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Technical Report Overview

Report: Line Creek Local Aquatic Effects Monitoring Program (LAEMP) Report 2021

Overview: This report presents the 2021 results of the local aquatic effects monitoring program developed for Teck's Line Creek Operations. The report presents data and evaluation of potential effects of the West Line Creek Active Water Treatment Facility on biological productivity and tissue selenium accumulation downstream of the facility.

This report was prepared for Teck by Minnow Environmental Inc.

For More Information

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Future studies will be made available at **teck.com/elkvalley.**

Line Creek Local Aquatic Effects Monitoring Program (LAEMP) Report, 2021

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April 2022

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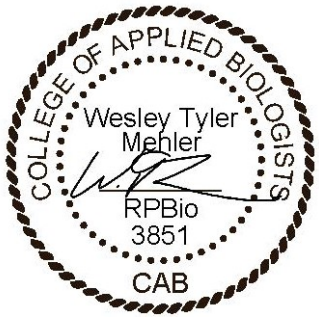

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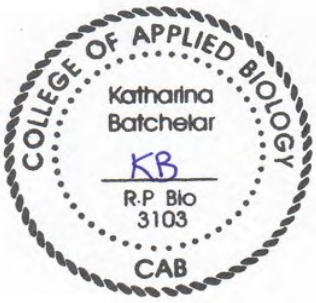

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EXECUTIVE SUMMARY

The Line Creek Local Aquatic Effects Monitoring Program (LAEMP) was primarily designed to evaluate changes related to the commissioning of the West Line Creek (WLC) Active Water Treatment Facility (AWTF) at the Line Creek Operation (LCO). There are three main foci to the monitoring in relation to the operation of the AWTF. Firstly, the fluidized bed reactor technology used at the WLC AWTF for selenium and nitrate removal requires the addition of phosphorus to the treatment process. Although the WLC AWTF is managed to minimize the amount of residual phosphorus in treated effluent, there is potential for phosphorus concentrations to increase in Line Creek downstream from the WLC AWTF discharge and potentially cause increased algal growth and changes to the trophic status and biotic community structure. Secondly, selenium removal from water involves microbial uptake, which deceases total selenium loads to Line Creek, but has the potential to biotransform selenium into reduced and more readily available forms of selenium to biota (i.e., selenite and organoselenium). The third focus of the LAEMP is to monitor other conditions related to active water treatment that could potentially adversely influence the receiving environment, other than those addressed by the first two foci.

Based on the above, the objectives for the Line Creek LAEMP were expressed as the following study questions: (1) Is active water treatment affecting biological productivity downstream in Line Creek? (2) Are tissue selenium concentrations reduced downstream from the WLC AWTF? and (3) Is WLC AWTF operation affecting aquatic biota through thermal effects, effects on dissolved oxygen concentrations, or concentrations of treatment-related constituents other than nutrients or selenium? This report evaluates monitoring data up to the end of the 2021 calendar year.

The WLC AWTF was recommissioned in 2018 with an Advanced Oxidation Process (AOP[1]), which is designed to reverse the shift in selenium species in AWTF effluent from chemically-reduced species back to a selenate-dominated condition. This change in treatment process was implemented in response to monitoring in 2016 and 2017 that confirmed elevated aqueous concentrations of chemically-reduced selenium in AWTF effluent (which have greater potential for bioaccumulation than selenate) and correspondingly elevated selenium concentrations in benthic invertebrates. Discharge to the receiving environment from the AWTF with AOP began on October 28, 2018 with variable flow and continued to do so until December 30, 2018, at which time consistent treatment flow near the maximum capacity of the facility began and has continued to do so into 2021.

[1] AOP refers to the advanced oxidation process and associated AWTF process modifications.

Biological productivity downstream in Line Creek did not appear to be influenced by operational activities of the AWTF with AOP in 2021. In 2021, concentrations of nutrients (total phosphorus, orthophosphate, and nitrate) were generally in the ranges of concentrations observed in previous years, with the operation of the AWTF with AOP (2019 to 2021) being more successful at minimizing phosphorus and orthophosphate contributions to the receiving environment than operation of the AWTF without AOP (in 2016 and 2017). Periphyton coverage at both mine-exposed and reference areas was moderate in 2021 (based on visual assessment) and showed temporal consistency with previous years. Areas that had moderately high periphyton coverage in 2020, RG_LILC3 and RG_LIDCOM, deceased to moderate coverage in 2021. Benthic invertebrate biomass and density at RG_LILC3 and RG_LIDSL downstream of the AWTF discharge also showed no significant increases in 2021 relative to previous years that could be related to operation of the AWTF with AOP. Benthic invertebrate community endpoints, as determined from kick and sweep sample collection, indicated no consistent adverse change in community characteristics related to operation of the AWTF with AOP in 2021. For instance, benthic invertebrate total abundance was within regional normal ranges and was largely similar to previous years (2017 to 2020) at mine-exposed areas in 2021. Additionally, a continued increase in the percentage of sensitive taxa (Ephemeroptera and EPT) at most areas of Line Creek downstream from the AWTF during the AWTF with AOP period (2019 to 2021) was suggestive of an improvement in benthic invertebrate community structure. Overall, biological productivity downstream from the WLC AWTF in 2021 did not change relative to previous years.

Consistent with 2019 and 2020, concentrations of non-selenate forms of aqueous selenium and selenium in benthic invertebrate tissues were significantly lower in Line Creek during operation of the AWTF with AOP in 2021 compared to AWTF operation without AOP. As a result, mean benthic invertebrate selenium concentrations in 2021 were below the Level 1 Elk Valley Water Quality Plan (EVWQP; 13 mg/kg) benchmark (for growth, reproduction, and survival of invertebrates) at all areas downstream of the AWTF discharge. Similar to past results during the AWTF with AOP period (2019 and 2021), concentrations of aqueous non-selenate species in 2021 were generally low and reflective of the low bioaccumulation in benthic invertebrates. Comparison of benthic invertebrate selenium concentrations to the selenium bioaccumulation model indicated that selenium bioaccumulation in areas downstream of the AWTF outfall in 2021 were within expectations of the model. Selenium concentrations in westslope cutthroat trout muscle tissue from two areas in Line Creek (RG_FO23 and RG_LIDSL) were also below site-specific benchmarks and the prediction limits of the bioaccumulation model except four of eight replicates at RG_LIDSL, which were above these benchmarks as well as the prediction limits. Fish tissue selenium concentrations at RG_LIDSL were also notably lower (2.4-times)

in 2021 (during AWTF with AOP) when compared to 2017 (during operations without AOP). Combined, the results from the 2021 LCO LAEMP indicated that the recommissioned AWTF with AOP continues to function as intended in decreasing the non-selenate species in AWTF effluent. This is consistent with results from the prior two years of AWTF with AOP operation: 2019 (Minnow 2020a) and 2020 (Minnow 2021a). Additionally, results from these last three years (2019 to 2021) have shown that the AWTF with AOP have resulted in selenium accumulation in benthic invertebrates from Line Creek that would be expected (as based on the selenium bioaccumulation model).

Operation of the AWTF with AOP in 2021 did not result in an obvious change in water temperature or dissolved oxygen concentrations downstream in Line Creek relative to areas upstream of the AWTF. Evaluation of water quality analytes demonstrated no increases in analyte concentrations that resulted in concentrations above guidelines or water quality benchmarks which have been the result of the AWTF with AOP operation in 2021. AWTF effluent samples showed no acute toxicity test failures in 2021. Except for three algae (*P. subcapitata*) results and one water flea (*C. dubia*) result, chronic toxicity results in 2021 were categorized as no adverse effect. The chronic toxicity results in 2021 were similar to or lower than responses in previous years, and the absence of consistent temporal pattern of responses or clear evidence of causal factors for observed effects suggest a lack of influence of the AWTF on chronic toxicity.

Overall, operation of the WLC AWTF with AOP in 2021 functioned as designed to remove aqueous total selenium and nitrate from effluent. Recommissioning of the AWTF with AOP resulted in decreased selenium bioaccumulation downstream in Line Creek relative to AWTF operation without AOP by decreasing the concentrations of non-selenate species in AWTF effluent. In addition, operation of the AWTF with AOP in 2021 did not influence the receiving environment through effects to biological productivity, or through potential effects related to factors other than nutrients or selenium. Results of the 2021 LCO LAEMP provide information that supports Teck's Adaptive Management Plan and inform future monitoring efforts. Overall, after three years of monitoring during the AWTF with AOP period, the results have conclusively shown that AWTF is functioning as expected, that conditions in Line Creek are stable, and that the questions of LCO LAEMP have largely been addressed.

Following the results contained in this report, Teck intends to submit an application to Ministry of Environment and Climate Change Strategy (ENV) to request an amendment to discontinue the LCO LAEMP and migrate LCO LAEMP monitoring into the RAEMP program in 2022. Teck will continue to monitor in accordance with the 2021 LCO LAEMP study design (April 30, 2021; Minnow, 2021b) until an application and subsequent approval to discontinue the LCO LAEMP have been made.

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ACRONYMS AND ABBREVIATIONS

AMP – Adaptive Management Plan

ANOVA – Analysis of Variance

AOP – Advanced Oxidation Process

AWTF – Active Water Treatment Facility

BCWQG – British Columbia Water Quality Guideline

CABIN – Canadian Aquatic Biomonitoring Network

CI – Calcite Index

CMO – Coal Mountain Operation

DQR – Data Quality Review

EMC – Environmental Monitoring Committee

ENV – British Columbia Ministry of Environment and Climate Change Strategy

EPT – Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisflies)

EVFFHC – Elk Valley Fish and Fish Habitat Committee

EVO – Elkview Operation

EVWQP – Elk Valley Water Quality Plan

EWT – Early Warning Trigger

FRO – Fording River Operation

GHO – Greenhills Operation

ICP-MS – Inductively Coupled Plasma Mass Spectrometry

K-M – Kaplan-Meier Method

LAEMP – Local Aquatic Effects Monitoring Program

LCO – Line Creek Operation

LPL – Lowest Practical Level, referring to taxonomic identification of benthic invertebrates

LRL – Laboratory Reporting Limit

QA/QC – Quality Assurance / Quality Control

RAEMP – Regional Aquatic Effects Monitoring Program

SPO – Site Performance Objective

SRC – Saskatchewan Research Council

WLC – West Line Creek

1 INTRODUCTION

1.1 Background

Teck Coal Limited (Teck) operates four mines in the Elk River watershed to extract steel-making coal. The four mines are the Fording River Operation (FRO), Greenhills Operation (GHO), Line Creek Operation (LCO), and Elkview Operation (EVO; Figure 1.1). A fifth mine, Coal Mountain Mine (CMM), is also owned by Teck and located in the Elk River watershed; however, it is no longer in operation and has been moved into the care and maintenance designation. Discharges from the mines to the Elk River watershed are authorized by the British Columbia Ministry of Environment and Climate Change Strategy (ENV) through permits that are periodically issued under provisions of the *Environmental Management Act*. Permit 107517 specifies the terms and conditions associated with discharges from Teck's Elk Valley mine operations.

Section 8.3.1 of Permit 107517 (version December 1, 2021) outlines the requirements for the Line Creek Local Aquatic Effects Monitoring Program (LAEMP) as follows:

> *"The Permittee must develop and implement a Local Aquatic Effects Monitoring program to determine the effects of the Line Creek discharge on the receiving environment. An annual study design for the program must be prepared in consultation with the EMC[2] and submitted to the Director for approval by May 1 each year."*

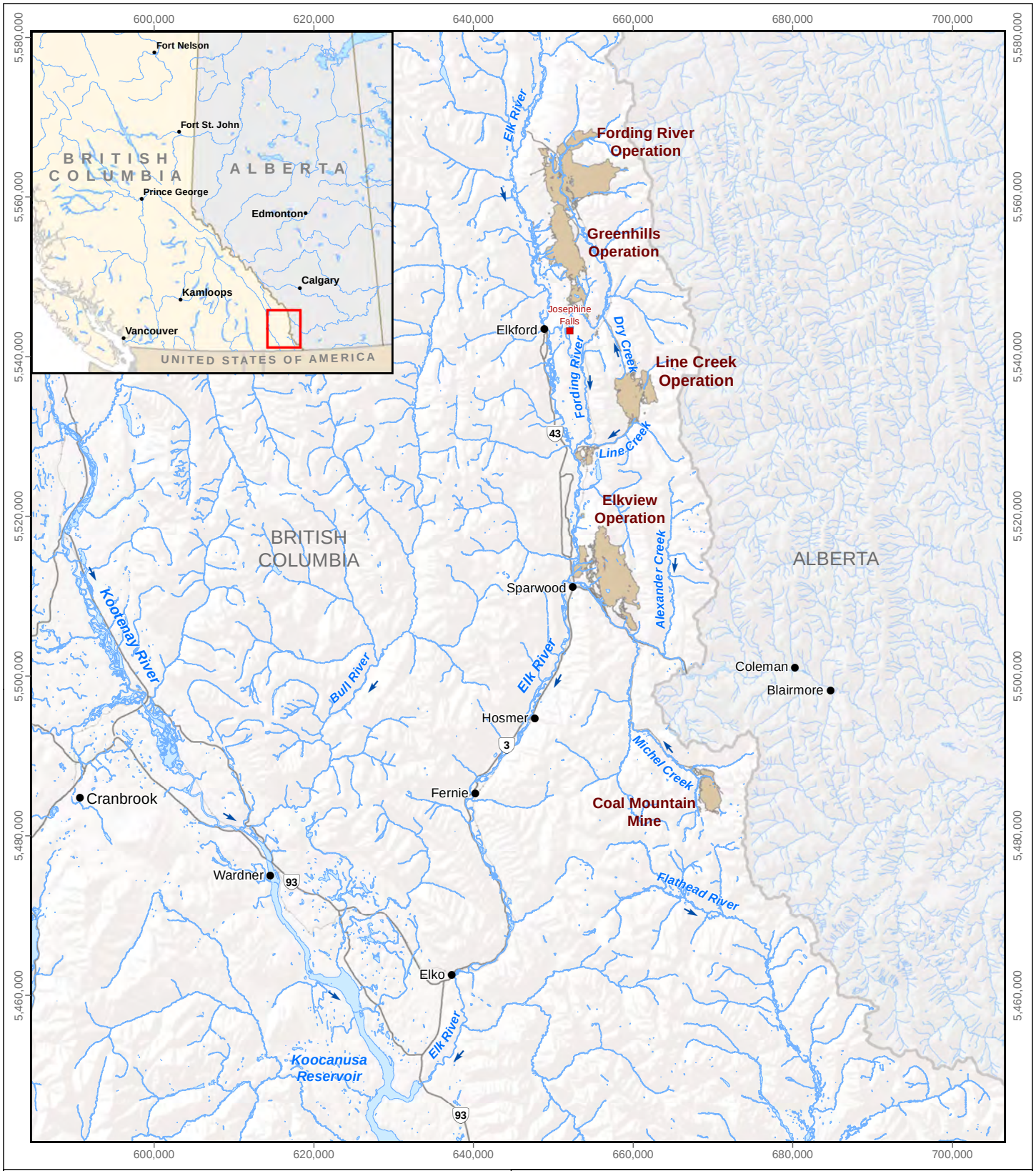
Also, Section 9.5 of Permit 107517 states:

> *The LAEMP Annual Reports must be reported on in accordance with generally accepted standards of good scientific practice in a written report and submitted to the Director by April 30 of each year following the data collection calendar year.*

In addition to monitoring under the LAEMP, Teck's Regional Aquatic Effects Monitoring Program (RAEMP) is a requirement under Permit 107517 and provides comprehensive routine monitoring and assessment of potential mine-related effects on the aquatic environment downstream from Teck's mines in the Elk Valley.

Teck conducts a variety of additional programs to monitor, evaluate, and/or manage the aquatic effects of mining operations within the Elk Valley at local and regional scales, including:

[2] EMC refers to the Environmental Monitoring Committee, which Teck was required to form under Permit 107517. The EMC consists of representatives from Teck, ENV, the Ministry of Energy and Mines, Environment Canada, the Ktunaxa Nation Council, Interior Health Authority, and an independent scientist. Environment Canada has agreed to provide input on a case-by-case basis when requested by the other members of the EMC but has not yet been called upon to participate. The EMC reviews submissions and provides technical advice to Teck and the ENV Director regarding monitoring programs.



LEGEND

Teck Coal Mine Operation

Teck's Coal Mine Operations within the Elk River Watershed, Southeast British Columbia

0 10 20 40 km

Projection: North American Datum 1983 UTM Zone 11 U

Date: January 2022
Project 217202.0036

minnow environmental inc.

Figure 1.1

Document Path: C:\Users\MLaPalme\Trinity Consultants, Inc\Teck - 217202.0036 - 2021 Line Creek LAEMP\D - GIS\LCO LAEMP\21-36 Figure 1.1 Teck Coal Limited Operation.mxd

- Water quality monitoring;
- Calcite monitoring;
- Fish and fish habitat management;
- Chronic Toxicity Testing Program;
- Tributary Management Plan; and
- Adaptive Management Plan

The goal of the Line Creek LAEMP is to assess site-specific conditions (e.g., commissioning of active water treatment) on a more frequent and localized basis than the RAEMP, as required until sufficient data have been collected, concerns no longer exist, or relevant monitoring can be incorporated into the RAEMP.

1.2 Study Questions

Although the broader objective of the Line Creek LAEMP is to assess site-specific conditions at LCO relating to potential effects of discharge on the receiving environment, the LAEMP was designed with the primary focus of monitoring aquatic health and evaluating potential effects related to the commissioning of the West Line Creek (WLC) Active Water Treatment Facility (AWTF) at LCO. Monitoring related to the operation of the WLC AWTF includes three main foci for the assessment of potential adverse effects to the receiving environment. These three foci are as follows:

1. The potential for changes in productivity, trophic status, and biological community structure downstream of the WLC AWTF. The fluidized bed reactor technology used at the WLC AWTF for selenium and nitrate removal requires the addition of phosphorus to the treatment process. Although the WLC AWTF is managed to minimize the amount of residual phosphorus in treated effluent, there is potential for phosphorus concentrations to increase in Line Creek downstream from the WLC AWTF discharge. Increased phosphorus concentrations in Line Creek could potentially cause increased algal growth and changes to trophic status and biological community structure.
2. The potential for a change in the chemical form of selenium released into Line Creek from the WLC AWTF. Selenium in surface waters of the Elk River watershed (including downstream of Teck's mines) is predominantly in the form of selenate, as would be expected in the well-oxygenated, flowing stream habitats that dominate this watershed. At the WLC AWTF, aqueous selenium is removed via uptake into microorganisms within the treatment system where it is transformed to chemically-reduced forms

(e.g., selenite and organoselenium species). In aquatic receiving environments, some reduced selenium species are accumulated into the base of the food web more readily than selenate (Ogle et al. 1988; Riedel et al. 1996; Stewart et al. 2010; Golder 2021c). The WLC AWTF was recommissioned in 2018 with an Advanced Oxidation Process (AOP) to mitigate observed increases in aqueous non-selenate selenium concentrations and in selenium accumulation in aquatic biota in the receiving environment (see Section 1.3 for details).

3. The potential for other conditions related to active water treatment to adversely influence the receiving environment (e.g., an increase in temperature or a decrease in dissolved oxygen concentrations in treated water being released to Line Creek; discharge of treatment-related constituents; or an increase in other aqueous constituents of concern).

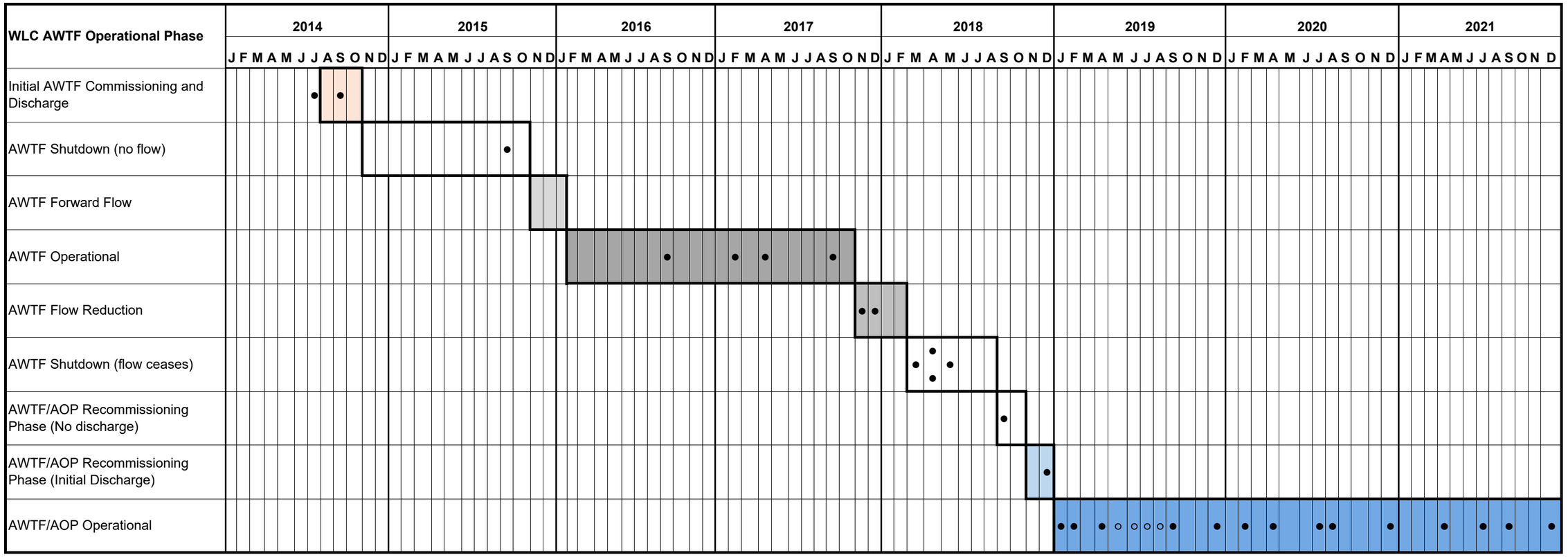
Based on the above, the objectives for the Line Creek LAEMP were expressed as the following study questions:

1. Is active water treatment affecting biological productivity downstream in Line Creek?
2. Are tissue selenium concentrations reduced downstream from the WLC AWTF?
3. Is WLC AWTF operation affecting aquatic biota through thermal effects, effects on dissolved oxygen concentrations, or concentrations of treatment-related constituents other than nutrients or selenium?

1.3 WLC AWTF Operational Timeline

Sampling for the Line Creek LAEMP began in September 2012 prior to initial commissioning of the WLC AWTF in 2014 (Figure 1.2). Interpretive reports for the Line Creek LAEMP have been submitted each year for annual monitoring that was initiated in 2014 (Minnow 2015, 2016, 2017a, 2018b, 2019a, 2020a, 2021a).

The AWTF operated briefly in 2014 (July 24 to October 16) but was shut down due to challenges with the performance of the facility, which included increased concentrations of selenium in benthic invertebrates downstream of the AWTF relative to baseline (2012; Minnow 2015). It was recommissioned in October 2015, with the operational phase commencing in February 2016 (Figure 1.2, Table 1.1). An increase in selenium concentrations in benthic invertebrates downstream of the AWTF was then noted in September 2016 (Minnow 2017a). Following this, Teck identified challenges in the performance of the WLC AWTF with respect to selenium treatment. Although treatment successfully resulted in lower aqueous total selenium concentrations in Line Creek, aqueous concentrations of chemically-reduced selenium species were elevated in AWTF effluent. These selenium species have greater potential for bioavailability



● = Tissue selenium analysis sampling event included in LAEMP Study Design or in the Approved AWTF Shutdown Plan. Multiple points in one month (i.e., April 2018) indicate multiple sampling events during the month.

○ = Additional tissue selenium analysis sampling event.

AWTF Non-Operational | AWTF Initial Operations | AWTF Forward Flow | AWTF Operational | AWTF Flow Reduction | AWTF with AOP Forward Flow | AWTF with AOP Operational

Figure 1.2: Overview of Completed Benthic Invertebrate Tissue Selenium Sampling Events in Relation to Phases of WLC AWTF Operation, 2014 to 2021

Notes: WLC = West Line Creek; AWTF = Active Water Treatment Facility; AOP = Advanced Oxidation Process; LAEMP = Local Aquatic Effects Monitoring Program.

Table 1.1: Dates Associated with Phases of WLC AWTF Operation

Phase		Start	End	Approximate Flow (m^3/day)
Initial AWTF Commissioning Phase		24-Jul-14	26-Aug-14	Variable flow
Initial AWTF Discharge		27-Aug-14	16-Oct-14	Variable flow
AWTF Shutdown (no flow)		17-Oct-14	26-Oct-15	0
AWTF Forward Flow During Commissioning		26-Oct-15	31-Jan-16	Variable flow
AWTF Operational		01-Feb-16	14-Oct-17	~5,300 to 5,500
AWTF Flow Reduction		15-Oct-17	08-Mar-18	~2,500
AWTF Intakes Closed, System Dewatered		27-Feb-18	8-Mar-18	Variable flow
AWTF Shutdown (flow ceases)		9-Mar-18	27-Oct-18	0
AWTF/AOP Recommissioning Phase[a]	No Discharge	30-Aug-18	27-Oct-18	0
	Forward Flow (Initial Discharge)	28-Oct-18	29-Dec-18[a]	0 to 5,500
AWTF/AOP Operational		30-Dec-18	indefinitely	~7,500

Notes: WLC = West Line Creek. AWTF = Active Water Treatment Facility. AOP = Advanced Oxidation Process.

[a] 120 days after recommissioning date.

to aquatic biota than selenate, which is the dominant form in the influent and other areas of the watershed (Minnow 2017a).

Continued monitoring in 2016 and 2017 confirmed that selenium concentrations in benthic invertebrates were significantly elevated downstream of the AWTF discharge relative to historical levels (Minnow 2017a, 2018b), and indicated that aqueous concentrations of chemically-reduced selenium species were elevated in Line Creek downstream of the AWTF. Teck then suspended AWTF operations in response to these results. Specifically, effluent flow through the AWTF was decreased by approximately half[3] starting in October 2017 before ceasing temporarily in March 2018 (Figure 1.2, Table 1.1), following the receipt of necessary authorizations from regulators. The AWTF flow reduction and shutdown process was supported by an approved monitoring plan (ENV 2018) that augmented the monitoring outlined in the 2017 Line Creek LAEMP study design (Minnow 2017c). During the shutdown period, concentrations of chemically-reduced aqueous selenium species decreased substantially, as did selenium concentrations in benthic invertebrate tissues (Minnow 2019a).

The AWTF remained shut down until recommissioning with an advanced oxidation process (AOP[4]), which was initiated on August 30, 2018, with no discharge to the environment occurring during this initial recommissioning (Figure 1.2, Table 1.1). The AOP is designed to reverse the shift in selenium species in AWTF effluent from chemically-reduced species back to a (chemically-oxidized) selenate-dominated condition thereby reducing the bioavailability of selenium in Line Creek. Discharge to the receiving environment from the AWTF with AOP began on October 28, 2018 with variable forward flow (Figure 1.2, Table 1.1) and this continued until December 29, 2018 (120 days after the start of recommissioning with AOP)[5], after which the AWTF with AOP operational phase began. The AWTF with AOP operational phase started on December 20, 2018[6] and has been operational since (e.g., 2019 to 2021).[7]

[3] AWTF effluent flow was approximately 5,300 - 5,500 m^3/day during operational phase, then was reduced to approximately 2,500 m^3/day during the flow reduction period.

[4] AOP refers to the advanced oxidation process and associated AWTF process modifications.

[5] AWTF effluent flow was 0 to approximately 5,500 m^3/day during operation stabilization of the AWTF with AOP.

[6] The terminology used to describe the AWTF operational phase that began on December 30, 2018 (i.e., following the AWTF/AOP recommissioning phase; August 30, 2018 to December 29, 2018) was updated to more accurately reflect AWTF/AOP operations during this time frame. Terminology in the 2019 LCO LAEMP report identified two AWTF operational phases following AWTF/AOP recommissioning; "AWTF Operational Stabilization" and "AWTF/AOP Steady State Operation" (Minnow 2020a). In the current report, the time period following AWTF/AOP recommissioning (December 30, 2018 to present) has been identified as a termed as a single "AWTF with AOP Operational" phase.

[7] The AWTF was shut down for over 24 hours on three occasions in 2021. The AWTF was shut down on June 26, 2021 for inspection/maintenance of the ozone generator (and remained off for ~32.5 hours) and for annual maintenance on two occasions, June 21 and July 27, 2021 (Teck 2022a).

1.4 Linkages to Teck's Adaptive Management Plan

As required in Section 10 of Permit 107517, Teck has developed an Adaptive Management Plan (AMP). The purpose of the AMP is to support implementation of the Elk Valley Water Quality Plan (EVWQP) to achieve water quality and calcite targets, to be protective of human health and the environment, and where necessary, restored and to facilitate continuous improvement of water quality in the Elk Valley (Teck 2021a). Following an adaptive management framework, the AMP identifies six Management Questions that will be re-evaluated at regular intervals as part of AMP updates throughout EVWQP implementation. Data from the RAEMP (Minnow 2018a, 2020b) and the various LAEMPs (including the present monitoring program) feeds into the adaptive management process to address these Management Questions that collectively address the environmental management objectives of the AMP (Teck 2021a) and the EVWQP (Teck 2014). The AMP also identifies key uncertainties that need to be reduced to fill gaps in current understanding and support achievement of the EVWQP objectives.

Information acquired from the Line Creek LAEMP is used in conjunction with studies in the Elk Valley area via the integration of data into the RAEMP (which includes other LAEMPs) to reduce these uncertainties and provide additional context to the ecological conditions of the Elk Valley area as a whole. Monitoring data from the LAEMP contributes to the broader data set assessed every three years within the RAEMP, in addition to addressing questions specific to the Line Creek LAEMP on an annual basis. The RAEMP is designed to evaluate multiple management related questions found in the AMP, such as Management Question #2, (i.e., "Will aquatic ecosystem health be protected by meeting the long-term site performance objectives?) and Management Question #5 (i.e., "Does monitoring indicate that mine-related changes in aquatic ecosystem conditions are consistent with expectations?"). Additionally, for each Management Question a "Key Uncertainty" framework has also been developed to identify data gaps and direct future work as described in annual AMP Reports.

The evaluation of biological triggers is incorporated into the current report as part of Management Question #5 of the AMP (Teck 2021a). Biological triggers were developed in consultation with the EMC for a subset of the biological monitoring endpoints that are effective indicators of changes at the ecosystem level. The purpose of the biological triggers is to quickly identify biological monitoring areas where unexpected biological conditions may be occurring that may require management action. In the current report, percent EPT (Ephemeroptera [mayflies], Plecoptera [stoneflies], and Trichoptera [caddisflies]), composite-taxa benthic invertebrate tissue selenium concentration, and westslope cutthroat trout (WCT; *Oncorhynchus clarkii lewisii* muscle tissue selenium concentrations in 2021 were assessed against their respective biological triggers (additional information and methods pertaining to this analysis can be found in Appendix E).

The third annual AMP report was submitted on July 31, 2021 and included monitoring data collected in 2020 (Teck 2021b). In 2020, concentrations of aqueous total selenium exceeded the SPO (daily maximum) at the Line Creek Compliance Point for a single event (Teck 2021b), and this low number of exceedances is similar to past years (Teck 2018, 2019b). This third annual AMP report indicated that while aqueous sulphate met the early warning trigger (EWT) throughout 2020 at the Line Creek Compliance Point (LC_LCDSSLCC), and nitrate concentrations at this area exceeded the Site Performance Objective (SPO; monthly average and daily maximum) with 75% of monthly average concentrations above the permit limits (Teck 2021b). The number of nitrate SPO exceedances observed in 2020 at the Line Creek Compliance Point (Teck 2021b) was lower than 2018 (which was the year which triggered the AMP response framework; Teck 2019b) but was higher than in 2019 (58% of monthly values were higher than the SPO; Teck 2020a). Actions associated with the AMP response to elevated aqueous nitrate concentrations in 2020 included increasing the water throughput of the AWTF as well as continuing to build on the LCO Nitrate Compliance Action Plan as outlined in detail in the 2020 Annual AMP report (Teck 2021b). Similar to past years (Teck 2020a), the investigation of cause identified blasting residue on waste rock (historical and recent) as the major source of nitrate in Line Creek. Several adjustments have been implemented as part of the AMP response framework and operations continue to implement and refine blasting practices, incorporate water management in pit design, continue evaluation of mine plans, monitoring/field data, and climate/hydrology data. Additional mitigation is planned through long-term adjustments outlined in the 2019 Implementation Plan Adjustment (Teck 2019a).

Selenium monitoring related to the LCO LAEMP is focused on concentrations in biota with the primary monitoring objective to evaluate conditions associated with the WLC AWTF operation. Specifically, the Line Creek LAEMP Question #2 is: “Are tissue selenium concentrations reduced downstream from the WLC AWTF?”. Adaptive management actions related to the LCO LAEMP monitoring have been implemented based on changes to the AWTF operational status as well as in response to biological tissue selenium results. For example, previous monitoring actions have included the addition of supplemental monthly monitoring of benthic invertebrate selenium concentrations between May and August 2019 (Minnow 2020a). This was completed following forward flow (and discharge to the receiving environment which began in October 2018) from the newly recommissioned AWTF with AOP to support better understanding of the AWTF with AOP performance. In addition, adjustments were made to the 2020 and 2021 LCO LAEMP study design regarding the timing of benthic invertebrate selenium monitoring (in discussion with the EMC) to better reflect spawning events of westslope cutthroat trout (i.e., replacing the February sampling event with a July sampling event) and shifting the May sampling event back to April (to further evaluate the elevated benthic invertebrate tissue noted in April 2019;

Minnow 2020a). The implementation of actions under the adaptive management framework is not constrained to the AMP or LAEMP annual reporting cycles. The adaptive management process can (and has been) triggered at any time during each annual LAEMP cycle (wherein results are reported on April 30th of each year for the preceding calendar year) depending on the answers to site-specific LAEMP questions and on available data. Monitoring plans and schedules will continue to adapt to findings in the field and operational needs.

For more information on the adaptive management framework, the Management Questions, the Key Uncertainties, the Response Framework, Continuous Improvement, linkages between the AMP and other EVWQP programs, and AMP reporting, refer to the AMP (Teck 2021a) and the 2020 Annual AMP report (Teck 2021b).

2 METHODS

2.1 Overview

The general approach for the Line Creek LAEMP (see Table 2.1) includes explanation of the collected data and data evaluation in relation to each of the study questions. This report includes data up to the end of the 2021 calendar year for all parameters. Historical data are also presented where appropriate.

Water quality and biological samples were collected from established monitoring areas in Line Creek and the Fording River (Figure 2.1, Table 2.2). These monitoring areas represent the same locations that have been sampled for the LCO LAEMP since 2017[8] (Minnow 2018b) and include areas both upstream and downstream of the AWTF discharge in Line Creek, as well as associated reference areas (RG_LI24 and RG_SLINE). Specifically, RG_LCUT is situated upstream from the AWTF discharge and mainly reflects water quality influences farther upstream on the main stem of Line Creek (LC_LCUSWLC) when the AWTF is operating. When West Line Creek flows are not being diverted to the AWTF for treatment (i.e., during reduction of effluent flow through the AWTF or during AWTF shutdown) water quality at RG_LCUT also reflects input from West Line Creek. The monitoring areas RG_LILC3, RG_LISP24, RG_LIDSL, RG_LIDCOM, and RG_LI8 are monitoring areas downstream from the WLC AWTF that provide spatial resolution of the potential influence of the AWTF treatment in Line Creek. Monitoring areas RG_FRUL and RG_FO23 are situated in the Fording River upstream and downstream of the Line Creek confluence, respectively (Figure 2.1, Table 2.2). Continuous water temperature is also monitored at six locations (Figure 2.2, Table 2.3).

To address the study questions described in Section 1.2, the 2021 Line Creek LAEMP included evaluation of the following components:

- Periphyton visual coverage scores;
- Benthic invertebrate density, biomass, community, and tissue selenium concentrations (composite-taxa samples);
- Concentrations of nutrients, total selenium, selenium species, and other analytes (i.e., those listed in Section 2.2.1) in water, based on routine water quality monitoring;

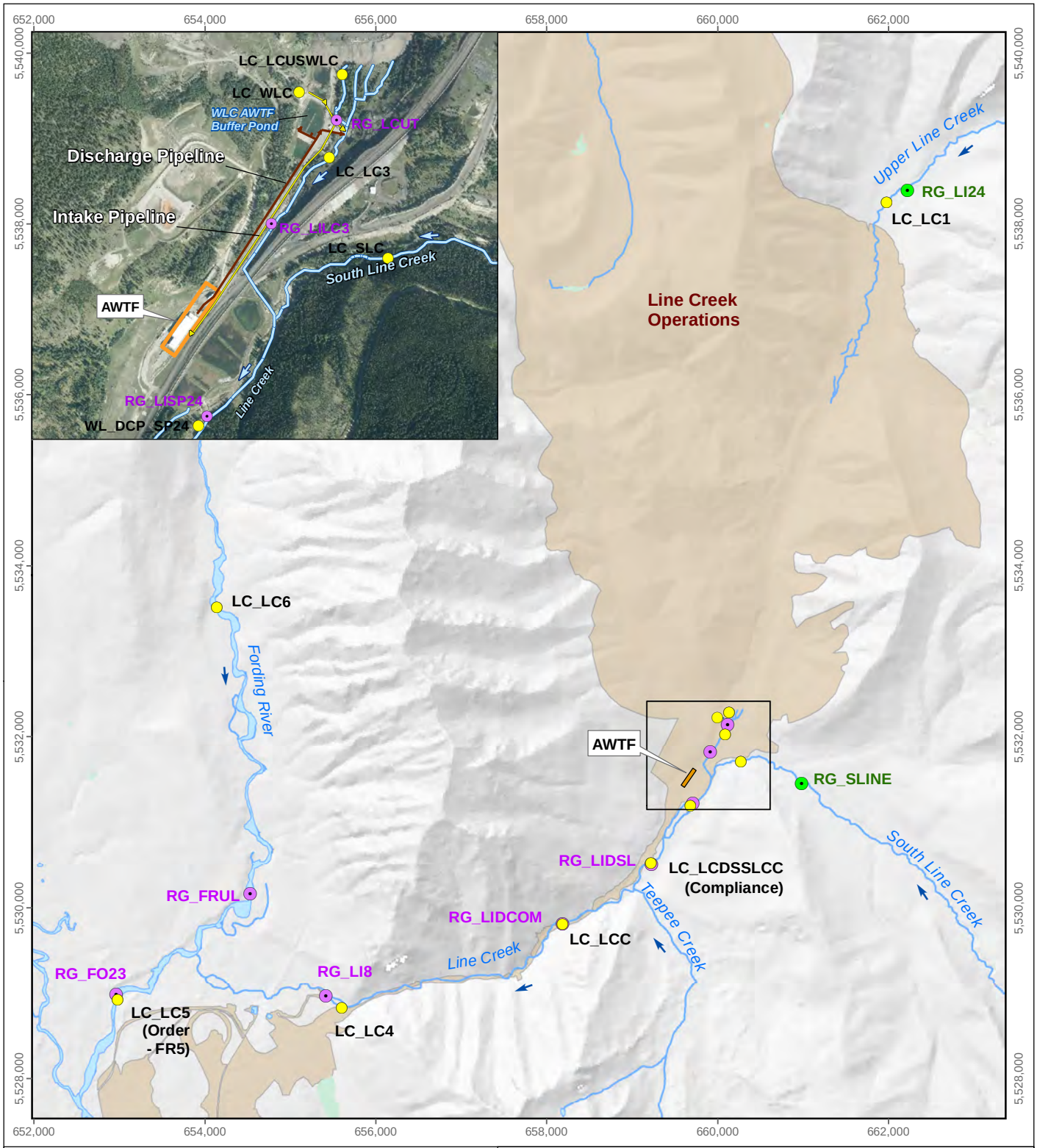
[8] The LCO LAEMP locations monitored in 2021 were the same as those initially sampled for the LCO LAEMP in 2014 (Minnow 2015), with the addition of RG_LCUT (LC_LCUSWLC) in 2016 (Minnow 2017a), and RG_LISP24 (WL_DCP_SP24) and RG_LIDCOM (LC_LCC) in 2017 (Minnow 2018b).

Table 2.1: General Approach for the 2021 Line Creek LAEMP as Presented in the LAEMP Study Design (Minnow 2021b)

Key Questions	Assessment Endpoints	Measurement Endpoints				How Data will be Evaluated to Address Key Question[a]
		Water	Sampling Areas	Biological	Sampling Areas	
Is active water treatment affecting biological productivity downstream in Line Creek?	Biological productivity downstream from the AWTF discharge post- compared to pre-AWTF commissioning, among AWTF operational phases, and relative to productivity observed upstream from the discharge	Nutrient concentrations	LC_LC1, LC_SLC, LC_WLC, LC_LCUSWLC, LC_LC3, WL_DCP_SP24, LC_LCDSSLCC, LC_LCC, LC_LC4, LC_LC6, LC_LC5 (see Table 2.4 for timing)	Periphyton coverage, Benthic invertebrate biomass, Benthic invertebrate community structure	Benthic Invertebrate Biomass - RG_LI24, RG_SLINE, RG_LILC3, RG_LIDSL Periphyton coverage and Benthic Invertebrate Community - RG_LI24, RG_SLINE, RG_LCUT, RG_LILC3, RG_LISP24, RG_LIDSL, RG_LIDCOM, RG_LI8, RG_FRUL, RG_FO23	Determine if there is an increase in periphyton coverage, benthic invertebrate biomass, or shift in community structure that has been demonstrated to correspond with changes in AWTF operational status and changes in parameters associated with productivity (e.g., nutrient concentrations)
Are tissue selenium concentrations reduced downstream from the AWTF?	Tissue selenium concentrations downstream from the AWTF discharge post- compared to pre-AWTF commissioning, among AWTF operational phases, and relative to concentrations observed upstream from the discharge	Total and dissolved selenium concentrations	LC_LC1, LC_SLC, LC_WLC, LC_LCUSWLC, LC_LC3, WL_DCP_SP24, LC_LCDSSLCC, LC_LCC, LC_LC4, LC_LC6, LC_LC5 (see Table 2.4 for timing)	Benthic invertebrate tissue selenium (composite-taxa samples)	RG_LI24, RG_SLINE, RG_LCUT, RG_LILC3, RG_LISP24, RG_LIDSL, RG_LIDCOM, RG_LI8, RG_FRUL, RG_FO23	Determine if there is a change in benthic invertebrate tissue selenium concentrations over time that corresponds to changes in total selenium concentrations or selenium speciation in water. Benthic invertebrate community data being collected for other purposes can be used as supporting evidence of ecosystem health status downstream from the AWTF
		Selenium speciation	LC_LC1, LC_SLC, LC_WLC, LC_LCUSWLC, LC_LC3, WL_DCP_SP24, LC_LCDSSLCC, LC_LCC, LC_LC4, LC_LC6, LC_LC5 (see Table 2.4 for timing)			
Is AWTF operation affecting aquatic biota through thermal effects, effects on dissolved oxygen concentrations or concentrations of treatment-related constituents other than nutrients or selenium?	Biological community structure downstream from the AWTF discharge post- compared to pre-AWTF commissioning, among AWTF operational phases, and relative to community structure observed upstream from the discharge	Temperature (data loggers)	5 locations in the effluent mixing zone, and 1 location upstream of the AWTF discharge (see Figure 2.2 and Table 2.3)	Benthic invertebrate community structure	RG_LI24, RG_SLINE, RG_LCUT, RG_LILC3, RG_LISP24, RG_LIDSL, RG_LIDCOM, RG_LI8, RG_FRUL, RG_FO23 (annually)	Temperatures that are above/below the guideline, and dissolved oxygen concentrations that are above the threshold for effects to fish outside of the initial mixing zone, and confirmation that the mixing zone is small, will be indicative of effective management of treated water discharge. Benthic invertebrate community data being collected for other purposes can be used as supporting evidence of ecosystem health status downstream from the AWTF
		Dissolved oxygen	LC_LC1, LC_SLC, LC_WLC, LC_LCUSWLC, LC_LC3, WL_DCP_SP24, LC_LCDSSLCC, LC_LCC, LC_LC4, LC_LC6, LC_LC5 (see Table 2.4 for timing)			
		Toxicity	LC_SLC, WL_BFWB_OUT_SP21, LC_LC3 LC_LCDSSLCC, LC_LC5 (see Table 2.4 for timing)			Determine if there is a change in benthic invertebrate community endpoints away from the reference condition that does not correspond to observed changes in nutrients or selenium concentrations

Notes: LAEMP = Local Aquatic Effects Monitoring Program. AWTF = Active Water Treatment Facility.

[a] Data evaluation approach presented differs slightly from the evaluation criteria in Table 2.1 of the study design. The data evaluation approach displayed herein is integrated for water and biological endpoints, and these were presented separately in the study design.



LEGEND

- Teck Water Quality Station
- Mine-exposed Biological Sampling Area
- Reference Biological Sampling Area
- Active Water Treatment Facility (AWTF) with Advanced Oxidation Process (AOP)
- Teck Coal Mine Operations

Line Creek LAEMP Biological Monitoring Areas and Teck Water Quality Stations, 2021

0 1 2 4 km

Map Projection: UTM Zone 11 U NAD 1983

N W E S

Date: April 2022
Project 217202.0036

minnow environmental inc.

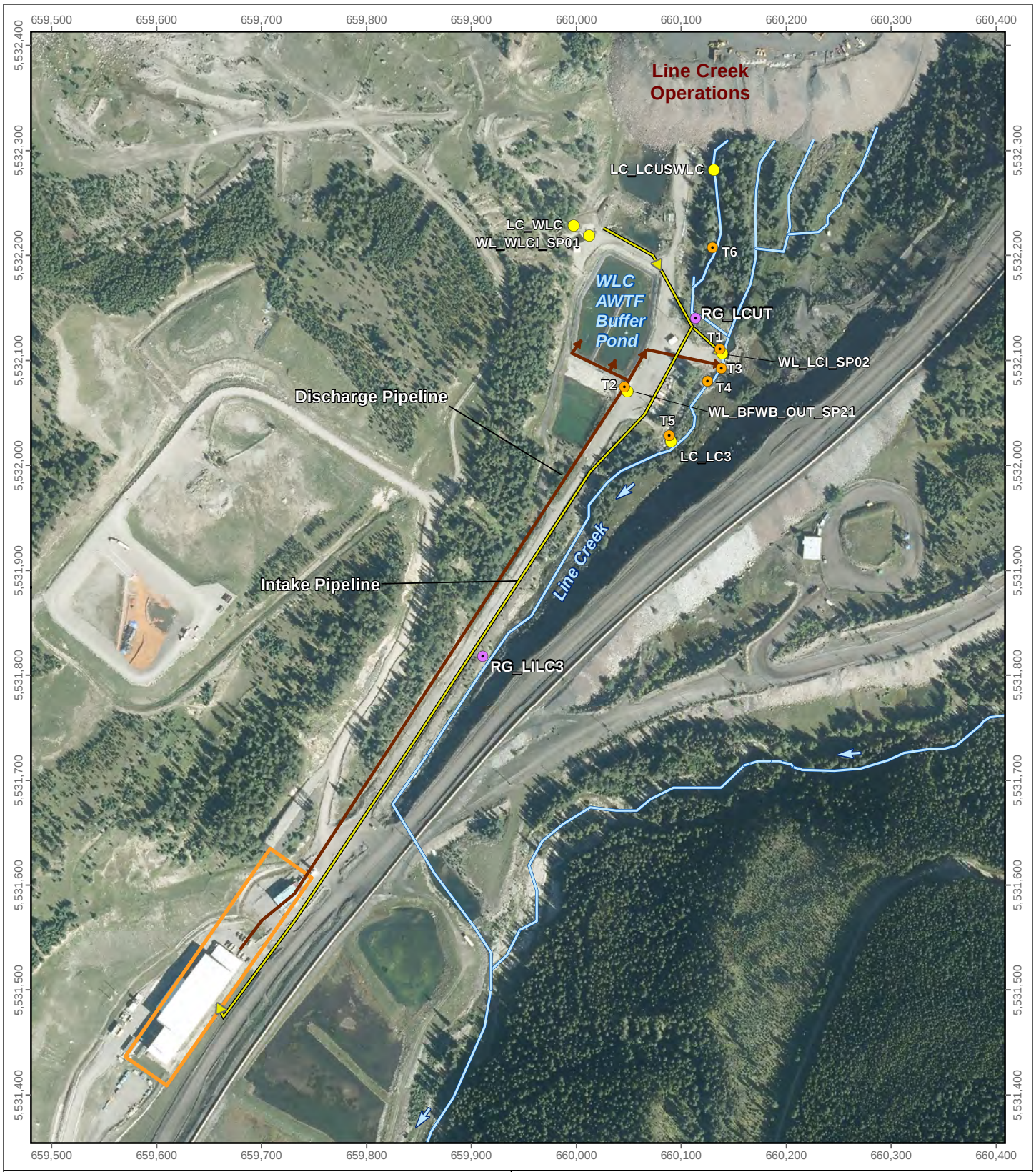
Figure 2.1

Document Path: C:\Users\MLaPalme\Trinity Consultants, Inc\Teck - 217202.0036 - 2021 Line Creek LAEMP\D - GIS\LCO LAEMP\21-36 Figure 2.1 LC LAEMP Bio Monitoring Areas and Teck WQ Stations.mxd

Table 2.2: Monitoring Areas Associated with Line Creek LAEMP, 2021

Area	Water Quality Sampling Station					Biological Sampling			
	Teck Location Code	EMS Number	Location Description	UTM (11U)		Station ID	Location Description	UTM (11U)	
				Easting	Northing			Easting	Northing
Reference	LC_LC1	E216142	Line Creek upstream of LCO and MSA North Pit	661979	5538254	RG_LI24	South fork of upper Line Creek	662214	5538393
	LC_SLC	E282149	South Line Creek west side of Main Rock Drain, upstream of Line Creek	660271	5531737	RG_SLINE	South Line Creek upstream of Line Creek and LCO	661122	5531374
Mine-exposed Line Creek	LC_LCUSWLC	E293369	Line Creek downstream of rock drain, upstream of West Line Creek and AWTF outfall	660114	5532140	RG_LCUT	Line Creek downstream of rock drain, downstream of West Line Creek and upstream of AWTF outfall	660114	5532140
	LC_LC3	0200337	Line Creek downstream of West Line Creek and AWTF outfall	660090	5532023	RG_LILC3	Line Creek downstream of West Line Creek and AWTF outfall	659911	5531818
	WL_DCP_SP24	N/A	Line Creek downstream of LC_WTF_OUT, approximately 50 m downstream of contingency pond discharge	659684	5531191	RG_LISP24	Line Creek downstream of LC_WTF_OUT, approximately 50 m downstream of contingency pond discharge	659674	5531168
	LC_LCDSSLCC (compliance)	E297110	Line Creek immediately downstream of South Line Creek confluence	659218	5530522	RG_LIDSL	Line Creek downstream of South Line Creek confluence	659294	5530583
	LC_LCC	N/A	Line Creek downstream of the compliance point	658185	5529820	RG_LIDCOM	Line Creek downstream of the compliance point	658184	5529814
	LC_LC4	020044	Line Creek canyon, upstream of Process Plant	655604	5528824	RG_LI8	Line Creek downstream of the canyon	655426	5528959
Mine-exposed Fording River	LC_LC6	0200338	Fording River downstream of Grace Creek, upstream of Line Creek	654140	5533513	RG_FRUL	Fording River downstream of Grace Creek, upstream of Line Creek	654530	5530162
	LC_LC5 (Order - FR5)	0200028	Fording River downstream of Line Creek	652977	5528919	RG_FO23	Fording River downstream of Line Creek	652808	5528334

Notes: UTM = Universal Transverse Mercator. LCO = Line Creek Operation. AWTF = Active Water Treatment Facility.



LEGEND

- Temperature Data Logger
- Biological Monitoring Area
- Teck Water Quality Station
- Active Water Treatment Facility (AWTF) with Advanced Oxidation Process (AOP)

Line Creek LAEMP Monitoring Areas and Teck Water Quality Stations in Upper Line Creek, 2021

0 85 170 340 Meters

Projection: North American Datum 1983 UTM Zone 11 U

N W E S

Date: April 2022
Project 217202.0036

minnow environmental inc.

Figure 2.2

Document Path: C:\Users\MLaPalme\Trinity Consultants, Inc\Teck - 217202.0036 - 2021 Line Creek LAEMP\D - GIS\LCO LAEMP\21-36 Figure 2.2 Line Creek LAEMP Monitoring Areas and Teck WQ in Upper Line CK.mxd

Table 2.3: Temperature Data Logger Locations, 2021

Logger ID	Location Description	UTM (NAD83, 11U)	
		Easting	Northing
T1	Temperature upstream of LC Intake	660137	5532111
T2	Temperature of Buffer Pond outlet box	660046	5532074
T3	Temperature in V-Notch Discharge	660140	5532096
T4	Temperature 5 m downstream of discharge	660130	5532076
T5	Temperature at LC3 (100 m DS of outfall)	660092	5532030
T6	Temperature at LCUT (upstream of LC Intake and T1 data logger)	660130	5532208

Notes: UTM = Universal Transverse Mercator. LC = Line Creek..

- *In situ* water quality (including temperature and dissolved oxygen) at routine water quality monitoring locations;
- Water temperature upstream and downstream of the WLC AWTF recorded continuously with data loggers; and
- Toxicity of WLC AWTF effluent and surface water samples collected downstream of the AWTF outfall, in the Fording River (downstream of Line Creek) [9], and at reference.

Water quality monitoring and acute and chronic water toxicity testing results presented in this report include requirements specified under Permit 107517. Biological sampling in 2021 was completed in accordance with previous LCO LAEMP study designs (2019 to 2021; Minnow 2019b, 2020c, Minnow 2021b) with minor modifications in the timing of sample collections details below. A modification in the timing of sample collection was requested by the EMC to provide more information on the dietary exposure of westslope cutthroat trout to selenium (measured in benthic invertebrate composite-taxa samples) close to their spawning window which occurs in the spring (see Minnow 2020c for details). As such, benthic invertebrate tissue selenium monitoring was completed four times in 2021; in early April[10], July, early September, and early December 2021 as specified in the 2021 LCO LAEMP study design (Minnow 2021b). The benthic invertebrate tissue selenium sampling events outlined in the previous LCO LAEMP study designs (2018 and 2019) occurred in February, April, September, and December (Minnow 2018c, 2019b), while sampling events encompassed by the 2020 and 2021 LCO study designs occurred in April, July, September, and December (i.e., compared to prior years the February sampling event was removed and a July sampling event was added).

Fish tissue monitoring was conducted at RG_LIDSL and RG_FO23 for purposes of the RAEMP in 2021 (Minnow 2021c). Additional fish tissue monitoring that was completed in previous years (Minnow 2018b, 2019a, 2020a) was not conducted as it was excluded from the 2020 and 2021 LCO LAEMP monitoring programs in an effort to help reduce the potential for sampling stress on

[9]Interpretation of chronic toxicity results in the present report was specifically focused on applicable results for monitoring stations located in Line Creek that were compared to the Line Creek reference (LC_SLC). LC_LC5 is located in the Fording River below the confluence with Line Creek (Figure 2.1), and results from this area were not compared to the Line Creek reference (LC_SLC), but rather compared to the Fording River reference (FR_UFR1; Golder 2021a). Therefore, although chronic toxicity monitoring was competed at LC_LC5 in 2021, results of this monitoring were not integrated into this report. See Golder 2022 for detailed chronic toxicity results for this monitoring area.

[10] The 2020 LCO LAEMP study design included a sampling event in early May 2021 (Minnow 2020c) compared to the late April sampling event conducted in 2020 (as specified in the 2019 LCO LAEMP study design [Minnow 2019b]). The sampling event for early May 2021 (which was initially moved to May to correspond with the WCT spawning window as requested by EMC, Minnow 2020c) was shifted back to April 2021 (as requested by EMC) as the EMC expressed interest in further understanding the increase in benthic invertebrate tissue selenium concentrations that was previously observed during April sampling events (i.e., April 2020; Minnow 2021b).

bull trout and westslope cutthroat populations in Line Creek related to LAEMP monitoring activities (Minnow 2020c, 2021b). The exclusion of fish tissue monitoring in these years was based on feedback from the EMC and the Elk Valley Fish and Fish Habitat Committee (EVFFHC) and as a proactive measure in response to a decline in the Upper Fording River WCT population in 2019 (Cope 2020). Regardless, fish tissue monitoring results for RG_FO23 and RG_LIDSL from those evaluations are included in this report.

2.2 Water Quality

2.2.1 Routine Water Quality

Water quality data assessed as part of the LCO LAEMP included data for routine monitoring managed by Teck (Tables 2.4 and 2.5), and water samples collected at the biological monitoring stations concurrently with biological sampling (Figure 2.1, Table 2.2)[11]. Water quality data were downloaded from Teck's EquIS™ database, including:

- Nutrient concentrations (i.e., nitrate, nitrite, ammonia, total phosphorus, and orthophosphate); Selenium concentrations (i.e., total and dissolved selenium concentrations, and selenium speciation results including concentrations of selenate, selenite, dimethylselenoxide, methylseleninic acid, selenocyanate, selenomethionine, methaneselenonic acid, selenosulphate, and unknown selenium species);
- Concentrations of analytes with early warning triggers under the AMP [i.e., total dissolved solids, sulphate, total concentrations of antimony, barium, boron, lithium, manganese, molybdenum, nickel, selenium (previously noted above), uranium, and zinc, and dissolved concentrations of cadmium and cobalt];
- Concentrations of analytes with British Columbia Water Quality Guidelines (BCWQGs; BCMOECCS 2021a,b) and/or water quality benchmarks (Teck 2014, Golder 2017b; see Appendix Table D.1 for a list of analytes and associated screening values); and
- *In situ* water quality data (i.e., temperature, pH, specific conductivity, and dissolved oxygen).

Quality assurance and quality control (QA/QC) associated with routine water quality monitoring were discussed in the annual water quality report for Permit 107517 (Teck 2022b). Quality control results associated with water samples collected concurrently with biological samples are

[11] The routine water quality monitoring locations and the biological monitoring locations for some areas differ slightly in exact location (e.g., LC_LCUSWLC; Figure 2.1).

Table 2.4: Summary of Water Quality Monitoring for Permit 107517

Location Description	Teck Water Station Code (associated Biological Station Code in brackets)	EMS Number	UTM (NAD83, 11U)		Water Quality Samples				
			Easting	Northing	Area Type	Field Parameters[a]	All Other Parameters Required Under Mine Permits[b]	Toxicity[e]	
								Acute[f]	Chronic[g]
Line Creek upstream of LCO	LC_LC1 (RG_LI24)	E216142	661979	5538254	Reference	M	M	-	-
South Line Creek	LC_SLC (RG_SLINE)	E282149	660271	5531737	Reference	M	M	-	Q/SA
Line Creek upstream of WLC AWTF	LC_LCUSWLC (RG_LCUT)	E293369	660114	5532140	Mine-exposed	M	M	-	-
West Line Creek (WLC)	LC_WLC (RG_LCUT)	E261958	5532227	659998	Mine-exposed	M	M	-	-
Line Creek AWTF Influent	WL_LCI_SP02	E293370	660138	5532109	Mine-exposed	D	M	-	-
West Line Creek AWTF Influent	WL_WLCI_SP01	E293371	660011	5532218	Mine-exposed	D	M	-	-
AWTF Effluent (buffer pond discharge)	WL_BFWB_OUT_SP21	E291569	660050	5532070	Mine-exposed	D	M[c]	Q	-
Line Creek ~200 m downstream of the WLC AWTF	LC_LC3 (RG_LILC3)	0200337	660090	5532023	Mine-exposed	W/M	W/M[h]	-	Q/SA
Line Creek	WL_DCP_SP24 (RG_LISP24)	-	659684	5531191	Mine-exposed	S	S	-	-
Line Creek downstream South Line Creek Confluence	LC_LCDSSLCC (RG_LIDSL)	E297110	659218	5530522	Mine-exposed	W/M	W/M[d,h]	-	Q/SA
Line Creek downstream of compliance	LC_LCC (RG_LIDCOM)	-	658185	5529820	Mine-exposed	S	S	-	-
Line Creek upstream of the process plant and ~5,550 m downstream of the WLC AWTF	LC_LC4 (RG_LI8)	0200044	655604	5528824	Mine-exposed	W/M	W/M[i]	-	-
Fording River upstream Line Creek	LC_LC6 (RG_FRUL)	0200338	654140	5533513	Mine-exposed	S	S	-	-
Fording River downstream Line Creek	LC_LC5 (RG_FO23)	0200028	652977	5528919	Mine-exposed	W/M	W/M	-	Q/SA

Notes: "-" = Sampling will not be completed at this area; UTM = Universal Transverse Mercator; LCO = Line Creek Operations; AWTF = Active Water Treatment Facility; D = daily; T = twice monthly; M = monthly; W = weekly; W/M = weekly during freshet (March 15 to July 15); Q = quarterly; S = September (once). September sampling at WL_DCP_SP24, LC_LCC, and LC_LC6 is not included in Permit 107517. Sampling frequency is currently managed through the permit, and after one year of data collection during sustained operation of the AWTF with AOP sampling frequency may be adjusted.

[a] Dissolved oxygen, water temperature, specific conductance, pH (see Table 2.5).

[b] Parameters consistent with Permit 107517 (see Table 2.5 for details).

[c] Three times weekly for total selenium and 5-day Biochemical Oxygen Demand. Selenium speciation, sulphide, bromate, hydrogen peroxide, and ozone measured at frequency shown (in addition to parameters listed in footnote b).

[d] Total phosphorus every two weeks from June 15th to September 30th.

[e] Acute and chronic as per Permit 107517 requirements.

[f] Q = Quarterly 96-hr rainbow trout LT_{50}; 48-hr Daphnia spp. LT_{50}.

[g] Q = Quarterly 7-day *C. dubia* growth and survival, 72-hr *P. subcapitata* growth tests; SA = Semi-annual 28-day *H. azteca* growth and survival tests in spring and fall, 30-day early life stage rainbow trout tests in spring and fall, 30-day early life stage fathead minnow tests in summer and winter.

[h] 5-day Biochemical Oxygen Demand, sulfide, bromate, hydrogen peroxide measured at frequency shown (in addition to parameters listed in footnote b).

[i] Bromate and hydrogen peroxide measured at frequency shown (in addition to parameters listed in footnote b).

Table 2.5: Water Quality Parameters Required Under Permit 107517[a]

Category	Parameters
Field Parameters	temperature, specific conductance, dissolved oxygen (DO), pH
Conventional Parameters	specific conductance, total dissolved solids (TDS), total suspended solids (TSS), hardness, alkalinity, dissolved organic carbon (DOC), total organic carbon (TOC), turbidity
Major Ions	bromide, fluoride, calcium, chloride, magnesium, potassium, sodium, sulphate
Nutrients	ammonia, nitrate, nitrite, total Kjeldahl nitrogen (TKN), orthophosphate, total phosphorus
Total and Dissolved Metals	aluminum, antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, tin, titanium, uranium, vanadium, zinc

[a] Parameters are consistent with those outlined in Table 24, Appendix 3 of Permit 107517.

discussed in greater detail in the Data Quality Review (DQR) in Appendix A (see Appendix G for applicable laboratory reports).

2.2.2 Toxicity Testing

Effluent samples from the WLC AWTF (WL_BFWB_OUT_SP21) were collected for acute toxicity testing, as stipulated in Permit 107517 (Table 2.4). The following acute toxicity tests were performed:

- Single concentration acute toxicity test (96-hour LT_{50}) using rainbow trout (*Oncorhynchus mykiss*); universal method: EPS 1/RM/9 (Environment Canada 2007a); and
- Single concentration acute toxicity test (48-hour LT_{50}) using *Daphnia* spp.; universal method: EPS 1/RM/11 (Environment Canada 1996).

Chronic toxicity tests were also completed on water samples collected quarterly and semiannually in 2021 at two mine-exposed areas of Line Creek (Compliance Point [LC_LCDSSLCC] and LC_LC3) and at one mine-exposed area of the Fording River (LC_LC5; Figure 2.1, Table 2.4), as per the Permit 107517. Chronic toxicity tests were also completed on water samples from one reference area (LC_SLC) in 2021 as a within-watershed reference location for Line Creek. The quarterly and semi-annual tests were completed as follows:

Quarterly tests:

- 72-hour growth/inhibition test using a freshwater alga (*Pseudokirchneriella subcapitata*), conducted using method: EPS1/RM/25 (Environment Canada 2007b); and
- 7-day test of reproduction and survival using a cladoceran (*Ceriodaphnia dubia*), conducted using method: EPS1/RM/21 (Environment Canada 2007c)[12].

Semi-annual tests – Q2 and Q4:

- 28-day water-only test of growth and survival using a freshwater amphipod (*Hyalella azteca*), conducted using methods adapted from US EPA (2000)[13]; and

[12] In the past (2019 and 2020), a single bioassay was used for each test area with the test allowed to continue to 8 days (per request of the EMC) with the lab collecting and compiling data for both 7- and 8-d test lengths. Reporting of the 8-d test length was discontinued in 2021 as past results have shown that differences in reproduction between the 7-and 8- test were negligible (Golder 2022).

[13] Additional testing with *H. azteca* was conducted in Q3 of 2021 as *H. azteca* Q2 test organisms were disposed of prior to measuring dry weight due to a lab technician error, and therefore the initial Q2 tests have only survival data. In response to this, tests were repeated in Q3 for all stations.

- 30-day early life stage toxicity test using rainbow trout, conducted using method: EPS 1/RM/28- 1E (Environment Canada 1998).

Semi-annual tests – Q1 and Q3:

- 30-day early life stage toxicity test using fathead minnow (*Pimephales promelas*), conducted using methods adapted from: EPA-712-C-96-121; US EPA 1996; and E1241-05; ASTM 2013.

Chronic toxicity results for each individual endpoint for each species were then categorized into one of the three categories: 'no adverse response', 'possible adverse response', and 'likely adverse response'.[14] Toxicity tests and associated QA/QC measures were completed by an accredited third-party laboratory. Water quality samples were collected during toxicity testing to support evaluation of toxicity results. The results were summarized in annual reports completed in accordance with Permit 107517 (Teck 2022b, Golder 2022). Applicable results (i.e., for monitoring stations in Line Creek associated with the LAEMP) are summarized in this report.

2.3 Primary Productivity

Periphyton coverage was visually scored during the September 2021 sampling event at each of the ten sampling areas where benthic invertebrates were collected by kick sampling (Table 2.6), consistent with the 2021 study design (Minnow 2021b). Scores were recorded for five stations located a minimum of 5 m apart in each area, and were based on the categories defined in the Canadian Aquatic Biomonitoring Network (CABIN) sampling method (Environment Canada 2012a):

1. Rocks not slippery, no obvious colour (<0.5 mm thick);
2. Rocks slightly slippery, yellow-brown to light green colour (0.5 – 1 mm thick);
3. Rocks have noticeable slippery feel, patches of thicker green to brown algae (1 – 5 mm thick);
4. Rocks are very slippery, numerous clumps (5 – 20 mm thick); and

[14] No adverse response: response not significantly lower than one or more references or response is below the regional normal range with an effect size of <20% relative to the mean of batch-specific references. Possible adverse response: response significantly lower than one or more references in the batch and not below the local normal range with an effect size of 20-50% relative to the mean of batch specific references or response is significantly lower than references and the local normal range, but not below the regional normal range. Likely adverse response: response significantly lower than one or more references in the batch and below the local and regional normal range or response is significantly lower than references but not below the local normal range with an effect size >50% relative to the mean of batch-specific references.

Table 2.6: Primary and Secondary Productivity and Benthic Invertebrate Community Sampling Completed in Line Creek and Fording River in September 2021 Compared to the 2021 LCO LAEMP Study Design (Minnow 2021a)

Area Type	Biological Sampling			
	Biological Area Code	Periphyton	Benthic Invertebrates	
		Visual Coverage Score	Kick Sampling (Community)	Hess Sampling (Density, Biomass, Community)
Reference	RG_SLINE	n=5 (√)	n=3 (√)	n=5 (√)
	RG_LI24	n=5 (√)	n=5 (√)[a]	n=5 (√)
Mine-exposed Line Creek	RG_LCUT	n=5 (√)	n=3 (√)[a]	-
	RG_LILC3	n=5 (√)	n=5 (√)[a]	n=10 (√)
	RG_LISP24	n=5 (√)	n=1 (√)	-
	RG_LIDSL	n=5 (√)	n=5 (√)[a]	n=10 (√)
	RG_LIDCOM	n=5 (√)	n=1 (√)	-
	RG_LI8	n=5 (√)	n=3 (√)	-
Mine-exposed Fording River	RG_FRUL	n=5 (√)	n=3 (√)[a]	-
	RG_FO23	n=5 (√)	n=5 (√)[a]	-

Notes: "-" = not sampled; "√" = target sample size was met.

