blank - Not analyzed

Appendix B1: LBRR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBRR-12+500	LBRR-12+500	LBRR-EDP	LBRR-EDP	LBRR-EDP	LBRR-EDP
					28-Sep-20	20-Oct-20	27-Feb-20	25-Mar-20	16-Apr-20	21-Jun-20
Selenium	µg/L	0.05	NG	2.0	0.339	0.467	1.94	2.19	0.84	3.54
Silicon	µg/L	50.0	NG	NG	4360	4400	5400	4630	2570	5540
Silver	µg/L	0.01-0.02	NG	NG	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01
Sodium	µg/L	50.0	NG	NG	41900	45800	66100	92500	35800	50200
Strontium	µg/L	0.20	NG	NG	467	653	998	1230	1100	848
Sulfur	µg/L	500	NG	NG	72200	78600	181000	430000	111000	242000
Tellerium	µg/L	0.2-0.4	NG	NG	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	<0.01	0.012	0.025	0.022	0.026	0.018
Thorium	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1
Tin	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1
Titanium	µg/L	0.3-0.6	NG	NG	<0.3	<0.3	<0.3	<0.6	<0.3	<0.3
Tungsten	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	<0.2	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	3.19	3.46	3.74	6.43	2.1	5.08
Vanadium	µg/L	0.5-1.0	NG	NG	<0.5	<0.5	<0.5	<1	<0.5	<0.5
Zinc	µg/L	1.00	NG	NG	<1	1.1	49	86.5	10	22.9
Zirconium	µg/L	0.06-0.12	NG	NG	<0.2	<0.2	<0.2	<0.4	<0.2	<0.2
Laboratory Work Order Number					L2509865	L2520229	VA20A2572	VA20A4062	L2438183	L2464256
Laboratory Identification Number					L2509865-7	L2520229-5	VA20A2572-006	VA20A4062-002	L2438183-13	L2464256-1

Notes:

Screening completed on BCAWQG-FST [1] and FLT [2] guideline values.

[1] BC Ministry of Environment, Water Protection & Sustainability Branch (2019). British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. 36 pp. Referenced for Freshwater Aquatic Life (F) water use and Short Term Maximum (ST) guidelines.

[2] BC Ministry of Environment, Water Protection & Sustainability Branch (2018). British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. 36 pp. Referenced for Freshwater Aquatic Life (F) water use and Long Term Average (LT) guidelines.

[3] Guideline is hardness dependant. Where results are above laboratory reportable detection limits, guideline limits have been evaluated based on individual sample hardness. Sample-specific guideline values are listed in parentheses after the laboratory result, where applicable.

[4] Guideline is for Chromium (IV) cation. Analytical results are for unspeciated Chromium. Where analytical results exceed the guideline, speciated analysis may be warranted.

[5] Guideline is pH dependant.

NG - No Guideline

Detection limit can vary as described in the COA. Detection limit can be raised when dilutation is required due to high Dissolved Solids/Electrical Conductivity (DLDS), e.g. nitrite.

BOLD and shaded dark gray: Exceeds BCAWQG-FST (Freshwater Short Term) guideline.

Shaded Light Gray: Exceeds BCAWQG-FLT (Freshwater Long Term) guideline.

RED - Measured value is below detection limit (DL); value shown is 50% of DL

Blank - Not analyzed

Appendix B1: LBRR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBRR-EDP	LBRR-EDP	LBRR-UC	LBRR-UC	RR9
					29-Jul-20	28-Sep-20	29-Jul-20	23-Aug-20	27-Feb-20
Selenium	µg/L	0.05	NG	2.0	0.26	0.71	0.869	1.34	0.935
Silicon	µg/L	50.0	NG	NG	995	4510	3480	5830	2540
Silver	µg/L	0.01-0.02	NG	NG	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	µg/L	50.0	NG	NG	8160	39500	39800	34100	58700
Strontium	µg/L	0.20	NG	NG	181	540	405	310	1770
Sulfur	µg/L	500	NG	NG	87000	108000	81700	63100	64500
Tellerium	µg/L	0.2-0.4	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	<0.01	0.013	0.018	0.012	0.019
Thorium	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.3-0.6	NG	NG	<0.3	<0.3	<0.3	<0.3	<0.3
Tungsten	µg/L	0.1-0.2	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	0.667	3.18	4.92	3.94	1.46
Vanadium	µg/L	0.5-1.0	NG	NG	<0.5	<0.5	<0.5	0.77	<0.5
Zinc	µg/L	1.00	NG	NG	3.5	7.9	1.7	36.6	6.1
Zirconium	µg/L	0.06-0.12	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2
Laboratory Work Order Number					L2482349	L2509865	L2482349	L2493339	VA20A2572
Laboratory Identification Number					L2482349-1	L2509865-6	L2482349-5	L2493339-7	VA20A2572-012

Notes:

Screening completed on BCAWQG-FST [1] and FLT [2] guideline values.

[1] BC Ministry of Environment, Water Protection & Sustainability Branch (2019). British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. 36 pp. Referenced for Freshwater Aquatic Life (F) water use and Short Term Maximum (ST) guidelines.

[2] BC Ministry of Environment, Water Protection & Sustainability Branch (2018). British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. 36 pp. Referenced for Freshwater Aquatic Life (F) water use and Long Term Average (LT) guidelines.

[3] Guideline is hardness dependant. Where results are above laboratory reportable detection limits, guideline limits have been evaluated based on individual sample hardness. Sample-specific guideline values are listed in parentheses after the laboratory result, where applicable.

[4] Guideline is for Chromium (IV) cation. Analytical results are for unspeciated Chromium. Where analytical results exceed the guideline, speciated analysis may be warranted.

[5] Guideline is pH dependant.

NG - No Guideline

Detection limit can vary as described in the COA. Detection limit can be raised when dilutation is required due to high Dissolved Solids/Electrical Conductivity (DLDS), e.g. nitrite.

BOLD and shaded dark gray: Exceeds BCAWQG-FST (Freshwater Short Term) guideline.

Shaded Light Gray: Exceeds BCAWQG-FLT (Freshwater Long Term) guideline.

RED - Measured value is below detection limit (DL); value shown is 50% of DL

Blank - Not analyzed

Appendix B2: SBIAR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	RBSBIAR-DS 27-Feb-20	RBSBIAR-DS 16-Apr-20	RBSBIAR-DS 27-May-20	RBSBIAR-DS 22-Jun-20	RBSBIAR-DS 29-Jul-20	RBSBIAR-DS 24-Aug-20	RBSBIAR-DS 28-Sep-20
Physical Parameters											
Temperature	°C						12.2				
Flow Rate	L/sec						1.00				
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	1000	1300	1900	1700	2800	1300	<1000
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	242	135	196	196	185	234	211
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	742	590	903	654	651	702	693
Hardness as CaCO3, dissolved	µg/L	500	NG	NG	234000	235000	331000	294000	318000	286000	307000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L				233000						
pH	pH Units	0.10	6.5 - 9	6.5-9.0	8.08	8.22	8.10	8.08	8.07	8.10	8.20
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	449000	493000	572000	449000	412000	470000	463000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	1500	341000	6300	3900	1400	3500	2000
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	242000	135000	196000	196000	185000	234000	211000
Anions and Nutrients											
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	548	980	299	136	65	130	100
Ammonia FST Guideline	µg/L		pH dependent (at Temp 4 °C or in situ T)		4950	3950	4950	4950	4950	4950	3950
Ammonia FLT Guideline				pH dependent (at Temp 4 °C or in situ T)	952	759	952	952	9520	9520	759
Chloride (Cl^-)	µg/L	500	600000	150,000	57100	49500	111000	59500	41300	46700	35200
Nitrate (NO_3^- as N)	µg/L	5.0-25.0	NG	NG	843	831	4750	2210	1160	1050	900
Nitrite (NO_2^- as N)	µg/L	1.0-5.0	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	46.5	93.4	45.4	19.2	6.4	18.3	5.4
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	69100	149000	103000	64200	96500	106000	111000
SO4 FLT Guideline Calc	µg/L		NG	Hardness 76,000-180,000 = 309,000 Hardness 181,000-250,000 = 429,000 Hardness > 250,000 site-specific	309000.00	429000	429000	429000	429000	429000	429000
Dissolved Organic Carbon (DOC)	mg/L		NG	NG	7.72	7.7	1.32	<1.0	1.7	1.5	1.2
Metals, Total											
Aluminum	µg/L	3.00	NG	NG	59.4	2440	46.7	116	36.1	142	309
Antimony	µg/L	0.10	NG	NG	0.42	0.72	0.33	0.28	0.34	0.37	0.26
Arsenic	µg/L	0.10	5.0	5.0	0.39	4.48	0.31	0.31	0.22	0.59	0.31
Barium	µg/L	0.10	NG	NG	73.2	385	139	164	193	131	150
Beryllium	µg/L	0.10	NG	NG	<0.1	0.26	<0.1	<0.1	<0.1	0.49	<0.1
Bismuth	µg/L	0.05	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10.0	1200	1200	95	94	161	93	81	82	81
Cadmium	µg/L	0.005	NG	NG	0.0729	0.451	0.0866	0.104	0.0294	0.683	0.158
Calcium	µg/L	50	NG	NG	67800	81000	97600	90000	87600	90900	86800
Cesium	µg/L	0.01	NG	NG	0.11	0.725	0.047	0.027	0.026	0.029	0.028
Chromium [4]	µg/L	0.1-1.0	NG	NG	6.7	15	0.27	0.24	0.25	0.55	0.42
Cobalt	µg/L	0.10	110	4.0	0.84	7.85	1.16	2.36	0.39	2.78	3.96
Copper [3]	µg/L	0.50	Calc. based on Hardness	2 to 10	2	17.4	1.11	1.19	0.83	2.28	3.29
Cu FST Guideline Calc. (relevant prior to August 2019)	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness ≥ 400,000 is Capped Value of 400,000				33.114	29.636	31.892	28.884	30.858
Cu FLT Guideline Calc. (relevant prior to August 2019)	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10			10	10	10	10	10
Iron	µg/L	10	1000	NG	58	**7730**	65	140	71	233	493
Lead [3]	µg/L	0.05	101 - 348	Calc. based on Hardness	<0.05	3.92	<0.05	<0.05	<0.05	0.454	<0.05
Pb FST Guideline Calc (Based on Hardness as CaCO3), applies to water hardness 8000-360,000 µg/L	µg/L		Based on Hardness 8000-360,000 Hardness ≤ 8000: 3 Hardness > 8000 : calc.		241.0	242.3	374.7	322.2	356.1	311.1	340.5
Pb FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 8000-360,000 Hardness ≤ 8000, NG Hardness > 8000 : calc.	12.7	12.8	17.9	15.9	17.2	15.4	16.6
Lithium	µg/L	1.0	NG	NG	21.8	29.1	36.5	21.6	16.5	18.5	21.5
Magnesium	µg/L	5.0	NG	NG	15500	16900	25500	18800	20000	22700	24100
Manganese [3]	µg/L	0.10	Calc. based on Hardness	Calc. based on Hardness	16.8	164	25.7	44.2	9.72	29.1	38.8
Mn FST Guideline Calc (Based on Hardness as CaCO3)	µg/L		Applies to Hardness 25000-259000 µg/L Mn : calc.		3118.7	3129.7	3394.2	3394.2	3394.2	3394.2	3394.2
Mn FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 37000-450000 µg/L Mn : calc.	1634.6	1639.0	2061.4	1898.6	2004.2	1863.4	1955.8
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	<0.005	0.0214	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	2000	≤ 1000	19.7	23.8	7.43	4.56	3.42	4.71	4.11
Nickel	µg/L	0.50	NG	NG	7.59	27	9.96	10.9	4.31	10.9	16
Phosphorus	µg/L	50.0	NG	NG	<50	327	<50	<50	<50	<50	<50
Potassium	µg/L	50.0	NG	NG	7090	7970	4220	3790	4080	4170	3900
Rubidium	µg/L	0.2	NG	NG	14.1	15.7	2.46	1.59	1.37	2.1	1.63
Selenium	µg/L	0.05	NG	2.0	1.13	2.43	0.873	0.738	0.918	1.02	0.816
Silicon	µg/L	100.0	NG	NG	4270	5580	3790	4040	4280	4200	4510
Silver [3] (Based on Hardness < or > 100000)	µg/L	0.01	0.10 - 3.0	0.05 - 1.5	<0.01	0.067	<0.01	<0.01	<0.01	<0.01	<0.01
Ag FST Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0
Ag FLT Guideline Calc	µg/L			Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Sodium	µg/L	50.0	NG	NG	55600	53100	79700	35400	28100	34300	33500
Strontium	µg/L	0.2	NG	NG	505	526	619	489	393	487	461
Sulfur	µg/L	500.0	NG	NG	25500	53000	40600	22200	32400	34200	39500
Tellerium	µg/L	0.2	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	0.025	0.103	0.018	<0.01	0.016	0.68	0.012
Thorium	µg/L	0.10	NG	NG	<0.1	2.05	<0.1	<0.1	<0.1	0.11	0.24
Tin	µg/L	0.10	NG	NG	<0.1	0.15	<0.1	<0.1	<0.1	0.12	<0.1
Titanium	µg/L	0.3-4.5	NG	NG	1.33	28.4	0.72	1.04	0.37	0.38	<0.3
Tungsten	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	0.892	1.77	1.21	1.28	1.01	1.45	1.35
Vanadium	µg/L	0.50	NG	NG	<0.5	7.67	<0.5	<0.5	<0.5	0.59	0.53
Zinc [3] (Based on Hardness < or > 90,000)	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	5.4	77	9.4	21.3	6.5	20.3	44.2
Zn FST Guideline Calc.	µg/L		Hardness 90,000 - 500,000, Calc. Hardness > 500,000, is Capped Value of 500,000		141.00	141.75	213.75	186.00	204.00	180.00	195.75
Zn FLT Guideline Calc.				Hardness 90,000 - 330,000, Calc. Hardness > 330,000, is Capped Value of 330,000	116	116	188	161	179	155	170
Zircronium	µg/L	0.06	NG	NG	<0.2	0.53	<0.2	<0.2	<0.2	<0.2	<0.2
Metals, Dissolved											
Aluminum [5]	µg/L	1.0	100	50	13.2	**103**	18.7	59.9	18.3	82.7	**169**
Al FST Guideline Calc (based on pH)	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100	100	100	100	100	100	100
Al FLT Guideline Calc (based on median pH)	µg/L			median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50	50	50	50	50	50	50
Antimony	µg/L	0.10	NG	NG	0.41	0.58	0.32	0.29	0.24	0.24	0.2
Arsenic	µg/L	0.10	NG	NG	0.37	0.49	0.24	0.2	0.21	0.21	0.2
Barium	µg/L	0.10	NG	NG	71	68.1	131	157	205	126	159
Beryllium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bismuth		0.05	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10.0	NG	NG	97	87	150	97	87	87	83
Cadmium [3] (Based on Hardness as $CaCO_3$)	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.0658	0.115	0.0719	0.0859	0.0258	0.0794	0.126
Cd FST Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		1.412	1.418	2.018	1.786	1.937	1.736	1.868
Cd FLT Guideline Calc.				Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.395	0.397	0.457	0.457	0.457	0.457	0.457
Calcium	µg/L	50.0	NG	NG	68300	69500	92600	84700	91500	79800	84800
Cesium		0.01	NG	NG	0.106	0.062	0.038	0.025	0.02	0.023	0.021
Chromium	µg/L	0.10	NG	NG	6.72	11	0.17	0.15	0.16	<0.1	<0.1
Cobalt	µg/L	0.10	NG	NG	0.82	3.47	1.02	2.21	0.42	2.06	3.55
Copper [6]	µg/L	0.20	Calc. based on BLM Model	Calc. based on BLM Model	1.85	3.35	0.84	0.80	0.70	0.99	1.48
Cu FST Guideline Value (Acute)	µg/L		BLM Ligand Model value		39.3	57.2	10.2	3.5	10.6	9.7	8.5
Cu FLT Guideline Value (Chronic)	µg/L			BLM Ligand Model value	9.6	11.5	1.6	0.6	2	1.8	1.6
Iron	µg/L	10.0	350	NG	5.0	12	5.00	5	12	5	34
Lead	µg/L	0.05	NG	NG	0.057	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lithium	µg/L	1.0	NG	NG	22.8	27	30	20.9	16.2	18.4	21.6
Magnesium	µg/L	5.0	NG	NG	15500	14900	24200	20100	21700	21100	23100
Manganese	µg/L	0.10	NG	NG	16	70.8	22.4	41.9	10.1	27.4	36.3
Mercury	µg/L	0.005	NG	NG	<0.005	0.0074	<0.005	0.025	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	NG	NG	19.8	25.8	7.36	4.62	3.3	4.39	4.23
Nickel	µg/L	0.50	NG	NG	7.51	16.2	9.32	9.89	4.29	9.91	14.6

Appendix B2: SBIAR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	RBSBIAR-DS	RBSBIAR-DS	RBSBIAR-US	RBSBIAR-US	RBSBIAR-US	RBSBIAR-US	RBSBIAR-US	RBSBIAR-US
					20-Oct-20	30-Nov-20	27-Feb-20	16-Apr-20	17-May-20	22-Jun-20	29-Jul-20	24-Aug-20
Physical Parameters												
Temperature	°C								8.4			
Flow Rate	L/sec								0.100			
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	1600	<1000	3300	2500	2100	2200	3400	1700
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	215	240	68.3	131	218	184	170	197
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	682	744	780	556	712	495	690	757
Hardness as CaCO3, dissolved	µg/L	500	NG	NG	303000	267000	159000	228000	370000	286000	348000	335000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L						174000					
pH	pH Units	0.10	6.5 - 9	6.5-9.0	8.08	8.26	7.72	8.23	8.09	7.98	8.02	8.01
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	462000	489000	511000	386000	518000	362000	498000	544000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	2800	500	32400	3300	1300	3600	500	2500
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	215000	240000	68300	131000	218000	184000	170000	197000
Anions and Nutrients												
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	100	62	612	25	10	25	25	64
Ammonia FST Guideline	µg/L		pH dependent (at Temp 4 °C or in situ T)		4950	**3150**	10300	3950	4950	6220	6220	6220
Ammonia FLT Guideline				pH dependent (at Temp 4 °C or in situ T)	9520	**606**	1980	759	952	1200	1200	1200
Chloride (Cl^-)	µg/L	500	600000	150,000	51100	35400	176000	84200	93800	41400	20900	21000
Nitrate (NO_3^- as N)	µg/L	5.0-25.0	NG	NG	1170	922	762	268	1720	653	884	482
Nitrite (NO_2^- as N)	µg/L	1.0-5.0	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	8.1	2.5	106	12.9	1.25	3.6	1.7	1.5
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	111000	127000	16900	17200	25900	23200	169000	221000
SO4 FLT Guideline Calc	µg/L		NG	Hardness 76,000-180,000 = 309,000 Hardness 181,000-250,000 = 429,000 Hardness > 250,000 site-specific	429000	429000	309000	429000	429000	429000	429000	429000
Dissolved Organic Carbon (DOC)	mg/L		NG	NG	2.2	1.8	17.8	3.1	1.26	1.2	2.1	3.1
Metals, Total												
Aluminum	µg/L	3.00	NG	NG	93.8	66.1	772	75.1	27.9	35.9	34.7	71.1
Antimony	µg/L	0.10	NG	NG	0.17	0.3	0.61	0.46	0.14	0.21	0.21	0.14
Arsenic	µg/L	0.10	5.0	5.0	0.21	0.2	1.58	0.52	0.12	0.28	0.2	0.32
Barium	µg/L	0.10	NG	NG	146	88.8	178	242	235	270	228	198
Beryllium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bismuth	µg/L	0.05	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10.0	1200	1200	69	59	42	47	25	25	23	25
Cadmium	µg/L	0.005	NG	NG	0.0477	0.0719	0.124	0.0593	0.0405	0.0133	0.017	0.0414
Calcium	µg/L	50	NG	NG	95400	85800	59000	80400	112000	87300	105000	117000
Cesium	µg/L	0.01	NG	NG	0.023	0.013	0.123	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium [4]	µg/L	0.1-1.0	NG	NG	0.25	0.11	5.07	0.39	0.18	0.24	0.32	0.32
Cobalt	µg/L	0.10	110	4.0	1.24	1.43	0.94	0.47	0.44	0.13	0.05	0.17
Copper [3]	µg/L	0.50	Calc. based on Hardness	2 to 10	1.03	0.99	9.93	1.32	0.25	0.25	0.55	0.79
Cu FST Guideline Calc. (relevant prior to August 2019)	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness ≥ 400,000 is Capped Value of 400,000		30.482	27.098			36.78	28.884	34.712	34.712
Cu FLT Guideline Calc. (relevant prior to August 2019)	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	10	10			10	10	10	10
Iron	µg/L	10	1000	NG	203	53	1750	139	56	56	55	117
Lead [3]	µg/L	0.05	101 - 348	Calc. based on Hardness	<0.05	<0.05	0.995	0.128	<0.05	<0.05	<0.05	0.072
Pb FST Guideline Calc (Based on Hardness as CaCO3), applies to water hardness 8000-360,000 µg/L	µg/L		Based on Hardness 8000-360,000 Hardness ≤ 8000: 3 Hardness > 8000 : calc.		334.8	285.0	147.3	233.1	417.0	311.1	399.4	380.5
Pb FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 8000-360,000 Hardness ≤ 8000, NG Hardness > 8000 : calc.	16.4	14.4	9.1	12.4	19.6	15.4	18.9	18.1
Lithium	µg/L	1.0	NG	NG	20.3	18	6.5	6.9	9.1	7.9	8.1	6.3
Magnesium	µg/L	5.0	NG	NG	23100	21300	6540	11900	24600	15700	18700	21600
Manganese [3]	µg/L	0.10	Calc. based on Hardness	Calc. based on Hardness	17.8	16.2	75.9	224	7.84	54.9	14.2	72.4
Mn FST Guideline Calc (Based on Hardness as CaCO3)	µg/L		Applies to Hardness 25000-259000 µg/L Mn : calc.		3394.2	3394.2	2292.2	3052.6	3394.2	3394.2	3394.2	3394.2
Mn FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 37000-450000 µg/L Mn : calc.	1938.2	1779.8	1304.6	1608.2	2233.0	1863.4	2136.2	2079.0
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	<0.005	<0.005	0.0062	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	2000	≤ 1000	3.99	4.19	7.12	3.89	1.15	1.96	0.914	1.27
Nickel	µg/L	0.50	NG	NG	7.39	9.99	3.88	2.08	2.5	0.93	0.6	1.18
Phosphorus	µg/L	50.0	NG	NG	<50	<50	136	<50	<50	<50	<50	<50
Potassium	µg/L	50.0	NG	NG	3480	2860	7680	3850	3390	3060	3320	4070
Rubidium	µg/L	0.2	NG	NG	1.33	1.02	2.37	0.54	0.58	0.55	0.47	0.75
Selenium	µg/L	0.05	NG	2.0	0.841	0.989	0.434	0.139	0.686	0.473	1.4	1.3
Silicon	µg/L	100.0	NG	NG	4000	3350	4660	3460	4440	4050	4190	4470
Silver [3] (Based on Hardness < or > 100000)	µg/L	0.01	0.10 - 3.0	0.05 - 1.5	<0.01	<0.01	0.014	<0.012	<0.01	<0.01	<0.01	<0.01
Ag FST Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Ag FLT Guideline Calc	µg/L			Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Sodium	µg/L	50.0	NG	NG	32700	36900	72100	8990	8830	6600	20700	29800
Strontium	µg/L	0.2	NG	NG	503	452	522	817	371	428	264	294
Sulfur	µg/L	500.0	NG	NG	35500	43100	6330	5380	11100	8010	53700	74600
Tellerium	µg/L	0.2	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	<0.01	0.02	0.027	<0.01	<0.01	<0.01	<0.01	0.028
Thorium	µg/L	0.10	NG	NG	<0.1	<0.1	0.21	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	8.99	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.3-4.5	NG	NG	0.68	<0.3	17.2	1.84	<0.3	1	0.77	1.35
Tungsten	µg/L	0.10	NG	NG	<0.1	<0.1	0.16	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	1.14	1.18	0.736	1.07	1.22	1.19	0.91	0.912
Vanadium	µg/L	0.50	NG	NG	<0.5	<0.5	3.34	<0.5	<0.5	<0.5	<0.5	0.51
Zinc [3] (Based on Hardness < or > 90,000)	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	14.6	15.3	14.8	1.5	6.1	1.5	5.3	4.2
Zn FST Guideline Calc.	µg/L		Hardness 90,000 - 500,000, Calc. Hardness > 500,000, is Capped Value of 500,000		192.75	165.75	84.75	136.50	243.00	180.00	226.50	216.75
Zn FLT Guideline Calc.				Hardness 90,000 - 330,000, Calc. Hardness > 330,000, is Capped Value of 330,000	167	140	59	111	188	155	188	188
Zircronium	µg/L	0.06	NG	NG	<0.2	<0.2	0.6	<0.2	<0.2	<0.2	0.29	<0.2
Metals, Dissolved												
Aluminum [5]	µg/L	1.0	100	50	46.1	48.7	5.5	3.9	6	3.3	3.2	5.0
Al FST Guideline Calc (based on pH)	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100	100	100	100	100	100	100	100
Al FLT Guideline Calc (based on median pH)	µg/L			median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50	50	50	50	50	50	50	50
Antimony	µg/L	0.10	NG	NG	0.2	0.19	0.5	0.41	0.13	0.2	0.13	0.13
Arsenic	µg/L	0.10	NG	NG	0.17	0.15	0.66	0.47	0.05	0.23	0.18	0.26
Barium	µg/L	0.10	NG	NG	138	91.8	150	237	233	291	258	198
Beryllium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bismuth		0.05	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10.0	NG	NG	57	57	42	41	24	26	25	24
Cadmium [3] (Based on Hardness as $CaCO_3$)	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.0475	0.0647	0.0819	0.0429	0.0522	0.0124	0.0184	0.0175
Cd FST Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		1.843	1.617	0.948	1.375	2.263	1.736	2.125	2.043
Cd FLT Guideline Calc.				Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.457	0.436	0.298	0.388	0.457	0.457	0.457	0.457
Calcium	µg/L	50.0	NG	NG	83500	73700	53600	72800	109000	89000	105000	98600
Cesium		0.01	NG	NG	0.016	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chromium	µg/L	0.10	NG	NG	0.11	<0.1	3.36	0.25	0.16	0.17	0.24	0.15
Cobalt	µg/L	0.10	NG	NG	1.19	1.43	0.28	0.36	0.54	<0.1	<0.1	0.12
Copper [6]	µg/L	0.20	Calc. based on BLM Model	Calc. based on BLM Model	0.65	0.86	4.93	1.0	0.42	0.36	0.44	0.59
Cu FST Guideline Value (Acute)	µg/L		BLM Ligand Model value		13.7	13.5	56.5	18.5	7.2	6.1	11.6	17.4
Cu FLT Guideline Value (Chronic)	µg/L			BLM Ligand Model value	2.6	2.6	17.7	3.4	1.3	1.1	2.1	3.1
Iron	µg/L	10.0	350	NG	39	24	5.0	5	61	5	5	5
Lead	µg/L	0.05	NG	NG	<0.05	<0.05	0.106	<0.05	<0.05	<0.05	<0.05	<0.05
Lithium	µg/L	1.0	NG	NG	20.1	20.2	6	6.2	8.3	7.3	8	6.9
Magnesium	µg/L	5.0	NG	NG	23000	20300	6200	11300	23800	15600	21100	21700
Manganese	µg/L	0.10	NG	NG	16.4	15.1	38.7	200	8.95	47.5	14.2	75.4
Mercury	µg/L	0.005	NG	NG	<0.005	<0.005	<0.005	<0.005	<0.005	0.025	<0.005	<0.005
Molybdenum	µg/L	0.05	NG	NG	4.04	4.21	6.86	5.21	1.13	1.9	0.999	1.18
Nickel	µg/L	0.50	NG	NG	7.4	9.56	1.47	1.77	2.76	0.95	<0.5	1.05