[a]Additional samples were taken at these areas as required for the purposes of the RAEMP (Minnow 2021a).

5. Rocks mostly obscured by algae mat, may have long strands (>20 mm thick).

2.4 Secondary Productivity and Invertebrate Community Structure (Hess Sampling)

Samples for analysis of benthic invertebrate density, biomass, and community structure were collected in September 2021 from two areas in Line Creek downstream from the WLC AWTF (RG_LILC3 and RG_LIDSL), and at two reference areas (RG_SLINE and RG_LI24). Five samples were collected at each reference area and 10 at each mine-exposed area (Figure 2.1, Table 2.6). The samples were collected using a Hess sampler (0.1 m^2 sampling area) with 500 µm mesh. Stations were located a minimum of 5 m apart to represent the overall area.

A single sample was collected at each station by carefully inserting the base of the Hess sampler into the substrate to a depth of approximately 5 to 10 cm. Gravel or cobble enclosed within the Hess sampler was carefully washed while allowing the current to carry dislodged organisms into the mesh collection net. Organisms collected into the net were rinsed into the bottom of the net, and then into a labelled wide-mouth plastic jar. Samples were preserved to a nominal concentration of 10% buffered formalin in ambient water within approximately 6 hours of collection, so biomass was not lost through predation or decomposition of tissues before the samples were sorted at the laboratory.

Benthic invertebrate biomass samples were sent to ZEAS Inc. (lead taxonomist Danuta Zaranko) in Nobleton, ON, for sorting and taxonomic identification. At the laboratory, preserved organisms in each sample were sorted from the sample debris, identified, and weighed at the family-level of taxonomy. Each family group of organisms was placed onto a fine cloth to drain excess surface moisture before being weighed to the nearest 0.1 mg. Total and family-level density and biomass were reported for each sample (preserved wet weight; see Appendix G for laboratory reports).

2.5 Benthic Invertebrate Community Structure (Kick and Sweep Sampling)

Three replicate samples were collected during the September 2021 sampling event from areas downstream from the AWTF outfall that have been monitored consistently over time (RG_LILC3, RG_LIDSL, and RG_LI8) and at each reference area (RG_SLINE, RG_LI24; Figure 2.1, Table 2.6). Single kick and sweep samples were also collected from riffle habitat at RG_LCUT (located upstream from the AWTF discharge), RG_LISP24, and RG_LIDCOM to provide additional spatial resolution of community characteristics (Table 2.6). The following samples were also collected from select areas for the purposes of the RAEMP (Minnow 2021c; sample sizes shown are in addition to those listed above): RG_LCUT (n=2, for a total of n=3), RG_LIDSL (n=2, for a total of n=5), RG_FRUL (n=2, for a total of n=3), and RG_FO23 (n=4, for a total of n=5). Replicates were collected from stations spaced a minimum of 50 m apart, where habitat allowed (i.e., riffle habitat was present) and sampling could be completed safely.

Benthic invertebrate community sampling followed the CABIN protocol, which involved a 3-minute travelling kick to dislodge organisms into a net having a triangular aperture measuring 36 cm per side and mesh having 400 µm openings (Environment Canada 2012a). During sampling, the field technician moved across the stream channel (from bank to bank, depending on stream depth and width) in an upstream direction. With the net being held immediately downstream of the technician's feet, the detritus and invertebrates disturbed from the substrate were passively collected in the kick-net by the stream current. After three minutes of sampling time, the sampler returned to the stream bank with the sample. The kick-net was rinsed with water to move all debris and invertebrates into the collection cup at the bottom of the net. The collection cup was then removed, and the contents poured into a labelled plastic jar and preserved to a nominal concentration of 10% buffered formalin in ambient water.

Benthic invertebrate community samples were sent to Cordillera Consulting (lead taxonomist Scott Finlayson), in Summerland BC, for sorting and taxonomic identification to the lowest practical level (LPL; typically genus or species). At the beginning of the sorting process, the total number of preserved organisms in each sample was estimated. If the total number was estimated to be greater than 300, then the sample was sub-sampled for sorting and enumeration. A minimum of 5% of each sample was sorted, consistent with requirements specified by Environment Canada (2012b, 2014). Sorting efficiency and sub-sampling accuracy and precision were quantified using methods outlined by Environment Canada (2012b, 2014). Total organism abundance was reported for each sample (see Appendix G for laboratory reports).

Consistent with the requirements of the CABIN sampling protocol, supporting habitat information (i.e., water velocity and depth, *in situ* water quality [temperature, dissolved oxygen, specific conductivity, pH], canopy cover, substrate characteristics [100 pebble count], etc.) was documented concurrent with benthic invertebrate community samples (Environment Canada 2012a; see Appendix F). In addition to the CABIN requirements, measurements of calcite presence and concretion were conducted on 100 particles (pebbles) at each biological sampling location concurrent with (and using the same particles as) the 100-pebble count. Calcite presence (Cp) has historically been a binary assessment (i.e., presence [score = 1] or absence [score = 0]; Teck 2016, Lotic 2021). In 2021, an additional method for assessing calcite presence in lotic environments was included (Cp', Lotic 2021, Zathey et al. 2021a, Robinson et al. 2022) that scored the percent of the particle surface area covered by calcite as a decimal to the nearest 10th percentile (0.1, 0.2, 0.3, etc.;

see Appendix F)[15]. The degree of concretion (Cc) was assessed by determining if the particle was removed with negligible resistance (not concreted; score = 0), noticeable resistance but removable (partially concreted; score = 1), or immovable (fully concreted; score = 2). If distinct particles were not visible due to heavy calcification, values of 1 (for presence) and 2 (for concretion) were recorded. If fines were encountered and calcite presence could not be visually confirmed, values of 0 (for presence) and 0 (for concretion) were recorded. If rocks were visible under fine material, the rock was selected for calcite measurements.

The results for the 100 particles was expressed as a Calcite Index (CI and CI') based on the following equations (Lotic 2021, Zathey et al. 2021a, Robinson et al. 2022):

$$CI = C_p + C_c \text{ or } CI = C_p' + C_c$$

Where:

$$CI \text{ or } CI' = Calcite\ Index^{16}$$

$$C_p = Calcite\ Presence\ Score = \frac{Number\ of\ particles\ with\ calcite}{100\ (binary\ score)}$$

$$C_p' = Calcite\ Presence\ Score = \frac{Number\ of\ particles\ with\ calcite}{100\ (proportional\ score)}$$

$$C_c = Calcite\ Concretion\ Score = \frac{Sum\ of\ particle\ concretion\ scores}{100}$$

2.6 Tissue Selenium Concentrations

2.6.1 Benthic Invertebrates

As outlined in Section 2.1, benthic invertebrate tissue selenium sampling in 2021 was completed in accordance with the 2020 and 2021 LCO LAEMP study designs (Minnow 2020c, 2021b). Four sampling events were completed in 2021: April, July, September, and December (Minnow 2021b). Five replicate benthic invertebrate tissue samples were collected from each sampling area (Table 2.7).

Benthic invertebrate tissue samples were collected for selenium analysis using the CABIN kick and sweep sampling method described in Section 2.5, except that sampling was not timed. All sampling events included collection of a composite sample of a variety of benthic invertebrate taxa (composite-taxa samples). These samples are useful for comparison to

[15] The new calcite assessment method was developed under the Regional Calcite Monitoring Program as a means to better describe the degree, extent, and trends of calcite deposition (Zathey et al. 2021a)

[16] CI refers to the binary assessment of Cp and CI' refers to the proportional assessment of Cp'.

Table 2.7: Benthic Invertebrate Composite-Taxa Tissue Selenium Sampling Completed in Line Creek and Fording River in 2021 Compared to the 2021 LCO LAEMP Study Design (Minnow 2021a)

Area Type	Biological Area Code	Apr 26 to 29	Jul 12 to 15	Sept 9 to 16	Nov 29 to Dec 2
Reference	RG_SLINE	n=5 (√)	n=5 (√)	n=5 (√)	n=5 (√)
	RG_LI24	n=5 (√)	n=5 (√)	n=5 (√)	n=5 (√)
Mine-exposed	RG_LCUT	n=5 (√)	n=5 (√)	n=5 (√)	n=5 (√)
	RG_LILC3	n=5 (√)	n=5 (√)	n=5 (√)	n=5 (√)
	RG_LISP24	n=5 (√)	n=5 (√)	n=5 (√)	n=5 (√)
	RG_LIDSL	n=5 (√)	n=5 (√)	n=5 (√)	n=5 (√)
	RG_LIDCOM	n=5 (√)	n=5 (√)	n=5 (√)	n=5 (√)
	RG_LI8	n=5 (√)	n=5 (√)	n=5 (√)	n=5 (√)
	RG_FRUL	n=5 (√)	n=5 (√)	n=5 (√)	n=5 (√)
	RG_FO23	n=5 (√)	n=5 (√)	n=5 (√)	n=5 (√)

Notes: AWTF = Active Water Treatment Facility. AOP = Advanced Oxidation Process. " √" = target sample size was met.

baseline data, and as an estimate of dietary selenium exposure for consumer organisms (e.g., fish, birds).

Upon collection of the sample using the kick and sweep sampling method at each replicate station, organisms were carefully removed from sample debris using tweezers until about 0.5 g of wet tissue was obtained. Field crews paid particular attention to proportions of annelids in kick and sweep collections, as these organisms have been known to hyperaccumulate some metals resulting in potentially biased results (Golder 2021b). If annelids occurred at a proportion greater than 5% of the total sample biomass at a given replicate station, then these organisms were included in the composite sample (at that same proportion). Additionally in this scenario, a separate 'annelid only' sample was collected for analysis from the replicate station. If the proportion of annelids represented less than 5% of the sample biomass for a given station, these organisms were not included in the composite-taxa sample.

Each benthic invertebrate tissue sample was photographed to document taxa composition, placed into a labelled vial, and stored in a cooler with ice packs until transfer to a freezer later in the day. Tissue samples were kept in a freezer until they were transported by courier in coolers with ice packs to TrichAnalytics Inc. in Saanichton, BC.[17] Samples were dehydrated (<60°C) upon receipt by the laboratory and analyzed using Laser Ablation Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Quality assurance/quality control measures associated with the tissue chemistry analyses included evaluation of laboratory duplicates and certified refence materials, discussed in greater detail in the Data Quality Review (DQR) in Appendix A (see Appendix G for applicable laboratory reports).

Results for selenium and other parameters were reported on a dry weight basis along with moisture content to allow conversion to wet weight values, as required (see Appendix G for laboratory reports).

2.6.2 Westslope Cutthroat Trout

Fish tissue monitoring (which was completed in previous years; Minnow 2018b, 2019a, 2020a) was excluded from the 2020 and 2021[18] LCO LAEMP monitoring programs in an effort to help

[17] In previous LCO LAEMP studies (Minnow 2018b, 2019a, 2020a, 2021a), benthic invertebrate tissue quality samples were analyzed by Saskatchewan Research Council (SRC) in Saskatoon, SK. Beginning in April 2020, benthic invertebrate tissue quality samples were submitted to TrichAnalytics Inc. instead of SRC for analyses based on the results of an Interlaboratory Tissue Analysis Validation Study (Golder 2020b).

[18] Although, fish tissue monitoring was included in past LCO LAEMP study designs (2017 to 2019; Minnow 2017c, 2018c, and 2019b), the 2021 LCO LAEMP study design did not include fish tissue selenium monitoring. The initial 2020 LCO LAEMP study design (Minnow 2020c) included fish tissue selenium monitoring in the scope of work, however it was later removed (June 3rd, 2020, Minnow 2020d) as a proactive measure in response to declines in the Upper Fording River westslope cutthroat trout population (Cope 2020) and feedback from the Environmental Monitoring Committee (EMC) and the EVFFHC. The exclusion of fish tissue monitoring from the 2021 LCO LAEMP study design is consistent with the revised 2020 LCO LAEMP study design and discussed with the EMC on March 8th, 2021.

reduce the potential for sampling stress on bull trout and westslope cutthroat populations (Cope 2020) in Line Creek related to LAEMP monitoring activities. However, fish monitoring was conducted at LCO in 2021 as part of the RAEMP following the approved study design (Minnow 2021c) and methods associated with that monitoring are described herein.

Eight mature WCT were collected by angling from RG_LIDSL and RG_FO23 in September 2021. Upon capture, fish were anesthetized using clove oil prior to processing. Measures of body weight were collected using appropriately sized spring scales (e.g., 100 g, 500 g, 1,000 g), and total and fork lengths were recorded using a measuring board equipped with a metre stick (± 1 mm). All fish were inspected for any deformities, erosions (fin and gill), lesions, tumors, or parasites during processing and representative photographs were collected. A biopsy punch was used to collect a non-lethal muscle sample from each fish, and Vetbond™ tissue adhesive was used to seal the wound and prevent infection. Skin was removed from each muscle sample using a scalpel and the remaining tissue was placed into a sterile microcentrifuge tube. Samples were stored on ice in the field and transferred to a freezer later in the day. Tissue samples were kept in a freezer until they were transported overnight in coolers with ice packs to an accredited laboratory.

Fish tissue samples were analyzed by a qualified third-party laboratory (Trich Analytics, Victoria, BC) for metals concentrations (including mercury and selenium), according to the methods detailed above for benthic invertebrate tissue analyses.

2.7 Data Analysis

2.7.1 Water Quality

Water quality data were downloaded from Teck's EquIS database and included both routine monitoring results collected by Teck and samples collected concurrently with biological sampling. Routine water quality results were paired with the closest biological monitoring station (Table 2.2). The location of routine water quality and biological monitoring stations differed slightly for some areas, therefore samples collected concurrently with biological sampling were named according to the biological monitoring location (Table 2.2). For instance, the biological monitoring area RG_LCUT is situated upstream from the AWTF and mainly reflects water quality influences farther upstream on the main stem of Line Creek (LC_LCUSWLC) when the AWTF is operating, but also reflects input from West Line Creek (LC_WLC) when the AWTF is not operational (and flows are not being diverted to the AWTF for treatment; see Section 2.1). Accordingly, water quality data

for RG_LCUT in 2021 (similar to 2019 and 2020) were associated with routine water quality monitoring data from LC_LCUSWLC for data analysis because the AWTF was operational throughout the year (Figure 1.2)[19].

Annual means of water quality data were computed by first taking a mean of results within months and then averaging monthly means. If replicate sample results were available, the Kaplan-Meier (K-M) mean of the replicates was used. Monthly means were also calculated using the K-M method. This method involved transforming the left censored (i.e., < value) dataset to a right censored (i.e., > value) dataset, and then using the K-M estimator (used to estimate the mean survival time in survival analysis) to estimate the mean. The calculation was conducted using the survfit() function in the *survival* package (Therneau 2017) in R software (R Core Team 2021) and involved calculating the area under the K-M *survival* curve. The K-M method is non-parametric and can accommodate multiple Laboratory Reporting Limits (LRLs).

The method described in Minnow (2017b) was used to visually explore temporal changes in total phosphorus and orthophosphate concentrations during AWTF operation. The method involves two steps. First, the monthly upper limits of total phosphorus and orthophosphate concentrations (97.5th percentile) were computed for the baseline (pre-AWTF operation) period at LC_LC3. Second, the monthly concentrations were plotted as a ratio of the monthly baseline 97.5th percentile concentrations (i.e., monthly mean concentration: monthly baseline 97.5th percentile concentration). These trend plots help visualize deviations from the pre-AWTF range. Total phosphorus concentrations at the Compliance Point (LC_LCDSSLCC [RG_LIDSL]) between June 15th and September 30th were also plotted relative to the phosphorus Site Performance Objective (≤ 0.02 mg/L) outlined in Permit 107517.

Routine water quality monitoring results were screened against BCWQG (BCMOECCS 2021a,b) as part of Teck's Annual Water Quality Monitoring Report (Teck 2022b) under Permit 107517. In addition, further screening against BCWQG and water quality benchmarks (Teck 2014, Golder 2017b; see Appendix Table D.1 for screening values) was completed for select analytes during the 2021 calendar year. These analytes included nutrients (i.e., nitrate, nitrite, total phosphorus, and orthophosphate); total and dissolved selenium, analytes with early warning triggers under the AMP (total dissolved solids, sulphate, total concentrations of antimony, barium, boron, lithium, manganese, molybdenum, nickel, uranium and zinc, and dissolved concentrations of cadmium and cobalt; Section 2.2.1), and analytes with BCWQG and/or water

[19] The AWTF was shut down for periods of over 24 hours on three occasions in 2021. The AWTF was shut down on June 26, 2021 for inspection/maintenance of the ozone generator (~32.5 hours) and for annual maintenance on two occasions, June 21 and July 27, 2021 (Teck 2022a). As the duration of these events were short, water quality data for RG_LCUT from the brief shut down periods were reported in relation to those from LC_LCUSWLC for data interpretation.

quality benchmarks. Plots of the analytes with early warning triggers under the AMP were prepared using available data from 2012 to 2021 for each monitoring station individually relative to BCWQG and water quality benchmarks (where applicable), and as combined plots to allow for visual comparison among stations. Aqueous selenium speciation results were plotted as monthly mean concentrations for each monitoring area.

Temperature and dissolved oxygen concentrations in Line Creek were graphically evaluated relative to BCWQG. British Columbia water temperature guidelines for bull trout and westslope cutthroat trout[20] specify a maximum ± 1 °C change from the optimum temperature range for different life stages of these species (spawning, incubation, and rearing; BCMOE 2001). Dissolved oxygen guidelines are also specific to life stage (buried embryo/alevin and all other life stages; BCMOE 1997). Guidelines for both these parameters were applied to periods of the year relevant to the specific life stage of each of the two species, with the time periods approximated from available literature (McPhail and Baxter 1996; McPhail 2007; COSEWIC 2016). Temperature data recorded continuously at locations immediately upstream and downstream of the AWTF discharge (using data loggers) were plotted relative to temperature measurements recorded further upstream at LC_LCUSWLC (also recorded using data loggers; Figure 2.2, Table 2.3).

2.7.2 Secondary Productivity Endpoints

Potential effects of AWTF operation on benthic invertebrate biomass and density were analyzed among areas and years using an Analysis of Variance (ANOVA) model. The model was used to assess changes in the difference in benthic invertebrate biomass or density between mine-exposed and reference areas among years. Data were included for the two mine-exposed areas (RG_LIDSL and RG_LILC3) and two reference areas (RG_SLINE and RG_LI24) sampled in 2021 and included all available results from 2014 to 2021. As recommended by the EMC, the analyses were completed by separately evaluating changes at each mine-exposed area relative to the two reference areas. Outliers with studentized residuals with magnitude greater than four were removed from the analysis, and one sample from RG_SLINE in 2018 was excluded due to issues with sample preservation identified by the laboratory.

The ANOVA model that was fit to the data for each mine-exposed area (and both reference areas) was:

[20] Three species make up the fish community of Line Creek including bull trout, westslope cutthroat trout, and mountain whitefish. Westslope cutthroat trout and bull trout are the dominant species, while mountain whitefish are present only of in certain reaches of Line Creek and only as adult and at low densities (Zathey 2021b). Therefore, data interpretation in relation to only bull trout and westslope cutthroat trout was the focus of this report.

$$Y = CI + Year\ + Area(CI) + Year \times CI + Year \times Area(CI) + \epsilon$$

where:

- Y = response variable;
- CI = a fixed factor for area type with two levels (control [reference] and impact [mine-exposed]);
- $Year$ = a fixed factor for year (2014 to 2021);
- $Area(CI)$ = a fixed factor for area because there are two reference areas (nested in CI because each area can only be assigned to one level of CI);
- $Year \times CI$ = the interaction between $Year$ and CI with a significant effect suggesting the difference between mine-exposed and reference areas varies among years;
- $Year \times Area(CI)$ = the interaction between $Year$ and $Area$ with a significant effect suggesting the difference between mine-exposed and reference results depends on which reference area the mine-exposed area is being compared to; and
- ϵ = the error term.

The ANOVA model was used to test for CI effects (i.e., changes in the difference between mine-exposed and reference areas among years). These changes were assessed by testing the significance of the interaction terms containing the $Year$ and CI terms. An α of 0.1 was used to test the significance of the interaction terms.

Interpretation of the ANOVA table began by assessing the significance of the interaction between $Area(CI)$ and $Year$. If the interaction term was significant, then the differences among areas changed over time, but it depended on which years and areas were compared. In that case, separate ANOVA models were run for each reference area with factors for $Area$ (one mine-exposed and one reference), $Year$ and $Year \times Area$. If there was a significant interaction, contrasts were conducted (with Bonferroni correction for the number of tests) to test for significant changes between the mine-exposed area and reference area among years.

If the interaction term between $Area(CI)$ and $Year$ was not significant, then the interpretation of the ANOVA table continued by assessing the significance of the interaction between CI and $Year$. This term in the model assessed whether the relative differences among area types depended on year. If this interaction term was significant, then contrasts were conducted to determine the changes between the mine-exposed area and the pooled reference areas among years.

Testing the significance of the interaction terms is the key hypothesis of interest in the ANOVA model as it tests for changes in the relative differences among areas over time. If all interaction

terms are not significant, then it can be concluded that there are no $Year$ effects that can be compared to AWTF operation schedules. Data were log_{10}-transformed prior to analysis.

Temporal differences in benthic invertebrate biomass and density at mine-exposed areas (RG_LILC3 and RG_LIDSL) were also assessed over the same time period (2014 to 2021) using an ANOVA for each area and endpoint. Prior to analysis, data were log10 transformed to better meet the assumptions of the analysis. When the overall ANOVA was significant ($\alpha < 0.1$), a Tukey's Honestly Significant Difference *post hoc* test was conducted for all pairwise comparisons.

The ANOVA models and contrasts as well as plots for visualizing the ANOVA results were conducted in R (R Core Team 2021) using customized scripts, and data were presented on log_{10}-transformed y-axes for consistency with the statistical approach. Letters were used on the plots to indicate which years differed significantly from one another based on the results of the ANOVA model for temporal evaluation of biomass and density at each mine-exposed areas.

2.7.3 Benthic Invertebrate Community Data

Community endpoints that were evaluated included density (Hess samples) or sample abundance (kick samples), family richness (Hess and kick samples), richness at the LPL of taxonomy (LPL richness; kick samples), and the abundances of major taxonomic groups, including the combined orders of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), collectively known as EPT, Ephemeroptera alone, and Chironomidae (midges; absolute and relative abundances for kick samples, and density for Hess samples). Community data for kick samples were plotted to show changes over time relative to regional normal ranges[21] as well as site-specific normal ranges.[22]

2.7.4 Tissue Selenium Concentrations

2.7.4.1 Benthic Invertebrates

Selenium concentrations measured in composite-taxa benthic invertebrate tissues were plotted over time relative to corresponding site-specific effect benchmarks (Table 2.8) and relative to the regional normal range[23]. Potential effects of AWTF operation on tissue selenium concentrations

[21] The reference normal range as presented in the RAEMP represents the 2.5th and 97.5th percentiles of the 2012 to 2019 (Minnow 2020b).

[22] Site-specific normal ranges represent the 2.5th and 97.5th percentile for a given area as determined by habitat predictors for that area in relation to the complete set of Elk Valley monitoring areas. The site-specific normal ranges were estimated using regression modelling as presented in the RAEMP (Minnow 2020b).

[23] The reference normal range as presented in the RAEMP represents the 2.5th and 97.5th percentiles of reference area data from 1996 to 2019 (Minnow 2020b).

Table 2.8: Selenium Benchmarks for Benthic Invertebrate and Westslope Cutthroat Trout Tissues in the Elk Valley

Endpoint	Tissue Type	Benchmark			Source
		Value (µg/g dw)	Type	Description	
Benthic Invertebrate Tissue	Whole body	4[a]	BC guideline	Interim guideline for aquatic dietary tissue based on weight of evidence of lowest published toxicity thresholds and no uncertainty factor applied	BCMOE (2014)
	Whole body	13	Site-specific benchmark	Level 1 (~10% effect) benchmark for growth, reproduction and survival of invertebrates	Teck (2014)
	Whole body	20	Site-specific benchmark	Level 2 (~20% effect) benchmark for growth, reproduction and survival of invertebrates	Teck (2014)
	Whole body	27	Site-specific benchmark	Level 3 (~50% effect) benchmark for growth, reproduction and survival of invertebrates	Golder (2014)
	Whole body	11[b]	Site-specific benchmark	Level 1 (~10% effect) benchmark for dietary effects to juvenile fish (growth)	Teck (2014)
	Whole body	18	Site-specific benchmark	Level 2 (~20% effect) benchmark for dietary effects to juvenile fish (growth)	Teck (2014)
	Whole body	26	Site-specific benchmark	Level 3 (~50% effect) benchmark for dietary effects to juvenile fish (growth)	Golder (2014)
	Whole body	15	Site-specific benchmark	Level 1 (~10% effect) benchmark for dietary effects to juvenile birds	Teck (2014)
	Whole body	22	Site-specific benchmark	Level 2 (~20% effect) benchmark for dietary effects to juvenile birds	Teck (2014)
	Whole body	41	Site-specific benchmark	Level 3 (~50% effect) benchmark for dietary effects to juvenile birds	Golder (2014)
Westslope Cutthroat Trout	Egg/ovary	25	Site-specific benchmark	Level 1 (~10% effect) benchmark for westslope cutthroat trout reproduction	Teck (2014)
	Egg/ovary	27	Site-specific benchmark	Level 2 (~20% effect) benchmark for westslope cutthroat trout reproduction	Teck (2014)
	Egg/ovary	33	Site-specific benchmark	Level 3 (~50% effect) benchmark for westslope cutthroat trout reproduction	Teck (2014)
	Muscle/muscle plug	15.5	Site-specific benchmark	Muscle equivalent to the 25 mg/kg dw ovary benchmark, based on the relationship observed between selenium in muscle and ovary in westslope cutthroat trout	Nautilus Environmental and Interior Reforestation (2011)

Notes: µg/g = microgram per gram. dw = dry weight. BC = British Columbia. BCMOE = British Columbia Ministry of the Environment.

[a] BC guidelines were not used in assessment of benthic invertebrate tissue selenium concentrations. Assessment was completed relative to site-specific benchmarks only.

[b] Site-specific benchmark is not applicable to effects to juvenile westslope cutthroat trout because studies with Yellowstone cutthroat trout have reported no effects at the Level 1 benchmark (see Teck [2014], Annex E, Appendix D [Elk Valley Water Quality Plan – Selenium Toxicity Literature Review]).

were evaluated for composite-taxa benthic invertebrate samples from each of the eight mine-exposed sampling areas (Table 2.7) using an ANOVA model. As recommended by the EMC, the analyses were completed by separately evaluating changes at each mine-exposed area relative to the two reference areas.

The ANOVA model that was fit to the data for each mine-exposed area (and both reference areas[24]) was:

$$Y = CI + Period + Time(Period) + Period \times CI + Time(Period) \times CI + \epsilon$$

where:

- Y = response variable;
- CI = a fixed factor for area type with two levels (control [reference] and impact [mine-exposed]);
- $Period$ = a fixed factor for time with up to six levels (Before [September 2012], Initial AWTF Operational Phase [August to October 2014], AWTF Operational [February 2016 to October 2017], Shutdown [October 2014 to October 2015, March to October 2018][25], Restart of AWTF with AOP [October 2018 to December 2018], and AWTF with AOP Operational Phase [December 2018 to December 2021]) depending on data availability, where each period included between one to eighteen individual sampling events and reflected the operational status of the WLC AWTF;
- $Period \times \mathrm{CI}$ = the interaction between $Period$ and CI with a significant effect suggesting the difference between mine-exposed and reference areas varies among periods;
- $Time(Period) \times \mathrm{CI}$ = the interaction between $Time(Period)$ and CI with a significant effect suggesting the difference between mine-exposed and reference areas varies among periods, but it depends on which sampling months are being compared; and
- ϵ = the error term.

[24] Benthic invertebrate selenium concentration data from both reference areas (RG_LI24 and RG_SLINE) were used in the ANOVA model, if available. If data from both reference areas were not available for a given sampling event, data from a single reference area were used. Results reported for RG_LI24 on May 3, 2018 were excluded from analyses because these were identified as anomalous and likely the result of a field error (see Minnow 2019a).

[25] Commissioning-phase discharge from the AWTF began August 27, 2014, and the facility was shut down on October 17, 2014, and recommissioned with forward flow occurring on October 26, 2015. Composite-taxa benthic invertebrate tissue selenium monitoring was completed in September 2015. Due to the brief period of exposure to less-than-capacity AWTF effluent, benthic invertebrate tissue selenium data from September 2015 are not considered representative of the AWTF operational phase but also do not represent a no-discharge condition. They were therefore excluded from ANOVA analyses, but are displayed in plots for context.

Only one data-point was collected for a given area in some years (i.e., no replicate sampling). Individual data points were used in the analyses rather than means (where n > 1 at an area), thus variation was assumed to be consistent across years. Because replicates within areas were not available for all years, an $Area(CI)$ x $Year$ interaction could not be tested, and this term was excluded from the model.

Interpretation of the ANOVA table began by assessing the significance of the interaction between $Time(Period)$ and CI. If the interaction was significant, then the differences among mine-exposed and reference areas varied among periods, but this difference could be dependent on which sample months were compared. In that case, contrasts were conducted to determine differences between periods for each sampling event using an α = 0.1, with a Bonferroni correction for the number of tests. Contrasts were limited to those between the "AWTF with AOP Operational Phase" period (2021) relative to the "Before" and "AWTF Operational Phase" periods (contrasts to the "Initial Operations" and "Shutdown" periods were excluded), because these were the most relevant contrasts for evaluating AWTF performance during the "AWTF with AOP Operational Phase". Differences among sampling events within a given period were not statistically contrasted, except for data from within the "AWTF with AOP Operational" period. The differences within the "AWTF with AOP Operational" period were completed using two approaches: 1) contrasts within 2021 to evaluate of AWTF with AOP performance in 2021 (the focus of the 2021 LCO LAEMP)[26]; and 2) contrasts of similar sampling events (e.g. April 2019 to April 2020 to April 2021) within the entire "AWTF with AOP Operational" period (i.e., January 2019 to December 2021) to better understand the stability of conditions throughout this operational period.

The magnitude of difference for a significant contrast was expressed in terms of the number of standard deviations as follows:

Magnitude of Difference = $\frac{(\bar{X}_1 - \bar{X}_2)}{S_r}$

where:

- $\bar{X}_1$ = difference between the $\log_{10}$(mean) for the mine-exposed and the $\log_{10}$(mean) for the reference areas in Sampling Event 1;

[26] The terminology used to describe the AWTF with AOP operational phase initiated on December 30, 2018 in the present report is consistent with the 2020 LCO LAEMP (Minnow 2021a), but differs from terminology in the 2019 LCO LAEMP report, which identified two AWTF operational phases after December 30, 2018: "AWTF Operational Stabilization" and "AWTF/AOP Steady State Operation" (Minnow 2020a). In the 2020 and the current LCO LAEMP report, after December 30, 2018 has been termed as a single "AWTF with AOP Operational" phase (see Section 1.3 for more details).

- $\bar{X}_2$ = difference between the $\log_{10}$(mean) for the mine-exposed and the $\log_{10}$(mean) for the reference areas in Sampling Event 2, and
- S_r= the standard deviation of the residuals in the ANOVA.

If the interaction term between $Time(Period)$ and CI was not significant, then the interpretation of the ANOVA table continued by assessing the significance of the interaction between $Period$ and CI. This term in the model assessed whether the relative differences between mine-exposed and reference area depended on period and if significant, contrasts (with Bonferroni correction) were used to compare among all time periods.

The magnitude of difference for a significant contrast was expressed in terms of the number of standard deviations using the equation above, where:

- $\bar{X}_1$ = difference between the $\log_{10}$(mean) for the mine-exposed and the $\log_{10}$(mean) for the reference areas in Time Period 1;
- $\bar{X}_2$ = difference between the $\log_{10}$(mean) for the mine-exposed and the $\log_{10}$(mean) for the reference areas in Time Period 2; and
- S_r= the standard deviation of the residuals in the ANOVA.

The ANOVA model outlined above was also used to evaluate changes in the difference of tissue selenium concentrations between sampling areas located upstream (RG_FRUL) and downstream (RG_FO23) of Line Creek on the Fording River.

Similar to the ANOVA model used to assess secondary productivity, testing the significance of the interaction terms is the key hypothesis of interest in these ANOVA models, as it tests for changes in the relative differences between the mine-exposed and reference areas over time. If all interaction terms are not significant, then it can be concluded that there are no period effects that can be attributed to AWTF operation schedule. If the interaction terms are significant, then the contrasts among sampling events within the "AWTF with AOP Operational Phase" period also present a key tool for the purpose of evaluating AWTF performance during operation with AOP. Data were $\log_{10}$-transformed prior to analysis using ANOVA. The ANOVA models and contrasts as well as plots for visualizing those results were conducted in R (R Core Team 2021), and data were presented on $\log_{10}$-transformed y-axes for consistency with the statistical approach.

Spatial differences in tissue selenium concentrations among areas during each sampling event in 2021 were tested using an ANOVA. Prior to analysis, data were $\log_{10}$ transformed to better meet the assumptions of the analysis. When the overall ANOVA was significant ($\alpha < 0.05$), a Tukey's Honestly Significant Difference *post hoc* test was conducted for all pairwise comparisons. The ANOVA models and contrasts as well as graphical plots were conducted in R

(R Core Team 2021) using customized scripts, with letters used to indicate which years differed significantly from one another.

Composite-taxa benthic invertebrate tissue selenium results from September 2012 to December 2021 were plotted relative to total selenium concentrations measured in water samples collected at or near the same time (within approximately three days) and location as the tissue samples. A line representing the regional one-step water-to-invertebrate selenium bioaccumulation model was also presented on the plot (Golder 2020c). Prediction intervals (95% percentile) for the model were calculated using the formula below (as described in Whitmore 1986):

$$\hat{Y} \pm t_{\frac{\alpha}{2},n-2} S_r \sqrt{(1 + \frac{1}{n} + \frac{(x - \bar{x})^2}{(n-1)S_x^2})}$$

where:

- $\hat{Y}$= the fitted regression value at X
- S_r= the root mean square deviation of the fitted regression model (= 0.148; $\log_{10}$ transformed)
- n = sample size (= 530)
- $\bar{X}$ = mean of the sample X_i values (= 0.817)
- S_x^2 = variance of the sample X_i values (= 0.866).

A possible increase in benthic invertebrate selenium concentrations at the reference area RG_SLINE since 2017 was noted and flagged by the EMC for further investigation. To better understand this trend, temporal changes in benthic invertebrate tissue concentrations at RG_SLINE were quantified using an ANOVA with factors *Year* and *Month* and their interaction. When the interaction the interaction between *Year* and *Month* was significant, it indicated that the differences among years varied among the months. Post-hoc comparisons were then conducted to test for differences among years for each month using a Tukey's Honestly Significant Difference *post hoc* test. Magnitudes of difference were calculated as a percent difference from the base year of monitoring

$$MOD = \frac{MCT_{Yeari} - MCT_{baseyear}}{MCT_{baseyear}} \text{ x } 100\%$$

Where the measures of central tendency (MCT) were the estimated marginal means from the ANOVA model. The ANOVA model and contrasts were conducted in R (R Core Team 2022).

2.7.4.2 Westslope Cutthroat Trout

Fish tissue data[27] collected from Line Creek as part of the RAEMP (Minnow 2021c) were incorporated into this report to continue the evaluation of fish tissue quality monitoring included in prior years of the LCO LAEMP (Minnow 2017c, 2018c, 2019b). Muscle selenium concentrations of WCT from RG_LIDSL and RG_FO23 in 2021 were tabulated with corresponding meristics data (total weight, length and fork length). Selenium concentrations in WCT muscle were plotted in comparison to the applicable site-specific muscle benchmark (15.5 mg/kg dw; Table 2.8). Ovary selenium concentrations of WCT from these areas were estimated from the muscle tissue concentrations based on the ovary-to-muscle concentration relationship of 1.6:1 (Nautilus and Interior Reforestation 2011) and plotted in comparison to site-specific effect benchmarks (Teck 2014; Table 2.8). Data from 2021 were plotted relative to WCT tissue selenium concentrations in areas of Line Creek and the Fording River from previous years (2001 to 2021).

Estimated WCT ovary tissue selenium results from 2001 to 2021 were plotted relative to total selenium concentrations measured in water samples collected at or near the same location and time as WCT tissue collection. A line representing the regional two-step model from water-to-invertebrates-to-fish egg/ovary selenium bioaccumulation model[28] was also presented on the plot (Golder 2018a). Prediction intervals (95% percentile) for the model were calculated using the same formula used for the benthic invertebrate model, but using the following parameters:

- S_r = 0.161; $\log_{10}$ transformed
- n = 112
- $\bar{X}$ = 0.867
- S_x^2 = 0.580.

Although fish tissue monitoring was limited to RG_LIDSL and RG_FO23 in 2021, benthic invertebrate and fish tissue quality monitoring completed for the LCO LAEMP has demonstrated that changes in fish tissue selenium concentrations between 2017 and 2019 were corroborated by those reported for benthic invertebrates (Minnow 2020a). As such, benthic invertebrate tissue selenium monitoring is expected to be sufficient to evaluate potential effects of AWTF with AOP steady-state operation on selenium concentrations in biota in the receiving environment.

[27] The DQR for the fish tissue chemistry collected at RG_LIDSL and RG_FO23 will be presented in the 2020-2022 RAEMP report.

[28] A two-step model from water-to-invertebrates-to-fish muscle selenium bioaccumulation model is not available as a focus has been on eggs of various organisms including fish, birds, and amphibians (Golder 2018a).

3 PRODUCTIVITY

3.1 Overview

Monitoring data were evaluated in this section to address Study Question #1: Is active water treatment affecting biological productivity downstream in Line Creek? To address this study question, primary and secondary productivity monitoring endpoints and concentrations of aqueous nutrients were evaluated in relation to the AWTF operational status. The AWTF with AOP was operational throughout 2021 with discharge to the receiving environment occurring throughout the year (see Section 1.3 for details).

3.2 Site Performance Objectives and Aqueous Nutrient Concentrations

As outlined in Section 1.2, the AWTF treatment process requires the addition of phosphorus, and there is the potential for increased phosphorus concentrations downstream in Line Creek during AWTF operation. Aqueous total phosphorus concentrations at the Compliance Point were consistently below the SPO of 0.02 mg/L throughout 2021, including the growing season (June 15 to September 30) to which the SPO applies (Figure 3.1).

In 2021, aqueous total phosphorus concentrations downstream of the AWTF discharge were within the range of concentrations reported prior to AWTF operation (i.e., 2012 to 2015, excluding initial operations in 2014; Figure 3.2; Appendix Figure B.1). Aqueous orthophosphate concentrations in 2021 were also within the range of results reported prior to AWTF operation (i.e., 2012 to 2015, excluding initial operations in 2014; Figure 3.3; Appendix Figure B.2).

Total phosphorus and orthophosphate concentrations were further evaluated using an approach recommended in the Proposal to Update the Site Performance Objective for Phosphorus in Line Creek (see Section 2.7.1; Minnow 2017b[29]). The purpose of this approach was to facilitate the early detection of potential changes in concentrations of these aqueous nutrients downstream of the AWTF. The evaluation involves the comparison of monthly mean concentrations of total phosphorus and orthophosphate to the upper range (97.5th percentile) of concentrations observed in each month during the baseline (pre-AWTF) period at LC_LC3 (upper panels in Figures 3.4 and 3.5). Monthly mean concentrations were then expressed as a ratio of the baseline 97.5th percentile for each month (bottom panels in Figures 3.4 and 3.5).

Throughout 2021, total phosphorus and orthophosphate concentrations at LC_LC3 were below the baseline 97.5th percentiles, with one exception (Figures 3.4 and 3.5). Specifically, the mean total phosphorus concentration at LC_LC3 was slightly higher than the baseline 97.5th percentile

[29] Included as Appendix C in Minnow (2017b).

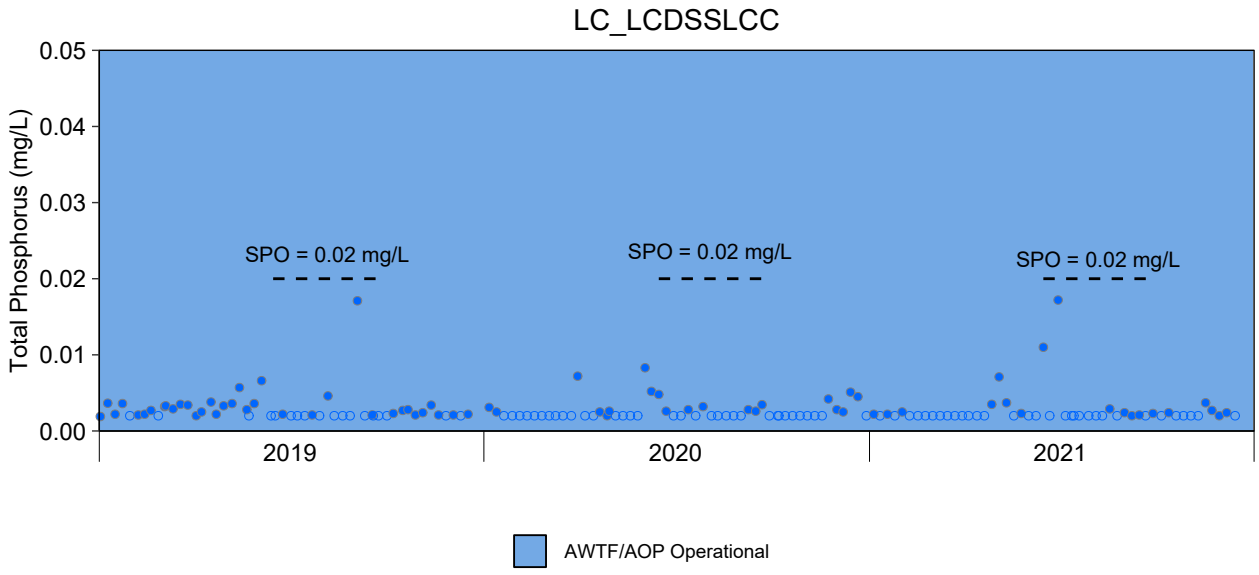


Figure 3.1: Total Phosphorus Concentrations in Water Collected from the Line Creek Compliance Point (LC_LCDSSLCC), 2019 to 2021

Notes: SPO = Site Performance Objective (0.02 mg/L). This pertains to the compliance point (LC_LCDSSLCC) only, as a growing season average calculated from measurements collected every two weeks between June 15th and September 30th, annually. If multiple results existed for a given location and day, the Kaplan-Meier mean of the duplicates was presented. Open symbols represent results below the laboratory reporting limit (LRL).

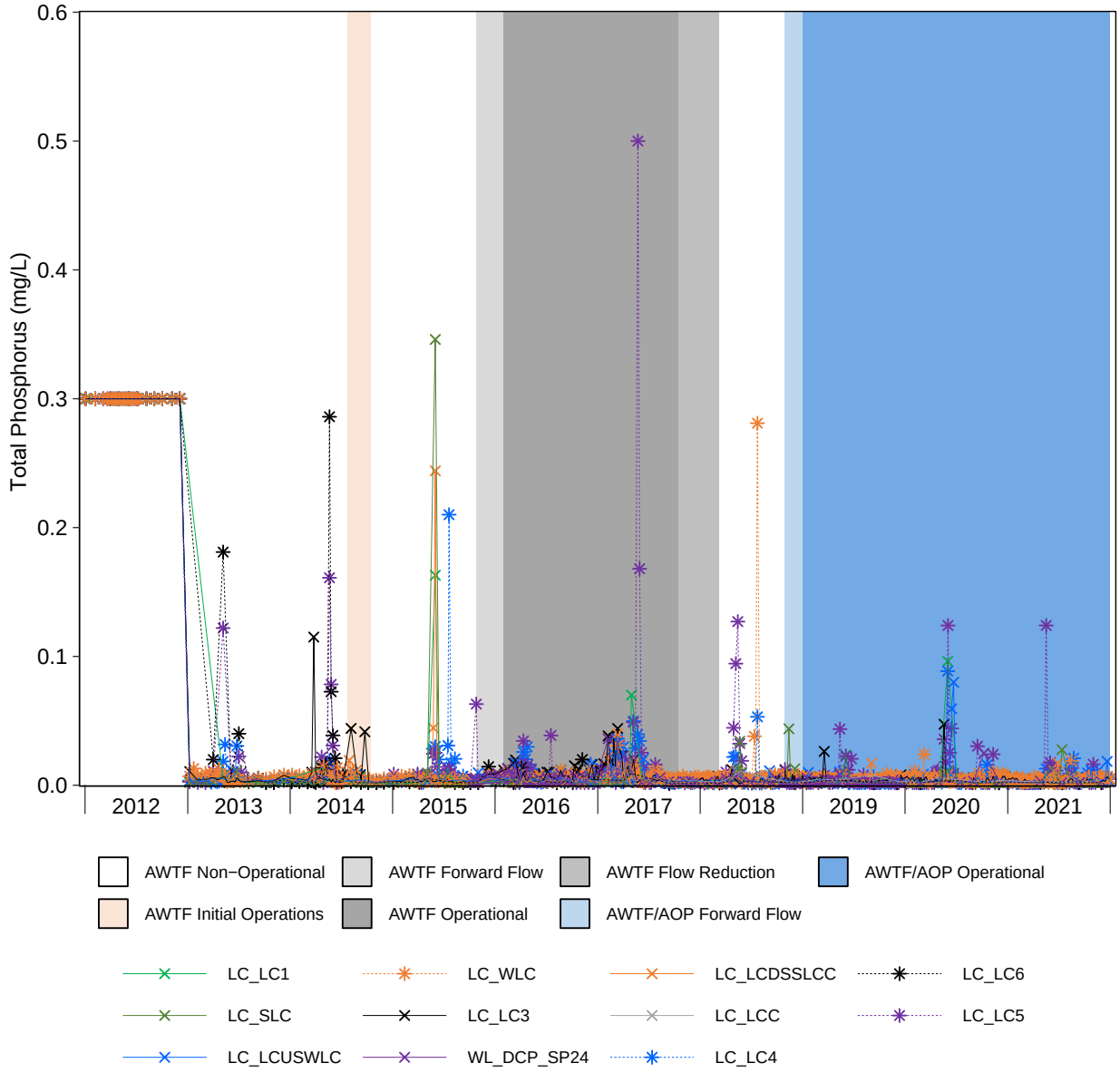


Figure 3.2: Time Series Plots for Aqueous Total Phosphorus Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRL ranged from 0.0010 and 0.30 mg/L). West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

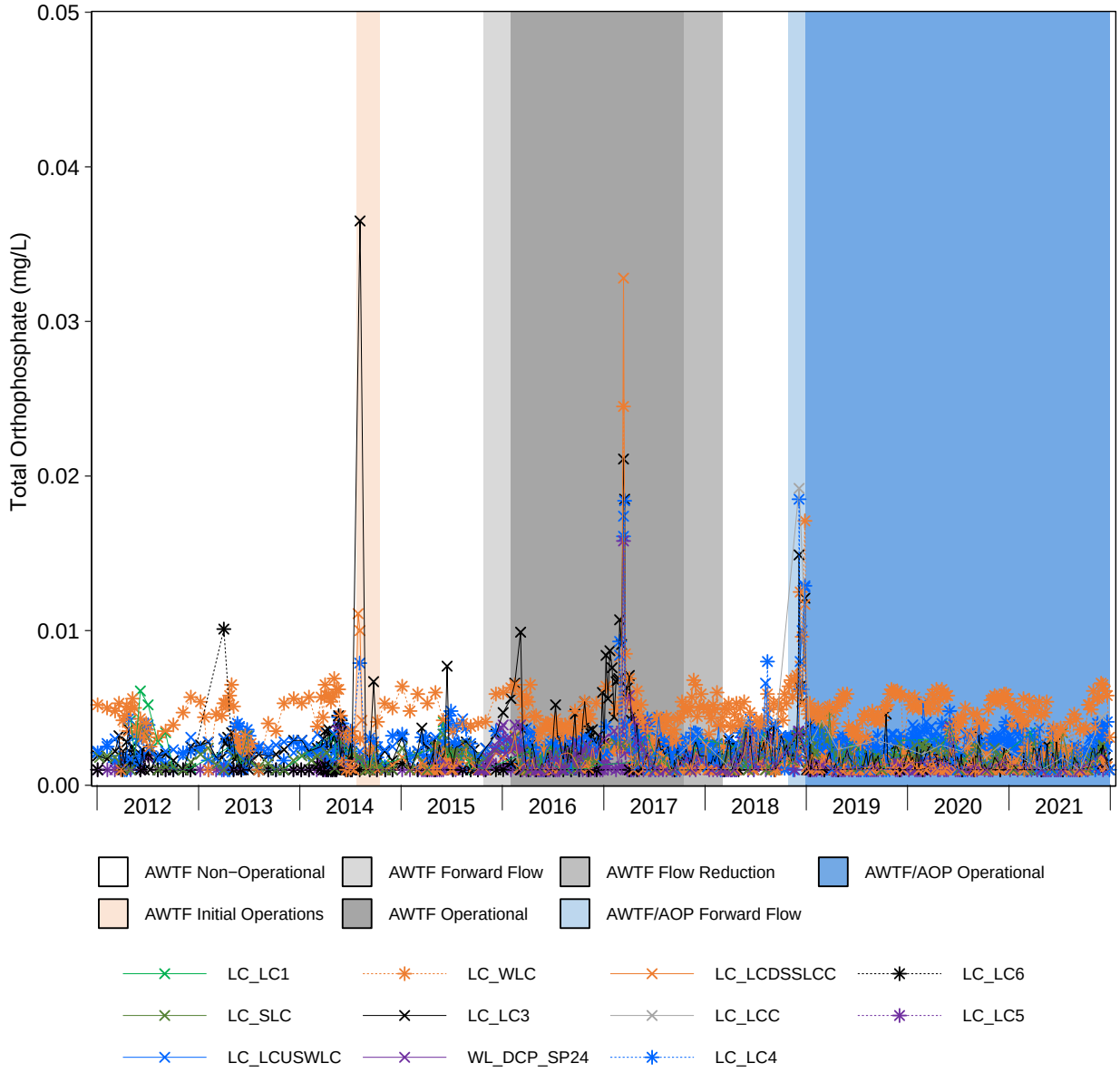


Figure 3.3: Time Series Plots for Aqueous Total Orthophosphate Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRL = 0.0010 mg/L). West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

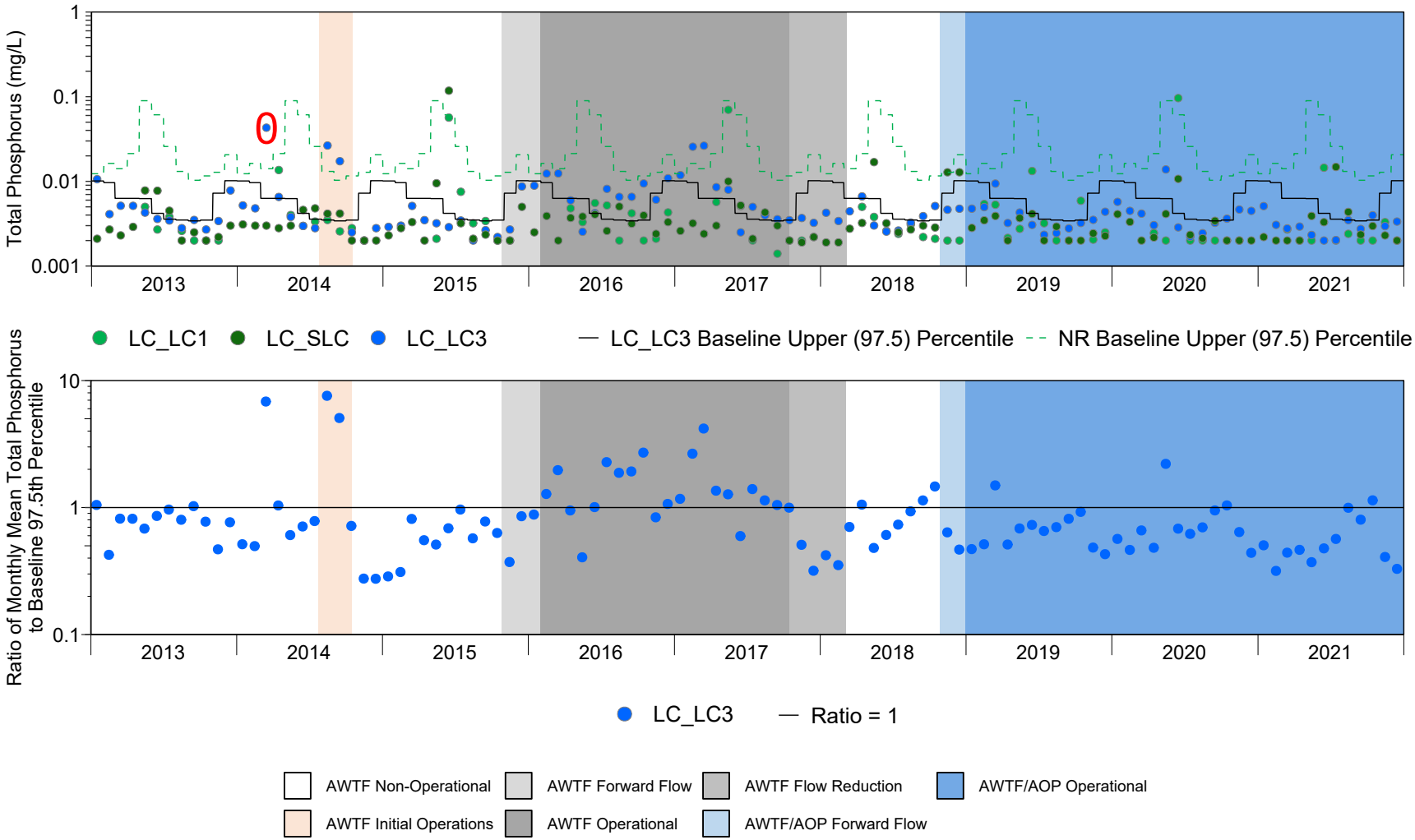


Figure 3.4: Total Phosphorus at LC_LC3 During AWTF Operation Relative to Pre-Operational Baseline Concentrations

Notes: Top panel shows monthly mean concentrations at LC_LC3 and reference stations relative to the monthly percentiles for the baseline period prior to AWTF operation. The data used to define the baseline 97.5th percentile for each month were concentrations for the specified month, the preceding month and the following month for unshaded months prior to 2018 shown in panels. The normal range (NR) was calculated from the 97.5 percentile in the Nutrient Evaluation (Minnow 2020b). Red circle indicates outlier excluded from the calculation of baseline percentile. Bottom panel presents the ratio of monthly mean concentrations at LC_LC3 relative to the baseline 97.5th percentile for the corresponding month.

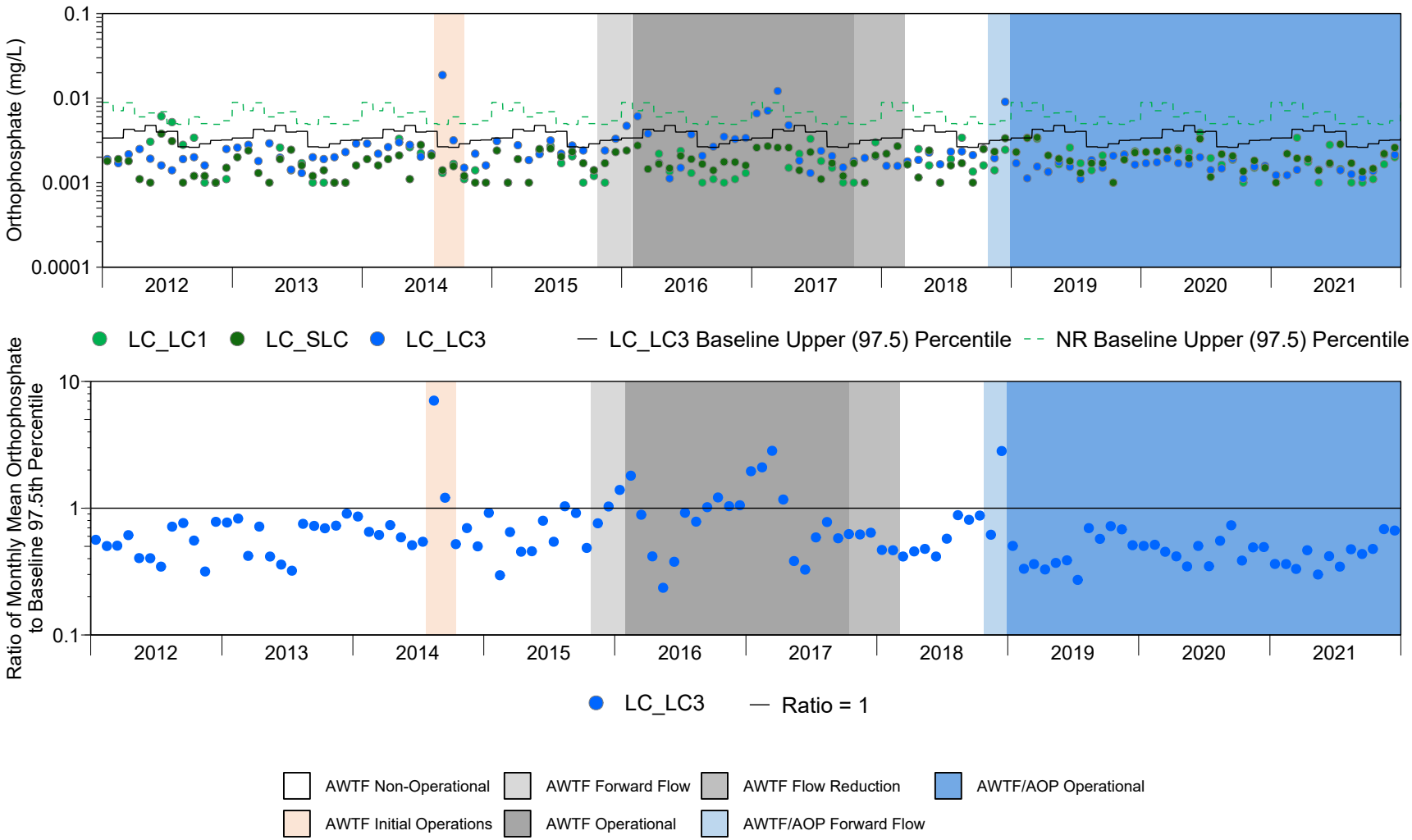


Figure 3.5: Orthophosphate at LC_LC3 During AWTF Operation Relative to Pre-Operational Baseline Concentrations

Notes: Top panel shows monthly mean concentrations at LC_LC3 and reference stations relative to the monthly percentiles for the baseline period prior to AWTF operation. The data used to define the baseline 97.5th percentile for each month were concentrations for the specified month, the preceding month and the following month for unshaded months prior to 2018 shown in panels. The normal range (NR) was calculated from the 97.5 percentile in the Nutrient Evaluation (Minnow 2020b). Bottom panel presents the ratio of monthly mean concentrations at LC_LC3 relative to the baseline 97.5th percentile for the corresponding month.

in October 2021 (Figure 3.4). These results are consistent with the 2019 and 2020 LCO LAEMP (i.e., monitoring which also occurred during the AWTF with AOP operational phase), which demonstrated that total phosphorus and orthophosphate concentrations were below the baseline 97.5th percentile with only a few exceptions including total phosphorus in March 2019 and May and October of 2020 (Figure 3.4; Minnow 2020a, 2021a). In contrast, the total phosphorus and orthophosphate concentrations during AWTF without AOP operation (in 2016 and 2017) were frequently greater than the baseline 97.5th percentiles at LC_LC3 (more frequently for total phosphorus than orthophosphate; Figures 3.4 and 3.5). Overall, operation of the AWTF with AOP (from 2019 to 2021) has been more successful at minimizing phosphorus and orthophosphate contributions to the receiving environment than operations of the AWTF without AOP (in 2016 and 2017).

One function of the AWTF is to decrease nitrate loads to the receiving environment, and the AWTF with AOP removed 35,469 kg of nitrate during operations in 2021 (Teck 2022a), which is similar to 2020 (36,766 kg of nitrate in 2020, Teck 2021c). Aqueous nitrate concentrations at the Compliance Point were below the SPO Daily Maximum Limit of 9 mg/L during the majority of 2021 (65%; Teck 2022b) but were higher than the daily SPO on 19 occasions as well as the monthly average compliance limit (7 mg/L) in all months except May, June, and August (see Teck 2022b for details). Exceedances of the daily SPOs and monthly average compliance limits, however, were always low (1.3 and 1.5-folds higher, respectively; Teck 2022b) and aqueous nitrate concentrations downstream of the AWTF discharge in 2021 were towards the low end of the range of concentrations reported prior to AWTF operation (i.e., 2012 to 2015, excluding initial operations in 2014; Figure 3.6; Appendix Figure B.3). In 2021, as with previous years, nitrate concentrations in samples from mine-exposed monitoring stations upstream and downstream of the AWTF discharge were above the long-term BCWQG (96 to 100% of samples in each area; Appendix Figure B.3; Appendix Tables D.2 and D.3). Although nitrate concentrations exceeded the EVWQP Level 1 benchmark at both areas upstream of the AWTF discharge in 2021 (34% [21 of 61 sampling events] and 53% [30 of 57 sampling events] of LC_LCUSWLC and LC_WLC samples, respectively), this was not the case at mine-exposed areas in Line Creek downstream of the discharge (LC_LC3, WL_DCP_SP24, LC_LCDSSLCC, LC_LCC, and LC_LC4 were all below the benchmark; Appendix Figure B.3, Appendix Tables D.2 and D.3) suggesting that the AWTF is functioning as expected in reducing nitrate concentrations. Nitrate concentrations at LC_LC3 (which is the nearest downstream area to the AWTF) were below the EVWQP Level 1 benchmark throughout 2021, which is a lower frequency of exceedance than in 2020 and 2019 (4% and 33% of samples, respectively; Minnow 2020a, 2021a).

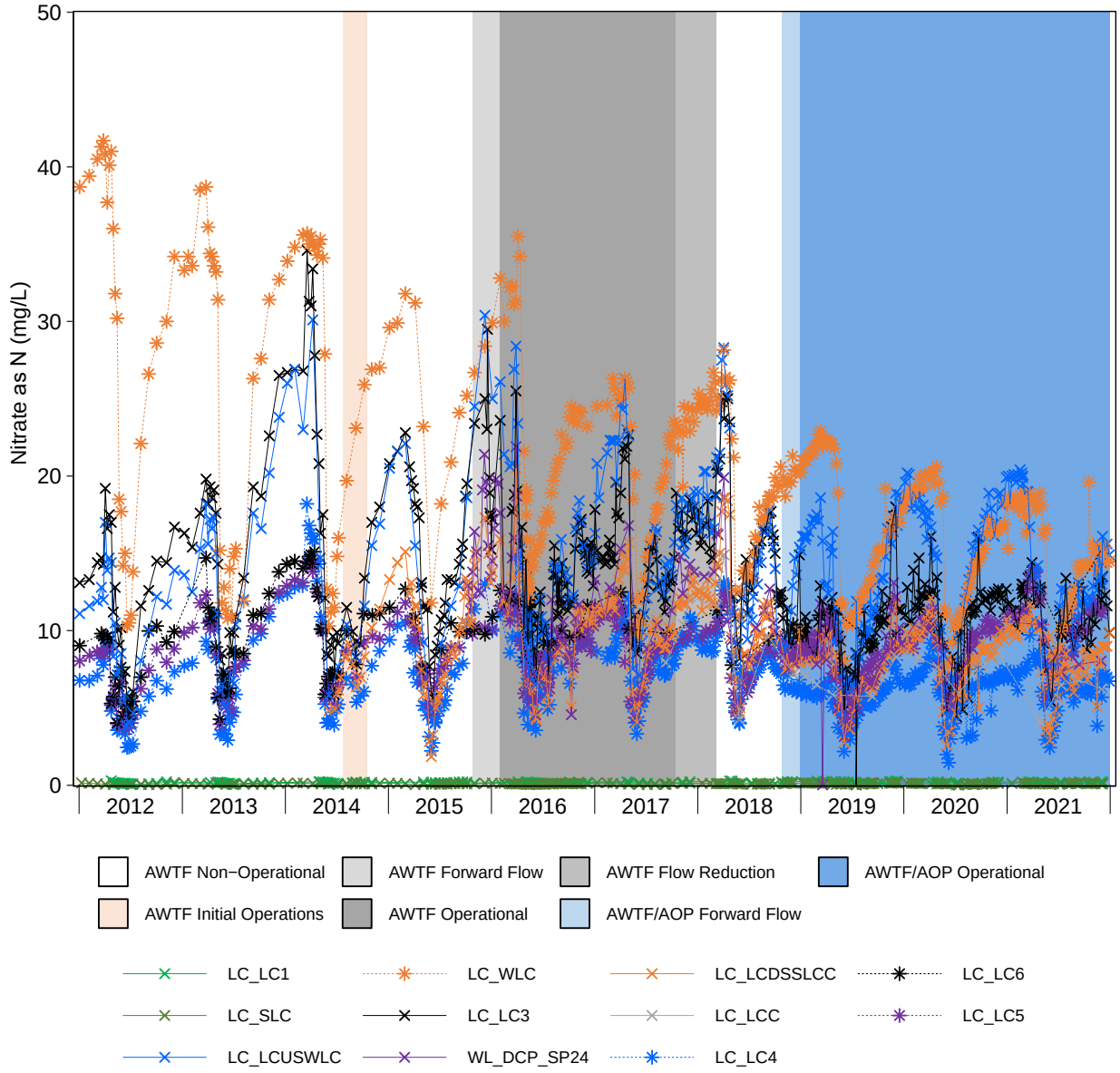


Figure 3.6: Time Series Plots for Aqueous Nitrate (as N) Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRL = 0.025 mg/L). West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

3.3 Primary Productivity Indicators

In 2021, mean periphyton coverage was moderate at nine of the ten study areas (Appendix Figure B.4; Appendix Table B.1), with visual scores at these areas between two and three (of a possible range from one [rocks not slippery and no obvious colour] to five [rocks mostly obscured by algae mat]). The one exception was RG_FRUL, which had a mean visual score of 1.8. The moderate visual periphyton scores for 2021 are similar to those from 2020, with the exception of RG_LILC3 and RG_LIDCOM, which both had lower periphyton scores in 2021 compared to those in 2020 (mean score of 4 in 2020; Minnow 2021a). The results for RG_LILC3 and RG_LIDCOM in 2021 was more similar to those prior to 2020 (mean score = 3 at both areas in 2017 to 2019; Minnow 2018b, 2019a, 2020a). As such, it is likely that the increased periphyton coverage noted in 2020 was an isolated event that may have been related to environmental factors that could have influenced periphyton growth during that year (e.g., lower water depth and flows, and/or increased temperature).

3.4 Secondary Productivity Indicators

Analyses of the potential changes in benthic invertebrate biomass and density at mine-exposed areas RG_LILC3 and RG_LIDSL (sampling areas immediately downstream of the AWTF discharge and the Compliance Point, respectively) relative to changes at the reference areas (RG_LI24 and RG_SLINE) over the same time period were performed excluding two outlying values for the reference area RG_SLINE – one in 2017 and one in 2018 (Figures 3.7 and 3.8; see Section 2.7.2 for data ANOVA methods, including outlier removal).

Benthic invertebrate biomass at RG_LILC3 (based on Hess sampling) in 2021 was not significantly different to previous years, with no significant temporal differences noted between 2014 and 2021 when evaluated either for RG_LILC3 only or for RG_LILC3 relative to reference over time (Figure 3.7; Appendix Tables B.2 and B.3). No significant temporal differences were noted for biomass at RG_LIDSL from 2014 to 2021 when evaluated at the mine-exposed area only, but subtle temporal differences were noted relative to changes at the reference area (p = 0.055), in which case biomass in 2019 was significantly lower compared to 2014. Otherwise, biomass at RG_LIDSL has been stable over the three years of AWTF with AOP operation (2019 to 2021) when evaluated alone or relative to reference (Figure 3.7; Appendix Tables B.2 and B.3). Combined, the biomass results at RG_LILC3 and RG_LIDSL did not indicate an increase in benthic invertebrate biomass associated with AWTF operation with AOP in 2019 to 2021.