Appendix B2: SBIAR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	RBSBIAR-US 28-Sep-20	RBSBIAR-US 20-Oct-20	RBSBIAR-US 30-Nov-20	RBSBIAR-US 21-Dec-20	RBSC-DS 23-Jan-20	RBSC-DS 27-Feb-20	RBSC-DS 25-Mar-20	RBSC-DS 16-Apr-20
Physical Parameters												
Temperature	°C											
Flow Rate	L/sec											
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	2700	2300	4700	4200	12200	14100	1000	23800
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	183	201	215	212	368	349	329	315
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	874	760	945	965	1050	1200	871	841
Hardness as CaCO3, dissolved	µg/L	500	NG	NG	416000	403000	380000	466000	502000	533000	418000	373000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L								580000	556000	460000	
pH	pH Units	0.10	6.5 - 9	6.5-9.0	8.05	7.97	8.04	8.15	8.26	7.76	7.97	7.95
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	641000	567000	679000	730000	721000	762000	558000	604000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	2700	1100	500	<1000	1500	1500	3500	12900
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	183000	201000	215000	212000	368000	349000	329000	315000
Anions and Nutrients												
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	25	25	25	<50	29.5	50.6	25.2	25
Ammonia FST Guideline	µg/L		pH dependent (at Temp 4 °C or in situ T)		4950	6220	6220	3950	3150	8770	6220	6220
Ammonia FLT Guideline				pH dependent (at Temp 4 °C or in situ T)	9520	1200	1200	759	606	1690	1200	1200
Chloride (Cl^-)	µg/L	500	600000	150,000	18400	41700	42800	39700	18600	19200	10500	10600
Nitrate (NO_3^- as N)	µg/L	5.0-25.0	NG	NG	171	1060	1070	1110	12.5	12.5	12.5	2.5
Nitrite (NO_2^- as N)	µg/L	1.0-5.0	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	3.8	0.5	2.5	2.5	2.5	2.5	2.5	0.5
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	270000	205000	277000	292000	230000	302000	169000	156000
SO4 FLT Guideline Calc	µg/L		NG	Hardness 76,000-180,000 = 309,000 Hardness 181,000-250,000 = 429,000 Hardness > 250,000 site-specific	429000	429000	429000	429000	429000	429000	309000	429000
Dissolved Organic Carbon (DOC)	mg/L		NG	NG	2.6	3.4	2.4	1.9	2.34	2.63	2.19	3.1
Metals, Total												
Aluminum	µg/L	3.00	NG	NG	21.5	10.6	9.4	<15	4.9	8	7.8	60.7
Antimony	µg/L	0.10	NG	NG	0.18	0.12	0.15	<0.5	<0.1	<0.1	<0.1	<0.1
Arsenic	µg/L	0.10	5.0	5.0	0.39	0.12	0.05	0.25	0.38	0.37	0.39	0.86
Barium	µg/L	0.10	NG	NG	118	268	118	81.9	29.2	27.4	33.5	57.7
Beryllium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
Bismuth	µg/L	0.05	NG	NG	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10.0	1200	1200	32	22	15	<50	66	87	54	45
Cadmium	µg/L	0.005	NG	NG	0.0152	0.015	0.0092	<0.025	0.0292	0.183	0.0249	0.0819
Calcium	µg/L	50	NG	NG	126000	127000	135000	146000	168000	158000	130000	117000
Cesium	µg/L	0.01	NG	NG	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	0.013
Chromium [4]	µg/L	0.1-1.0	NG	NG	0.13	0.14	0.12	<0.05	<0.1	<0.1	0.16	0.11
Cobalt	µg/L	0.10	110	4.0	0.11	0.05	0.05	<0.5	0.84	1.58	0.54	1.48
Copper [3]	µg/L	0.50	Calc. based on Hardness	2 to 10	0.51	<0.5	<0.5	<2.5	0.25	0.25	0.25	0.25
Cu FST Guideline Calc. (relevant prior to August 2019)	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness ≥ 400,000 is Capped Value of 400,000		39.6	39.6	37.72	39.6	39.6	39.6	39.6	39.6
Cu FLT Guideline Calc. (relevant prior to August 2019)	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	10	10	10	10	10	10	10	10
Iron	µg/L	10	1000	NG	47	20	21	<50	359	332	319	600
Lead [3]	µg/L	0.05	101 - 348	Calc. based on Hardness	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	0.07
Pb FST Guideline Calc (Based on Hardness as CaCO3), applies to water hardness 8000-360,000 µg/L	µg/L		Based on Hardness 8000-360,000 Hardness ≤ 8000: 3 Hardness > 8000 : calc.		417.0	417.0	417.0	416.968	417.0	417.0	417.0	417.0
Pb FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 8000-360,000 Hardness ≤ 8000, NG Hardness > 8000 : calc.	19.6	19.6	19.6	19.57	19.6	19.6	19.6	19.6
Lithium	µg/L	1.0	NG	NG	9.1	9	7.1	7.5	33.1	47.4	22.8	24.9
Magnesium	µg/L	5.0	NG	NG	25300	25600	27800	32000	39100	39500	32900	28500
Manganese [3]	µg/L	0.10	Calc. based on Hardness	Calc. based on Hardness	31.3	0.96	0.93	5.27	1860	2330	1460	1760
Mn FST Guideline Calc (Based on Hardness as CaCO3)	µg/L		Applies to Hardness 25000-259000 µg/L Mn : calc.		3394.2	3394.2	3394.2	3394	3394.2	3394.2	3394.2	3394.2
Mn FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 37000-450000 µg/L Mn : calc.	2435.4	2378.2	2277.0	2585	2585.0	2585.0	2444.2	2246.2
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0192	<0.005
Molybdenum	µg/L	0.05	2000	≤ 1000	1.63	1.18	0.94	1.08	1.46	1.19	3.05	1.4
Nickel	µg/L	0.50	NG	NG	1.54	<0.5	<0.5	<2.5	21.2	45.4	11.6	21.3
Phosphorus	µg/L	50.0	NG	NG	<50	<50	<50	<250	<50	<50	<50	<50
Potassium	µg/L	50.0	NG	NG	4260	3860	3450	3370	1700	1750	1460	1540
Rubidium	µg/L	0.2	NG	NG	0.63	0.66	0.55	<1	1.22	1.53	0.98	1.18
Selenium	µg/L	0.05	NG	2.0	1.48	1.31	1.64	1.88	<0.05	<0.05	<0.05	0.094
Silicon	µg/L	100.0	NG	NG	5050	4710	3990	3750	4670	4060	3860	3510
Silver [3] (Based on Hardness < or > 100000)	µg/L	0.01	0.10 - 3.0	0.05 - 1.5	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01
Ag FST Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Ag FLT Guideline Calc	µg/L			Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Sodium	µg/L	50.0	NG	NG	37600	15500	21600	24100	40800	52700	32100	27900
Strontium	µg/L	0.2	NG	NG	340	389	379	385	413	461	348	347
Sulfur	µg/L	500.0	NG	NG	97700	66500	91100	96200	87700	107000	58900	50900
Tellerium	µg/L	0.2	NG	NG	<0.2	<0.2	<0.2	<1	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	0.011	<0.01	<0.01	<0.05	<0.01	0.011	<0.01	0.011
Thorium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.3-4.5	NG	NG	0.67	<0.3	<0.3	<1.5	<0.3	0.33	<0.3	1.44
Tungsten	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	1.3	1.3	1.31	1.55	1.59	1.36	1.1	1.13
Vanadium	µg/L	0.50	NG	NG	0.65	<0.5	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5
Zinc [3] (Based on Hardness < or > 90,000)	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	1.5	1.5	1.5	7.5	3.4	21.7	1.5	8.3
Zn FST Guideline Calc.	µg/L		Hardness 90,000 - 500,000, Calc. Hardness > 500,000, is Capped Value of 500,000		277.50	267.75	250.50	315	340.50	340.50	279.00	245.25
Zn FLT Guideline Calc.				Hardness 90,000 - 330,000, Calc. Hardness > 330,000, is Capped Value of 330,000	188	188	188	187.5	188	188	188	188
Zircronium	µg/L	0.06	NG	NG	<0.2	<0.2	<0.2	<1	<0.2	<0.2	0.23	<0.2
Metals, Dissolved												
Aluminum [5]	µg/L	1.0	100	50	2.6	1.4	0.5	0.5	0.5	0.5	0.5	1.1
Al FST Guideline Calc (based on pH)	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100	100	100	100	100	100	100	100
Al FLT Guideline Calc (based on median pH)	µg/L			median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50	50	50	50	50	50	50	50
Antimony	µg/L	0.10	NG	NG	0.17	0.13	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
Arsenic	µg/L	0.10	NG	NG	0.36	0.05	0.05	0.25	0.36	0.36	0.35	0.83
Barium	µg/L	0.10	NG	NG	120	259	117	77	28.9	26.6	31.9	56.6
Beryllium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
Bismuth		0.05	NG	NG	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10.0	NG	NG	31	19	13	<50	58	90	51	38
Cadmium [3] (Based on Hardness as $CaCO_3$)	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.0127	0.013	0.0096	<0.025	0.0131	0.0516	0.0211	0.0182
Cd FST Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		2.554	2.472	2.327	2.8008	2.801	2.801	2.567	2.282
Cd FLT Guideline Calc.				Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.457	0.457	0.457	0.4571	0.457	0.457	0.457	0.457
Calcium	µg/L	50.0	NG	NG	126000	119000	110000	138000	144000	145000	117000	104000
Cesium		0.01	NG	NG	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01
Chromium	µg/L	0.10	NG	NG	<0.1	0.11	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
Cobalt	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.5	0.74	1.76	0.52	1.47
Copper [6]	µg/L	0.20	Calc. based on BLM Model	Calc. based on BLM Model	0.42	0.35	0.25	<1	0.1	0.1	0.1	0.1
Cu FST Guideline Value (Acute)	µg/L		BLM Ligand Model value		15.3	16.6	12.9	11.3		10.4	12	16.5
Cu FLT Guideline Value (Chronic)	µg/L			BLM Ligand Model value	2.7	3.0	2.3	2.1		1.6	2.1	2.8
Iron	µg/L	10.0	350	NG	5	<10	5	<50	338	234	300	184
Lead	µg/L	0.05	NG	NG	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Lithium	µg/L	1.0	NG	NG	8.3	9.5	7.6	6.9	29.8	49.2	24.8	23
Magnesium	µg/L	5.0	NG	NG	24400	25700	25400	29600	35000	41400	30400	27500
Manganese	µg/L	0.10	NG	NG	28.9	0.51	0.46	4.73	2030	2570	1340	1730
Mercury	µg/L	0.005	NG	NG	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.021	<0.005
Molybdenum	µg/L	0.05	NG	NG	1.63	1.21	0.843	1.01	0.846	1.02	0.914	1.46
Nickel	µg/L	0.50	NG	NG	1.34	<0.5	<0.5	<2.5	22.4	50	10.9	21.8

Appendix B2: SBIAR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	RBSC-DS 27-May-20	RBSC-DS 22-Jun-20	RBSC-DS 29-Jul-20	RBSC-DS 24-Aug-20	RBSC-DS 28-Sep-20	RBSC-DS 30-Nov-20	RBSC-DS 21-Dec-20	RBSBIAR-EDS 16-Apr-20
Physical Parameters												
Temperature	°C				16.2							
Flow Rate	L/sec				-							
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	20000	9300	3600	4800	5400	23100	17100	5800
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	412	382	255	350	350	395	388	197
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	1660	1510	779	1080	1410	1220	1180	999
Hardness as CaCO3, dissolved	µg/L	500	NG	NG	871000	763000	363000	513000	682000	568000	601000	482000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L											
pH	pH Units	0.10	6.5 - 9	6.5-9.0	7.97	8.02	8.10	8.00	8.05	7.76	7.98	8.16
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	1230000	1190000	517000	801000	1050000	903000	891000	818000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	6700	9300	11500	8000	5500	2400	<1000	5390000
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	412000	382000	255000	350000	350000	395000	388000	197000
Anions and Nutrients												
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	2.5	25	304	25	25	25	<50	326
Ammonia FST Guideline	µg/L		pH dependent (at Temp 4 °C or in situ T)		6220	6220	4950	6220	4950	8770	6220	3950
Ammonia FLT Guideline				pH dependent (at Temp 4 °C or in situ T)	1200	1200	952	1200	952	1690	1200	759
Chloride (Cl^-)	µg/L	500	600000	150,000	40500	43400	53300	24000	30800	25100	22400	121000
Nitrate (NO_3^- as N)	µg/L	5.0-25.0	NG	NG	2.5	12.5	718	45	12.5	12.5	<25	536
Nitrite (NO_2^- as N)	µg/L	1.0-5.0	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	0.5	2.5	8.2	2.5	2.5	2.5	2.5	13.1
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	563000	507000	86600	312000	455000	329000	310000	169000
SO4 FLT Guideline Calc	µg/L		NG	Hardness 76,000-180,000 = 309,000 Hardness 181,000-250,000 = 429,000 Hardness > 250,000 site-specific	429000	429000	429000	429000	429000	429000	429000	429000
Dissolved Organic Carbon (DOC)	mg/L		NG	NG	3.25	3.3	1.9	2.7	3.1	4.2	3.1	6.4
Metals, Total												
Aluminum	µg/L	3.00	NG	NG	24.6	32.3	146	59.6	15.4	11.2	<15	11500
Antimony	µg/L	0.10	NG	NG	<0.1	<0.1	0.22	<0.1	<0.1	<0.1	<0.5	0.87
Arsenic	µg/L	0.10	5.0	5.0	0.64	0.95	0.23	0.65	0.8	0.23	0.25	**14.7**
Barium	µg/L	0.10	NG	NG	57.8	60.9	191	115	59	39.2	35	913
Beryllium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	1.49
Bismuth	µg/L	0.05	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	0.168
Boron	µg/L	10.0	1200	1200	128	126	171	57	98	91	79	79
Cadmium	µg/L	0.005	NG	NG	0.172	0.319	0.0865	0.168	0.171	0.179	0.113	3.16
Calcium	µg/L	50	NG	NG	245000	229000	94900	151000	196000	193000	162000	236000
Cesium	µg/L	0.01	NG	NG	0.011	0.012	0.031	0.012	<0.01	0.012	<0.05	2.07
Chromium [4]	µg/L	0.1-1.0	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.05	22.9
Cobalt	µg/L	0.10	110	4.0	3.94	3.19	3.89	2.63	3.02	0.37	0.52	43.7
Copper [3]	µg/L	0.50	Calc. based on Hardness	2 to 10	0.25	0.53	1.61	0.25	<0.5	<0.5	<2.5	69.1
Cu FST Guideline Calc. (relevant prior to August 2019)	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness ≥ 400,000 is Capped Value of 400,000		39.6	39.6	36.122	39.6	39.6	39.6	39.6	
Cu FLT Guideline Calc. (relevant prior to August 2019)	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	10	10	10	10	10	10	10	4997.625
Iron	µg/L	10	1000	NG	659	679	373	765	**1090**	157	177	**32600**
Lead [3]	µg/L	0.05	101 - 348	Calc. based on Hardness	<0.05	<0.05	<0.05	0.053	<0.05	0.417	<0.25	13.5
Pb FST Guideline Calc (Based on Hardness as CaCO3), applies to water hardness 8000-360,000 µg/L	µg/L		Based on Hardness 8000-360,000 Hardness ≤ 8000: 3 Hardness > 8000 : calc.		417.0	417.0	417.0	417.0	417.0	417.0	416.968	417.0
Pb FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 8000-360,000 Hardness ≤ 8000, NG Hardness > 8000 : calc.	19.6	19.6	19.6	19.6	19.6	19.6	19.57	19.6
Lithium	µg/L	1.0	NG	NG	70	70.6	33.3	31.8	52.4	40.6	34.8	53.1
Magnesium	µg/L	5.0	NG	NG	68300	57100	23800	39000	55100	52300	43600	52500
Manganese [3]	µg/L	0.10	Calc. based on Hardness	Calc. based on Hardness	**4880**	3320	65.8	**3430**	**3960**	1830	2320	1250
Mn FST Guideline Calc (Based on Hardness as CaCO3)	µg/L		Applies to Hardness 25000-259000 µg/L Mn : calc.		3394.2	3394.2	3394.2	3394.2	3394.2	3394.2	3394	3394.2
Mn FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 37000-450000 µg/L Mn : calc.	2585.0	2585.0	2202.2	2585.0	2585.0	2585.0	2585	2585.0
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0059
Molybdenum	µg/L	0.05	2000	≤ 1000	1.3	0.916	1.19	1.2	1.05	0.728	0.8	3.38
Nickel	µg/L	0.50	NG	NG	61.4	51.3	16.1	36.4	53.5	22.4	21.9	124
Phosphorus	µg/L	50.0	NG	NG	<50	209	<50	<80	53	<50	<250	1480
Potassium	µg/L	50.0	NG	NG	2430	2550	3230	1880	2290	2280	1880	4740
Rubidium	µg/L	0.2	NG	NG	1.94	1.8	1.37	1.11	2	1.73	1.4	21.4
Selenium	µg/L	0.05	NG	2.0	0.159	0.213	0.339	0.055	0.091	0.081	<0.25	2.25
Silicon	µg/L	100.0	NG	NG	4830	5060	4630	4020	4620	4820	4000	16100
Silver [3] (Based on Hardness < or > 100000)	µg/L	0.01	0.10 - 3.0	0.05 - 1.5	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	0.255
Ag FST Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Ag FLT Guideline Calc	µg/L			Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Sodium	µg/L	50.0	NG	NG	96900	84600	57300	47900	72300	66500	47300	31400
Strontium	µg/L	0.2	NG	NG	710	650	452	436	631	575	476	1030
Sulfur	µg/L	500.0	NG	NG	231000	178000	28600	98900	167000	149000	101000	63800
Tellerium	µg/L	0.2	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1	0.3
Thallium	µg/L	0.01	NG	NG	0.022	0.023	0.011	0.024	0.014	0.016	<0.05	0.338
Thorium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	6.22
Tin	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	0.33
Titanium	µg/L	0.3-4.5	NG	NG	0.63	1.5	<0.3	1.3	0.47	<0.3	<1.5	91.8
Tungsten	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1
Uranium	µg/L	0.01	NG	NG	3.03	3.03	1.03	1.43	2.53	2.3	1.94	4.4
Vanadium	µg/L	0.50	NG	NG	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.5	30.3
Zinc [3] (Based on Hardness < or > 90,000)	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	23.7	26.6	28.9	13.6	17.6	7.9	7.5	**474**
Zn FST Guideline Calc.	µg/L		Hardness 90,000 - 500,000, Calc. Hardness > 500,000, is Capped Value of 500,000		340.50	340.50	237.75	340.50	340.50	340.50	340.5	327.00
Zn FLT Guideline Calc.				Hardness 90,000 - 330,000, Calc. Hardness > 330,000, is Capped Value of 330,000	188	188	188	188	188	188	187.5	188
Zircronium	µg/L	0.06	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1	0.48
Metals, Dissolved												
Aluminum [5]	µg/L	1.0	100	50	7.1	2.5	**108**	1.8	1.4	0.5	5.4	82.6
Al FST Guideline Calc (based on pH)	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100	100	100	100	100	100	100	100
Al FLT Guideline Calc (based on median pH)	µg/L			median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50	50	50	50	50	50	50	50
Antimony	µg/L	0.10	NG	NG	<0.1	<0.1	0.16	<0.1	<0.1	<0.1	<0.5	0.24
Arsenic	µg/L	0.10	NG	NG	0.51	0.57	0.22	0.52	0.73	0.27	0.25	0.24
Barium	µg/L	0.10	NG	NG	57.3	53.6	210	111	58.3	46.7	33.8	109
Beryllium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1
Bismuth		0.05	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05
Boron	µg/L	10.0	NG	NG	132	133	186	61	95	77	85	59
Cadmium [3] (Based on Hardness as $CaCO_3$)	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.0654	0.144	0.0568	0.0418	0.0292	0.154	0.093	0.407
Cd FST Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		2.801	2.801	2.219	2.801	2.801	2.801	2.8008	2.801
Cd FLT Guideline Calc.				Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.457	0.457	0.457	0.457	0.457	0.457	0.4571	0.457
Calcium	µg/L	50.0	NG	NG	242000	208000	98400	142000	189000	149000	168000	133000
Cesium		0.01	NG	NG	<0.01	<0.01	0.031	<0.01	<0.01	<0.01	<0.05	0.022
Chromium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1
Cobalt	µg/L	0.10	NG	NG	3.82	3.11	4.54	2.54	2.76	0.58	<0.5	17.2
Copper [6]	µg/L	0.20	Calc. based on BLM Model	Calc. based on BLM Model	0.1	0.1	0.86	0.1	0.1	0.22	<1	1.18
Cu FST Guideline Value (Acute)	µg/L		BLM Ligand Model value		20.2	21.7	14.3	16.2	20.4	21.5	18.1	40.7
Cu FLT Guideline Value (Chronic)	µg/L			BLM Ligand Model value	2.6	3.0	2.3	2.5	3.0	2.5	2.8	7.8
Iron	µg/L	10.0	350	NG	236	341	28	335	**518**	152	124	5
Lead	µg/L	0.05	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05
Lithium	µg/L	1.0	NG	NG	65.3	71.5	34.7	33	50.2	37.3	33	43.5
Magnesium	µg/L	5.0	NG	NG	64600	59000	28400	38300	50700	47800	44400	36200
Manganese	µg/L	0.10	NG	NG	4650	3250	75.1	3650	3790	1670	2300	380
Mercury	µg/L	0.005	NG	NG	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	NG	NG	1.08	0.888	1.19	1.2	1.02	0.635	0.81	2.09
Nickel	µg/L	0.50	NG	NG	61.5	51.2	16.9	35.8	47.7	20.4	22.2	57

Appendix B2: SBIAR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	RBSBIAR-EDS 27-May-20	RBSBIAR-EDS 22-Jun-20	RBSBIAR-EDS 29-Jul-20	RBSBIAR-EDS 24-Aug-20	RBSBIAR-EDS 28-Sep-20	RBSBIAR-EDS 20-Oct-20	RBSBIAR-EDS 30-Nov-20
Physical Parameters											
Temperature	°C				15.7						
Flow Rate	L/sec				0.150						
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	3400	1800	7300	3500	2900	2300	2300
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	286	262	263	298	258	267	337
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	878	988	711	843	767	762	907
Hardness as CaCO3, dissolved	µg/L	500	NG	NG	319000	417000	448000	307000	315000	286000	246000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L										
pH	pH Units	0.10	6.5 - 9	6.5-9.0	8.11	8.10	7.98	8.00	8.08	8.07	8.11
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	583000	724000	525000	545000	495000	519000	564000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	7700	72200	500	13700	6700	2900	2400
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	286000	262000	263000	298000	258000	267000	337000
Anions and Nutrients											
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	446	399	25	421	315	356	337
Ammonia FST Guideline	µg/L		pH dependent (at Temp 4 °C or in situ T)		4950	4950	6220	6220	4950	4950	4950
Ammonia FLT Guideline				pH dependent (at Temp 4 °C or in situ T)	952	952	1220	1220	952	952	952
Chloride (Cl^-)	µg/L	500	600000	150,000	65700	54900	61100	57000	50700	58000	55300
Nitrate (NO_3^- as N)	µg/L	5.0-25.0	NG	NG	541	808	1240	748	746	699	481
Nitrite (NO_2^- as N)	µg/L	1.0-5.0	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	17.4	5.3	0.5	14.2	5.9	5.7	2.5
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	112000	223000	29200	111000	84200	96200	98800
SO4 FLT Guideline Calc	µg/L		NG	Hardness 76,000-180,000 = 309,000 Hardness 181,000-250,000 = 429,000 Hardness > 250,000 site-specific	429000	429000	429000	429000	429000	429000	429000
Dissolved Organic Carbon (DOC)	mg/L		NG	NG	1.49	1.7	1.6	1.4	1.2	3.1	2.0
Metals, Total											
Aluminum	µg/L	3.00	NG	NG	166	3970	5.7	137	108	76.7	41.3
Antimony	µg/L	0.10	NG	NG	0.26	0.26	0.21	0.19	0.16	0.18	0.18
Arsenic	µg/L	0.10	5.0	5.0	0.36	1.82	0.14	0.4	0.32	0.3	0.21
Barium	µg/L	0.10	NG	NG	161	209	308	163	182	155	104
Beryllium	µg/L	0.10	NG	NG	<0.1	1.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bismuth	µg/L	0.05	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10.0	1200	1200	214	181	20	162	181	191	163
Cadmium	µg/L	0.005	NG	NG	0.124	2.54	0.0121	0.113	0.0479	0.0396	0.0654
Calcium	µg/L	50	NG	NG	88800	125000	122000	91500	87400	87600	75300
Cesium	µg/L	0.01	NG	NG	0.042	0.125	<0.01	0.043	0.036	0.032	0.018
Chromium [4]	µg/L	0.1-1.0	NG	NG	0.15	3.27	<0.1	0.18	0.21	0.13	<0.1
Cobalt	µg/L	0.10	110	4.0	3.97	43.3	0.05	4.51	2.46	1.91	1.96
Copper [3]	µg/L	0.50	Calc. based on Hardness	2 to 10	2.33	49.9	0.25	1.3	0.94	0.63	0.6
Cu FST Guideline Calc. (relevant prior to August 2019)	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness ≥ 400,000 is Capped Value of 400,000		31.986	39.6	39.6	30.858	31.61	28.884	25.124
Cu FLT Guideline Calc. (relevant prior to August 2019)	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	10	10	10	10	10	10	9.84
Iron	µg/L	10	1000	NG	86	**6550**	5	302	199	152	87
Lead [3]	µg/L	0.05	101 - 348	Calc. based on Hardness	<0.05	0.718	<0.05	0.097	0.072	0.054	<0.05
Pb FST Guideline Calc (Based on Hardness as CaCO3), applies to water hardness 8000-360,000 µg/L	µg/L		Based on Hardness 8000-360,000 Hardness ≤ 8000: 3 Hardness > 8000 : calc.		357.5	417.0	417.0	340.5	351.8	311.1	256.8
Pb FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 8000-360,000 Hardness ≤ 8000, NG Hardness > 8000 : calc.	17.3	19.6	19.6	16.6	17.0	15.4	13.3
Lithium	µg/L	1.0	NG	NG	49.1	74.5	10.1	29.4	34.3	35.9	37.7
Magnesium	µg/L	5.0	NG	NG	26900	36800	26900	24900	25900	23300	21200
Manganese [3]	µg/L	0.10	Calc. based on Hardness	Calc. based on Hardness	71.7	444	2.52	86.7	58.1	61.4	58.3
Mn FST Guideline Calc (Based on Hardness as CaCO3)	µg/L		Applies to Hardness 25000-259000 µg/L Mn : calc.		3394.2	3394.2	3394.2	3394.2	3394.2	3394.2	3250.9
Mn FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 37000-450000 µg/L Mn : calc.	2008.6	2439.8	2576.2	1955.8	1991.0	1863.4	1687.4
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	2000	≤ 1000	1.84	1.7	0.707	1.45	1.23	1.33	1.4
Nickel	µg/L	0.50	NG	NG	15.5	147	<0.5	15.1	9.15	7.77	9.48
Phosphorus	µg/L	50.0	NG	NG	<50	142	<50	<50	<50	<50	<50
Potassium	µg/L	50.0	NG	NG	2950	3680	4060	3100	3060	2530	2060
Rubidium	µg/L	0.2	NG	NG	1.72	3.1	0.55	1.87	1.34	1.31	1.02
Selenium	µg/L	0.05	NG	2.0	0.701	0.744	0.522	0.382	0.386	0.358	0.397
Silicon	µg/L	100.0	NG	NG	4150	7090	5430	4620	4910	4270	3530
Silver [3] (Based on Hardness < or > 100000)	µg/L	0.01	0.10 - 3.0	0.05 - 1.5	<0.01	<0.013	<0.01	<0.01	<0.01	<0.01	<0.01
Ag FST Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0
Ag FLT Guideline Calc	µg/L			Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Sodium	µg/L	50.0	NG	NG	110000	77000	5190	78100	74500	88600	103000
Strontium	µg/L	0.2	NG	NG	591	605	306	456	449	484	448
Sulfur	µg/L	500.0	NG	NG	42900	78200	10300	37000	31300	33200	35100
Tellerium	µg/L	0.2	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	0.012	0.03	<0.01	0.033	<0.01	<0.01	<0.01
Thorium	µg/L	0.10	NG	NG	<0.1	3.39	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.3-4.5	NG	NG	1.3	28.9	<0.3	1.19	1.46	1.47	0.57
Tungsten	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	1.21	4.35	1.3	0.948	0.872	0.778	0.672
Vanadium	µg/L	0.50	NG	NG	<0.5	3.12	<0.5	<0.5	0.62	<0.5	<0.5
Zinc [3] (Based on Hardness < or > 90,000)	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	19.1	**560**	1.5	27.5	16.2	11.3	12.3
Zn FST Guideline Calc.	µg/L		Hardness 90,000 - 500,000, Calc. Hardness > 500,000, is Capped Value of 500,000		204.75	278.25	301.50	195.75	201.75	180.00	150.00
Zn FLT Guideline Calc.				Hardness 90,000 - 330,000, Calc. Hardness > 330,000, is Capped Value of 330,000	179	188	188	170	176	155	125
Zircronium	µg/L	0.06	NG	NG	<0.2	<0.39	<0.2	<0.2	0.78	<0.2	<0.2
Metals, Dissolved											
Aluminum [5]	µg/L	1.0	100	50	**109**	**404**	1.5	44.9	31.5	16.9	16.9
Al FST Guideline Calc (based on pH)	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100	100	100	100	100	100	100
Al FLT Guideline Calc (based on median pH)	µg/L			median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50	50	50	50	50	50	50
Antimony	µg/L	0.10	NG	NG	0.24	0.16	0.13	0.18	0.12	0.18	0.16
Arsenic	µg/L	0.10	NG	NG	0.29	0.14	0.15	0.27	0.2	0.21	0.19
Barium	µg/L	0.10	NG	NG	154	134	336	151	193	142	106
Beryllium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bismuth		0.05	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10.0	NG	NG	217	182	20	172	174	146	170
Cadmium [3] (Based on Hardness as $CaCO_3$)	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.103	1.00	0.0127	0.0331	0.0205	0.0243	0.0421
Cd FST Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		1.943	2.560	2.756	1.868	1.918	1.736	1.487
Cd FLT Guideline Calc.				Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.457	0.457	0.457	0.457	0.457	0.457	0.410
Calcium	µg/L	50.0	NG	NG	84900	108000	131000	83400	86100	76800	66800
Cesium		0.01	NG	NG	0.037	0.028	<0.01	0.03	0.021	0.019	0.016
Chromium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Cobalt	µg/L	0.10	NG	NG	3.65	33.7	<0.1	4.15	2.13	1.81	1.95
Copper [6]	µg/L	0.20	Calc. based on BLM Model	Calc. based on BLM Model	1.77	3.2	0.38	0.59	0.43	0.39	0.40
Cu FST Guideline Value (Acute)	µg/L		BLM Ligand Model value		11.5	12.5	8.1	9.9	9.1	22.8	15.3
Cu FLT Guideline Value (Chronic)	µg/L			BLM Ligand Model value	1.9	2.0	1.4	1.4	1.4	3.6	2.4
Iron	µg/L	10.0	350	NG	5.00	5	5	5	21	24	26
Lead	µg/L	0.05	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Lithium	µg/L	1.0	NG	NG	41	70.1	10.3	29.9	31.3	37	40.6
Magnesium	µg/L	5.0	NG	NG	26000	35800	29600	23900	24300	22800	19200
Manganese	µg/L	0.10	NG	NG	66.7	371	2.56	83.6	51.6	57.1	52.8
Mercury	µg/L	0.005	NG	NG	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	NG	NG	1.79	1.34	0.754	1.46	1.23	1.31	1.45
Nickel	µg/L	0.50	NG	NG	14.6	114	<0.5	14.2	8.25	7.5	9

Appendix B2: SBIAR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	RBSBIAR-EUS 27-May-20	RBSBIAR-EUS 22-Jun-20	RBSBIAR-EUS 29-Jul-20	RBSBIAR-EUS 24-Aug-20	RBSBIAR-EUS 28-Sep-20	RBSBIAR-EUS 20-Oct-20	RBSBIAR-EUS 30-Nov-20
Physical Parameters											
Temperature	°C				9.0						
Flow Rate	L/sec				0.120						
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	7300	5400	9000	6100	6000	4300	9000
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	239	259	311	324	256	269	307
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	678	689	1170	742	673	648	781
Hardness as CaCO3, dissolved	µg/L	500	NG	NG	411000	416000	617000	371000	380000	383000	369000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L										
pH	pH Units	0.10	6.5 - 9	6.5-9.0	7.92	7.92	8.06	7.90	7.95	7.92	7.92
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	470000	491000	904000	504000	494000	469000	503000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	3200	2700	1300	500	500	500	500
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	239000	259000	311000	324000	256000	269000	307000
Anions and Nutrients											
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	14.5	25	25	25	25	25	25
Ammonia FST Guideline	µg/L		pH dependent (at Temp 4 °C or in situ T)		6220	7420	4950	7420	6220	7420	7420
Ammonia FLT Guideline				pH dependent (at Temp 4 °C or in situ T)	1200	1430	952	1430	1200	1430	1430
Chloride (Cl^-)	µg/L	500	600000	150,000	69200	59400	23800	60000	52800	62500	70100
Nitrate (NO_3^- as N)	µg/L	5.0-25.0	NG	NG	1030	1130	12.5	1340	1290	1310	1090
Nitrite (NO_2^- as N)	µg/L	1.0-5.0	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	0.5	0.5	2.5	0.5	0.5	0.5	0.5
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	28100	36800	339000	30500	30500	34100	30100
SO4 FLT Guideline Calc	µg/L		NG	Hardness 76,000-180,000 = 309,000 Hardness 181,000-250,000 = 429,000 Hardness > 250,000 site-specific	429000	429000	429000	429000	429000	429000	429000
Dissolved Organic Carbon (DOC)	mg/L		NG	NG	1.8	1.2	3.4	1.5	1.3	2.6	2.0
Metals, Total											
Aluminum	µg/L	3.00	NG	NG	11.4	11.5	7.5	26	9	21	5.5
Antimony	µg/L	0.10	NG	NG	<0.1	0.11	0.5	0.19	0.13	0.11	0.14
Arsenic	µg/L	0.10	5.0	5.0	0.13	0.15	0.54	0.22	0.16	0.15	0.05
Barium	µg/L	0.10	NG	NG	265	281	153	335	295	300	251
Beryllium	µg/L	0.10	NG	NG	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	<0.1
Bismuth	µg/L	0.05	NG	NG	<0.05	<0.05	0.25	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10.0	1200	1200	15	19	81	19	20	19	14
Cadmium	µg/L	0.005	NG	NG	0.0135	0.0127	0.163	0.0555	0.0158	0.0136	0.0097
Calcium	µg/L	50	NG	NG	124000	124000	172000	134000	112000	126000	114000
Cesium	µg/L	0.01	NG	NG	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	<0.01
Chromium [4]	µg/L	0.1-1.0	NG	NG	0.11	<0.1	0.5	0.18	0.12	0.43	<0.1
Cobalt	µg/L	0.10	110	4.0	0.05	0.05	0.98	0.05	0.05	0.05	0.05
Copper [3]	µg/L	0.50	Calc. based on Hardness	2 to 10	0.25	0.25	2.5	0.55	<0.5	<0.5	<0.5
Cu FST Guideline Calc. (relevant prior to August 2019)	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness ≥ 400,000 is Capped Value of 400,000		39.6	39.6	39.6	36.874	37.72	38.002	36.686
Cu FLT Guideline Calc. (relevant prior to August 2019)	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	10	10	10	10	10	10	10
Iron	µg/L	10	1000	NG	17	19	279	45	11	35	5
Lead [3]	µg/L	0.05	101 - 348	Calc. based on Hardness	<0.05	<0.05	0.25	<0.05	<0.05	<0.05	<0.05
Pb FST Guideline Calc (Based on Hardness as CaCO3), applies to water hardness 8000-360,000 µg/L	µg/L		Based on Hardness 8000-360,000 Hardness ≤ 8000: 3 Hardness > 8000 : calc.		417.0	417.0	417.0	417.0	417.0	417.0	417.0
Pb FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 8000-360,000 Hardness ≤ 8000, NG Hardness > 8000 : calc.	19.6	19.6	19.6	19.6	19.6	19.6	19.6
Lithium	µg/L	1.0	NG	NG	8.1	8.9	47.1	8	9.6	9	7.1
Magnesium	µg/L	5.0	NG	NG	29100	26300	42500	27500	27500	26800	25500
Manganese [3]	µg/L	0.10	Calc. based on Hardness	Calc. based on Hardness	3.58	3.74	1600	5.21	1.93	1.65	0.79
Mn FST Guideline Calc (Based on Hardness as CaCO3)	µg/L		Applies to Hardness 25000-259000 µg/L Mn : calc.		3394.2	3394.2	3394.2	3394.2	3394.2	3394.2	3394.2
Mn FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 37000-450000 µg/L Mn : calc.	2413.4	2435.4	2585.0	2237.4	2277.0	2290.2	2228.6
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	2000	≤ 1000	0.714	0.793	1.25	0.912	0.824	0.758	0.594
Nickel	µg/L	0.50	NG	NG	0.87	<0.5	36.6	0.65	<0.5	0.52	<0.5
Phosphorus	µg/L	50.0	NG	NG	<50	<50	<250	<50	<50	<50	<50
Potassium	µg/L	50.0	NG	NG	3050	3560	2450	4050	3780	3550	2940
Rubidium	µg/L	0.2	NG	NG	0.43	0.43	1.4	0.67	0.61	0.5	0.38
Selenium	µg/L	0.05	NG	2.0	0.661	0.504	0.25	0.56	0.535	0.527	0.376
Silicon	µg/L	100.0	NG	NG	4610	5220	4740	6080	5840	5510	4580
Silver [3] (Based on Hardness < or > 100000)	µg/L	0.01	0.10 - 3.0	0.05 - 1.5	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	<0.01
Ag FST Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0
Ag FLT Guideline Calc	µg/L			Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Sodium	µg/L	50.0	NG	NG	5480	5520	50100	5280	5610	5400	5030
Strontium	µg/L	0.2	NG	NG	312	314	512	315	297	306	307
Sulfur	µg/L	500.0	NG	NG	11300	12600	108000	10500	11200	11500	10700
Tellerium	µg/L	0.2	NG	NG	<0.2	<0.2	1	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	<0.01	<0.01	0.05	0.043	<0.01	<0.01	<0.01
Thorium	µg/L	0.10	NG	NG	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	0.10	NG	NG	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.3-4.5	NG	NG	<0.3	<0.3	1.5	0.59	0.33	0.4	<0.3
Tungsten	µg/L	0.10	NG	NG	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	1.15	1.23	2	1.29	1.19	1.19	1.15
Vanadium	µg/L	0.50	NG	NG	<0.5	<0.5	2.5	<0.5	0.7	<0.5	<0.5
Zinc [3] (Based on Hardness < or > 90,000)	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	1.50	1.5	7.5	1.5	1.5	1.5	1.5
Zn FST Guideline Calc.	µg/L		Hardness 90,000 - 500,000, Calc. Hardness > 500,000, is Capped Value of 500,000		273.75	277.50	340.50	243.75	250.50	252.75	242.25
Zn FLT Guideline Calc.				Hardness 90,000 - 330,000, Calc. Hardness > 330,000, is Capped Value of 330,000	188	188	188	188	188	188	188
Zircronium	µg/L	0.06	NG	NG	<0.2	<0.2	<1.0	<0.2	<0.2	<0.2	<0.2
Metals, Dissolved											
Aluminum [5]	µg/L	1.0	100	50	1.4	17.1	5	2.4	1.4	1.3	0.5
Al FST Guideline Calc (based on pH)	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100	100	100	100	100	100	100
Al FLT Guideline Calc (based on median pH)	µg/L			median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50	50	50	50	50	50	50
Antimony	µg/L	0.10	NG	NG	<0.1	<0.1	0.5	0.15	0.11	0.11	<0.1
Arsenic	µg/L	0.10	NG	NG	0.05	0.05	0.58	0.14	0.11	0.05	0.05
Barium	µg/L	0.10	NG	NG	266	272	158	312	311	272	260
Beryllium	µg/L	0.10	NG	NG	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	<0.1
Bismuth		0.05	NG	NG	<0.05	<0.05	0.25	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10.0	NG	NG	15	19	79	18	19	16	15
Cadmium [3] (Based on Hardness as $CaCO_3$)	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.01	0.0109	0.096	0.0161	0.0094	0.0096	0.0105
Cd FST Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		2.522	2.554	2.801	2.270	2.327	2.345	2.257
Cd FLT Guideline Calc.				Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.457	0.457	0.457	0.457	0.457	0.457	0.457
Calcium	µg/L	50.0	NG	NG	119000	121000	178000	108000	110000	110000	107000
Cesium		0.01	NG	NG	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	<0.01
Chromium	µg/L	0.10	NG	NG	<0.1	0.14	0.5	<0.1	<0.1	<0.1	<0.1
Cobalt	µg/L	0.10	NG	NG	<0.1	<0.1	1.01	<0.1	<0.1	<0.1	<0.1
Copper [6]	µg/L	0.20	Calc. based on BLM Model	Calc. based on BLM Model	0.32	0.36	0.5	0.41	0.33	0.31	0.24
Cu FST Guideline Value (Acute)	µg/L		BLM Ligand Model value		8.5	5.8	21.4	7.0	6.4	12.1	9.4
Cu FLT Guideline Value (Chronic)	µg/L			BLM Ligand Model value	1.5	1.0	3.5	1.2	1.1	2.1	1.7
Iron	µg/L	10.0	350	NG	5.00	5	96	5	5	5	5
Lead	µg/L	0.05	NG	NG	<0.05	<0.05	0.25	<0.05	<0.05	<0.05	<0.05
Lithium	µg/L	1.0	NG	NG	7.5	8.6	51.5	8.1	8.5	9.4	8.5
Magnesium	µg/L	5.0	NG	NG	27400	27500	42100	24900	25900	26400	24900
Manganese	µg/L	0.10	NG	NG	2.78	3.26	1780	4.31	1.63	0.81	0.56
Mercury	µg/L	0.005	NG	NG	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	NG	NG	0.686	0.628	1.44	0.787	0.795	0.735	0.59
Nickel	µg/L	0.50	NG	NG	0.79	<0.5	34.7	<0.5	<0.5	<0.5	<0.5