Density at RG_LILC3 has been stable from 2014 to 2021 based on the evaluation of temporal changes at RG_LILC3 only (i.e., no significant differences among years; Figure 3.8, Table 3.1;

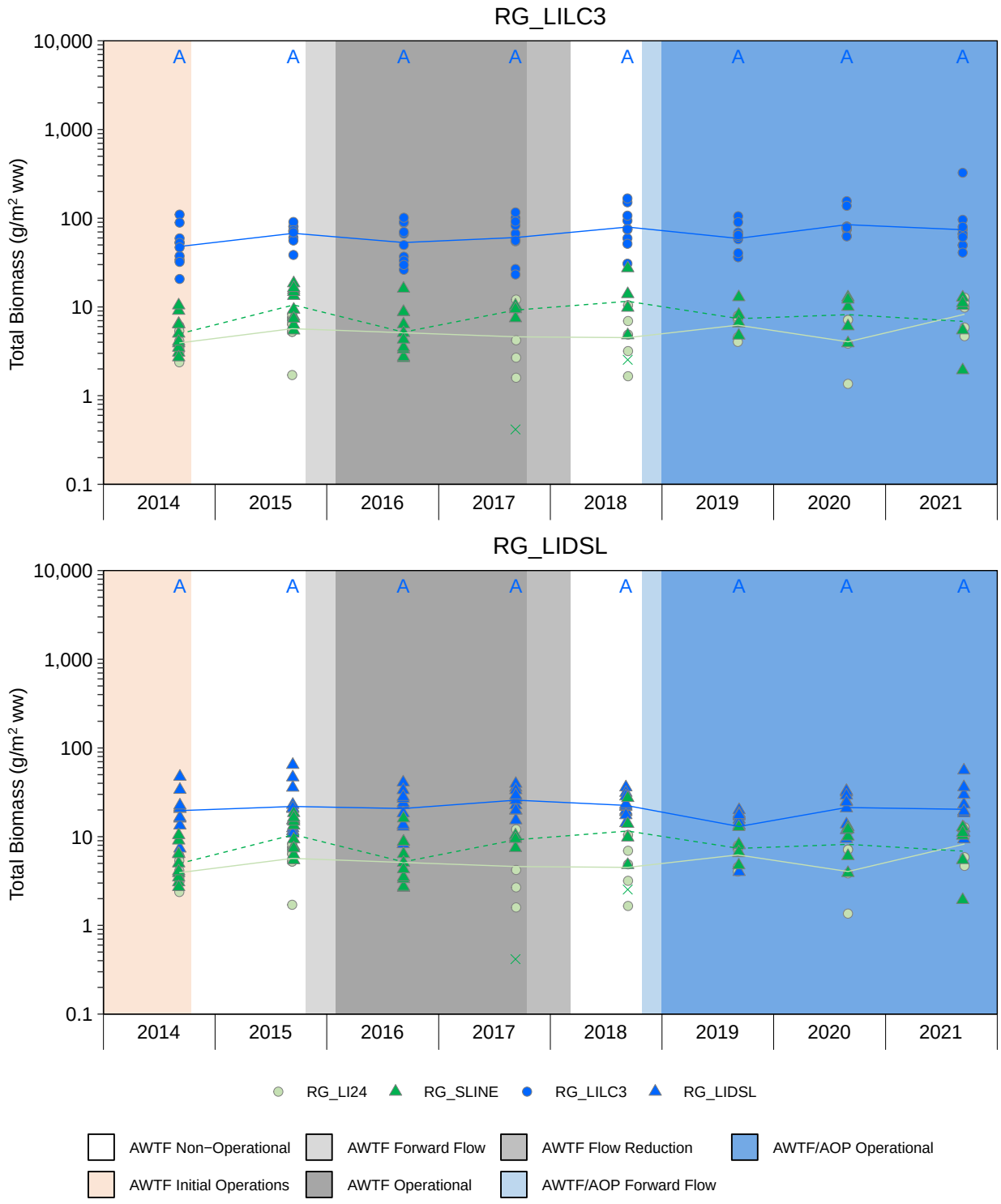


Figure 3.7: Total Benthic Invertebrate Biomass (Hess Sampling) for RG_LILC3 and RG_LIDSL Relative to RG_SLINE and RG_LI24 (Reference Areas), 2014 to 2021

Notes: West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines are displayed for each monitoring area to provide context, but pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge. Years that share a letter (e.g., A,B) were not significantly different (*p* value > 0.1) in a Tukey HSD post−hoc contrast among years for the respective exposed station. Outliers not used in analysis plotted with an 'X'. g/m^2 = grams per metre squared. ww = wet weight.

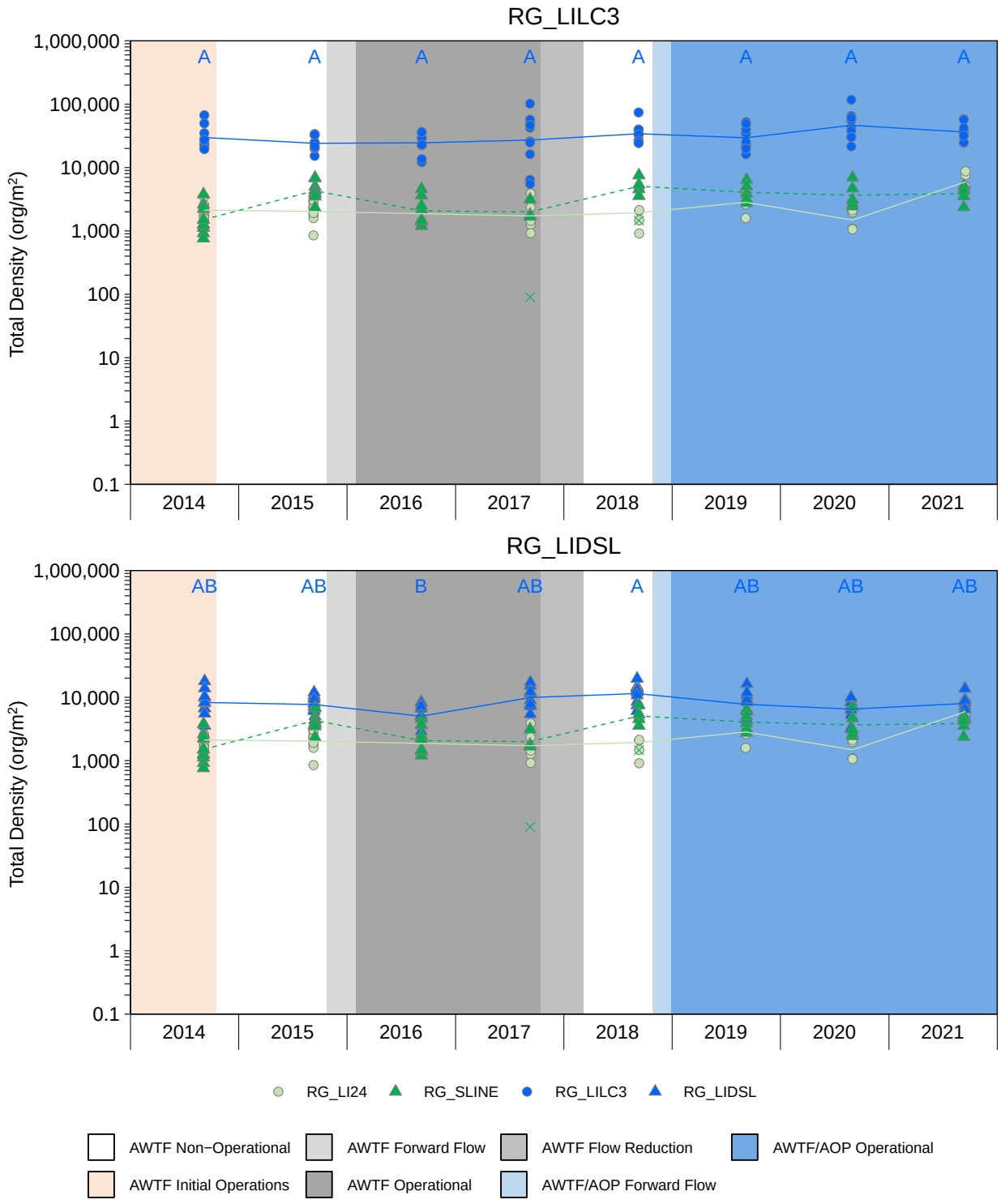


Figure 3.8: Total Benthic Invertebrate Density (Hess Sampling) for RG_LILC3 and RG_LIDSL Relative to RG_SLINE and RG_LI24 (Reference Areas), 2014 to 2021

Notes: West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines are displayed for each monitoring area to provide context, but pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge. Years that share a letter (e.g., A,B) were not significantly different (*p* value > 0.1) in a Tukey HSD post−hoc contrast among years for the respective exposed station. Outliers not used in analysis plotted with an 'X'. org/m² = organisms per metre squared.

Table 3.1: Geometric Means of Benthic Invertebrate Density for Hess Sampling in Areas of Line Creek, 2014 to 2021

Area	Benthic Invertebrate Density (# organisms/m^2)							
	2014	2015	2016	2017	2018	2019	2020	2021
RG_LI24	2,120	2,028	-	1,723	1,933	3,182	1,482	5,940
RG_SLINE	1,508	4,300	2,072	1,072	5,062	4,067	3,659	3,857
RG_SLINE[a]	1,508	4,300	2,072	1,993	3,947	4,067	3,659	3,857
RG_LILC3	29,805	24,136	24,564	27,162	34,153	29,481	46,510	36,405
RG_LIDSL	8,276	7,690	5,024	9,910	11,452	7,718	6,506	7,992

Note: "-" = no data

[a] One outlier removed in 2017 and 2018.

Appendix Table B.4).[31] Density at RG_LILC3 relative to RG_SLINE in 2021 was similar to prior years, while density at RG_LILC3 in 2021 relative to RG_LI24 was either similar (2014, 2015, 2017, and 2019) or lower than previous years (2018 and 2020). Overall, no increases in density at RG_LILC3 were noted (when compared to either reference area) when comparing years of AWTF with AOP (2019 to 2021) to previous years of evaluation (including pre-AWTF operation). Similarly, density at RG_LIDSL in 2021 showed no significant differences when compared to previous years (2014 to 2020) based on the evaluation of temporal changes at RG_LIDSL only. However, temporal differences were observed when density at RG_LIDSL was evaluated in relation to changes in reference over the same time frame, with the differences dependent on reference area. Benthic invertebrate density at RG_LIDSL was significantly higher in 2021 when compared to previous years (excluding 2019) when evaluated in relation to changes in RG_LI24 but showed no differences to those same years (except for 2014) when evaluated in relation to changes at RG_SLINE (Figure 3.8; Appendix Table B.4). Combined, the density results at RG_LILC3 and RG_LIDSL did not indicate an increase in benthic invertebrate density compared to both reference areas that was associated with AWTF operation with AOP in 2021 (which is similar to results from 2019 and 2020).

Benthic invertebrate abundance in kick and sweep samples from 2021 were within or above the regional and site-specific normal ranges at mine-exposed areas in Line Creek (both upstream and downstream of the AWTF discharge) and in the Fording River (upstream and downstream of the Line Creek; Appendix Figure B.5, Appendix Table B.5). Total sample abundance at mine-exposed areas downstream[32] of the AWTF discharge in 2021 was within the range of previous AWTF operational years (without AOP [2016, 2017] or with AOP [2019, 2020]; Appendix Figure B.5). Two areas of Line Creek downstream of the AWTF with longer-term datasets (RG_LIDSL and RG_LI8), have shown slightly higher abundance during AWTF with AOP operation (2019 to 2021) compared to pre-AWTF (2012 to 2015; Appendix Figure B.5). However, benthic invertebrate abundance results for RG_LILC3 (the area located closest to the AWTF discharge) from 2019 to 2021 were within the range of pre-AWTF results, suggesting that temporal increases in abundance observed at areas further downstream were likely not AWTF-related. These results are consistent with the benthic invertebrate biomass and density results discussed above.

In summary, monitoring data indicated that secondary productivity in Line Creek was not affected by AWTF with AOP operations in 2021. This is consistent with the similarity in aqueous

[31] Benthic density data were not available for RG_LI24 in 2016 for comparison.

[32] Areas downstream of AWTF discharge include RG_LILC3, RG_LISP 24, RG_LIDSL, RG_LIDCOM, RG_LI8, and RG_FO23. Pre-AWTF operational abundance values were not available for RG_LISP24 or RG_LIDCOM.

nutrient concentrations (Section 3.2) and primary productivity results (Section 3.3) in 2021 relative to previous years (namely 2019 and 2020) but also those prior to AWTF operation.

3.5 Benthic Invertebrate Community Structure

Endpoints related to benthic invertebrate community structure were evaluated relative to regional normal ranges and site-specific ranges defined in the RAEMP (Minnow 2020b). Community taxon richness (i.e., number of different taxa identified to LPL of identification) was within or above the regional normal range and site-specific normal range at mine-exposed and reference sampling areas in 2021 (Appendix Figure B.6, Appendix Table B.5). Taxon richness at RG_LILC3 in 2021 was similar to 2020 and higher than 2018 and 2019 (Appendix Figure B.6). An increase in taxon richness in 2020 and 2021 relative to 2018 and 2019 was also observed at RG_LCUT (Appendix Figure B.6), which is upstream of the AWTF discharge, suggesting that these increases are likely due to natural variability or conditions further upstream (Appendix Figure B.6).

Percent EPT in 2021 fell below the regional normal and site-specific ranges at mine-exposed areas upstream (RG_LCUT) of the AWTF as well as three of the six downstream areas of the AWTF discharge (RG_LILC3, RG_LISP24, RG_FO23 [1 of 5 replicates]; Appendix Figure B.7, Appendix Table B.5). Although percent EPT fell below the regional and site-specific ranges for these three areas, percent EPT was either within (RG_FO23) or higher than results from the previous three years (RG_LILC3 and RG_LISP24; i.e., 2018 to 2020). At the other areas located downstream of AWTF in Line Creek (RG_LIDSL, RG_LIDCOM, and RG_LI8), EPT percentages were within the regional and site-specific ranges in 2021 (Appendix Figure B.7, Appendix Table B.5) as well as higher than the last three years of evaluation (2018 to 2020).

Percent Ephemeroptera (mayflies) results in 2021 showed a spatial pattern generally consistent with the percent EPT results. Ephemeroptera percentages fell below the regional and site-specific ranges at mine-exposed areas upstream (RG_LCUT) of the AWTF and immediately downstream of the AWTF discharge (RG_LILC3; Appendix Figure B.8, Appendix Table B.5), which is consistent with results from 2020 (Minnow 2021a). Percent Ephemeroptera at areas located further downstream in Line Creek and in the Fording River were within the regional normal range but below the site-specific normal range at RG_LISP24, RG_LIDSL (1 of 5 replicates), RG_LIDCOM, and RG_FO23 (2 of 5 replicates; Appendix Figure B.8, Appendix Table B.5). Despite this, results from mine-exposed areas of Line Creek in 2021 were within or higher than the range of previous years, including prior to the commissioning of the AOP. Specifically, percent Ephemeroptera was higher in 2021 at RG_LILC3 than seven of the nine previous years of evaluation (2012, 2014, 2016 to 2020; Appendix Figure B.7). Similarly, higher percent Ephemeroptera at areas further downstream, specifically RG_LISP24, RG_LIDSL, RG_LIDCOM,

and RG_LI8, have been observed during AWTF with AOP Operation (2019 to 2021) when compared to AWTF without AOP (Appendix Figure B.7). It should be noted, however, that increases in percent Ephemeroptera as well as percent EPT were also noted at RG_LCUT (upstream of the AWTF discharge), and thus increases in these endpoints may be attributed to the influences other than those related to the AWTF with AOP operation. Regardless, increases in these indices (percent EPT and percent Ephemeroptera) during the AWTF with AOP period (when compared to AWTF without AOP) at most downstream areas of the AWTF discharge is suggestive of an improvement in benthic invertebrate community structure.

Percent Chironomidae in 2021 was above the reference normal range at areas immediately upstream (RG_LCUT) and at two of the six areas downstream from the AWTF (RG_LILC3 and RG_LISP24; Appendix Figure B.9, Appendix Table B.5). The percentage of Chironomidae at RG_LCUT, RG_LILC3, and RG_LISP24 was lower than previous years, with percent Chironomidae being only slight above the reference normal range for RG_LISP24 (Appendix Figure B.9). Percent Chironomidae at these three areas has decreased from 2019 which compliments the increase in percent EPT during this same time frame (Appendix Figures B.7 and B.9). Remaining sampling areas located furthest downstream of the AWTF (RG_LI8, RG_LIDSL, RG_LIDCOM, and RG_FO23) showed Chironomidae percentages in 2021 that were within the reference normal range as well as lower than results from 2020 (Appendix Figure B.9).

Percent EPT was also assessed against the biological trigger established for this endpoint (information pertaining to the determination of the biological trigger value can be found in Appendix E). This was completed for LCO LAEMP monitoring areas with available water quality predictions (i.e., five mine-exposed areas [RG_LCUT, RG_LILC3, RG_LIDSL, RG_LI8, and RG_FO23] and the two reference areas [RG_SLINE and RG_LI24]; see Appendix E for details). In 2021, three of the five mine exposed areas evaluated had percent EPT for all replicates which corresponded to a biological trigger (i.e., percent EPT was below the biological trigger), including RG_LCUT (the area upstream of the AWTF discharge), RG_LILC3 (the area in closest proximity to the AWTF discharge), and RG_FO23 (area at the confluence of the Fording River and Line Creek). In contrast, all five mine-exposed areas in 2020 had at least one replicate that corresponded to a biological trigger suggesting an increase in percent EPT from 2020 to 2021 (Minnow 2021a). Percent EPT at these areas has previously been flagged for further investigation in the RAEMP based on benthic invertebrate community results (Minnow 2020b). Further information regarding the percent EPT biological trigger as it pertains to the LCO LAEMP can be found in Appendix E.

3.6 Summary

Total phosphorus concentrations at the Compliance Point (LC_LCDSSLCC) were below the SPO of 0.02 mg/L during the 2021 growing season (June 15 to September 30), consistent with previous years. Aqueous nutrient concentrations (total phosphorus, orthophosphate, and nitrate) in 2021 were generally within the range observed prior to AWTF operation. In addition, results suggest that operation of the AWTF with AOP from 2019 to 2021 was more successful at minimizing phosphorus and orthophosphate contributions to the receiving environment than during the AWTF operational phase without AOP (in 2016 and 2017).

Periphyton coverage at all mine-exposed areas (as well as reference) was moderate in 2021 (based on the CABIN visual assessment, see Section 2.3) and was consistent with results from previous years. This included areas RG_LILC3 and RG_LIDCOM, which showed lower periphyton coverage in 2021 in comparison periphyton coverage in 2020 (RG_LILC3 and RG_LIDCOM had periphyton scores of 4) but were similar to results from 2017 to 2019 suggesting that results in 2020 were an isolated event likely associated with variability in environmental factors. Benthic invertebrate biomass and density at mine-exposed areas of Line Creek showed no significant increases in 2021 when compared to previous years that could be related to operation of the AWTF with AOP, and has been stable during the AWTF with AOP period (2019 to 2021). Benthic invertebrate total abundance (measured by kick and sweep) in all areas in 2021 were similar to results from 2019 and 2020 (i.e., the other years of operation of AWTF with AOP), and although higher in some cases than pre-AWTF conditions (2012 to 2015), were all still within the regional normal range. Additionally, the absence of an increase in abundance at the closest area to the AWTF discharge (RG_LILC3) during AWTF with AOP operations (2019 to 2021) compared to pre-AWTF conditions 2017, suggests that marginal increases in abundance over this period further downstream were likely unrelated to the AWTF with AOP (consistent with the biomass and density results). Benthic invertebrate community endpoints indicated no adverse change in community characteristics related to AWTF with AOP operations in 2021. Rather, an increase in the percentage of sensitive taxa (as measured through evaluations of percent EPT and percent Ephemeroptera) in 2019, 2020, and 2021 at most downstream areas of Line Creek (as well as the upstream area, RG_LCUT) relative to past years was suggestive of an improvement in benthic invertebrate community structure. Overall, biological productivity downstream from the WLC AWTF did not appear to be affected by AWTF with AOP operations throughout 2021, which is consistent with past evaluations during this operational period (2019 and 2020).

4 SELENIUM CONCENTRATIONS

4.1 Overview

Monitoring data were evaluated in this section to address Study Question #2: Are tissue selenium concentrations reduced downstream from the WLC AWTF? To address this study question, selenium concentrations in benthic invertebrate tissue were evaluated in relation to the AWTF operational status. The AWTF with AOP was operational throughout 2021 with discharge to the receiving environment occurring throughout the year (see Section 1.3 for details).

4.2 Tissue Selenium Concentrations

4.2.1 Composite-Taxa Benthic Invertebrate Samples

Two areas sampled in September 2021, RG_LILC3 (n=1) and RG_LI8 (n=3), had a proportion of annelids that met the criteria to evaluate annelids separately[33]. The 'annelid only' tissue replicates for both areas were either just slightly higher (<4 mg/kg dw higher; RG_LILC3) or within the range of the corresponding composite taxa samples (RG_LI8; Appendix Table C.1). Overall, the presence of annelids in these four samples (of the 50 samples taken throughout Line Creek in September) are not expected to affect the results of the study and the analysis will focus on composite-taxa benthic invertebrate results.

Benthic invertebrate tissue selenium concentrations at mine-exposed areas downstream of the AWTF in Line Creek (RG_LILC3, RG_LISP24, RG_LIDSL, RG_LIDCOM, and RG_LI8) were significantly lower during each of the AWTF with AOP operational phase sampling events in 2021 than each of the sampling events during AWTF without AOP operations (2016 and 2017), compared to changes at the reference areas over the same time frame (Figure 4.1; Appendix Figures C.1 to C.2, Appendix Tables C.1 to C.6). Furthermore, benthic invertebrate selenium concentrations in 2021 for these areas were either similar to or lower than concentrations prior to AWTF operation (2012) when considered relative to changes at the reference area over the same period (where data exist for this comparison: RG_LILC3, RG_LIDSL, RG_LI8; Figure 4.1; Appendix Figure C.2, Appendix Tables C.2, C.4, C.6). In contrast, RG_LCUT, which is upstream of the AWTF outfall (and thus would not be influenced by the AWTF), did not show consistent differences between the 2021 AWTF with AOP period and the AWTF without AOP period (2016 and 2017) as 5 of the 12 comparisons showed no differences (Appendix Table C.7).

[33] As noted in the methods, annelids were only included in the composite-taxa tissue sample if the proportion of annelids was >5% of the total biomass sample, and if so, an additional 'annelids only' sample was also evaluated. This process started in September 2021 as previous assessments have suggested that the presence of annelids in composite-taxa benthic invertebrate tissue sample may bias the results high (Golder 2021b). Annelids were not found at a high enough proportion in December sampling for any area to be evaluated separately.

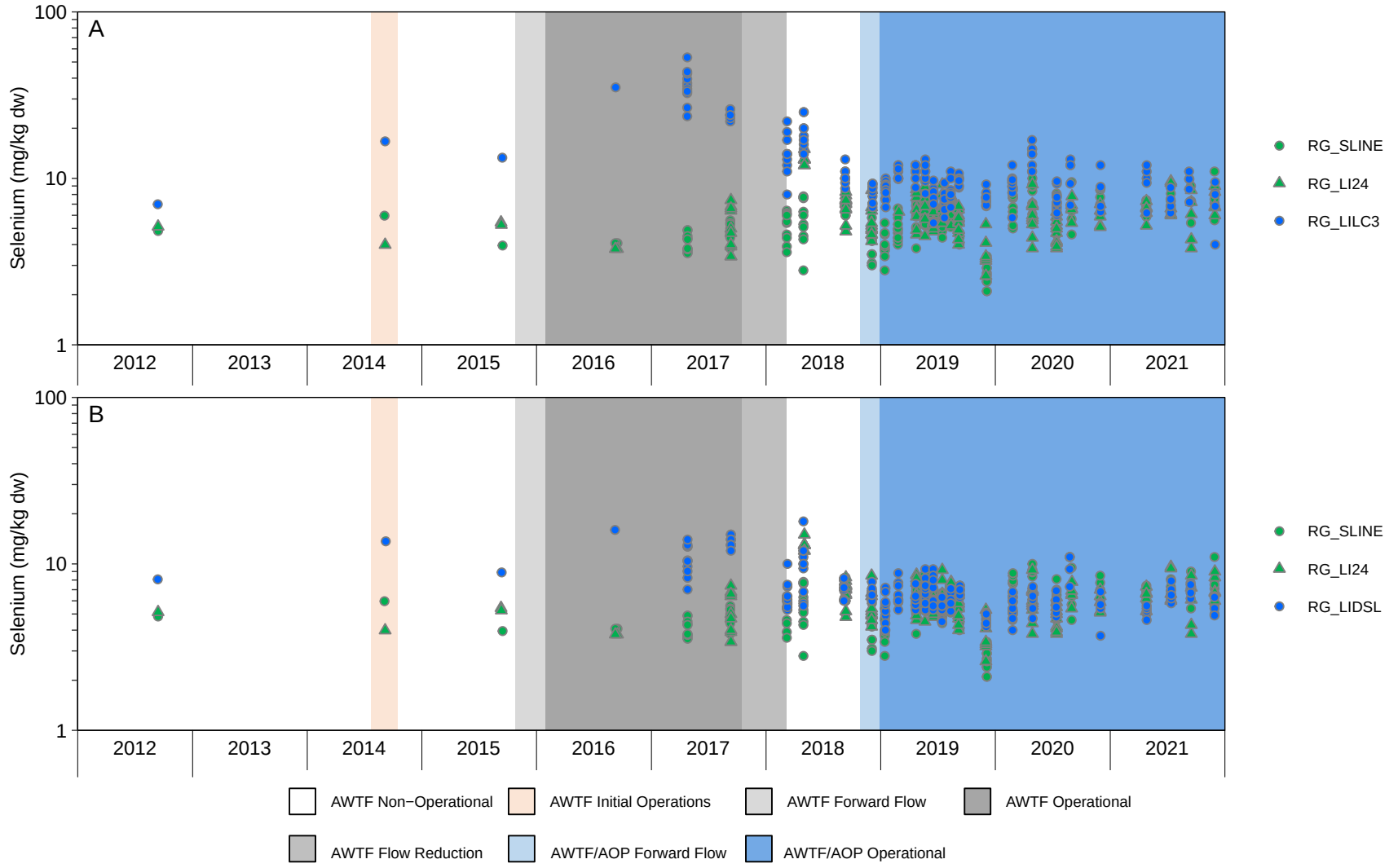


Figure 4.1: Benthic Invertebrate Selenium Concentrations, for A) RG_LILC3 and B) RG_LIDSL (Mine−exposed Areas) Relative to RG_SLINE and RG_LI24 (Reference Areas), 2012 to 2021

Notes: Blue symbols represent mine-exposed areas and green symbols represent reference areas. Due to a brief period of exposure to less−than−capacity AWTF effluent in 2014, benthic invertebrate tissue selenium data from September 2015 were not considered representative of AWTF operation, but also not representative of a no−discharge condition. These data were therefore excluded from analyses and are displayed in plots for context only. West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines are displayed for each monitoring area to provide context, but pertain only to mine- exposed monitoring areas located downstream of the AWTF discharge

Within the 2021 AWTF with AOP operational phase, changes in benthic invertebrate selenium concentrations at each downstream area in Line Creek were compared to changes at the reference areas over the same time frame (Appendix Table C.8 to C.12). The purpose of this comparison was to evaluate AWTF with AOP performance during 2021 and better understand how seasonality may influence benthic invertebrate tissue selenium concentrations. Results of this analysis indicated that selenium concentrations in benthic invertebrates (as a function of changes in reference areas) changed differently at each of the mine-exposed areas in Line Creek during this period (Appendix Tables C.8 to C.12). Relatively few patterns in the significant changes within 2021 were consistently observed among the mine-exposed areas relative to reference. The possible exception was significantly lower selenium tissue concentrations in December samples when compared to those collected in April or September. Benthic invertebrate tissue selenium concentrations were significantly higher in April when compared to December in three of five areas (RG_LILC3, RG_LISP24, and RG_LIDCOM), while all five areas had significantly higher benthic invertebrate tissue selenium concentrations in September when compared to samples from December (Figure 4.1; Appendix Figures C.1 and C.2, Appendix Tables C.8 to C.12). Similar seasonality observations were noted with the area upstream of the AWTF as well, as RG_LCUT also had higher benthic invertebrate tissue selenium concentrations in April and September when compared to December (as well as July; Appendix Table C.13). Taxon composition of benthic invertebrate samples was also largely consistent throughout the year among monitoring areas (Appendix Table C.1), suggesting that the increased tissue selenium concentrations in September and April were not related to sample composition. Overall, these results suggest that seasonality is a factor influencing benthic invertebrate tissue selenium concentrations, with higher concentrations noted in April and September.

Changes in benthic invertebrate tissue selenium concentrations at each area were also evaluated relative to changes at the reference areas throughout the AWTF with AOP operational phase (i.e., January 2019 to December 2021) to assess the stability of tissue selenium concentrations over this period. Benthic invertebrate tissue selenium concentrations were grouped by month and then compared amongst years (i.e., comparing the same month in 2019 to 2020 to 2021) and overall few differences were noted at each of the mine-exposed areas downstream of the AWTF (Appendix Tables C.14 to C.19). The notable exception was sampling events in December, as benthic tissue selenium concentrations in December were generally significantly lower than the previous sampling event(s). For instance, RG_LILC3 showed lower concentrations in 2021 and 2020 when compared to 2019 (which was also the case for RG_LISP24, RG_LIDSL, RG_LIDCOM and RG_FO23). This trend was also apparent in the area upstream of the AWTF outfall, RG_LCUT (Appendix Table C.20), which suggests that benthic invertebrate tissue

selenium concentrations in Line Creek were lower overall (both upstream and downstream of the AWTF outfall) in December 2020 and 2021 when compared to December 2019. Regardless, areas downstream of the AWTF outfall showed either no significant difference or a significant decrease with each preceding year (2019 ≥ 2020 ≥ 2021) in benthic invertebrate tissue selenium concentrations (when comparing similar months between years), suggesting that the AWTF with AOP is functioning as expected and that benthic invertebrate tissue concentrations in the area are stable.

Selenium concentrations in benthic invertebrates collected from the six areas downstream of the AWTF discharge in Line Creek were similar to or lower than reference and/or upstream of the discharge (RG_LCUT) throughout the 2021 sampling period (Figure 4.2, Table 4.1). In addition, mean benthic invertebrate selenium concentrations at areas downstream of the AWTF in 2021 were within the regional normal range and below the Level 1 EVWQP Benchmark for effects to invertebrates (13 mg/kg dw), except concentrations at RG_LILC3 in April and September which were higher than the regional normal range (Figure 4.2, Table 4.1). The benthic invertebrate selenium concentrations at RG_LILC3 in 2021 (as well as in the other years of AWTF with AOP operation; 2019 and 2020) represent a substantial improvement relative to 2016 and 2017 (during the AWTF operational phase without AOP) when tissue selenium concentrations exceeded the EVWQP Level 2 and Level 3 benchmarks for effects to benthic invertebrates at this area (Table 4.1; Minnow 2017a, 2018b). Similar to the results in 2020 (Minnow 2021a) and 2019 (Minnow 2020a), results from 2021 continued to indicate that the spatial and temporal extent of benthic invertebrate selenium concentrations was substantially decreased compared to AWTF operation without AOP (e.g., Minnow 2018b) and in the few events mean concentrations were above the reginal normal range (such as at RG_LILC3 in April and Sept 2021) it was only in the area immediately downstream of the AWTF (specifically RG_LILC3).

Selenium concentrations in benthic invertebrates from the Fording River downstream of Line Creek (RG_FO23) were similar to the Fording River upstream of Line Creek (RG_FRUL; Figure 4.3, Table 4.1) in all four sampling events in 2021 (April, September, July, November/December). The slight (but non-significant) difference in benthic invertebrate selenium concentrations between RG_FRUL and RG_FO23 was stable throughout 2021 (Figure 4.3; Appendix Table C.21), with mean selenium concentrations that were slightly lower downstream (RG_FO23) compared to upstream of Line Creek (but not significantly so; Figure 4.3). In addition, the difference in benthic invertebrate selenium concentrations between RG_FO23 and RG_FRUL was similar in 2021 (during the 2021 AWTF with AOP operational phase) compared to baseline and AWTF without AOP with a single exception. Specifically, benthic invertebrate tissue selenium concentrations at RG_FO23 in September 2021

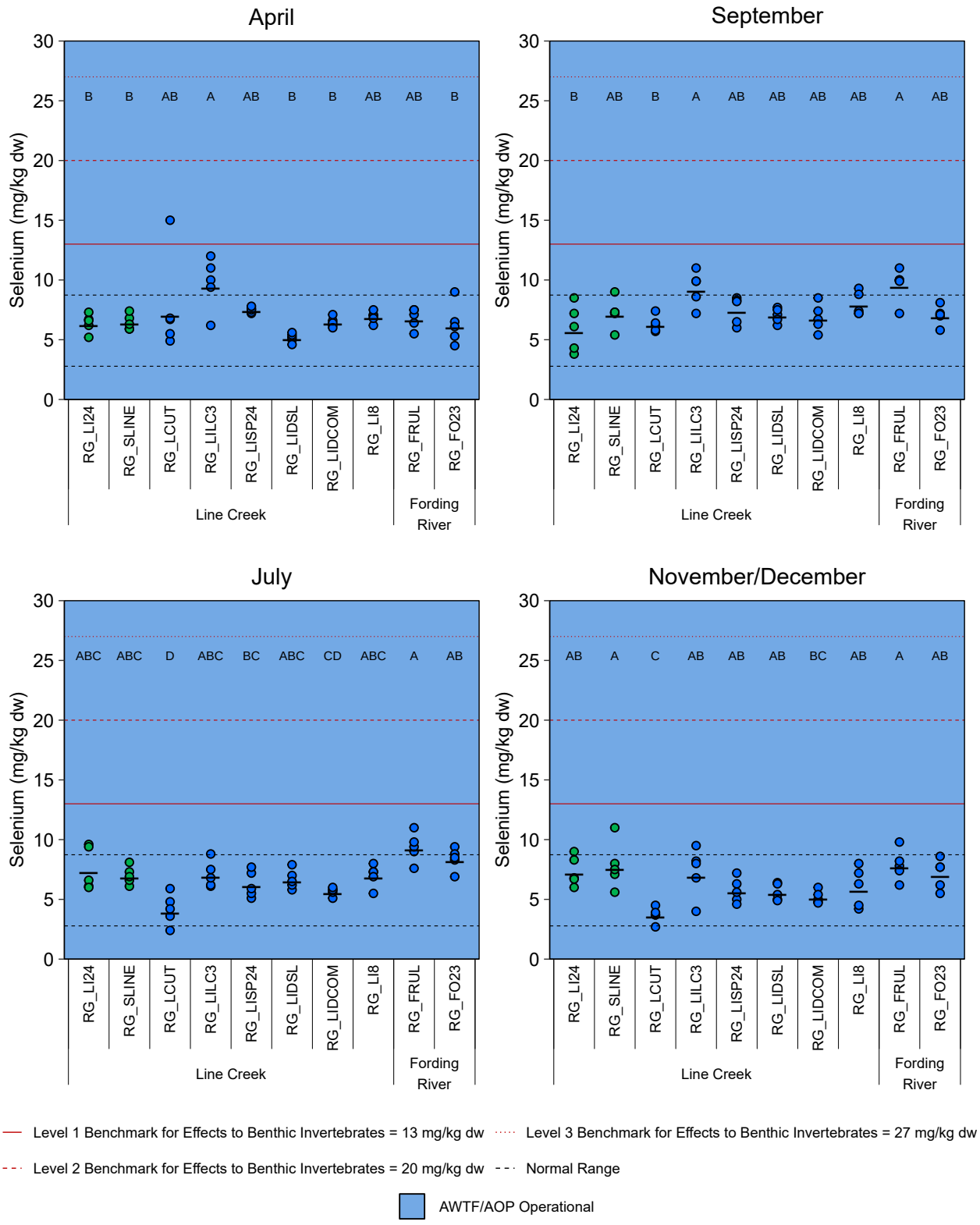


Figure 4.2: Selenium Concentrations in Composite−taxa Benthic Invertebrate Samples Collected at Reference (Green) and Mine−exposed (Blue) Areas of Line Creek and Fording River, 2021

Notes: West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine−exposed monitoring areas downstream of the AWTF discharge. Dashed black lines represent the normal range defined as the 2.5th and 97.5th percentiles of the 1996 to 2019 reference area data from the Regional Aquatic Environmental Monitoring Program (RAEMP). Areas that do not share a letter (e.g. a,b,c) are significantly different (a = 0.05) in a Tukey's HSD test following a two−way ANOVA by area with Selenium log10 transformed.

Table 4.1: Mean[a] Selenium Concentrations (mg/kg dw) in Benthic Invertebrate Composite-Taxa Samples Collected from Line Creek and Fording River, Line Creek LAEMP, 2006 to 2021

Area		Biological Area Code	Biological Area Description	Prior to AWTF Operation									Initial AWTF Operation (July 24 to Oct 16, 2014	No AWTF Operation (Oct 17, 2014 to Oct 26, 2015)	AWTF Operation (Feb 1, 2016 to Oct 14, 2017)				AWTF Flow Reduction (Oct 15, 2017 to Mar 8, 2018)		AWTF Operation Suspended (Mar 9, 2018 to Oct 27, 2018)				
				2006 (August)	2009 (May/ June)	2009 (August/ September)	2010 (May)	2010 (August)	2011 (August)	2012 (September)	2013 (July)	2014 (July)	2014 (September)	2015 (September)	2016 (September)	2017 (February/ March)	2017 (April)	2017 (September)	2017 (November)	2017 (December)	2018 (March)	2018 (April)	2018 (April/May)	2018 (May)	2018 (September)
Sample Size (n)				**1**	**1**	**4**	**3**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**5**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**
Line Creek	Reference	RG_LI24	South fork of upper Line Creek upstream of LCO and Teck water station LC_LC1	1.4	4.4	-	-	-	-	5.1	-	-	4.0	5.3	3.8	-	-	5.2	-	-	(frozen)	-	13	-	7.0
		RG_SLINE	South Line Creek upstream of Line Creek and LCO	-	-	-	-	-	-	4.8	-	-	6.0	3.9	4.1	-	4.1	4.8	-	-	5.2	-	5.7	-	6.6
	Mine-exposed	RG_LCUT	Line Creek downstream of rock drain, downstream of West Line Creek and upstream of AWTF outfall	-	-	-	-	-	-	-	-	-	-	-	6.2	5.0	6.4	5.9	6.7	6.9	6.3	7.0	7.6	7.5	7.9
		RG_LILC3	Line Creek downstream of West Line Creek and AWTF outfall	-	-	-	-	-	-	7.0	-	-	17	13	35	27	37	24	26	27	14	19	18	15	10
		RG_LISP24	Line Creek downstream of LC_WTF_OUT, approximately 50 m downstream of contingency pond discharge	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	14	13	7.4	11	10	8.9	8.2
		RG_LIDSL	Line Creek downstream of South Line Creek confluence	-	-	-	-	-	-	8.1	-	5.6	14	8.9	16	12	10	14	12	11	6.6	9.3	10	9.3	7.2
		RG_LIDCOM	Line Creek downstream of the compliance point	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.6	7.4	9.4	7.7	9.3	9.1	9.4	7.7
		RG_LI8	Line Creek downstream of the canyon	7.8	11	9.0	-	6.3[d]	8.4	7.8	4.3	-	8.4	9.3	12	8.9	8.6	11	8.3	8.9	6.9	10	12	8.6	9.0
Fording River	Mine-exposed	RG_FRUL	Fording River downstream of Grace Creek, upstream of Line Creek	-	-	-	-	-	-	7.9	-	-	-	7.5	-	-	7.0	8.1	-	-	6.9	-	8.1	-	11
		RG_FO23	Fording River downstream of Line Creek	10	5.8	8.83	5.0	5.9	8.8	7.5	11	8.8	-	6.4	6.7	-	6.6	8.9	-	-	6.4	7.9	8.7	7.6	9.4

Notes: "-" = no data. FRUL=FOUL prior to 2016. Calculation of the mean for RG_LI24 in Sept 2018 included results from both RG_LI24 and RG_DSLI24, RG_DSLI24 was sampled in Sept 2018 to investigate anomalous results at RG_LI24 reported in May 2018, but results from both areas were similar in Sept 2018, therefore data were pooled (Minnow 2019a).

[a] Means are only presented where the number of samples > 1, all other data are individual values.

[b] Sample size n = 9.

[c] Sample size n = 5.

[d] Sample size n = 1.

[e] Sample size n = 4.

[f] Sample size n = 6.

Table 4.1: Mean[a] Selenium Concentrations (mg/kg dw) in Benthic Invertebrate Composite-Taxa Samples Collected from Line Creek and Fording River, Line Creek LAEMP, 2006 to 2021

Area		Biological Area Code	Biological Area Description	AWTF/ AOP Forward Flow (Oct 28 to Dec 29, 2018)	AWTF/AOP Operational (December 29, 2018 to Present)																
				2018 (December)	2019 (January)	2019 (February/March)	2019 (April)	2019 (May)	2019 (June)	2019 (July)	2019 (August)	2019 (September)	2019 (December)	2020 (February)	2020 (April)	2020 (July)	2020 (August/September)	2020 (November/December)	2021 (April)	2021 (July)	2021 (September)	2021 (November/December)
Sample Size (n)				10	10	10	10	10	10	10	10	10	10	10	10	10	5	5	5	5	5	5
Line Creek	Reference	RG_LI24	South fork of upper Line Creek upstream of LCO and Teck water station LC_LC1	5.6	(frozen)	6.3[d]	6.8	6.7	5.4	6.6	6.8	5.4	3.7[f]	(frozen)	6.1	4.9	6.6	5.9	6.4	7.5	6.0	7.4
		RG_SLINE	South Line Creek upstream of Line Creek and LCO	4.3	4.0	4.9	5.9	5.9	6.1	5.7	6.0	5.1	2.7	7.0	7.7	6.2	6.5	7.2	6.5	7.0	7.2	7.8
	Mine-exposed	RG_LCUT	Line Creek downstream of rock drain, downstream of West Line Creek and upstream of AWTF outfall	6.5	6.1[b]	(frozen)	8.7[c]	4.0[b]	4.2	3.3	5.5	7.8	4.6	7.4	8.2	3.9	7.2	5.8	7.8	4.2	6.3	3.7
		RG_LILC3	Line Creek downstream of West Line Creek and AWTF outfall	8.2	8.5	11	11	10	7.8	7.2	8.1	9.7	7.6	9.2	14	7.4	11	9	9.7	7.1	9.3	7.3
		RG_LISP24	Line Creek downstream of LC_WTF_OUT, approximately 50 m downstream of contingency pond discharge	6.7	6.2	7.1	7.4	-	-	-	-	6.6	5.9	6.5	6.8	5.7	9.2	7.9	7.5	6.3	7.5	5.7
		RG_LIDSL	Line Creek downstream of South Line Creek confluence	6.7	5.7	6.6	6.0	7.1	6.8	5.4	6.0	7.0	4.7	5.5	5.9	5.8	9.9	5.5	5.2	6.7	7.0	5.6
		RG_LIDCOM	Line Creek downstream of the compliance point	7.4	7.0	7.7	8.0	-	-	-	-	6.5	5.3	5.7	6.6	5.2	6.4	5.5	6.5	5.7	6.9	5.2
		RG_LI8	Line Creek downstream of the canyon	7.2	5.8	6.6	7.4	6.1	6.7	6.4	6.7	6.5	4.2	5.1	6.7	5.3	10	8	6.9	7.0	8.0	6.0
Fording River	Mine-exposed	RG_FRUL	Fording River downstream of Grace Creek, upstream of Line Creek	10	7.5[c]	6.9	8.1	-	-	-	-	10	8.5	7.8	6.9	11	11	10	6.8	9.4	9.6	7.9
		RG_FO23	Fording River downstream of Line Creek	9.8	7.3	5.7[e]	7.6	-	-	-	-	8.5	6.7	5.1	8.0	7.8	7.5	7.2	6.3	8.4	7.0	7.1

Notes: "-" = no data. FRUL=FOUL prior to 2016. Calculation of the mean for RG_LI24 in Sept 2018 included results from both RG_LI24 and RG_DSLI24, RG_DSLI24 was sampled in Sept 2018 to investigate anomalous results at RG_LI24 reported in May 2018, but results from both areas were similar in Sept 2018, therefore data were pooled (Minnow 2019a).

[a] Means are only presented where the number of samples > 1, all other data are individual values.

[b] Sample size n = 9.

[c] Sample size n = 5.

[d] Sample size n = 1.

[e] Sample size n = 4.

[f] Sample size n = 6.

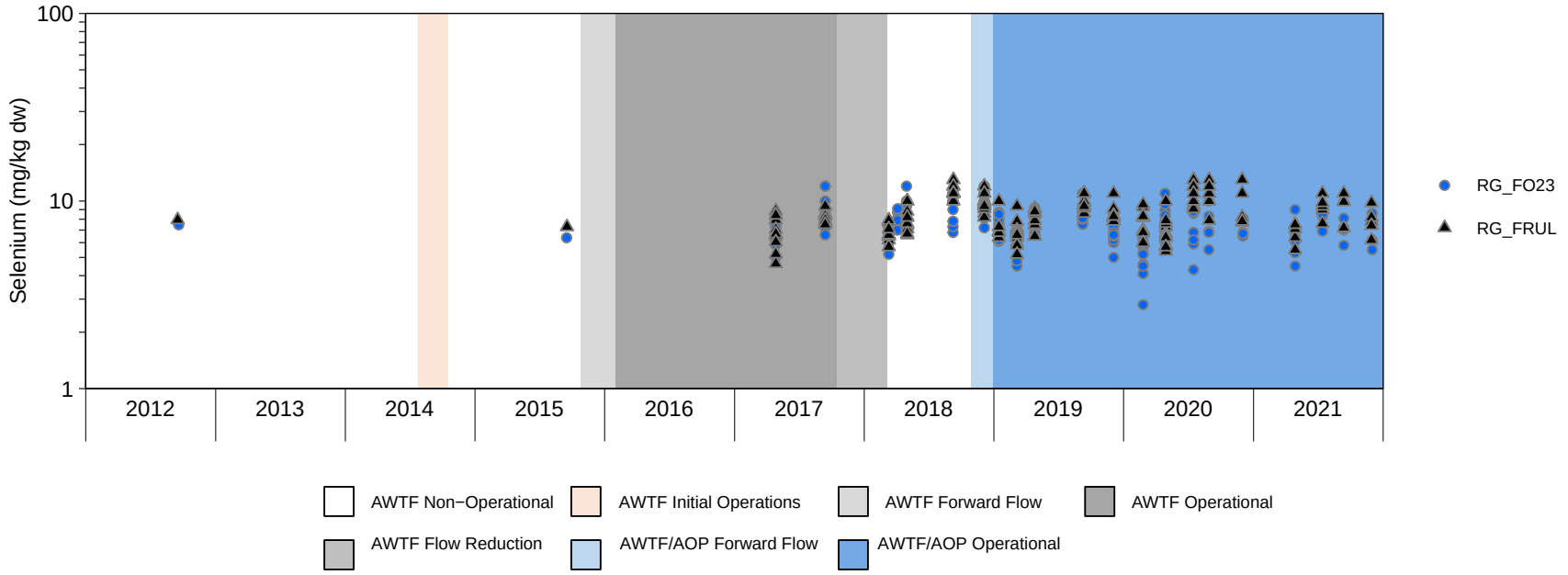


Figure 4.3: Benthic Invertebrate Selenium Concentrations, for RG_FO23 (Fording River Downstream of Line Creek) Relative to RG_FRUL (Fording River Upstream of Line Creek), 2012 to 2021

Notes: Due to a brief period of exposure to less−than−capacity AWTF effluent in 2014, benthic invertebrate tissue selenium data from September 2015 were not considered representative of AWTF operation, but also not representative of a no−discharge condition. These data were therefore excluded from analyses, and are displayed in plots for context only. West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines are displayed for each monitoring area to provide context, but pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge.

were lower relative to RG_FRUL in comparison September 2017 when concentrations at both areas were similar (Figure 4.3; Appendix Table C.22). Overall, the temporal and spatial similarity of benthic invertebrate tissue selenium concentrations in the Fording River downstream of Line Creek compared to upstream, combined with slightly lower mean selenium concentrations downstream, indicate there was no influence of Line Creek on benthic invertebrate tissue selenium concentrations in the Fording River in 2021. This is consistent with previous findings (Minnow 2018b, 2019a, 2020d, 2021a).

A slight but significant increase in benthic invertebrate selenium concentrations at the South Line Creek reference area (RG_SLINE) was noted between 2017 and 2021 and flagged by the EMC for further investigation (Figure 4.1). Statistical evaluation indicated that the change was unlikely an artefact of the laboratory change that occurred in 2020 (see Section 2.6.1 for more details) since increases were noted prior to the laboratory change (Appendix Table C.23). There has not been mine-related operational activity in the vicinity of RG_SLINE, and stable aqueous selenium concentrations (which were below the long-term BC WQG) combined with consistently low concentrations of non-selenate selenium species (as discussed further in Section 4.3) at this area indicate that the increase in unlikely related to mining activities. It is possible that variation in the composition of composite-taxa samples might have contributed, at least in part, to some of the changes observed in benthic invertebrate selenium concentrations. Specifically, composite-taxa benthic invertebrate samples had higher Trichoptera content and lower tissue selenium concentrations in 2018 and 2019, while more recent results (2020 and 2021) had a higher Ephemeroptera content and selenium concentrations (Appendix Table C.24). Similar temporal changes in family-level biomass results (as measured by Hess sampling, see Section 2.4) were not evident from 2018 to 2021 (Appendix Table C.25), suggesting that changes in sample composition were not due to a change community structure and relative taxon biomass, but rather potentially related to variability in field sampling. Without more information it remains unclear whether temporal variability in sample composition may be related to the observed increase in benthic invertebrate selenium concentrations. Despite this, mean concentrations remain within the regional normal range and continued monitoring will help to better understand the potential cause of the observed increase.

Selenium concentrations in benthic invertebrate tissue was also assessed against the biological trigger established for this endpoint (information pertaining to the determination of the biological trigger value can be found in Appendix E). This was completed for each replicate from LCO LAEMP monitoring areas with available water quality predictions (i.e., five mine-exposed areas [RG_LCUT, RG_LILC3, RG_LIDSL, RG_LI8, and RG_FO23] and the two reference areas [RG_SLINE and RG_LI24]; see Appendix E for details). Aside from one replicate at

RG_SLINE (reference) and one replicate at RG_LCUT (which is located upstream from the AWTF discharge), replicate samples from mine-exposed and reference areas of Line Creek had selenium concentrations that below the biological trigger. Further information regarding the benthic invertebrate tissue selenium biological trigger as it pertains to the LCO LAEMP can be found in Appendix E.

4.2.2 Westslope Cutthroat Trout

As noted in the methods, fish tissue sampling was not conducted as part of the LCO LAEMP in 2021. Fish tissue was, however, collected for purposes of the RAEMP (Minnow 2021c) in September 2021. Eight westslope cutthroat trout (WCT) were caught in the vicinity of RG_LIDSL and RG_FO23. Selenium concentrations in muscle tissue of individuals caught from RG_LIDSL ranged from 4.3 to 18 mg/kg dw (with a mean selenium concentration of 11.5 ± 5.6 mg/kg dw), while those individuals caught from RG_FO23 had mean selenium concentrations in muscle tissue ranging from 6.9 to 10 mg/kg dw (with a mean selenium concentration of 8.7 ± 1.5 mg/kg dw; Figure 4.4; Appendix Table C.26). Of the sixteen WCT sampled, four individuals at RG_LIDSL had muscle selenium concentrations that exceeded (by no more than 1.2-times) the site-specific muscle benchmark (15.5 mg/kg dw; Nautilus Environmental and Interior Reforestation 2011). In contrast, mean selenium concentration in WCT tissue at RG_LILC3 (n=4) and RG_LIDSL (n=2) in 2017 (when the AWTF was operational without AOP) had selenium concentrations in WCT muscle tissue of 27 mg/kg dw and 30 mg/kg dw, respectively (or 1.7 to 1.9 times higher than the site-specific muscle benchmark).

Measurement of selenium in eggs or ripening ovaries is the most direct way to evaluate potential effects of selenium on fish reproduction compared to measurement of selenium in water or other tissue types (Janz et al. 2010; Golder 2014; USEPA 2016). For this reason, site-specific benchmarks were derived in the EVWQP based on fish egg/ovary selenium concentrations (Golder 2014). However, it is challenging to align sampling events with when fish are ripe so that eggs can be harvested non-lethally from females (by applying gentle abdominal pressure). If non-lethal expression of eggs is not possible, collection of ovaries requires that fish be sacrificed. Therefore, monitoring of selenium in fish has often involved non-lethal collection of muscle plugs for selenium analysis. Typically, non-lethal muscle sampling is conducted during the same timeframe just prior to spawning, however, a comparison of WCT muscle selenium concentrations from May (i.e., prior to spawning) and late August/September (i.e., post-spawning) in 2015 under the RAEMP showed no differences among seasons (Minnow 2018a). Subsequent WCT sampling efforts targeting non-lethal muscle samples under the RAEMP were planned for early September to avoid capture stress on gravid females (Minnow 2018d, 2021c). Selenium concentrations in fish eggs/ovaries can be estimated from muscle for fish species that

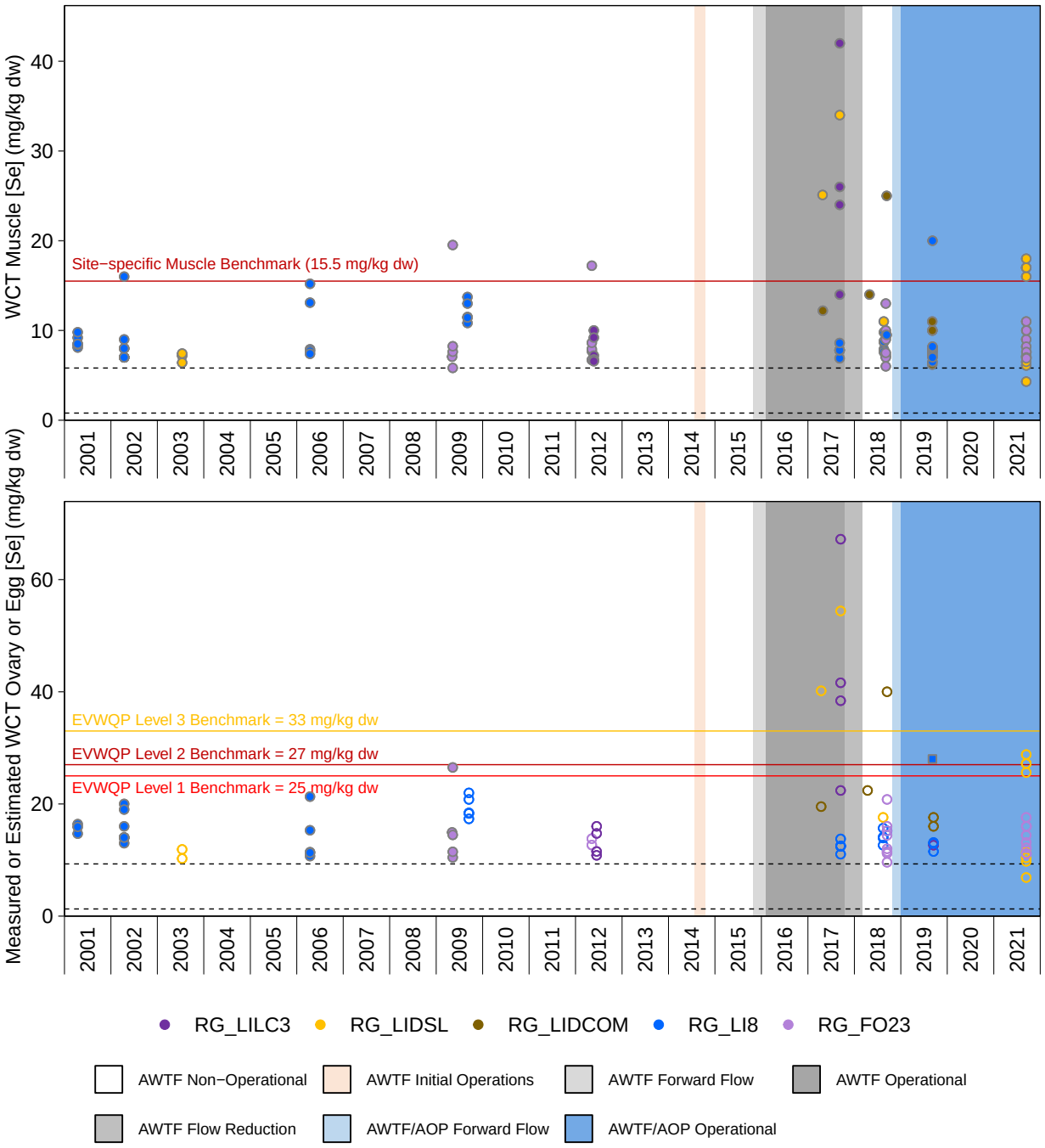


Figure 4.4: Selenium Concentrations in Muscle and Ovaries of Westslope Cutthroat (WCT) Trout Sampled From Line Creek and Fording River, 2001 to 2021

Notes: Measured muscle and ovary selenium concentrations are plotted as solid circles. Selenium was measured in ripe eggs collected non−lethally from one adult female in 2019, and this is plotted as a solid square. Ovary concentrations that were estimated from muscle selenium concentrations (based on the ovary−to−muscle concentration relationship of 1.6:1 presented by Nautilus and Interior Reforestation 2011) are plotted with open circles.
Ovary selenium was estimated only for individuals lacking measured egg/ovary concentrations (if female). Dashed black lines represent the muscle normal range defined as the 2.5th and 97.5th percentiles of the 1998 to 2019 reference area muscle data from the Regional Aquatic Environmental Monitoring Program (RAEMP).

exhibit a strong muscle-to-ovary selenium relationship, as an indirect means of evaluating potential effects of selenium on fish reproduction. A strong ovary-to-muscle relationship for selenium concentrations has been characterized for westslope cutthroat trout, which indicates that egg/ovary selenium concentrations are typically about 1.6-times the concentrations in muscle of the same fish (Nautilus and Interior Reforestation 2011). Similar to muscle tissue, all fish (n=8) collected at RG_FO23 and four of eight fish collected at RG_LIDSL had ovary selenium concentrations below the EVWQP Level 1 Benchmark (25 mg/kg dw; Figure 4.4 Golder 2014). The remaining four fish at RG_LIDSL had ovary selenium concentrations that were higher than the EVWQP Level 1 Benchmark, with three of these exceeding the EVWQP Level 2 Benchmark (27 mg/kg dw). However, the ovary concentrations reported in 2021 (as estimated from muscle concentrations) were substantially lower than those from 2017 when the AWTF was operational without AOP, when mean selenium concentrations were 40.2 and 54.4 mg/kg dw, respectively (Appendix Table C.27). It should be noted that resident and migratory life forms of WCT are known to exist in the Elk Valley with home ranges that can vary dramatically; individual home ranges for WCT documented near the Fording River Operation ranged from 0.7 to 31.6 km (Cope et al. 2016). As such, the selenium tissue concentrations in WCT reported for some individuals (muscle or estimated ovary) caught near RG_LIDSL could represent dietary selenium exposure from a larger area. Further information regarding fish abundance, density, and spawning as well as supporting fish habitat information for Line Creek can be found in the Line Creek Aquatic Monitoring Program report (Zathey et al. 2021b).

Selenium concentrations in WCT muscle tissue were assessed against the biological trigger established for this endpoint (information pertaining to the determination of the biological trigger value can be found in Appendix E). This was completed for each replicate from the LCO LAEMP monitoring areas with available fish tissue quality data and water quality predictions (which was RG_LIDSL and RG_FO23 areas; see Appendix E for details). While no individual WCT muscle tissue replicates had selenium concentrations that were above the biological trigger at RG_FO23, four of the eight replicates at RG_LIDSL exceeded the biological trigger. Additional investigations into fish tissue Se in Line Creek will be undertaken in the 2022 field season. This confirmatory sampling will be incorporated into the LCO LAEMP 2022 data review. Further information regarding the selenium concentrations in WCT muscle tissue biological trigger at RG_LIDSL and RG_FO23 can be found in Appendix E.

4.3 Aqueous Selenium

The AWTF with AOP was effective throughout 2021 in decreasing the aqueous total selenium concentrations downstream in Line Creek, removing a similar amount of selenium from WLC

influent in 2021 (536 kg, Teck 2022a) as 2020 (540 kg, Teck 2021c) but more than 2019 (475 kg; Teck 2020b). The decrease in aqueous total selenium concentrations in 2021 (similar to results in 2020 and 2019; Minnow 2020a, 2021a) was particularly evident at LC_LC3 compared to when the AWTF was not operational (Figure 4.5; Appendix Figures C.3 and C.4[34]). Aqueous concentrations of total selenium at the compliance point, LC_LCDSSLCC, did not exceed permit limits (50 µg/L) in 2021 (Teck 2022b), but was detected in all samples above the long-term BCWQG at mine-exposed stations in 2021 (Appendix Figure C.4, Appendix Table D.3). This was true for stations both upstream and downstream of the AWTF discharge in Line Creek and in the Fording River upstream and downstream of the Line Creek confluence. Aqueous total selenium concentrations were also consistently (i.e., 100% of sampling events) above the Level 1 EVWQP Benchmark throughout 2021 for mine-exposed areas upstream and downstream of the AWTF in Line Creek (excluding LC_LCDSSLCC [96%] and LC_LC4 [88%], while concentrations directly upstream of the AWTF (LC_WLC) also exceeded the Level 2 EVWQP in 100% of sampling events in 2021 (which was similar to 2020; Minnow 2021a). It should be noted that while aqueous total selenium concentrations at the reference LC_SLC (which corresponds with RG_SLINE) was below the long-term BCWQG for a majority of 2021 (<3% of samples were above the guideline), aqueous total selenium concentrations at the reference LC_LC1 (which corresponds to the RG_LI24) was above this guideline in 71% of samples take in 2021, suggesting some natural variability of this consistent in the area. Nevertheless, the difference between LC_WLC and those areas downstream of the AWTF indicate that treatment is working as expected in decreasing selenium concentrations in effluent.

Aqueous selenium in all study areas was primarily in the oxidized form selenate (Figure 4.6; Appendix Table C.28). Aqueous selenium in chemically-reduced forms such as selenite or organoselenium species are present at much lower concentrations than selenate. The combined total of non-selenate selenium species typically represents <1% of the aqueous total selenium in waters from upstream of the AWTF discharge in Line Creek (i.e., LC_LCUSWLC in 2021 mean Σnon-selenate species: 0.23%, range: 0.13 to 0.53%; Appendix Table C.28). Some of these non-selenate selenium species are known to be more readily accumulated by aquatic biota than selenate (Ogle et al. 1988; Riedel et al. 1996; Stewart et al. 2010). As described in Section 1.3, in response to increased concentrations of chemically-reduced forms of aqueous selenium in AWTF effluent, the AWTF was recommissioned with an AOP to reverse the shift in selenium species back to a selenate-dominated condition. Concentrations of non-selenate species (including organoselenium species such as dimethylseleneoxide and methylseleninic acid) at LC_LC3 in 2021 (Figure 4.6) were similar to past years of AWTF with

[34] Appendix Figure C.3 presents aqueous total selenium results with LC_WLC excluded for greater resolution of results.

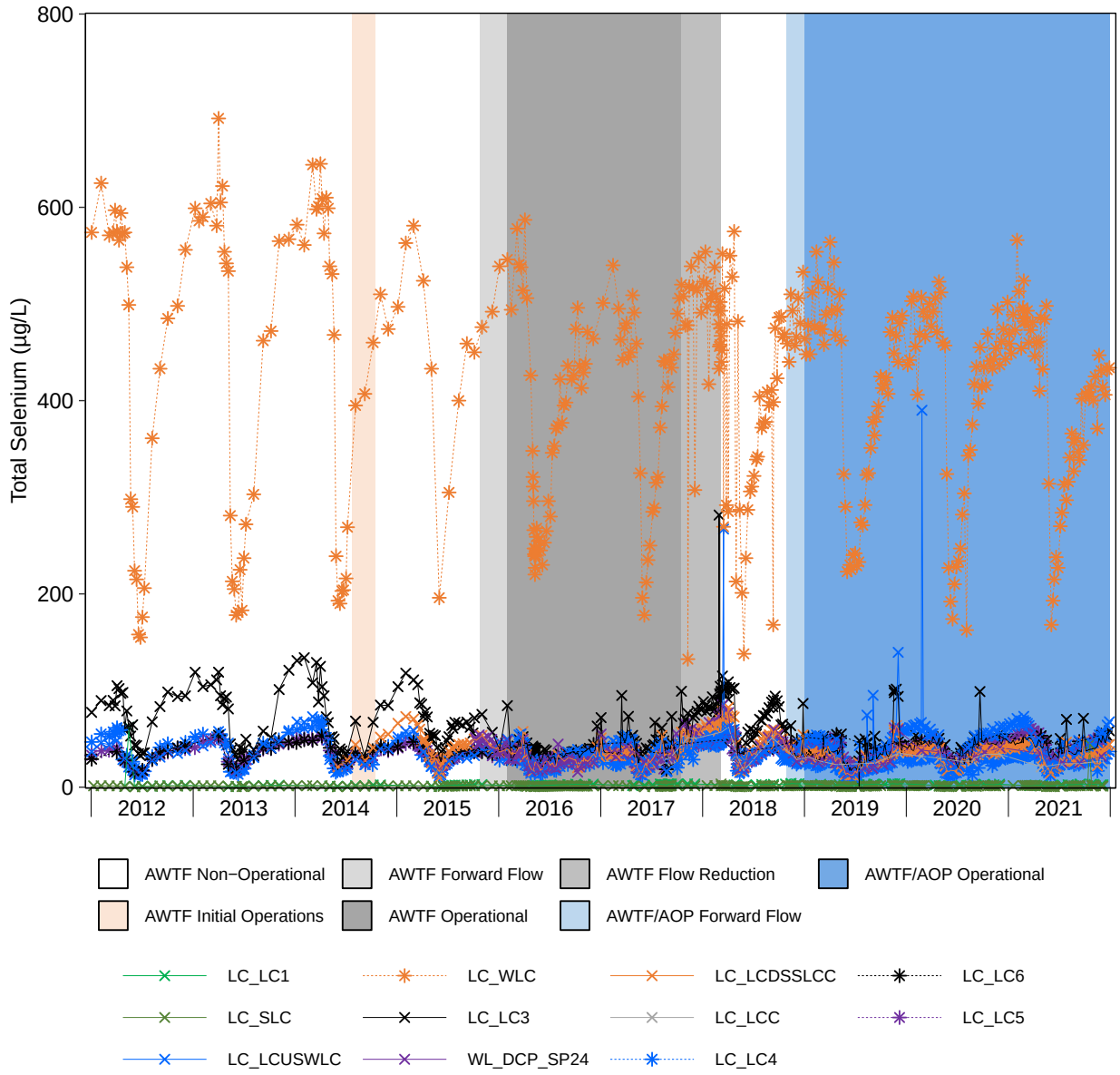


Figure 4.5: Time Series Plots for Aqueous Total Selenium Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations were above the LRL in all samples. West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine− exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

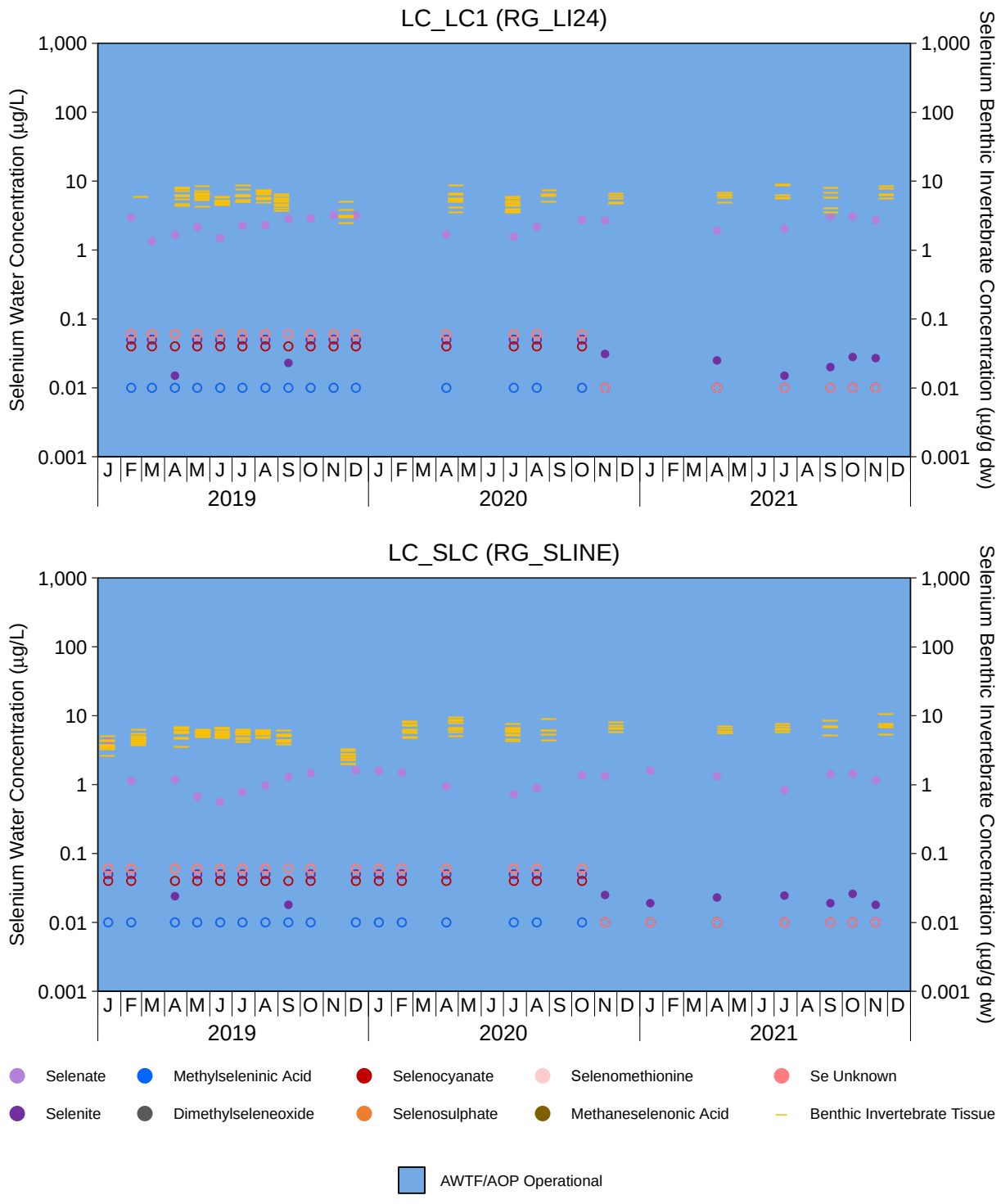


Figure 4.6: Monthly Mean Selenium Species and Benthic Invertebrate Tissue Selenium at Mine−Exposed and Reference Stations in Line Creek, LCO LAEMP, January 2019 to December 2021

Notes: Samples at the laboratory reporting limit (LRL) are plotted with an open symbol.