Appendix B2: SBIAR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	RBSBIAR-DS	RBSBIAR-DS	RBSBIAR-DS	RBSBIAR-DS	RBSBIAR-DS	RBSBIAR-DS	RBSBIAR-DS
					27-Feb-20	16-Apr-20	27-May-20	22-Jun-20	29-Jul-20	24-Aug-20	28-Sep-20
Phosphorus	µg/L	50.0	NG	NG	<50	<50	<50	<50	<50	<50	<50
Potassium	µg/L	50.0	NG	NG	7150	7280	4290	3630	4090	4120	3620
Rubidium	µg/L	0.20	NG	NG	14.6	10.6	2.19	1.5	1.48	2.11	1.46
Selenium	µg/L	0.05	NG	2.0	1.01	2.53	0.922	0.708	1.16	0.744	0.9
Silicon	µg/L	50.0	NG	NG	4170	2900	3400	3930	4660	4390	4600
Silver	µg/L	0.01	NG	NG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	µg/L	50.0	NG	NG	54300	52900	72500	33200	30800	33600	31400
Strontium	µg/L	0.20	NG	NG	504	503	561	470	371	461	472
Sulfur	µg/L	500	NG	NG	23700	56000	38900	21500	35600	35300	38500
Tellurium	µg/L	0.20	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	0.03	0.023	0.018	0.014	0.013	0.012	<0.01
Thorium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.30	NG	NG	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Tungsten	µg/L	0.10	NG	NG	<0.1	0.11	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	0.873	1.25	1.2	1.15	0.995	1.15	1.18
Vanadium	µg/L	0.50	NG	NG	<0.5	0.57	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	µg/L	1.00	NG	NG	4.9	6.3	6.7	15.4	4.8	13.8	26.5
Zircronium	µg/L	0.06	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Laboratory Work Order Number					VA20A2572	L2438183	L2454036	L2464256	L2482349	L2493339	L2509865
Laboratory Identification Number					VA20A2572-001	L2438183-8		L2464256-10	L2482349-12	L2493339-9	L2509866-3

Appendix B2: SBIAR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	RBSBIAR-DS	RBSBIAR-DS	RBSBIAR-US	RBSBIAR-US	RBSBIAR-US	RBSBIAR-US	RBSBIAR-US	RBSBIAR-US
					20-Oct-20	30-Nov-20	27-Feb-20	16-Apr-20	17-May-20	22-Jun-20	29-Jul-20	24-Aug-20
Phosphorus	µg/L	50.0	NG	NG	<50	<50	<50	<50	<50	<50	<50	<50
Potassium	µg/L	50.0	NG	NG	3580	3120	7060	3570	3540	2850	3340	4250
Rubidium	µg/L	0.20	NG	NG	1.29	1.17	1.38	0.41	0.58	0.49	0.49	0.61
Selenium	µg/L	0.05	NG	2.0	1.03	1.12	0.448	0.161	0.723	0.616	1.86	1.67
Silicon	µg/L	50.0	NG	NG	3980	3600	3380	3270	4270	3940	4600	5080
Silver	µg/L	0.01	NG	NG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	µg/L	50.0	NG	NG	32900	38700	65700	8890	8190	6410	22800	31400
Strontium	µg/L	0.20	NG	NG	500	456	509	754	346	467	251	268
Sulfur	µg/L	500	NG	NG	36500	40400	6150	6010	11000	8720	62000	81600
Tellurium	µg/L	0.20	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	0.012	<0.01	0.011	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.30	NG	NG	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Tungsten	µg/L	0.10	NG	NG	<0.1	<0.1	0.16	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	1.15	1.23	0.684	0.946	1.21	1.16	0.907	0.826
Vanadium	µg/L	0.50	NG	NG	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	µg/L	1.00	NG	NG	12.6	15.4	3.7	1.3	6.7	0.5	2.3	0.5
Zircronium	µg/L	0.06	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Laboratory Work Order Number					L2520229	L2535101	VA20A2572	L2438183	L2454036	L2464256	L2482349	L2493339
Laboratory Identification Number					L2520229-1	L2535101-1	VA20A2572-002	L2438183-6		L2464256-8	L2482349-10	L2493339-7

Appendix B2: SBIAR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	RBSBIAR-US	RBSBIAR-US	RBSBIAR-US	RBSBIAR-US	RBSC-DS	RBSC-DS	RBSC-DS	RBSC-DS
					28-Sep-20	20-Oct-20	30-Nov-20	21-Dec-20	23-Jan-20	27-Feb-20	25-Mar-20	16-Apr-20
Phosphorus	µg/L	50.0	NG	NG	<50	<50	<50	<250	<50	<50	<50	<50
Potassium	µg/L	50.0	NG	NG	3920	4070	3610	3110	1790	1910	1490	1490
Rubidium	µg/L	0.20	NG	NG	0.59	0.61	0.46	<1	1.26	1.62	1	0.94
Selenium	µg/L	0.05	NG	2.0	1.36	1.54	1.73	1.9	0.07	<0.05	0.092	0.098
Silicon	µg/L	50.0	NG	NG	4990	4770	3920	3530	4030	4110	3800	3610
Silver	µg/L	0.01	NG	NG	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01
Sodium	µg/L	50.0	NG	NG	34600	15900	21900	22400	42200	53600	29700	27900
Strontium	µg/L	0.20	NG	NG	330	396	355	355	403	486	337	317
Sulfur	µg/L	500	NG	NG	93300	67300	76900	92400	79100	108000	55200	52100
Tellurium	µg/L	0.20	NG	NG	<0.2	<0.2	<0.2	<1	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	<0.01	<0.01	<0.01	<0.05	<0.01	0.015	<0.01	<0.01
Thorium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.30	NG	NG	<0.3	<0.3	<0.3	<1.5	<0.3	<0.3	<0.3	<0.3
Tungsten	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	1.15	1.31	1.29	1.46	1.56	1.53	1.12	0.993
Vanadium	µg/L	0.50	NG	NG	<0.5	<0.5	<0.5	<2.5	<0.5	<0.5	<0.5	<0.5
Zinc	µg/L	1.00	NG	NG	0.5	0.5	0.5	<5	2.8	23.8	2.4	6.2
Zircronium	µg/L	0.06	NG	NG	<0.2	<0.2	<0.2	<1	<0.2	<0.2	<0.2	<0.2
Laboratory Work Order Number					L2509865	L2520229	L2535101	L2542477	VA20A0816		VA20A4062	L2438183
Laboratory Identification Number					L2509865-1	L2520229-2	L2535101-2		VA20A0816-001		VA20A4062-001	L2438183-7

Appendix B2: SBIAR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	RBSC-DS	RBSC-DS	RBSC-DS	RBSC-DS	RBSC-DS	RBSC-DS	RBSC-DS	RBSBIAR-EDS
					27-May-20	22-Jun-20	29-Jul-20	24-Aug-20	28-Sep-20	30-Nov-20	21-Dec-20	16-Apr-20
Phosphorus	µg/L	50.0	NG	NG	<50	<50	<50	<50	<50	<50	<250	<50
Potassium	µg/L	50.0	NG	NG	2640	2460	3390	1880	2040	2410	1890	2480
Rubidium	µg/L	0.20	NG	NG	1.82	1.76	1.62	1.21	1.76	1.65	1.4	1.87
Selenium	µg/L	0.05	NG	2.0	0.129	0.149	0.436	0.056	0.109	0.103	<0.25	1.68
Silicon	µg/L	50.0	NG	NG	4500	4780	5200	4160	4380	4870	4060	2590
Silver	µg/L	0.01	NG	NG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.01
Sodium	µg/L	50.0	NG	NG	90900	79500	67400	48600	63800	66000	47600	31800
Strontium	µg/L	0.20	NG	NG	673	614	423	442	631	507	483	790
Sulfur	µg/L	500	NG	NG	225000	172000	32100	103000	155000	91900	104000	72800
Tellurium	µg/L	0.20	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1	<0.2
Thallium	µg/L	0.01	NG	NG	0.023	0.019	<0.01	0.012	0.011	0.012	<0.05	0.015
Thorium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1
Tin	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1
Titanium	µg/L	0.30	NG	NG	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<1.5	<0.3
Tungsten	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1
Uranium	µg/L	0.01	NG	NG	3.16	2.72	1.02	1.5	2.15	2.19	1.98	1.72
Vanadium	µg/L	0.50	NG	NG	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2.5	<0.5
Zinc	µg/L	1.00	NG	NG	23.4	23.7	17.8	9.7	9.4	5.7	6	37.1
Zircronium	µg/L	0.06	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<1	<0.2
Laboratory Work Order Number					L2454036	L2464256	L2482349	L2493339	L2509865	L2535101	L2542477	L2438183
Laboratory Identification Number						L2464256-12	L2482349-14	L2493339-11	L2509865-5	L2535101-5		L2438183-9

Appendix B2: SBIAR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	RBSBIAR-EDS	RBSBIAR-EDS	RBSBIAR-EDS	RBSBIAR-EDS	RBSBIAR-EDS	RBSBIAR-EDS	RBSBIAR-EDS
					27-May-20	22-Jun-20	29-Jul-20	24-Aug-20	28-Sep-20	20-Oct-20	30-Nov-20
Phosphorus	µg/L	50.0	NG	NG	<50	<50	<50	<50	<50	<50	<50
Potassium	µg/L	50.0	NG	NG	3090	3190	4070	3120	2770	2650	2200
Rubidium	µg/L	0.20	NG	NG	1.64	1.78	0.59	1.7	1.21	1.17	1.06
Selenium	µg/L	0.05	NG	2.0	0.703	0.708	0.696	0.435	0.38	0.383	0.397
Silicon	µg/L	50.0	NG	NG	3910	4700	6070	4820	4800	4110	3560
Silver	µg/L	0.01	NG	NG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	µg/L	50.0	NG	NG	101000	66400	5870	77500	68200	88900	101000
Strontium	µg/L	0.20	NG	NG	524	537	301	444	441	473	459
Sulfur	µg/L	500	NG	NG	42600	74700	11800	37600	29600	32700	30900
Tellurium	µg/L	0.20	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	0.013	0.017	<0.01	0.013	<0.01	<0.01	<0.01
Thorium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.30	NG	NG	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Tungsten	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	1.23	2.9	1.32	0.897	0.764	0.739	0.72
Vanadium	µg/L	0.50	NG	NG	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Zinc	µg/L	1.00	NG	NG	16	82.7	1.3	17.5	10.6	12.2	13.2
Zircronium	µg/L	0.06	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Laboratory Work Order Number					L2454036	L2464256	L2482349	L2493339	L2509865	L2520229	L2535101
Laboratory Identification Number						L2464256-11	L2482349-13	L2493339-10	L2509865-4	L2520229-4	L2535101-4

Appendix B2: SBIAR Surface Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	RBSBIAR-EUS	RBSBIAR-EUS	RBSBIAR-EUS	RBSBIAR-EUS	RBSBIAR-EUS	RBSBIAR-EUS	RBSBIAR-EUS
					27-May-20	22-Jun-20	29-Jul-20	24-Aug-20	28-Sep-20	20-Oct-20	30-Nov-20
Phosphorus	µg/L	50.0	NG	NG	<50	<50	<250	<50	<50	<50	<50
Potassium	µg/L	50.0	NG	NG	3170	3520	2380	3900	3480	3660	3270
Rubidium	µg/L	0.20	NG	NG	0.41	0.47	1.4	0.58	0.55	0.45	0.39
Selenium	µg/L	0.05	NG	2.0	0.674	0.514	0.25	0.604	0.592	0.591	0.496
Silicon	µg/L	50.0	NG	NG	4420	4960	4600	5880	5850	5430	5020
Silver	µg/L	0.01	NG	NG	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	<0.01
Sodium	µg/L	50.0	NG	NG	5200	5330	48900	5030	5130	5400	5440
Strontium	µg/L	0.20	NG	NG	292	308	554	272	286	302	322
Sulfur	µg/L	500	NG	NG	10800	11700	107000	9660	10500	11500	10300
Tellurium	µg/L	0.20	NG	NG	<0.2	<0.2	1	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	<0.01	<0.01	0.05	<0.01	<0.01	<0.01	<0.01
Thorium	µg/L	0.10	NG	NG	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	<0.1
Tin	µg/L	0.10	NG	NG	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.30	NG	NG	<0.3	<0.3	1.5	<0.3	<0.3	<0.3	<0.3
Tungsten	µg/L	0.10	NG	NG	<0.1	<0.1	0.5	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	1.18	1.15	2	1.1	1	1.13	1.27
Vanadium	µg/L	0.50	NG	NG	<0.5	<0.5	2.5	<0.5	<0.5	<0.5	<0.5
Zinc	µg/L	1.00	NG	NG	1.4	1.6	13.5	1.3	0.5	0.5	1.4
Zircronium	µg/L	0.06	NG	NG	<0.2	1.78	<1.0	<0.2	<0.2	<0.2	<0.2
Laboratory Work Order Number					L2454036	L2464256	L2482349	L2493339	L2509865	L2520229	L2535101
Laboratory Identification Number						L2464256-9	L2482349-11	L2493339-8	L2509865-2	L2520229-3	L2535101-3

Notes:
Screening completed on BC AWQG-FWAL FST 1 and FLT 2 guideline values.

[1] BC Ministry of Environment, Water Protection & Sustainability Branch (2019), British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. 36 pp. Referenced for Freshwater Aquatic Life (FWAL) water use and Short Term Maximum (FST) guidelines.
[2] BC Ministry of Environment, Water Protection & Sustainability Branch (2018). British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. 36 pp. Referenced for Freshwater Aquatic Life (FWAL) water use and Long Term Average (FLT) guidelines.
[3] Guideline is hardness dependant. Where results are above laboratory reportable detection limits, guideline limits have been evaluated based on individual sample hardness. Sample-specific guideline values are listed in parentheses after the laboratory result, where applicable.
[4] Guideline is for Chromium (IV) cation. Analytical results are for unspeciated Chromium. Where analytical results exceed the guideline, speciated analysis may be warranted.
[5] Guideline is pH dependant.
[6] Guideline is Dissolved Organic Carbon (DOC) dependent. BML Model assumed 10% DOC and Humic acid 10% of DOC value, due to no DOC in lab analysis.
NG - No Guideline
Detection limit can vary as described in the COA. Detection limit can be raised when dilutation is requited due to high Dissolved Solids/Electrical Conductivity (DLDS), e.g. nitrite.
BOLD and shaded dark gray: Exceeds BCAWQG-FFST (Short-term Maximum) guideline.
Shaded Light Gray: Exceeds BCAWQG-FLT (Long-term Average) guideline.
RED - Measured value is below detection limit (DL); value shown is 50% of DL
Blank - Not analyzed

Appendix B3: L3 Creek Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBL3C-0.02 17-Apr-20	LBL3C-0.02 27-May-20	LBL3C-0.02 21-Jun-20	LBL3C-0.02 29-Jul-20	LBL3C-0.02 23-Aug-20	LBL3C-0.02 29-Sep-20	LBL3C-0.02 20-Oct-20
Physical Parameters											
Temperature	°C					9.3					
Flow Rate	L/sec					2.00					
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	2400	500	500	500	1200	500	500
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	73.5	219	185	219	257	239	244
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	224	1380	1090	1680	1770	1870	1590
Hardness as $CaCO_3$, dissolved	µg/L	500	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn, F)	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn, F)	81800	733000	555000	894000	1040000	969000	955000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L										
pH	pH Units	0.10	6.5 - 9.0	6.5-9.0	7.77	8.39	8.41	8.26	8.22	8.17	8.18
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	276000	1140000	817000	1390000	1560000	1560000	1480000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	1250000	29100	26500	6800	5500	3400	4800
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	9400	11400	<1000	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	73500	209000	174000	219000	257000	239000	244000
Anions and Nutrients											
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	147	16.1	<50	<50	57	<50	<50
Ammonia FST Guideline	µg/L		pH dependent (at Temp 4 °C or in situ T)		8770	2520	2520	3150	3950	3950	3950
Ammonia FLT Guideline	µg/L			pH dependent (at Temp 4 C or in situ T)	1690	484	484	606	759	759	759
Chloride (Cl^-)	µg/L	500	600000	150,000	7870	48500	25400	24600	49300	36100	53100
Nitrate (NO_3^- as N)	µg/L	5.0-100	NG	NG	496	3560	1860	4440	5790	7440	7970
Nitrite (NO_2^- as N)	µg/L	1.0-20.0	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	12.4	<5	<5	7.2	<5	7.5	<5
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	30200	571000	413000	769000	886000	884000	895000
SO_4 LTA Guideline Calc (Based on Hardness as CaCO3)	µg/L		NG	Hardness 0-30,000 = 128,000; Hardness 31,000-75,000 = 218,000; Hardness 76,000-180,000 = 309,000; Hardness 181,000-250,000 = 429,000; Hardness > 250,000 site-specific	309000	429000	429000	429000	429000	429000	429000
Total Dissolved Carbon (DOC)	mg/L		NG	NG	23.1	6.15	13.4	4.2	4.2	4.7	5.1
Metals, Total											
Aluminum	µg/L	3.00	NG	NG	3320	676	871	618	452	361	479
Antimony	µg/L	0.1-1.0	NG	NG	0.23	0.18	0.25	0.32	0.5	0.5	0.14
Arsenic	µg/L	0.10	5.0	5.0	3.75	0.62	1.16	0.57	0.54	0.5	0.51
Barium	µg/L	0.10	NG	NG	234	68.5	78.3	67.5	64.5	50.2	47.4
Beryllium	µg/L	0.1-1.0	NG	NG	0.48	<0.1	<0.1	0.11	0.5	0.5	<0.1
Bismuth	µg/L	0.05-0.10	NG	NG	<0.05	<0.05	<0.05	<0.05	0.25	0.25	<0.05
Boron	µg/L	10.0	1200	1200	27	85	78	109	107	113	102
Cadmium	µg/L	0.005	NG	NG	0.832	0.34	0.281	0.394	0.522	0.517	0.491
Calcium	µg/L	50	NG	NG	40200	196000	148000	253000	310000	258000	280000
Cesium	µg/L	0.01-0.02	NG	NG	0.45	0.065	0.106	0.042	0.05	0.05	0.024
Chromium [4]	µg/L	0.10	NG	NG	5.02	0.6	0.7	0.27	0.5	0.5	0.16
Cobalt	µg/L	0.10	110.0	4.0	8.99	12.8	6.46	6.53	4.71	4.03	4.3
Copper [3]	µg/L	0.5-1.0	Calc. based on Hardness	2 to 10	16.4	2.48	3.73	2.23	2.5	2.8	2.29
Cu STM Guideline Calc. (relevant prior to Aug. 2019)	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness ≥ 400,000 is Capped Value of 400,000		9.69	39.60	39.6	39.6	39.6	39.6	39.6
Cu LTA Guideline Calc. (relevant prior to Aug. 2019)	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	3.27	10.0	10.0	10.0	10.0	10.0	10.0
Iron	µg/L	10	1000	NG	**6530**	807	**1150**	693	433	334	570
Lead [3]	µg/L	0.05-0.1	Calc. based on Hardness	Calc. based on Hardness	5.82	0.3	0.526	0.124	0.25	0.25	0.068
Pb STM Guideline Calc.	µg/L		Hardness ≤ 8000 is 3; Hardness 8000-360,000: calc. Hardness>360,000 is Capped Value of 360,000		63.22	416.97	416.97	416.97	416.97	416.97	416.97
Pb LTA Guideline Calc.	µg/L			Hardness 8000-360,000: calc. Hardness > 360,000 is Capped Value of 360,000	5.78	19.57	19.57	19.57	19.57	19.57	19.57
Lithium	µg/L	1.0	NG	NG	8.8	38.2	29.3	44.4	43.7	48	40.1
Magnesium	µg/L	5.0	NG	NG	10900	66000	45500	75500	96700	94800	87600
Manganese [3]	µg/L	0.10	Calc. based on Hardness	Calc. based on Hardness	460	1080	446	428	195	130	150
Mn STM Guideline Calc.	µg/L		Hardness 25,000 - 259,000 : calc.; Hardness > 259,000 is Capped Value of 259,000		1441	3394	3394	3394	3394	3394	3394
Mn LTA Guideline Calc.	µg/L			Hardness 37,000 - 450,000: calc.; Hardness > 450,000 is Capped Value of 450,000	965	2585	2585	2585	2585	2585	2585
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	<0.005	<0.005	0.0073	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05-0.10	2000	≤ 1000	0.768	1.5	1.95	2.23	2.37	2.27	1.93
Nickel	µg/L	0.5	NG	NG	23.9	33.7	24.7	32.2	29.9	29	27.1
Phosphorus	µg/L	50-500	NG	NG	796	<50	78	<50	<250	<250	<50
Potassium	µg/L	50.0	NG	NG	10700	6550	8940	6320	6110	5690	4860
Rubidium	µg/L	0.2	NG	NG	6.4	1.78	2.58	2.02	1.9	1.3	1.4
Selenium	µg/L	0.05	NG	2.0	0.498	2.53	1.58	2.28	2.67	3.4	3.92
Silicon	µg/L	100.0	NG	NG	6630	4500	4410	4400	4520	4230	4070
Silver [3] (Based on Hardness < or > 100000)	µg/L	0.01-0.02	0.10 - 3.0	0.05 - 1.5	0.055	<0.01	<0.013	<0.01	0.05	0.05	<0.01
Ag STM Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		0.100	3.000	3.0	3.0	3.0	3.0	3.0
Ag LTA Guideline Calc	µg/L			Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	0.050	1.500	1.5	1.5	1.5	1.5	1.5
Sodium	µg/L	50.0	NG	NG	4480	48700	30200	44100	52300	50600	50500
Strontium	µg/L	0.2	NG	NG	121	617	468	746	935	870	933
Sulfur	µg/L	500.0	NG	NG	9360	210000	143000	247000	311000	310000	303000
Tellurium	µg/L	0.2-2.0	NG	NG	<0.2	<0.2	<0.2	<0.2	1	1	<0.2
Thallium	µg/L	0.01-0.02	NG	NG	0.094	0.021	0.033	0.031	0.05	0.05	0.021
Thorium	µg/L	0.1-1.0	NG	NG	0.71	<0.1	0.16	<0.1	0.5	0.5	<0.1
Tin	µg/L	0.1-1.0	NG	NG	<0.1	<0.1	<0.1	<0.1	0.5	0.5	<0.1
Titanium	µg/L	0.3-6.3	NG	NG	29.5	8.23	4.57	2.27	1.5	1.5	1.03
Tungsten	µg/L	0.1-1.0	NG	NG	<0.1	<0.1	<0.1	<0.1	0.5	0.5	<0.1
Uranium	µg/L	0.01	NG	NG	0.915	3.99	3.25	5.19	6.6	7.01	5.94
Vanadium	µg/L	0.5-1.0	NG	NG	13.1	1.37	1.75	0.59	2.5	2.5	<0.5
Zinc [3]	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	**75**	34.1	35.6	44	42	40	41.9
Zn STM Guideline Calc.	µg/L		Hardness 90,000 - 500,000, Calc. Hardness > 500,000, is Capped Value of 500,000		33.00	340.50	340.50	340.50	340.50	340.50	340.50
Zn LTA Guideline Calc.	µg/L			Hardness 90,000 - 330,000, Calc. Hardness > 330,000, is Capped Value of 330,000	7.5	187.5	187.5	187.5	187.5	187.5	187.5
Zircronium	µg/L	0.06-0.28	NG	NG	0.75	0.23	0.23	<0.2	1	1	<0.2
Metals, Dissolved											
Aluminum [5]	µg/L	1.0	100.0	50.0	57.9	**160**	**203**	**172**	**184**	**152**	**143**
Al STM Guideline Calc.	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100.0	100.0	100.0	100.0	100.0	100.0	100.0
Al LTA Guideline Calc.	µg/L			median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Antimony	µg/L	0.1-2.0	NG	NG	<0.1	0.15	0.21	0.22	0.22	0.5	0.5
Arsenic	µg/L	0.1-2.0	NG	NG	0.75	0.24	0.52	0.25	0.28	0.5	0.5
Barium	µg/L	0.10	NG	NG	27.1	61.5	69.4	62.9	59.2	47.4	43.1
Beryllium	µg/L	0.1-2.0	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.5
Bismuth	µg/L	0.05-1.0	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	0.25	0.25
Boron	µg/L	10.0	NG	NG	23	80	79	95	101	102	87
Cadmium [3]	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.0758	0.29	0.217	0.309	0.416	0.473	0.428
Cd STM Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		0.478	2.801	2.801	2.801	2.801	2.801	2.801
Cd LTA Guideline Calc.	µg/L			Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.182	0.457	0.457	0.457	0.457	0.457	0.457
Calcium	µg/L	50.0	NG	NG	21900	192000	148000	244000	265000	255000	239000
Cesium	µg/L	0.01-0.2	NG	NG	<0.01	<0.01	0.012	0.015	0.013	0.05	0.05
Chromium	µg/L	0.1-2.0	NG	NG	0.24	<0.1	<0.1	<0.1	<0.1	0.5	0.5
Cobalt	µg/L	0.10	NG	NG	0.76	11.4	5.81	5.64	4.11	3.74	4.03
Copper [6]	µg/L	0.2-4.0	Calc. based on BLM Model	Calc. based on BLM Model	2.4	1.56	2.61	1.51	1.75	2.2	1.5
Cu STM (Acute) Guideline Value	µg/L		BLM Ligand Model value		56.4	47	97	27.6	28.1	29.8	32.8
Cu LTA (Chronic) Guideline Value	µg/L			BLM Ligand Model value	9.7	9.6	19.3	5.4	5.2	5.3	5.8
Iron	µg/L	10.0	350	NG	229	12	43.00	12	5	25	58
Lead	µg/L	0.05-1.0	NG	NG	0.192	<0.05	<0.05	<0.05	<0.05	0.25	0.25
Lithium	µg/L	1.0	NG	NG	2.7	31.6	27.8	45.5	41.1	44.5	42.4