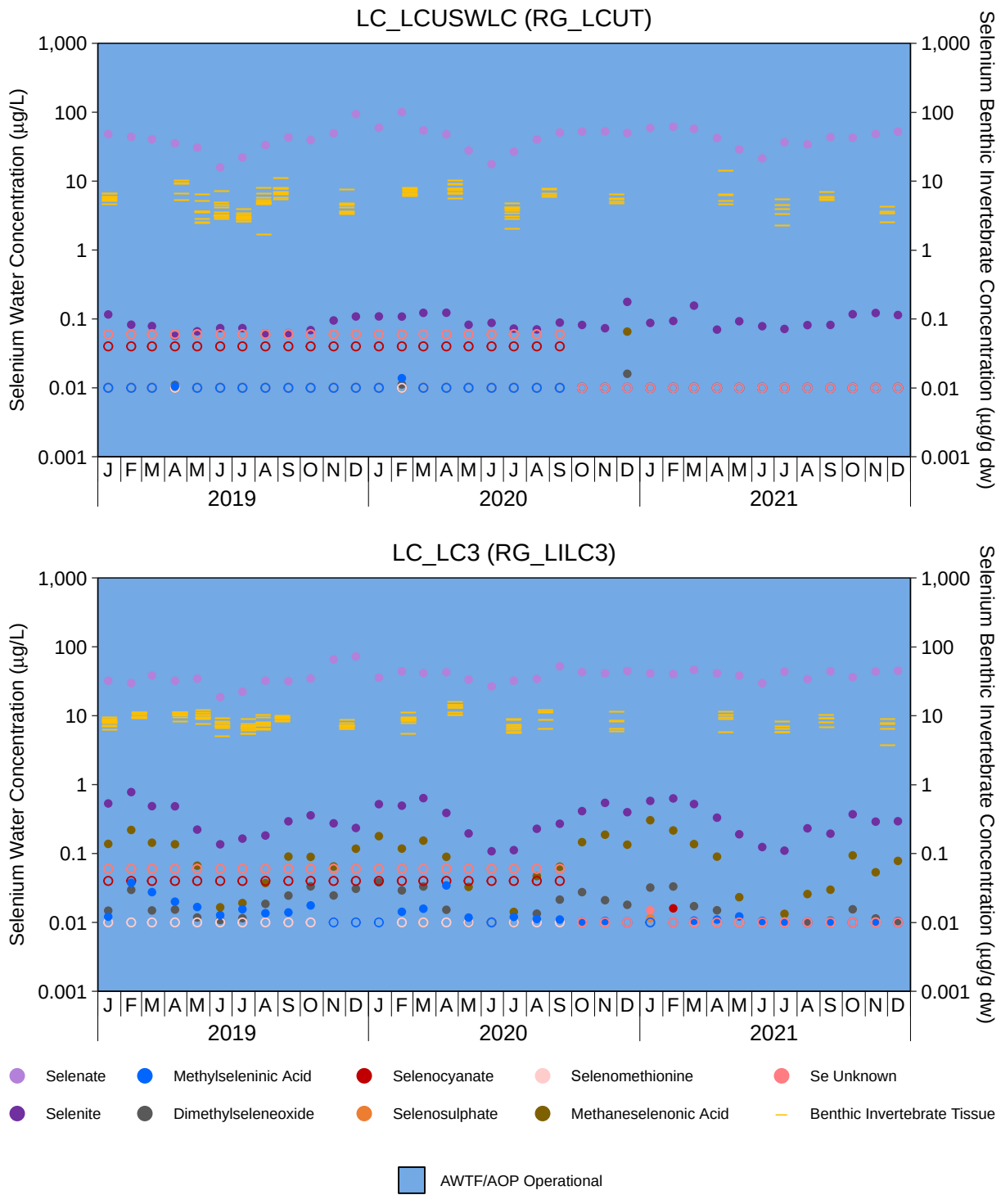


Figure 4.6: Monthly Mean Selenium Species and Benthic Invertebrate Tissue Selenium at Mine−Exposed and Reference Stations in Line Creek, LCO LAEMP, January 2019 to December 2021

Notes: Samples at the laboratory reporting limit (LRL) are plotted with an open symbol.

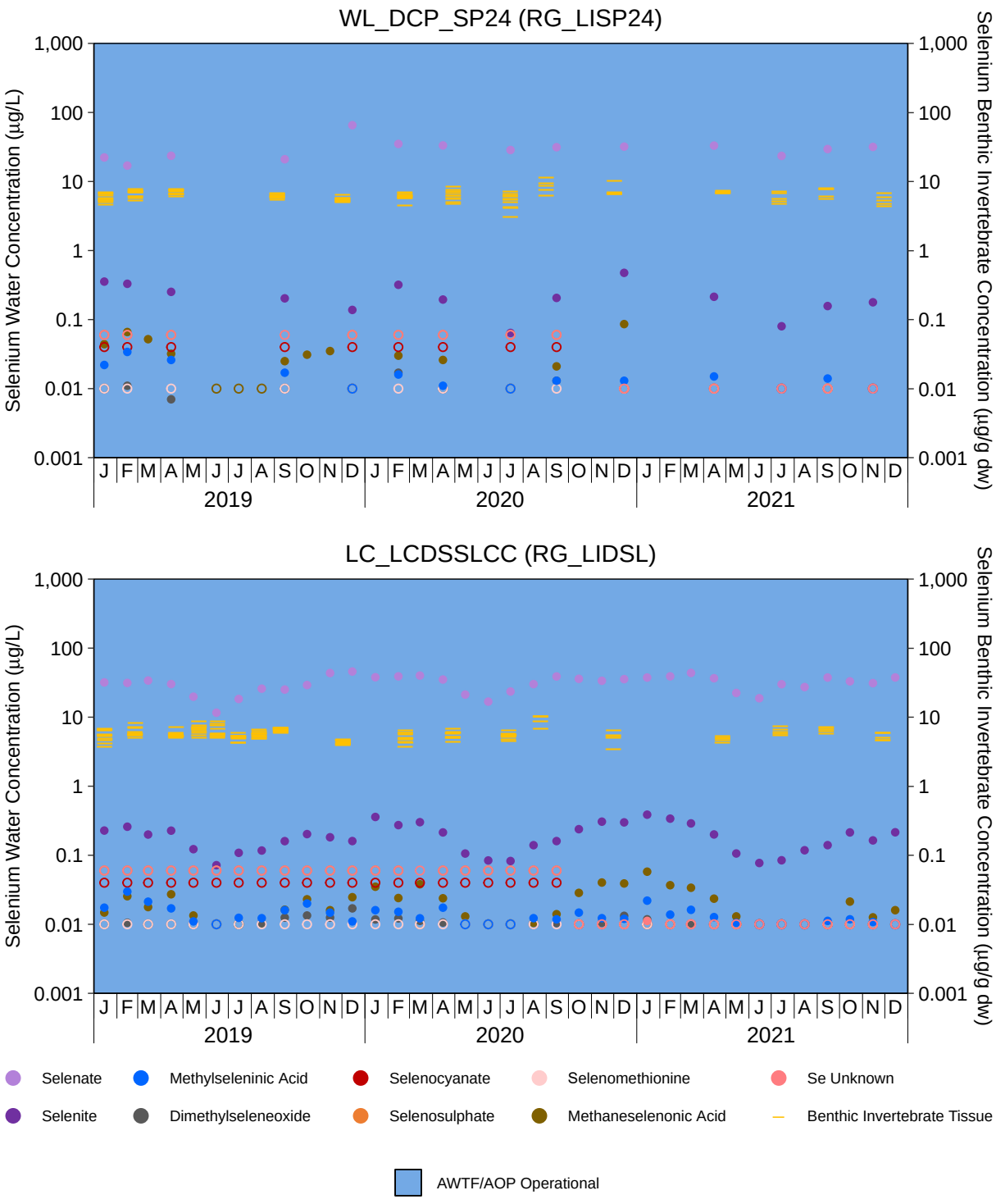


Figure 4.6: Monthly Mean Selenium Species and Benthic Invertebrate Tissue Selenium at Mine−Exposed and Reference Stations in Line Creek, LCO LAEMP, January 2019 to December 2021

Notes: Samples at the laboratory reporting limit (LRL) are plotted with an open symbol.

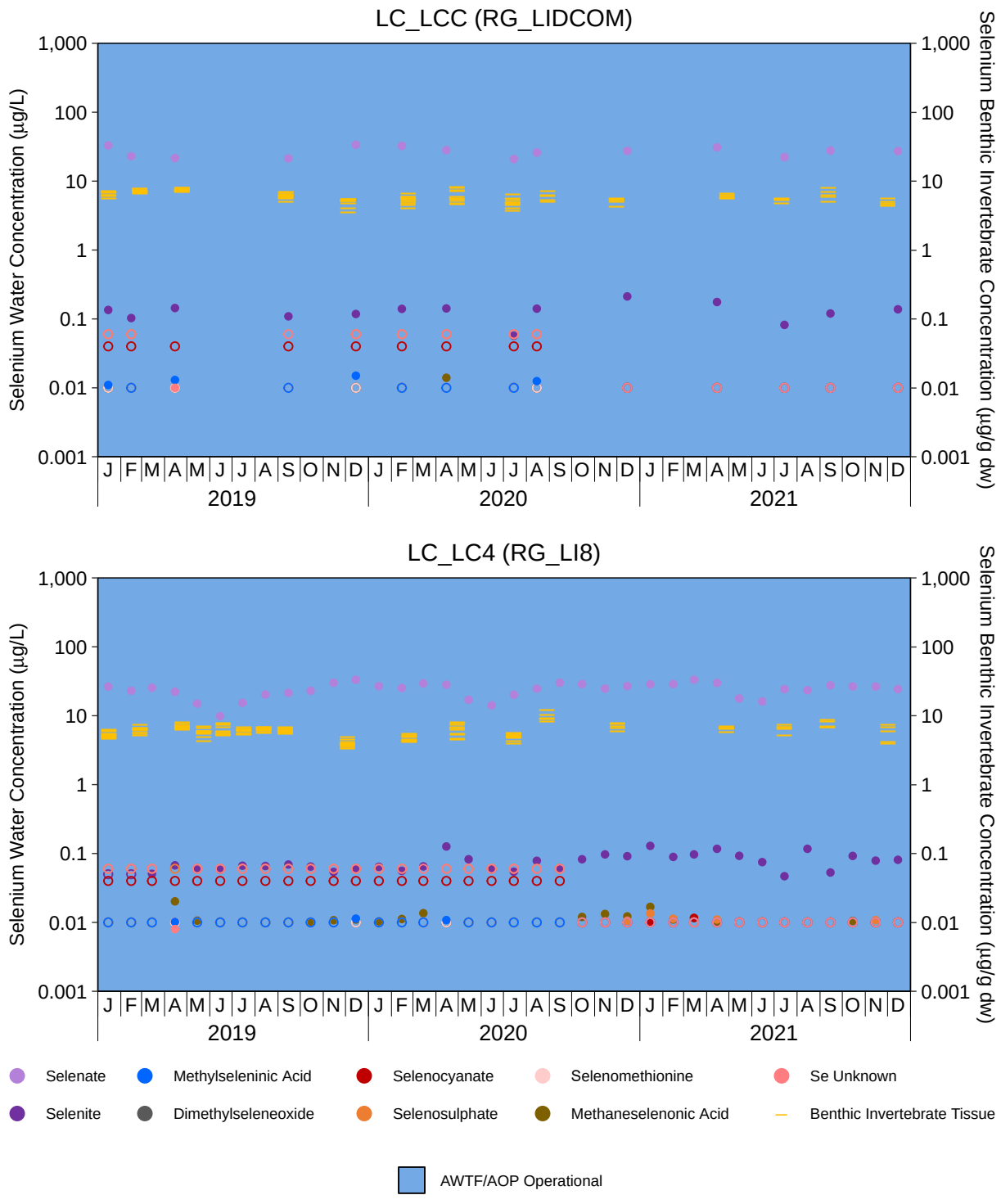


Figure 4.6: Monthly Mean Selenium Species and Benthic Invertebrate Tissue Selenium at Mine−Exposed and Reference Stations in Line Creek, LCO LAEMP, January 2019 to December 2021

Notes: Samples at the laboratory reporting limit (LRL) are plotted with an open symbol.

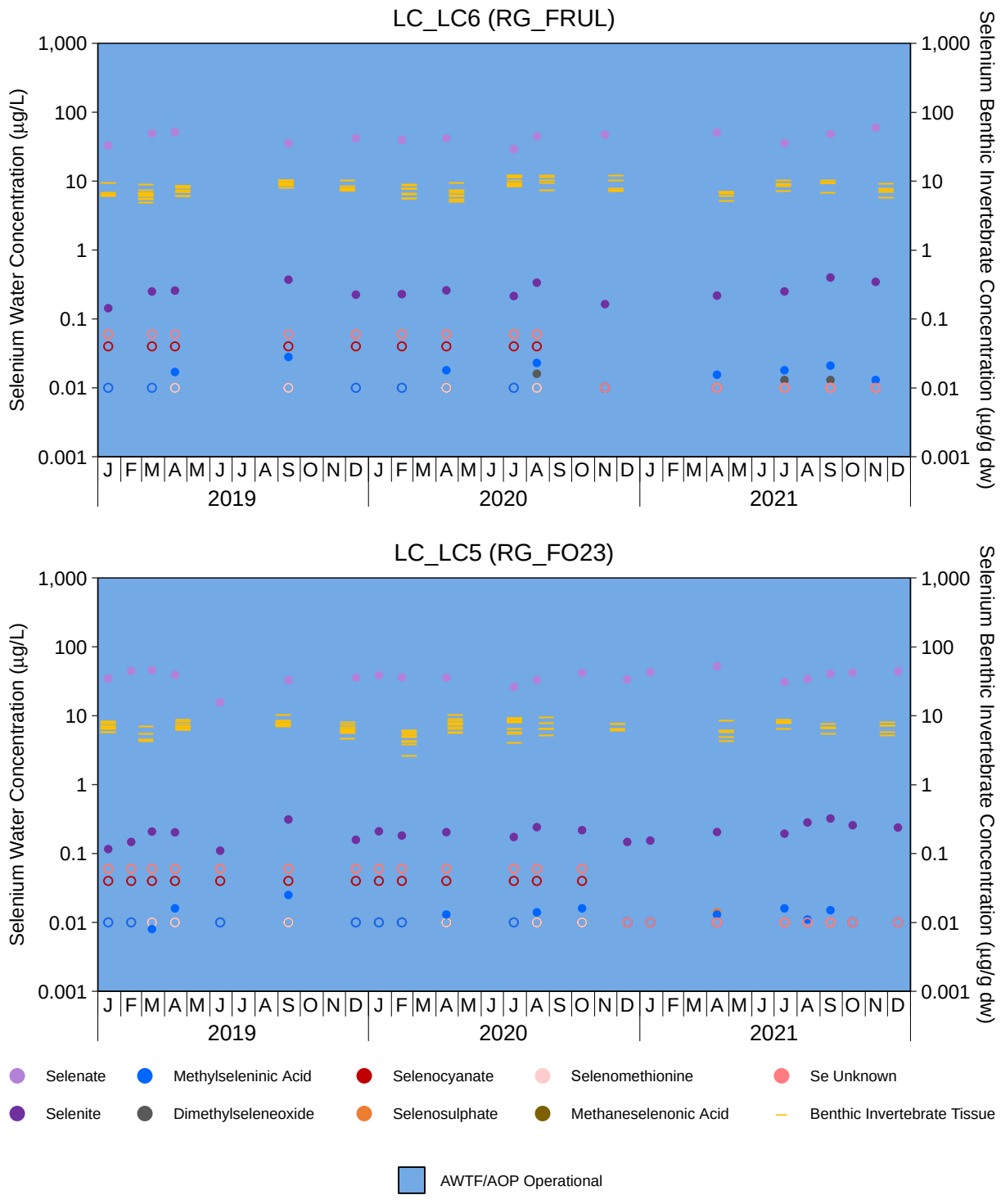


Figure 4.6: Monthly Mean Selenium Species and Benthic Invertebrate Tissue Selenium at Mine−Exposed and Reference Stations in Line Creek, LCO LAEMP, January 2019 to December 2021

Notes: Samples at the laboratory reporting limit (LRL) are plotted with an open symbol.

AOP operation (2020 and 2019; Minnow 2020a, 2021a), and substantially lower than during AWTF operation without AOP in 2017 (Minnow 2018b). These results were corroborated by selenium concentrations in benthic invertebrates from downstream of the AWTF discharge in Line Creek, which were significantly lower during AWTF with AOP operation than during AWTF operation without AOP, relative to reference (see Section 4.2.1).

Seasonal trends in selenium speciation were noted during AWTF with AOP operation (2019 to 2021), with higher concentrations of non-selenate species observed in winter months (specifically January to March) and lower concentrations observed in summer (i.e., June, July; Figure 4.6; Appendix Table C.28). This trend of higher aqueous concentrations in winter months has also been observed for analytes that include total dissolved solids and sulphate (Appendix Figures D.1, D.2, D.5, D.6), suggesting that the observed seasonal increases may be related to decreased baseflow in Line Creek over the winter. In 2021, the highest selenite, dimethylselenoxide, and methaneselenonic acid concentrations (0.70, 0.052 and 0.38 µg/L, respectively) were reported at LC_LC3 (or RG_LILC3) on January 18th, 2021. This represents a 2.2-fold increase in selenite for LC_LC3 when compared to the remainder of the year (mean concentration: 0.31 µg/L; Appendix Table C.28). Although a majority of the organoselenium species were not frequently detected, when they were it was generally in winter (Figure 4.6; Appendix Table C.28). For instance, dimethylselenoxide was detected in 24 of 50 samples at LC_LC3, with 46% of those detections (or 11 samples) being collected between the months of January and March. These peaks in non-selenate species observed in winter (in January to March) at RG_LILC3 were followed by benthic invertebrate selenium concentrations at RG_LILC3 in April that were elevated in comparison to concentrations to other sampling events in 2021 (Figures 4.6 and 4.7; see Section 4.2.1 for details), suggesting that the seasonal increase in non-selenate species observed in the winter or early spring of 2021 may be linked to an increase in benthic invertebrate tissue selenium at this area. Regardless, benthic invertebrate tissue selenium concentrations at RG_LILC3 in April 2021 remained similar to upstream of the AWTF (at RG_LCUT) in 2021, significantly lower than during AWTF without AOP operation (relative to reference in 2016 and 2017; see Section 4.2.1 for details), and lower than those observed in 2018 immediately following shutdown of the ATWF without AOP (although not tested statistically; Figure 4.7, Table 4.1). It should be noted that benthic invertebrate tissue selenium concentrations at RG_LILC3 in September 2021, which were slightly above the regional normal range, did not show similar pattens in elevated selenium speciation concentration (selenite and other non-selenate species were lower than in winter 2021; Figure 4.6). Regardless, benthic invertebrate tissue selenium concentrations at RG_LILC3 in September were not significantly higher than the reference area (RG_SLINE; Figure 4.2) suggesting that this slight increase over the regional normal range at this area during this sampling

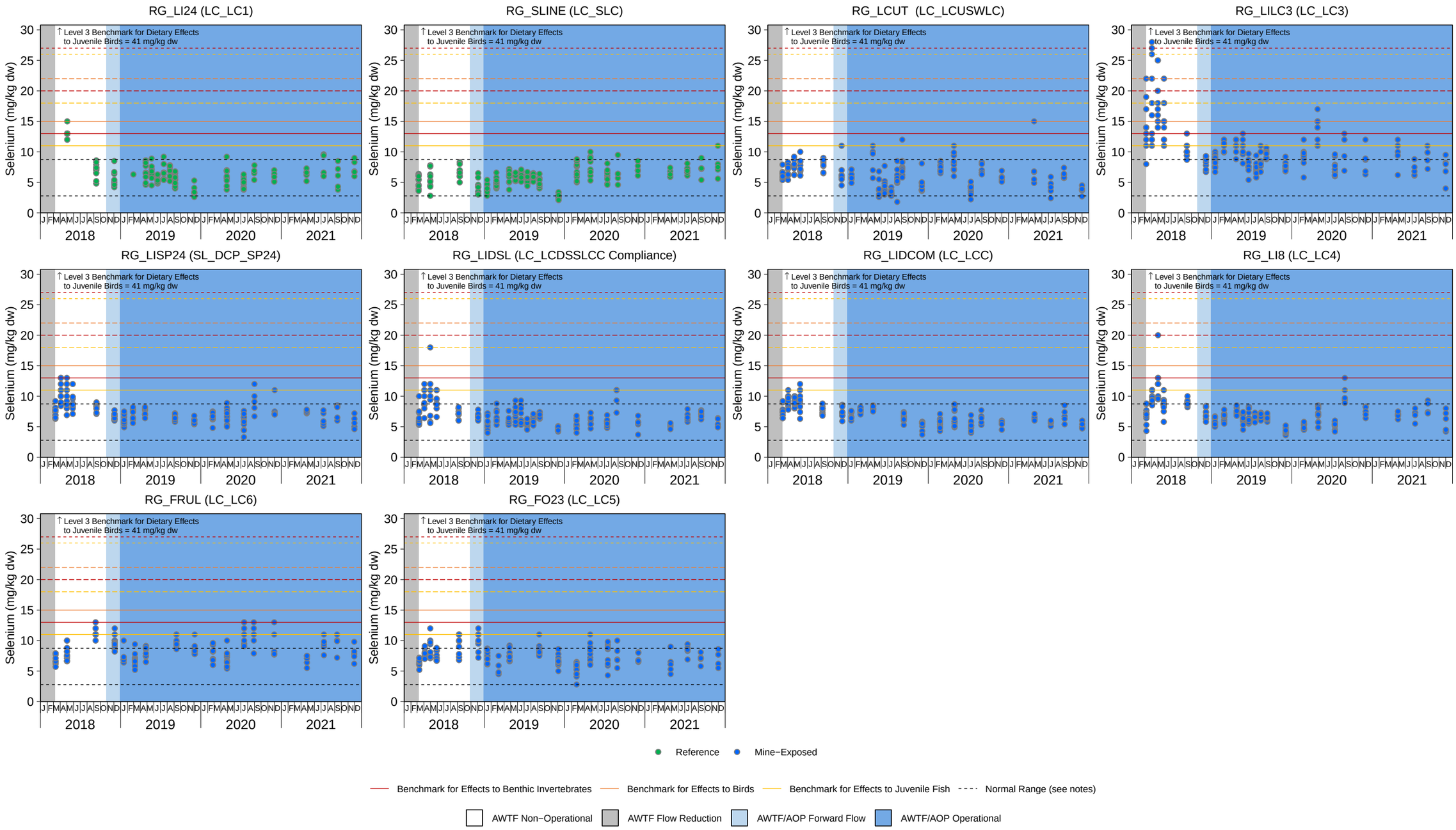


Figure 4.7: Selenium Concentrations in Benthic Invertebrate Composite−taxa Samples from Line Creek and Fording River, 2018 to 2021

Notes: Dashed black lines represent the normal range defined as the 2.5th and 97.5th percentiles of the 1996 to 2019 reference area data from the Regional Aquatic Environmental Monitoring Program (RAEMP). Solid lines indicate Level 1 benchmarks, long dashed lines indicate level 2 benchmarks, and short dashed lines indicate Level 3 benchmarks. West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines are displayed for each monitoring area to provide context, but pertain only to mine−exposed monitoring areas downstream of the AWTF discharge.

event maybe due to natural variability. Overall, the results from 2021 continued to indicate that the AWTF with AOP functioned as intended to limit selenium accumulation by aquatic biota downstream (compared to AWTF operation without AOP).

4.4 Bioaccumulation

Benthic invertebrate tissue selenium results from 2012 to 2021 were plotted relative to the regional one-step water-to-invertebrate lotic selenium accumulation model (Figure 4.8; Golder 2020c). The model is based on observed relationships between aqueous and benthic invertebrate tissue selenium values from samples collected previously in Line Creek and in other areas of the Elk River watershed (Golder 2020c). Plotted values in areas downstream of the AWTF discharge were within or below the 95% prediction limits of the model in 2021 (Figures 4.8 and 4.9), which is similar to the other years of AWTF with AOP operation (excluding three individuals samples from RG_LILC3 in April 2020 [Minnow 2021a]). This coincides with past observations, as the majority of plotted values have largely been within the model predictions, except for samples collected nearest the AWTF in 2016 and 2017 during AWTF operation without AOP (e.g., RG_LILC3 in Figure 4.9). It should be noted that although complete removal of organoselenium species is not expected with the addition of AOP, lower selenium bioaccumulation was evident during all years of AWTF operation with AOP (2019 to 2021) than without. Combined, the results support the conclusion that selenium accumulation in Line Creek during AWTF operation without AOP was related to higher-than-normal concentrations of non-selenate forms of selenium, and that the recommissioning of the AWTF with AOP has been functioning to decrease non-selenate forms and associated accumulation in aquatic biota.

Westslope cutthroat trout ovary tissue selenium results from 2001 to 2021[35] (either from actual ovary samples or estimated from muscle) were plotted relative to the regional two-step water-to-invertebrate-to-fish egg/ovary selenium bioaccumulation model (Figure 4.10; Golder 2018a). As noted earlier, fish sampling was completed in two areas in 2021, RG_LIDSL and RG_FO23, as part of RAEMP monitoring (Minnow 2021c). Although modelled WCT ovary selenium concentrations of four of the eight replicates fell slightly above the 95% prediction limits of the model for RG_LIDSL in 2021 (11% to 25% above the prediction interval), individual results for RG_FO23 fell within the prediction limits as did mean results for both areas in 2021 (Figure 4.10). This was similar to the other years of AWTF with AOP operation (2019 and 2020), wherein the majority of replicates fell within the prediction limits (with the exception of one individual replicate at RG_LI8 in 2019, Minnow 2020a). In contrast, modelled mean WCT ovary

[35] Seven fish were not included in this analysis as concurrent aqueous selenium concentrations were not available. Fish were from 2001 (n=3; RG_LI8), 2003 (n=2, RG_LIDSL), 2017 (n=1; RG_LIDCOM), and 2018 [n=1; RG_LIDCOM] with concentrations ranging from 14.7 to 22.4 mg/kg dw and are shown in Figure 4.4.

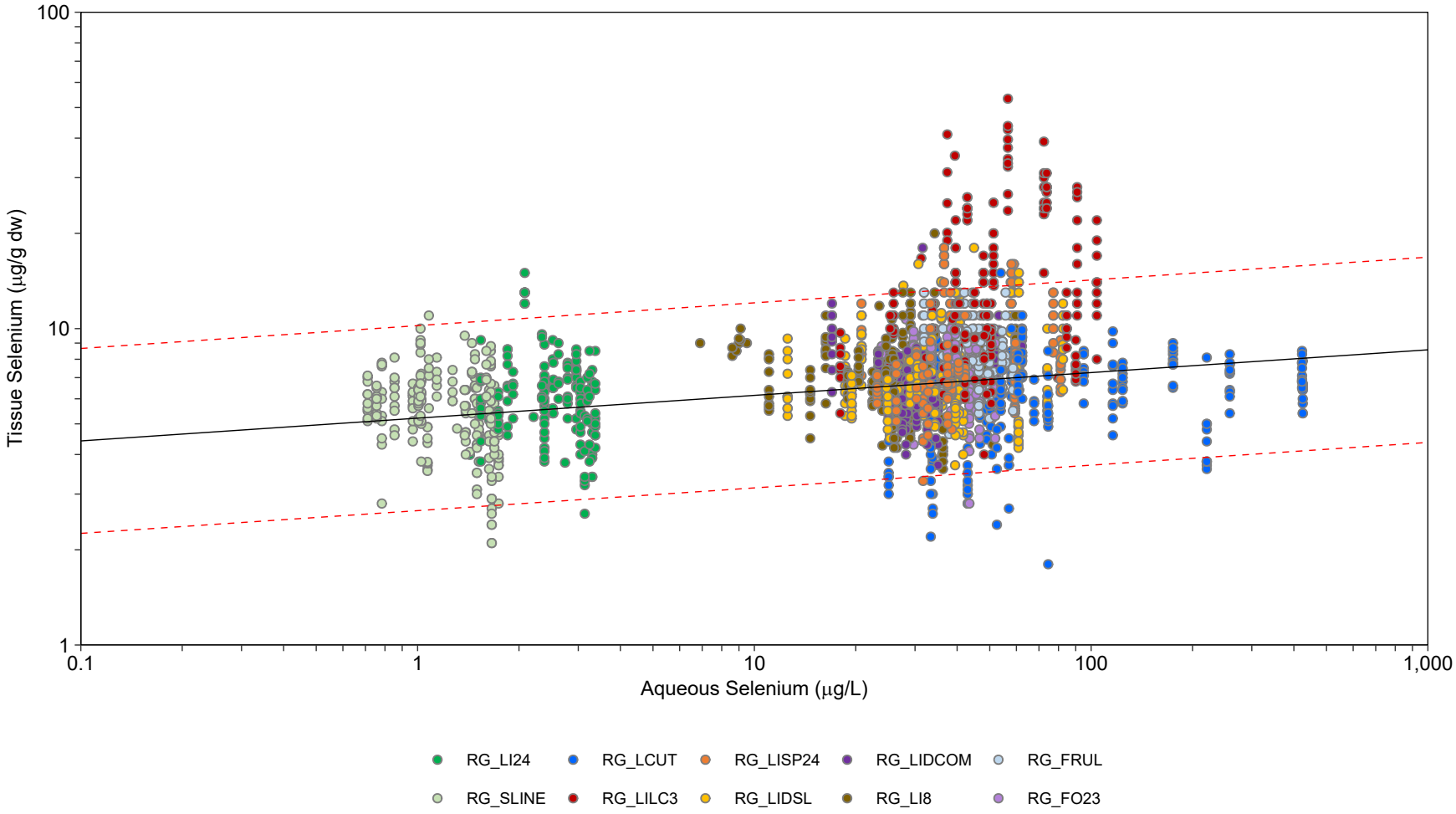


Figure 4.8: Observed and Modelled Selenium Concentrations in Benthic Invertebrate Composite Samples Relative to Aqueous Total Selenium Concentrations at Stations Upstream and Downstream of West Line Creek Active Water Treatment Facility, 2012 to 2021

Notes: Mean benthic invertebrate selenium concentrations (solid black line) were estimated using a one-step water to benthic invertebrate selenium accumulation model: $\log_{10}[Se]_{benthic\ invertebrate}=0.717+0.072 \times \log_{10}[Se]_{aq}$ (Golder 2020c). The 95% prediction limits for a single value from the one-step water to benthic invertebrate selenium accumulation model are plotted as dashed red lines. Reference areas are shown in green. One data point for station RG_FO23 on September 16th, 2015 is the average of two duplicate measurements.

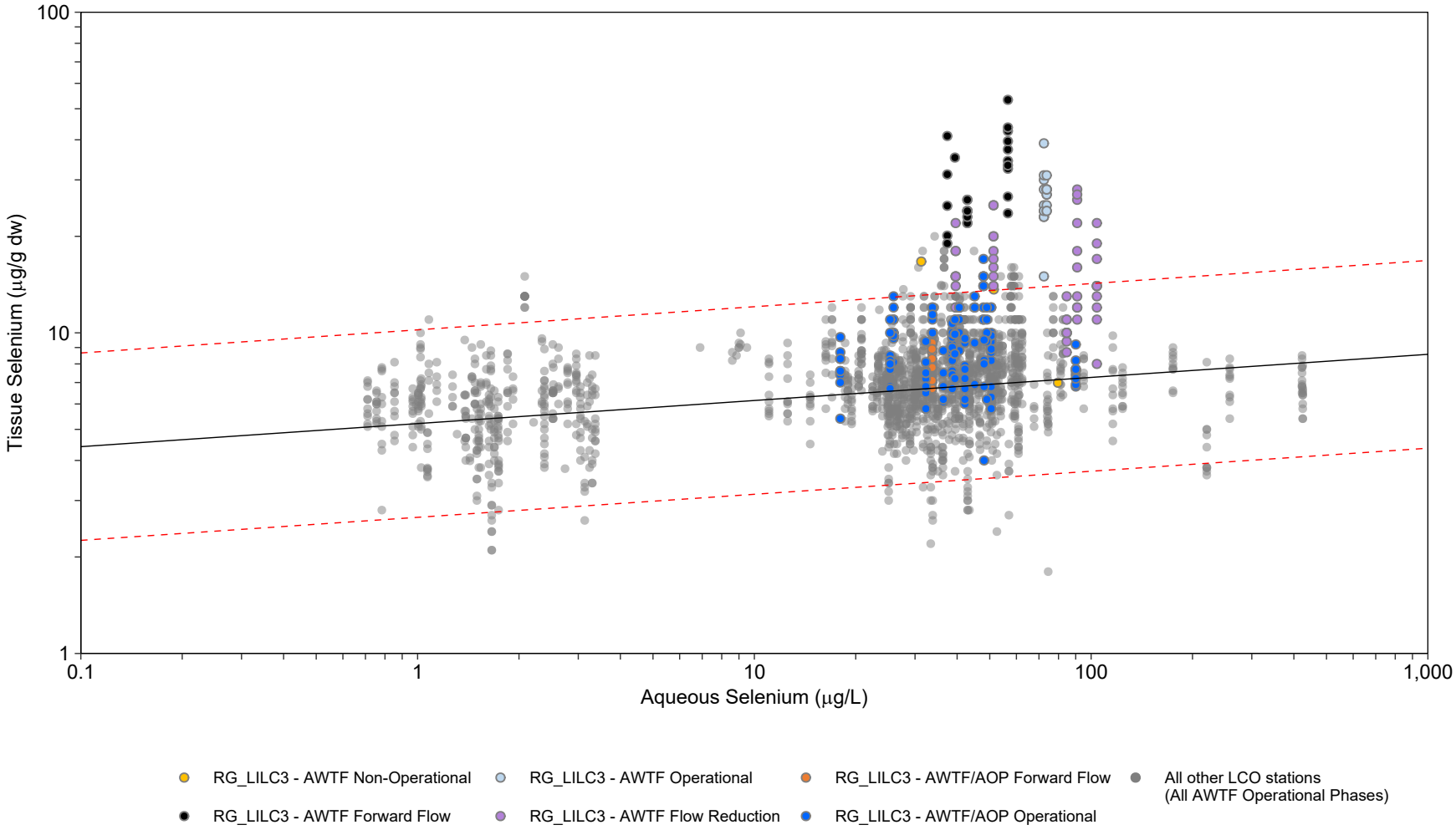


Figure 4.9: Observed and Modelled Selenium Concentrations in Benthic Invertebrate Composite Samples Relative to Aqueous Total Selenium Concentrations at Stations Upstream and Downstream of West Line Creek Active Water Treatment Facility, 2012 to 2021

Notes: Mean benthic invertebrate selenium concentrations (solid black line) were estimated using a one-step water to benthic invertebrate selenium accumulation model: log10[Se]benthic invertebrate=0.717+0.072 x $\log_{10}[Se]_{aq}$ (Golder 2020c). The 95% prediction limits for a single value from the one-step water to benthic invertebrate selenium accumulation model are plotted as dashed red lines. One data point for station RG_FO23 on September 16th, 2015 is the average of two duplicate measurements.

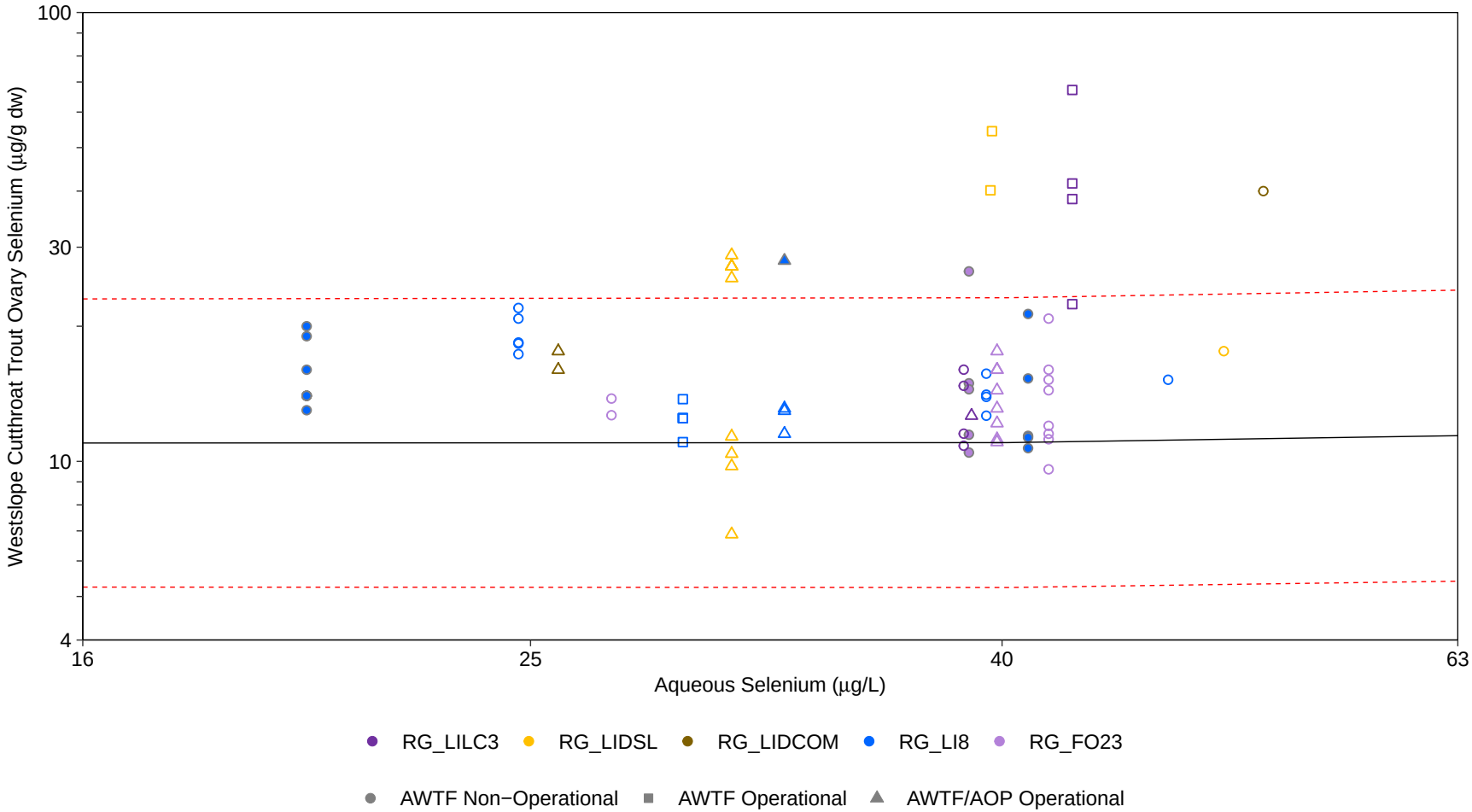


Figure 4.10: Observed and Modelled Selenium Concentrations in Westslope Cutthroat Trout Ovary Samples Relative to Aqueous Total Selenium Concentrations, LCO LAEMP, 2001 to 2021

Notes: Measured ovary selenium concentrations are plotted as filled shapes and ovary concentrations that were estimated from muscle selenium concentrations (based on the ovary−to−muscle concentration relationship of 1.6:1 presented by Nautilus and Interior Reforestation 2011) are plotted as open symbols. Mean egg and ovary selenium concentrations (solid black line) were estimated using a two−step water to fish egg selenium accumulation model: step 1 − log10[Se]benthic invertebrate = 0.717+0.072 x log10[Se]aq and step 2 − log10[Se]fish = 1.02 + 0.026 x log10[Se]inv when [Se]inv < 6.8 and log10[Se]fish = 1.26 + 1.10 x log10[Se]inv when [Se]inv >= 6.8 (Golder 2018). The 95% prediction limits for a single value from the two−step water to fish egg selenium accumulation model are plotted as dashed red lines. Seven replicates (from 2001 (n=3; RG_LI8), 2003 (n=2, RG_LIDSL), 2017 (n=1; RG_LIDCOM), and 2018 (n=1; RG_LIDCOM) did not have concurrent aqueous selenium concentrations and thus are not shown, fish muscle tissue selenium concentrations for these fish ranged from 14.7 to 22.4 mg/kg dw and are shown in Figure 4.4.

selenium concentrations in years prior to the AWTF with AOP, namely 2017 (AWTF without AOP) and 2018 (AWTF non-operational) were substantially above (up to 2.4-times) the 95% prediction limits of the model. Selenium concentration in WCT tissue at RG_LIDSL and RG_FO23 will be further evaluated in the larger context of the Elk Valley as part of the RAEMP to better understand both spatial and temporal trends for this endpoint.

Overall, the selenium bioaccumulation results during the AWTF with AOP operation relative to the AWTF operation without AOP clearly indicate that the AWTF with AOP functioned as intended throughout 2021 to limit selenium accumulation by aquatic biota.

4.5 Summary

Concentrations of non-selenate forms of aqueous selenium in Line Creek were lower during operation of the AWTF with AOP in 2021, compared to AWTF operation without AOP, which is consistent with past results from AWTF with AOP operation (2019 and 2020). Benthic invertebrate tissue monitoring in Line Creek identified substantially lower selenium concentrations in 2021 during AWTF with AOP operations (similar to other years of AWTF with AOP operation; 2019 and 2020) compared to concentrations that were observed during AWTF without AOP operation. Mean benthic invertebrate selenium concentrations were below the EVWQP Level 1 benchmark at all areas downstream of the AWTF discharge in 2021, which is similar to other years of AWTF with AOP operation (with the one exception being three replicates in April 2020 at RG_LILC3). Similarly, mean benthic invertebrate selenium concentrations in areas downstream of the AWTF discharge were largely within the regional normal range and had similar concentrations to the reference areas (excluding two sampling events at RG_LILC3 (in April and September). Comparison of benthic invertebrate selenium concentrations to the selenium bioaccumulation model in areas downstream of the ATWF discharge indicated that selenium bioaccumulation in 2021 was within expectations of the model. This is similar to past results of these areas during AWTF with AOP operation (2019 and 2020), with selenium concentrations in benthic invertebrate tissues in these samples being more similar to the selenium bioaccumulation model predictions than those during ATWF operation without AOP. In westslope cutthroat trout, mean tissue selenium concentrations were below the site-specific benchmarks for muscle and ovary in fish from RG_LIDSL and RG_FO23, although tissues from four of eight individual fish from RG_LIDSL exceeded the benchmarks. Similarly, the majority of the estimated ovary concentrations (as predicted from muscle concentrations) from westslope cutthroat in 2021 were within the prediction interval of the ovary bioaccumulation model, with the exception of the four individuals from RG_LIDSL. Furthermore, WCT selenium concentrations at RG_LIDSL in 2021 (during AWTF with AOP operation) were substantially lower than those observed in 2017 (during AWTF without AOP operation). Combined, the aqueous selenium speciation and benthic

invertebrate tissue selenium monitoring results all indicated that the recommissioned AWTF with AOP has been functioning as intended to shift selenium speciation in AWTF effluent from chemically-reduced species back to a selenate-dominated condition since 2019, thereby reducing the bioavailability of selenium in Line Creek.

5 OTHER POTENTIAL INFLUENCES OF THE WLC AWTF

5.1 Overview

Monitoring data were evaluated in this section to address Study Question #3: Is WLC AWTF operation affecting aquatic biota through thermal effects, effects on dissolved oxygen concentrations, or concentrations of treatment-related constituents other than nutrients or selenium? To address this study question, water temperature and dissolved oxygen results in 2021 were evaluated upstream and downstream of the AWTF, and water quality and toxicity testing results were evaluated in relation to changes in AWTF operational status. The AWTF with AOP was operational throughout 2021 with discharge to the receiving environment occurring throughout the year (see Section 1.3 for details).

5.2 Temperature

Water temperatures measured by continuous loggers in Line Creek upstream (LC Intake Pond [Data logger T1]) and downstream (LC Mixing Zone Discharge [Data logger T4] and LC3 Downstream [Data logger T5]) of the AWTF in 2021 were largely similar to one another in 2021, with the exception of slightly higher temperatures recorded at data logger T5 (at LC3 Downstream) from June to December when compared to the two other loggers which were located further upstream (T1 [upstream of the AWTF discharge] and T4 [immediately downstream of the AWTF discharge]; Figure 5.1). The slightly higher temperatures at data logger T5 compared to T4 cannot be attributed to an AWTF-influence because T5 is located further downstream of the AWTF discharge than T4 (which is immediately downstream of the AWTF discharge), therefore the observed differences were likely due to an absence of canopy coverage at LC_LC3. The temperatures at data logger T5 were also slightly (~1°C) warmer than those collected upstream of the AWTF discharge at LC_LCUSWLC (Data logger T6) and LC Intake Pond (Data Logger T1) from January to June[36]. Canopy cover at LC_LCUSWLC (Data logger T6), although limited, is denser than the complete absence of canopy cover where the temperature loggers further downstream are located, and the LC Intake Pond data logger (Data logger T1) is situated in a ponded area, whereas the Data logger T6 (at LC_LCUSWLC) is in a free-flowing lotic area. Therefore, the slightly higher temperatures at monitoring locations downstream of LC_LCUSWLC are likely attributable to these habitat differences. Although water temperatures downstream of the AWTF discharge (Data logger T4 and Data logger T5)

[36] Temperature recordings at LC_LCUSWLC (Data logger T6) are not reported after December 1, 2021 as the data logger was retrieved, downloaded, and redeployed at this time (see Section 2.7.1).

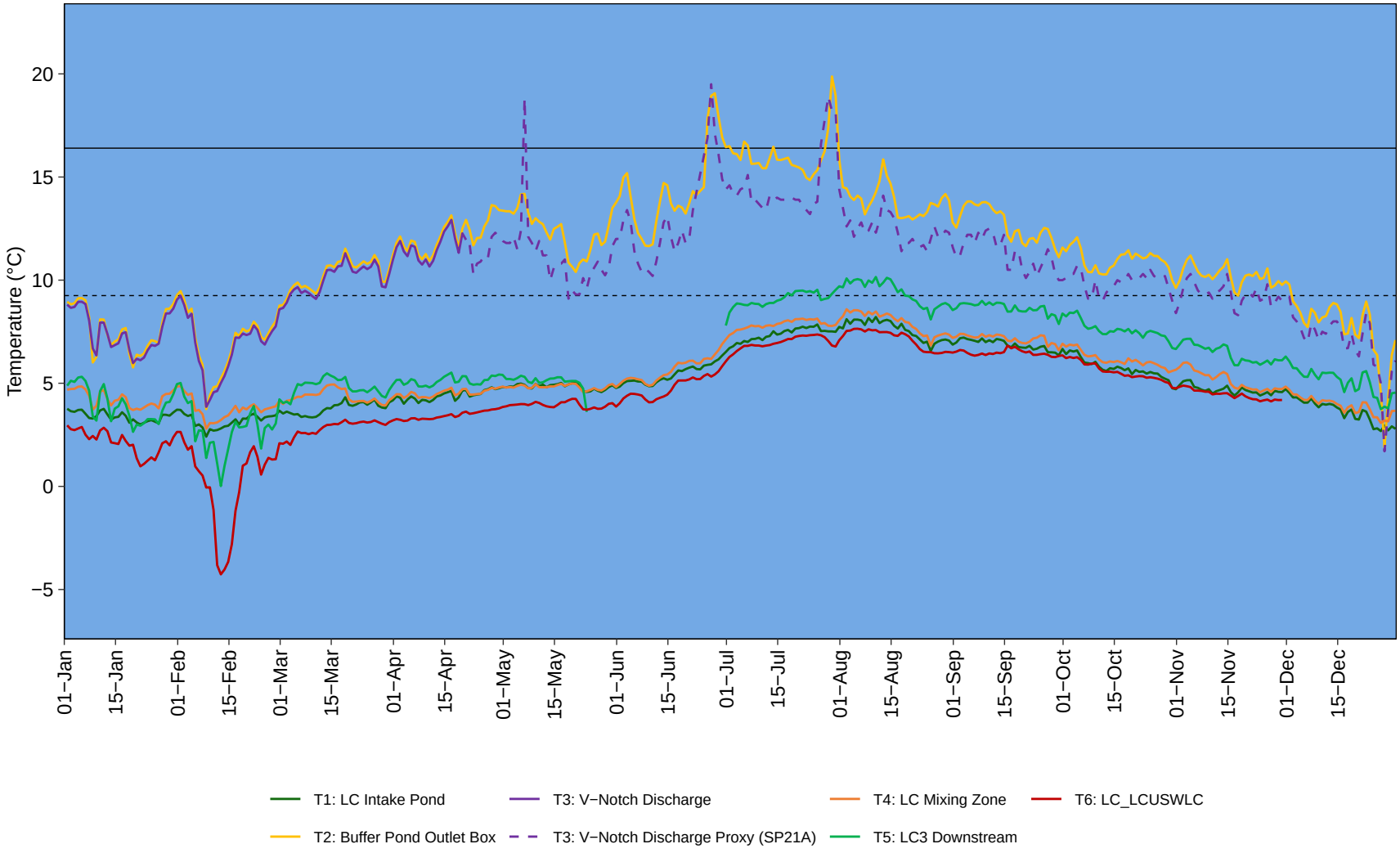


Figure 5.1: Mean Daily Water Temperature Recorded by Temperature Loggers, Line Creek LAEMP, 2021

Notes: The horizonal solid black line indicates the maximum temperature at T2 and T3 in 2020. The horizontal dashed black line indicates the maximum temperature at T1, T4, T5, and T6. Spot measurements from SP21A were used as a proxy for T3: V−notch discharge after April 22 due to the logger malfunctioning. Values between May 25th and June 30th were removed for T5: LC3 Downstream due to the logger malfunctioning. Temperature data from the LC_LCUSWLC temperature logger (T6) is reported up until Dec 1st, which corresponds to the last date when data was retrieved.

were slightly higher than observed at the more covered area upstream (LC_LCUSWLC; Data logger T6), the similarity to temperatures measured directly upstream of the AWTF discharge (Data logger T1) indicates that AWTF with AOP operation in 2021 did not influence water temperatures downstream (Figure 5.1).

British Columbia guidelines for water temperature are defined as a maximum ± 1º C change from the optimum temperature range for different fish life stages (BCMOE 2001). Line Creek water temperatures throughout 2021 were within, or lower than, the optimum temperature ranges specified for different life stages of bull trout and westslope cutthroat trout (Figure 5.2). The use of temperature loggers and routine water quality monitoring also allows for the investigation of extreme weather events, such as the heat wave that occurred in the summer of 2021. To address input from the EMC concerning potential effects of the heat wave in 2021 on benthic invertebrate, water temperatures in Line Creek were compared between 2020 and 2021. This analysis showed that effects of the heat wave on water temperature were limited to July and August 2021, with daily mean temperatures in 2021 at LC_LC3 (based on continuous temperature logger data) that was similar to or lower than 2020 in all months excluding July (9 of 31 days or 29% of the month) and August (18 of 31 days or 58% of the month; Figure 5.1; Minnow 2021a). This was consistent with results from routine water quality monitoring, with water temperatures at both the reference (LC_LC1 and LC_SLC) and mine-exposed areas (LC_LCUSWLC and LC_LCDSSLCC) that were consistently higher (>2°C) in July and August in 2021 when compared to 2020, which was not the case for the remaining months (with the exception of LC_LC1 in May; Appendix Table D.1).

5.3 Dissolved Oxygen

Dissolved oxygen concentrations measured in 2021 upstream and downstream of the AWTF discharge were above the instantaneous minimum criterion for the protection of the most sensitive fish (embryo/alevin) life stages (9 mg/L; BCMOE 1997) except for single sampling events at the mine-exposed areas LC_LC4 and LC_LCDSSLCC and two sampling events at the reference area LC_SLC (Figure 5.3). The occurrence of dissolved oxygen concentrations below the instantaneous minimum criterion at both mine-exposed and reference areas indicates that this was not related to AWTF operation. Dissolved oxygen concentrations were above the 30-day mean for all other fish life stages throughout 2021 (8 mg/L; Figure 5.3). Monthly mean concentrations of dissolved oxygen were below the 30-day mean criterion of 11 mg/L for the most sensitive fish life stages (buried embryo/alevin) at all mine-exposed and reference areas from May to August, while all areas were above the criterion in January, February, and April (Table 5.1). The most frequent occurrence of dissolved oxygen concentrations below the 30-day mean criterion of 11 mg/L was in the area upstream of the AWTF discharge (LC_LCUSWLC; 9 months)

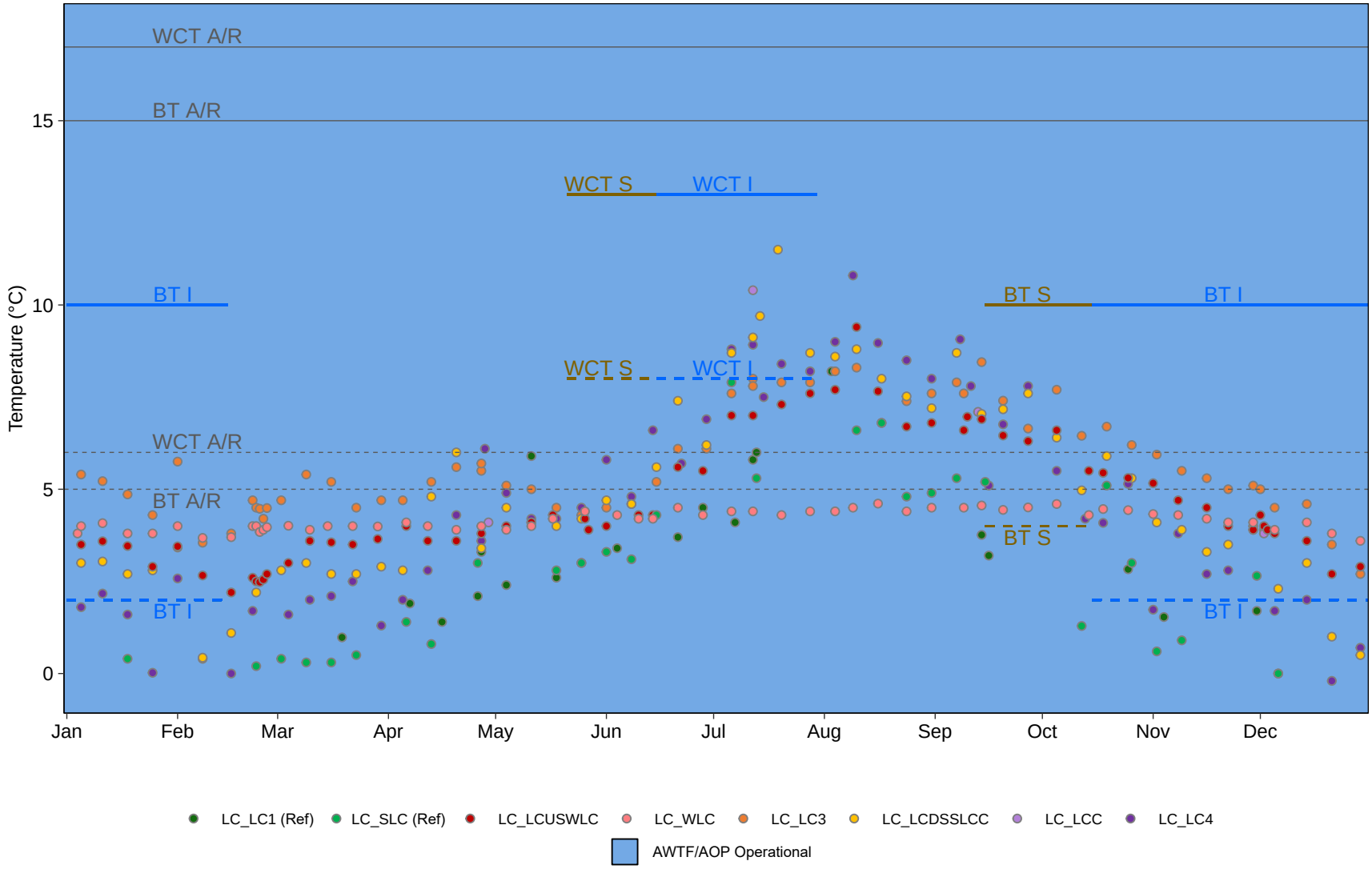


Figure 5.2: Water Temperatures at Monitoring Stations in Line Creek in 2021 Relative to BCMOE (2001) Guidelines for Maximum (Solid Lines) and Minimum (Dotted Lines) Temperatures for Protection of Fish Species

Notes: BT = bull trout; WCT = westslope cutthroat trout; S = spawning; I = incubation; A/R = alevin/rearing. The timing of fish life history stages was approximated from COSEWIC (2016), McPhail and Baxter (1996), and McPhail (2007).

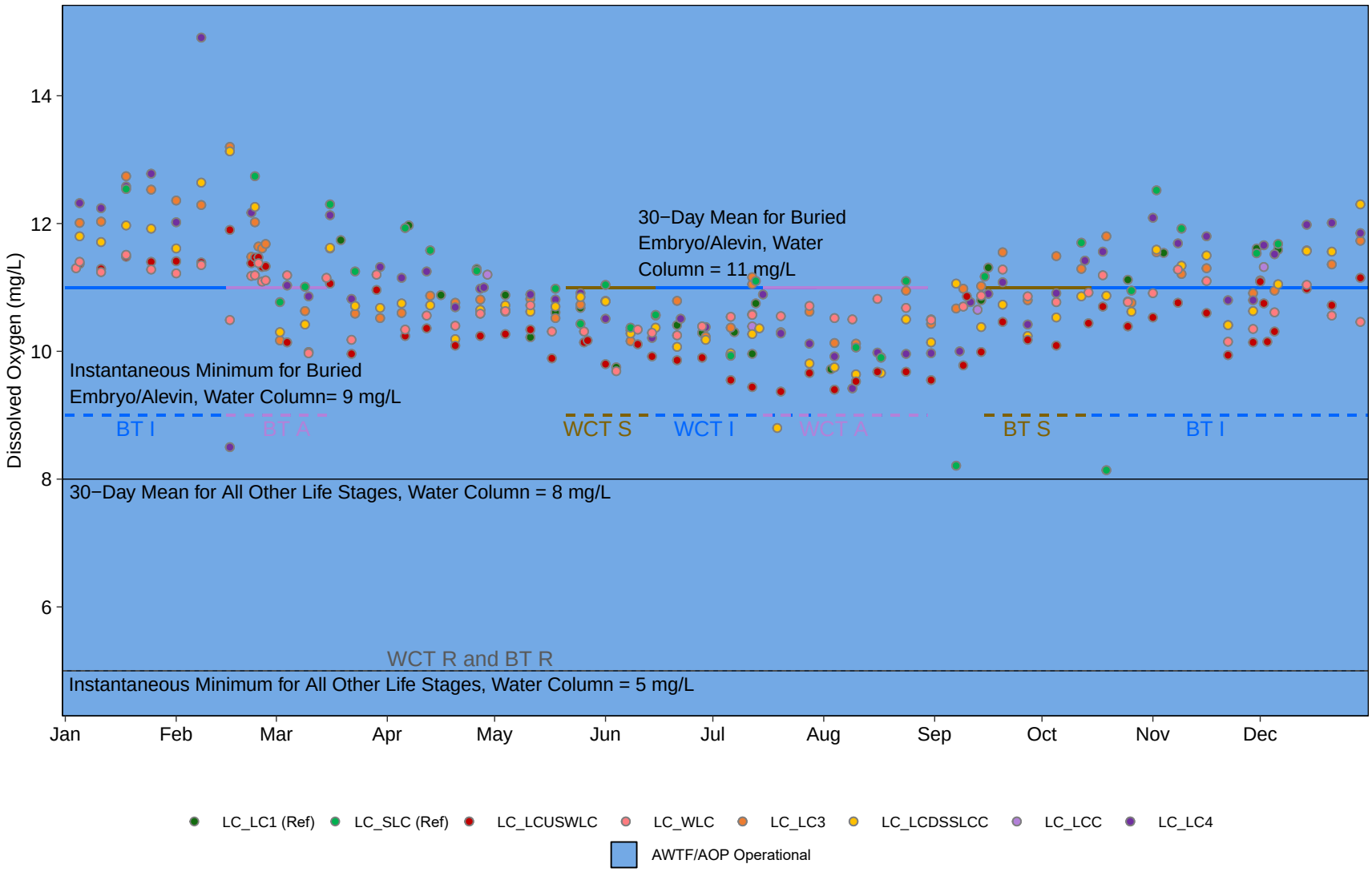


Figure 5.3: Dissolved Oxygen Concentrations at Sampling Stations in Line Creek in 2021, Relative to the BCMOE (1997) Criteria for the Protection of Fish Life Stages

Notes: BT = bull trout; WCT = westslope cutthroat trout; S = spawning; I = incubation; A/R = alevin/rearing. The timing of fish life history stages was approximated from COSEWIC (2016), McPhail and Baxter (1996), and McPhail (2007). Spawning, incubation, and alevin stages were included in application of buried embryo/alevin guideline values.

Table 5.1: Monthly Mean Dissolved Oxygen Concentrations (mg/L) in Line Creek, 2021

Month	LC_LC1	LC_SLC	LC_LCUSWLC	LC_WLC	LC_LC3	LC_LCDSSLCC	LC_LCC	LC_LC4
January	-	12.5	11.4	11.3	12.3	11.9	-	12.5
February	-	12.7	11.5	11.1	12.0	12.4	-	11.9
March	11.7	11.3	10.4	10.7	10.7	10.7	-	11.2
April	11.2	11.6	10.2	10.5	10.7	10.6	11.2	11.0
May	10.6	10.7	10.2	10.5	10.7	10.7	-	10.8
June	10.2	10.7	9.92	10.2	10.5	10.3	-	10.4
July	10.3	10.5	9.51	10.6	10.7	9.84	10.4	10.4
August	9.72	10.4	9.57	10.6	10.3	9.94	-	9.85
September	11.1	9.69	10.3	10.9	11.0	10.6	10.7	10.6
October	11.1	10.3	10.4	10.9	11.3	10.7	-	11.2
November	11.6	12.0	10.4	10.8	11.1	11.1	-	11.4
December	11.6	11.7	10.7	10.7	11.3	11.6	11.3	11.8

Less than 30-day water column mean criterion of 11 mg/L for buried embryo/alevin life stages (guideline was applied to all months except April, see notes for details).

Notes: "-" = no data/not recorded. Spawning, incubation, and alevin stages for bull trout and westslope cutthroat trout were included in the application of buried embryo/alevin guideline values, and were applicable to at least some portion of each month except April. The timing of life history stages for these species was approximated from COSEWIC (2016), McPhail and Baxter (1996), and McPhail (2007). See Figure 5.3 for graphical display of these life history stages.

compared to areas downstream of the AWTF (LC_LCDSSLCC [7 months], LC_LC1 [4 months], LC_LC3 and LC_LC4 [5 months]; Table 5.1). Furthermore, areas downstream of the AWTF discharge showed a similar occurrence of dissolved oxygen concentrations below the 30-day mean as the reference areas (LC_LC1 and LC_SLC), except for March (wherein both upstream [LC_LCUSWLC and LC_WLC] and two of the four downstream areas [LC_LC3 and LC_LCDSSLCC] were below the criterion while both references were not). Regardless, in all circumstances where dissolved oxygen concentrations were below the criterion for areas downstream of the AWTF the same trend was also apparent for upstream areas, indicating that these exceedances were not related to AWTF operation in 2021.

5.4 Water Quality Analytes

Evaluation of analytes with early warning triggers under the AMP and those with BCWQG and/or water quality benchmarks (see Sections 2.2.1 and 2.7.1; Appendix Figures D.1 to D.28, C.3 and C.4, Appendix Tables D.2 and D.3) indicated that nitrate was detected with high frequency (ranging from 96% to 100% of samples for an area) above the long-term BCWQG at mine-exposed stations (see Section 3.2 for the influence of nitrate on productivity). This was true for stations both upstream and downstream of the AWTF discharge in Line Creek and in the Fording River upstream and downstream of the Line Creek confluence. Total nitrate concentrations at LC_LC3 (e.g., the area in closest proximity downstream of the AWTF outfall) were below the Level 1 EVWQP benchmark for the entirety of 2021 (Figure 3.6; Appendix Figure B.3, Appendix Table D.3), which is slightly lower than in 2020 when the exceedance frequency was 4% of samples (2 out of 53 sampling events; Minnow 2021a). The results at LC_LC3 were similar to areas further downstream in 2021, as total nitrate concentrations did not exceed the Level 1 EVWQP Benchmark at these areas either throughout 2021 (Figure 3.6; Appendix Figure B.3, Appendix Table D.3). In contrast, concentrations of total nitrate upstream of the AWTF discharge (LC_WLC and LC_LCUSWLC) showed a higher frequency (53 and 34%, respectively) of exceeding the Level 1 EVWQP Benchmarks. Thus, the higher concentrations upstream of the AWTF suggest that the AWTF is functioning as expected in decreasing concentrations of nitrate downstream. Evaluation of selenium was also included in the assessment of water quality analytes and is discussed in detail in Section 4.3, therefore it is excluded here.

Concentrations of six other analytes had concentrations higher than applicable BCWQG and/or water quality benchmarks (i.e., EVWQP Benchmarks, Interim Screening Values [for nickel], or Level 1 Screening Value [for total dissolved solids]) downstream of the AWTF discharge. These included total dissolved solids (18% > Level 1 Screening Value at LC_LC3), sulphate (25% > long-term BCWQG and Level 1 EVWQP Benchmark at LC_LC3), total

nickel (> Level 1 interim screening value at LC_LC3 [100%], WL_DCP_SP24 [100%], and LC_LCDSSLCC [15%]), dissolved cadmium (10% >Level 1 EVWQP Benchmark at LC_LC3), dissolved copper (> long-term BCWQG at LC_LC3 [13%] and LC_LC4 [2%]), and total mercury (> long-term BCWQG at LC_LC4 [4%] and LC_LC5 [8%]; Appendix Figures D.1 to D.28, Appendix Table D.3). However, annual mean concentrations of these analytes were lower downstream of the AWTF when compared to upstream of the AWTF discharge, as evidenced by fewer benchmark exceedances than at areas upstream of the AWTF outfall [RG_LCUSWLC and LC_WLC]. In the case of mercury at LC_LC4 and LC_LC5, past studies have shown that mercury inputs (total and methyl) in the Elk Valley Area are not related to mining activities (Azimuth 2019); furthermore, total mercury concentrations at the two reference areas (LC_LC1 and LC_SLC) were also higher than the long-term BCWQG at a similar frequency (3 to 7% of sampling events) as LC_LC5 (8%; Appendix Table D.3) suggesting naturally elevated mercury concentrations in the area.

Visual inspection of results from 2012 to 2021 indicated temporal increases in analyte concentrations at monitoring stations downstream of the AWTF discharge (i.e., comparing results during AWTF with AOP operations to years without AOP or pre-AWTF) for three analytes, which was similar to results from 2020 (Minnow 2021a). Specifically, temporal increases in dissolved cobalt, total manganese, and total molybdenum concentrations were noted during AWTF with AOP operation (2019 to 2021) at areas downstream and in close proximity of the AWTF discharge (namely LC_LC3; Appendix Figures D.15, D.16, and D.19 to D.22) in comparison to earlier years (2017 to 2018). Mean concentrations of total manganese and total molybdenum at LC_LC3 remained well below (approximately 46- and 1,980-times lower) the long-term BCWQG (Appendix Figures D.19 and D.22, Appendix Table D.3), while dissolved cobalt, which does not have an applicable BCWQG, was within the range of pre-AWTF results (i.e., 2014 and earlier; Appendix Figures D.15 and D.16, Appendix Table D.3). Additionally, aqueous concentrations of these three constituents were also lower in 2021 at LC_LC3 when compared to 2020 (Appendix Figures D.15, D.19, and D.21). The increase in molybdenum could be related to the use of antiscalant (which contains molybdenum) which started in 2018 (pers. Comm. Traverse 2021).

5.5 Toxicity Results

Acute toxicity testing with was conducted with 31 effluent samples from WL_BFWB_OUT_SP21 using the water flea (*Daphnia magna*) and rainbow trout in 2021 (Teck 2022a). No samples failed the test criteria for acute toxicity (i.e., did not cause > 50% mortality to either organism) although two sampling events causing 10% mortality to rainbow trout (Table 5.2; Appendix Table D.4).

Table 5.2: Summary of Acute Toxicity Test Results for Line Creek Monitoring Stations, 2021 (Teck 2022)

Water Station			Water Flea *(Daphnia magna)*		Rainbow Trout *(Oncorhynchus mykiss)*	
Teck Code	**Description**	**Year**	**# Tests > 50% Mortality**	**Total # tests**	**# Tests > 50% Mortality**	**Total # tests**
WL_BFWB_OUT_SP21	West Line Creek AWTF effluent outfall	2021	0	31	0	31

Acute toxicity test failure(s) (> 50% test mortality).

Chronic toxicity testing was performed quarterly on samples collected at LC_LC3 and the Compliance Point (LC_LCDSSLCC) to evaluate potential effects to *C. dubia* and *P. subcapitata*, while semi-annual chronic toxicity tests were conducted to evaluate potential effects to *H. azteca*, fathead minnow, and rainbow trout; results are discussed on species-specific basis below.

Effects to *C. dubia* (survival and reproduction) were not significantly different when compared to reference throughout most of 2021 (for both monitoring areas [LC_LC3 and LC_LCDSSLCC]), except for the reproduction endpoint for LC_LC3 in Q4. Reproduction at LC_LC3 in Q4 was significantly different than three of the four reference areas evaluated and was categorized as 'possible adverse response' (Table 5.3; Golder 2022). Nickel showed the greatest evidence as the likely cause of the observed response, as aqueous analyte concentrations (13 µg/L) exceeded the Level 1 interim screening value (Golder 2022) and was higher than the reproduction EC_{20} for Nickel (10 µg/L; Nautilus 2018). The magnitude of response at LC_LC3 in 2021 Q4 (25% reduction in reproduction), which was categorized as a 'possible adverse response', was similar to 2020 Q4 (22% reduction in reproduction) and Q4 2019 (24% reduction in reproduction), which were both categorized as 'no adverse response' during those years of testing.

Effects to cell yield for *P. subcapitata* at LC_LC3 were observed in Q1 ('possible adverse effects') and Q2 ('likely adverse effects') for LC_LC3 and in Q4 for LC_LCDSSLCC ('possible adverse effects'). All other responses in 2021 were either not significantly different when compared to reference or were categorized as 'no adverse response' despite significantly lower cell yield than one or more reference areas (Golder 2022; Table 5.3). No water quality analytes were identified as potentially contributing to the observed responses in 2021 (Golder 2022). However, it should be noted that mean cell yields in both Q1 and Q4 were affected by systematically reduced growth across all areas evaluated (despite variability in water chemistry) which adds a level of uncertainty around the observed effects for LC_LC3 in Q1 and LC_LCDSSLCC in Q4 Golder 2022). The frequency of an adverse effect (either 'possible adverse response' or 'likely adverse response') for *P. subcapitata* in 2021 was higher than in 2020 when a single 'possible adverse response' was reported for LC_LC3 in Q3 (remaining 2020 results indicated 'no adverse response'; Golder 2022). However, as noted above there is additional uncertainty associated with the effects observed in Q1 and Q4 of 2021 due to systematic reduction in cell yield among areas in these quarters (Golder 2022). Fewer adverse effects were reported in 2021 compared to 2019 when both LC_LC3 and LC_LCDSSLCC reported a 'likely adverse response' in *P. subcapitata* cell yield in Q3, but it should be noted that the *P. subcapitata* results from Q3 2019 were considered anomalous due to reduced cell yield among areas (including reference; Golder 2020a).

Table 5.3: **Results of Quarterly and Semi-Annual Chronic Toxicity Tests at LC_LCDSSLCC in 2015 to 2021and LC_LC3 in 2019 and 2021 (Golder 2016, 2017a, 2018, 2019, 2020a, 2021a, 2022)**

Area	Quarter		Water Flea (*Ceriodaphnia dubia*)[b]		Amphipod (*Hyalella azteca*)[c]		Green Alga (*Pseudokirchneriella subcapitata*)	Rainbow Trout (*Oncorhynchus mykiss*)				Fathead Minnow (*Pimephales promelas*)[d]				
			Survival (% control-normalized)	Reproduction (% control-normalized; Protocol-specified)	Survival (% control-normalized)	Dry Weight (% control-normalized)	Cell Yield ($x10^4$ cells/ml)	Survival (% control-normalized)	Viability (% control-normalized)	Length (% control-normalized)	Wet Weight (% control-normalized)	Hatch (% control-normalized)	Survival (% control-normalized)	Biomass (% control-normalized)	Length (% control-normalized)	Normal Development (% control-normalized)
LC_LCDSSLCC	2015	Q1	100 ± 0	98 ± 14	-	-	117 ± 2.2	-	-	-	-	-	-	-	-	-
		Q2	100 ± 0	**82 ± 12**	-	-	**69.2 ± 5.7**	102 ± 3	101 ± 6	101 ± 4	101 ± 5	-	-	-	-	-
		Q3	100 ± 0	107 ± 20	-	-	83 ± 21	-	-	-	-	-	-	-	-	-
		Q4	100 ± 0	80 ± 24	-	-	94 ± 18	88 ± 9	87 ± 9	98 ± 4	103 ± 4	-	-	-	-	-
	2016	Q1	100 ± 0	109 ± 16	-	-	129.5 ± 5.3	-	-	-	-	-	-	-	-	-
		Q2	100 ± 0	**67 ± 39**	-	-	**91.0 ± 4.8**	78 ± 6	88 ± 16	104 ± 2	97 ± 12	-	-	-	-	-
		Q3	100 ± 0	83 ± 21	-	-	119.5 ± 5.5	-	-	-	-	-	-	-	-	-
		Q4	100 ± 0	94 ± 18	-	-	156.0 ± 4.5	**70 ± 10**	**69 ± 8**	104 ± 1	116 ± 11	-	-	-	-	-
	2017	Q1	100 ± 0	**92 ± 38**	-	-	211.8 ± 15.4	-	-	-	-	-	-	-	-	-
		Q2	100 ± 0	124 ± 11	-	-	134.0 ± 4.2	99 ± 8	93 ± 18	107 ± 6	125 ± 10	-	-	-	-	-
		Q3	100 ± 0	104 ± 25	-	-	146.8 ± 10.1	-	-	-	-	-	-	-	-	-
		Q4	100 ± 0	127 ± 15	-	-	103.5 ± 4.4	**41 ± 44**	**41 ± 44**	109 ± 3	119 ± 5	-	-	-	-	-
	2018	Q1	100 ± 0	75 ± 19	-	-	164.3 ± 10.3	-	-	-	-	-	-	-	-	-
		Q2	100 ± 0	***40 ± 12***	96 ± 15	108 ± 35	147.5 ± 4.8	102 ± 3	103 ± 2	104 ± 5	109 ± 16	-	-	-	-	-
		Q3	100 ± 0	106 ± 18	109 ± 10	150 ± 30	97.0 ± 12.2	-	-	-	-	-	-	-	-	-
		Q4	100 ± 35	***63 ± 23***	74 ± 30	***35 ± 20***	***87.7 ± 8.2***	100 ± 9	103 ± 11	106 ± 1	110 ± 4	-	-	-	-	-
	2019	Q1	100 ± 0	92 ± 21	-	-	81.5 ± 4.5	-	-	-	-	100 ± 0	89 ± 14	87 ± 6	***90 ± 3***	98 ± 5
		Q2	100 ± 0	81 ± 6	-	-	*110.8 ± 2.6*	101 ± 11	101 ± 15	104 ± 3	115 ± 5	-	-	-	-	-
		Q3	80 ± 42	92 ± 23	90 ± 17	*51 ± 26*	***29.8 ± 3.3***	-	-	-	-	100 ± 0	***64 ± 12***	**71 ± 8**	104 ± 5	96 ± 7
		Q4	100 ± 0	88 ± 17	**73 ± 35**	84 ± 51	***104.0 ± 10.0***	90 ± 6	86 ± 4	103 ± 2	107 ± 3	-	-	-	-	-
	2020	Q1	111 ± 0	93 ± 9	-	-	***74 ± 5.3***	-	-	-	-	98 ± 3	***39 ± 29***	**52 ± 35**	117 ± 7	112 ± 0
		Q2	90 ± 32	86 ± 34	107 ± 5	92 ± 18	**111 ± 5.6**	113 ± 18	109 ± 24	100 ± 7	103 ± 16	-	-	-	-	-
		Q3	90 ± 32	***70 ± 22***	-	-	**105 ± 9.0**	-	-	-	-	100 ± 0	96 ± 10	87 ± 6	90 ± 6	100 ± 0
		Q4	100 ± 0	74 ± 15	88 ± 17	63 ± 30	119 ± 4.4	***89 ± 8***	***87 ± 10***	102 ± 0	111 ± 8	-	-	-	-	-
	2021	Q1	100 ± 0	91 ± 27	-	-	***86 ± 3.4***	-	-	-	-	105 ± 0	104 ± 8	90 ± 9	96 ± 2	100 ± 4
		Q2	90 ± 32	87 ± 29	104 ± 5	-[e]	*55 ± 2.2*	100 ± 2	106 ± 2	106 ± 0.4	135 ± 16	-	-	-	-	-
		Q3	90 ± 32	91 ± 30	98 ± 9	*61 ± 8*	85.8 ± 5.0	-	-	-	-	102 ± 4	76 ± 18	87 ± 15	93 ± 3	104 ± 5
		Q4	100 ± 0	93 ± 21	107 ± 5	115 ± 19	***61.5 ± 7.6***	101 ± 12	100 ± 14	108 ± 5	107 ± 12	-	-	-	-	-
LC_LC3	2019	Q1	100 ± 0	86 ± 12	-	-	79.5 ± 8.0	-	-	-	-	100 ± 0	86 ± 4	89 ± 4	96 ± 1	100 ± 0
		Q2	100 ± 0	85 ± 12	-	-	*113.8 ± 11.4*	92 ± 14	94 ± 13	104 ± 2	118 ± 8	-	-	-	-	-
		Q3	100 ± 0	105 ± 20	75 ± 17	67 ± 26	***27.0 ± 3.6***	-	-	-	-	100 ± 0	95 ± 13	92 ± 5	105 ± 2	100 ± 0
		Q4	90 ± 32	76 ± 22	***67 ± 45***	153 ± 25	122.8 ± 8.5	90 ± 5	83 ± 17	101 ± 3	104 ± 10	-	-	-	-	-
	2020	Q1	111 ± 0	88 ± 20	-	-	***75 ± 3.8***	-	-	-	-	100 ± 0	96 ± 7	84 ± 4	96 ± 2	100 ± 0
		Q2	100 ± 0	*87 ± 18*	*76 ± 46*	**75 ± 29**	120 ± 3.9	96 ± 29	**91 ± 33**	99 ± 8	116 ± 22	-	-	-	-	-
		Q3	100 ± 0	***82 ± 18***	-	-	***83 ± 7.4***	-	-	-	-	92 ± 6	73 ± 12	98 ± 7	104 ± 5	94 ± 13
		Q4	100 ± 0	78 ± 18	96 ± 9	49 ± 19	114 ± 5.5	**90 ± 2**	91 ± 2	101 ± 1	106 ± 12	-	-	-	-	-
	2021	Q1	90 ± 32	93 ± 40	-	-	***74.5 ± 9***	-	-	-	-	105 ± 0	104 ± 10	89 ± 6	96 ± 4	98 ± 4
		Q2	100 ± 0	99 ± 20	104 ± 5	-[e]	***47.2 ± 2.4***	98 ± 3	101 ± 6	105 ± 1	122 ± 21	-	-	-	-	-
		Q3	100 ± 0	91 ± 11	100 ± 6	*59 ± 7*	***80.8 ± 5.6***	-	-	-	-	105 ± 0	91 ± 15	102 ± 8	93 ± 7	102 ± 5
		Q4	90 ± 32	**75 ± 28**	102 ± 10	122 ± 9	**75 ± 3.4**	113 ± 4	110 ± 5	106 ± 4	104 ± 9	-	-	-	-	-

result significantly lower than at least one reference area
Bold result significantly lower than Fording River reference (FR_UFR1).
Underline result significantly lower than Elk River reference (GH_ER2).
Italic result significantly lower than Michel Creek reference (CM_MC1).
result significantly lower than South Line Creek reference (LC_SLC).

Notes: Q_x = Calendar year quarters. "-" = no data available.

[a] Results presented as percent survival or endpoint ± standard deviation. Chronic toxicity testing at LC_LC3 was initiated in 2019.

[b] Two test lengths were used to evaluate potential effects *on Ceriodaphnia dubia* reproduction in 2019. These included: 1) a protocol-specified test length (i.e., reproduction was measured when ≥60 % of controls produced three or more broods; as per Environment Canada [2007c]); and 2) an 8-day test duration (Golder 2020). These two test lengths were used in 2019 to evaluate potential brood effect. Prior to 2019, the protocol-specified test length was used.

[c] Based on the Permit 107517 and 106970 Chronic Toxicity Program integration amendment (ENV 2019), chronic toxicity testing of *Hyalella azteca* (28-day test) is required on a semi-annual basis (spring and fall; see Section 2.2.2). Collection of toxicity test samples in early 2019 (Q1) began before the amendment was issued. Therefore, toxicity testing of *H. azteca* in Q1 was completed according to the previous requirements (Permit 107517). *H. azteca* testing was completed in Q3 and Q4 in 2019.

[d] Fathead minnow chronic toxicity testing (30-day early life stage test) at LC_LCDSSLC and LC_LC3 was initiated in 2019.

[e] *H. azteca* Q2 test organisms were disposed of prior to measuring dry weight due to a lab technician error (see Section 2.2.2), and therefore the initial Q2 tests have only survival data. In response to this, tests were repeated in Q3 for all stations.

Effects to survival and growth of *H. azteca* were categorized as either not significantly different when compared to reference or were categorized as 'no adverse response' for both LC_LC3 and LCDSSLCC in 2021 (Q2, Q3[37], and Q4; Golder 2022). Similar results were encountered for fathead minnows (Q1 and Q3; via evaluation of hatch, survival, biomass, length, and normal development) and rainbow trout (Q2 and Q4; survival, viability, length, and wet weight) as effects were either not significantly different from reference or were categorized as "no adverse response" (Golder 2022). The lack of toxicity to *H. azteca* and both fish species (fathead minnow and rainbow trout) from water at both areas in 2021 contrasts with a higher frequency of reported effects for these species in previous years of evaluation (2018, 2019; Golder 2019, 2020a, 2021a).

Overall, acute toxicity testing of AWTF effluent showed no test failures in 2021 (Teck 2022a). Chronic toxicity responses were noted on a few occasions for *P. subcapitata* in 2021 but there is additional uncertainty associated with the observed effects observed due to systematic reduction in cell yield among all test areas in these quarters. The remaining four test species (*C. dubia, H. azteca,* fathead minnow, and rainbow trout) showed 'no adverse effects' throughout most of 2021, with only *C. dubia* at LC_LC3 in Q4 being categorized as 'possible adverse effects'. Temporal comparisons of chronic toxicity results for LC_LC3 and LC_LCDSSLCC indicated that observed organism responses (or lack thereof) for chronic toxicity testing in 2021 were similar to or lower than previous years. In addition, few adverse responses have been observed at either area since initiation of testing, there is no apparent consistent pattern of responses, and there is no clear evidence of casual factors (Golder 2022), suggesting a lack of influence of the AWTF. Combined, these results indicated the toxicity responses observed in 2021 were likely not related to AWTF with AOP operation. This conclusion is consistent with findings of benthic invertebrate community monitoring over the same time-period that indicated no obvious adverse change in community characteristics associated with the AWTF with AOP operation in 2021.

5.6 Summary

Operation of the AWTF with AOP in 2021 did not significantly change water temperature or dissolved oxygen concentrations downstream in Line Creek. Evaluation of water quality analytes demonstrated no increases in analyte concentrations that resulted in concentrations above guidelines or water quality benchmarks during AWTF with AOP operation in 2021. Additionally, chronic toxicity testing in most cases (except with the possibly of a few green algae toxicity results), suggested that toxicity was either similar to or lower than previous years.

[37] *H. azteca* Q2 test organisms were disposed of prior to measuring dry weight due to a lab technician error (see Section 2.2.2), and therefore the initial Q2 tests have only survival data. In response to this, tests were repeated in Q3 for all stations.

Overall, there did not appear to be influences on aquatic biota associated with the WLC AWTF with AOP operations in 2021 that were not already being addressed through monitoring related to Study Questions #1 (productivity) and #2 (tissue selenium accumulation), which is consistent with past evaluations during this operational period (2019 and 2020).

6 SUMMARY

Potential effects to the aquatic environment related to the commissioning of the WLC AWTF were evaluated by addressing three study questions, which focus on: 1) potential effects to biological productivity; 2) selenium concentrations in biota; and 3) potential effects related to factors other than nutrients or selenium.

Evaluation of Study Question #1 (potential influences on biological productivity) indicated that aqueous total phosphorus concentrations at the Compliance Point (LC_LCDSSLCC) were consistently below the SPO of 0.02 mg/L during 2021. In 2021, concentrations of nutrients (total phosphorus, orthophosphate, and nitrate) were generally in the ranges of concentrations observed in previous years. Additionally, the results suggested that the operation of the AWTF with AOP (2019 to 2021) was more successful at minimizing phosphorus and orthophosphate contributions to the receiving environment than operation of the AWTF without AOP (in 2016 and 2017).

Periphyton coverage at all mine-exposed and reference areas was moderate in 2021 (based on visual assessment) and was consistent with past results. Periphyton coverage at RG_LILC3 and RG_LIDCOM was moderate in 2021 (similar to results from 2017 to 2019), and decreased from 2020, suggesting results from 2020 were an isolated event. Benthic invertebrate biomass and density at RG_LIDSL and RG_LILC3 (the two downstream areas in closest proximity to the AWTF discharge) showed no significant increase in 2021 related to during operation of the AWTF with AOP. Benthic invertebrate total abundance (measured by kick and sweep) was within regional normal ranges and was largely similar to previous years (2017 to 2020) at mine-exposed areas in 2021. Where abundance was increased relative to pre-AWTF results, the absence of a change closest to the AWTF discharge indicated that the increase was likely unrelated to AWTF with AOP operation (consistent with the biomass and density results). Benthic invertebrate community endpoints, as determined from kick and sweep sample collection, indicated no consistent adverse changes in community characteristics related to operation stabilization of the AWTF with AOP in 2021. Rather, continued increase in the percentage of sensitive taxa (Ephemeroptera and EPT) at most areas of Line Creek downstream from the AWTF during the AWTF with AOP period (2019 to 2021) was suggestive of an improvement in benthic invertebrate community structure (Table 6.1).

Overall, assessment of Study Question #1 indicated that biological productivity downstream from the AWTF has not been affected by the operation of the AWTF with AOP (2019 to 2021) relative to previous years of operation.

Table 6.1: Summary of Measurement Endpoints, Analyses, and Results of Line Creek LAEMP, 2021

Study Question	Water				Biological			
	Measurement Endpoint	Indicator	Analysis/Evaluation	Result	Measurement Endpoint	Indicator	Analysis/Evaluation	Result
Is active water treatment affecting biological productivity downstream in Line Creek?	Nutrient concentrations	Nitrate	1) Comparison to SPO 2) Comparison to BCWQG and Water Quality Benchmarks	1) Nitrate was below the SPO during a majority of 2021 (65% of sampling events) 2) Concentrations > BCWQG at all mine-exposed areas. Concentrations < Level 1 benchmark for all areas downstream of discharge.	Periphyton productivity	Visual Coverage Scores	Coverage scored according to CABIN guidance (Environment Canada 2012)	Coverage scored as moderate at all mine-exposed areas (which for RG_LILC3 and RG_LIDCOM was lower than 2020) and mild-moderate at reference stations, similar to previous years.
					Benthic invertebrate productivity	Biomass	ANOVA analysis among years = 2014 to 2021 Areas: Ref = RG_SLINE, RG_LI24; Exp = RG_LILC3, RG_LIDSL	No adverse effect associated with AWTF with AOP operation in 2021. No significant differences in biomass at RG_LILC3 or RG_LIDSL in 2021 when compared to previous years (or when compared to previous years relative to reference).
						Density	ANOVA analysis among years = 2014 to 2021 Areas: Ref = RG_SLINE, RG_LI24; Exp = RG_LILC3, RG_LIDSL	No adverse effect associated with AWTF with AOP operation in 2021. Density at RG_LIDSL in 2021 was not significantly different than previous years or when compared to previous years relative to RG_SLINE, however density at RG_LIDSL was significantly higher in 2021 than all previous years (excluding 2019) when comparisons among years was relative to changes at the reference RG_LI24. Density at RG_LILC3 in 2021 was not significantly different than previous years or when compared to previous years relative to RG_SLINE, while density at RG_LILC3 in 2021 relative to RG_LI24 was either similar (2014, 2015, 2017, and 2019) or lower than previous years (2018 and 2020).
		Total Phosphorus	1) Comparison to SPO 2) Comparison to the LC_LC3 baseline 97.5th percentile	1) Phosphorus did not exceed SPO in 2021. 2) Concentrations in 2021 were below the LC_LC3 baseline with the exception of one sample in October.	Benthic invertebrate community structure	Abundance	Comparison to past observations and reference normal range (NR)	No evidence of adverse effect on secondary productivity associated with AWTF with AOP operation in 2021. Average organism abundance at Exp areas were within NR in 2021 and within range of previous AWTF operational years. Abundance at RG_LIDSL and RG_LI8 in 2021 was higher than pre-ATWF conditions on occasion, but a lack of increase at RG_LILC3 (immediately downstream of AWTF discharge) indicates increase is likely not AWTF-related.
						Richness	Comparison to past observations and reference normal range (NR)	No evidence of adverse effect associated with AWTF with AOP operation in 2021. Average species richness at all mine-exposed area were within both NR and SNR (except RG_LIDCOM which was slightly above SNR).
		Orthophosphate	Comparison to the LC_LC3 baseline 97.5th percentile	Concentrations in 2021 were below the LC_LC3 baseline.		%EPT, %Ephemeroptera (%E), %Chironomidae (%C)	Comparison to past observations and reference normal range (NR)	No evidence of adverse effect associated with AWTF with AOP operation in 2021. Average %EPT was within NR except immediately downstream of the AWTF discharge (at RG_LILC3 and RG_LISP24) and within or above range of previous years. %E in 2021 was similar or increased in comparison to previous years, with all areas were within NR except for RG_LILC3. Higher percent Ephemeroptera at areas further downstream, specifically RG_LISP24, RG_LIDSL, LIDCOM, and LI8, have been observed during AWTF with AOP Operation (2019 to 2021) when compared to AWTF without AOP. %C downstream of AWTF discharge were within range of previous years or showed decreases in composition.

Notes: Ref = Reference sampling station/area; Exp = Mine-exposed sampling station/area; SPO = Site Performance Objective; BCWQG = British Columbia Water Quality Guideline; NR and SNR = Regional normal range and site-specific normal range of reference area data, respectively from the RAEMP (see Minnow 2020b for details); Water quality benchmarks are those outlined in Teck (2014). It should be noted that the terminology used to describe the AWTF operational phase initiated on December 30, 2018 has been updated in the present report. Terminology in the 2019 LCO LAEMP report identified two AWTF operational phases after December 30, 2018: “AWTF Operational Stabilization” and “AWTF/AOP Steady State Operation” (Minnow 2020a). In the current report, after December 30, 2018 has been termed as a single “AWTF with AOP Operational” phase (see Section 1.3 for more details).

Table 6.1: Summary of Measurement Endpoints, Analyses, and Results of Line Creek LAEMP, 2021

Study Question	Water				Biological			
	Measurement Endpoint	Indicator	Analysis/Evaluation	Result	Measurement Endpoint	Indicator	Analysis/Evaluation	Result
Are tissue selenium concentrations reduced downstream from the AWTF?	Total and dissolved selenium concentrations		Visual inspection of data	General decrease in total [Se] downstream of the AWTF discharge during AWTF with AOP operation in 2021.	Composite-taxa selenium tissue samples		1) ANOVA analysis: Before = 2012; Initial Operations = 2014; AWTF without AOP = 2016 to 2017; Shutdown = Mar to Aug 2018; AWTF with AOP Restart = Oct 2018 to Dec 2018; AWTF with AOP (2019 to 2021); Post-hoc contrasts limited to AWTF with AOP (2021) vs. AWTF without AOP and Before, within AWTF with AOP (2021), and AWTF with AOP (2019 to 2021; grouped by season). Areas: Ref = RG_SLINE, RG_LI24; Exp = RG_LCUT, RG_LILC3, RG_LISP24, RG_LIDSL, RG_LIDCOM, RG_LI8, RG_FRUL, RG_FO23 2) Spatial analysis using ANOVA during each sampling event (April 2021 to Dec 2021) 3) Comparison to reference normal range (NR) 4) Comparison to site-specific benchmarks 5) Temporal analysis (ANOVA) for RG_SLINE and visual evaluation of benthic invertebrate composite taxa samples	1) Significant decrease in tissue [Se] during AWTF with AOP in 2021 compared to without AOP at all Exp areas downstream of the AWTF, relative to change at reference over the same period. Tissue [Se] in 2021 similar to Before period (where data available), relative to change at reference. Tissue [Se] during the AWTF with AOP period show few differences suggesting stability in conditions during this operational period. 2) Tissue [Se] downstream of AWTF discharge were similar to reference and/or upstream of AWTF (RG_LCUT) throughout 2021. 3) Mean tissue [Se] results at Exp areas of Line Creek downstream of the AWTF were within or only slightly higher than NR except for two sampling event at RG_LILC3 in April and September. 4) Average tissue [Se] downstream of AWTF discharge were below the EVWQP Level 1 Benchmark throughout 2021 5) Benthic invertebrate tissue [Se] concentration at RG_SLINE has increased since 2017, the observed increase is not believed to be due to operational activities or the laboratory change (2020), changes in benthic invertebrate taxa present in composite samples may be partially responsible for observed increase.
	Selenium speciation		Comparison downstream relative to upstream from the AWTF, and of Line Creek input to Fording River	Lower concentrations of selenite and other non-selenate species in Line Creek downstream of the AWTF discharge during AWTF with AOP relative to concentrations during operation without AOP. Concentrations of non-selenate concentrations in Line Creek downstream of the AWTF in 2021 were higher in winter (January to March) and lowest during summer (June and July).	WCT selenium tissue samples (RG_LIDSL and RG_FO23 Only)		1) Comparison to site-specific benchmarks for muscle and estimated ovary concentrations 2) Comparison to reference normal range (NR) 3) Visual inspection of 2001 to 2021 data	1) Mean WCT muscle selenium tissue and estimated ovary selenium tissue concentrations were below their respective site specific benchmarks except 4 of 8 replicates at RG_LIDSL that exceeded those benchmarks. 2) Mean WCT muscle selenium tissue and estimated ovary selenium tissue concentrations were above the NR 3) Mean WCT muscle selenium concentrations were substantially lower during 2021 (in the AWTF with AOP Period) when compared to 2017 (AWTF without AOP period).
	Selenium bioaccumulation model (RG_LIDSL and RG_FO23 Only)		Comparison of composite-taxa benthic tissue selenium results to one-step water-to-invertebrate model	Tissue selenium concentrations reported during 2021 AWTF with AOP fall within the model prediction intervals.	Benthic invertebrate community structure	Abundance	Comparison to past observations and reference normal range (NR)	No evidence of adverse effect on secondary productivity associated with AWTF with AOP operation in 2021. Average organism abundance at Exp areas were within NR in 2021 and within range of previous AWTF operational years. Abundance at RG_LIDSL and RG_LI8 in 2021 was higher than pre-ATWF conditions on occasion, but a lack of increase at RG_LILC3 (immediately downstream of AWTF discharge) indicates increase is likely not AWTF-related.
						Richness	Comparison to past observations and reference normal range (NR)	No evidence of adverse effect associated with AWTF with AOP operation in 2021. Average species richness at all mine-exposed area were within both NR and SNR (except RG_LIDCOM which was slightly above SNR).
			Comparison of WCT tissue selenium results to two-step water-to-invertebrate-to-fish model	Mean WCT tissue selenium concentrations reported during 2021 at RG_LIDSL and RG_FO23 fall within the model prediction intervals except 4 of 8 replicates at RG_LIDSL. WCT at RG_LIDSL in 2021 were substantially lower in 2021 (during AWTF with AOP) when compared to 2017 (during AWTF without AOP).		%EPT, %Ephemeroptera (%E), %Chironomidae (%C)	Comparison to past observations and reference normal range (NR)	No evidence of adverse effect associated with AWTF with AOP operation in 2021. Average %EPT was within NR except immediately downstream of the AWTF discharge (at RG_LILC3 and RG_LISP24) and within or above range of previous years. %E in 2021 was similar or increased in comparison to previous years, with all areas were within NR except for RG_LILC3. Higher percent Ephemeroptera at areas further downstream, specifically RG_LISP24, RG_LIDSL, LIDCOM, and LI8, have been observed during AWTF with AOP Operation (2019 to 2021) when compared to AWTF without AOP. %C downstream of AWTF discharge were within range of previous years or showed decreases in composition.

Notes: Ref = Reference sampling station/area; Exp = Mine-exposed sampling station/area; SPO = Site Performance Objective; BCWQG = British Columbia Water Quality Guideline; NR and SNR = Regional normal range and site-specific normal range of reference area data, respectively from the RAEMP (see Minnow 2020b for details); Water quality benchmarks are those outlined in Teck (2014). It should be noted that the terminology used to describe the AWTF operational phase initiated on December 30, 2018 has been updated in the present report. Terminology in the 2019 LCO LAEMP report identified two AWTF operational phases after December 30, 2018: "AWTF Operational Stabilization" and "AWTF/AOP Steady State Operation" (Minnow 2020a). In the current report, after December 30, 2018 has been termed as a single "AWTF with AOP Operational" phase (see Section 1.3 for more details).

Table 6.1: Summary of Measurement Endpoints, Analyses, and Results of Line Creek LAEMP, 2021

Study Question	Water				Biological			
	Measurement Endpoint	Indicator	Analysis/Evaluation	Result	Measurement Endpoint	Indicator	Analysis/Evaluation	Result
Is AWTF operation affecting aquatic biota through thermal effects, effects on dissolved oxygen concentrations or concentrations of treatment-related constituents other than nutrients or selenium?	Temperature	Data loggers	1) Comparison downstream relative to upstream of the AWTF 2) Comparison of 2020 to 2021 (to evaluate 2021 heat wave)	1) No evidence that AWTF with AOP operation increased downstream temperature in 2021 when compared to upstream data loggers in similar habitat. 2) Increased temperatures from 2020 to 2021 were limited to July and August (not an influence of the AWTF)	Benthic invertebrate community structure	Abundance	Comparison to past observations and reference normal range (NR)	No evidence of adverse effect on secondary productivity associated with AWTF with AOP operation in 2021. Average organism abundance at Exp areas were within NR in 2021 and within range of previous AWTF operational years. Abundance at RG_LIDSL and RG_LI8 in 2021 was higher than pre-ATWF conditions on occasion, but a lack of increase at RG_LILC3 (immediately downstream of AWTF discharge) indicates increase is likely not AWTF-related.
		Routine monitoring	1) Comparison to BCWQG 2) Comparison of 2020 to 2021 (to evaluate 2021 heat wave)	1) Temperatures were within or below guideline temperature ranges for both bull trout and westslope cutthroat trout. 2) Increased temperatures from 2020 to 2021 were limited to July and August (not an influence of the AWTF)				
	Dissolved oxygen		Comparison to BCWQG	DO concentrations in 2021 > instantaneous minimum criterion and > 30-day average for all other life stages but < 30-day criterion for sensitive life stages (namely during summer months [May to October]). Similar trends were noted in areas both upstream and downstream of AWTF as well as reference, suggesting this was not due to AWTF with AOP operation.		Richness	Comparison to past observations and reference normal range (NR)	No evidence of adverse effect associated with AWTF with AOP operation in 2021. Average species richness at all mine-exposed area were within both NR and SNR (except RG_LIDCOM which was slightly above SNR).
	Analytes with Early Warning Triggers		1) Comparison to past results 2) Comparison to BCWQG 3) Comparison to Water Quality Benchmarks	1) No obvious temporal increases in analyte concentrations associated with AWTF with AOP operation in 2021. Concentrations of dissolved cobalt, total manganese, total molybdenum which were identified in the 2020 report, were lower in 2021 than 2020 and were still well below benchmark values [Mn and Mo] or within the pre-AWTF range [Co]). 2) Long-term BCWQG were exceeded for [NO_3], [SO_4], total [Se], dissolved [Cu], and dissolved [Cd] both upstream and downstream of AWTF discharge, and for total [Hg] downstream of AWTF discharge and at reference. 3) Level 1 EVWQP benchmark was exceeded for [TDS], [SO_4], total [Ni], total [Se] and dissolved [Cd] in both upstream and downstream areas. Exceedances in downstream areas were generally confined to areas directly downstream of the discharge (such as LC_LC3). Upstream areas showed a greater level of exceedance as LC_WLC exceeded Level 2 EVWQP benchmark for total [Se] as well as Interim Level 3 benchmark for total [Ni].				
	Toxicity		Comparison of acute and chronic toxicity test results to reference, and past results	No acute toxicity failed the criterion in 2021 (< 50% mortality). Majority of chronic toxicity testing results were either similar to or lower than previous years, with the exception of possibly a few algae results that were associated with increased uncertainty due to low cell yield among all areas.		%EPT, %Ephemeroptera (%E), %Chironomidae (%C)	Comparison to past observations and reference normal range (NR)	No evidence of adverse effect associated with AWTF with AOP operation in 2021. Average %EPT was within NR except immediately downstream of the AWTF discharge (at RG_LILC3 and RG_LISP24) and within or above range of previous years. %E in 2021 was similar or increased in comparison to previous years, with all areas were within NR except for RG_LILC3. Higher percent Ephemeroptera at areas further downstream, specifically RG_LISP24, RG_LIDSL, LIDCOM, and LI8, have been observed during AWTF with AOP Operation (2019 to 2021) when compared to AWTF without AOP. %C downstream of AWTF discharge were within range of previous years or showed decreases in composition.

Notes: Ref = Reference sampling station/area; Exp = Mine-exposed sampling station/area; SPO = Site Performance Objective; BCWQG = British Columbia Water Quality Guideline; NR and SNR = Regional normal range and site-specific normal range of reference area data, respectively from the RAEMP (see Minnow 2020b for details); Water quality benchmarks are those outlined in Teck (2014). It should be noted that the terminology used to describe the AWTF operational phase initiated on December 30, 2018 has been updated in the present report. Terminology in the 2019 LCO LAEMP report identified two AWTF operational phases after December 30, 2018: “AWTF Operational Stabilization” and “AWTF/AOP Steady State Operation” (Minnow 2020a). In the current report, after December 30, 2018 has been termed as a single “AWTF with AOP Operational” phase (see Section 1.3 for more details).

Evaluation of Study Question #2 (assessment of selenium concentrations) focused on aqueous selenium concentrations and selenium concentrations in biota. Aqueous selenium throughout Line Creek is primarily in the oxidized form, selenate, and chemically-reduced forms of aqueous selenium (such as selenite or organoselenium species) are present at much lower concentrations (typically <1% of the aqueous total selenium). Although the WLC AWTF without AOP successfully decreased concentrations of total selenium in Line Creek, the effluent contained higher proportions of chemically-reduced selenium species, some of which are known to be more readily accumulated than selenate by aquatic biota. The AWTF was recommissioned in 2018 with an AOP, which is designed to reverse the shift in selenium species in AWTF effluent from chemically-reduced species back to a selenate-dominated condition, thereby reducing the bioavailability of selenium in Line Creek.

Benthic invertebrate tissue monitoring in Line Creek identified substantially lower selenium concentrations throughout the operational phase with AOP (2019 to 2021) compared to concentrations during the operational phase of AWTF without AOP at all mine-exposed areas downstream of the AWTF discharge. In 2021, mean benthic invertebrate selenium concentrations were below the EVWQP Level 1 benchmark at all areas downstream of the AWTF discharge, and were largely within the regional normal range of the Elk Valley (excluding results from April and September at RG_LILC3 which were slightly higher than the normal range). Comparison of benthic invertebrate selenium concentrations to the selenium bioaccumulation model indicated that bioaccumulation in 2021 was within model limits. This suggests that bioaccumulation was occurring as “expected” (including from April and September at RG_LILC3) which is similar to results from other years of AWTF with AOP operation (2019 and 2020, with the exception of three samples in 2020) and is in contrast to results collected during ATWF operation without AOP. Mean selenium concentrations in westslope cutthroat trout muscle tissue from two areas in Line Creek (RG_FO23 and RG_LIDSL) in 2021 were below site-specific benchmarks and estimated ovary concentrations were below prediction limits of the bioaccumulation model, except four of eight replicates from RG_LIDSL. Fish muscle and estimated ovary selenium concentrations at RG_LIDSL were notably lower (2.4-times) in 2021 (during AWTF with AOP) when compared to 2017 (during operations without AOP).

Overall, assessment of Study Question #2 in 2021 (similar to other years of AWTF with AOP operation [2019 and 2020]) indicated that aqueous selenium speciation and benthic invertebrate tissue selenium monitoring results support the conclusion that the recommissioned AWTF with AOP is functioning as intended to decrease the concentrations of non-selenate species in AWTF effluent resulting in reduced selenium bioaccumulation in Line Creek.

Evaluation of Study Question #3 (potential effects related to factors other than nutrients or selenium) indicated that the operation of the AWTF with AOP in 2021 did not significantly change water temperature or dissolved oxygen concentrations downstream in Line Creek. Evaluation of water quality analytes with early warning triggers also demonstrated no increases in concentrations in 2021 related to operation of the AWTF with AOP. AWTF effluent samples showed no acute toxicity test failures in 2021. Except for three algae (*P. subcapitata*) results and one water flea (*C. dubia*) result, chronic toxicity results in 2021 were categorized as no adverse effect. The chronic toxicity results in 2021 were similar to or lower than responses in previous years, and the absence of consistent temporal pattern of responses or clear evidence of causal factors for observed effects suggest a lack of influence of the AWTF on chronic toxicity. Overall, there did not appear to be influences on aquatic biota associated with the WLC AWTF operations throughout the AWTF with AOP operational period (2019 to 2021) that were not already being addressed through monitoring related to Study Questions #1 (productivity) and #2 (tissue selenium accumulation; Table 6.1).

The results from the Line Creek LAEMP provide information that supports Teck's Adaptive Management Plan (Teck 2021a) and Table 6.2 summarizes material presented in this report that is relevant to the AMP. The results from this study also supported the evaluation of biological triggers which are intended to identify unexpected monitoring results that may lead to responses under the AMP response framework. Biological trigger results indicated that three of the five mine-exposed areas evaluated (RG_LCUT [upstream of the AWTF outfall], RG_LILC3, and RG_LIDSL) had %EPT for all replicates which corresponded to a biological trigger (i.e., %EPT was below the biological trigger; Table 6.3). Although uncertainty remains around the cause of biological responses associated with the change in %EPT at the areas identified by the biological triggers, this trigger will continue to be monitored as part of the RAEMP. Other efforts are also currently underway, namely predictive modeling, to resolve uncertainty around effects of mine-related stressors on benthic invertebrate community endpoints. Aside from one replicate at RG_SLINE (reference) and one replicate at RG_LCUT (which is located upstream from the AWTF discharge), replicate benthic invertebrate tissue selenium samples from mine-exposed and reference areas of Line Creek had selenium concentrations that were below the biological trigger. Selenium concentrations in WCT muscle tissue was assessed against the biological trigger for RG_LIDSL and RG_FO23 (which were sampled as part of the RAEMP), while no individual replicates had WCT muscle tissue selenium concentrations that were above the biological trigger at RG_FO23, four of the eight replicates at RG_LIDSL exceeded the biological trigger. Additional confirmatory investigations into fish tissue Se in Line Creek will be undertaken in the 2022 field season. The selenium concentrations in

Table 6.2: Summary of Findings, Responses and Adjustments Related to the LCO LAEMP in 2021

Key Question(s)	Data Evaluation Process	Outcome(s)	Responses & Adjustments in 2021	EMC Engagement
Is active water treatment affecting biological productivity downstream in Line Creek?	1. Determine if there is an increase in benthic invertebrate biomass, or shift in community structure that has been demonstrated to correspond with changes in AWTF operational status and changes in parameters associated with productivity (e.g., nutrient concentrations)	No evidence of effect on productivity associated with WLC AWTF with AOP operation in 2021.	None	Proposed 2021 LCO LAEMP Study Design discussed by tele-conference March 8, 2021. 2021 Study Design submitted to ENV/EMC May 1, 2021. Draft data package of 2021 results and outline of proposal to transition the LCO LAEMP to the RAEMP submitted to EMC February 22, 2022 and discussed by tele-conference March 1, 2022. Written input from EMC on March draft data package and proposal to transition LCO LAEMP into the RAEMP received on March 24, 2022.
Are tissue selenium concentrations reduced downstream from the WLC AWTF?	2. Determine if there is a change in benthic invertebrate and fish tissue selenium concentrations over time that corresponds to changes in total selenium concentrations or selenium speciation in water. Benthic invertebrate community data being collected for other purposes can be used as supporting evidence of ecosystem health status downstream from the AWTF.	The WLC AWTF was recommissioned with an AOP in late 2018 in response to significantly increased concentrations of chemically-reduced aqueous selenium species and increase selenium concentrations in tissues of aquatic biota downstream of the AWTF outfall in Line Creek in 2016 and 2017. Monitoring results from 2021 indicated the recommissioned AWTF with AOP is functioning as intended to decrease aqueous concentrations of non-selenate species in AWTF effluent and reduce selenium bioaccumulation in Line Creek.	WLC AWTF was re-commissioned in August 2018 with AOP to modify chemically reduced selenium species in effluent back to a selenate-dominated condition having lower selenium bioavailability. The AWTF with AOP was operational throughout 2021 with few exceptions.	

Notes: WLC = West Line Creek; ATWF = Active Water Treatment Facility; LAEMP = Local Aquatic Effects Monitoring Program; AOP = Advanced Oxidation Process.

Table 6.2: Summary of Findings, Responses and Adjustments Related to the LCO LAEMP in 2021

Key Question(s)	Data Evaluation Process	Outcome(s)	Responses & Adjustments in 2021	EMC Engagement
Is AWTF operation affecting aquatic biota through thermal effects, effects on dissolved oxygen concentrations or concentrations of treatment-related constituents other than nutrients or selenium?	3a. Temperatures that are above/below the guideline, and dissolved oxygen concentrations that are above the threshold for effects to fish outside of the initial mixing zone, and confirmation that the mixing zone is small, will be indicative of effective management of treated water discharge. Benthic invertebrate community data being collected for other purposes can be used as supporting evidence of ecosystem health status downstream from the AWTF. 3b. Determine if there is a change in benthic invertebrate community endpoints away from the reference condition that does not correspond to observed changes in nutrients or selenium concentrations. 3c. Determine if there is a change in acute or chronic toxicity testing results that corresponds with a change in WLC AWTF operational status.	AWTF operations did not significantly influence water temperature or dissolved oxygen concentrations. Evaluation of most water quality parameters, including treatment-related constituents, demonstrated no obvious increases in concentrations during AWTF with AOP operation with a few exceptions. Dissolved cobalt, total manganese, and total molybdenum increased in relation to initiation of AWTF with AOP operations, but remain either well below guidelines (manganese and molybdenum) or within the range of per-AWTF conditions (dissolved cobalt). Additionally, concentrations of these three analytes were lower in 2021 than 2020 and 2019. Ongoing monitoring of these analytes will provide further information regarding the nature of these increases. Effluent samples showed no acute toxicity. Chronic toxicity at LC_LC3 or LCLCDSSLCC for most species was either not-significantly different from reference areas or was similar to or lower than prior years, with the exception of several algae results that were associated with increased uncertainty due to low cell yield among all areas.	None	

Notes: WLC = West Line Creek; ATWF = Active Water Treatment Facility; LAEMP = Local Aquatic Effects Monitoring Program; AOP = Advanced Oxidation Process.

Table 6.3: Summary of Biological Trigger Analysis for Percent EPT, Selenium Benthic Invertebrate Tissue (BIT), and Selenium Westslope Cutthroat Trout (WCT) Muscle Tissue, Line Creek LAEMP, 2021

Waterbody	Area		% EPT[a]		Selenium BIT[b]		Selenium WCT Muscle Tissue[a]	
			Number Replicates Evaluated	Number of Replicates Reaching Biological Trigger[c]	Number Replicates Evaluated	Number of Replicates Reaching Biological Trigger[d]	Number Replicates Evaluated	Number of Replicates Reaching Biological Trigger[e]
Line Creek	RG_SLINE	Reference	5	0	40	0	-	-
	RG_LI24		5	1	30	0	-	-
	RG_LCUT	Mine-exposed	1	1	40	0	-	-
	RG_LILC3		5	5	40	4	-	-
	RG_LIDSL		5	5	40	0	8	4
	RG_LI8		3	1	40	0	-	-
Fording River	RG_FO23	Mine-exposed	5	4	40	0	8	0

Notes: "-" = not evaluated; % EPT = Percent EPT (Ephemeroptera ([mayflies], Plecoptera [stoneflies], and Trichoptera [caddisflies]); Selenium BIT = Selenium concentrations in benthic invertebrate tissue (mg/kg dw); WCT = Westslope Cutthroat Trout.

[a] Biological Trigger analysis for %EPT and selenium WCT muscle tissue was for the September sampling event.

[b] Biological Trigger analysis for Selenium BIT was for the April, July, September, and November/December sampling events.

[c] Number of Replicates Reaching Biological Trigger for % EPT refers to those replicates which were below both triggering steps (i.e., below the lower 2.5th percentile of the habitat-adjusted normal range and expectations [as based on predicted ADIT Scores]). See Section E.2.2 for more details.

[d] Number of Replicates Reaching Biological Trigger for Selenium BIT refers to those replicates which were above both triggering steps (i.e., above the upper 97.5th percentile prediction limit of the regional normal range and expectations [as based on the predicted 95% percentile from the water to benthic invertebrate selenium bioaccumulation model]). See section E.2.3 for more details.

[e] Number of Replicates Reaching Biological Trigger for Selenium WCT Muscle Tissue refers to those replicates which were above triggering steps (i.e., above the upper 97.5th percentile prediction limit of the regional normal range and expectations [as based on the predicted 95% percentile from the 2-step bioaccumulation model - water to benthic invertebrates, invertebrates to fish]). See section E.2.4 for more details.

WCT muscle tissue from this confirmatory investigation will be further evaluated in the larger context of the Elk Valley as part of the RAEMP to better understand both spatial and temporal trends for this biological trigger. Further information regarding the selenium concentrations in benthic invertebrate tissue and WCT muscle tissue biological trigger as it pertains to the LCO LAEMP can be found in Appendix E. Given that current biological triggers were sufficient to identify monitoring areas where biological responses are occurring, no additional triggers are recommended at this time.

After three years of monitoring during the AWTF with AOP period, the results have conclusively shown that the AWTF is decreasing selenium concentrations in aquatic biota and has not influenced biological productivity or other water quality parameters (such as temperature, dissolved oxygen, or aqueous concentrations of mine-related analytes). Monitoring efforts in Line Creek have over this three-year timeframe have shown that conditions in the creek are stable and that the questions of the LCO LAEMP have been answered.

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APPENDIX A
DATA QUALITY REVIEW (DQR)

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DATA QUALITY REVIEW

APPENDIX A DATA QUALITY REVIEW

A1 INTRODUCTION

A1.1 Background

A variety of factors can influence the physical, chemical, and biological measurements made in an environmental study and thus affect the accuracy and/or precision of the data. Depending on their magnitude, inaccuracy, or imprecision have the potential to affect the reliability of conclusions made from data. Therefore, it is important to ensure that programs incorporate appropriate steps to control non-natural sources of data variability (i.e., minimize variability that does not reflect authentic spatial and temporal variability in the environment) and thus assure the quality of the data. Data quality as a concept is meaningful only when it relates to the intended use of the data. That is, one must know the context in which the data will be interpreted in order to establish a relevant basis for judging whether or not the data set is adequate. A data quality review (DQR) involves the comparison of field and laboratory measurement performance to Data Quality Objectives (DQOs) established for a particular study, such as evaluation of Laboratory Reporting Limits (LRL), blank sample data, data precision (based on field and laboratory duplicate samples), and data accuracy (based on matrix spike recoveries and/or analysis of standards or certified reference materials). Trusted analytical laboratories certified by Canadian Association for Laboratory Accreditation (CALA) or the National Environmental Laboratory Accreditation Program (NELAP) with a rigorous internal quality assurance program were selected to ensure the highest possible data quality. DQOs were established *a priori* to reflect reasonable and achievable performance expectations (Table A.1). Programs involving many samples and analytes usually yield some results that exceed DQOs. This is particularly so for multi-element scans, as the analytical conditions are not necessarily optimal for every element included in the scan. Generally, scan results may be considered acceptable if no more than 20% of the parameters fail to meet DQOs. Overall, the intent of a DQR is not to reject any measurement that did not meet a DQO, but to ensure that any questionable data received more scrutiny to determine what effect, if any, this had on interpretation of results within the context of the project.

A1.2 Quality Control Samples

A Data Quality Review (DQR) was conducted on all laboratory data collected as part of the 2021 Line Creek Local Aquatic Effects Monitoring Program (LAEMP). The objective of a DQR is to define the overall quality of the data presented in the report, and, by extension, the confidence with which the data can be used to derive conclusions.

Table A.1: Laboratory Data Quality Objectives for the Line Creek LAEMP, 2021

Quality Control Measure	Quality Control Sample Type/Check	Study Component			
		Water Chemistry	**Selenium Speciation**	**Benthic Invertebrate Community**	**Benthic Invertebrate Tissue Chemistry**
		ALS Environmental	**Brooks Applied Labs**	**Cordillera Consulting**	**TrichAnalytics**
Analytical Laboratory LRLs	Comparison of actual LRL versus target LRL	LRL for each parameter should be at least as low as applicable guidelines, benchmarks, and screening values	LRL for each parameter should be at least as low as applicable guidelines, benchmarks, and screening values	-	LRL for each parameter should be at least as low as applicable guidelines and benchmarks
Blank Analysis	Field, Trip, or Laboratory Blank	Concentrations measured in blank samples should be < LRL	Concentrations measured in blank samples should be < LRL	-	-
Laboratory Precision	Laboratory Duplicates	< 4% (pH) <10% (conductivity) ≤15% RPD or <2x LRL (ORP, turbidity) ≤20% RPD or <2x LRL (all remaining analytes)	≤25% RPD (selenium species) ≤20% RPD (total selenium)	-	≤60% RPD (calcium and strontium) ≤40% RPD (all remaining analytes)
	Organism Sorting Efficiency	-	-	≥ 95%	-
	Organism Sub-Sampling Precision and Accuracy	-	-	<20% between subsamples	-
Accuracy	Recovery of Blank Spike	-	75 to 125% (methylseleninic acid, selenate, selenite, selenocyanate, selenomethionine, total selenium)	-	-
	Recovery of Matrix Spike	70 to 130% (TKN, orthophosphate, phosphorus, TOC, DOC, total and dissolved metals) 75 to 125% (ammonia, bromide, chloride, fluoride, nitrate, nitrite, sulphate)	75 to 125% (selenate, selenite, selenocyanate, selenomethionine, total selenium)	-	-
	Matrix Spike Duplicate	-	75 to 125% (selenate, selenite, selenocyanate, selenomethionine, total selenium)	-	-
	Recovery of Certified Reference Material	-	75 to 125% (total selenium)		60 to 140% (antimony, barium, boron, silver, tin, titanium) 90 to 110% (selenium) 70 to 130% (all remaining analytes)
	Laboratory Control Sample	6.9 to 7.1 (pH) 75 to 125% (TKN) 80 to 120% (orthophosphate, phosphorus, DOC, TOC, total and dissolved metals) 85 to 115% (acidity, alkalinity, ammonia, bromide, TDS, TSS, turbidity) 90 to 110% (conductivity, chloride, fluoride, nitrate, nitrite, sulphate) 95.4 to 104% (ORP)	-	-	-
	Taxonomic Accuracy	-	-	<5% TIR	-

Notes: LRL = Laboratory Reporting Limit; "-" = not applicable; < = less than; ≤ = less than or equal to; % = percent; RPD = Relative Percent Difference; ORP = oxidation-reduction potential; TKN = Total Kjeldahl Nitrogen; TOC = total organic carbon; DOC = dissolved organic carbon; TSS = total suspended solids; TDS = total dissolved solids; mg/kg dw = milligrams per kilogram dry weight; TIR = total identification error rate.

A DQR involves the examination of analytical results associated with several types of Quality Control (QC) samples collected or prepared in the field and laboratory. General QC samples collected for this project include the following:

- **Blanks** are samples of de-ionized water and/or appropriate reagent(s) that are handled and analyzed in the same way as regular samples. These samples will reflect any contamination of samples occurring in the field (in the case of field or travel blanks) or in the laboratory (in the case of laboratory or method blanks). Analyte concentrations should be below detection.
- **Laboratory Duplicates** are replicate sub-samples created in the laboratory from randomly selected field samples which are sub-sampled and then analyzed independently using identical analytical methods. The laboratory duplicate sample results reflect any variability introduced during laboratory sample handling and analysis and thus provide a measure of laboratory precision.
- **Field Duplicates** are samples collected from a randomly selected field station that are homogenized to the extent possible, split and analyzed separately in the laboratory. The duplicate samples are handled and analyzed in an identical manner in the laboratory.
- **Spike Recovery Samples** are created in the laboratory by adding a known amount/concentration of a given analyte (or mixture of analytes) to a randomly selected test sample previously divided to create two sub-samples. The spiked and regular sub-samples are then analyzed in an identical manner. The spike recovery represents the difference between the measured spike amount (total amount in the spiked sample minus the amount in the original sample) relative to the known spike amount (as a percentage). Two types of spike recovery samples are commonly analyzed: spiked blanks (or blank spikes) are created using laboratory control materials whereas matrix spikes (MS) are created using field-collected samples. The analysis of spiked samples provides an indication of the accuracy of analytical results.
- **Certified Reference Materials (CRM) or Reference Materials (RM)** are commercially prepared (or commercially homogenized) samples containing known chemical concentrations that are processed and analyzed along with batches of environmental samples. The sample results are then compared to the known concentrations to provide a measure of analytical accuracy. The results are reported as the percent of the known concentration that was recovered in the analysis.

- **Laboratory Control Samples** are created in the laboratory to have a known analyte concentration in a matrix free of interferences, such as deionized water or reference sand. The sample results are compared to the target results to confirm that the analytical method is accurate in a purified reference sample. The results are reported as the percent of the known concentration that was recovered in the analysis.

- **Laboratory Sorting Duplicates** are randomly selected grabs of the initially sorted community material. These samples are recounted and the number of invertebrates that were not recovered during the initial sort was determined. In order to reduce bias, recounting is conducted by an analyst uninvolved in the initial sample processing. This check is performed on 10% of samples and determines the accuracy through assessment of recovery (sorting) efficiency and quantifies any under-estimation of organism enumeration.

- **Taxonomic Quality Control Samples** are a randomly selected portion of a benthic invertebrate community field sample to be assessed by the laboratory using an internal quality control audit. A blind re-enumeration and re-identification of random samples is performed by an analyst uninvolved in the original sample processing. This assessment quantifies taxonomic misidentification among laboratory analysts and ensures accurate organism identities are reported.

- **Laboratory Subsamples** are community samples prepared by the laboratory to ensure that the fraction of the total sample examined was an accurate representation of the total number of organisms. By comparing the amount recovered between at least two sub-samples, one can assess the analytical precision. In addition, comparisons of the sub-samples from the whole community sample allows for an evaluation of sub-sampling accuracy.

A2 WATER CHEMISTRY

A2.1 Laboratory Reporting Limits

The analytical reports for water chemistry from ALS Environmental (ALS; CG2102635, CG2102605, CG2102545, CG2101123, CG2101100, CG2101066, CG2101142, CG2102562, CG2106222, CG2106271, CG2106342, CG2104006, CG2104078, CG2104115, CG2104190, and CG2104208; Appendix G) and Brooks Applied Labs (BAL; 2105072, 2112095, 2107238, 2109310, and 2109236; Appendix G) were examined to assess LRLs relative to analyte concentrations and applicable guidelines (Tables A.2 and A.3). Water quality data from 2021 were entered directly into Teck's EQuIS database, and thus were assessed as part of Teck's annual water quality reporting in 2021. The LRLs for water quality analytes were assessed relative to British Columbia Water Quality Guidelines (BC WQG; BCMOECCS 2021a,b) for the protection of freshwater aquatic life, Elk Valley Water Quality Plan (EVWQP; Teck 2014) benchmarks, screening values for water quality (Teck 2020), and relevant site-specific benchmarks. Several analytes were reported at concentrations below the LRL in 100% of samples (Tables A.2 and A.3). For those analytes with one or more result(s) below the LRL, achieved LRLs were consistently lower than the BC WQG, EVWQP benchmarks, and screening values for water quality, if relevant guidelines exist. Therefore, the achieved LRLs were appropriate for this study.

A2.2 Laboratory and Field Blanks

A total of 326 method blank (MB) samples were analyzed in the ALS laboratory reports (Appendix G). Of the 1,604 reported method blank individual analyte results, all concentrations were non-detectable and indicate that there was no inadvertent laboratory contamination.

A total of 40 method blank (MB) samples were analyzed in the BAL laboratory reports (Appendix G). Of the 168 reported method blank results, five total selenium results had detectable concentrations (3.0% of results; see laboratory reports 2109236 and 2109310 in Appendix G) and did not meet the DQO. However, total selenium concentrations from BAL were not used for interpretations. Therefore, no analytes of interest were affected by possible laboratory contamination.

Four field blank samples and three trip blank samples were submitted to ALS for water chemistry analyses to assess the potential for field sampling contamination (see laboratory reports CG2101066, CG2106271, CG2102545, CG2101142, CG2104006, and CG2106222 in Appendix G). The same DQOs that were used for laboratory blanks were also used for field

Table A.2: Laboratory Reporting Limit (LRL) Evaluation for Water Chemistry Analyses

Parameter	Units	BC WQG[a]		EVWQP Level 1 Benchmarks/ Relevant Screening Values[b]	Range of LRLs	No. LRLs > Guideline[c]	No. Sample Results < LRL
		Long-term	Short-term				
Physical Tests							
Total Suspended Solids	mg/L	-	-	-	1	-	29 (72.5%)
Turbidity	NTU	-	-	-	0.1	-	5 (12.5%)
Anions and Nutrients							
Acidity (as $CaCO_3$)	mg/L	-	-	-	2	-	38 (95.0%)
Alkalinity, Carbonate (as CO_3)	mg/L	-	-	-	1	-	13 (56.5%)
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	-	-	-	1	-	21 (52.5%)
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	-	-	-	1	-	40 (100%)
Alkalinity, Hydroxide (as OH)	mg/L	-	-	-	1	-	23 (100%)
Bromide (Br)	mg/L	-	-	-	0.05 to 0.25	-	40 (100%)
Ammonia, Total (as N)[d]	mg/L	0.102	0.752	-	0.005	0	24 (60.0%)
Nitrite (as N)[e]	mg/L	0.060	0.020	-	0.001 to 0.005	0	22 (55.0%)
Total Kjeldahl Nitrogen	mg/L	-	-	-	0.05	-	16 (40.0%)
Orthophosphate - Dissolved	mg/L	-	-	-	0.001	-	17 (42.5%)
Phosphorus (P) - Total	mg/L	-	-	-	0.002	-	19 (47.5%)
Cation - Anion Difference	%	-	-	-	0.01	-	2 (5.00%)
Organic / Inorganic Carbon							
Dissolved Organic Carbon	mg/L	-	-	-	0.5	-	4 (10.0%)
Total Organic Carbon	mg/L	-	-	-	0.5	-	4 (10.0%)
Total Metals							
Aluminum	mg/L	-	-	-	0.003	-	12 (30.0%)
Antimony	mg/L	0.0090	-	-	0.0001	0	8 (20.0%)
Arsenic	mg/L	-	0.0050	-	0.0001	0	3 (7.50%)
Beryllium	µg/L	0.13	-	-	0.02	0	40 (100%)
Bismuth	mg/L	-	-	-	0.00005	-	40 (100%)
Boron	mg/L	1.2	-	-	0.01	0	11 (27.5%)
Chromium[f]	mg/L	0.001	-	-	0.0001	0	4 (10.0%)
Cobalt	µg/L	4.00	110	-	0.1	0	38 (95.0%)
Copper	mg/L	-	-	-	0.0005	-	37 (92.5%)
Iron	mg/L	-	1.00	-	0.01	0	21 (52.5%)
Lead[g]	mg/L	0.00838	0.130	-	0.00005	0	39 (97.5%)
Manganese[g]	mg/L	1.24	0.130	-	0.0001	0	2 (5.00%)
Mercury[h]	µg/L	0.00125	-	-	0.0005	0	40 (100%)
Nickel[g]	mg/L	0.126	-	0.0053	0.0005	0	6 (15.0%)
Silver[g]	mg/L	0.001500	0.00300	-	0.00001	0	40 (100%)
Thallium	mg/L	0.00080	-	-	0.00001	0	31 (77.5%)
Tin	mg/L	-	-	-	0.0001	-	40 (100%)
Titanium	mg/L	-	-	-	0.0003 to 0.0009	-	39 (97.5%)
Vanadium	mg/L	-	-	-	0.0005	-	39 (97.5%)
Zinc[g]	mg/L	0.048	0.0735	-	0.003	0	13 (32.5%)
Dissolved Metals							
Aluminum[i]	mg/L	0.0500	0.100	-	0.001	0	19 (47.5%)
Antimony	mg/L	-	-	-	0.0001	-	9 (22.5%)
Arsenic	mg/L	-	-	-	0.0001	-	17 (42.5%)
Beryllium	µg/L	-	-	-	0.02	-	40 (100%)
Bismuth	mg/L	-	-	-	0.00005	-	40 (100%)
Boron	mg/L	-	-	-	0.01	-	11 (27.5%)
Chromium	mg/L	-	-	-	0.0001	-	13 (32.5%)
Cobalt	µg/L	-	-	-	0.1	-	39 (97.5%)
Copper	mg/L	-	-	-	0.0002	-	21 (52.5%)
Iron	mg/L	-	0.350	-	0.01	0	39 (97.5%)
Lead	mg/L	-	-	-	0.00005	-	40 (100%)
Manganese	mg/L	-	-	-	0.0001	-	7 (17.5%)
Mercury	µg/L	-	-	-	0.000005	-	40 (100%)
Nickel	mg/L	-	-	-	0.0005	-	6 (15.0%)
Silver	mg/L	-	-	-	0.00001	-	40 (100%)
Thallium	mg/L	-	-	-	0.00001	-	31 (77.5%)
Tin	mg/L	-	-	-	0.0001	-	40 (100%)
Titanium	mg/L	-	-	-	0.0003	-	40 (100%)
Vanadium	mg/L	-	-	-	0.0005	-	40 (100%)
Zinc	mg/L	-	-	-	0.001	-	4 (10.0%)

Notes: Only analytes with at least one result < Laboratory Reporting Limit (L RL) or LRL were above guidelines were displayed. The total number of samples in 2021 (n) was 40, which included four field duplicate samples. EVWQP = Elk Valley Water Quality Plan; "-" = no applicable guideline exists.

[a] British Columbia Water Quality Guidelines for the protection of Aquatic Life (BCMOECCS 2021a,b)

[b] Where more than one EVWQP Level 1 Benchmark or screening value was applicable, the most conservative (lowest) value was used.

[c] The LRLs for all analytes were consistently less than the applicable EVWQP Level 1 benchmarks (Teck 2014) or screening values (Golder 2014; Teck 2020).

[d] Guideline is the most conservative (lowest), based on estimates of a maximum temperature of 20 °C and a minimum pH of 9.0.

[e] Minimum water quality guidelines for Nitrite (as N) reported in BCMOECCS (2021a) for chloride concentrations < 2 mg/L.

[f] Guideline for Chromium VI (0.001 mg/L) was selected, as this is the principal species found in surface waters.

[g] Hardness-based guidelines calculated using the minimum hardness observed for all samples (144 mg/L).

[h] The most conservative guideline (0.00125 µg/L) was applied.

[i] Guideline based on minimum field pH (7.51).

Table A.3: Laboratory Reporting Limit (LRL) Evaluation for Selenium Speciation Analyses

Parameter	Units	BC WQG[a]		EVWQP Level 1 Benchmarks/ Relevant Screening Values[b]	Range of LRLs	No. LRLs > Guideline	No. Sample Results < LRL
		Long-term	Short-term				
DMSeO - Dimethylselenoxide	mg/L	-	-	-	0.01	-	39 (95.1%)
MeSe(IV) - Methylseleninic Acid	mg/L	-	-	-	0.01	-	31 (75.6%)
MeSe(VI) - Methaneselenonic Acid	mg/L	-	-	-	0.01	-	32 (78.0%)
SeCN - Selenocyanate	mg/L	-	-	-	0.01	-	41 (100%)
SeMe - Selenomethionine	mg/L	-	-	-	0.01	-	41 (100%)
Selenosulfate	mg/L	-	-	-	0.01	-	41 (100%)
Selenium Unknown	mg/L	-	-	-	0.01	-	41 (100%)

Notes: The total number of samples in 2021 (n) was 41 including 4 field duplicate samples. EVWQP = Elk Valley Water Quality Plan; LRL = Laboratory Reporting Limit, "-"= no applicable guideline exists. Only analytes with at least one result < LRL or an LRL above guidelines were displayed.

[a] British Columbia Water Quality Guidelines for the protection of Aquatic Life (BCMOECCS 2021a,b).

[b] Where more than one EVWQP Level 1 Benchmark or screening value was applicable, the most conservative (lowest) value was used.

blanks (i.e., concentrations should be below the LRL). Of the 388 individual analyte results measured in the field blanks, only two (0.52% of results; acidity in one sample and total manganese in another) were above the LRL and so did not meet the laboratory DQO (Table A.4). Out of 192 individual analyte results for trip blank samples, only two results (0.81% of results; ammonia in two samples) were above the LRL and did not meet the laboratory DQO (Table A.4). Acidity, total ammonia, and total manganese are generally analytes of low concern in the LCO LAEMP, and when taken in the larger context of samples overall, the implications of detectable concentrations of these analytes in 25% of field blank samples is negligible.