Appendix B3: L3 Creek Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBL3C-0.02 30-Nov-20	LBL3C-1.43 27-Feb-20	LBL3C-1.43 25-Mar-20	LBL3C-1.43 17-Apr-20	LBL3C-1.43 27-May-20	LBL3C-1.43 21-Jun-20	LBL3C-1.43 29-Jul-20	LBL3C-1.43 23-Aug-20
Physical Parameters												
Temperature	°C								9.2			
Flow Rate	L/sec								2.00			
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	3600	7800	3500	2400	2000	500	5600	500
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	275	226	254	72.2	210	162	239	269
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	1920	1250	1470	212	1210	955	1620	1440
Hardness as $CaCO_3$, dissolved	µg/L	500	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn, F)	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn, F)	967000	611000	721000	78300	639000	524000	899000	859000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L					638000	824000					
pH	pH Units	0.10	6.5 - 9.0	6.5-9.0	8.2	7.92	8.09	7.81	8.35	8.33	8.05	8.20
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	1730000	1010000	1100000	239000	894000	679000	1370000	1230000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	3900	23200	25700	827000	113000	68100	33600	18700
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	162000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	5600	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	275000	226000	254000	72200	205000	<1000	239000	269000
Anions and Nutrients												
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	<50	18	17.5	134	44.2	62	<50	82
Ammonia FST Guideline	µg/L		pH dependent (at Temp 4 °C or in situ T)		3950	7420	4950	8770	2520	3150	4950	3950
Ammonia FLT Guideline	µg/L			pH dependent (at Temp 4 C or in situ T)	759	1430	952	1690	484	606	952	759
Chloride (Cl^-)	µg/L	500	600000	150,000	42000	30100	60700	8100	54900	29300	33600	40400
Nitrate (NO_3^- as N)	µg/L	5.0-100	NG	NG	10100	11600	14100	517	4830	1950	14800	14500
Nitrite (NO_2^- as N)	µg/L	1.0-20.0	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	<5	6.4	<10	11.7	<5	2.2	<5	<5
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	885000	400000	467000	25300	445000	318000	645000	593000
SO_4 LTA Guideline Calc (Based on Hardness as CaCO3)	µg/L		NG	Hardness 0-30,000 = 128,000; Hardness 31,000-75,000 = 218,000; Hardness 76,000-180,000 = 309,000; Hardness 181,000-250,000 = 429,000; Hardness > 250,000 site-specific	429000	429000	429000	309000	429000	429000	429000	429000
Total Dissolved Carbon (DOC)	mg/L		NG	NG	4.3	3.59	4.48	19.1	7.35	11.6	3	3.9
Metals, Total												
Aluminum	µg/L	3.00	NG	NG	454	407	482	6990	1980	2850	674	320
Antimony	µg/L	0.1-1.0	NG	NG	0.14	0.16	0.16	0.39	0.23	0.3	0.5	0.5
Arsenic	µg/L	0.10	5.0	5.0	0.46	0.6	0.67	**6.28**	1.1	1.66	0.5	0.67
Barium	µg/L	0.10	NG	NG	38	58	61	321	116	107	49	86.1
Beryllium	µg/L	0.1-1.0	NG	NG	<0.1	<0.1	<0.1	0.49	0.2	0.33	0.5	0.5
Bismuth	µg/L	0.05-0.10	NG	NG	<0.05	<0.05	<0.05	0.13	<0.05	<0.05	0.25	0.25
Boron	µg/L	10.0	1200	1200	96	68	84	28	72	75	115	87
Cadmium	µg/L	0.005	NG	NG	0.434	0.0758	0.0994	0.609	0.507	0.661	0.371	0.181
Calcium	µg/L	50	NG	NG	270000	155000	200000	34600	151000	121000	231000	234000
Cesium	µg/L	0.01-0.02	NG	NG	0.013	0.07	0.075	1.2	0.199	0.181	0.05	0.05
Chromium [4]	µg/L	0.10	NG	NG	<0.1	1.51	1.05	13.1	1.95	1.88	0.5	0.67
Cobalt	µg/L	0.10	110.0	4.0	3.85	0.78	1.13	7.83	31.9	25.8	17.9	29.8
Copper [3]	µg/L	0.5-1.0	Calc. based on Hardness	2 to 10	2.34	2.09	1.88	21.4	3.78	5.84	2.5	2.5
Cu STM Guideline Calc. (relevant prior to Aug. 2019)	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness ≥ 400,000 is Capped Value of 400,000		39.6		39.6	9.3602	39.6	39.6	39.6	39.6
Cu LTA Guideline Calc. (relevant prior to Aug. 2019)	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	10.0		10	3.132	10.0	10	10	10
Iron	µg/L	10	1000	NG	486	988	973	**14800**	**2240**	**2710**	421	779
Lead [3]	µg/L	0.05-0.1	Calc. based on Hardness	Calc. based on Hardness	<0.05	0.479	0.569	8.96	0.734	0.967	0.25	0.31
Pb STM Guideline Calc.	µg/L		Hardness ≤ 8000 is 3; Hardness 8000-360,000: calc. Hardness>360,000 is Capped Value of 360,000		416.97	417	417	59.80	416.97	416.97	416.97	416.97
Pb LTA Guideline Calc.	µg/L			Hardness 8000-360,000: calc. Hardness > 360,000 is Capped Value of 360,000	19.57	19.6	19.6	5.64	19.57	19.57	19.57	19.57
Lithium	µg/L	1.0	NG	NG	40	29.7	36.4	12.5	34.6	30.5	46.9	42.7
Magnesium	µg/L	5.0	NG	NG	92000	60700	78600	11200	57600	42900	87400	89600
Manganese [3]	µg/L	0.10	Calc. based on Hardness	Calc. based on Hardness	114	38.1	41.2	326	2380	1580	1420	2470
Mn STM Guideline Calc.	µg/L		Hardness 25,000 - 259,000 : calc.; Hardness > 259,000 is Capped Value of 259,000		3394	3394	3394	1403	3394	3394	3394	3394
Mn LTA Guideline Calc.	µg/L			Hardness 37,000 - 450,000: calc.; Hardness > 450,000 is Capped Value of 450,000	2585	2585	2585	949.5	2585.0	2585.0	2585.0	2585.0
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	<0.005	<0.005	0.0127	<0.005	0.0058	0.0139	<0.005	<0.005
Molybdenum	µg/L	0.05-0.10	2000	≤ 1000	1.88	1.66	1.29	1.1	1.61	2.22	0.78	1.39
Nickel	µg/L	0.5	NG	NG	28.6	7.17	9.2	26.1	64	61.8	46.5	64.2
Phosphorus	µg/L	50-500	NG	NG	<50	<50	73	840	79	138	<250	<250
Potassium	µg/L	50.0	NG	NG	4650	4320	4920	11600	6630	10600	5370	4850
Rubidium	µg/L	0.2	NG	NG	1.32	1.1	1.33	12.5	2.61	2.94	1	1.4
Selenium	µg/L	0.05	NG	2.0	4.61	4.09	4.91	0.717	1.68	1.37	4.51	3.09
Silicon	µg/L	100.0	NG	NG	3870	4960	5540	12100	6100	5650	5600	5990
Silver [3] (Based on Hardness < or > 100000)	µg/L	0.01-0.02	0.10 - 3.0	0.05 - 1.5	<0.01	0.01	0.011	**0.15**	<0.016	<0.017	0.05	0.05
Ag STM Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		3.0	3.0	3.0	0.1	3.000	3.0	3.0	3.0
Ag LTA Guideline Calc	µg/L			Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	1.5	1.5	1.5	0.1	1.500	1.5	1.5	1.5
Sodium	µg/L	50.0	NG	NG	53200	20700	38900	4470	39000	30100	37300	28500
Strontium	µg/L	0.2	NG	NG	902	552	660	119	520	404	709	787
Sulfur	µg/L	500.0	NG	NG	302000	140000	158000	8420	147000	118000	213000	206000
Tellurium	µg/L	0.2-2.0	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	1	1
Thallium	µg/L	0.01-0.02	NG	NG	0.016	0.011	0.016	0.165	0.031	0.038	0.05	0.05
Thorium	µg/L	0.1-1.0	NG	NG	<0.1	0.13	0.17	1.38	0.3	0.34	0.5	0.5
Tin	µg/L	0.1-1.0	NG	NG	<0.1	<0.1	<0.1	0.11	<0.1	<0.1	0.5	0.5
Titanium	µg/L	0.3-6.3	NG	NG	0.49	9.17	11.3	67.2	25	14.9	1.5	5.8
Tungsten	µg/L	0.1-1.0	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.5
Uranium	µg/L	0.01	NG	NG	6.18	4.57	5.48	0.974	3.79	2.78	5.28	5.52
Vanadium	µg/L	0.5-1.0	NG	NG	<0.5	1.66	2.03	24	3.71	3.51	2.5	2.5
Zinc [3]	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	39.3	6.6	5.4	**87**	73.9	95.2	39	22
Zn STM Guideline Calc.	µg/L		Hardness 90,000 - 500,000, Calc. Hardness > 500,000, is Capped Value of 500,000		340.50	340.50	340.50	33.00	340.50	340.50	340.50	340.50
Zn LTA Guideline Calc.	µg/L			Hardness 90,000 - 330,000, Calc. Hardness > 330,000, is Capped Value of 330,000	187.5	187.5	187.5	7.5	187.5	187.5	187.5	187.5
Zircronium	µg/L	0.06-0.28	NG	NG	<0.2	0.28	0.37	0.77	0.56	0.41	<1.0	1
Metals, Dissolved												
Aluminum [5]	µg/L	1.0	100.0	50.0	**134**	3.8	1.7	47.6	72.5	**132**	31.5	6.7
Al STM Guideline Calc.	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Al LTA Guideline Calc.	µg/L			median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50.0	50.0	50.0	50.0	50.0	50.0	50.0	50.0
Antimony	µg/L	0.1-2.0	NG	NG	0.5	<0.1	0.12	<0.1	0.16	0.21	0.5	0.13
Arsenic	µg/L	0.1-2.0	NG	NG	0.5	0.17	0.17	0.68	0.23	0.46	0.5	0.3
Barium	µg/L	0.10	NG	NG	40.2	44.7	41.8	29.7	79.4	74.6	44.4	68.1
Beryllium	µg/L	0.1-2.0	NG	NG	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	<0.1
Bismuth	µg/L	0.05-1.0	NG	NG	0.25	<0.05	<0.05	<0.05	<0.05	<0.05	0.25	<0.05
Boron	µg/L	10.0	NG	NG	114	72	81	22	70	79	99	83
Cadmium [3]	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.457	0.0521	0.0608	0.0718	0.444	0.401	0.281	0.137
Cd STM Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		2.801	2.801	2.801	0.457	2.801	2.801	2.801	2.801
Cd LTA Guideline Calc.	µg/L			Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.457	0.457	0.457	0.177	0.457	0.457	0.457	0.457
Calcium	µg/L	50.0	NG	NG	238000	144000	176000	20200	160000	133000	224000	199000
Cesium	µg/L	0.01-0.2	NG	NG	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01
Chromium	µg/L	0.1-2.0	NG	NG	0.5	0.22	0.21	0.2	0.22	0.14	0.5	0.12
Cobalt	µg/L	0.10	NG	NG	3.95	0.3	0.64	0.85	32.1	20.7	15.5	23.1
Copper [6]	µg/L	0.2-4.0	Calc. based on BLM Model	Calc. based on BLM Model	1.6	0.88	0.9	2.05	1.62	2.77	0.5	0.71
Cu STM (Acute) Guideline Value	µg/L		BLM Ligand Model value		29.2	17	26	55.6	54	80.8	16.1	23.4
Cu LTA (Chronic) Guideline Value	µg/L			BLM Ligand Model value	5.1	2.8	4.8	9.5	10.9	15.8	2.7	4.4
Iron	µg/L	10.0	350	NG	70	11	5	178	218	172.00	50	5
Lead	µg/L	0.05-1.0	NG	NG	0.25	<0.05	<0.05	0.156	<0.05	<0.05	0.25	<0.05
Lithium	µg/L	1.0	NG	NG	45.2	32.5	35.6	2.2	29.6	29.5	49.1	38.8

Appendix B3: L3 Creek Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBL3C-1.43 29-Sep-20	LBL3C-1.43 21-Oct-20	LBL3C-1.43 30-Nov-20	LBL3C-1.43 20-Dec-20	LBL3C-1.65 17-Apr-20	LBL3C-1.65 27-May-20	LBL3C-1.65 21-Jun-20
Physical Parameters											
Temperature	°C									6.0	
Flow Rate	L/sec									1.50	
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	2300	9000	9900	4900	2100	500	500
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	249	296	313	283	64.9	191	158
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	1650	1580	1880	1650	192	898	772
Hardness as $CaCO_3$, dissolved	µg/L	500	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn, F)	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn, F)	860000	1030000	986000	934000	72200	417000	366000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L										
pH	pH Units	0.10	6.5 - 9.0	6.5-9.0	8.01	8.12	8.03	8.04	7.78	8.43	8.4
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	1370000	1510000	1640000	1390000	252000	640000	558000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	2900	11400	3900	8600	440000	5700	29900
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	158000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	8400	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	249000	296000	313000	283000	64900	182000	<1000
Anions and Nutrients											
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	<50	<50	<50	<50	157	8.1	<50
Ammonia FST Guideline	µg/L		pH dependent (at Temp 4 °C or in situ T)		6220	4950	6220	6220	8770	2520	2520
Ammonia FLT Guideline	µg/L			pH dependent (at Temp 4 C or in situ T)	1200	952	1220	1220	1690	484	484
Chloride (Cl^-)	µg/L	500	600000	150,000	40400	47600	50100	52500	5730	67300	28300
Nitrate (NO_3^- as N)	µg/L	5.0-100	NG	NG	18400	20800	22200	22900	495	342	1380
Nitrite (NO_2^- as N)	µg/L	1.0-20.0	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	<5	<5	<5	<5	13.4	<1	3.1
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	670000	734000	765000	627000	22200	216000	217000
SO_4 LTA Guideline Calc (Based on Hardness as CaCO3)	µg/L		NG	Hardness 0-30,000 = 128,000; Hardness 31,000-75,000 = 218,000; Hardness 76,000-180,000 = 309,000; Hardness 181,000-250,000 = 429,000; Hardness > 250,000 site-specific	429000	429000	429000	429000	218000	429000	429000
Total Dissolved Carbon (DOC)	mg/L		NG	NG	3.5	3.8	3.9	2.4	<1.0	12.2	15.7
Metals, Total											
Aluminum	µg/L	3.00	NG	NG	47	185	29.2	122	9050	73.7	359
Antimony	µg/L	0.1-1.0	NG	NG	0.5	0.12	<0.1	<0.5	0.4	0.29	0.34
Arsenic	µg/L	0.10	5.0	5.0	0.5	0.46	0.19	0.25	**7.23**	0.55	1.13
Barium	µg/L	0.10	NG	NG	51.1	42.5	32.2	42.4	398	91.7	119
Beryllium	µg/L	0.1-1.0	NG	NG	0.5	<0.1	<0.1	<0.5	0.57	<0.1	<0.1
Bismuth	µg/L	0.05-0.10	NG	NG	0.25	<0.05	<0.05	<0.25	0.171	<0.05	<0.05
Boron	µg/L	10.0	1200	1200	101	115	104	113	32	67	81
Cadmium	µg/L	0.005	NG	NG	0.106	0.134	0.242	0.076	0.639	0.0359	0.07
Calcium	µg/L	50	NG	NG	214000	237000	248000	219000	34100	106000	91700
Cesium	µg/L	0.01-0.02	NG	NG	0.05	0.036	<0.01	<0.05	1.65	<0.01	0.058
Chromium [4]	µg/L	0.10	NG	NG	0.5	0.45	0.2	<0.05	17.3	0.33	0.91
Cobalt	µg/L	0.10	110.0	4.0	18.7	12.5	34	0.83	8.36	0.14	0.44
Copper [3]	µg/L	0.5-1.0	Calc. based on Hardness	2 to 10	2.5	0.93	0.62	<2.5	26.2	2.94	4.63
Cu STM Guideline Calc. (relevant prior to Aug. 2019)	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness ≥ 400,000 is Capped Value of 400,000		39.6	39.6	39.6	39.6	8.79	39.60	36.404
Cu LTA Guideline Calc. (relevant prior to Aug. 2019)	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	10	10	10	10	2.89	10.0	10
Iron	µg/L	10	1000	NG	96	407	127	269	**19600**	103	746
Lead [3]	µg/L	0.05-0.1	Calc. based on Hardness	Calc. based on Hardness	0.25	0.155	<0.05	<0.25	11.0	0.071	0.42
Pb STM Guideline Calc.	µg/L		Hardness ≤ 8000 is 3; Hardness 8000-360,000: calc. Hardness>360,000 is Capped Value of 360,000		416.97	416.97	416.97	416.968	53.93	416.97	416.97
Pb LTA Guideline Calc.	µg/L			Hardness 8000-360,000: calc. Hardness > 360,000 is Capped Value of 360,000	19.57	19.57	19.57	19.57	5.41	19.57	19.57
Lithium	µg/L	1.0	NG	NG	50.6	50.7	50.3	52.4	16	7.4	8.9
Magnesium	µg/L	5.0	NG	NG	97300	99800	104000	106000	11000	39900	32800
Manganese [3]	µg/L	0.10	Calc. based on Hardness	Calc. based on Hardness	1390	924	**2700**	24.5	332	1.83	13.6
Mn STM Guideline Calc.	µg/L		Hardness 25,000 - 259,000 : calc.; Hardness > 259,000 is Capped Value of 259,000		3394	3394	3394	3394	1336	3394	3394
Mn LTA Guideline Calc.	µg/L			Hardness 37,000 - 450,000: calc.; Hardness > 450,000 is Capped Value of 450,000	2585.0	2585.0	2585.0	2585	922.7	2439.8	2215.4
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	<0.005	<0.005	<0.005	<0.005	0.0404	0.0106	0.016
Molybdenum	µg/L	0.05-0.10	2000	≤ 1000	0.98	0.95	0.875	0.99	3.36	2.5	2.69
Nickel	µg/L	0.5	NG	NG	47.5	31.8	70	17.9	33	3.17	5.57
Phosphorus	µg/L	50-500	NG	NG	<250	<50	<50	<250	965	<50	101
Potassium	µg/L	50.0	NG	NG	4840	5130	4210	3920	13100	9870	12500
Rubidium	µg/L	0.2	NG	NG	1	0.82	0.66	<1	15.1	0.44	1.49
Selenium	µg/L	0.05	NG	2.0	4.34	5.64	5.19	5.4	0.722	0.624	0.658
Silicon	µg/L	100.0	NG	NG	5420	5970	5490	5700	15800	3040	4290
Silver [3] (Based on Hardness < or > 100000)	µg/L	0.01-0.02	0.10 - 3.0	0.05 - 1.5	0.05	<0.01	<0.01	<0.05	**0.223**	<0.01	<0.011
Ag STM Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		3.0	3.0	3.0	3.0	0.1	3.000	3.0
Ag LTA Guideline Calc	µg/L			Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	1.5	1.5	1.5	1.5	0.1	1.500	1.5
Sodium	µg/L	50.0	NG	NG	31700	39300	35800	27600	3180	37000	23000
Strontium	µg/L	0.2	NG	NG	753	787	828	771	125	383	357
Sulfur	µg/L	500.0	NG	NG	222000	180000	257000	204000	7500	80800	76500
Tellurium	µg/L	0.2-2.0	NG	NG	1	0.21	<0.2	<1	<0.2	<0.2	<0.2
Thallium	µg/L	0.01-0.02	NG	NG	0.05	0.015	<0.01	<0.05	0.201	<0.01	0.011
Thorium	µg/L	0.1-1.0	NG	NG	0.5	<0.1	<0.1	<0.5	1.53	<0.1	0.12
Tin	µg/L	0.1-1.0	NG	NG	0.5	0.35	<0.1	<0.5	0.29	<0.1	<0.1
Titanium	µg/L	0.3-6.3	NG	NG	1.5	4.29	0.53	2.9	60.7	2.1	7.41
Tungsten	µg/L	0.1-1.0	NG	NG	0.5	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	6.55	6.26	6.43	7.57	1.09	4.36	2.57
Vanadium	µg/L	0.5-1.0	NG	NG	2.5	0.95	<0.5	<2.5	28.5	0.56	1.98
Zinc [3]	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	7.5	7.5	41.5	7.5	**95.2**	1.5	6.4
Zn STM Guideline Calc.	µg/L		Hardness 90,000 - 500,000, Calc. Hardness > 500,000, is Capped Value of 500,000		340.50	340.50	340.50	340.5	33.00	278.25	240.00
Zn LTA Guideline Calc.	µg/L			Hardness 90,000 - 330,000, Calc. Hardness > 330,000, is Capped Value of 330,000	187.5	187.5	187.5	187.5	7.5	187.5	187.5
Zircronium	µg/L	0.06-0.28	NG	NG	1	<0.23	<0.2	<1	0.73	<0.2	<0.39
Metals, Dissolved											
Aluminum [5]	µg/L	1.0	100.0	50.0	19.6	5.8	5	5	18.4	2.5	13.6
Al STM Guideline Calc.	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100.0	100.0	100.0	100	100.0	100.0	100.0
Al LTA Guideline Calc.	µg/L			median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50.0	50.0	50.0	50	50.0	50.0	50.0
Antimony	µg/L	0.1-2.0	NG	NG	0.5	0.5	0.5	<0.5	<0.1	0.28	0.3
Arsenic	µg/L	0.1-2.0	NG	NG	0.5	0.5	0.5	0.25	0.59	0.45	0.79
Barium	µg/L	0.10	NG	NG	45	37.6	35.4	30.7	31.2	80.7	112
Beryllium	µg/L	0.1-2.0	NG	NG	0.5	0.5	0.5	<0.5	<0.1	<0.1	<0.1
Bismuth	µg/L	0.05-1.0	NG	NG	0.25	0.25	0.25	<0.25	<0.05	<0.05	<0.05
Boron	µg/L	10.0	NG	NG	97	99	135	119	22	62	83
Cadmium [3]	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.104	0.217	0.262	0.059	0.0718	0.0331	0.0363
Cd STM Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		2.801	2.801	2.801	2.8008	0.421	2.560	2.238
Cd LTA Guideline Calc.	µg/L			Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.457	0.457	0.457	0.4571	0.166	0.457	0.457
Calcium	µg/L	50.0	NG	NG	213000	237000	223000	221000	18400	106000	92500
Cesium	µg/L	0.01-0.2	NG	NG	0.05	0.05	0.05	<0.05	<0.01	<0.01	<0.01
Chromium	µg/L	0.1-2.0	NG	NG	0.5	0.5	0.5	<0.5	0.15	0.17	0.23
Cobalt	µg/L	0.10	NG	NG	15.6	12.6	35.3	<0.5	0.29	<0.1	0.15
Copper [6]	µg/L	0.2-4.0	Calc. based on BLM Model	Calc. based on BLM Model	0.5	0.5	0.5	0.5	**2.14**	2.77	3.74
Cu STM (Acute) Guideline Value	µg/L		BLM Ligand Model value		17.6	21.7	20.6	12.4	1.4	95	111.8
Cu LTA (Chronic) Guideline Value	µg/L			BLM Ligand Model value	2.9	3.9	3.3	2.2	0.2	19.1	21.8
Iron	µg/L	10.0	350	NG	25	25	58	25	105	<10	27.00
Lead	µg/L	0.05-1.0	NG	NG	0.25	0.25	0.25	<0.25	0.101	<0.05	<0.05
Lithium	µg/L	1.0	NG	NG	45.4	56.8	63.4	42.2	1.8	6.6	7.7