Two field blank samples were submitted to BAL for aqueous selenium speciation analyses to assess potential field sampling contamination (see laboratory reports 2112095 and 2109236 in Appendix G). Total and dissolved selenium were detectable in one sample each (Table A.5). However, measures of total and dissolved selenium from BAL are not used in interpretations, so this potential field contamination does not affect the conclusions of the study. No trip blank samples were collected for selenium speciation.

Overall, field and trip blank analyses indicated few instances of inadvertent sampling contamination that may impact conclusions drawn from the data.

A2.3 Data Precision

A total of 44 laboratory duplicate samples were used to evaluate precision within the ALS laboratory reports (Appendix G). Out of the 1,569 individual analyte results, only one result was flagged by the laboratory (0.06% of results). This result for Total Kjeldahl Nitrogen (TKN) was biased low due to high concentrations of nitrate (see laboratory report CG2104006 in Appendix G). This bias towards lower TKN will be considered during interpretation. Overall, ALS laboratory analytical precision was considered good.

A total of 10 laboratory duplicate samples were used to evaluate precision within the BAL laboratory reports (Appendix G). Of the 34 individual analyte results, all met the laboratory DQO. Therefore, BAL laboratory analytical precision was considered excellent.

Three sets of field duplicate samples were collected to assess field sampling precision for water chemistry analyzed by ALS (Table A.6). Relative percent differences (RPDs) could not be calculated if both analyte concentrations were below the LRL. Of the RPDs that could be calculated, only 13 RPDs were greater than 30%, which consisted of RPDs for total ammonia, organic carbon (TOC), aluminum, lead, and manganese, and dissolved aluminum and manganese in one duplicate pair each, and turbidity, TKN, and dissolved copper in two duplicate pairs (7.0% of comparisons; Table A.6). Of those 13 RPDs, five

Table A.4: Field Blank and Trip Blank Evaluation for Water Chemistry Analyses

Parameter	Units	Range of LRLs	No. Field Blank Results > LRL	No. Trip Blank Results > LRL
Anions and Nutrients				
Acidity (as $CaCO_3$)	mg/L	2	1 (25%)	0
Ammonia, Total (as N)	mg/L	0.005	0	2 (66.7%)
Total Metals				
Manganese	mg/L	0.0001	1 (25%)	0

Notes: LRL = Laboratory Reporting Limit. Four field blank samples and three trip blank sample were collected in 2021. Only analytes with at least one blank results > LRL were displayed. Calcium, magnesium, potassium, and sodium are the only dissolved metals measured in trip blank samples.

Table A.5: Field Blank Evaluation for Selenium Speciation Analyses

Parameter	Units	Range of LRLs	No. Field Blank Results > LRL
Selenium (Se)-Total	µg/L	0.165 to 0.198	1 (50%)
Selenium (Se)-Dissolved	µg/L	0.165 to 0.198	1 (50%)

Notes: EVWQP = Elk Valley Water Quality Plan; LRL = Laboratory Reporting Limit. Two field blank samples were collected in 2021. Only analytes with at least one blank results > LRL were displayed.

Table A.6: Field Duplicate Results for Water Chemistry Analyses

Parameter	Units	RG_LILC3_WS_LAEMP_LCO_2021-09-09_NP	RG_RIVER_WS_2021-09-09_NP	RPD (%)	RG_LCUT_WS_LAEMP_LCO_2021-07_NP	RG_RIVER_WS_2021-07_NP	RPD (%)	RG_LISP24_WS_LAEMP_LCO_2021-12_NP	RG_RIVER_WS_2021-12_NP	RPD (%)
Physical Tests										
Conductivity (@ 25°C)	µS/cm	945	946	0.106	904	900	0.443	846	845	0.118
Hardness (as $CaCO_3$)	mg/L	515	508	1.37	492	486	1.23	438	441	0.683
pH	pH	8.37	8.38	0.119	8.15	8.20	0.612	8.13	8.14	0.123
ORP	mV	446	434	2.73	442	448	1.35	420	483	14.0
Total Suspended Solids	mg/L	<1	<1	-	<1	<1	-	<1	<1	-
Total Dissolved Solids	mg/L	680	690	1.46	716	704	1.69	588	576	2.06
Turbidity	NTU	0.140	0.160	13.3	0.100	0.220	75.0	0.100	0.160	46.2
Anions and Nutrients										
Acidity (as $CaCO_3$)	mg/L	<2	<2	-	4.20	3.60	15.4	<2	<2	-
Alkalinity, Bicarbonate (as HCO_3)	mg/L	250	243	2.84	-	-	-	207	210	1.44
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	205	199	2.97	204	204	0	170	172	1.17
Alkalinity, Carbonate (as CO_3)	mg/L	7.60	8.80	14.6	-	-	-	<1	<1	-
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	12.6	14.6	14.7	<1	<1	-	<1	<1	-
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<1	<1	-	<1	<1	-	<1	<1	-
Alkalinity, Hydroxide (as OH)	mg/L	<1	<1	-	-	-	-	<1	<1	-
Alkalinity, Total (as $CaCO_3$)	mg/L	217	214	1.39	204	204	0	207	210	1.44
Bromide (Br)	mg/L	<0.05	<0.05	-	<0.25	<0.25	-	<0.05	<0.05	-
Chloride (Cl)	mg/L	14.3	14.3	0	7.78	8.07	3.66	12.8	12.8	0
Fluoride	mg/L	0.166	0.169	1.79	0.162	0.174	7.14	0.190	0.192	1.05
Ammonia, Total (as N)	mg/L	<0.005	<0.005	-	<0.005	0.0139	94.2	<0.005	<0.005	-
Nitrate (as N)	mg/L	9.76	9.78	0.205	15.4	16.0	3.82	8.04	8.02	0.249
Nitrite (as N)	mg/L	0.00180	0.00140	25.0	<0.005	<0.005	-	0.00100	<0.001	0
Total Kjeldahl Nitrogen	mg/L	0.248	<0.05	133[a]	<0.05	<0.05	-	0.315	0.171	59.3
Orthophosphate - Dissolved	mg/L	0.00120	0.00120	0	<0.001	<0.001	-	0.00200	0.00210	4.88
Phosphorus (P) - Total	mg/L	0.00220	0.00250	12.8	<0.002	<0.002	-	0.00270	0.00240	11.8
Sulfate	mg/L	267	267	0	259	264	1.91	246	246	0
Organic / Inorganic Carbon										
Dissolved Organic Carbon	mg/L	1.05	1.31	22.0	0.570	0.580	1.74	0.910	0.830	9.20
Total Organic Carbon	mg/L	0.990	1.36	31.5	0.800	0.840	4.88	0.970	0.810	18.0
Total Metals										
Aluminum	mg/L	0.00450	<0.003	40.0	<0.003	0.00340	12.5	<0.003	<0.003	-
Antimony	mg/L	0.000320	0.000310	3.17	0.000430	0.000450	4.55	0.000220	0.000220	0
Arsenic	mg/L	0.000100	<0.0001	0	0.000110	0.000120	8.70	0.000110	0.000120	8.70
Barium	mg/L	0.0573	0.0571	0.350	0.0389	0.0399	2.54	0.0544	0.0524	3.75
Beryllium	µg/L	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-
Bismuth	mg/L	<0.00005	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	-
Boron	mg/L	0.0180	0.0190	5.41	0.0200	0.0200	0	0.0160	0.0160	0
Cadmium	µg/L	0.296	0.322	8.41	0.663	0.693	4.42	0.170	0.181	6.27
Calcium	mg/L	116	116	0	111	111	0	102	102	0
Chromium	mg/L	0.000110	0.000110	0	0.000130	0.000140	7.41	0.000120	0.000100	18.2
Cobalt	µg/L	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
Copper	mg/L	<0.0005	<0.0005	-	0.000590	0.000510	14.5	<0.0005	<0.0005	-
Iron	mg/L	0.0200	0.0200	0	<0.01	<0.01	-	0.0180	0.0200	10.5
Lead	mg/L	0.000112	<0.00005	76.5	<0.00005	<0.00005	-	<0.00005	<0.00005	-
Lithium	mg/L	0.0539	0.0534	0.932	0.0678	0.0678	0	0.0467	0.0462	1.08
Magnesium	mg/L	52.0	51.0	1.94	50.7	51.0	0.590	49.0	49.1	0.204
Manganese	mg/L	0.0102	0.0100	1.98	0.000190	0.000140	30.3	0.00832	0.00819	1.57
Mercury	µg/L	<0.0005	<0.0005	-	<0.0005	<0.0005	-	<0.0005	<0.0005	-
Molybdenum	mg/L	0.00293	0.00299	2.03	0.00198	0.00204	2.99	0.00259	0.00257	0.775
Nickel	mg/L	0.00855	0.00831	2.85	0.0136	0.0142	4.32	0.00565	0.00548	3.05
Potassium	mg/L	1.72	1.68	2.35	1.80	1.81	0.554	1.49	1.44	3.41
Selenium	µg/L	39.4	39.4	0	52.5	53.0	0.948	32.8	35.0	6.49
Silicon	mg/L	2.22	2.23	0.449	2.13	2.07	2.86	2.08	2.10	0.957
Silver	mg/L	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001	-
Sodium	mg/L	8.72	8.50	2.56	9.08	9.42	3.68	8.40	8.21	2.29
Strontium	mg/L	0.214	0.217	1.39	0.243	0.249	2.44	0.202	0.201	0.496
Sulphur	mg/L	95.4	96.6	1.25	92.4	90.8	1.75	88.5	87.8	0.794
Thallium	mg/L	<0.00001	<0.00001	-	0.0000180	0.0000170	5.71	<0.00001	<0.00001	-
Tin	mg/L	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-
Titanium	mg/L	<0.0003	<0.0003	-	<0.0003	<0.0003	-	<0.0003	<0.0003	-
Uranium	mg/L	0.00400	0.00405	1.24	0.00396	0.00396	0	0.00342	0.00343	0.292
Vanadium	mg/L	<0.0005	<0.0005	-	<0.0005	<0.0005	-	<0.0005	<0.0005	-
Zinc	mg/L	0.0119	0.0120	0.837	0.0249	0.0247	0.806	0.00690	0.00730	5.63
Dissolved Metals										
Aluminum	mg/L	0.00100	<0.001	0	<0.001	0.00240	82.4	<0.001	<0.001	-
Antimony	mg/L	0.000300	0.000300	0	0.000420	0.000420	0	0.000210	0.000210	0
Arsenic	mg/L	<0.0001	<0.0001	-	0.000140	0.000140	0	0.000110	<0.0001	9.52
Barium	mg/L	0.0590	0.0575	2.58	0.0419	0.0411	1.93	0.0515	0.0514	0.194
Beryllium	µg/L	<0.02	<0.02	-	<0.02	<0.02	-	<0.02	<0.02	-
Bismuth	mg/L	<0.00005	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	-
Boron	mg/L	0.0180	0.0180	0	0.0190	0.0190	0	0.0140	0.0140	0
Cadmium	µg/L	0.299	0.276	8.00	0.693	0.678	2.19	0.167	0.154	8.10
Calcium	mg/L	116	117	0.858	108	107	0.930	99.0	100	1.01
Chromium	mg/L	<0.0001	<0.0001	-	0.000170	0.000140	19.4	<0.0001	<0.0001	-
Cobalt	µg/L	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1	-
Copper	mg/L	0.000440	0.000270	47.9	0.000510	0.000570	11.1	0.000300	0.000210	35.3
Iron	mg/L	<0.01	<0.01	-	<0.01	<0.01	-	<0.01	<0.01	-
Lead	mg/L	<0.00005	<0.00005	-	<0.00005	<0.00005	-	<0.00005	<0.00005	-
Lithium	mg/L	0.0556	0.0535	3.85	0.0720	0.0689	4.40	0.0436	0.0434	0.460
Magnesium	mg/L	54.7	52.4	4.30	54.1	53.1	1.87	46.4	46.4	0
Manganese	mg/L	0.00936	0.00903	3.59	0.000150	0.000250	50.0	0.00646	0.00636	1.56
Mercury	µg/L	<0.005	<0.005	-	<0.005	<0.005	-	<0.005	<0.005	-
Molybdenum	mg/L	0.00295	0.00293	0.680	0.00194	0.00192	1.04	0.00252	0.00250	0.797
Nickel	mg/L	0.00834	0.00812	2.67	0.0146	0.0142	2.78	0.00529	0.00528	0.189
Potassium	mg/L	1.90	1.81	4.85	2.06	2.02	1.96	1.53	1.51	1.32
Selenium	µg/L	41.9	41.4	1.20	63.8	59.5	6.97	36.0	36.4	1.10
Silicon	mg/L	2.05	2.08	1.45	2.16	2.14	0.930	2.06	2.19	6.12
Silver	mg/L	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001	-
Sodium	mg/L	9.66	`	2.62	9.70	9.78	0.821	8.16	8.16	0
Sulphur	mg/L	0.223	0.217	2.73	0.232	0.229	1.30	0.208	0.209	0.480
Strontium	mg/L	96.2	96.8	0.622	99.4	95.9	3.58	85.1	85.6	0.586
Thallium	mg/L	0.0000120	0.0000120	0	0.0000200	0.0000230	14.0	<0.00001	<0.00001	-
Tin	mg/L	<0.0001	<0.0001	-	<0.0001	<0.0001	-	<0.0001	<0.0001	-
Titanium	mg/L	<0.0003	<0.0003	-	<0.0003	<0.0003	-	<0.0003	<0.0003	-
Uranium	mg/L	0.00362	0.00363	0.276	0.00404	0.00400	0.995	0.00328	0.00336	2.41
Vanadium	mg/L	<0.0005	<0.0005	-	<0.0005	<0.0005	-	<0.0005	<0.0005	-
Zinc	mg/L	0.0117	0.0120	2.53	0.0281	0.0287	2.11	0.00600	0.00630	4.88

ndicates RPD exceeded 30%

Notes: RPD = relative percent difference; "-"= no data/not calculated; LRL = Laboratory Reporting Limit. The RPD was calculated using < LRL results at the LRL if one result in a duplicate pair was below the LRL. The RPD was not calculated if both results were < LRL.

[a] Both results for TKN that contributed to this RPD were reported as being biased low due to high concentrations of nitrate in the samples. Therefore, this RPD may not accurately represent differences in TKN between samples due to sample heterogeneity.

RPDs (total ammonia, aluminum, lead, and dissolved aluminum, and one RPD for TKN) resulted from one concentration in the pair being below the LRL, where greater variability is expected. There were eight analytes that had RPDs greater than 30% and the analyte was detectable in both samples (TOC, total manganese, dissolved manganese, one RPD for TKN, and both RPDs for turbidity and dissolved copper), but these analytes were of low concern for interpretation. Additionally, TKN concentrations in one pair of duplicate samples were both biased low due to high concentrations of nitrate in the sample; therefore, this RPD may not accurately represent differences in TKN between samples due to sample heterogeneity (Table A.6). As a relatively low percentage of comparisons failed the DQO (and most of those analytes were of low concern in regard to data interpretation), field sampling precision was considered good.

Four sets of field duplicate samples were collected to assess field sampling precision for selenium speciation (Table A.7). RPDs could not be calculated for several selenium speciation duplicate samples as the analyte concentrations in both samples were below the LRL. Of the 18 comparisons that could be calculated, only one did not meet the DQO of 30% (methaneselenonic acid; Table A.7). Greater variability was expected with this comparison since one sample concentration in the pair was below the LRL. Overall, field sampling precision was considered good.

Overall, as very few calculable RPDs exceeded the DQO of 30% and all RPDs for analytes of concern met the DQO, laboratory and field precision were considered excellent.

A2.4 Data Accuracy

Data accuracy within the ALS laboratory reports was evaluated based on results of 339 Laboratory Control Samples (LCS) and 35 Matrix Spike (MS) samples (Appendix G). Three of the 1,537 LCS individual analyte results (0.13% of LCS results) failed the laboratory DQO but were considered acceptable as per the Ontario Ministry of Environment (OMOE) and the Canadian Council of Ministers of the Environment (CCME) as DQOs were only slightly exceeded (by less than 10%) for less than 10% of analytes in a multi-parameter scan (see laboratory reports CG2104208 and CG2106271 in Appendix G). Out of 1,361 MS individual analyte results, one result for TKN was biased low due to a high nitrate concentration (see laboratory report CG2106342). This bias towards lower TKN will be considered during data interpretation. Recovery could not be calculated in 15.7% of MS samples as background levels were greater than or equal to the initial spike concentration. However, as several other QC tests were successful and matrix spike issues due to high background presence is not uncommon, MS recovery not being calculable in several MS

Table A.7: Field Duplicate Results for Selenium Speciation Analyses

Parameter	Units	RG_LILC3_WS_LAEMP_LCO_2021-09-09	RG_RIVER_WS_2021-09-09	RPD (%)	RG_LCUT_WS_LAEMP_LCO_2021-04-27	RG_RIVER_WS_2021-04-27	RPD (%)	RG_LILC3_WS_LAEMP_LCO_2021-07-12	RG_RIVER_WS_2021-07-12	RPD (%)	RG_LISP24_WS_LAEMP_LCO_2021-11-30	RG_RIVER_WS_2021-11-30	RPD (%)
Selenium (Se)-Total	µg/L	0.0350	0.0347	0.861	46.9	46.0	1.94	35.0	34.5	1.44	30.9	31.7	2.56
Selenium (Se)-Dissolved	µg/L	0.0348	0.0340	2.33	48.6	45.6	6.37	33.8	35.9	6.03	31.3	31.2	0.320
DMSeO - Dimethylselenoxide	mg/L	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001	-
MeSe(IV) - Methylseleninic Acid	mg/L	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001	-
MeSe(VI) - Methaneselenonic Acid	mg/L	0.0000170	<0.00001	51.9	<0.00001	<0.00001	-	<0.00001	<0.00001	-	0.0000140	0.0000110	24.0
Se(IV) - Selenite	mg/L	0.000179	0.000156	13.7	0.0000670	0.0000720	7.19	0.0000940	0.0000990	5.18	0.000178	0.000161	10.0
Se(VI) - Selenate	mg/L	0.0371	0.0304	19.9	0.0440	0.0500	12.8	0.0352	0.0341	3.17	0.0317	0.0312	1.59
SeCN - Selenocyanate	mg/L	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001	-
SeMe - Selenomethionine	mg/L	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001	-
Selenosulfate	mg/L	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001	-
Selenium Unknown	mg/L	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001	-	<0.00001	<0.00001	-

Indicates RPD exceeded 30%.

Notes: RPD = relative percent difference; "-"= no data/not calculated; LRL = Laboratory Reporting Limit. The RPD was calculated using < LRL results at the LRL if one result in a duplicate pair was below the LRL. The RPD was not calculated if both results were <LRL.

samples is not of great concern. Overall, the accuracy achieved by the laboratory in this study was considered good.

Data accuracy within the BAL laboratory reports was evaluated based on results of 30 LCS, 10 MS samples, 19 Matrix Spike Duplicate (MSD) samples, and 24 Reference Material (RM) samples (Appendix G). All 50 LCS, 19 MS, 19 MSD, and 24 RM individual analyte results met the laboratory DQO. Therefore, the accuracy achieved by the laboratory in this study was considered excellent.

A2.5 Hold Times

The recommended hold times for pH and oxidation-reduction potential (ORP) analyses (0.25 to 0.34 hrs) were exceeded in all samples collected. As *in situ* pH was used for data interpretation, these pH exceedances had no impact on data interpretability. ORP is not used a great extent in any analyses. Turbidity exceeded hold times in three samples for one day and in one sample for less than a day (see laboratory reports CG2104006 and CG2104078 in Appendix G). Nitrate and nitrite exceeded hold times by one day in one sample (see laboratory report CG2104078) and by three days in two samples due to re-analysis or re-dilution (see laboratory report CG2104115 in Appendix G). The hold time for dissolved orthophosphate was exceeded by one day in two samples (see laboratory reports CG2104115 and CG2104208 in Appendix G). All hold times were met for selenium speciation samples. Overall, few samples exceeded hold times, and thus hold time exceedances are expected to have little effect on the interpretation of results.

A2.6 Other Concerns

TKN concentrations in 23 water samples may have been biased low due to high nitrate concentrations (see laboratory reports CG2104006, CG2102635, CG2102605, CG2104078, CG2106342, CG2106271, CG2106222, CG2106342, CG2104115 in Appendix G). This bias to low TKN concentrations due to high nitrate was also observed in one laboratory duplicate sample (see laboratory report CG2104006 in Appendix G) and in one MS (see laboratory report CG2106342). Two of the above water samples had TKN results below the LRL (RG_RIVER_WS_2021-09-09_NP and RG_LCUT_WS_2021-09-10_NP), which impacted the RPD calculated between the two field duplicate samples (Table A.6). TKN remained detectable in the remaining 21 water samples, and undetectable TKN concentrations are expected to have little effect on the overall interpretation of TKN or other water chemistry results.

A2.7 Data Quality Statement

Water chemistry data collected for the 2021 Line Creek LAEMP were of acceptable quality as characterized by good detectability, negligible analyte concentrations in method blanks, little field contamination, excellent laboratory precision and accuracy, and few hold time exceedances. Some field imprecision was indicated but was marginal and will be considered during data interpretation. Some TKN samples were biased low due to high concentration of nitrate, and this will also be considered during interpretation. Overall, the associated data from ALS and BAL can be used with a high level of confidence in the derivation of conclusions.

A3 BENTHIC COMMUNITY

A3.1 Sub-Sampling Precision and Accuracy

The analytical reports from Cordillera Consulting Inc. (benthic invertebrate community structure; see Appendix G for laboratory reports) were examined to assess sub-sampling accuracy. For all samples, Canadian Aquatic Biomonitoring Network (CABIN) protocols were followed for sub-sampling (i.e., identification of a minimum 300 invertebrates), with a minimum of 5% of a sample being assessed. All benthic invertebrate community structure samples (n = 34) were subject to sub-sampling (Table A.8). Both the precision and accuracy of the sub-samples randomly chosen for sub-sample assessment (n = 3) met the DQO in all sub-samples (Table A.9). Thus, the precision and accuracy for sub-sampling of the benthic invertebrate community samples was considered excellent.

A3.2 Organism Sorting Efficiency

To measure the effectiveness of the sorters, at least 10% of samples were selected at random for resorting analysis by a different sorter. Sorting efficiency (i.e., percent recovery) of benthic invertebrate samples was excellent, achieving an average of 98% for the three community structure samples evaluated (Table A.10). Recovery in quality control samples was above the laboratory's DQO (95%), and thus organism sorting efficiency was considered excellent.

A3.3 Taxonomic Identification Accuracy

Cordillera Consulting Inc. performed an internal audit of taxonomic identification for at least 10% of all community structure samples (n = 3; Table A.11). The analysts reported a total identification error rate (TIR) of 0 to 0.310%, a percent difference in enumeration (PDE) of 0.122 to 0.194%, a percent taxonomic disagreement (PTD) of 0.612 to 0.967%, and a Bray Curtis Dissimilarity Index (BCDI [which is a measure of the differences in identifications between different analysts] of 0.005 to 0.008). The laboratory DQO was based on TIR as per CABIN laboratory methods (< 5% TIR; Environment Canada 2014). As TIR was below 5% for all samples examined, the taxonomic accuracy of the analysis was considered excellent.

A3.4 Data Quality Statement

Benthic invertebrate community data collected for the present study were of excellent quality as characterized by excellent sorting efficiency and excellent taxonomic identification accuracy. Therefore, the associated data can be used with a high level of confidence in the derivation of conclusions.

Table A.8: Percent of Sample Sorted and the Total Number of Invertebrates Recovered from the Sampled Fraction, 2021

Laboratory	Sample ID	Date	Laboratory ID	% Sampled	# Invertebrates
Benthic invertebrate community structure samples (Cordillera Consulting Inc.)	RG_LILC3_BIC_1_2021-09-09	9-Sep-21	CC221341	5%	625
	RG_LILC3_BIC_2_2021-09-09	9-Sep-21	CC221342	5%	411
	RG_LILC3_BIC_3_2021-09-09	9-Sep-21	CC221343	5%	936
	RG_FRUL_BIC_1_2021-09-12	12-Sep-21	CC221344	5%	411
	RG_FRUL_BIC_2_2021-09-12	12-Sep-21	CC221345	5%	307
	RG_FRUL_BIC_3_2021-09-12	12-Sep-21	CC221346	10%	492
	RG_LIDSL_BIC_1_2021-09-14	14-Sep-21	CC221347	5%	587
	RG_LIDSL_BIC_2_2021-09-14	14-Sep-21	CC221348	5%	728
	RG_LIDSL_BIC_3_2021-09-14	14-Sep-21	CC221349	5%	515
	RG_LIDSL_BIC_4_2021-09-14	14-Sep-21	CC221350	5%	374
	RG_LIDSL_BIC_5_2021-09-14	14-Sep-21	CC221351	5%	564
	RG_LCUT_BIC_1_2021-09-10	10-Sep-21	CC221352	5%	495
	RG_LCUT_BIC_2_2021-09-10	10-Sep-21	CC221353	5%	466
	RG_LCUT_BIC_3_2021-09-10	10-Sep-21	CC221354	5%	521
	RG_SLINE_BIC_1_2021-09-15	15-Sep-21	CC221355	10%	314
	RG_SLINE_BIC_2_2021-09-15	15-Sep-21	CC221356	5%	356
	RG_SLINE_BIC_3_2021-09-15	15-Sep-21	CC221357	7%	326
	RG_LIDCOM_BIC_1_2021-09-13	13-Sep-21	CC221358	5%	1,165
	RG_LISP24_BIC_1_2021-09-13	13-Sep-21	CC221359	5%	497
	RG_FO23_BIC_1_2021-09-12	12-Sep-21	CC221360	12%	350
	RG_FO23_BIC_2_2021-09-12	12-Sep-21	CC221361	5%	409
	RG_FO23_BIC_3_2021-09-12	12-Sep-21	CC221362	5%	472
	RG_FO23_BIC_4_2021-09-12	12-Sep-21	CC221363	5%	333
	RG_FO23_BIC_5_2021-09-12	12-Sep-21	CC221364	5%	402
	RG_LI8_BIC_1_2021-09-11	11-Sep-21	CC221365	5%	730
	RG_LI8_BIC_2_2021-09-11	11-Sep-21	CC221366	5%	546
	RG_LI8_BIC_3_2021-09-11	11-Sep-21	CC221367	5%	489
	RG_LILC3_BIC_4_2021-09-10	10-Sep-21	CC221368	5%	1,219
	RG_LILC3_BIC_5_2021-09-10	10-Sep-21	CC221369	5%	923
	RG_LI24_BIC_1_2021-09-16	16-Sep-21	CC221370	5%	444
	RG_LI24_BIC_2_2021-09-16	16-Sep-21	CC221371	5%	459
	RG_LI24_BIC_3_2021-09-16	16-Sep-21	CC221372	5%	484
	RG_LI24_BIC_4_2021-09-16	16-Sep-21	CC221373	6%	332
	RG_LI24_BIC_5_2021-09-16	16-Sep-21	CC221374	5%	663

Table A.9: Benthic Invertebrate Community Sub-sampling Precision and Accuracy, 2021

Station ID		Organisms in Subsample										Total	Precision Error		Accuracy Error	
Sample ID	Laboratory ID	1	2	3	4	5	6	7	8	9	10		Min (%)	Max (%)	Min (%)	Max (%)
RG_SLINE_BIC_1_2021-09-15	CC221355	270	267	280	282	313	253	279	304	252	269	2,769	0.36	19.49	0.76	13.04
RG_FRUL_BIC_1_2021-09-12	CC221344	352	347	337	351	346	-	-	-	-	-	1,733	0.28	4.26	0.12	2.77
RG_FRUL_BIC_3_2021-09-12	CC221346	488	472	444	495	478	-	-	-	-	-	2,377	1.26	10.30	0.55	6.60
													0.63	**11.35**	**0.48**	**7.47**

Note: "-" indicates no data available.

Table A.10: Benthic Invertebrate Community Sorting Efficiency, 2021

Sample ID	Laboratory ID	Number of Organisms Recovered (Initial Sort)	Number of Organisms in Re-sort	Sorting Efficiency
RG_LILC3_BIC_3_2021-09-09	CC221343	936	24	97%
RG_FO23_BIC_1_2021-09-12	CC221360	350	5	99%
RG_LI8_BIC_3_2021-09-11	CC221367	489	3	99%
				98%

Table A.11: Percent Benthic Invertebrate Community Organism Recovery[a], 2021

Sample ID	Laboratory ID	Percent Sampled (%)	Taxa Identified	TIR (%)	PDE (%)	PTD (%)	BCDI
RG_LILC3_BIC_2_2021-09-09	CC221342	5	410	0	0.122	0.730	0.006
RG_LIDSL_BIC_3_2021-09-14	CC221349	5	517	0	0.194	0.967	0.008
RG_SLINE_BIC_3_2021-09-15	CC221357	7	327	0.310	0.153	0.612	0.005

Notes: TIR = Total Identification Error Rate, PDE = Percent Difference in Enumeration, PTD = Percent Taxonomic Disagreement, BCDI = Bray Curtis Dissimilarity Index to quantify differences in identifications.

[a] For error rationale and calculations, refer to Cordillera report (Appendix G).

A4 BENTHIC INVERTEBRATE TISSUE CHEMISTRY

A4.1 Laboratory Reporting Limits

Analytical reports of benthic invertebrate tissue metal concentrations from TrichAnalytics (see laboratory reports 2021-216, 2021-264, 2021-282, 2021-240 in Appendix G) were examined to provide an inventory of analyte results below the LRL and to compare the LRLs for these analytes to available benchmarks (Table A.12). Arsenic and mercury were the only analytes that had at least one result below the LRL (Table A.12). However, the sole focus of interpretation of benthic invertebrate tissue chemistry results for the Line Creek LAEMP was selenium. Selenium was detectable (i.e., above the LRL) in all benthic invertebrate samples, therefore comparison of the selenium LRL to the applicable benchmark (i.e., Elk Valley Water Quality Plan Level 1 benchmark for effects to invertebrates [13 mg/kg dry weight]; Teck 2014) was not necessary to assess whether adequate detectability was achieved. Overall, the detectability of selenium in all samples (i.e., below the LRL) indicates that the achieved LRLs were suitable for the study.

A4.2 Data Accuracy and Precision

Laboratory precision of benthic invertebrate tissue samples were evaluated based on 24 CRM samples and 21 duplicate pairs. All 720 CRM individual analyte results met the laboratory DQO, except for two results for tin (precision results of 21 and 27%) and one result for antimony (precision result of 36%). All 630 laboratory duplicate individual analyte results met the laboratory DQO. Since selenium is the focus of benthic invertebrate tissue chemistry interpretation for the Line Creek LAEMP and all CRM and LSC results for selenium met the laboratory DQO, laboratory analytical precision was considered excellent.

A4.3 Data Quality Statement

Benthic invertebrate tissue data collected for the 2021 LCO LAEMP were of good quality as characterized by good detectability, appropriate LRLs, and excellent laboratory precision and accuracy. Therefore, the associated data can be used with a good level of confidence in the derivation of conclusions for this study.

Table A.12: Laboratory Reporting Limit (LRL) Evaluation for Benthic Invertebrate Tissue Chemistry Analyses

Parameter	Units	BC WQG (Short-term[a])	Range of LRLs	No. Sample Results < LRL
Arsenic	mg/kg dw	-	0.436 to 0.496	31 (15.2%)
Mercury	mg/kg dw	-	0.024 to 0.04	8 (3.92%)

Notes: "-" = no applicable guideline exists; LRL = Laboratory Reporting Limit; dw = dry weight. Only analytes with at least one sample results < LRL are displayed. Total number of samples wa s 50 (n=50). LRLs for selenium were below the BC WQG short-term guideline (13 mg/kg dry weight; BCMOECCS 2021a,b).

[a] British Columbia Water Quality Guidelines for the protection of Aquatic Life (BCMOECCS 2021a,b)

A5 DATA QUALITY REVIEW SUMMARY

Overall, the quality of the data collected for this project was considered acceptable for the derivation of conclusions associated with the objectives of the 2021 Line Creek LAEMP. The few parameters that did not meet DQOs, including hold time exceedances for nitrate and nitrate, biased TKN concentrations, and low frequencies of possible field contamination, were be considered during data interpretation.

A6 REFERENCES

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Environment Canada. 2014. CABIN (Canadian Aquatic Biomonitoring Network) Laboratory Methods: Processing, Taxonomy, and Quality Control of Benthic Macroinvertebrate Samples. Environment Canada. May 2014.

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APPENDIX B
PRODUCTIVITY

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PRODUCTIVITY

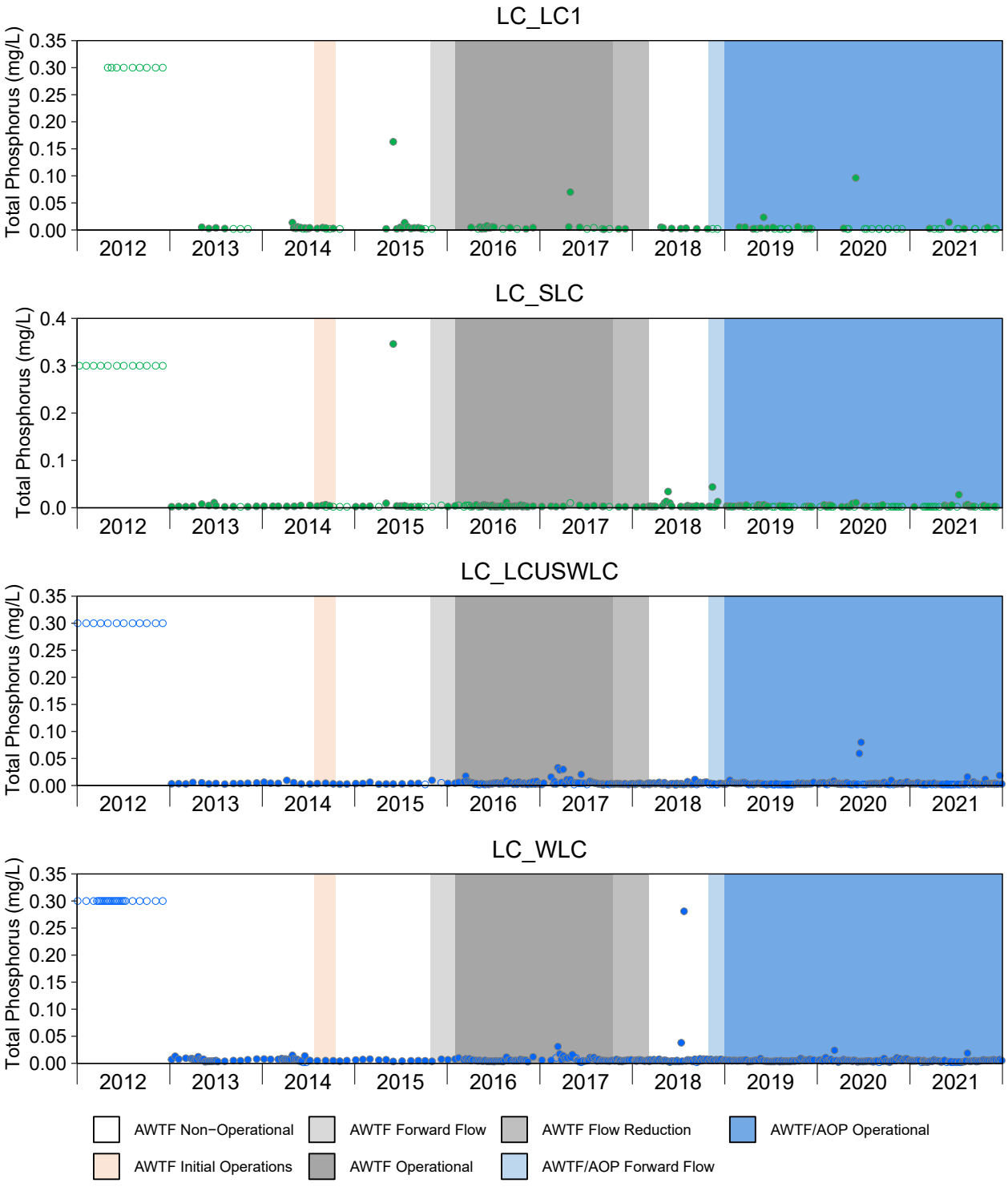
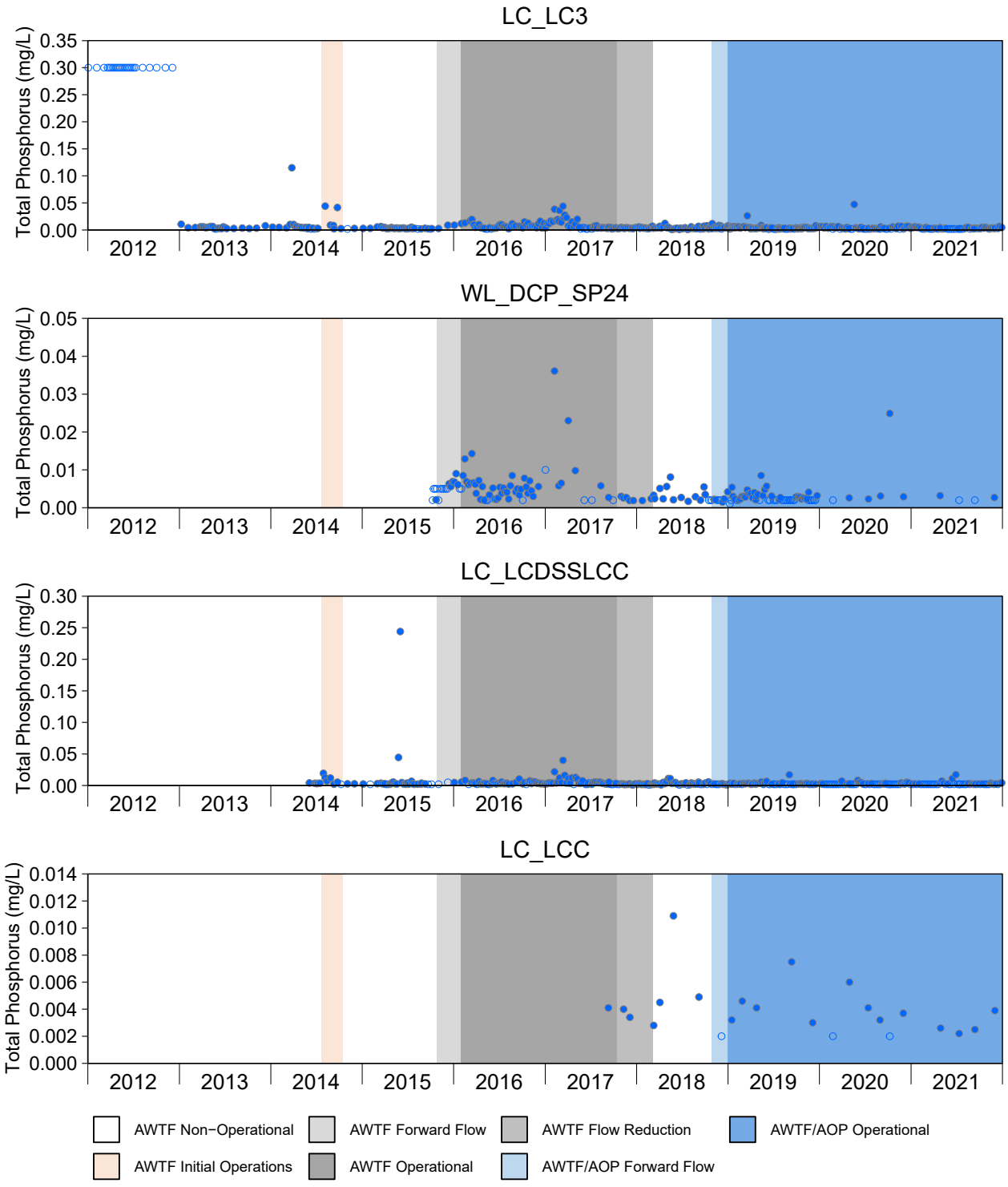


Figure B.1: Time Series Plots for Total Phosphorus Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.



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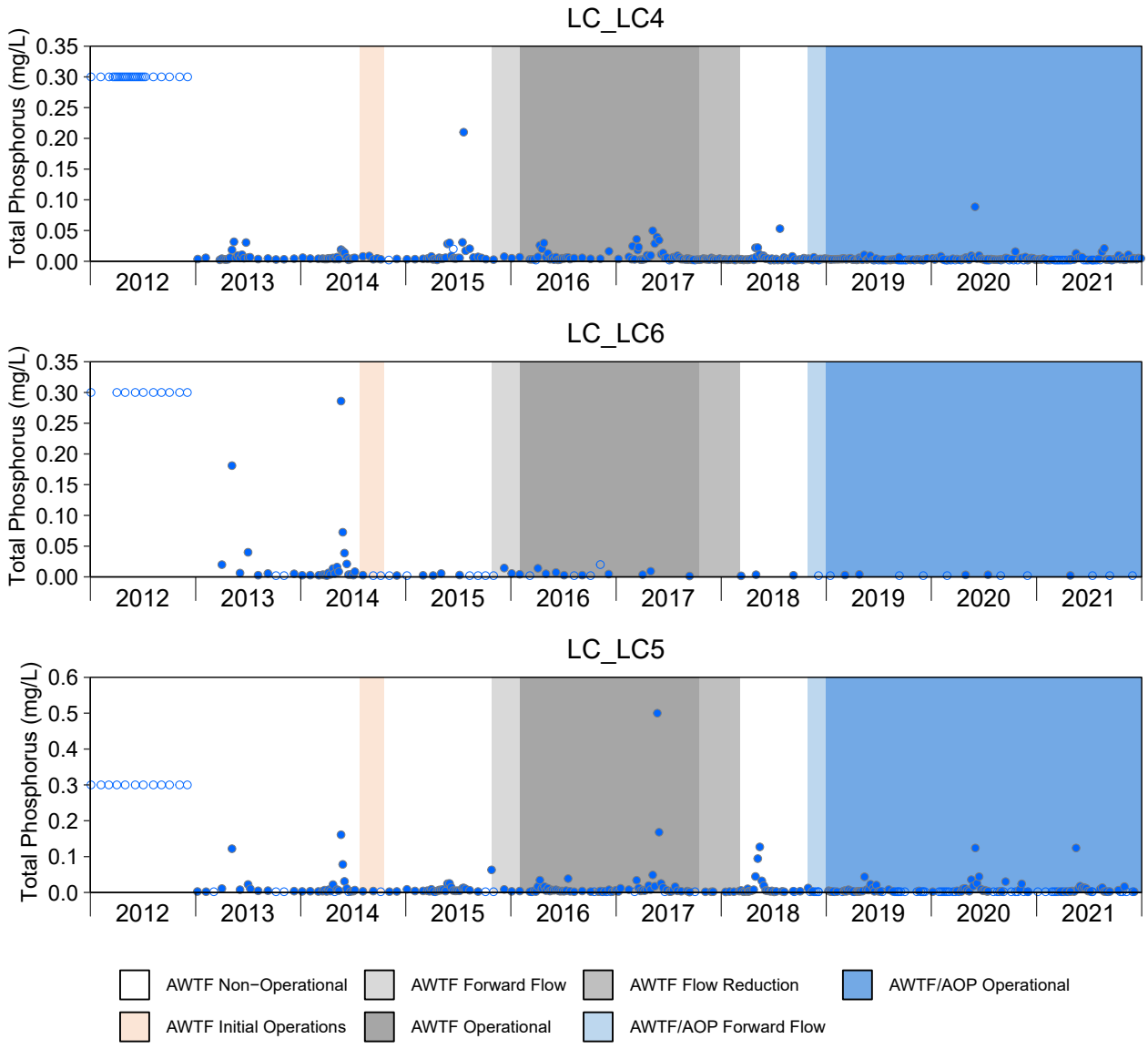

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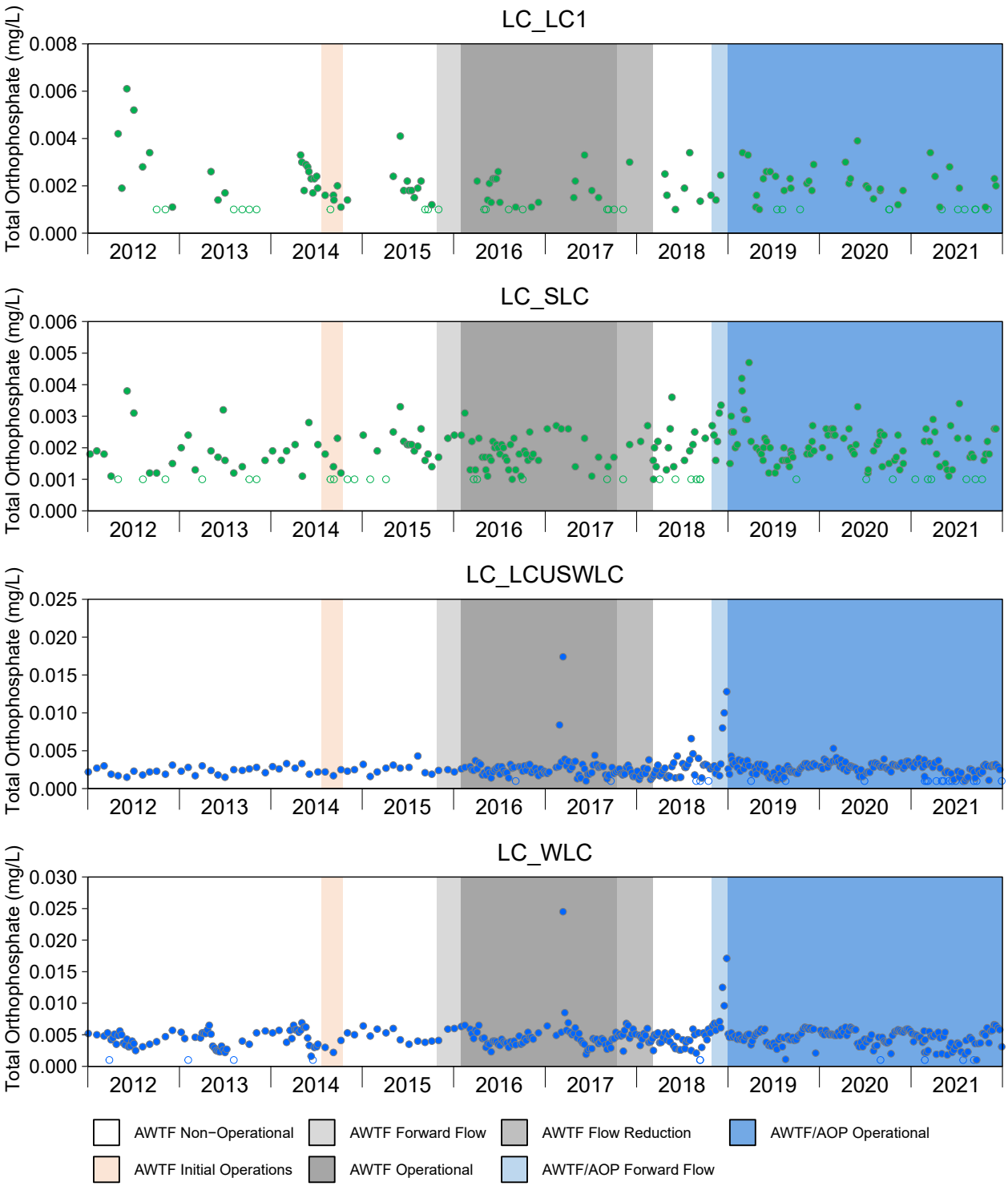
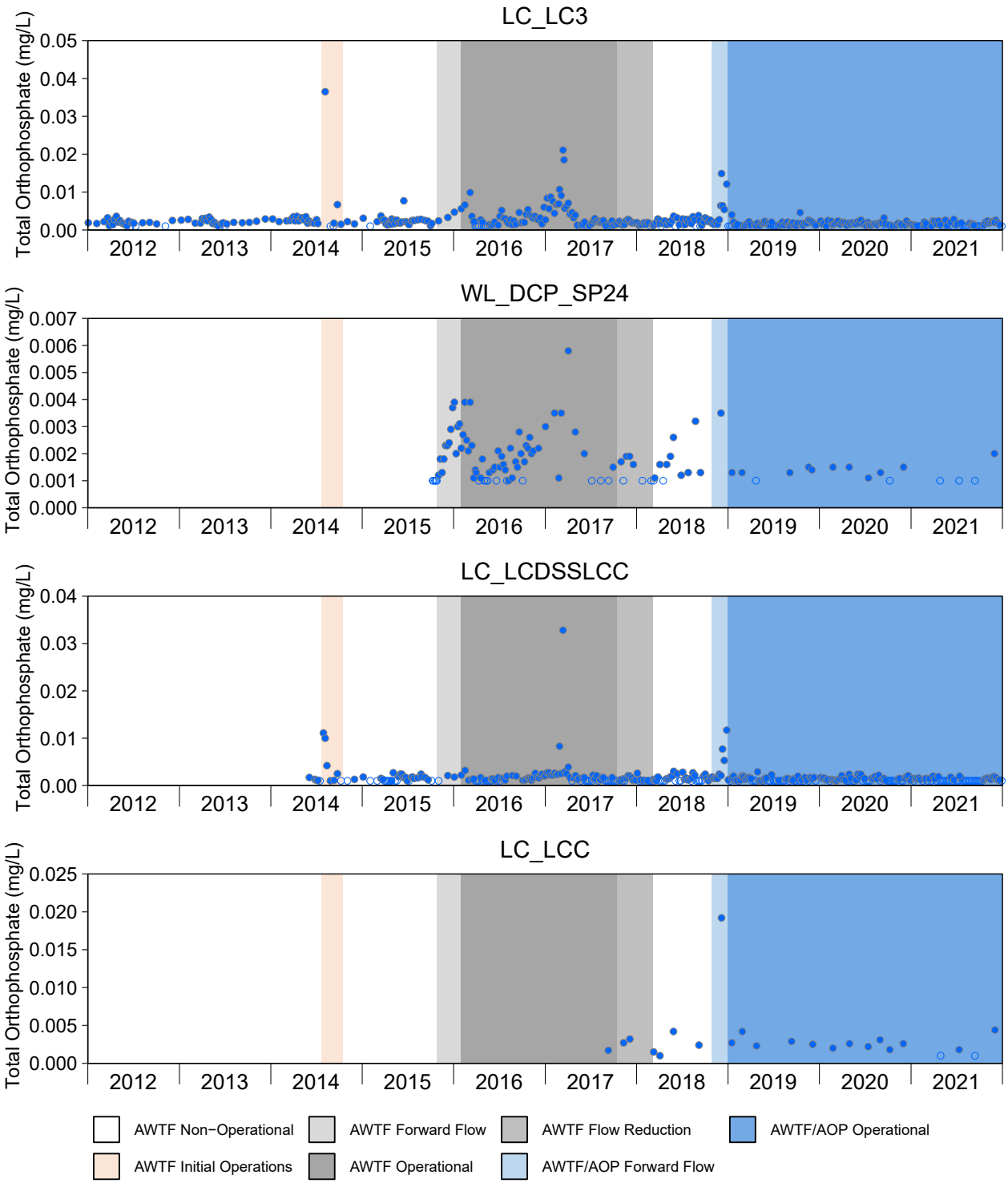


Figure B.2: Time Series Plots for Total Orthophosphate Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.



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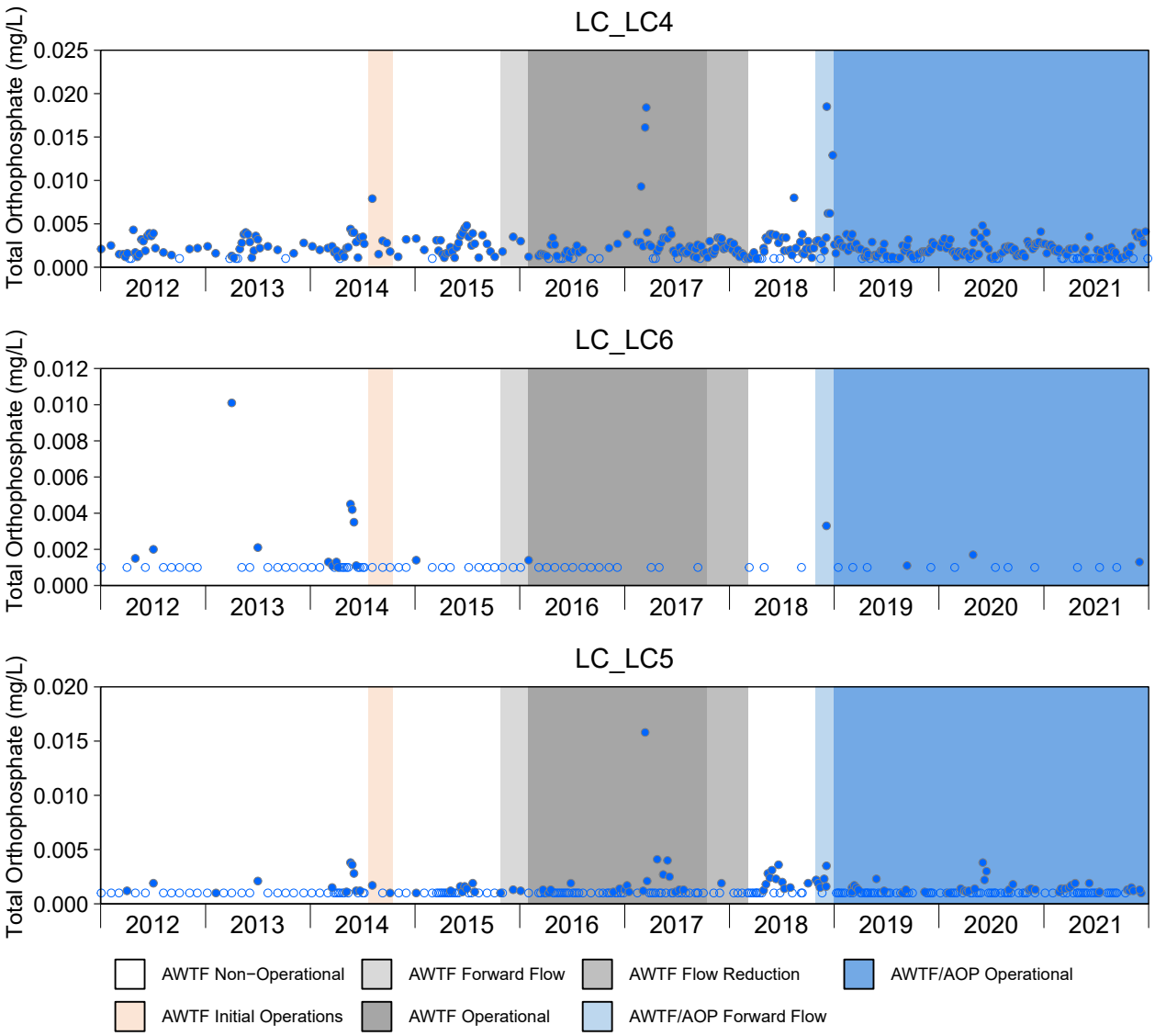

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Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

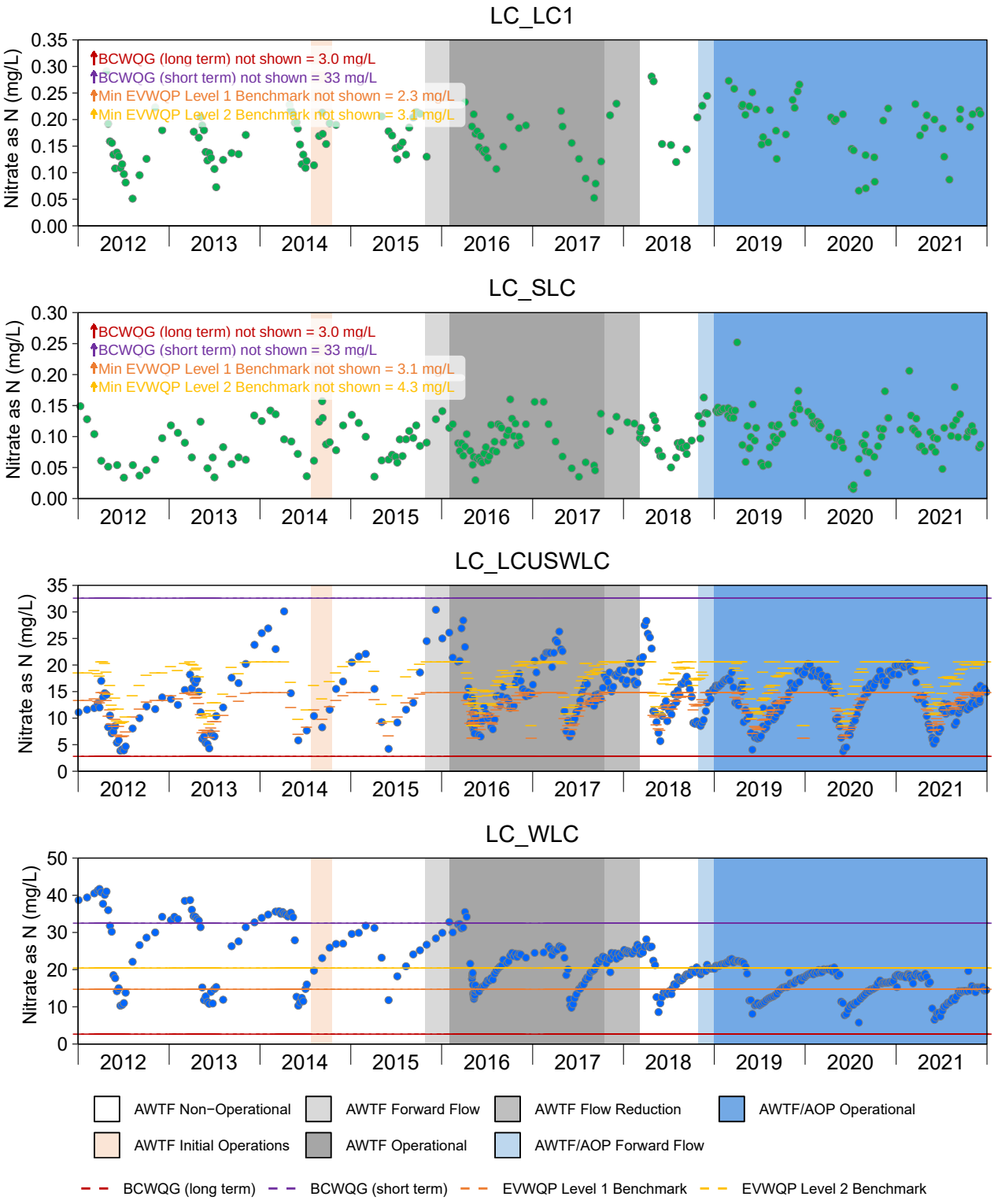

Figure B.3: Time Series Plots for Nitrate (as N) Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

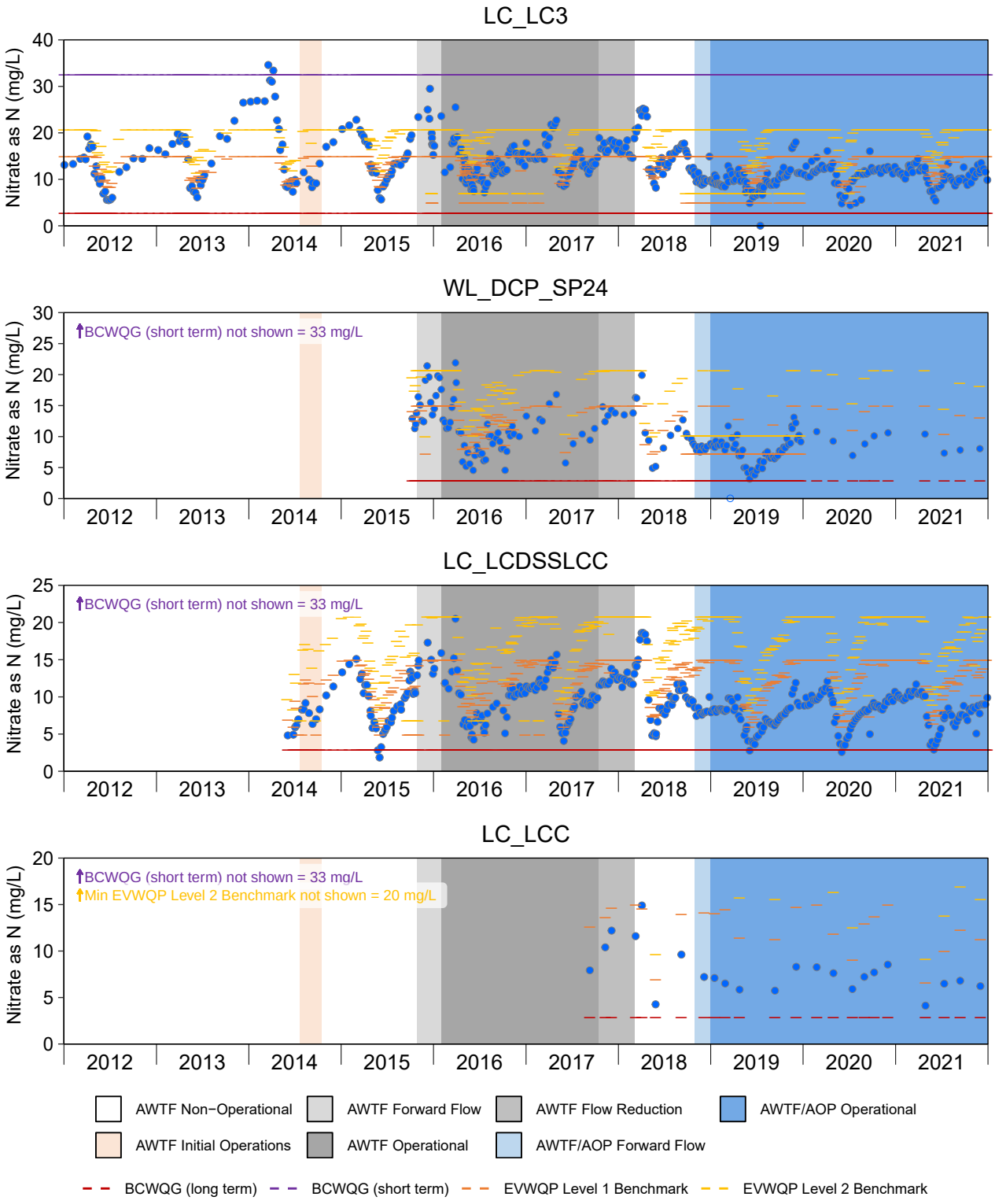

Figure B.3: Time Series Plots for Nitrate (as N) Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness.

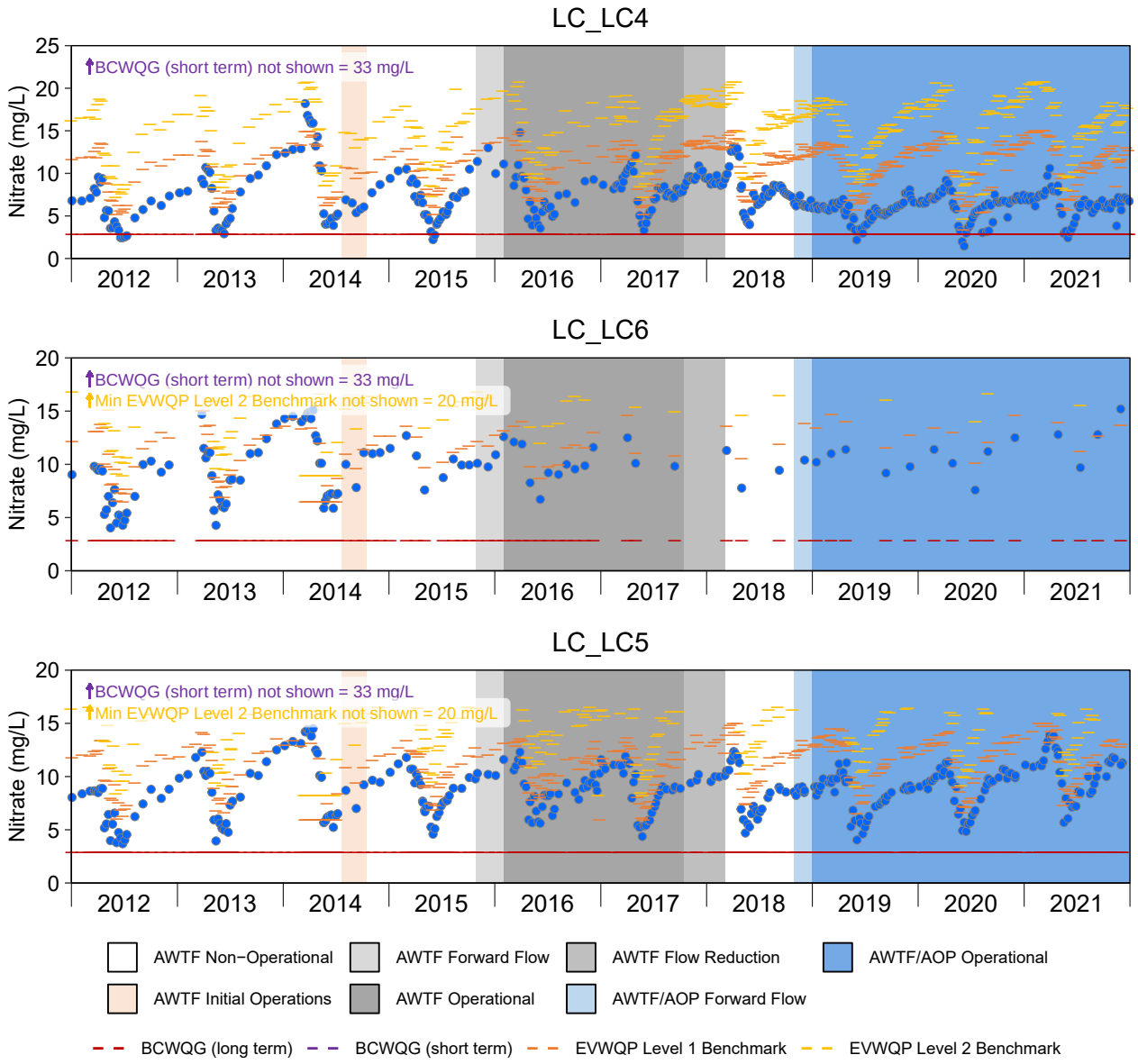

Figure B.3: Time Series Plots for Nitrate (as N) Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness.

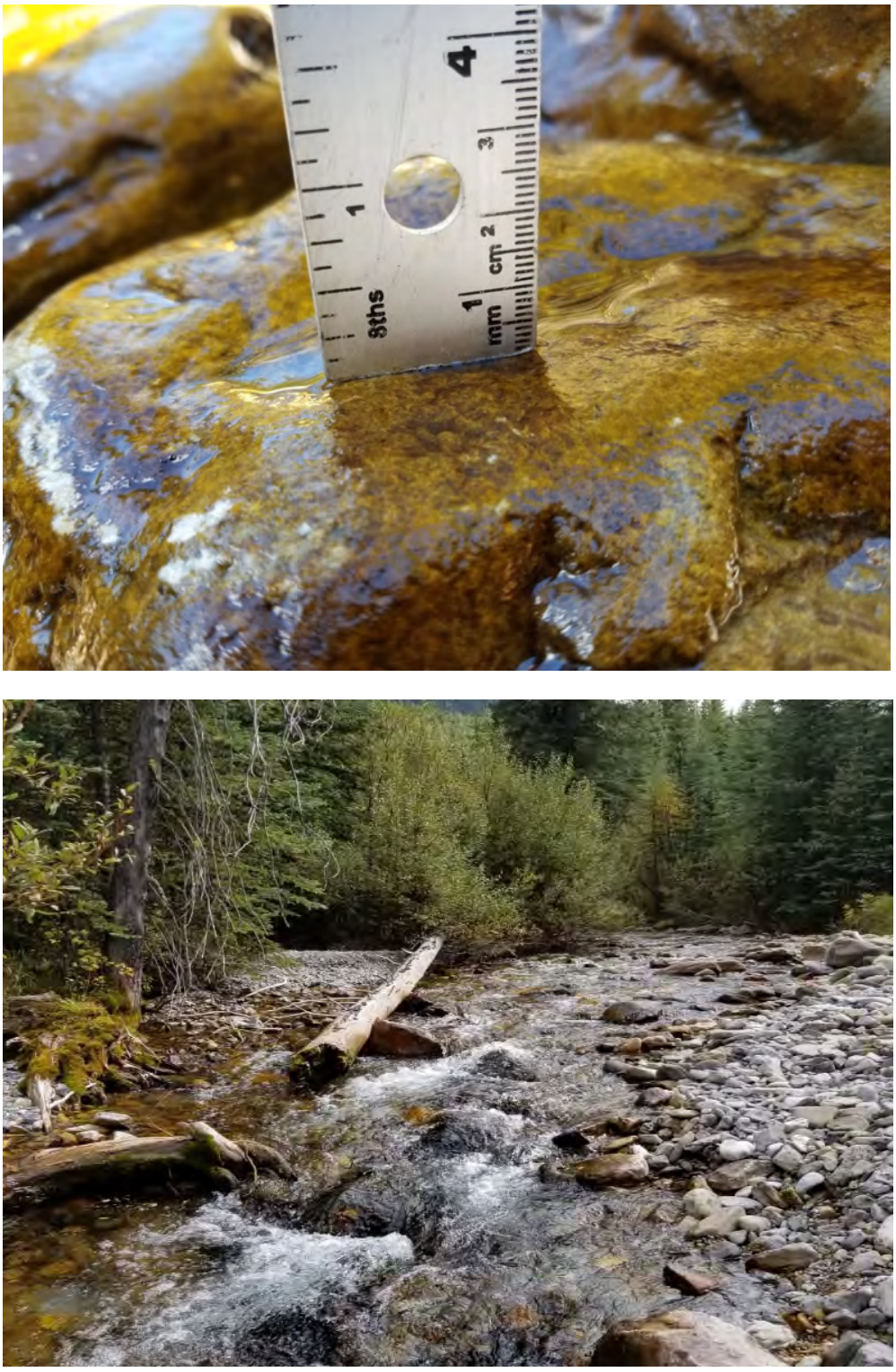

Figure B.4: Periphyton Coverage and Site Photograph at RG_LI24 (Reference), September 2021

Note: Site photo was taken looking upstream.