Appendix B3: L3 Creek Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBL3C-3.32 17-Apr-20	LBL3C-3.32 27-May-20	LBL3C-3.32 21-Jun-20	LBL3C-3.32 29-Jul-20	LBL3C-3.32 23-Aug-20	LBL4C-0.18 17-Apr-20
Physical Parameters										
Temperature	°C					11.4				
Flow Rate	L/sec					1.00				
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	2100	500	500	500	500	2000
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	65.4	210	165	324	344	108
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	174	891	1200	1580	1540	238
Hardness as $CaCO_3$, dissolved	µg/L	500	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn, F)	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn, F)	78400	413000	589000	774000	854000	109000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L									
pH	pH Units	0.10	6.5 - 9.0	6.5-9.0	7.86	8.42	8.26	8.39	8.19	7.92
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	239000	649000	905000	1230000	1290000	277000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	919000	7100	44800	1600	500	2940000
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	324000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	9000	<1000	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	65400	201000	165000	<1000	344000	108000
Anions and Nutrients										
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	202	21.8	2930	264	92	65
Ammonia FST Guideline	µg/L		pH dependent (at Temp 4 °C or in situ T)		7420	2520	3150	2520	3950	7420
Ammonia FLT Guideline	µg/L			pH dependent (at Temp 4 C or in situ T)	1430	484	606	484	759	1430
Chloride (Cl^-)	µg/L	500	600000	150,000	6330	66100	42400	61500	60900	13000
Nitrate (NO_3^- as N)	µg/L	5.0-100	NG	NG	532	62.2	636	1760	1430	124
Nitrite (NO_2^- as N)	µg/L	1.0-20.0	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	13.6	<1	109	50.6	13.4	3.5
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	14100	201000	479000	535000	616000	28700
SO_4 LTA Guideline Calc (Based on Hardness as CaCO3)	µg/L		NG	Hardness 0-30,000 = 128,000; Hardness 31,000-75,000 = 218,000; Hardness 76,000-180,000 = 309,000; Hardness 181,000-250,000 = 429,000; Hardness > 250,000 site-specific	309000	429000	429000	429000	429000	309000
Total Dissolved Carbon (DOC)	mg/L		NG	NG	12.2	16.6	19.7	16.4	15.6	27.9
Metals, Total										
Aluminum	µg/L	3.00	NG	NG	7800	182	2980	91.7	36	20200
Antimony	µg/L	0.1-1.0	NG	NG	0.28	0.21	0.27	0.4	0.5	0.52
Arsenic	µg/L	0.10	5.0	5.0	**5.48**	0.82	2.08	0.65	0.66	**12.5**
Barium	µg/L	0.10	NG	NG	353	95.2	116	151	153	824
Beryllium	µg/L	0.1-1.0	NG	NG	0.63	<0.1	0.22	<0.1	0.5	1.51
Bismuth	µg/L	0.05-0.10	NG	NG	0.159	<0.05	<0.05	<0.05	0.25	0.356
Boron	µg/L	10.0	1200	1200	31	58	131	124	84	35
Cadmium	µg/L	0.005	NG	NG	0.745	0.0355	0.266	0.0966	0.073	2.25
Calcium	µg/L	50	NG	NG	34200	105000	147000	210000	223000	84900
Cesium	µg/L	0.01-0.02	NG	NG	1.33	0.029	0.107	<0.01	0.05	2.85
Chromium [4]	µg/L	0.10	NG	NG	13.9	0.45	2.89	0.42	0.5	35.1
Cobalt	µg/L	0.10	110.0	4.0	8.19	0.28	5.06	0.56	0.61	22.2
Copper [3]	µg/L	0.5-1.0	Calc. based on Hardness	2 to 10	23.2	2.23	5.61	2.18	2.5	61.5
Cu STM Guideline Calc. (relevant prior to Aug. 2019)	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness ≥ 400,000 is Capped Value of 400,000		9.37	39.60	39.6	39.6	39.6	12.25
Cu LTA Guideline Calc. (relevant prior to Aug. 2019)	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	3.14	10.0	10	10	10	4.36
Iron	µg/L	10	1000	NG	**15800**	282	**1620**	121	116	**41600**
Lead [3]	µg/L	0.05-0.1	Calc. based on Hardness	Calc. based on Hardness	11.2	0.139	0.786	<0.05	0.25	26.5
Pb STM Guideline Calc.	µg/L		Hardness ≤ 8000 is 3; Hardness 8000-360,000: calc. Hardness>360,000 is Capped Value of 360,000		59.90	416.97	416.97	416.97	416.97	91.11
Pb LTA Guideline Calc.	µg/L			Hardness 8000-360,000: calc. Hardness > 360,000 is Capped Value of 360,000	5.65	19.57	19.57	19.57	19.57	6.86
Lithium	µg/L	1.0	NG	NG	15	10.6	19.1	20.1	13.8	33.9
Magnesium	µg/L	5.0	NG	NG	10800	38300	57400	68000	80800	24900
Manganese [3]	µg/L	0.10	Calc. based on Hardness	Calc. based on Hardness	308	25.2	851	231	211	928
Mn STM Guideline Calc.	µg/L		Hardness 25,000 - 259,000 : calc.; Hardness > 259,000 is Capped Value of 259,000		1404	3394	3394	3394	3394	1741
Mn LTA Guideline Calc.	µg/L			Hardness 37,000 - 450,000: calc.; Hardness > 450,000 is Capped Value of 450,000	950	2422	2585	2585	2585	1085
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05-0.10	2000	≤ 1000	0.614	1.17	1.37	1.72	1.48	2.47
Nickel	µg/L	0.5	NG	NG	28.6	5.04	19.1	10.3	8.7	70.6
Phosphorus	µg/L	50-500	NG	NG	1070	<50	136	<50	<250	1940
Potassium	µg/L	50.0	NG	NG	13200	12100	18000	15900	14900	11000
Rubidium	µg/L	0.2	NG	NG	13.7	1.67	7.18	2.72	1.8	28.3
Selenium	µg/L	0.05	NG	2.0	0.536	0.553	0.598	0.523	0.34	1.54
Silicon	µg/L	100.0	NG	NG	13100	2300	5340	4320	3970	27700
Silver [3] (Based on Hardness < or > 100000)	µg/L	0.01-0.02	0.10 - 3.0	0.05 - 1.5	**0.172**	<0.01	<0.014	<0.01	0.05	0.488
Ag STM Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		0.1	3.000	3.0	3.0	3.0	3.0
Ag LTA Guideline Calc	µg/L			Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	0.1	1.500	1.5	1.5	1.5	1.5
Sodium	µg/L	50.0	NG	NG	3210	36900	37800	54600	65800	8930
Strontium	µg/L	0.2	NG	NG	110	410	510	760	771	263
Sulfur	µg/L	500.0	NG	NG	4410	76600	163000	179000	206000	11400
Tellurium	µg/L	0.2-2.0	NG	NG	<0.2	<0.2	<0.2	<0.2	1	<0.2
Thallium	µg/L	0.01-0.02	NG	NG	0.173	<0.01	0.046	0.016	0.05	0.462
Thorium	µg/L	0.1-1.0	NG	NG	1.09	<0.1	0.25	<0.1	0.5	3.29
Tin	µg/L	0.1-1.0	NG	NG	<0.1	<0.1	<0.1	<0.1	0.5	<0.1
Titanium	µg/L	0.3-6.3	NG	NG	39.4	5.66	7.48	0.51	1.5	92.7
Tungsten	µg/L	0.1-1.0	NG	NG	<0.1	<0.1	<0.1	<0.1	0.5	<0.1
Uranium	µg/L	0.01	NG	NG	1.02	2.23	2.38	6.29	6.52	2.48
Vanadium	µg/L	0.5-1.0	NG	NG	26.3	1.1	2.87	<0.5	2.5	56.8
Zinc [3]	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	**102**	4.7	128	11.7	7.5	**214**
Zn STM Guideline Calc.	µg/L		Hardness 90,000 - 500,000, Calc. Hardness > 500,000, is Capped Value of 500,000		33.00	275.25	340.50	340.50	340.50	47.25
Zn LTA Guideline Calc.	µg/L			Hardness 90,000 - 330,000, Calc. Hardness > 330,000, is Capped Value of 330,000	7.5	187.5	187.5	187.5	187.5	21.8
Zircronium	µg/L	0.06-0.28	NG	NG	0.66	0.44	0.71	0.39	1	0.58
Metals, Dissolved										
Aluminum [5]	µg/L	1.0	100.0	50.0	32.8	6.9	**359**	34.7	14.2	76.1
Al STM Guideline Calc.	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100.0	100.0	100.0	100.0	100.0	100.0
Al LTA Guideline Calc.	µg/L			median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50.0	50.0	50.0	50.0	50.0	50.0
Antimony	µg/L	0.1-2.0	NG	NG	<0.1	0.19	0.23	0.33	0.23	0.12
Arsenic	µg/L	0.1-2.0	NG	NG	0.93	0.67	1.08	0.73	0.66	0.96
Barium	µg/L	0.10	NG	NG	46.3	82.8	112	157	153	44.9
Beryllium	µg/L	0.1-2.0	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Bismuth	µg/L	0.05-1.0	NG	NG	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Boron	µg/L	10.0	NG	NG	22	53	135	134	89	20
Cadmium [3]	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.0298	0.0256	0.167	0.0985	0.0487	0.0535
Cd STM Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		0.458	2.535	2.801	2.801	2.801	0.643
Cd LTA Guideline Calc.	µg/L			Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.177	0.457	0.457	0.457	0.457	0.225
Calcium	µg/L	50.0	NG	NG	21000	106000	144000	185000	208000	30800
Cesium	µg/L	0.01-0.2	NG	NG	<0.01	<0.01	0.032	<0.01	<0.01	<0.01
Chromium	µg/L	0.1-2.0	NG	NG	0.22	0.12	0.49	0.35	0.19	0.24
Cobalt	µg/L	0.10	NG	NG	0.12	0.17	4.12	0.6	0.52	0.16
Copper [6]	µg/L	0.2-4.0	Calc. based on BLM Model	Calc. based on BLM Model	2.55	1.99	3.56	2.19	1.64	2.42
Cu STM (Acute) Guideline Value	µg/L		BLM Ligand Model value		35.9	128.6	131	137.7	115.3	74.2
Cu LTA (Chronic) Guideline Value	µg/L			BLM Ligand Model value	6.1	25.9	25.8	29.5	21.5	12.9
Iron	µg/L	10.0	350	NG	137	40	87.00	43	51	231
Lead	µg/L	0.05-1.0	NG	NG	0.107	<0.05	<0.05	<0.05	<0.05	0.207
Lithium	µg/L	1.0	NG	NG	1.6	8.7	16.9	20.9	15.9	2.7

Appendix B3: L3 Creek Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBL4C-0.18 27-May-20	LBL4C-0.18 21-Jun-20	LBL4C-0.18 29-Jul-20	LBL4C-0.18 23-Aug-20	LBL4C-0.18 29-Sep-20	LBL4C-0.18 21-Oct-20	LBL4C-0.18 30-Nov-20
Physical Parameters											
Temperature	°C				8.4						
Flow Rate	L/sec				1.00						
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	4000	500	156000	219000	351000	340000	346000
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	141	123	0.5	0.5	0.5	0.5	0.5
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	1130	1030	2160	2410	2970	2770	3190
Hardness as $CaCO_3$, dissolved	µg/L	500	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn, F)	NG (Acceptable ranges exist when calculating exceedances for Cd, Cu, Pb, Mn, Zn, F)	478000	453000	964000	1110000	1150000	1240000	1290000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L										
pH	pH Units	0.10	6.5 - 9.0	6.5-9.0	8.18	8.15	**4.29**	**3.90**	**3.57**	**3.57**	**3.77**
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	818000	738000	1880000	2420000	2550000	2910000	2960000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	90600	174000	13000	6900	500	500	4800
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	141000	123000	<1000	<1000	<1000	<1000	<1000
Anions and Nutrients											
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	68.1	73	229	362	176	146	106
Ammonia FST Guideline	µg/L		pH dependent (at Temp 4 °C or in situ T)		3950	3950	-	-	-	-	-
Ammonia FLT Guideline	µg/L			pH dependent (at Temp 4 C or in situ T)	759	759	-	-	-	-	-
Chloride (Cl^-)	µg/L	500	600000	150,000	74700	36600	31700	42800	44300	50600	109000
Nitrate (NO_3^- as N)	µg/L	5.0-100	NG	NG	36.5	34	56	87	166	279	88
Nitrite (NO_2^- as N)	µg/L	1.0-20.0	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	<1	<5	<5	<5	<5	<5	<5
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	382000	414000	1290000	1680000	1910000	2050000	2000000
SO_4 LTA Guideline Calc (Based on Hardness as CaCO3)	µg/L		NG	Hardness 0-30,000 = 128,000; Hardness 31,000-75,000 = 218,000; Hardness 76,000-180,000 = 309,000; Hardness 181,000-250,000 = 429,000; Hardness > 250,000 site-specific	429000	429000	429000	429000	429000	429000	429000
Total Dissolved Carbon (DOC)	mg/L		NG	NG	9.3	10.3	6.1	5.8	5.7	5.5	5.0
Metals, Total											
Aluminum	µg/L	3.00	NG	NG	3400	6820	24700	37200	52100	51200	49600
Antimony	µg/L	0.1-1.0	NG	NG	0.18	0.33	0.5	0.5	1	0.5	1
Arsenic	µg/L	0.10	5.0	5.0	0.83	2.98	1.68	2.9	4.1	2.66	4.3
Barium	µg/L	0.10	NG	NG	67.8	128	25.7	18.2	8.5	5.62	8.4
Beryllium	µg/L	0.1-1.0	NG	NG	0.49	0.85	4.49	5.06	6.3	5.82	5.3
Bismuth	µg/L	0.05-0.10	NG	NG	<0.05	<0.05	0.25	0.25	0.5	0.25	0.5
Boron	µg/L	10.0	1200	1200	61	68	168	181	220	200	200
Cadmium	µg/L	0.005	NG	NG	0.811	1.43	5.51	6.81	8.83	8.07	9.97
Calcium	µg/L	50	NG	NG	122000	120000	256000	300000	291000	310000	343000
Cesium	µg/L	0.01-0.02	NG	NG	0.071	0.474	0.087	0.073	0.1	0.069	0.1
Chromium [4]	µg/L	0.10	NG	NG	1.08	4.68	1.91	2.94	4.2	4.2	3.9
Cobalt	µg/L	0.10	110.0	4.0	17.5	24.5	**111**	**159**	**192**	**175**	**176**
Copper [3]	µg/L	0.5-1.0	Calc. based on Hardness	2 to 10	4.93	12	23.7	29.7	36.1	30.9	27
Cu STM Guideline Calc. (relevant prior to Aug. 2019)	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness ≥ 400,000 is Capped Value of 400,000		39.60	39.6	39.6	39.6	39.6	39.6	39.6
Cu LTA Guideline Calc. (relevant prior to Aug. 2019)	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	10.0	10	10	10	10	10	10
Iron	µg/L	10	1000	NG	**1490**	**5810**	**4070**	**5430**	**6980**	**4020**	**2650**
Lead [3]	µg/L	0.05-0.1	Calc. based on Hardness	Calc. based on Hardness	0.297	2.4	0.25	0.25	0.5	0.25	<0.5
Pb STM Guideline Calc.	µg/L		Hardness ≤ 8000 is 3; Hardness 8000-360,000: calc. Hardness>360,000 is Capped Value of 360,000		416.97	416.97	416.968	416.97	416.97	416.97	416.97
Pb LTA Guideline Calc.	µg/L			Hardness 8000-360,000: calc. Hardness > 360,000 is Capped Value of 360,000	19.57	19.57	19.57	19.57	19.57	19.57	19.57
Lithium	µg/L	1.0	NG	NG	37.7	54.1	185	165	217	181	159
Magnesium	µg/L	5.0	NG	NG	47200	41700	90200	128000	148000	138000	145000
Manganese [3]	µg/L	0.10	Calc. based on Hardness	Calc. based on Hardness	941	946	**4070**	**5440**	**6410**	**5870**	**6260**
Mn STM Guideline Calc.	µg/L		Hardness 25,000 - 259,000 : calc.; Hardness > 259,000 is Capped Value of 259,000		3394	3394	3394	3394	3394	3394	3394
Mn LTA Guideline Calc.	µg/L			Hardness 37,000 - 450,000: calc.; Hardness > 450,000 is Capped Value of 450,000	2585	2585	2585	2585	2585	2585	2585
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	0.0062	0.0107	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05-0.10	2000	≤ 1000	0.775	1.92	0.25	0.25	0.5	0.25	0.5
Nickel	µg/L	0.5	NG	NG	57.6	88.5	403	531	668	596	666
Phosphorus	µg/L	50-500	NG	NG	52	154	<250	<250	500	<250	500
Potassium	µg/L	50.0	NG	NG	7700	7910	5270	5200	5070	3910	3930
Rubidium	µg/L	0.2	NG	NG	2.19	6.15	4.9	6.6	6.8	5.5	5.1
Selenium	µg/L	0.05	NG	2.0	0.768	1.28	0.75	1.29	1.7	1.06	0.95
Silicon	µg/L	100.0	NG	NG	4600	8200	8720	10400	11400	9960	9600
Silver [3] (Based on Hardness < or > 100000)	µg/L	0.01-0.02	0.10 - 3.0	0.05 - 1.5	<0.01	0.04	0.05	0.05	0.1	0.05	<0.1
Ag STM Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		3.0	3.0	3	3.0	3.0	3.0	3.0
Ag LTA Guideline Calc	µg/L			Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Sodium	µg/L	50.0	NG	NG	70000	0.1	103000	143000	167000	169000	205000
Strontium	µg/L	0.2	NG	NG	443	0.1	761	800	806	831	963
Sulfur	µg/L	500.0	NG	NG	147000	3.0	401000	590000	692000	702000	719000
Tellurium	µg/L	0.2-2.0	NG	NG	<0.2	1.5	1	1	2	1	2
Thallium	µg/L	0.01-0.02	NG	NG	0.024	#VALUE!	0.084	0.104	0.1	0.085	0.1
Thorium	µg/L	0.1-1.0	NG	NG	0.18	#VALUE!	0.53	0.58	1.5	1.4	1
Tin	µg/L	0.1-1.0	NG	NG	<0.1	0.1	0.5	0.5	1	0.5	1
Titanium	µg/L	0.3-6.3	NG	NG	6	0.1	1.5	1.5	3	1.5	3
Tungsten	µg/L	0.1-1.0	NG	NG	<0.1	0.1	0.5	0.5	1	0.5	1
Uranium	µg/L	0.01	NG	NG	1.92	0.1	4.19	5.12	6.97	5.75	4.84
Vanadium	µg/L	0.5-1.0	NG	NG	1.3	0.1	2.5	2.5	5	2.5	5
Zinc [3]	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	91.9	0.1	**809**	**1080**	**1490**	**1290**	**1430**
Zn STM Guideline Calc.	µg/L		Hardness 90,000 - 500,000, Calc. Hardness > 500,000, is Capped Value of 500,000		324.00	305.25	340.5	340.50	340.50	340.50	340.50
Zn LTA Guideline Calc.	µg/L			Hardness 90,000 - 330,000, Calc. Hardness > 330,000, is Capped Value of 330,000	187.5	187.5	187.5	187.5	187.5	187.5	187.5
Zircronium	µg/L	0.06-0.28	NG	NG	<0.34	3.0	<1.0	1	2	1	2
Metals, Dissolved											
Aluminum [5]	µg/L	1.0	100.0	50.0	**246**	**291**	**24400**	**35200**	**49100**	**46800**	**46200**
Al STM Guideline Calc.	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100.0	100.0	0.019836252	20.4	22.4	22.4	21.1
Al LTA Guideline Calc.	µg/L			median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50.0	50.0	0.005121122	5.2	5.8	5.8	5.4
Antimony	µg/L	0.1-2.0	NG	NG	0.14	0.19	0.5	<0.1	0.5	0.5	0.5
Arsenic	µg/L	0.1-2.0	NG	NG	0.25	0.37	2.02	2.65	2.82	2.34	2.83
Barium	µg/L	0.10	NG	NG	58.2	62.3	27.6	16.9	7.21	5.41	6.92
Beryllium	µg/L	0.1-2.0	NG	NG	<0.1	<0.1	4.21	4.44	6.09	5.58	5.56
Bismuth	µg/L	0.05-1.0	NG	NG	<0.05	<0.05	0.25	<0.05	0.25	0.25	0.25
Boron	µg/L	10.0	NG	NG	57	65	164	165	198	172	188
Cadmium [3]	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.637	0.752	**6.03**	**6.11**	**8.01**	**7.95**	**9.93**
Cd STM Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		2.801	2.788	2.801	2.801	2.801	2.801	2.801
Cd LTA Guideline Calc.	µg/L			Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.457	0.457	0.457	0.457	0.457	0.457	0.457
Calcium	µg/L	50.0	NG	NG	120000	113000	229000	261000	275000	279000	290000
Cesium	µg/L	0.01-0.2	NG	NG	0.012	0.013	0.072	0.057	0.07	0.06	0.05
Chromium	µg/L	0.1-2.0	NG	NG	<0.1	<0.1	1.43	2.39	4.07	4.21	3.45
Cobalt	µg/L	0.10	NG	NG	15.4	18	124	146	174	174	175
Copper [6]	µg/L	0.2-4.0	Calc. based on BLM Model	Calc. based on BLM Model	2.77	4.09	**24.8**	**25.7**	**32.6**	**30.6**	**26.5**
Cu STM (Acute) Guideline Value	µg/L		BLM Ligand Model value		68.3	68.7	0.2	0.2	0.2	0.2	0.2
Cu LTA (Chronic) Guideline Value	µg/L			BLM Ligand Model value	14	13.6	0.2	0.2	0.2	0.2	0.2
Iron	µg/L	10.0	350	NG	195	42.00	**3220**	**4830**	**6320**	**4160**	**2250**
Lead	µg/L	0.05-1.0	NG	NG	<0.05	<0.05	0.25	0.115	0.25	0.25	0.25
Lithium	µg/L	1.0	NG	NG	31.4	46.4	179	148	185	198	175

Appendix B3: L3 Creek Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBL3C-0.02 17-Apr-20	LBL3C-0.02 27-May-20	LBL3C-0.02 21-Jun-20	LBL3C-0.02 29-Jul-20	LBL3C-0.02 23-Aug-20	LBL3C-0.02 29-Sep-20	LBL3C-0.02 20-Oct-20
Magnesium	µg/L	5.0	NG	NG	6610	62000	45000	68900	91100	80300	87200
Manganese	µg/L	0.10	NG	NG	52.6	993	410	399	189	119	141
Mercury	µg/L	0.005-0.1	NG	NG	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05-1.0	NG	NG	0.786	1.35	1.63	2.23	2.31	2.25	1.83
Nickel	µg/L	0.50	NG	NG	3.53	30.6	21.7	27.7	26.4	27.1	26.7
Phosphorus	µg/L	50-1000	NG	NG	233	<50	<50	<50	<50	<250	<250
Potassium	µg/L	50.0	NG	NG	9610	6660	8260	5670	6170	5140	4940
Rubidium	µg/L	0.20	NG	NG	1.54	1.08	1.71	1.92	1.93	1.5	1.2
Selenium	µg/L	0.05-1.0	NG	2.0	0.359	2.3	2.05	2.3	2.98	3.18	3.49
Silicon	µg/L	50.0	NG	NG	2070	3400	4020	3950	4490	3600	3730
Silver	µg/L	0.01-0.2	NG	NG	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	0.05
Sodium	µg/L	50.0	NG	NG	4550	43900	29500	39200	50100	48500	49700
Strontium	µg/L	0.20	NG	NG	77.9	567	514	737	898	838	883
Sulfur	µg/L	500	NG	NG	10100	200000	151000	240000	313000	269000	274000
Tellurium	µg/L	0.2-4.0	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	1	1
Thallium	µg/L	0.01-0.2	NG	NG	<0.01	0.016	0.014	0.026	0.027	0.05	0.05
Thorium	µg/L	0.1-2.0	NG	NG	0.13	<0.1	<0.1	<0.1	<0.1	0.5	0.5
Tin	µg/L	0.1-2.0	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.5
Titanium	µg/L	0.3-6.0	NG	NG	8.42	<0.3	<0.3	<0.3	<0.3	1.5	1.5
Tungsten	µg/L	0.1-2.0	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	0.5
Uranium	µg/L	0.01	NG	NG	0.322	3.95	3.06	4.9	6.53	6.68	5.78
Vanadium	µg/L	0.5-10	NG	NG	0.61	<0.5	<0.5	<0.5	<0.5	2.5	2.5
Zinc	µg/L	1.00	NG	NG	6.5	20.4	13.6	24.5	26.7	30.7	34.1
Zirconium	µg/L	0.06-1.2	NG	NG	0.59	<0.2	<0.2	<0.2	<0.2	1	1
Laboratory Work Order Number					L2438183	L2454036	L2464256	L2482349	L2493339	L2510600	L2520229
Laboratory Identification Number					L2438183-1		L2464256-3	L2482349-2	L2493339-1	L2510600-1	L2520229-6

Appendix B3: L3 Creek Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBL3C-0.02	LBL3C-1.43	LBL3C-1.43	LBL3C-1.43	LBL3C-1.43	LBL3C-1.43	LBL3C-1.43	LBL3C-1.43
					30-Nov-20	27-Feb-20	25-Mar-20	17-Apr-20	27-May-20	21-Jun-20	29-Jul-20	23-Aug-20
Magnesium	µg/L	5.0	NG	NG	90700	60800	68200	6770	58100	46900	82800	88100
Manganese	µg/L	0.10	NG	NG	107	9.13	18.7	68.5	2430	1380	1310	2130
Mercury	µg/L	0.005-0.1	NG	NG	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05-1.0	NG	NG	1.88	1.48	1.25	0.752	1.42	1.27	0.87	1.26
Nickel	µg/L	0.50	NG	NG	29.1	5.34	7.78	3.22	64.3	47.6	40.5	50.6
Phosphorus	µg/L	50-1000	NG	NG	<250	<50	<50	290	<50	<50	<250	<50
Potassium	µg/L	50.0	NG	NG	5110	4420	4760	9830	7180	9100	5000	5050
Rubidium	µg/L	0.20	NG	NG	1.3	0.53	0.48	1.53	1.04	1.39	1	0.94
Selenium	µg/L	0.05-1.0	NG	2.0	4.72	4.68	5.07	0.347	1.68	2.0	4.27	4.01
Silicon	µg/L	50.0	NG	NG	4100	4360	4750	2000	3890	4520	5030	5800
Silver	µg/L	0.01-0.2	NG	NG	0.05	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	<0.01
Sodium	µg/L	50.0	NG	NG	55300	20400	36000	4380	39700	29700	33500	29500
Strontium	µg/L	0.20	NG	NG	913	537	620	75.1	495	459	662	735
Sulfur	µg/L	500	NG	NG	277000	136000	155000	8390	162000	134000	207000	208000
Tellurium	µg/L	0.2-4.0	NG	NG	1	<0.2	<0.2	<0.2	<0.2	<0.2	1	<0.2
Thallium	µg/L	0.01-0.2	NG	NG	0.05	<0.01	<0.01	<0.01	0.015	0.013	0.05	0.011
Thorium	µg/L	0.1-2.0	NG	NG	0.5	<0.1	<0.1	0.11	<0.1	<0.1	0.5	<0.1
Tin	µg/L	0.1-2.0	NG	NG	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	<0.1
Titanium	µg/L	0.3-6.0	NG	NG	1.5	0.34	<0.3	5.76	<0.3	<0.3	1.5	<0.3
Tungsten	µg/L	0.1-2.0	NG	NG	0.5	<0.1	<0.1	<0.1	<0.1	<0.1	0.5	<0.1
Uranium	µg/L	0.01	NG	NG	7.27	4.87	5.55	0.3	3.76	2.68	4.82	5.26
Vanadium	µg/L	0.5-10	NG	NG	2.5	<0.5	<0.5	0.57	<0.5	<0.5	2.5	<0.5
Zinc	µg/L	1.00	NG	NG	37	1.9	1.1	6.9	48.7	27.9	20.6	11.3
Zirconium	µg/L	0.06-1.2	NG	NG	1	<0.2	<0.2	0.53	<0.2	<0.2	<1.0	<0.2
Laboratory Work Order Number					L2535101	VA20A2572	VA20A4062	L2438183	L2454036	L2464256	L2482349	L2493339
Laboratory Identification Number					L2535101-9	VA20A2572-004		L2438183-2		L2464256-4	L2482349-3	L2493339-2

Appendix B3: L3 Creek Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBL3C-1.43	LBL3C-1.43	LBL3C-1.43	LBL3C-1.43	LBL3C-1.65	LBL3C-1.65	LBL3C-1.65
					29-Sep-20	21-Oct-20	30-Nov-20	20-Dec-20	17-Apr-20	27-May-20	21-Jun-20
Magnesium	µg/L	5.0	NG	NG	80000	105000	104000	93000	6400	37100	32800
Manganese	µg/L	0.10	NG	NG	1140	2850	2450	7.28	25.8	0.11	0.54
Mercury	µg/L	0.005-0.1	NG	NG	<0.005	<0.005	<0.005	<0.005	<0.005	0.009	0.0083
Molybdenum	µg/L	0.05-1.0	NG	NG	0.92	0.98	0.93	0.78	1.73	2.17	1.63
Nickel	µg/L	0.50	NG	NG	40.4	73.2	71.8	14.1	1.49	2.92	4.37
Phosphorus	µg/L	50-1000	NG	NG	<250	<250	<250	<250	280	<50	54
Potassium	µg/L	50.0	NG	NG	4400	4470	4690	4160	11500	10300	11600
Rubidium	µg/L	0.20	NG	NG	1	1	1	<1	1.68	0.3	1.1
Selenium	µg/L	0.05-1.0	NG	2.0	4.37	5.19	4.83	5.44	0.3	0.636	0.78
Silicon	µg/L	50.0	NG	NG	4950	5640	5890	5090	2040	2670	3870
Silver	µg/L	0.01-0.2	NG	NG	0.05	0.05	0.05	<0.05	<0.01	<0.01	<0.01
Sodium	µg/L	50.0	NG	NG	30900	36300	37600	29400	2950	33300	22500
Strontium	µg/L	0.20	NG	NG	715	826	872	704	73.4	355	388
Sulfur	µg/L	500	NG	NG	203000	261000	235000	196000	7240	78300	80400
Tellurium	µg/L	0.2-4.0	NG	NG	1	1	1	<1	<0.2	<0.2	<0.2
Thallium	µg/L	0.01-0.2	NG	NG	0.05	0.05	0.05	<0.05	<0.01	<0.01	<0.01
Thorium	µg/L	0.1-2.0	NG	NG	0.5	0.5	0.5	<0.5	<0.1	<0.1	<0.1
Tin	µg/L	0.1-2.0	NG	NG	0.5	0.5	0.5	<0.5	<0.1	<0.1	<0.1
Titanium	µg/L	0.3-6.0	NG	NG	1.5	1.5	1.5	<1.5	0.94	<0.3	1.15
Tungsten	µg/L	0.1-2.0	NG	NG	0.5	0.5	0.5	<0.5	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	6.16	6.6	7.66	6.64	0.243	4.29	2.45
Vanadium	µg/L	0.5-10	NG	NG	2.5	2.5	2.5	<2.5	<0.5	<0.5	<0.5
Zinc	µg/L	1.00	NG	NG	8.7	34.8	48.3	<5	5.1	1.9	1.5
Zirconium	µg/L	0.06-1.2	NG	NG	1	1	1	<1	<0.22	<0.2	<0.34
Laboratory Work Order Number					L2510600	L2520235	L2535101	L2542477	L2438183	L2454036	L2464256
Laboratory Identification Number					L2510600-3	L2520235-1	L2535101-7		L2438183-3		L2464256-5

Appendix B3: L3 Creek Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBL3C-3.32 17-Apr-20	LBL3C-3.32 27-May-20	LBL3C-3.32 21-Jun-20	LBL3C-3.32 29-Jul-20	LBL3C-3.32 23-Aug-20	LBL4C-0.18 17-Apr-20
Magnesium	µg/L	5.0	NG	NG	6320	35900	55700	75800	81500	7680
Manganese	µg/L	0.10	NG	NG	0.75	17.3	810	235	201	2.35
Mercury	µg/L	0.005-0.1	NG	NG	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05-1.0	NG	NG	0.742	0.851	1	1.57	1.5	1.48
Nickel	µg/L	0.50	NG	NG	2.14	4.49	15.6	10.6	8.22	2.82
Phosphorus	µg/L	50-1000	NG	NG	279	<50	<50	<50	<50	75
Potassium	µg/L	50.0	NG	NG	12200	12600	16500	16500	15900	7310
Rubidium	µg/L	0.20	NG	NG	1.62	1.25	6.78	3.15	2.1	0.95
Selenium	µg/L	0.05-1.0	NG	2.0	0.143	0.509	0.655	0.673	0.482	0.499
Silicon	µg/L	50.0	NG	NG	2120	1710	4350	4470	4430	1890
Silver	µg/L	0.01-0.2	NG	NG	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	µg/L	50.0	NG	NG	3200	33400	35600	60400	67600	8390
Strontium	µg/L	0.20	NG	NG	66	376	558	688	784	99.1
Sulfur	µg/L	500	NG	NG	4010	72100	172000	185000	235000	9540
Tellurium	µg/L	0.2-4.0	NG	NG	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/L	0.01-0.2	NG	NG	<0.01	<0.01	0.033	0.013	<0.01	<0.01
Thorium	µg/L	0.1-2.0	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	0.17
Tin	µg/L	0.1-2.0	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Titanium	µg/L	0.3-6.0	NG	NG	5.46	1.26	1.53	<0.3	<0.3	13.5
Tungsten	µg/L	0.1-2.0	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Uranium	µg/L	0.01	NG	NG	0.144	2.25	2.04	6.39	6.53	0.466
Vanadium	µg/L	0.5-10	NG	NG	0.79	<0.5	<0.5	<0.5	<0.5	0.99
Zinc	µg/L	1.00	NG	NG	1.8	3.3	35.1	9.3	4.1	2.4
Zirconium	µg/L	0.06-1.2	NG	NG	0.61	<0.31	0.42	0.34	<0.34	0.58
Laboratory Work Order Number					L2438183	L2454036	L2464256	L2482349	L2493339	L2438183
Laboratory Identification Number					L2438183-5		L2464256-6	L2482349-4	L2493339-3	L2438183-4

Appendix B3: L3 Creek Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST [1]	BCAWQG-FLT [2]	LBL4C-0.18 27-May-20	LBL4C-0.18 21-Jun-20	LBL4C-0.18 29-Jul-20	LBL4C-0.18 23-Aug-20	LBL4C-0.18 29-Sep-20	LBL4C-0.18 21-Oct-20	LBL4C-0.18 30-Nov-20
Magnesium	µg/L	5.0	NG	NG	43600	41700	95000	111000	113000	132000	138000
Manganese	µg/L	0.10	NG	NG	867	837	4330	5170	5880	5710	5470
Mercury	µg/L	0.005-0.1	NG	NG	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05-1.0	NG	NG	0.783	1.04	0.25	0.124	0.25	0.25	0.25
Nickel	µg/L	0.50	NG	NG	52.2	63.9	411	469	603	601	639
Phosphorus	µg/L	50-1000	NG	NG	<50	<50	<250	<50	<250	<250	<250
Potassium	µg/L	50.0	NG	NG	7980	7420	5140	5060	4250	4110	4370
Rubidium	µg/L	0.20	NG	NG	1.75	2.23	5.4	6	6.4	5.1	4.7
Selenium	µg/L	0.05-1.0	NG	2.0	0.651	1.28	0.84	1.41	0.76	1.01	1.02
Silicon	µg/L	50.0	NG	NG	3560	4400	9370	11100	10100	10100	9770
Silver	µg/L	0.01-0.2	NG	NG	<0.01	<0.01	0.05	<0.01	0.05	0.05	0.05
Sodium	µg/L	50.0	NG	NG	62900	49000	107000	135000	152000	171000	211000
Strontium	µg/L	0.20	NG	NG	412	432	636	765	766	819	924
Sulfur	µg/L	500	NG	NG	143000	137000	444000	629000	596000	577000	474000
Tellurium	µg/L	0.2-4.0	NG	NG	<0.2	<0.2	1	<0.2	1	1	1
Thallium	µg/L	0.01-0.2	NG	NG	0.018	0.017	0.068	0.083	0.086	0.079	0.064
Thorium	µg/L	0.1-2.0	NG	NG	<0.1	<0.1	0.5	0.83	1.27	1.34	0.92
Tin	µg/L	0.1-2.0	NG	NG	<0.1	<0.1	0.5	<0.1	0.5	0.5	0.5
Titanium	µg/L	0.3-6.0	NG	NG	<0.3	<0.3	1.5	<0.3	1.5	1.5	1.5
Tungsten	µg/L	0.1-2.0	NG	NG	<0.1	<0.1	0.5	<0.1	0.5	0.5	0.5
Uranium	µg/L	0.01	NG	NG	1.8	2.25	3.88	4.97	6.35	5.8	5.06
Vanadium	µg/L	0.5-10	NG	NG	<0.5	<0.5	2.5	<0.5	2.5	2.5	2.5
Zinc	µg/L	1.00	NG	NG	42.7	30.7	863	971	1370	1340	1470
Zirconium	µg/L	0.06-1.2	NG	NG	<0.2	<0.2	<1.0	<0.2	1	1	1
Laboratory Work Order Number					L2454036	L2464256	L2482349	L2493339	L2510600	L2520235	L2535101
Laboratory Identification Number						L2464256-7	L2482349-7	L2493339-4	L2510600-2	L2520235-2	L2535101-8

Notes:

Screening completed on BC AWQG-FWAL STM [1] and LTA [2] guideline values.

[1] BC Ministry of Environment, Water Protection & Sustainability Branch (2018). British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. 36 pp. Referenced for Freshwater Aquatic Life (FWAL) water use and Short Term Maximum (STM) guidelines.

[2] BC Ministry of Environment, Water Protection & Sustainability Branch. 2018. British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. 36 pp. Referenced for Freshwater Aquatic Life (FWAL) water use and Long Term Average (LTA) guidelines.

[3] Guideline is hardness dependant. Where results are above laboratory reportable detection limits, guideline limits have been evaluated based on individual sample hardness. Sample-specific guideline values are listed in parentheses after the laboratory result, where applicable.

[4] Guideline is for Chromium (IV) cation. Analytical results are for unspeciated Chromium. Where analytical results exceed the guideline, speciated analysis may be warranted.

[5] Guideline is pH dependant.

[6] Guideline is Dissolved Organic Carbon (DOC) dependent. BML Model assumed 10% DOC and Humic acid 10% of DOC value, due to no DOC in lab analysis.

NG - No Guideline

Detection limit can vary as described in the COA. Detection limit can be raised when dilutation is requited due to high Dissolved Solids/Electrical Conductivity (DLDS), e.g. nitrite.

BOLD and shaded dark gray: Exceeds BCAWQG-FSTM (Short-term Maximum) guideline.

Shaded Light Gray: Exceeds BCAWQG-LTA (Long-term Average) guideline.

RED - Measured value is below detection limit (DL); value shown is 50% of DL

Blank - Not analyzed

Appendix A4 LBDB Area Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	LB SIDE CHANNEL E	LBP POND	LBP POND
					08/10/2020	08/10/2020	20/11/2020
Physical Parameters							
Temperature	°C						
Flow Rate	L/sec						
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	1630000	6100	3400
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	<1	295	377
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	8750	3530	4040
Hardness as CaCO3, dissolved	µg/L	500	NG	NG	2820000	1970000	2270000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L						
pH	pH Units	0.10	6.5 - 9	6.5-9.0	**3.01**	8.23	8.13
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	9120000	3380000	3910000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	126000	13900	55200
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	<1000	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	<1000	295000	377000
Anions and Nutrients							
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	7100	118	670
Ammonia FST Guideline	µg/L		pH dependent (**at Temp 4 °C** or in situ T)		-	3950	4950
Ammonia FLT Guideline				pH dependent (**at Temp 4 °C** or in situ T)	-	759	952
Chloride (Cl^-)	µg/L	500	600000	150,000	22100	6400	8200
Nitrate (NO_3^- as N)	µg/L	5.0-25.0	NG	NG	141	<25	354
Nitrite (NO_2^- as N)	µg/L	1.0-5.0	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	<10	<5	41
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	6280000	2130000	2670000
SO4 FLT Guideline Calc	µg/L		NG	Hardness 76,000-180,000 = 309,000 Hardness 181,000-250,000 = 429,000 Hardness > 250,000 site-specific	429000	429000	429000
Dissolved Organic Carbon (DOC)	mg/L		NG	NG	7.3	23.7	3.2
Metals, Total							
Aluminum	µg/L	3.00	NG	NG	116000	169	1450
Antimony	µg/L	0.10	NG	NG	0.5	0.5	0.5
Arsenic	µg/L	0.10	5.0	5.0	**11.9**	0.75	1.29
Barium	µg/L	0.10	NG	NG	60.5	81.7	66.1
Beryllium	µg/L	0.10	NG	NG	19.1	0.5	0.5
Bismuth	µg/L	0.05	NG	NG	0.25	0.25	0.25
Boron	µg/L	10.0	1200	1200	**1280**	208	216
Cadmium	µg/L	0.005	NG	NG	3.67	0.037	0.285
Calcium	µg/L	50	NG	NG	329000	419000	505000
Cesium	µg/L	0.01	NG	NG	0.507	0.05	0.05
Chromium [4]	µg/L	0.1-1.0	NG	NG	8.4	0.5	0.81
Cobalt	µg/L	0.10	110	4.0	**472**	13.5	58.2
Copper [3]	µg/L	0.50	Calc. based on Hardness	2 to 10	46.4	2.5	2.5
Cu FST Guideline Calc. (relevant prior to August 2019)	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness ≥ 400,000 is Capped Value of 400,000		39.6	39.6	39.6
Cu FLT Guideline Calc. (relevant prior to August 2019)	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	10.0	10.0	10
Iron	µg/L	10	1000	NG	**293000**	**1260**	**8750**
Lead [3]	µg/L	0.05	101 - 348	Calc. based on Hardness	2.52	0.25	0.37
Pb FST Guideline Calc (Based on Hardness as CaCO3), applies to water hardness 8000-360,000 µg/L	µg/L		Based on Hardness 8000-360,000 Hardness ≤ 8000: 3 Hardness > 8000 : calc.		417.0	417.0	417.0
Pb FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 8000-360,000 Hardness ≤ 8000, NG Hardness > 8000 : calc.	19.6	19.6	19.6
Lithium	µg/L	1.0	NG	NG	320	81.8	104
Magnesium	µg/L	5.0	NG	NG	411000	220000	265000
Manganese [3]	µg/L	0.10	Calc. based on Hardness	Calc. based on Hardness	**17300**	**6550**	**13500**
Mn FST Guideline Calc (Based on Hardness as CaCO3)	µg/L		Applies to Hardness 25000-259000 µg/L Mn : calc.		3394.2	3394.2	3394.2
Mn FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 37000-450000 µg/L Mn : calc.	2585	2585	2585
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	2000	≤ 1000	0.96	1.84	1.7
Nickel	µg/L	0.50	NG		1570	38	91.2
Phosphorus	µg/L	50.0	NG	NG	290	<250	<250
Potassium	µg/L	50.0	NG	NG	7950	15300	15200
Rubidium	µg/L	0.2	NG	NG	16.1	3.4	4.6
Selenium	µg/L	0.05	NG	2.0	0.65	0.43	0.49
Silicon	µg/L	100.0	NG	NG	6860	970	5210
Silver [3] (Based on Hardness < or > 100000)	µg/L	0.01	0.10 - 3.0	0.05 - 1.5	0.102	0.05	0.05
Ag FST Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		3.0	3.0	3.0
Ag FLT Guideline Calc	µg/L			Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	1.5	1.5	1.5
Sodium	µg/L	50.0	NG	NG	1170000	250000	269000
Strontium	µg/L	0.2	NG	NG	3070	1030	1090
Sulfur	µg/L	500.0	NG	NG	2200000	749000	831000
Tellerium	µg/L	0.2	NG	NG	1	1	1
Thallium	µg/L	0.01	NG	NG	0.181	0.05	0.05
Thorium	µg/L	0.10	NG	NG	4.66	0.5	0.5
Tin	µg/L	0.10	NG	NG	0.5	0.5	0.5
Titanium	µg/L	0.3-4.5	NG	NG	14.2	1.5	3.3
Tungsten	µg/L	0.10	NG	NG	0.5	0.5	0.5
Uranium	µg/L	0.01	NG	NG	5.62	5.85	9.71
Vanadium	µg/L	0.50	NG	NG	4.5	2.5	2.5
Zinc [3] (Based on Hardness < or > 90,000)	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	**10600**	20	**396**
Zn FST Guideline Calc.	µg/L		Hardness 90,000 - 500,000, Calc. Hardness > 500,000, is Capped Value of 500,000		340.5	340.5	340.5
Zn FLT Guideline Calc.				Hardness 90,000 - 330,000, Calc. Hardness > 330,000, is Capped Value of 330,000	187.5	187.5	187.5
Zircronium	µg/L	0.06	NG	NG	1.2	<1	<1
Metals, Dissolved							
Aluminum [5]	µg/L	1.0	100	50	**134000**	25.9	**294**
Al FST Guideline Calc (based on pH)	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		30.4	100.0	100.0
Al FLT Guideline Calc (based on median pH)	µg/L			median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	8.5	50.0	50.0
Antimony	µg/L	0.10	NG	NG	0.5	0.5	0.15
Arsenic	µg/L	0.10	NG	NG	10.7	0.6	0.75
Barium	µg/L	0.10	NG	NG	11.1	77.5	54.7
Beryllium	µg/L	0.10	NG	NG	22.7	0.5	<0.1
Bismuth		0.05	NG	NG	0.25	0.25	<0.05
Boron	µg/L	10.0	NG	NG	1500	202	220
Cadmium [3] (Based on Hardness as $CaCO_3$)	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	**3.85**	0.025	0.0188
Cd FST Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		2.80	2.80	2.80
Cd FLT Guideline Calc.				Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.46	0.46	0.46
Calcium	µg/L	50.0	NG	NG	362000	419000	483000
Cesium		0.01	NG	NG	0.278	0.05	<0.01
Chromium	µg/L	0.10	NG	NG	7.16	0.5	0.29
Cobalt	µg/L	0.10	NG	NG	568	13.1	56.7
Copper [6]	µg/L	0.20	Calc. based on BLM Model	Calc. based on BLM Model	**49.3**	<1	0.32
Cu FST Guideline Value (Acute)	µg/L		BLM Ligand Model value		0.2	147.7	21.5
Cu FLT Guideline Value (Chronic)	µg/L			BLM Ligand Model value	0.2	26.2	3.00
Iron	µg/L	10.0	350	NG	**314000**	**416**	**7180**
Lead	µg/L	0.05	NG	NG	1.0	0.25	<0.05
Lithium	µg/L	1.0	NG	NG	381	85.9	100
Magnesium	µg/L	5.0	NG	NG	464000	225000	257000
Manganese	µg/L	0.10	NG	NG	20100	6700	13500
Mercury	µg/L	0.005	NG	NG	<0.005	<0.005	<0.005
Molybdenum	µg/L	0.05	NG	NG	0.45	1.94	1.58
Nickel	µg/L	0.50	NG	NG	1850	37.1	90.3
Phosphorus	µg/L	50.0	NG	NG	<250	<250	<50