Figure B.4: Periphyton Coverage and Site Photograph at RG_SLINE (Reference), September 2021

Note: Site photo was taken looking upstream.

Figure B.4: Periphyton Coverage and Site Photograph at RG_LCUT (Exposed), September 2021

Note: Site photo was taken looking upstream.

Figure B.4: Periphyton Coverage and Site Photograph at Station RG_LILC3 (Exposed), September 2021

Note: Site photo was taken looking upstream.

Figure B.4: Periphyton Coverage and Site Photograph at RG_LISP24 (Exposed), September 2021

Note: Site photo was taken looking upstream.

Figure B.4: Periphyton Coverage and Site Photograph at RG_LIDSL (Exposed), September 2021

Note: Site photo was taken looking upstream.

Figure B.4: Periphyton Coverage and Site Photograph at RG_LIDCOM (Exposed), September 2021

Note: Site photo was taken looking upstream.

Figure B.4: Periphyton Coverage and Site Photograph at Station RG_LI8 (Exposed), September 2021

Note: Site photo was taken looking upstream.

Figure B.4: Periphyton Coverage and Site Photograph at Station RG_FRUL (Exposed), September 2021

Note: Site photo was taken looking upstream.

Figure B.4: Periphyton Coverage and Site Photograph at Station RG_FO23 (Exposed), September 2021

Note: Site photo was taken looking upstream.

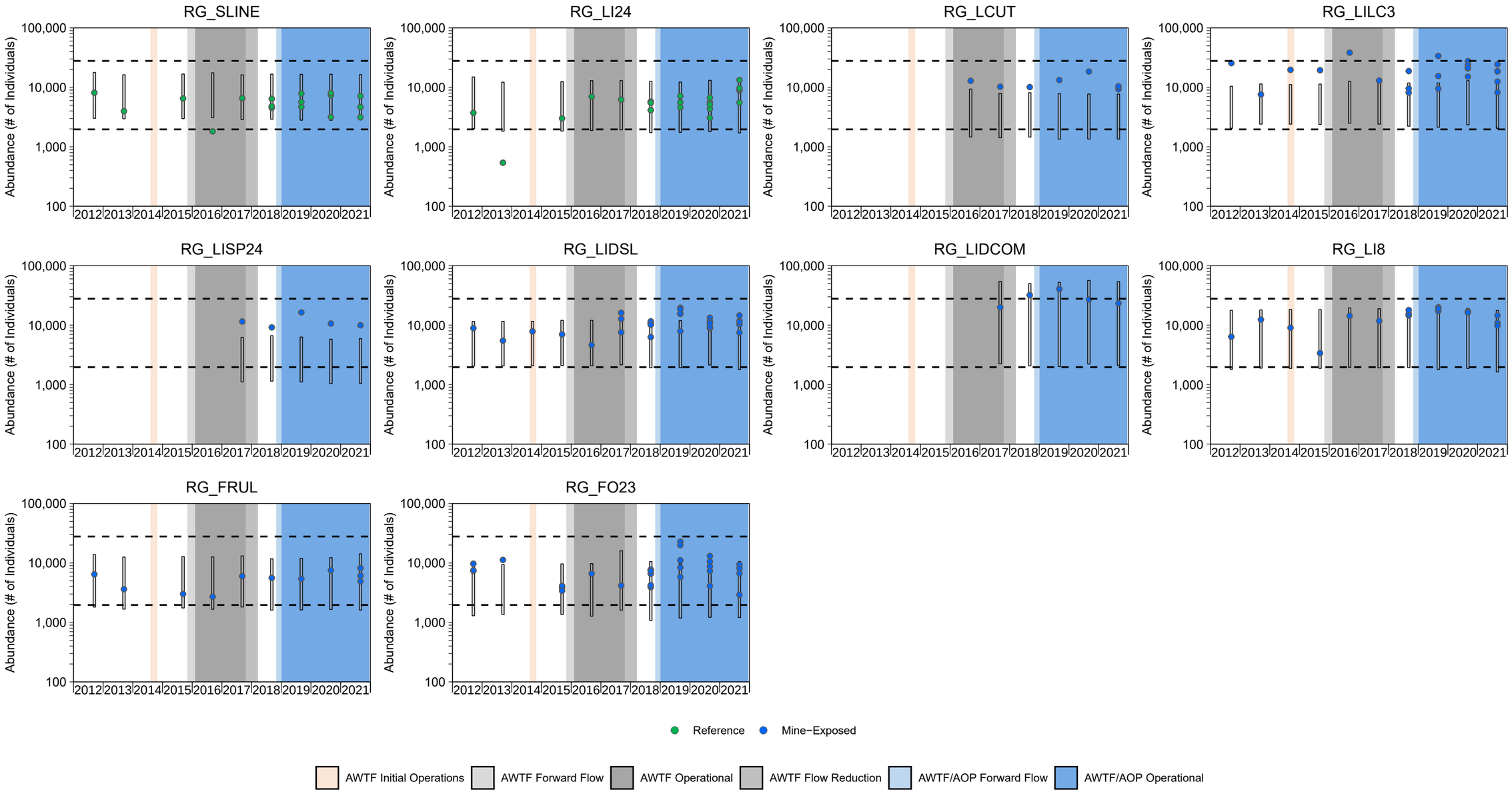

Figure B.5: Benthic Invertebrate Community Abundance (3-minute Kick and Sweep Sampling) from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Site specific normal ranges using regression models shown with grey shading and black rectangle. Dashed black lines represent the normal range defined as the 2.5th and 97.5 percentiles of the 2012 to 2019 reference area data from the Regional Aquatic Environmental Monitoring Program (RAEMP).

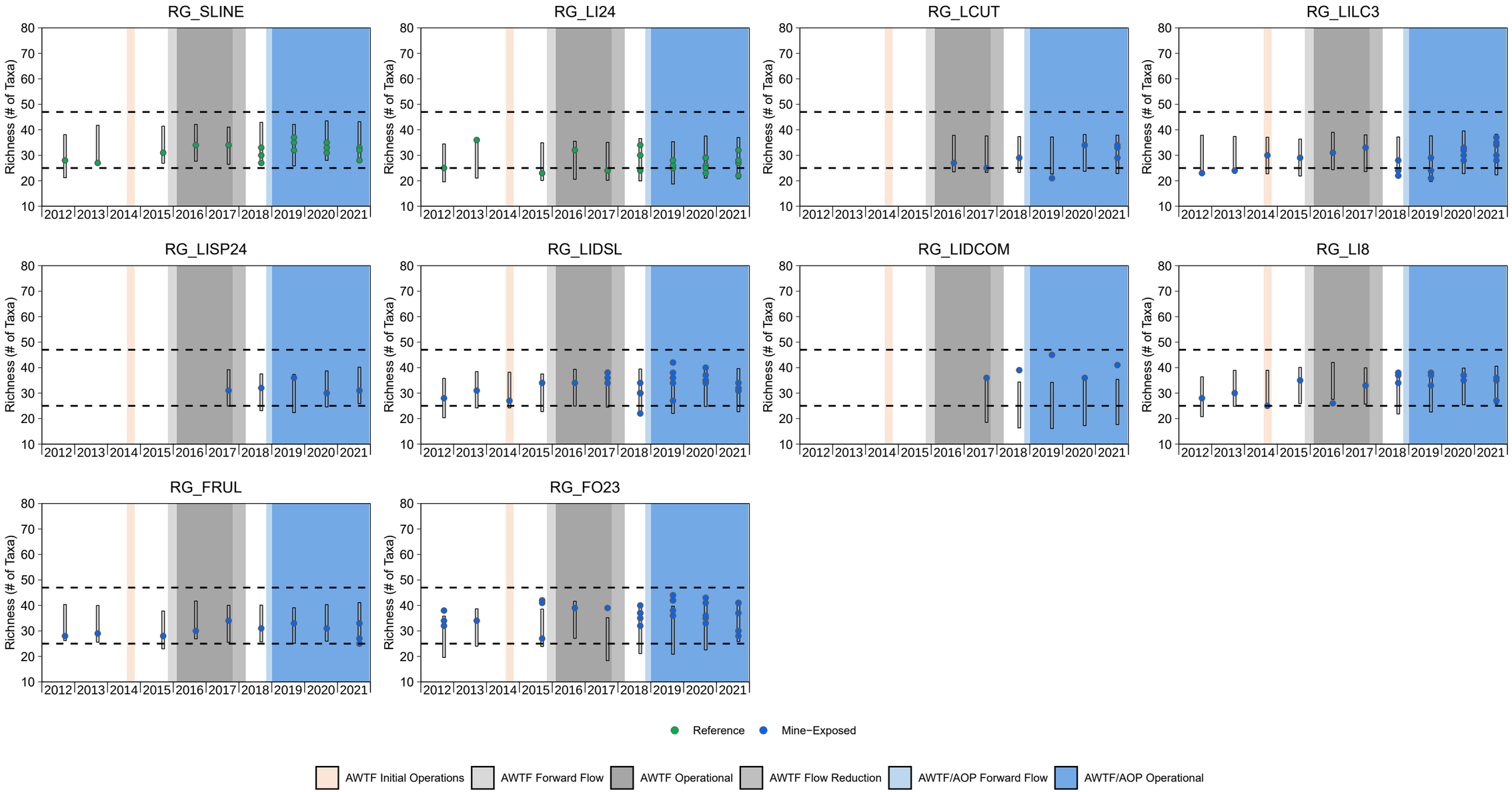

Figure B.6: Benthic Invertebrate Richness (Lowest Practical Level; 3-Minute Kick and Sweep Sampling) from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Site specific normal ranges using regression models shown with grey shading and black rectangle. Dashed black lines represent the normal range defined as the 2.5th and 97.5 percentiles of the 2012 to 2019 reference area data from the Regional Aquatic Environmental Monitoring Program (RAEMP).

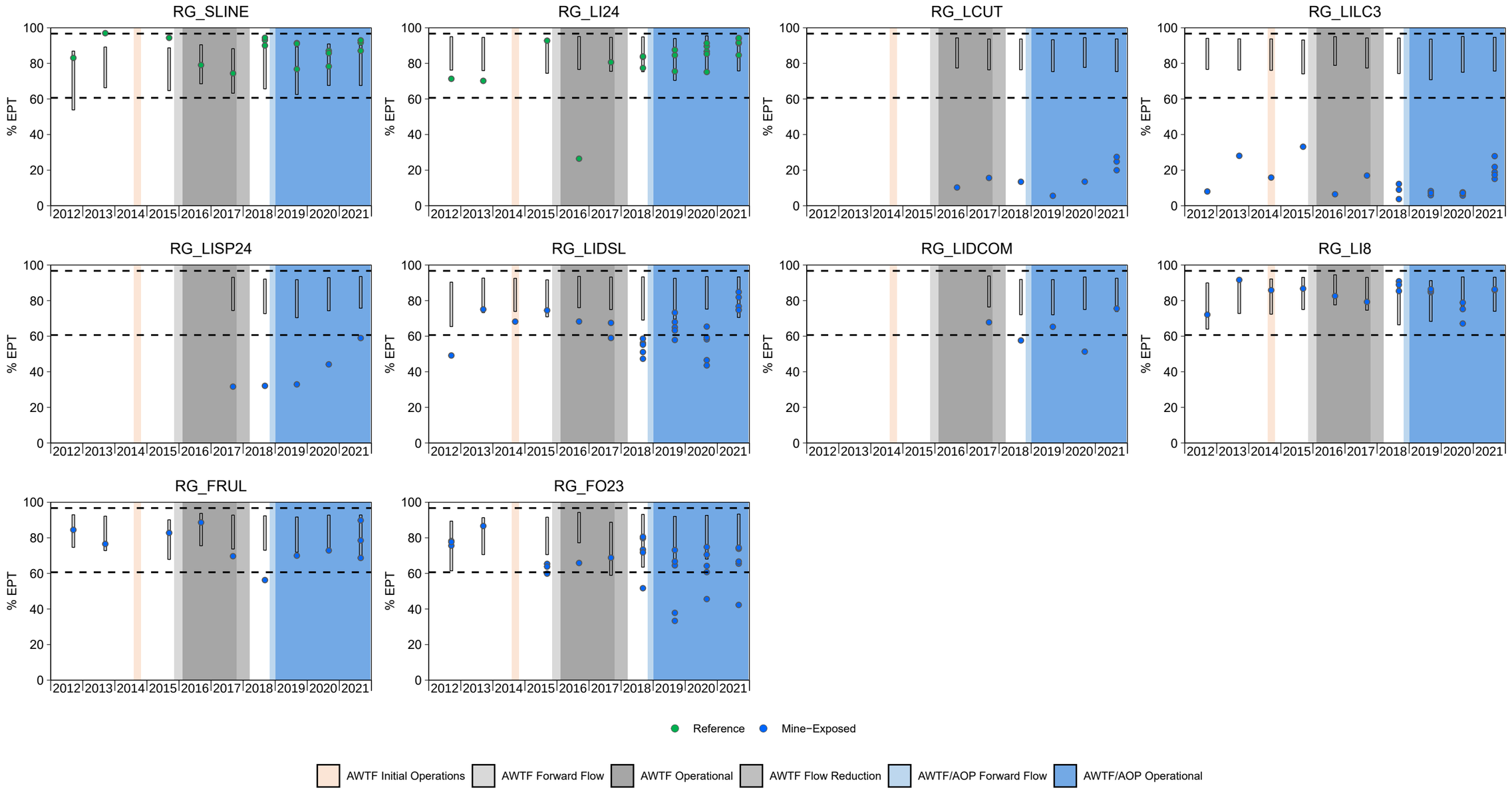

Figure B.7: Benthic Invertebrate Community Relative Ephemeroptera, Plecoptera, and Trichoptera Abundance (%EPT; 3-Minute Kick and Sweep Sampling) from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Site specific normal ranges using regression models shown with grey shading and black rectangle. Dashed black lines represent the normal range defined as the 2.5th and 97.5 percentiles of the 2012 to 2019 reference area data from the Regional Aquatic Environmental Monitoring Program (RAEMP).

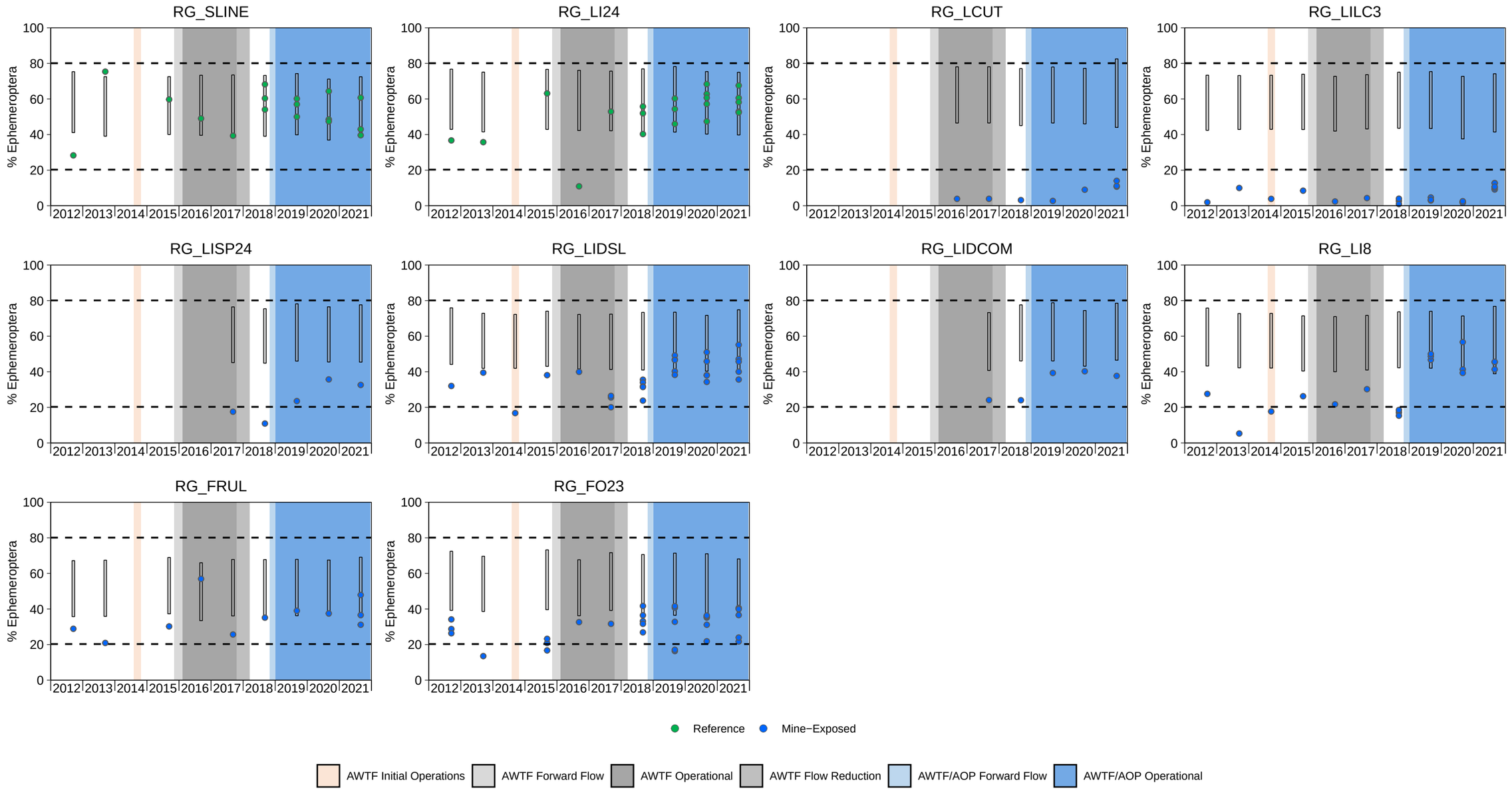

Figure B.8: Benthic Invertebrate Community Relative Ephemeroptera Abundance (%Ephemeroptera; 3-Minute Kick and Sweep Sampling) from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Site specific normal ranges using regression models shown with grey shading and black rectangle. Dashed black lines represent the normal range defined as the 2.5th and 97.5th percentiles of the 2012 to 2019 reference area data fro the Regional Aquatic Environmental Program (RAEMP).

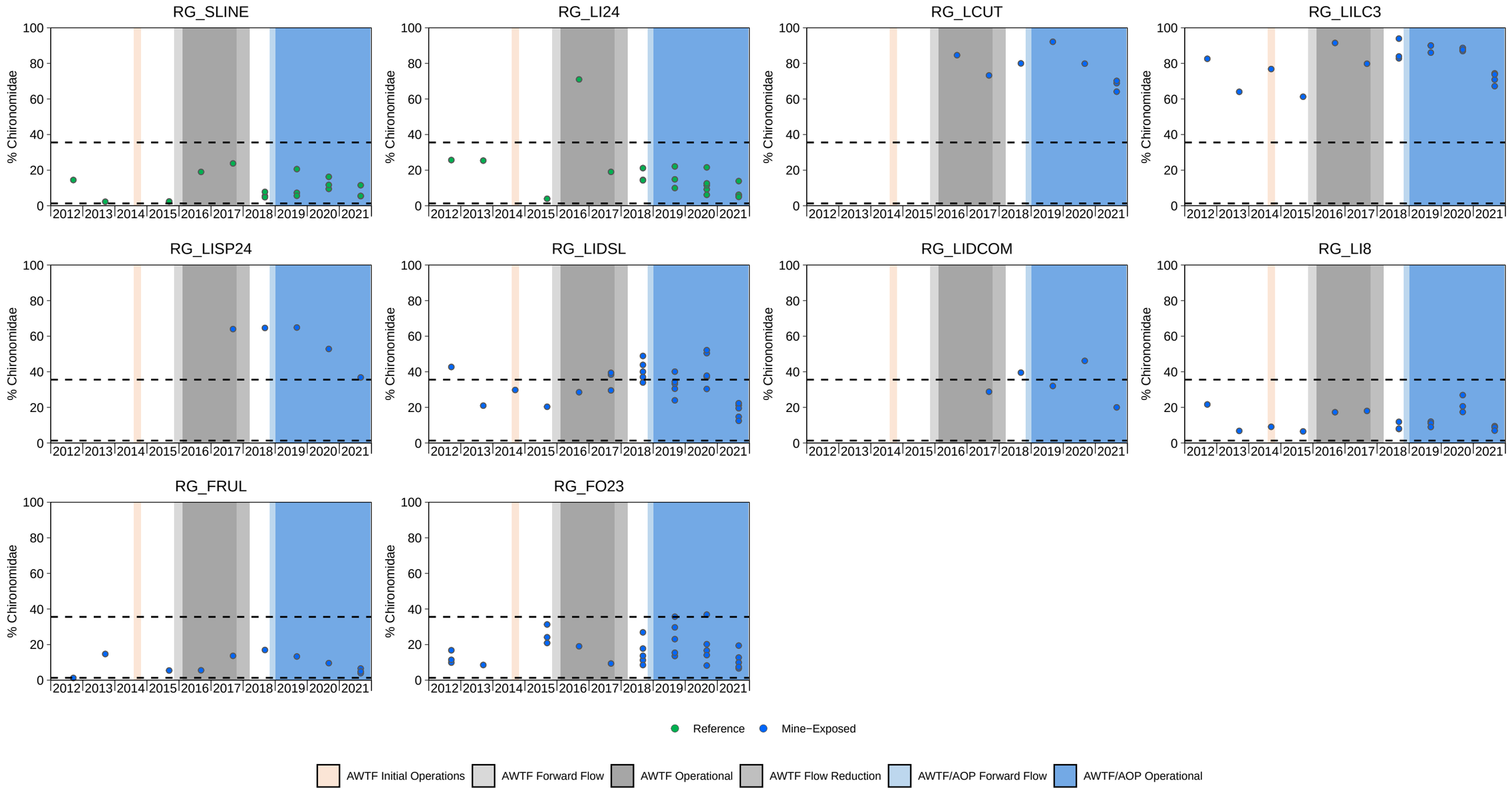

Figure B.9: Benthic Invertebrate Community Relative Chironomidae Abundance (%Chironomidae; 3-Minute Kick and Sweep Sampling) from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Site specific normal ranges using regression models shown with grey shading and black rectangle. Dashed black lines represent the normal range defined as the 2.5th and 97.5th percentiles of the 2012 to 2019 data from the Regional Aquatic Envrionmental Monitoring Program (RAEMP).

Table B.1: Visual Periphyton Coverage Scores from Line Creek and Fording River, September 2021

Area Type	Biological Area Code	Station					Mean	Standard Deviation
		1	2	3	4	5		
Reference	RG_SLINE	2	2	2	2	2	2.0	0.0
Reference	RG_LI24	2	2	2	2	2	2.0	0.0
Mine-Exposed	RG_LCUT	3	3	3	3	3	3.0	0.0
Mine-Exposed	RG_LILC3	3	3	3	3	3	3.0	0.0
Mine-Exposed	RG_LISP24	3	3	3	3	4	3.2	0.4
Mine-Exposed	RG_LIDSL	4	3	3	2	3	3.0	0.7
Mine-Exposed	RG_LIDCOM	3	3	3	3	3	3.0	0.0
Mine-Exposed	RG_LI8	2	2	2	2	3	2.2	0.4
Mine-Exposed	RG_FRUL	2	2	1	2	2	1.8	0.4
Mine-Exposed	RG_FO23	3	3	3	2	2	2.6	0.5

Periphyton Coverage Scores (Environment Canada, 2012b):
1 = Rocks not slippery, no obvious colour (<0.5mm thick)
2 = Rocks slightly slippery, yellow-brown to light green colour (0.5-1mm thick)
3 = Rocks have noticeable slippery feel, patches of thicker green to brown algae (1-5mm thick)
4 = Rocks are very slippery, numerous clumps (5-20mm thick)
5 = Rocks mostly obscured by algae mat, may have long strands (>20mm thick)

Table B.2: Statistical Comparisons of Total Benthic Invertebrate Biomass (Hess Samples) Over Time and Relative to Reference (RG_SLINE and RG_LI24) for RG_LIDSL and RG_LILC3, 2014 to 2021

Area	Comparison	Term	DF	F-Statistic	P-value	Comparisons Among Years							
						2014	2015	2016	2017	2018	2019	2020	2021
RG_LILC3	RG_LILC3 over time					A	A	A	A	A	A	A	A
	RG_LILC3 vs RG_SLINE and RG_LI24 over time	Year	7	4.01	<0.001								
		CI	1	950	<0.001								
		Area(CI)	1	16.7	<0.001								
		CI×Year	7	0.696	0.675	A	A	A	A	A	A	A	A
		Area(CI)×Year	6	1.64	0.140								
		Error	155	-	-								
RG_LIDSL	RG_LIDSL over time					A	A	A	A	A	A	A	A
	RG_LIDSL vs RG_SLINE and RG_LI24 over time	Year	7	2.53	0.017								
		CI	1	237	<0.001								
		Area(CI)	1	16.1	<0.001								
		CI×Year	7	2.02	0.055	B	AB	AB	AB	AB	A	AB	AB
		Area(CI)×Year	6	1.59	0.154								
		Error	155	-	-								

Relevant p-value < 0.1.

Notes: "-" = no data. Years that share a letter (e.g., A,B) are not significantly different (p value=0.1). Letters assigned such that the year with the highest mean value (for the Year term) or highest difference between mine-exposed and reference (for the Area×Year term) is assigned the letter A. The p-value used to determine differences were adjusted using Tukey's honestly significant differences method. One outlier removed in 2017 and 2018.

Table B.3: Summary Metrics for Benthic Invertebrate Endpoints Collected by Hess Sampler at Line Creek, September 2021

Area	Biological Area Code	Sample Code	Total Density (org/m^2)[a]	Biomass (g/m^2 ww)[a]	EPT Density (org/m^2)	Ephemeroptera Density (org/m^2)	Chironomidae Density (org/m^2)
Reference	RG_LI24	RG_LI24_HESS-1	7,560	13	6,980	5,320	460
		RG_LI24_HESS-2	4,930	9.9	4,260	3,190	480
		RG_LI24_HESS-3	5,000	4.7	4,680	3,400	200
		RG_LI24_HESS-3	8,720	11	7,300	5,200	880
		RG_LI24_HESS-4	4,550	5.9	4,230	3,270	120
	RG_SLINE	RG_SLINE_HESS-1	3,530	10	2,830	1,270	120
		RG_SLINE_HESS-2	4,640	5.4	3,600	1,940	640
		RG_SLINE_HESS-3	2,370	1.9	1,480	470	70
		RG_SLINE_HESS-4	5,150	13	4,470	2,750	100
		RG_SLINE_HESS-5	4,270	11	3,770	2,750	150
Mine-exposed	RG_LILC3	RG_LILC3_HESS-1	32,960	74	3,200	1,520	23,200
		RG_LILC3_HESS-2	24,490	66	2,410	440	16,840
		RG_LILC3_HESS-3	39,010	50	3,290	1,800	22,840
		RG_LILC3_HESS-4	33,590	50	2,170	880	18,960
		RG_LILC3_HESS-5	57,050	325	6,160	2,880	30,960
		RG_LILC3_HESS-6	34,590	67	3,970	1,440	19,840
		RG_LILC3_HESS-7	42,080	80	3,680	1,680	23,960
		RG_LILC3_HESS-8	25,030	41	1,630	680	14,920
		RG_LILC3_HESS-9	31,820	61	2,530	920	18,360
		RG_LILC3_HESS-10	58,450	96	3,970	1,760	36,640
	RG_LIDSL	RG_LIDSL_HESS-1	8,210	18	4,500	3,080	1,760
		RG_LIDSL_HESS-2	8,370	23	5,840	3,960	1,340
		RG_LIDSL_HESS-3	13,820	30	8,580	5,580	1,260
		RG_LIDSL_HESS-4	7,250	12	5,320	3,130	480
		RG_LIDSL_HESS-5	4,690	11	3,140	1,380	550
		RG_LIDSL_HESS-6	13,640	36	9,060	6,060	2,640
		RG_LIDSL_HESS-7	8,840	19	7,070	4,530	450
		RG_LIDSL_HESS-8	4,510	9.4	2,970	1,660	430
		RG_LIDSL_HESS-9	6,470	19	4,660	2,560	600
		RG_LIDSL_HESS-10	9,360	56	7,320	3,720	520

Notes: org = organism; ww = wet weight; EPT = Ephemeroptera, Plecoptera, Trichoptera

[a] Total density and biomass are reported for all organisms in the sample.

Table B.4: Statistical Comparisons of Total Benthic Invertebrate Density (Hess Samples) Over Time and Relative to Reference (RG_SLINE and RG_LI24) for RG_LIDSL and RG_LILC3, 2014 to 2021

Area	Comparison	Term	DF	F-Statistic	P-value	Comparisons Among Years							
						2014	2015	2016	2017	2018	2019	2020	2021
RG_LILC3	RG_LILC3 over time					A	A	A	A	A	A	A	A
	RG_LILC3 vs RG_SLINE and RG_LI24 over time	Year	7	6.52	<0.001								
		CI	1	1,331	<0.001								
		Area(CI)	1	9.75	0.002								
		CI×Year	7	3.40	0.002								
		Area(CI)×Year	6	5.39	<0.001	CI×Year effect depends on Area							
		Error	155	-	-								
	RG_LILC3 vs RG_SLINE over time	Area	1	802	<0.001								
		Year	7	5.51	<0.001								
		Area×Year	7	3.72	0.001	B	A	AB	AB	A	A	AB	AB
		Error	117	-	-								
	RG_LILC3 vs RG_LI24 over time	Area	1	876	<0.001								
		Year	7	3.45	0.002								
		Area×Year	6	3.89	0.001	ABC	BC	-	ABC	AC	BC	A	B
		Error	110	-	-								
RG_LIDSL	RG_LIDSL over time					AB	AB	B	AB	A	AB	AB	AB
	RG_LIDSL vs RG_SLINE and RG_LI24 over time	Year	7	7.92	<0.001								
		CI	1	316	<0.001								
		Area(CI)	1	11.6	<0.001								
		CI×Year	7	4.69	<0.001								
		Area(CI)×Year	6	6.39	<0.001	CI×Year effect depends on Area							
		Error	155	-	-								
	RG_LIDSL vs RG_SLINE over time	Area	1	167	<0.001								
		Year	7	7.35	<0.001								
		Area×Year	7	4.93	<0.001	C	B	AB	AC	AB	B	B	AB
		Error	117	-	-								
	RG_LIDSL vs RG_LI24 over time	Area	1	272	<0.001								
		Year	7	4.81	<0.001								
		Area×Year	6	5.39	<0.001	B	B	-	B	B	AB	B	A
		Error	110	-	-								

Relevant p-value < 0.1.

Notes: "-" = no data. Years that share a letter (e.g., A,B) are not significantly different (p-value=0.1). Letters assigned such that the year with the highest mean value (for the Year term) or highest difference between mine-exposed and reference (for the Area×Year term) is assigned the letter A. The p-value used to determine differences were adjusted using Tukey's honestly significant differences method. One outlier removed in 2017 and 2018.

Table B.5: Summary of Benthic Invertebrate Endpoints Collected by 3-Minute Kick and Sweep Sampling at Line Creek and Fording River, September 2021

Area	Biological Area Code	Sample Code	Abundance (# org/ 3-min kick)	LPL Richness (# of taxa)	Family Richness	EPT		Ephemeroptera		Chironomidae	
						Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)
Reference	RG_SLINE	RG_SLINE-01	3,140	33	20	2,880	92	1,350	43	170	5.4
		RG_SLINE-02	7,120	28	16	6,200	87	2,820	40	820	12
		RG_SLINE-03	4,657	32	18	4,329	93	2,829	61	257	5.5
	RG_LI24	RG_LI24-01	8,880	22	15	8,340	94	6,000	68	460	5.2
		RG_LI24-02	9,180	27	16	8,380	91	5,560	61	560	6.1
		RG_LI24-03	9,680	27	19	8,880	92	5,120	53	600	6.2
		RG_LI24-04	5,533	32	18	4,683	85	2,900	52	767	14
		RG_LI24-05	13,260	28	15	12,500	94	7,720	58	660	5.0
Mine-exposed	RG_LCUT	RG_LCUT-01	9,900	33	18	2,460	25	1,060	11	6,820	69
		RG_LCUT-02	9,320	29	15	1,860	20	1,040	11	6,540	70
		RG_LCUT-03	10,420	34	17	2,860	27	1,460	14	6,680	64
	RG_LILC3	RG_LILC3-01	12,500	30	17	2,360	19	1,140	9.1	9,300	74
		RG_LILC3-02	8,220	28	18	1,240	15	820	10.0	6,100	74
		RG_LILC3-03	18,720	34	17	5,220	28	2,380	13	12,579	67
		RG_LILC3-04	24,380	37	18	5,320	22	3,100	13	17,280	71
		RG_LILC3-05	18,460	35	20	3,200	17	1,980	11	13,620	74
	RG_LISP24	RG_LISP24-01	9,940	31	16	5,860	59	3,240	33	3,660	37
	RG_LIDSL	RG_LIDSL-01	11,740	32	19	8,780	75	4,700	40	2,480	21
		RG_LIDSL-02	14,560	34	19	11,920	82	6,860	47	2,140	15
		RG_LIDSL-03	10,300	31	17	8,740	85	5,680	55	1,280	12
		RG_LIDSL-04	7,480	31	16	5,740	77	3,420	46	1,460	20
		RG_LIDSL-05	11,280	31	18	8,420	75	4,020	36	2,520	22
	RG_LIDCOM	RG_LIDCOM-01	23,300	41	23	17,600	76	8,780	38	4,660	20
	RG_LI8	RG_LI8-01	14,600	35	19	12,540	86	6,040	41	1,380	9.5
		RG_LI8-02	10,920	36	21	9,400	86	4,960	45	960	8.8
		RG_LI8-03	9,780	27	18	8,440	86	4,460	46	680	7.0
	RG_FRUL	RG_FRUL-01	8,220	25	18	7,380	90	2,560	31	540	6.6
		RG_FRUL-02	6,140	27	20	4,820	78	2,940	48	240	3.9
		RG_FRUL-03	4,920	33	23	3,380	69	1,800	37	240	4.9
	RG_FO23	RG_FO23-01	2,917	41	27	1,233	42	633	22	567	19
		RG_FO23-02	8,180	30	21	6,040	74	3,320	41	1,040	13
		RG_FO23-03	9,440	37	27	6,180	66	2,260	24	940	10.0
		RG_FO23-04	6,660	28	20	4,960	74	2,660	40	440	6.6
		RG_FO23-05	8,040	41	26	5,360	67	2,940	37	600	7.5

Notes: LPL= Lowest Practical Level; EPT= Ephemeroptera, Plecoptera, and Trichoptera.

APPENDIX C
SELENIUM

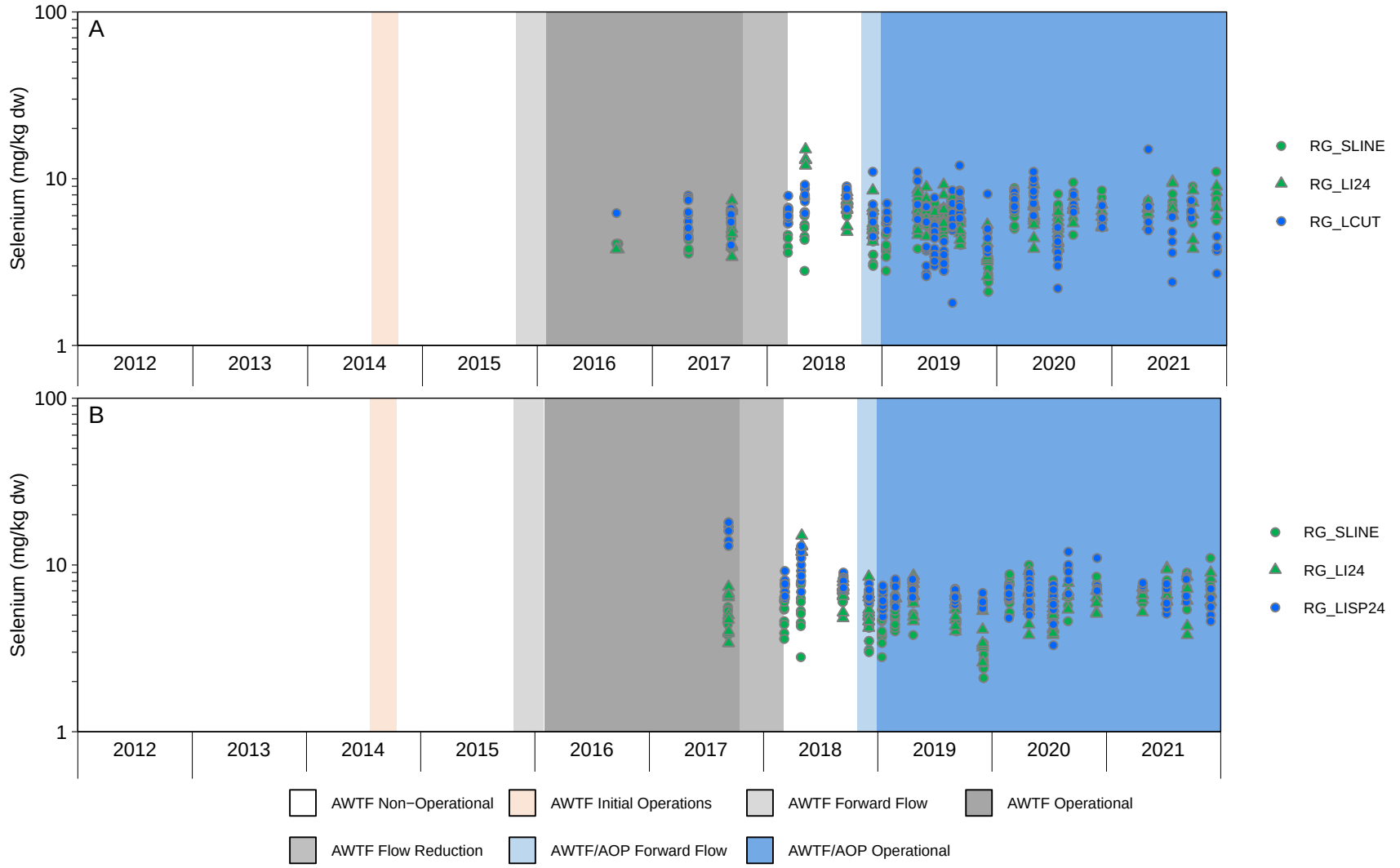

Figure C.1: Benthic Invertebrate Selenium Concentrations, for A) RG_LCUT and B) RG_LISP24 (Mine−exposed Areas) Relative to RG_SLINE and RG_LI24 (Reference Areas), 2012 to 2021

Notes: Blue symbols represent mine-exposed areas and green symbols represent reference areas. Due to a brief period of exposure to less−than−capacity AWTF effluent in 2014, benthic invertebrate tissue selenium data from September 2015 were not considered representative of AWTF operation, but also not representative of a no−discharge condition. These data were therefore excluded from analyses and are displayed in plots for context only. West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines are displayed for each monitoring area to provide context, but pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge.

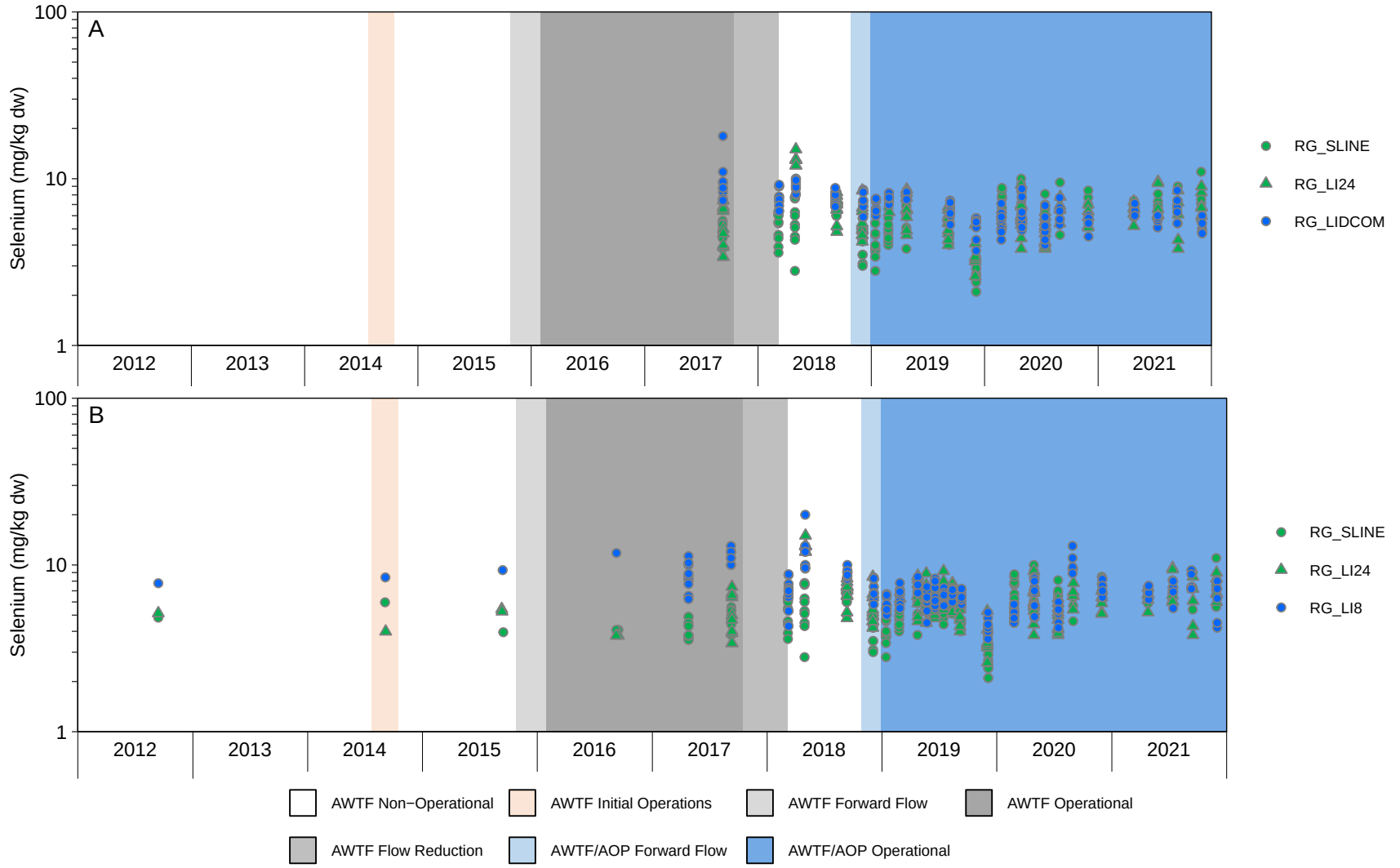

Figure C.2: Benthic Invertebrate Selenium Concentrations, for A) RG_LIDCOM, and B) RG_LI8 (Mine−exposed Areas) Relative to RG_SLINE and RG_LI24 (Reference Areas), 2012 to 2021

Notes: Blue symbols represent mine-exposed areas and green symbols represent reference areas. Due to a brief period of exposure to less−than−capacity AWTF effluent in 2014, benthic invertebrate tissue selenium data from September 2015 were not considered representative of AWTF operation, but also not representative of a no−discharge condition. These data were therefore excluded from analyses and are displayed in plots for context only. West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines are displayed for each monitoring area to provide context, but pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge.

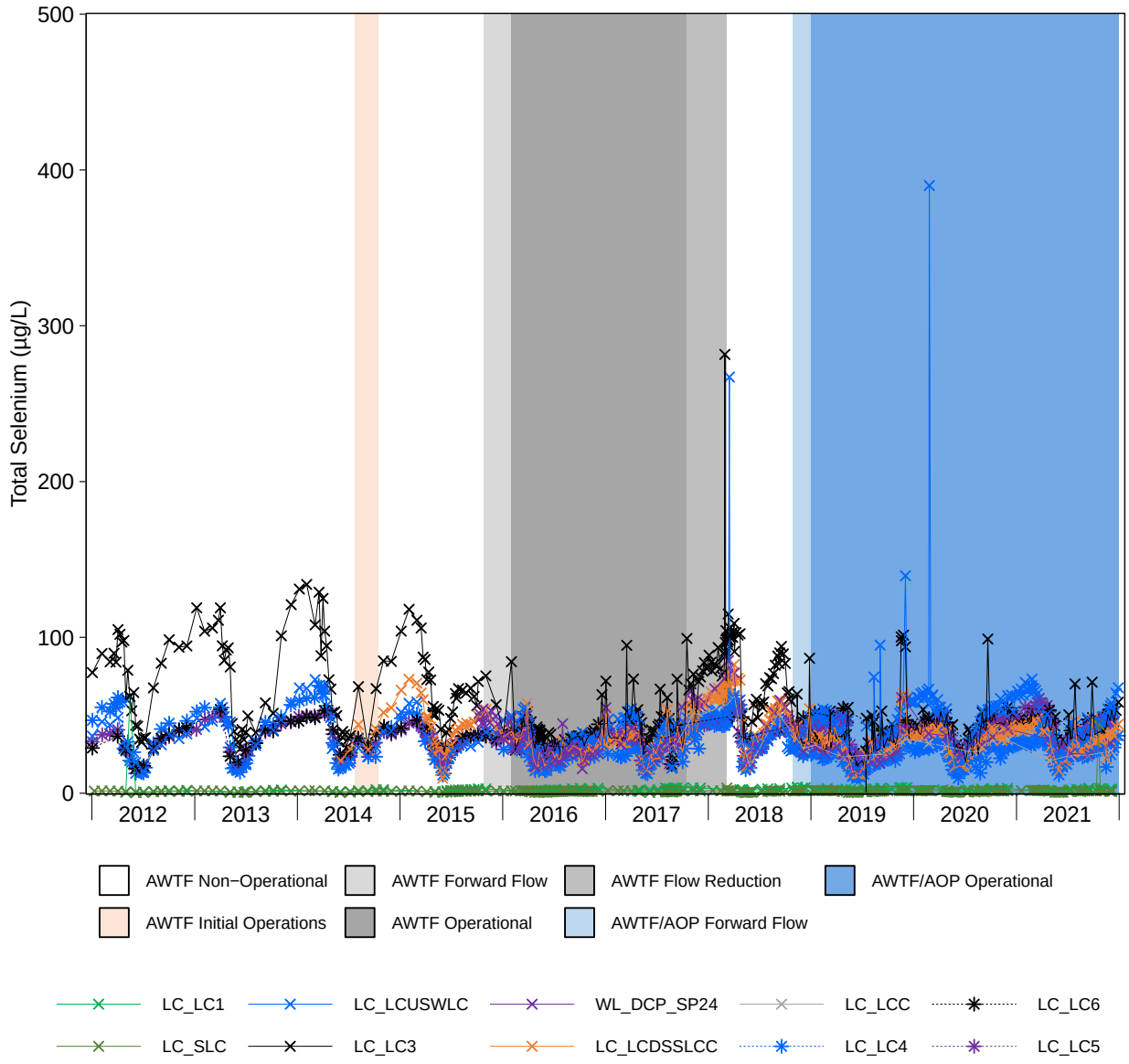

Figure C.3: Time Series Plots for Aqueous Total Selenium Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations were above the LRL in all samples. West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine− exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017. This plot excludes data from LC_WLC.

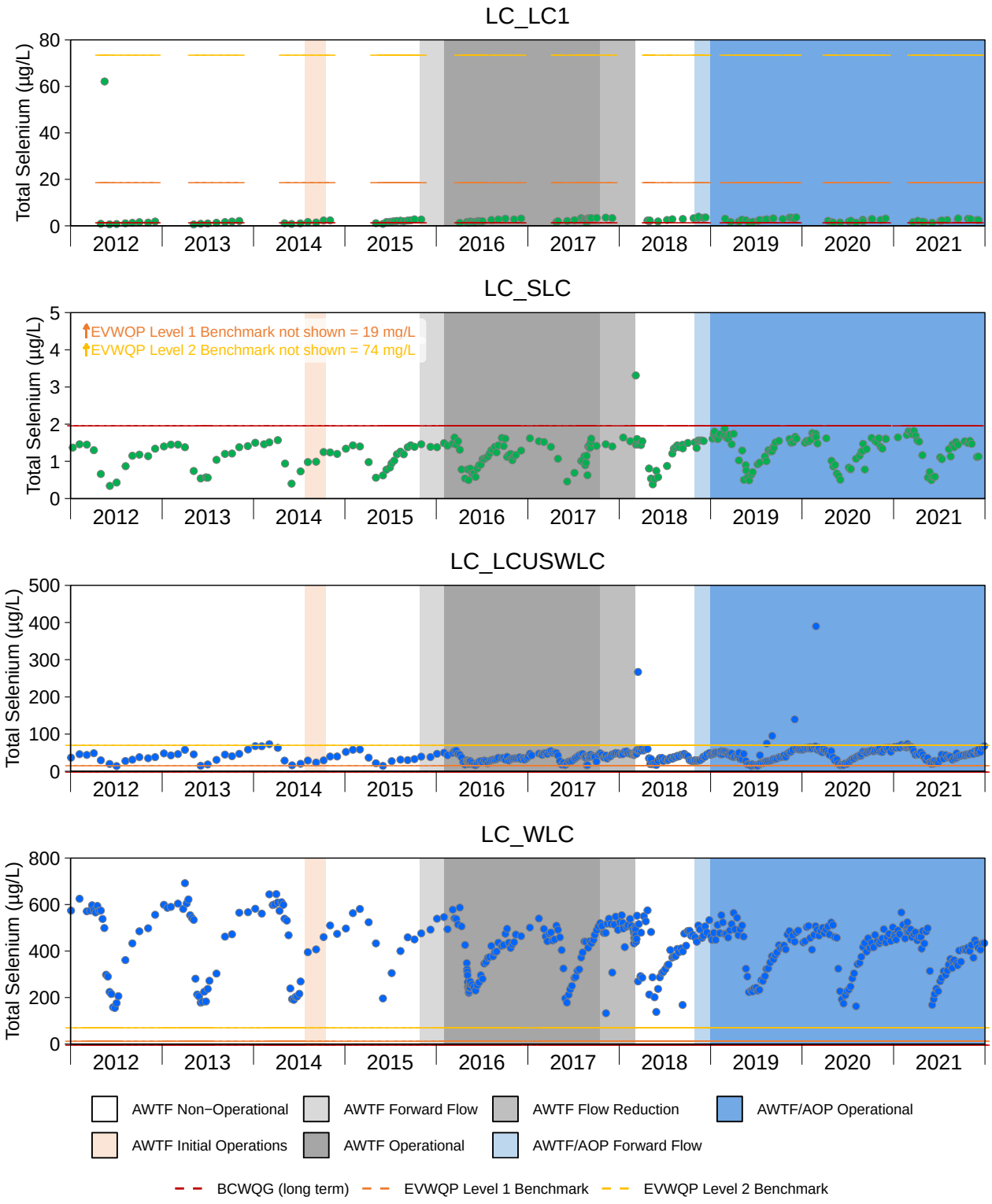

Figure C.4: Time Series Plots for Total Selenium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017. On one sampling event (October 18, 2021), LC_SLC had a total Se concentration of 44.1 µg/L, this value is a suspected outlier (as the corresponding dissolved concentration was much lower [1.5 µg/L]), as such this value is not shown in the plot.

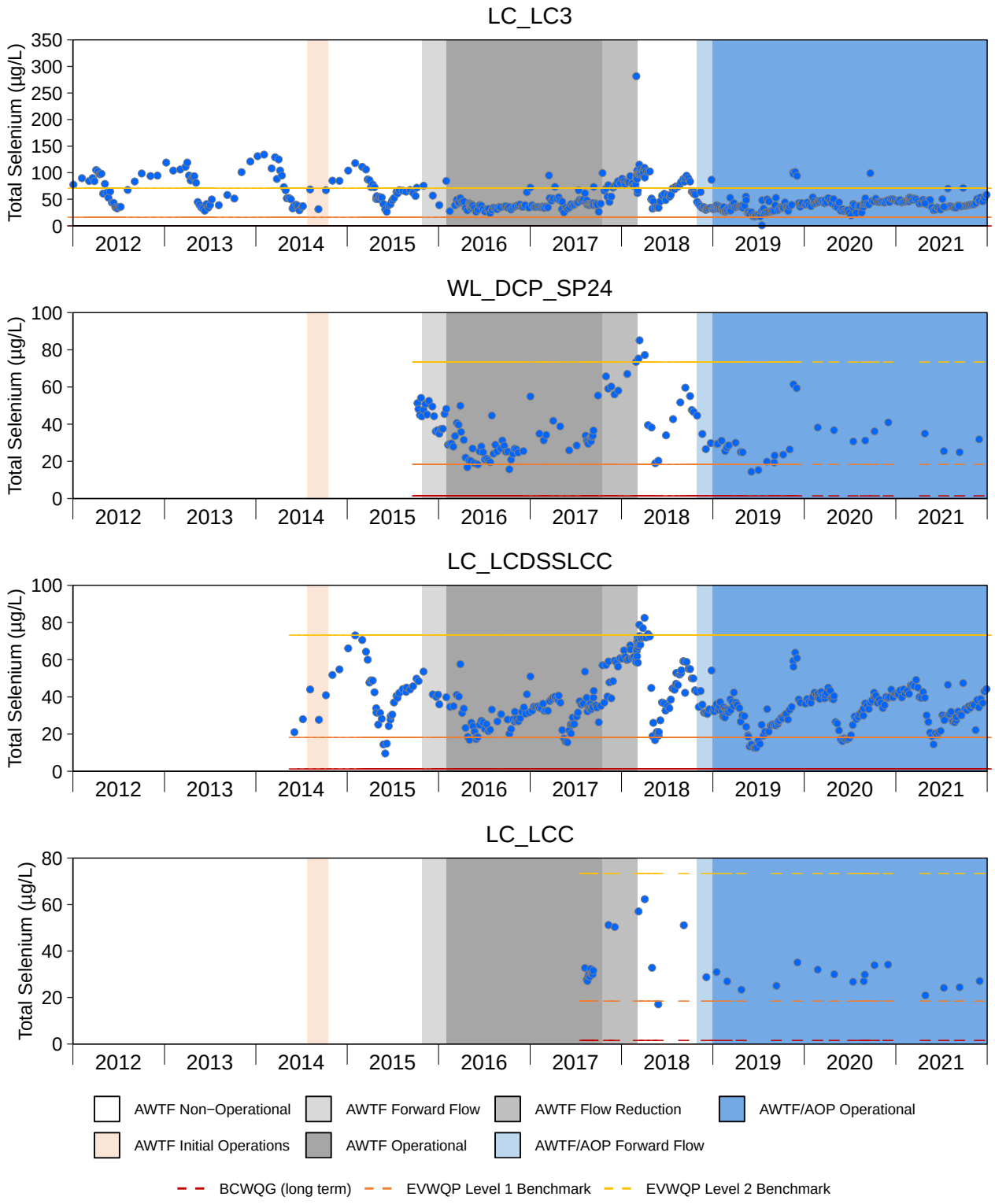

Figure C.4: Time Series Plots for Total Selenium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

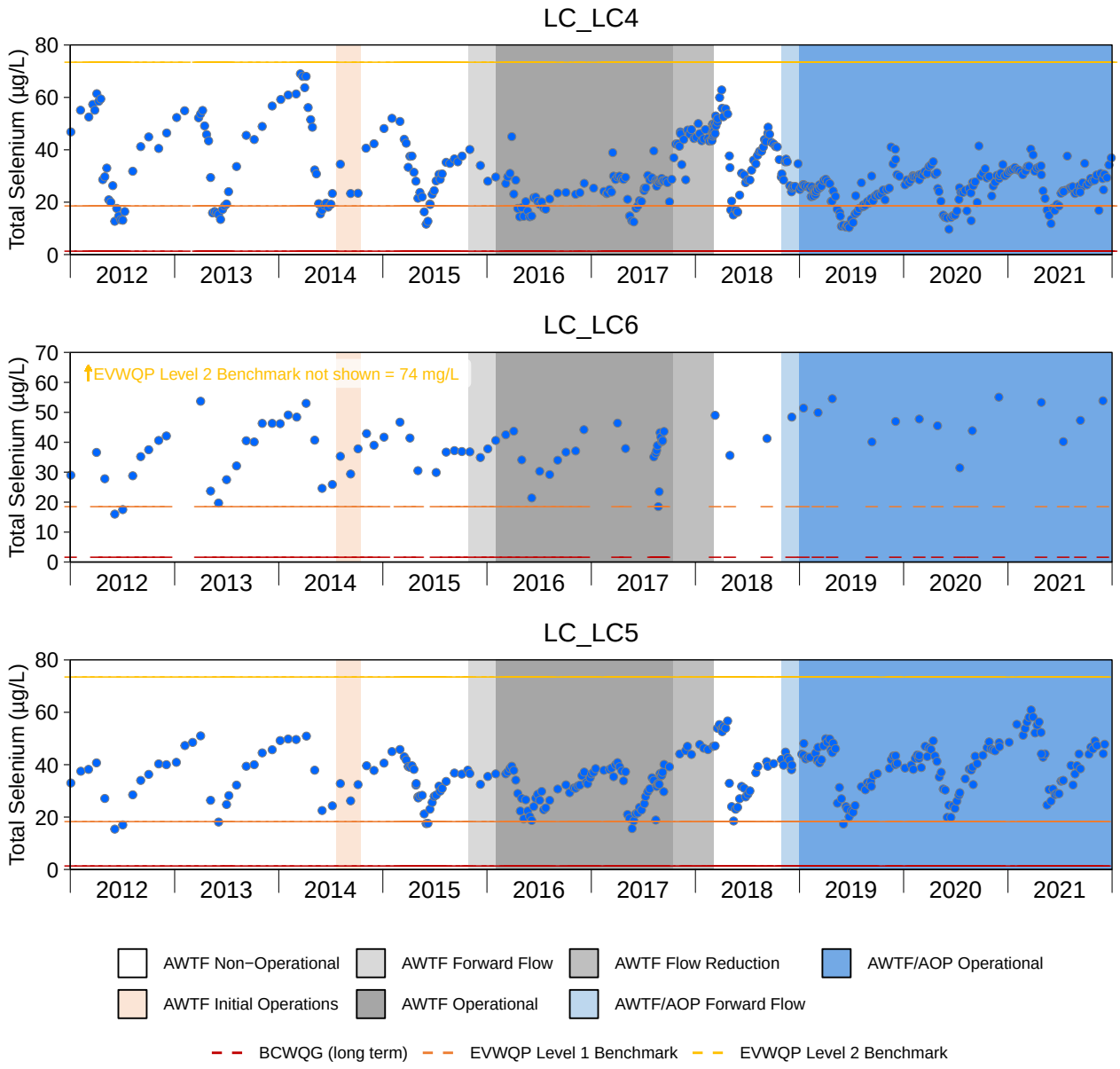

Figure C.4: Time Series Plots for Total Selenium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL.

Table C.1: Selenium Concentrations in Benthic Invertebrate Composite-Taxa Samples Collected from Line Creek and Fording River, Line Creek LAEMP, 2021

Waterbody		Biological Area Code	Sample Code	Sample Date	Dominant Taxa	Selenium Concentration (mg/kg dw)					
						Sample	Area Median	Area Minimum	Area Maximum	Area Mean	Area Standard Deviation
Line Creek	Reference	RG_LI24	RG_LI24_INV-1	26-Apr-21	Ephem, Plec	6.7	6.6	5.2	7.3	6.4	0.8
			RG_LI24_INV-2	26-Apr-21	Plec, Ephem, Tipul	6.2					
			RG_LI24_INV-3	26-Apr-21	Ephem, Plec, Rhyac	7.3					
			RG_LI24_INV-4	26-Apr-21	Ephem, Plec, Trich	6.6					
			RG_LI24_INV-5	26-Apr-21	Plec, Ephem, Trich	5.2					
			RG_LI24_INV-1	13-Jul-21	Ephem, Plec, Trich	9.6	6.6	6.0	9.6	7.5	1.8
			RG_LI24_INV-2	13-Jul-21	Ephem, Plec, Trich	6.1					
			RG_LI24_INV-3	13-Jul-21	Ephem, Plec, Trich	6.6					
			RG_LI24_INV-4	13-Jul-21	Ephem, Plec, Trich	9.4					
			RG_LI24_INV-5	13-Jul-21	Ephem, Plec, Trich	6.0					
			RG_LI24_INV-1	16-Sep-21	Plec, Ephem	7.2	6.1	3.8	8.5	6.0	2.0
			RG_LI24_INV-2	16-Sep-21	Plec, Ephem	6.1					
			RG_LI24_INV-3	16-Sep-21	Plec, Ephem	3.8					
			RG_LI24_INV-4	16-Sep-21	Plec, Ephem	4.3					
			RG_LI24_INV-5	16-Sep-21	Plec, Ephem	8.5					
			RG_LI24_INV-1	30-Nov-21	Ephem, Plec	6.8	6.8	6.0	9.0	7.4	1.2
			RG_LI24_INV-2	30-Nov-21	Ephem, Plec	6.0					
			RG_LI24_INV-3	30-Nov-21	Ephem, Plec, Tipul	8.3					
			RG_LI24_INV-4	30-Nov-21	Ephem, Plec	9.0					
			RG_LI24_INV-5	30-Nov-21	Ephem, Plec	6.7					
		RG_SLINE	RG_SLINE_INV-1	26-Apr-21	Ephem, Plec, Rhyac	6.8	6.3	5.9	7.4	6.5	0.6
			RG_SLINE_INV-2	26-Apr-21	Plec, Ephem, Rhyac	5.9					
			RG_SLINE_INV-3	26-Apr-21	Plec, Ephem, Rhyac	5.9					
			RG_SLINE_INV-4	26-Apr-21	Plec, Ephem	6.3					
			RG_SLINE_INV-5	26-Apr-21	Ephem, Plec, Rhyac	7.4					
			RG_SLINE_INV-1	13-Jul-21	Ephem, Plec, Trich	7.3	6.9	6.1	8.1	7.0	0.8
			RG_SLINE_INV-2	13-Jul-21	Ephem, Plec, Rhyac	8.1					
			RG_SLINE_INV-3	13-Jul-21	Ephem, Plec, Rhyac	6.1					
			RG_SLINE_INV-4	13-Jul-21	Ephem, Plec, Rhyac	6.6					
			RG_SLINE_INV-5	13-Jul-21	Ephem, Plec, Rhyac	6.9					
			RG_SLINE_INV-1	15-Sep-21	Ephem, Plec, Trich	7.3	7.3	5.4	9.0	7.2	1.3
			RG_SLINE_INV-2	15-Sep-21	Ephem, Plec, Trich	7.2					
			RG_SLINE_INV-3	15-Sep-21	Ephem, Plec, Trich	9.0					
			RG_SLINE_INV-4	15-Sep-21	Ephem, Plec, Trich	5.4					
			RG_SLINE_INV-5	15-Sep-21	Ephem, Plec, Trich	7.3					
			RG_SLINE_INV-1	29-Nov-21	Plec, Ephem, Para	7.1	7.5	5.6	11.0	7.8	2.0
			RG_SLINE_INV-2	29-Nov-21	Plec, Ephem, Rhyac	8.0					
			RG_SLINE_INV-3	29-Nov-21	Ephem, Plec, Rhyac	5.6					
			RG_SLINE_INV-4	29-Nov-21	Ephem, Plec, Trich	11.0					
			RG_SLINE_INV-5	29-Nov-21	Plec, Ephem, Rhyac	7.5					
	Mine-exposed	RG_LCUT	RG_LCUT_INV-1	27-Apr-21	Para, Trich, Plec	15.0	6.7	4.9	15.0	7.8	4.1
			RG_LCUT_INV-2	27-Apr-21	Para, Plec, Chiron	6.7					
			RG_LCUT_INV-3	27-Apr-21	Para, Plec, Trich	4.9					
			RG_LCUT_INV-4	27-Apr-21	Para, Trich, Plec	6.8					
			RG_LCUT_INV-5	27-Apr-21	Plec, Trich, Rhyac	5.5					
			RG_LCUT_INV-1	12-Jul-21	Para, Chiron, Rhyac	3.6	4.2	2.4	5.9	4.2	1.3
			RG_LCUT_INV-2	12-Jul-21	Para, Chiron, Rhyac	2.4					
			RG_LCUT_INV-3	12-Jul-21	Para, Chiron, Rhyac	4.8					
			RG_LCUT_INV-4	12-Jul-21	Plec, Rhyac, Chiron	4.2					
			RG_LCUT_INV-5	12-Jul-21	Chiron, Rhyac, Para	5.9					
			RG_LCUT_INV-1	10-Sep-21	Chiron, Trich, Plec	5.7	6.2	5.7	7.4	6.3	0.7
			RG_LCUT_INV-2	10-Sep-21	Chiron, Plec, Trich	6.2					
			RG_LCUT_INV-3	10-Sep-21	Chiron, Plec, Trich	5.8					
			RG_LCUT_INV-4	10-Sep-21	Chiron, Plec	7.4					
			RG_LCUT_INV-5	10-Sep-21	Chiron, Plec, Trich	6.4					
			RG_LCUT_INV-1	1-Dec-21	Plec, Para, Rhyac	4.5	3.7	2.7	4.5	3.7	0.6
			RG_LCUT_INV-2	1-Dec-21	Plec, Para, Trich	3.7					
			RG_LCUT_INV-3	1-Dec-21	Plec, Para, Trich	3.7					
			RG_LCUT_INV-4	1-Dec-21	Plec, Para, Chiron	3.9					
			RG_LCUT_INV-5	1-Dec-21	Plec, Para, Trich	2.7					
		RG_LILC3	RG_LILC3_INV-1	27-Apr-21	Para, Chiron, Trich	6.2	10.0	6.2	12.0	9.7	2.2
			RG_LILC3_INV-2	27-Apr-21	Rhyac, Para, Chiron	10.0					
			RG_LILC3_INV-3	27-Apr-21	Para, Rhyac, Chiron	11.0					
			RG_LILC3_INV-4	27-Apr-21	Para, Rhyac, Trich	12.0					
			RG_LILC3_INV-5	27-Apr-21	Para, Rhyac, Plec	9.4					
			RG_LILC3_INV-1	12-Jul-21	Para, Rhyac, Chiron	6.1	6.8	6.1	8.8	7.1	1.1
			RG_LILC3_INV-2	12-Jul-21	Para, Rhyac, Chiron	6.2					
			RG_LILC3_INV-3	12-Jul-21	Para, Rhyac, Chiron	8.8					
			RG_LILC3_INV-4	12-Jul-21	Para, Rhyac, Plec	6.8					
			RG_LILC3_INV-5	12-Jul-21	Rhyac, Plec, Chiron	7.5					
			RG_LILC3_INV-1	9-Sep-21	Trich	9.9	9.9	7.2	11.0	9.3	1.5
			RG_LILC3_INV-2	9-Sep-21	Trich, Rhyac, Plec	8.6					
			RG_LILC3_INV-3	9-Sep-21	Trich, Oligo, Plec	11.0					
			RG_LILC3_INV-4	10-Sep-21	Trich, Plec, Chiron	7.2					
			RG_LILC3_INV-5	10-Sep-21	Trich, Plec, Chiron	9.9					
			RG_LILC3_LUM-3	9-Sep-21	Oligo Only	15.0	NA	NA	NA	NA	NA
			RG_LILC3_INV-1	1-Dec-21	Plec, Para, Chiron	9.5	8.0	4.0	9.5	7.3	2.1
			RG_LILC3_INV-2	1-Dec-21	Plec, Para, Chiron	4.0					
			RG_LILC3_INV-3	1-Dec-21	Para, Plec, Chiron	6.8					
			RG_LILC3_INV-4	1-Dec-21	Para, Plec, Chiron	8.2					
			RG_LILC3_INV-5	1-Dec-21	Plec, Chiron, Para	8.0					
		RG_LISP24	RG_LISP24_INV-1	27-Apr-21	Para, Rhyac, Ephem	7.2	7.5	7.2	7.8	7.5	0.2
			RG_LISP24_INV-2	27-Apr-21	Plec, Para, Ephem	7.3					
			RG_LISP24_INV-3	27-Apr-21	Para, Plec, Rhyac	7.6					
			RG_LISP24_INV-4	27-Apr-21	Rhyac, Ephem, Para	7.5					
			RG_LISP24_INV-5	27-Apr-21	Plec, Para, Ephem	7.8					
			RG_LISP24_INV-1	12-Jul-21	Plec, Para, Ephem	7.2	5.9	5.1	7.7	6.3	1.1
			RG_LISP24_INV-2	12-Jul-21	Rhyac, Ephem, Para	5.1					
			RG_LISP24_INV-3	12-Jul-21	Plec, Para, Ephem	5.5					
			RG_LISP24_INV-4	12-Jul-21	Ephem, Para, Chiron	5.9					
			RG_LISP24_INV-5	12-Jul-21	Plec, Para, Ephem	7.7					
			RG_LISP24_INV-1	13-Sep-21	Plec, Chiron, Ephem, Trich	6.0	8.2	6.0	8.5	7.5	1.2
			RG_LISP24_INV-2	13-Sep-21	Plec, Chiron, Ephem, Trich	6.5					
			RG_LISP24_INV-3	13-Sep-21	Plec, Chiron, Ephem, Trich	8.5					
			RG_LISP24_INV-4	13-Sep-21	Plec, Chiron, Ephem, Trich	8.3					
			RG_LISP24_INV-5	13-Sep-21	Plec, Chiron, Ephem, Trich	8.2					
			RG_LISP24_INV-1	30-Nov-21	Para, Rhyac, Plec	5.0	5.6	4.6	7.2	5.7	1.0
			RG_LISP24_INV-2	30-Nov-21	Plec, Rhyac, Para	6.3					
			RG_LISP24_INV-3	30-Nov-21	Plec, Ephem, Rhyac	4.6					
			RG_LISP24_INV-4	30-Nov-21	Plec, Ephem, Para	7.2					
			RG_LISP24_INV-5	30-Nov-21	Plec, Ephem, Para	5.6					

Notes: Abbreviation of taxa was used. Plec = Plecoptera (stonefly). Ephem = Ephemeroptera (mayfly). Trich = Trichoptera (caddisfly). Dipt = Diptera (true flies). Oligo = Oligo (worms). Chiron = Chironomidae (non-biting midge). Tipul = Tipulidae (crane fly). Rhyac = Rhyacophilidae. Para = Parapsyche. Nema = Nematoda. Oligo Only = annelids only samples (which is not included in the analysis of composite-taxa and were collected based on annelids at >5% of the total biomass sample [Golder 2021b]).