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	LB SIDE CHANNEL E	LBP POND	LBP POND
					08/10/2020	08/10/2020	20/11/2020
Potassium	µg/L	50.0	NG	NG	7730	13600	15000
Rubidium	µg/L	0.20	NG	NG	15	3.2	3.95
Selenium	µg/L	0.05	NG	2.0	0.69	0.34	0.324
Silicon	µg/L	50.0	NG	NG	6040	800	4730
Silver	µg/L	0.01	NG	NG	0.05	0.05	<0.01
Sodium	µg/L	50.0	NG	NG	1270000	238000	259000
Strontium	µg/L	0.20	NG	NG	3430	1020	1030
Sulfur	µg/L	500	NG	NG	2470000	774000	832000
Tellurium	µg/L	0.20	NG	NG	<1	<1	<0.2
Thallium	µg/L	0.01	NG	NG	0.134	0.05	<0.01
Thorium	µg/L	0.10	NG	NG	3.91	0.5	<0.1
Tin	µg/L	0.10	NG	NG	0.5	0.5	<0.1
Titanium	µg/L	0.30	NG	NG	1.5	1.5	<0.3
Tungsten	µg/L	0.10	NG	NG	0.5	0.5	<0.1
Uranium	µg/L	0.01	NG	NG	5.49	5.07	9.29
Vanadium	µg/L	0.50	NG	NG	2.5	2.5	<0.5
Zinc	µg/L	1.00	NG	NG	12900	16.3	227
Zircronium	µg/L	0.06	NG	NG	<1	<1	0.28
Laboratory Work Order Number					L2515191	L2515191	L2532220
Laboratory Identification Number					L2515191-3	L2515191-4	L2532220-1

Notes:

Screening completed on BC AWQG-FWAL FST 1 and FLT 2 guideline values.

[1] BC Ministry of Environment, Water Protection & Sustainability Branch (2019), British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. 36 pp. Referenced for Freshwater Aquatic Life (FWAL) water use and Short Term Maximum (FST) guidelines.

[2] BC Ministry of Environment, Water Protection & Sustainability Branch (2018). British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. 36 pp. Referenced for Freshwater Aquatic Life (FWAL) water use and Long Term Average (FLT) guidelines.

[3] Guideline is hardness dependant. Where results are above laboratory reportable detection limits, guideline limits have been evaluated based on individual sample hardness. Sample-specific guideline values are listed in parentheses after the laboratory result, where applicable.

[4] Guideline is for Chromium (IV) cation. Analytical results are for unspeciated Chromium. Where analytical results exceed the guideline, speciated analysis may be warranted.

[5] Guideline is pH dependant.

[6] Guideline is Dissolved Organic Carbon (DOC) dependent. BML Model assumed 10% DOC and Humic acid 10% of DOC value, due to no DOC in lab analysis.

NG - No Guideline

Detection limit can vary as described in the COA. Detection limit can be raised when dilutation is requited due to high Dissolved Solids/Electrical Conductivity (DLDS), e.g. nitrite.

BOLD and shaded dark gray: Exceeds BCAWQG-FFST (Short-term Maximum) guideline.

Shaded Light Gray: Exceeds BCAWQG-FLT (Long-term Average) guideline.

RED - Measured value is below detection limit (DL); value shown is 50% of DL

Blank - Not analyzed

Appendix B5 L2 Powerhouse Water Analytical Results

Parameter	Unit	RDL	BCAWQG - FST 1	BCAWQG - FLT 2	L2 DS	L2 DS	L2 DS	L2 DS	L2 DS (0.01um filter)	L2 US	L2 US
					08/10/2020	20/11/2020	04/12/2020	14-12-2020	14-12-2020	08/10/2020	04/12/2020
Physical Parameters											
Temperature	°C										
Flow Rate	L/sec										
Acidity (Total as $CaCO_3$)	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000		<1000	1400
Alkalinity (Total as $CaCO_3$)	mg/L	1.0	NG	NG	171	262	166	343		180	153
Electrical Conductivity (EC)	µS/cm	2.0	NG	NG	577	1050	707	1550		761	459
Hardness as CaCO3, dissolved	µg/L	500	NG	NG	92200	210000	134000	291000		256000	153000
Hardness as CaCO3, from total Ca/Mg (New January 2020)	µg/L										
pH	pH Units	0.10	6.5 - 9	6.5-9.0	8.36	8.31	8.52	8.26		8.34	8.22
Total Dissolved Solids (TDS)	µg/L	10000	NG	NG	388000	672000	545000	1000000		507000	302000
Total Suspended Solids (TSS)	µg/L	3000	NG	NG	136000	7900	76100	144000		23000	19900
Alkalinity (Hydroxide) as $CaCO_3$	µg/L	1000	NG	NG	<1000	<1000	<1000	<1000		<1000	<1000
Alkalinity (Carbonate as $CaCO_3$)	µg/L	1000	NG	NG	4000	5000	9800	<1000		4400	<1000
Alkalinity (Bicarbonate as $CaCO_3$)	µg/L	1000	NG	NG	167000	257000	156000	343000		176000	153000
Anions and Nutrients											
Ammonia (NH_4 as N)	µg/L	5.0	pH dependent (6.5-9.0)	pH dependent (6.5-9.0)	111	218	252	334		53	<50
Ammonia FST Guideline	µg/L		pH dependent (**at Temp 4 °C** or in situ T)		2520	3150	2010	3150		3150	3950
Ammonia FLT Guideline				pH dependent (**at Temp 4 °C** or in situ T)	484	606	387	606		606	759
Chloride (Cl^-)	µg/L	500	600000	150,000	23000	65600	44000	110000		46200	6570
Nitrate (NO_3^- as N)	µg/L	5.0-25.0	NG	NG	218	237	145	316		430	316
Nitrite (NO_2^- as N)	µg/L	1.0-5.0	Cl-dependent (> 10,000 µg/L) Guideline: 600 ug/L	Cl-dependent (> 10,000 µg/L) Guideline: 200 ug/L	13.1	19.3	19.5	41		17.9	<1
Sulphate (SO_4) [3]	µg/L	300	NG	309,000 - 429,000	105000	204000	120000	348000		132000	86200
SO4 FLT Guideline Calc	µg/L		NG	Hardness 76,000-180,000 = 309,000; Hardness 181,000-250,000 = 429,000; Hardness > 250,000 site-specific	309000	429000	309000	429000		429000	309000
Dissolved Organic Carbon (DOC)	mg/L		NG	NG	4.8	22.2	4.2	2.86		4.1	1.6
Metals, Total											
Aluminum	µg/L	3.00	NG	NG	690	367	781	497		755	399
Antimony	µg/L	0.10	NG	NG	2.36	1.23	1.62	1.89		1.62	0.45
Arsenic	µg/L	0.10	5.0	5.0	1.92	1.79	2.35	2.88		1.57	0.71
Barium	µg/L	0.10	NG	NG	87.7	56.7	71.4	56.4		144	78.7
Beryllium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1		<0.1	<0.1
Bismuth	µg/L	0.05	NG	NG	<0.05	<0.05	<0.05	<0.25		<0.05	<0.05
Boron	µg/L	10.0	1200	1200	193	177	139	308		200	80
Cadmium	µg/L	0.005	NG	NG	0.0294	0.0238	0.0362	<0.025		0.0529	0.052
Calcium	µg/L	50	NG	NG	75900	61800	37500	97200		71100	42400
Cesium	µg/L	0.01	NG	NG	0.105	0.037	0.081	0.058		0.128	0.062
Chromium [4]	µg/L	0.1-1.0	NG	NG	2.9	1.14	2.18	1.59		5.61	1.09
Cobalt	µg/L	0.10	110	4.0	0.55	0.22	0.41	<0.5		1.03	0.38
Copper [3]	µg/L	0.50	Calc. based on Hardness	2 to 10	3.81	2.19	3.57	<2.5		3.64	1.95
Cu FST Guideline Calc. (relevant prior to August 2019)	µg/L		Hardness 13,000 - 400,000 : calc.; Hardness ≥ 400,000 is Capped Value of 400,000		10.7	21.74	14.596	29.354		26.1	16.382
Cu FLT Guideline Calc. (relevant prior to August 2019)	µg/L			Hardness 50,000 - 250,000: calc.; Hardness > 250,000, Cu = 10	3.7	8.4	5.36	10		10.0	6.12
Iron	µg/L	10	1000	NG	702	222	483	290		**1110**	963
Lead [3]	µg/L	0.05	101 - 348	Calc. based on Hardness	0.56	0.29	0.424	0.27		0.69	0.493
Pb FST Guideline Calc (Based on Hardness as CaCO3), applies to water hardness 8000-360,000 µg/L	µg/L		Based on Hardness 8000-360,000 Hardness ≤ 8000: 3 Hardness > 8000 : calc.		73.6	209.9	118.5	318.0		270.2	140.295
Pb FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 8000-360,000 Hardness ≤ 8000, NG Hardness > 8000 : calc.	6.2	11.5	7.9	15.7		13.8	8.782
Lithium	µg/L	1.0	NG	NG	31.8	33.5	26.7	57.3		27.1	18.4
Magnesium	µg/L	5.0	NG	NG	22700	18100	12000	27300		15900	10600
Manganese [3]	µg/L	0.10	Calc. based on Hardness	Calc. based on Hardness	17	6.99	12.4	8.45		38.3	43.4
Mn FST Guideline Calc (Based on Hardness as CaCO3)	µg/L		Applies to Hardness 25000-259000 µg/L Mn : calc.		1556.0	2854.2	2016.7	3394.2		3361	2226
Mn FLT Guideline Calc (Based on Hardness as CaCO3)	µg/L			Applies to Hardness 37000-450000 µg/L Mn : calc.	1010.7	1529.0	1194.6	1885.4		1731	1278
Mercury (Based on methyl Hg & total mass Hg)	µg/L	0.005	NG	Calc.	<0.005	<0.005	<0.005	<0.005		<0.005	<0.005
Molybdenum	µg/L	0.05	2000	≤ 1000	11.4	16.5	19.2	33.7		8.37	2.18
Nickel	µg/L	0.50	NG		2	1.5	1.85	<2.5		3.68	3.7
Phosphorus	µg/L	50.0	NG	NG	<50	<50	<50	<250		<59	53
Potassium	µg/L	50.0	NG	NG	6140	5390	6260	8250		5170	1490
Rubidium	µg/L	0.2	NG	NG	6.56	6.09	8.05	8.9		3.84	1.18
Selenium	µg/L	0.05	NG	2.0	2.65	1.8	1.72	3.43		1.86	2.32
Silicon	µg/L	100.0	NG	NG	6140	4480	5420	5840		6400	3540
Silver [3] (Based on Hardness < or > 100000)	µg/L	0.01	0.10 - 3.0	0.05 - 1.5	0.016	<0.01	<0.01	<0.05		0.023	<0.01
Ag FST Guideline Calc	µg/L		Hardness ≤ 100,000 Ag = 0.10 Hardness > 100,000 Ag = 3.0		0.1	3.0	3.0	3.0		3.0	3
Ag FLT Guideline Calc	µg/L			Hardness ≤ 100,000 Ag = 0.05 Hardness > 100,000 Ag = 1.5	0.05	1.5	1.5	1.5		1.5	1.5
Sodium	µg/L	50.0	NG	NG	151000	158000	136000	260000		74100	36400
Strontium	µg/L	0.2	NG	NG	286	253	205	363		491	289
Sulfur	µg/L	500.0	NG	NG	82300	67700	53500	120000		49700	30700
Tellerium	µg/L	0.2	NG	NG	<0.2	<0.2	<0.2	<1		<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	0.018	<0.01	0.011	<0.05		0.025	0.014
Thorium	µg/L	0.10	NG	NG	0.14	<0.1	<0.1	<0.5		0.16	0.11
Tin	µg/L	0.10	NG	NG	1.53	0.4	1.25	0.56		1.24	0.24
Titanium	µg/L	0.3-4.5	NG	NG	19.6	4.21	11.6	4.7		20.9	11.5
Tungsten	µg/L	0.10	NG	NG	1.01	0.53	1.03	1.03		0.63	<0.1
Uranium	µg/L	0.01	NG	NG	2.53	1.8	1.35	2.98		1.63	1.23
Vanadium	µg/L	0.50	NG	NG	5.32	3.45	5.19	6.6		3.95	1.79
Zinc [3] (Based on Hardness < or > 90,000)	µg/L	3.0	Calc. based on Hardness	Calc. based on Hardness	21.6	18.1	13.4	<15		21.9	10.2
Zn FST Guideline Calc.	µg/L		Hardness 90,000 - 500,000, Calc. Hardness > 500,000, is Capped Value of 500,000		34.7	123.0	66.0	183.8		157.5	80.25
Zn FLT Guideline Calc.				Hardness 90,000 - 330,000, Calc. Hardness > 330,000, is Capped Value of 330,000	9.15	97.5	40.5	158.25		132	54.75
Zircronium	µg/L	0.06	NG	NG	0.75	0.27	0.63	<1		0.46	<0.23
Metals, Dissolved											
Aluminum [5]	µg/L	1.0	100	50	48.3	**258**	**552**	**340**	**235**	20.4	9.8
Al FST Guideline Calc (based on pH)	µg/L		pH < 6.5 : calc. Al pH ≥ 6.5 : 100.0 Al		100	100	100	100	100	100	100
Al FLT Guideline Calc (based on median pH)	µg/L			median pH < 6.5 : calc. Al median pH ≥ 6.5 : 50.0 Al	50	50	50	50	50	50	50
Antimony	µg/L	0.10	NG	NG	0.39	1.2	1.75	1.68	1.71	1.47	0.38
Arsenic	µg/L	0.10	NG	NG	0.79	1.75	2.57	2.69	2.43	0.97	0.37
Barium	µg/L	0.10	NG	NG	47	52.9	58.4	43.8	32	137	63.5
Beryllium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.1	<0.02	<0.1	<0.1
Bismuth		0.05	NG	NG	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05
Boron	µg/L	10.0	NG	NG	46	187	168	280	301	188	91
Cadmium [3] (Based on Hardness as $CaCO_3$)	µg/L	0.005	Calc. based on Hardness	Calc. based on hardness	0.0058	0.0077	0.0098	<0.025	<0.01	0.014	0.016
Cd FST Guideline Calc.	µg/L		Hardness 7,000 - 455,000, Calc. Hardness > 455,000, is Capped Value of 455,000		0.54	1.26	0.80	1.77		1.55	0.9115
Cd FLT Guideline Calc.	µg/L			Hardness 3,400 - 285,000, Calc. Hardness > 285,000, is Capped Value of 285,000	0.20	0.37	0.26	0.46		0.42	0.2892
Calcium	µg/L	50.0	NG	NG	26000	56300	37000	73100	68400	74100	44700
Cesium		0.01	NG	NG	<0.01	0.026	0.029	<0.05	0.039	<0.01	<0.01
Chromium	µg/L	0.10	NG	NG	0.56	0.59	1.88	1.28	1.13	3.59	0.35
Cobalt	µg/L	0.10	NG	NG	<0.1	0.11	0.11	<0.5	0.12	0.47	<0.1
Copper [6]	µg/L	0.20	Calc. based on BLM Model	Calc. based on BLM Model	1.36	0.84	1.33	<1	1.02	1.03	0.67
Cu FST Guideline Value (Acute)	µg/L		BLM Ligand Model value		28.6	172.1	41.1	23.5	23.5	36.6	10.6
Cu FLT Guideline Value (Chronic)	µg/L			BLM Ligand Model value	5.4	37.2	9.2	4.4	4.4	7.7	2.0
Iron	µg/L	10.0	350	NG	23	25	27	<50	<10	<10	<10
Lead	µg/L	0.05	NG	NG	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05
Lithium	µg/L	1.0	NG	NG	6.4	34.7	28.5	49.6	64.3	29.7	19.4
Magnesium	µg/L	5.0	NG	NG	6620	16900	10000	26400	27800	17300	10000
Manganese	µg/L	0.10	NG	NG	1.25	3.49	2.46	2.55	0.22	22.1	19.4
Mercury	µg/L	0.005	NG	NG	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005
Molybdenum	µg/L	0.05	NG	NG	3.47	16.8	23.1	30.8	33	8.74	2.47
Nickel	µg/L	0.50	NG	NG	0.81	1.21	1.17	<2.5	1.73	2.7	2.73
Phosphorus	µg/L	50.0	NG	NG	<50	<50	<50	<250	<50	<50	<50
Potassium	µg/L	50.0	NG	NG	1550	5730	6930	8300	9340	5250	1320
Rubidium	µg/L	0.20	NG	NG	1.07	6.5	7.58	8.5	8.38	2.67	0.57
Selenium	µg/L	0.05	NG	2.0	0.517	1.79	1.7	3.36	3.58	2.04	2.69
Silicon	µg/L	50.0	NG	NG	2770	4360	4980	5440	5480	4440	2860
Silver	µg/L	0.01	NG	NG	<0.01	<0.01	<0.01	<0.05	<0.02	<0.01	<0.01
Sodium	µg/L	50.0	NG	NG	21900	155000	124000	257000	288000	73300	34700
Strontium	µg/L	0.20	NG	NG	115	234	189	319	337	649	291
Sulfur	µg/L	500	NG	NG	9480	67300	45400	113000	134000	51100	29600
Tellurium	µg/L	0.20	NG	NG	<0.2	<0.2	<0.2	<1	<0.2	<0.2	<0.2
Thallium	µg/L	0.01	NG	NG	<0.01	<0.01	<0.01	<0.05	<0.01	<0.01	<0.01
Thorium	µg/L	0.10	NG	NG	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1
Tin	µg/L	0.10	NG	NG	0.36	0.33	1.38	<0.5	0.42	0.77	0.12
Titanium	µg/L	0.30	NG	NG	0.73	0.85	0.98	<1.5	<0.3	0.32	<0.3
Tungsten	µg/L	0.10	NG	NG	0.2	0.64	1.25	0.98	0.98	0.56	<0.1
Uranium	µg/L	0.01	NG	NG	0.536	1.75	1.14	2.76	2.53	1.36	1.14
Vanadium	µg/L	0.50	NG	NG	1.15	2.91	4.8	5.9	5.56	1.47	<0.5
Zinc	µg/L	1.00	NG	NG	2.4	4.9	2.2	<5	<1.0	5.1	2.8
Zircronium	µg/L	0.06	NG	NG	<0.2	<0.2	<0.2	<1	<0.3	<0.2	<0.2
Laboratory Work Order Number					L2515191	L2532220	L2537214	L2540107	VA20C3500	L2515191	L2537214
Laboratory Identification Number					L2515191-2	L2532220-2	L2537214-2	L2540107-1	VA20C3500-001	L2515191-1	L2537214-1

Notes:

Screening completed on BCAWQG-FST [1] and FLT [2] guideline values.

[1] BC Ministry of Environment, Water Protection & Sustainability Branch (2019). British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. 36 pp.

[2] BC Ministry of Environment, Water Protection & Sustainability Branch (2018). British Columbia Approved Water Quality Guidelines (BCAWQG): Aquatic Life, Wildlife & Agriculture Summary Report. 36 pp.

[3] Guideline is hardness dependant. Where results are above laboratory reportable detection limits, guideline limits have been evaluated based on individual sample hardness. Sample-specific guideline values are

[4] Guideline is for Chromium (IV) cation. Analytical results are for unspeciated Chromium. Where analytical results exceed the guideline, speciated analysis may be warranted.

[5] Guideline is pH dependant.

NG - No Guideline

Detection limit can vary as described in the COA. Detection limit can be raised when dilutation is required due to high Dissolved Solids/Electrical Conductivity (DLDS), e.g. nitrite.

BOLD and shaded dark gray: Exceeds BCAWQG-FST (Freshwater Short Term) guideline.

Shaded Light Gray: Exceeds BCAWQG-FLT (Freshwater Long Term) guideline.

RED - Measured value is below detection limit (DL); value shown is 50% of DL

Blank - Not analyzed