Table C.1: Selenium Concentrations in Benthic Invertebrate Composite-Taxa Samples Collected from Line Creek and Fording River, Line Creek LAEMP, 2021

Waterbody		Biological Area Code	Sample Code	Sample Date	Dominant Taxa	Selenium Concentration (mg/kg dw)					
						Sample	Area Median	Area Minimum	Area Maximum	Area Mean	Area Standard Deviation
Line Creek	Mine-exposed	RG_LIDSL	RG_LIDSL_INV-1	27-Apr-21	Para, Plec, Rhyac	5.0	5.2	4.6	5.6	5.2	0.4
			RG_LIDSL_INV-2	27-Apr-21	Para, Plec, Rhyac	5.2					
			RG_LIDSL_INV-3	27-Apr-21	Para, Plec, Ephem	5.4					
			RG_LIDSL_INV-4	27-Apr-21	Para, Plec, Ephem	5.6					
			RG_LIDSL_INV-5	27-Apr-21	Para, Plec, Ephem	4.6					
			RG_LIDSL_INV-1	14-Jul-21	Ephem, Chiron, Rhyac	7.9	6.5	5.8	7.9	6.7	0.8
			RG_LIDSL_INV-2	14-Jul-21	Ephem, Chiron, Para	5.8					
			RG_LIDSL_INV-3	14-Jul-21	Ephem, Chiron, Para	7.0					
			RG_LIDSL_INV-4	14-Jul-21	Ephem, Chiron, Rhyac	6.2					
			RG_LIDSL_INV-5	14-Jul-21	Ephem, Chiron, Para	6.5					
			RG_LIDSL_INV-1	14-Sep-21	Plec, Ephem, Trich	7.1	7.1	6.2	7.7	7.0	0.6
			RG_LIDSL_INV-2	14-Sep-21	Plec, Ephem, Trich	6.2					
			RG_LIDSL_INV-3	14-Sep-21	Plec, Ephem, Trich, Chiron	7.7					
			RG_LIDSL_INV-4	14-Sep-21	Plec, Ephem, Trich, Chiron	6.7					
			RG_LIDSL_INV-5	14-Sep-21	Plec, Ephem, Trich, Chiron	7.5					
			RG_LIDSL_INV-1	29-Nov-21	Rhyac, Para, Plec	5.0	5.4	4.9	6.4	5.6	0.7
			RG_LIDSL_INV-2	29-Nov-21	Plec, Ephem, Para	6.4					
			RG_LIDSL_INV-3	29-Nov-21	Para, Plec, Rhyac	5.4					
			RG_LIDSL_INV-4	29-Nov-21	Plec, Ephem, Para	4.9					
			RG_LIDSL_INV-5	29-Nov-21	Rhyac, Plec, Para	6.3					
		RG_LIDCOM	RG_LIDCOM_INV-1	29-Apr-21	Para, Ephem, Plec	6.6	6.4	6.0	7.1	6.5	0.4
			RG_LIDCOM_INV-2	29-Apr-21	Para, Ephem, Plec	6.2					
			RG_LIDCOM_INV-3	29-Apr-21	Para, Ephem, Plec	6.4					
			RG_LIDCOM_INV-4	29-Apr-21	Para, Ephem, Rhyac	7.1					
			RG_LIDCOM_INV-5	29-Apr-21	Ephem, Para, Plec	6.0					
			RG_LIDCOM_INV-1	12-Jul-21	Ephem, Chiron, Plec	5.1	5.8	5.1	6.0	5.7	0.3
			RG_LIDCOM_INV-2	12-Jul-21	Ephem, Chiron, Rhyac	5.8					
			RG_LIDCOM_INV-3	12-Jul-21	Ephem, Para, Trich	5.6					
			RG_LIDCOM_INV-4	12-Jul-21	Ephem, Para, Trich	5.8					
			RG_LIDCOM_INV-5	12-Jul-21	Ephem, Chiron, Para	6.0					
			RG_LIDCOM_INV-1	13-Sep-21	Plec, Ephem, Trich	6.7	6.7	5.4	8.5	6.9	1.2
			RG_LIDCOM_INV-2	13-Sep-21	Plec, Ephem, Trich	7.4					
			RG_LIDCOM_INV-3	13-Sep-21	Plec, Ephem, Trich	8.5					
			RG_LIDCOM_INV-4	13-Sep-21	Plec, Ephem, Trich	5.4					
			RG_LIDCOM_INV-5	13-Sep-21	Plec, Ephem	6.3					
			RG_LIDCOM_INV-1	2-Dec-21	Para, Rhyac, Plec	5.0	5.0	4.7	6.0	5.2	0.5
			RG_LIDCOM_INV-2	2-Dec-21	Plec, Para, Rhyac	4.8					
			RG_LIDCOM_INV-3	2-Dec-21	Plec, Rhyac, Ephem	6.0					
			RG_LIDCOM_INV-4	2-Dec-21	Plec, Para, Rhyac	4.7					
			RG_LIDCOM_INV-5	2-Dec-21	Plec, Rhyac, Para	5.4					
		RG_LI8	RG_LI8_INV-1	28-Apr-21	Ephem, Plec, Rhyac	6.2	7.0	6.2	7.5	6.9	0.5
			RG_LI8_INV-2	28-Apr-21	Ephem, Plec, Para	7.1					
			RG_LI8_INV-3	28-Apr-21	Ephem, Plec, Para	7.0					
			RG_LI8_INV-4	28-Apr-21	Para, Rhyac, Plec	6.8					
			RG_LI8_INV-5	28-Apr-21	Para, Ephem, Plec	7.5					
			RG_LI8_INV-1	15-Jul-21	Ephem, Rhyac, Plec	7.3	7.3	5.5	8.0	7.0	0.9
			RG_LI8_INV-2	15-Jul-21	Ephem, Rhyac, Chiron	7.3					
			RG_LI8_INV-3	15-Jul-21	Ephem, Rhyac, Plec	6.9					
			RG_LI8_INV-4	15-Jul-21	Ephem, Rhyac, Plec	8.0					
			RG_LI8_INV-5	15-Jul-21	Ephem, Rhyac, Para	5.5					
			RG_LI8_INV-1	11-Sep-21	Plec, Trich, Ephem	9.3	7.4	7.2	9.3	8.0	1.0
			RG_LI8_INV-2	11-Sep-21	Plec, Trich, Ephem	7.4					
			RG_LI8_INV-3	11-Sep-21	Plec, Trich, Ephem	7.2					
			RG_LI8_INV-4	11-Sep-21	Plec, Trich, Ephem	8.8					
			RG_LI8_INV-5	11-Sep-21	Plec, Trich, Ephem	7.2					
			RG_LI8_LUM-1	11-Sep-21	Oligo Only	7.9	NA	NA	NA	NA	NA
			RG_LI8_LUM-2	11-Sep-21	Oligo Only	5.5					
			RG_LI8_LUM-3	11-Sep-21	Oligo Only	7.7					
			RG_LI8_INV-1	2-Dec-21	Plec, Rhyac, Ephem	4.2	6.3	4.2	8.0	6.0	1.7
			RG_LI8_INV-2	2-Dec-21	Rhyac, Plec, Ephem	6.3					
			RG_LI8_INV-3	2-Dec-21	Plec, Ephem, Rhyac	4.5					
			RG_LI8_INV-4	2-Dec-21	Rhyac, Plec, Ephem	8.0					
			RG_LI8_INV-5	2-Dec-21	Plec, Rhyac, Ephem	7.2					
Fording River	Mine-exposed	RG_FRUL	RG_FRUL_INV-1	28-Apr-21	Plec, Ephem, Trich	6.4	7.1	5.5	7.5	6.8	0.9
			RG_FRUL_INV-2	28-Apr-21	Plec, Ephem, Dipt	7.5					
			RG_FRUL_INV-3	28-Apr-21	Plec, Ephem, Trich	7.1					
			RG_FRUL_INV-4	28-Apr-21	Ephem, Plec, Rhyac	5.5					
			RG_FRUL_INV-5	28-Apr-21	Plec, Ephem, Dipt	7.5					
			RG_FRUL_INV-1	14-Jul-21	Plec, Ephem, Dipt	11.0	9.4	7.6	11.0	9.4	1.2
			RG_FRUL_INV-2	14-Jul-21	Plec, Ephem, Nema	9.0					
			RG_FRUL_INV-3	14-Jul-21	Plec, Ephem, Nema	9.4					
			RG_FRUL_INV-4	14-Jul-21	Plec, Ephem, Rhyac	7.6					
			RG_FRUL_INV-5	14-Jul-21	Plec, Ephem, Rhyac	9.8					
			RG_FRUL_INV-1	12-Sep-21	Plec	10.0	10.0	7.2	11.0	9.6	1.4
			RG_FRUL_INV-2	12-Sep-21	Tipul, Plec	10.0					
			RG_FRUL_INV-3	12-Sep-21	Plec, Ephem	7.2					
			RG_FRUL_INV-4	12-Sep-21	Tipul, Plec	9.9					
			RG_FRUL_INV-5	12-Sep-21	Plec, Tipul, Dipt	11.0					
			RG_FRUL_INV-1	29-Nov-21	Plec, Ephem	7.8	7.8	6.2	9.8	7.9	1.3
			RG_FRUL_INV-2	29-Nov-21	Plec, Ephem, Tipul	8.2					
			RG_FRUL_INV-3	29-Nov-21	Plec, Ephem, Tipul	7.4					
			RG_FRUL_INV-4	29-Nov-21	Plec, Tipul, Dipt	9.8					
			RG_FRUL_INV-5	29-Nov-21	Plec, Dipt, Ephem	6.2					
		RG-FO23	RG_FO23_INV-1	28-Apr-21	Ephem, Plec, Rhyac	9.0	6.1	4.5	9.0	6.3	1.7
			RG_FO23_INV-2	28-Apr-21	Ephem, Plec, Trich	6.5					
			RG_FO23_INV-3	28-Apr-21	Plec, Ephem, Rhyac	6.1					
			RG_FO23_INV-4	28-Apr-21	Plec, Ephem, Dipt	4.5					
			RG_FO23_INV-5	28-Apr-21	Plec, Ephem, Trich	5.3					
			RG_FO23_INV-1	14-Jul-21	Plec, Ephem, Rhyac	9.4	8.5	6.9	9.4	8.4	0.9
			RG_FO23_INV-2	14-Jul-21	Plec, Ephem, Rhyac	6.9					
			RG_FO23_INV-3	14-Jul-21	Plec, Ephem, Rhyac	8.3					
			RG_FO23_INV-4	14-Jul-21	Plec, Ephem, Rhyac	8.8					
			RG_FO23_INV-5	14-Jul-21	Plec, Ephem, Rhyac	8.5					
			RG_FO23_INV-1	12-Sep-21	Plec, Ephem	8.1	7.1	5.8	8.1	7.0	0.8
			RG_FO23_INV-2	12-Sep-21	Plec, Ephem, Trich	7.2					
			RG_FO23_INV-3	12-Sep-21	Plec, Ephem, Trich	5.8					
			RG_FO23_INV-4	12-Sep-21	Plec, Ephem	7.0					
			RG_FO23_INV-5	12-Sep-21	Plec, Ephem	7.1					
			RG_FO23_INV-1	1-Dec-21	Plec, Ephem	7.7	7.7	5.5	8.6	7.1	1.3
			RG_FO23_INV-2	1-Dec-21	Ephem, Plec, Rhyac	7.7					
			RG_FO23_INV-3	1-Dec-21	Plec, Ephem, Rhyac	6.2					
			RG_FO23_INV-4	1-Dec-21	Ephem, Plec	8.6					
			RG_FO23_INV-5	1-Dec-21	Plec, Ephem	5.5					

Notes: Abbreviation of taxa was used. Plec = Plecoptera (stonefly). Ephem = Ephemeroptera (mayfly). Trich = Trichoptera (caddisfly). Dipt = Diptera (true flies). Oligo = Oligo (worms). Chiron = Chironomidae (non-biting midge). Tipul = Tipulidae (crane fly). Rhyac = Rhyacophilidae. Para = Parapsyche. Nema = Nematoda. Oligo Only = annelids only samples (which is not included in the analysis of composite-taxa and were collected based on annelids at >5% of the total biomass sample [Golder 2021b]). NA = not applicable.

Table C.2: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations During Each Operational Period[a] at RG_LILC3 Area Relative to the Reference (RG_LI24 and RG_SLINE) Areas

ANOVA Model						
Term		DF	SS[b]	MS[c]	F-Ratio	P-Value
Period		5	1.4	0.28	44	<0.001
CI		1	10	10	1487	<0.001
Period×CI		5	4.5	0.89	140	<0.001
Time(Period)		20	2.1	0.10	16	<0.001
Time(Period)×CI		20	1.7	0.086	13	<0.001
Error		510	-			
Contrasts (P-value and Magnitude of Difference)[d]						
Period 1	**Period 2**				**P-value**	**MOD**
B	AOP (2021_4)				ns	-
	AOP (2021_7)				ns	-
	AOP (2021_9)				ns	-
	AOP (2021_12)				ns	-
AWTF (2016_9)	AOP (2021_4)				<0.001	-9.8 SD
	AOP (2021_7)				<0.001	-12.0 SD
	AOP (2021_9)				<0.001	-9.9 SD
	AOP (2021_12)				<0.001	-12.2 SD
AWTF (2017_4)	AOP (2021_4)				<0.001	-9.7 SD
	AOP (2021_7)				<0.001	-11.9 SD
	AOP (2021_9)				<0.001	-9.8 SD
	AOP (2021_12)				<0.001	-12.1 SD
AWTF (2017_9)	AOP (2021_4)				<0.001	-6.5 SD
	AOP (2021_7)				<0.001	-8.7 SD
	AOP (2021_9)				<0.001	-6.6 SD
	AOP (2021_12)				<0.001	-9.0 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/16 and in an increasing direction

Contrast P-value < 0.1/16 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] Operational periods include: the Before (B), AWTF Operational (AWTF), Initial Operation (IO), Shut Down (SD), Restart (RS), and AWTF with AOP Operational (AOP) Periods.

[b] SS = sum of squares of ANOVA model.

[c] MS = mean sum of squares of ANOVA model.

[d] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.3: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations During Each Operational Period[a] at RG_LISP24 Relative to the Reference (RG_LI24 and RG_SLINE) Areas

ANOVA Model					
Term	DF	SS[b]	MS[c]	F-Ratio	P-Value
Period	3	0.56	0.19	27	<0.001
CI	1	1.4	1.4	208	<0.001
Period×CI	3	1.2	0.40	58	<0.001
Time(Period)	14	1.7	0.12	18	<0.001
Time(Period)×CI	14	0.82	0.058	8	<0.001
Error	373	-			

Contrasts (P-value and Magnitude of Difference)[d]				
Period 1	**Period 2**		**P-value**	**MOD**
AWTF (2017_9)	AOP (2021_4)		<0.001	-5.4 SD
	AOP (2021_7)		<0.001	-7.0 SD
	AOP (2021_9)		<0.001	-5.4 SD
	AOP (2021_12)		<0.001	-7.7 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/4 and in an increasing direction

Contrast P-value < 0.1/4 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] Operational periods include: the Before (B), AWTF Operational (AWTF), Initial Operation (IO), Shut Down (SD), Restart (RS), and AWTF with AOP Operational (AOP) Periods

[b] SS = sum of squares of ANOVA model.

[c] MS = mean sum of squares of ANOVA model.

[d] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.4: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations During Each Operational Period[a] at RG_LIDSL Relative to the Reference (RG_LI24 and RG_SLINE) Areas

ANOVA Model					
Term	DF	SS[b]	MS[c]	F-Ratio	P-Value
Period	5	0.41	0.082	13	<0.001
CI	1	0.89	0.89	140	<0.001
Period×CI	5	2.2	0.43	68	<0.001
Time(Period)	19	2.1	0.11	18	<0.001
Time(Period)×CI	19	1.0	0.050	7.9	<0.001
Error	501	-			
Contrasts (P-value and Magnitude of Difference)[d]					
Period 1	**Period 2**			**P-value**	**MOD**
B	AOP (2021_4)			0.005	-3.8 SD
	AOP (2021_7)			ns	-
	AOP (2021_9)			ns	-
	AOP (2021_12)			0.002	-4.2 SD
AWTF (2016_9)	AOP (2021_4)			<0.001	-8.9 SD
	AOP (2021_7)			<0.001	-8.1 SD
	AOP (2021_9)			<0.001	-7.2 SD
	AOP (2021_12)			<0.001	-9.3 SD
AWTF (2017_4)	AOP (2021_4)			<0.001	-6.4 SD
	AOP (2021_7)			<0.001	-5.6 SD
	AOP (2021_9)			<0.001	-4.7 SD
	AOP (2021_12)			<0.001	-6.8 SD
AWTF (2017_9)	AOP (2021_4)			<0.001	-6.8 SD
	AOP (2021_7)			<0.001	-6.0 SD
	AOP (2021_9)			<0.001	-5.1 SD
	AOP (2021_12)			<0.001	-7.2 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/16 and in an increasing direction

Contrast P-value < 0.1/16 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] Operational periods include: the Before (B), AWTF Operational (AWTF), Initial Operation (IO), Shut Down (SD), Restart (RS), and AWTF with AOP Operational (AOP) Periods

[b] SS = sum of squares of ANOVA model.

[c] MS = mean sum of squares of ANOVA model.

[d] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.5: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations During Each Operational Period[a] at RG_LIDCOM Relative to the Reference (RG_LI24 and RG_SLINE) Areas

ANOVA Model						
Term		DF	SS[b]	MS[c]	F-Ratio	P-Value
Period		3	0.31	0.10	15	<0.001
CI		1	0.68	0.68	101	<0.001
Period×CI		3	0.43	0.14	21	<0.001
Time(Period)		14	1.6	0.11	17	<0.001
Time(Period)×CI		14	1.1	0.079	12	<0.001
Error		373	-			
Contrasts (P-value and Magnitude of Difference)[d]						
Period 1	**Period 2**				**P-value**	**MOD**
AWTF (2017_9)	AOP (2021_4)				<0.001	-3.4 SD
	AOP (2021_7)				<0.001	-4.7 SD
	AOP (2021_9)				<0.001	-3.1 SD
	AOP (2021_12)				<0.001	-5.3 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/4 and in an increasing direction

Contrast P-value < 0.1/4 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] Operational periods include: the Before (B), AWTF Operational (AWTF), Initial Operation (IO), Shut Down (SD), Restart (RS), and AWTF with AOP Operational (AOP) Periods.

[b] SS = sum of squares of ANOVA model.

[c] MS = mean sum of squares of ANOVA model.

[d] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.6: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations During Each Operational Period[a] at RG_LI8 Relative to the Reference (RG_LI24 and RG_SLINE) Areas

ANOVA Model					
Term	DF	SS[b]	MS[c]	F-Ratio	P-Value
Period	5	0.61	0.12	21	<0.001
CI	1	1.4	1.4	236	<0.001
Period×CI	5	1.5	0.29	50	<0.001
Time(Period)	22	2.8	0.13	22	<0.001
Time(Period)×CI	22	0.82	0.037	6.4	<0.001
Error	509	-			

Contrasts (P-value and Magnitude of Difference)[d]				
Period 1	**Period 2**		**P-value**	**MOD**
B	AOP (2021_4)		ns	-
	AOP (2021_7)		ns	-
	AOP (2021_9)		ns	-
	AOP (2021_12)		0.004	-3.9 SD
AWTF (2016_9)	AOP (2021_4)		<0.001	-5.8 SD
	AOP (2021_7)		<0.001	-6.4 SD
	AOP (2021_9)		<0.001	-5.0 SD
	AOP (2021_12)		<0.001	-7.6 SD
AWTF (2017_4)	AOP (2021_4)		<0.001	-3.7 SD
	AOP (2021_7)		<0.001	-4.3 SD
	AOP (2021_9)		<0.001	-2.9 SD
	AOP (2021_12)		<0.001	-5.5 SD
AWTF (2017_9)	AOP (2021_4)		<0.001	-4.4 SD
	AOP (2021_7)		<0.001	-5.0 SD
	AOP (2021_9)		<0.001	-3.6 SD
	AOP (2021_12)		<0.001	-6.2 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/16 and in an increasing direction

Contrast P-value < 0.1/16 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] Operational periods include: the Before (B), AWTF Operational (AWTF), Initial Operation (IO), Shut Down (SD), Restart (RS), and AWTF with AOP Operational (AOP) Periods.

[b] SS = sum of squares of ANOVA model.

[c] MS = mean sum of squares of ANOVA model.

[d] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.7: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations During Each Operational Period[a] at RG_LCUT Area Relative to the Reference (RG_LI24 and RG_SLINE) Areas

ANOVA Model					
Term	DF	SS[b]	MS[c]	F-Ratio	P-Value
Period	3	0.51	0.17	21	<0.001
CI	1	0.0026	0.0026	0.32	0.573
Period×CI	3	0.57	0.19	23	<0.001
Time(Period)	19	2.5	0.13	16	<0.001
Time(Period)×CI	19	2.3	0.12	15	<0.001
Error	482	-			

Contrasts (P-value and Magnitude of Difference)[d]				
Period 1	**Period 2**		**P-value**	**MOD**
AWTF (2016_9)	AOP (2021_4)		ns	-
	AOP (2021_7)		<0.001	-5.0 SD
	AOP (2021_9)		ns	-
	AOP (2021_12)		<0.001	-5.7 SD
AWTF (2017_4)	AOP (2021_4)		ns	-
	AOP (2021_7)		<0.001	-4.9 SD
	AOP (2021_9)		0.002	-2.2 SD
	AOP (2021_12)		<0.001	-5.5 SD
AWTF (2017_9)	AOP (2021_4)		ns	-
	AOP (2021_7)		<0.001	-3.7 SD
	AOP (2021_9)		ns	-
	AOP (2021_12)		<0.001	-4.4 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/12 and in an increasing direction

Contrast P-value < 0.1/12 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] Operational periods include: the Before (B), AWTF Operational (AWTF), Initial Operation (IO), Shut Down (SD), Restart (RS), and AWTF with AOP Operational (AOP) Periods.

[b] SS = sum of squares of ANOVA model.

[c] MS = mean sum of squares of ANOVA model.

[d] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.8: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations at RG_LILC3 Within 2021 Relative to the Reference Areas (RG_LI24 and RG_SLINE)

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	P-Value
Period	5	1.4	0.28	44	<0.001
CI	1	10	10	1487	<0.001
Period×CI	5	4.5	0.89	140	<0.001
Time(Period)	20	2.1	0.10	16	<0.001
Time(Period)×CI	20	1.7	0.086	13	<0.001
Error	510	-			

Contrasts (P-value and Magnitude of Difference)[c]				
Period 1	**Period 2**		**P-value**	**MOD**
2021_4	2021_7		0.004	-2.3 SD
	2021_9		ns	-
	2021_12		0.001	-2.5 SD
2021_7	2021_9		0.007	2.1 SD
	2021_12		ns	-
2021_9	2021_12		0.003	-2.3 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/6 and in an increasing direction

Contrast P-value < 0.1/6 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] SS = sum of squares of ANOVA model.

[b] MS = mean sum of squares of ANOVA model.

[c] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.9: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations at RG_LISP24 Within 2021 Relative to the Reference Areas (RG_LI24 and RG_SLINE)

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	P-Value
Period	3	0.56	0.19	27	<0.001
CI	1	1.4	1.4	208	<0.001
Period×CI	3	1.2	0.40	58	<0.001
Time(Period)	14	1.7	0.12	18	<0.001
Time(Period)×CI	14	0.82	0.058	8	<0.001
Error	373	-			
Contrasts (P-value and Magnitude of Difference)[c]					
Period 1	**Period 2**			**P-value**	**MOD**
2021_4	2021_7			ns	-
	2021_9			ns	-
	2021_12			0.004	-2.2 SD
2021_7	2021_9			ns	-
	2021_12			ns	-
2021_9	2021_12			0.004	-2.2 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/6 and in an increasing direction

Contrast P-value < 0.1/6 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3rd, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] SS = sum of squares of ANOVA model.

[b] MS = mean sum of squares of ANOVA model.

[c] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.10: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations at RG_LIDSL Within 2021 Relative to the Reference Areas (RG_LI24 and RG_SLINE)

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	P-Value
Period	5	0.41	0.082	13	<0.001
CI	1	0.89	0.89	140	<0.001
Period×CI	5	2.2	0.43	68	<0.001
Time(Period)	19	2.1	0.11	18	<0.001
Time(Period)×CI	19	1.0	0.050	7.9	<0.001
Error	501	-			
Contrasts (P-value and Magnitude of Difference)[c]					
Period 1	**Period 2**			**P-value**	**MOD**
2021_4	2021_7			ns	-
	2021_9			ns	-
	2021_12			ns	-
2021_7	2021_9			ns	-
	2021_12			ns	-
2021_9	2021_12			0.007	-2.1 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/6 and in an increasing direction

Contrast P-value < 0.1/6 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] SS = sum of squares of ANOVA model.

[b] MS = mean sum of squares of ANOVA model.

[c] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.11: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations at RG_LIDCOM Within 2021 Relative to the Reference Areas (RG_LI24 and RG_SLINE)

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	P-Value
Period	3	0.31	0.10	15	<0.001
CI	1	0.68	0.68	101	<0.001
Period×CI	3	0.43	0.14	21	<0.001
Time(Period)	14	1.6	0.11	17	<0.001
Time(Period)×CI	14	1.1	0.079	12	<0.001
Error	373	-			
Contrasts (P-value and Magnitude of Difference)[c]					
Period 1	**Period 2**			**P-value**	**MOD**
2021_4	2021_7			ns	-
	2021_9			ns	-
	2021_12			0.011	-2.0 SD
2021_7	2021_9			ns	-
	2021_12			ns	-
2021_9	2021_12			0.004	-2.3 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/6 and in an increasing direction

Contrast P-value < 0.1/6 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] SS = sum of squares of ANOVA model.

[b] MS = mean sum of squares of ANOVA model.

[c] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.12: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations at RG_LI8 Within 2021 Relative to the Reference Areas (RG_LI24 and RG_SLINE)

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	P-Value
Period	5	0.61	0.12	21	<0.001
CI	1	1.4	1.4	236	<0.001
Period×CI	5	1.5	0.29	50	<0.001
Time(Period)	22	2.8	0.13	22	<0.001
Time(Period)×CI	22	0.82	0.037	6.4	<0.001
Error	509	-			
Contrasts (P-value and Magnitude of Difference)[c]					
Period 1	**Period 2**			**P-value**	**MOD**
2021_4	2021_7			ns	-
	2021_9			ns	-
	2021_12			ns	-
2021_7	2021_9			ns	-
	2021_12			ns	-
2021_9	2021_12			<0.001	-2.6 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/6 and in an increasing direction

Contrast P-value < 0.1/6 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] SS = sum of squares of ANOVA model.

[b] MS = mean sum of squares of ANOVA model.

[c] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.13: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations at RG_LCUT Within 2021 Relative to the Reference Areas (RG_LI24 and RG_SLINE)

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	P-Value
Period	3	0.51	0.17	21	<0.001
CI	1	0.0026	0.0026	0.32	0.573
Period×CI	3	0.57	0.19	23	<0.001
Time(Period)	19	2.5	0.13	16	<0.001
Time(Period)×CI	19	2.3	0.12	15	<0.001
Error	482	-			

Contrasts (P-value and Magnitude of Difference)[c]				
Period 1	**Period 2**		**P-value**	**MOD**
2021_4	2021_7		<0.001	-3.3 SD
	2021_9		ns	-
	2021_12		<0.001	-4.0 SD
2021_7	2021_9		<0.001	2.7 SD
	2021_12		ns	-
2021_9	2021_12		<0.001	-3.4 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/6 and in an increasing direction

Contrast P-value < 0.1/6 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] SS = sum of squares of ANOVA model.

[b] MS = mean sum of squares of ANOVA model.

[c] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.14: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations at RG_LILC3 Within the AWTF with AOP Operational Period Relative to the Reference Areas (RG_LI24 and RG_SLINE)

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	P-Value
Period	5	1.4	0.28	44	<0.001
CI	1	10	10	1487	<0.001
Period×CI	5	4.5	0.89	140	<0.001
Time(Period)	20	2.1	0.10	16	<0.001
Time(Period)×CI	20	1.7	0.086	13	<0.001
Error	510	-			

Contrasts (P-value and Magnitude of Difference)[c]				
Period 1	**Period 2**		**P-value**	**MOD**
2019_4	2020_4		ns	-
	2021_4		ns	-
2020_4	2021_4		ns	-
2019_7	2020_7		ns	-
	2021_7		ns	-
2020_7	2021_7		ns	-
2019_9	2020_9		ns	-
	2021_9		ns	-
2020_9	2021_9		ns	-
2019_12	2020_12		<0.001	-3.8 SD
	2021_12		<0.001	-5.5 SD
2020_12	2021_12		ns	-

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/12 and in an increasing direction

Contrast P-value < 0.1/12 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] SS = sum of squares of ANOVA model.

[b] MS = mean sum of squares of ANOVA model.

[c] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.15: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations at RG_LISP24 Within the AWTF with AOP Operational Period Relative to the Reference Areas (RG_LI24 and RG_SLINE)

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	P-Value
Period	3	0.56	0.19	27	<0.001
CI	1	1.4	1.4	208	<0.001
Period×CI	3	1.2	0.40	58	<0.001
Time(Period)	14	1.7	0.12	18	<0.001
Time(Period)×CI	14	0.82	0.058	8	<0.001
Error	373	-			

Contrasts (P-value and Magnitude of Difference)[c]				
Period 1	**Period 2**		**P-value**	**MOD**
2019_4	2020_4		ns	-
	2021_4		ns	-
2020_4	2021_4		ns	-
2020_7	2021_7		ns	-
2019_9	2020_9		ns	-
	2021_9		ns	-
2020_9	2021_9		ns	-
2019_12	2020_12		<0.001	-2.6 SD
	2021_12		<0.001	-5.0 SD
2020_12	2021_12		0.002	-2.4 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/10 and in an increasing direction

Contrast P-value < 0.1/10 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3rd, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] SS = sum of squares of ANOVA model.

[b] MS = mean sum of squares of ANOVA model.

[c] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.16: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations at RG_LIDSL Within the AWTF with AOP Operational Period Relative to the Reference Areas (RG_LI24 and RG_SLINE)

ANOVA Model						
Term		DF	SS[a]	MS[b]	F-Ratio	P-Value
Period		5	0.41	0.082	13	<0.001
CI		1	0.89	0.89	140	<0.001
Period×CI		5	2.2	0.43	68	<0.001
Time(Period)		19	2.1	0.11	18	<0.001
Time(Period)×CI		19	1.0	0.050	7.9	<0.001
Error		501	-			
Contrasts (P-value and Magnitude of Difference)[c]						
Period 1	**Period 2**				**P-value**	**MOD**
2019_4	2020_4				ns	-
	2021_4				ns	-
2020_4	2021_4				ns	-
2019_7	2020_7				ns	-
	2021_7				ns	-
2020_7	2021_7				ns	-
2019_9	2020_9				ns	-
	2021_9				ns	-
2020_9	2021_9				ns	-
2019_12	2020_12				<0.001	-3.5 SD
	2021_12				<0.001	-4.1 SD
2020_12	2021_12				ns	-

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/12 and in an increasing direction

Contrast P-value < 0.1/12 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] SS = sum of squares of ANOVA model.

[b] MS = mean sum of squares of ANOVA model.

[c] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.17: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations at RG_LIDCOM Within the AWTF with AOP Operational Period Relative to the Reference Areas (RG_LI24 and RG_SLINE)

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	P-Value
Period	3	0.31	0.10	15	<0.001
CI	1	0.68	0.68	101	<0.001
Period×CI	3	0.43	0.14	21	<0.001
Time(Period)	14	1.6	0.11	17	<0.001
Time(Period)×CI	14	1.1	0.079	12	<0.001
Error	373	-			

Contrasts (P-value and Magnitude of Difference)[c]				
Period 1	**Period 2**		**P-value**	**MOD**
2019_4	2020_4		0.007	-1.5 SD
	2021_4		ns	-
2020_4	2021_4		ns	-
2019_7	2020_7		ns	-
	2021_7		ns	-
2020_7	2021_7		ns	-
2019_9	2020_9		ns	-
	2021_9		ns	-
2020_9	2021_9		ns	-
2019_12	2020_12		<0.001	-4.0 SD
	2021_12		<0.001	-5.0 SD
2020_12	2021_12		ns	-

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/12 and in an increasing direction

Contrast P-value < 0.1/12 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] SS = sum of squares of ANOVA model.

[b] MS = mean sum of squares of ANOVA model.

[c] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.18: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations at RG_LI8 Within the AWTF with AOP Operational Period Relative to the Reference Areas (RG_LI24 and RG_SLINE)

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	P-Value
Period	5	0.61	0.12	21	<0.001
CI	1	1.4	1.4	236	<0.001
Period×CI	5	1.5	0.29	50	<0.001
Time(Period)	22	2.8	0.13	22	<0.001
Time(Period)×CI	22	0.82	0.037	6.4	<0.001
Error	509	-			

Contrasts (P-value and Magnitude of Difference)[c]				
Period 1	**Period 2**		**P-value**	**MOD**
2019_4	2020_4		ns	-
	2021_4		ns	-
2020_4	2021_4		ns	-
2019_7	2020_7		ns	-
	2021_7		ns	-
2020_7	2021_7		ns	-
2019_9	2020_9		ns	-
	2021_9		ns	-
2020_9	2021_9		ns	-
2019_12	2020_12		ns	-
	2021_12		<0.001	-3.4 SD
2020_12	2021_12		0.006	-2.1 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/12 and in an increasing direction

Contrast P-value < 0.1/12 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] SS = sum of squares of ANOVA model.

[b] MS = mean sum of squares of ANOVA model.

[c] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.19: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations at RG_FO23 Within the AWTF with AOP Operational Period Relative to the Reference Areas (RG_LI24 and RG_SLINE)

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	P-Value
Period	4	0.38	0.094	13	<0.001
CI	1	2.2	2.2	303	<0.001
Period×CI	4	0.61	0.15	21	<0.001
Time(Period)	17	1.8	0.11	14	<0.001
Time(Period)×CI	17	1.2	0.072	10	<0.001
Error	403	-			

Contrasts (P-value and Magnitude of Difference)[c]				
Period 1	**Period 2**		**P-value**	**MOD**
2019_4	2020_4		ns	-
	2021_4		ns	-
2020_4	2021_4		ns	-
2020_7	2021_7		ns	-
2019_9	2020_9		0.007	-1.8 SD
	2021_9		0.003	-2.0 SD
2020_9	2021_9		ns	-
2019_12	2020_12		<0.001	-3.6 SD
	2021_12		<0.001	-4.4 SD
2020_12	2021_12		ns	-

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/10 and in an increasing direction

Contrast P-value < 0.1/10 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] SS = sum of squares of ANOVA model.

[b] MS = mean sum of squares of ANOVA model.

[c] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.20: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations at RG_LCUT Within the AWTF with AOP Operational Period Relative to the Reference Areas (RG_LI24 and RG_SLINE)

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	P-Value
Period	3	0.51	0.17	21	<0.001
CI	1	0.0026	0.0026	0.32	0.573
Period×CI	3	0.57	0.19	23	<0.001
Time(Period)	19	2.5	0.13	16	<0.001
Time(Period)×CI	19	2.3	0.12	15	<0.001
Error	482	-			

Contrasts (P-value and Magnitude of Difference)[c]				
Period 1	**Period 2**		**P-value**	**MOD**
2019_4	2020_4		ns	-
	2021_4		ns	-
2020_4	2021_4		ns	-
2019_7	2020_7		ns	-
	2021_7		ns	-
2020_7	2021_7		ns	-
2019_9	2020_9		ns	-
	2021_9		0.004	-2.0 SD
2020_9	2021_9		ns	-
2019_12	2020_12		<0.001	-2.5 SD
	2021_12		<0.001	-5.4 SD
2020_12	2021_12		<0.001	-2.9 SD

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/12 and in an increasing direction

Contrast P-value < 0.1/12 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] SS = sum of squares of ANOVA model.

[b] MS = mean sum of squares of ANOVA model.

[c] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.21: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations at RG_FO23 Within 2021 Relative to RG_FRUL (Upstream of Line Creek)

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	P-Value
Period	4	0.24	0.059	12	<0.001
CI	1	0.23	0.23	48	<0.001
Period×CI	4	0.095	0.024	5	<0.001
Time(Period)	16	1.1	0.072	15	<0.001
Time(Period)×CI	16	0.29	0.018	4	<0.001
Error	300	-			

Contrasts (P-value and Magnitude of Difference)[c]				
Period 1	**Period 2**		**P-value**	**MOD**
2021_4	2021_7		ns	-
	2021_9		ns	-
	2021_12		ns	-
2021_7	2021_9		ns	-
	2021_12		ns	-
2021_9	2021_12		ns	-

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/6 and in an increasing direction

Contrast P-value < 0.1/6 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3rd, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] SS = sum of squares of ANOVA model.

[b] MS = mean sum of squares of ANOVA model.

[c] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.22: Results Table for the Asymmetric 2-way ANOVA Model Comparing Benthic Invertebrate Selenium Concentrations During Each Operational Period[a] at RG_FO23 (Downstream of Line Creek) Relative to RG_FRUL (Upstream of Line Creek)

ANOVA Model					
Term	DF	SS[b]	MS[c]	F-Ratio	P-Value
Period	4	0.24	0.059	12	<0.001
CI	1	0.23	0.23	48	<0.001
Period×CI	4	0.095	0.024	5	<0.001
Time(Period)	16	1.1	0.072	15	<0.001
Time(Period)×CI	16	0.29	0.018	4	<0.001
Error	300	-			
Contrasts (P-value and Magnitude of Difference)[d]					
Period 1	**Period 2**			**P-value**	**MOD**
B	AOP (2021_4)			ns	-
	AOP (2021_7)			ns	-
	AOP (2021_9)			ns	-
	AOP (2021_12)			ns	-
AWTF (2017_4)	AOP (2021_4)			ns	-
	AOP (2021_7)			ns	-
	AOP (2021_9)			ns	-
	AOP (2021_12)			ns	-
AWTF (2017_9)	AOP (2021_4)			ns	-
	AOP (2021_7)			ns	-
	AOP (2021_9)			0.002	-2.4 SD
	AOP (2021_12)			ns	-

P-value for **Period×CI** or **Time(Period)×CI** factors < 0.1

Contrast P-value < 0.1/12 and in an increasing direction

Contrast P-value < 0.1/12 and in a decreasing direction

Notes: "-" = not relevant. Selenium results from RG_LI24 collected on May 3rd, 2018 were excluded from the analyses because these were identified as anomalous, and likely the result of a field error.

[a] Operational periods include: the Before (B), AWTF Operational (AWTF), Initial Operation (IO), Shut Down (SD), Restart (RS), and AWTF with AOP Operational (AOP) Periods.

[b] SS = sum of squares of ANOVA model.

[c] MS = mean sum of squares of ANOVA model.

[d] Magnitude of difference (MOD) was calculated as the difference in period 2 - difference in period 1/pooled standard deviation (SD).

Table C.23: ANOVA Comparison of Benthic Tissue Concentrations at Among Years Before and After at Lab Change at RG_SLINE, 2017 to 2021

ANOVA		Month	Magnitude of Differences from Base Year[a]					Differences Among Years[b]				
			Before			After		Before			After	
			2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Term	**P-value**	April	Base Year	**33**	**41**	**84**	**56**	C	B	B	A	AB
Year	<0.001	July	-	-	Base Year	7.8	24	-	-	A	A	A
Month	<0.001	September	Base Year	**36**	5.5	32	**49**	B	A	B	AB	A
Year x Month	<0.001	December	-	Base Year	**-36**	**73**	**84**	-	B	C	A	A

Relevant p-value < 0.05
> 20% Decrease in concentration
> 33% Decrease in concentration
> 43% Decrease in concentration
> 50% Decrease in concentration
> 25% Increase in concentration
> 50% Increase in concentration
> 75% Increase in concentration
> 100% Increase in concentration
***Bold** Significant increase or decrease from base year (α = 0.05)

Note: "-" = no data.

[a] Magnitude of difference calculated as ($Year_i$ - Base Year)/Base Year x 100% with the significance of the comparison determined using a Tukey's Honestly Significant Difference (HSD) test.

[b] Years that do not share a letter were identified as being significantly different in a Tukey's HSD test (α = 0.05).

Table C.24: Dominant Taxa in Composite-Taxa Tissue Samples Collected at RG_SLINE, 2014 to 2021[a]

Year	April	July	September[b]	December
2014	-	-	-	-
2015	-	-	-	-
2016	-	-	-	-
2017	-	-	-	-
2018	-	-	Trichoptera, Plecoptera	Plecoptera, Trichoptera
2019	Plecoptera, Trichoptera, Ephemeroptera	-	Trichoptera, Plecoptera	-
2020	Plecoptera, Trichoptera, Ephemeroptera	-	Trichoptera, Ephemeroptera, Plecoptera	Plecoptera, Ephemeroptera, Trichoptera
2021	Ephemeroptera, Plecoptera, Trichoptera	Ephemeroptera, Trichoptera, Plecoptera	Plecoptera, Ephemeroptera, Trichoptera	Plecoptera, Trichoptera, Ephemeroptera

Note: "-" indicates no data available.

[a] Dominant taxa were assessed using visual estimates of biomass. Taxa in table represent a summary of taxa dominance across stations.

[b] September sampling for composite-taxa tissue was sampled concurrently with Hess sampling (see Table C.23).

Table C.25: Biomass of Major Taxonomic Groups Over Time at RG_SLINE, 2014 to 2021[a]

Year	Hess Sample Biomass							
	Ephemeroptera		Plecoptera		Trichoptera		Diptera	
	Median Biomass (g/m^2)	Median % of Total Biomass	Median Biomass (g/m^2)	Median % of Total Biomass	Median Biomass (g/m^2)	Median % of Total Biomass	Median Biomass (g/m^2)	Median % of Total Biomass
2014	1.83	44.1	1.25	25.6	0.578	16.8	0.360	10.4
2015	2.84	29.7	3.86	41.0	1.41	17.4	0.724	5.57
2016	1.51	31.8	1.43	25.4	1.26	27.8	0.624	11.8
2017	1.57	32.3	2.28	23.5	3.64	35.3	0.327	4.39
2018	2.25	16.1	1.42	22.7	2.17	22.1	0.304	8.52
2019	2.56	36.9	2.00	24.4	1.47	17.9	0.550	8.48
2020	3.56	35.4	1.54	21.8	2.62	30.4	0.373	9.56
2021	2.19	23.4	4.03	40.0	1.50	15.1	0.440	8.28

[a] Biomass samples were collected in September.

Table C.26: Physical Measures and Tissue Selenium Concentrations for Westslope Cutthroat Trout Sampled from Line Creek, 2001 to 2021

AWTF Operation Phase	Waterbody	Area	Year	Capture Location UTM (NAD83, 11U)		Study	Processing Date	Fish ID	Total Length	Fork Length	Body Weight	Sex[a]	Age	Tissue Selenium (mg/kg dw)				Recorded Deformities (DELT)[d]
				Easting	Northing				(cm)	(cm)	(g)			Muscle	Ovary	Egg[b]	Estimated Ovary[c]	
Prior to AWTF Operation	Line Creek	RG_LI8	2001	654480	5529034	Golder 2005	Apr-2001	L1-1	-	34.0	530	M	5	9.2	-	-	-	-
		RG_LI8	2001	654480	5529034		Apr-2001	L1-2	-	32.0	475	M	3	8.1	-	-	-	-
		RG_LI8	2001	654480	5529034		Apr-2001	L1-4	-	34.6	680	M	4	8.5	-	-	-	-
		RG_LI8	2001	654480	5529034		Apr-2001	L1-3	-	36.1	725	F	4	8.4	15	-	-	-
		RG_LI8	2001	654480	5529034		Apr-2001	L1-5	-	32.9	550	F	4	9.8	16	-	-	-
		RG_LI8	2001	654480	5529034		Apr-2001	L1-6	-	32.5	500	F	5	8.5	16	-	-	-
		RG_LI8	2002	654480	5529034		Apr-2002	LN-1	-	38.5	780	M	7	8.0	-	-	-	-
		RG_LI8	2002	654480	5529034		Apr-2002	LN-2	-	39.0	750	F	7	16	20	-	-	-
		RG_LI8	2002	654480	5529034		Apr-2002	LN-3	-	34.7	615	F	5	7.0	14	-	-	-
		RG_LI8	2002	654480	5529034		Apr-2002	LN-4	-	32.5	480	F	6	8.0	19	-	-	-
		RG_LI8	2002	654480	5529034		Apr-2002	LN-5	-	34.5	550	F	7	7.0	14	-	-	-
		RG_LI8	2002	654480	5529034		Apr-2002	LN-6	-	37.8	785	F	6	7.0	14	-	-	-
		RG_LI8	2002	654480	5529034		Apr-2002	LN-7	-	38.5	850	F	7	9.0	16	-	-	-
		RG_LI8	2002	654480	5529034		Apr-2002	LN-8	-	33.6	525	F	6	7.0	13	-	-	-
		RG_LI8	2002	654480	5529034		Apr-2002	LN-9	-	30.1	400	F	5	7.0	14	-	-	-
		RG_LI8	2002	654480	5529034		Apr-2002	LN-10	-	37.8	675	F	6	8.0	14	-	-	-
		RG_LIDSL	2003	659281	5530548	Minnow 2004	Jul-2003	LC-CT1	-	39.1	800	M	6	7.2	-	-	-	-
		RG_LIDSL	2003	659281	5530548		Jul-2003	LC-CT2	-	34.8	700	F	4	6.4	-	-	10	-
		RG_LIDSL	2003	659281	5530548		Jul-2003	LC-CT3	-	31.5	470	F	4	7.4	-	-	12	-
		RG_LI8	2006	657406	5529218	Minnow et al. 2007	Apr-2006	LI8001	-	30.6	435	F	5	7.9	11	-	-	-
		RG_LI8	2006	657406	5529218		Apr-2006	LI8002	-	31.7	427	F	5	7.7	11	-	-	-
		RG_LI8	2006	657406	5529218		Apr-2006	LI8003	-	27.4	288	F	5	7.4	21	-	-	-
		RG_LI8	2006	657406	5529218		Apr-2006	LI8004	-	21.4	132	F	6	15	11	-	-	-
		RG_LI8	2006	657406	5529218		Apr-2006	LI8005	-	20.5	117	F	5	13	15	-	-	-

Muscle selenium concentration exceeding the site-specific benchmark for WCT of 15.5 mg/kg dw (Nautilus and Interior Reforestation 2011).

Ovary selenium concentration exceeding the Level 1 site-specific benchmark (equivalent of EC_{10}) for WCT of 25 mg/kg dw (Elk Valley Water Quality Plan; Golder 2014).

Ovary selenium concentration exceeding the Level 2 site-specific benchmark (equivalent of EC_{20}) for WCT of 27 mg/kg dw (Elk Valley Water Quality Plan; Golder 2014).

Ovary selenium concentration exceeding the Level 3 site-specific benchmark (equivalent of EC_{50}) for WCT of 33 mg/kg dw (Elk Valley Water Quality Plan; Golder 2014).

Notes: "-" = no data recorded; AWTF = Active Water Treatment Facility; LCO = Line Creek Operations; LAEMP = Local Aquatic Effects Monitoring Program; AOP = Advanced Oxidation Process.

[a] F = female; M = male; U = unknown (sex of fish could not be determined, either because fish was not sufficiently mature or samples were collected non-lethally and sex could not be determined based on non-lethal evaluation of physical characteristics).

[b] Ripe egg tissue was collected from one individual sampled non-lethally in 2019. Although westslope cutthroat trout spawn in the spring, this female released ripe eggs with minimal abdominal pressure during the collection of physical measures (length and weight).

[c] Ovary concentrations were estimated from muscle selenium concentrations based on the average ovary-to-muscle concentration relationship of 1.6:1 presented by Nautilus and Interior Reforestation (2011). Ovary selenium was estimated only for individuals lacking measured egg/ovary concentrations (if female) or if sex was unknown.

[d] DELT = Deformities, erosions, lesions, tumors. - = DELT observations were not recorded. DELT observations were initiated in 2017 following the start of AWTF operation.

Table C.26: Physical Measures and Tissue Selenium Concentrations for Westslope Cutthroat Trout Sampled from Line Creek, 2001 to 2021

AWTF Operation Phase	Waterbody	Area	Year	Capture Location UTM (NAD83, 11U)		Study	Processing Date	Fish ID	Total Length	Fork Length	Body Weight	Sex[a]	Age	Tissue Selenium (mg/kg dw)				Recorded Deformities (DELT)[d]
				Easting	Northing				(cm)	(cm)	(g)			Muscle	Ovary	Egg[b]	Estimated Ovary[c]	
Prior to AWTF Operation	Line Creek	RG_LI8	2009	657406	5529218	Minnow et al. 2011	Sep-2009	LI8a	-	30.5	435	F	5	12	-	-	18	-
		RG_LI8	2009	657406	5529218		Sep-2009	LI8b	-	28.8	327	F	6	11	-	-	17	-
		RG_LI8	2009	657406	5529218		Sep-2009	LI8c	-	22.1	184	F	6	11	-	-	18	-
		RG_LI8	2009	657406	5529218		Sep-2009	LI8d	-	21.2	112	F	4	14	-	-	22	-
		RG_LI8	2009	657406	5529218		Sep-2009	LI8e	-	21.3	132	F	4	13	-	-	21	-
		RG_LILC3	2012	660085	5532021	Minnow 2014	24-May-12	LILC3-WCT1	-	21.1	135	F	-	10	-	-	16	-
		RG_LILC3	2012	660085	5532021		24-May-12	LILC3-WCT2	-	18.2	63	U	-	7.2	-	-	12	-
		RG_LILC3	2012	660085	5532021		24-May-12	LILC3-WCT3	-	18.0	58	U	-	9.2	-	-	15	-
		RG_LILC3	2012	660085	5532021		24-May-12	LILC3-WCT4	-	17.7	57	U	-	6.8	-	-	11	-
		RG_LILC3	2012	660085	5532021		1-Jun-12	LILC3-WCT5	-	20.0	79	M	-	6.6	-	-	-	-
AWTF Operation	Line Creek	RG_LI8	2017	655320	5529059	2017 LCO LAEMP (Minnow 2018b)	7-Sep-17	LI8-WCT-01	36.7	35.1	645	U	-	6.9	-	-	11	none
		RG_LI8	2017	655320	5529059		7-Sep-17	LI8-WCT-02	44.6	42.8	1,005	U	-	7.8	-	-	12	slight jaw malformation
		RG_LI8	2017	655320	5529059		7-Sep-17	LI8-WCT-03	32.1	30.4	382	U	-	7.8	-	-	12	none
		RG_LI8	2017	655320	5529059		8-Sep-17	LI8-WCT-04	40.1	38.7	750	U	-	7.8	-	-	12	bite on stomach from another fish
		RG_LI8	2017	655320	5529059		8-Sep-17	LI8-WCT-05	31.7	30.5	355	U	-	8.6	-	-	14	none
		RG_LIDCOM	2017	658185	5529820		28-Apr-17	LIDCOM-WCT-01	36.5	35.5	570	U	-	12	-	-	20	none
		RG_LIDSL	2017	659293	5530590		26-Apr-17	LIDSL-WCT-01	27.0	26.5	220	U	-	25	-	-	40	none
		RG_LIDSL	2017	659293	5530590		8-Sep-17	LIDSL-WCT-01	41.4	39.8	885	U	-	34	-	-	54	none
		RG_LILC3	2017	659892	5531560		8-Sep-17	LILC3-WCT-02	30.7	29.4	345	U	-	26	-	-	42	bite marks from another fish
		RG_LILC3	2017	659892	5531560		8-Sep-17	LILC3-WCT-03	26.2	25.3	230	U	-	14	-	-	22	none
		RG_LILC3	2017	659892	5531560		8-Sep-17	LILC3-WCT-04	27.4	26.2	230	U	-	24	-	-	38	none
		RG_LILC3	2017	659892	5531560		8-Sep-17	LILC3-WCT-05	23.4	22.2	122	U	-	42	-	-	67	none

Muscle selenium concentration exceeding the site-specific benchmark for WCT of 15.5 mg/kg dw (Nautilus and Interior Reforestation 2011).

Ovary selenium concentration exceeding the Level 1 site-specific benchmark (equivalent of EC_{10}) for WCT of 25 mg/kg dw (Elk Valley Water Quality Plan; Golder 2014).

Ovary selenium concentration exceeding the Level 2 site-specific benchmark (equivalent of EC_{20}) for WCT of 27 mg/kg dw (Elk Valley Water Quality Plan; Golder 2014).

Ovary selenium concentration exceeding the Level 3 site-specific benchmark (equivalent of EC_{50}) for WCT of 33 mg/kg dw (Elk Valley Water Quality Plan; Golder 2014).

Notes: "-" = no data recorded; AWTF = Active Water Treatment Facility; LCO = Line Creek Operations; LAEMP = Local Aquatic Effects Monitoring Program; AOP = Advanced Oxidation Process.

[a] F = female; M = male; U = unknown (sex of fish could not be determined, either because fish was not sufficiently mature or samples were collected non-lethally and sex could not be determined based on non-lethal evaluation of physical characteristics).

[b] Ripe egg tissue was collected from one individual sampled non-lethally in 2019. Although westslope cutthroat trout spawn in the spring, this female released ripe eggs with minimal abdominal pressure during the collection of physical measures (length and weight).

[c] Ovary concentrations were estimated from muscle selenium concentrations based on the average ovary-to-muscle concentration relationship of 1.6:1 presented by Nautilus and Interior Reforestation (2011). Ovary selenium was estimated only for individuals lacking measured egg/ovary concentrations (if female) or if sex was unknown.

[d] DELT = Deformities, erosions, lesions, tumors. - = DELT observations were not recorded. DELT observations were initiated in 2017 following the start of AWTF operation.

Table C.26: Physical Measures and Tissue Selenium Concentrations for Westslope Cutthroat Trout Sampled from Line Creek, 2001 to 2021

AWTF Operation Phase	Waterbody	Area	Year	Capture Location UTM (NAD83, 11U)		Study	Processing Date	Fish ID	Total Length	Fork Length	Body Weight	Sex[a]	Age	Tissue Selenium (mg/kg dw)				Recorded Deformities (DELT)[d]
				Easting	Northing				(cm)	(cm)	(g)			Muscle	Ovary	Egg[b]	Estimated Ovary[c]	
AWTF Shutdown	Line Creek	RG_LIDCOM	2018	658135	5529841	2018 LCO LAEMP (Minnow 2019a)	30-Apr-18	LIDCOM-WCT-01	35.2	34.6	450	U	-	14	-	-	22	-
		RG_LIDSL	2018	659232	5530500		20-Aug-18	RG_LIDSL_WCT-2-M_20180820	-	17.8	83	U	-	11	-	-	18	none
		Mid-Canyon	2018	656825	5529140		21-Aug-18	RG_LI8_WCT-2-M_20180821	-	19.5	99	U	-	7.9	-	-	13	none
		Mid-Canyon	2018	656825	5529140		21-Aug-18	RG_LI8_WCT-3-M_20180821	-	30.3	315	U	-	8.7	-	-	14	none
		Mid-Canyon	2018	656825	5529140		21-Aug-18	RG_LI8_WCT-4-M_20180821	-	32.0	414	U	-	9.8	-	-	16	none
		Mid-Canyon	2018	656825	5529140		21-Aug-18	RG_LI8_WCT-5-M_20180821	-	24.6	182	U	-	8.8	-	-	14	none
		RG_LIDCOM	2018	658185	5529798		12-Sep-18	RG_LIDCOM_WCT-1-M_20180912	30.4	29.1	345	U	-	25	-	-	40	none
		RG_LI8	2018	654584	5529020		12-Sep-18	RG_LI8_WCT-1-M_20180912	26.2	24.9	210	U	-	9.5	-	-	15	none
	Fording River	RG_FO23	2018	652956	5528903		05-Sep-18	RG_FO23_WCT-1-M_20180905	40.0	38.5	710	U	-	10	-	-	16	none
		RG_FO23	2018	652956	5528903		05-Sep-18	RG_FO23_WCT-2-M_20180905	41.4	38.8	730	U	-	7.2	-	-	12	angling scarring around mouth
		RG_FO23	2018	652956	5528903		05-Sep-18	RG_FO23_WCT-3-M_20180905	34.9	33.4	455	U	-	7.0	-	-	11	none
		RG_FO23	2018	652956	5528903		05-Sep-18	RG_FO23_WCT-4-M_20180905	32.4	30.3	310	U	-	9.5	-	-	15	none
		RG_FO23	2018	652956	5528903		05-Sep-18	RG_FO23_WCT-5-M_20180905	22.7	21.5	121	U	-	7.5	-	-	12	none
		RG_FO23	2018	652874	5528402		05-Sep-18	RG_FO23_WCT-6-M_20180905	42.0	40.2	750	U	-	9.0	-	-	14	none
		RG_FO23	2018	652874	5528402		05-Sep-18	RG_FO23_WCT-7-M_20180905	33.2	31.4	385	U	-	6.0	-	-	10	scarring around mouth
		RG_FO23	2018	652874	5528402		05-Sep-18	RG_FO23_WCT-8-M_20180905	30.8	29.2	315	U	-	13	-	-	21	none
AWTF with AOP Operation	Line Creek	RG_LILC3	2019	659870	5531576	2019 LCO LAEMP	05-Sep-19	RG_LILC3_WCT-01	20.7	19.7	98	F	SA	7.9	-	-	13	none
		RG_LILC3	2019	659870	5531576		06-Sep-19	RG_LILC3_WCT-04	41.7	39.2	945	M	A	10	-	-	16	none
		RG_LIDCOM	2019	658185	5529820		05-Sep-19	RG_LIDCOM_WCT-02	37.5	35.5	625	F	A	11	-	-	18	none
		RG_LIDCOM	2019	658185	5529820		05-Sep-19	RG_LIDCOM_WCT-03	40.7	39.0	840	M	A	6.2	-	-	10	none
		RG_LIDCOM	2019	658185	5529820		06-Sep-19	RG_LIDCOM_WCT-05	32.2	30.7	420	M	A	7.6	-	-	12	none
		RG_LIDCOM	2019	658185	5529820		06-Sep-19	RG_LIDCOM_WCT-06	38.1	36.5	840	M	A	7.4	-	-	12	none
		RG_LIDCOM	2019	658185	5529820		06-Sep-19	RG_LIDCOM_WCT-07	34.3	32.9	545	M	A	7.9	-	-	13	none
		RG_LIDCOM	2019	658185	5529820		06-Sep-19	RG_LIDCOM_WCT-08	29.9	28.7	360	F	A	10	-	-	16	none
		RG_LI8	2019	655378	5529048		06-Sep-19	RG_LI8_WCT-01	48.5	46.8	1,140	M	A	7.7	-	-	12	none
		RG_LI8	2019	655378	5529048		06-Sep-19	RG_LI8_WCT-02	33.2	32.0	410	F	A	7.2	-	-	12	none
		RG_LI8	2019	654671	5529013		07-Sep-19	RG_LI8_WCT-03	36.3	35.0	515	F	A	8.1	-	-	13	none
		RG_LI8	2019	654671	5529013		07-Sep-19	RG_LI8_WCT-04	25.6	24.5	195	M	A	6.5	-	-	10	none
		RG_LI8	2019	654671	5529013		07-Sep-19	RG_LI8_WCT-05	44.7	43.3	900	F	A	20	-	28	-	none
		RG_LI8	2019	655378	5529048		07-Sep-19	RG_LI8_WCT-06	45.2	43.4	980	F	A	8.2	-	-	13	none
		RG_LI8	2019	655378	5529048		07-Sep-19	RG_LI8_WCT-07	40.6	39	760	M	A	7.0	-	-	11	none

Muscle selenium concentration exceeding the site-specific benchmark for WCT of 15.5 mg/kg dw (Nautilus and Interior Reforestation 2011).
Ovary selenium concentration exceeding the Level 1 site-specific benchmark (equivalent of EC_{10}) for WCT of 25 mg/kg dw (Elk Valley Water Quality Plan; Golder 2014).
Ovary selenium concentration exceeding the Level 2 site-specific benchmark (equivalent of EC_{20}) for WCT of 27 mg/kg dw (Elk Valley Water Quality Plan; Golder 2014).
Ovary selenium concentration exceeding the Level 3 site-specific benchmark (equivalent of EC_{50}) for WCT of 33 mg/kg dw (Elk Valley Water Quality Plan; Golder 2014).

Notes: "-" = no data recorded; AWTF = Active Water Treatment Facility; LCO = Line Creek Operations; LAEMP = Local Aquatic Effects Monitoring Program; AOP = Advanced Oxidation Process.

[a] F = female; M = male; U = unknown (sex of fish could not be determined, either because fish was not sufficiently mature or samples were collected non-lethally and sex could not be determined based on non-lethal evaluation of physical characteristics).

[b] Ripe egg tissue was collected from one individual sampled non-lethally in 2019. Although westslope cutthroat trout spawn in the spring, this female released ripe eggs with minimal abdominal pressure during the collection of physical measures (length and weight).

[c] Ovary concentrations were estimated from muscle selenium concentrations based on the average ovary-to-muscle concentration relationship of 1.6:1 presented by Nautilus and Interior Reforestation (2011). Ovary selenium was estimated only for individuals lacking measured egg/ovary concentrations (if female) or if sex was unknown.

[d] DELT = Deformities, erosions, lesions, tumors. - = DELT observations were not recorded. DELT observations were initiated in 2017 following the start of AWTF operation.

Table C.26: Physical Measures and Tissue Selenium Concentrations for Westslope Cutthroat Trout Sampled from Line Creek, 2001 to 2021

AWTF Operation Phase	Waterbody	Area	Year	Capture Location UTM (NAD83, 11U)		Study	Processing Date	Fish ID	Total Length	Fork Length	Body Weight	Sex[a]	Age	Tissue Selenium (mg/kg dw)				Recorded Deformities (DELT)[d]
				Easting	Northing				(cm)	(cm)	(g)			Muscle	Ovary	Egg[b]	Estimated Ovary[c]	
AWTF with AOP Operation	Line Creek	RG_LIDSL	2021	659232	5530500	2021 LCO LAEMP	13-Sep-21	RG_LIDSL_WCT-01	22.7	21.6	125	U	-	16.0	-	-	26	-
		RG_LIDSL	2021	659232	5530500		13-Sep-21	RG_LIDSL_WCT-02	27.2	26.1	216	U	-	6.1	-	-	10	-
		RG_LIDSL	2021	659232	5530500		13-Sep-21	RG_LIDSL_WCT-03	31.4	29.9	395	U	-	18.0	-	-	29	-
		RG_LIDSL	2021	659232	5530500		13-Sep-21	RG_LIDSL_WCT-04	29.4	28.2	315	U	-	17.0	-	-	27	-
		RG_LIDSL	2021	659232	5530500		13-Sep-21	RG_LIDSL_WCT-05	32.7	31.4	440	U	-	17.0	-	-	27	-
		RG_LIDSL	2021	659232	5530500		13-Sep-21	RG_LIDSL_WCT-06	27.4	26.5	256	U	-	7.1	-	-	11	-
		RG_LIDSL	2021	659232	5530500		13-Sep-21	RG_LIDSL_WCT-07	44.5	42.4	1,075	U	-	4.3	-	-	7	-
		RG_LIDSL	2021	659232	5530500		13-Sep-21	RG_LIDSL_WCT-08	29.9	28.7	355	U	-	6.5	-	-	10	-
	Fording River	RG_FO23	2021	652956	5528903		13-Sep-21	RG_FO23_WCT-01	27.9	26.4	255	U	-	9.0	-	-	14	-
		RG_FO23	2021	652956	5528903		13-Sep-21	RG_FO23_WCT-02	38.4	36.6	595	U	-	8.2	-	-	13	-
		RG_FO23	2021	652956	5528903		13-Sep-21	RG_FO23_WCT-03	45.8	43.7	1,110	U	-	11.0	-	-	18	-
		RG_FO23	2021	652956	5528903		14-Sep-21	RG_FO23_WCT-04	34.9	33.2	490	U	-	7.6	-	-	12	-
		RG_FO23	2021	652956	5528903		14-Sep-21	RG_FO23_WCT-05	32.1	30.9	395	U	-	10.0	-	-	16	-
		RG_FO23	2021	652874	5528402		14-Sep-21	RG_FO23_WCT-06	34.5	32.7	455	U	-	7.0	-	-	11	-
		RG_FO23	2021	652874	5528402		14-Sep-21	RG_FO23_WCT-07	29.9	28.3	305	U	-	6.9	-	-	11	-
		RG_FO23	2021	652874	5528402		14-Sep-21	RG_FO23_WCT-08	31.4	29.9	340	U	-	10.0	-	-	16	-

Muscle selenium concentration exceeding the site-specific benchmark for WCT of 15.5 mg/kg dw (Nautilus and Interior Reforestation 2011).
Ovary selenium concentration exceeding the Level 1 site-specific benchmark (equivalent of EC_{10}) for WCT of 25 mg/kg dw (Elk Valley Water Quality Plan; Golder 2014).
Ovary selenium concentration exceeding the Level 2 site-specific benchmark (equivalent of EC_{20}) for WCT of 27 mg/kg dw (Elk Valley Water Quality Plan; Golder 2014).
Ovary selenium concentration exceeding the Level 3 site-specific benchmark (equivalent of EC_{50}) for WCT of 33 mg/kg dw (Elk Valley Water Quality Plan; Golder 2014).

Notes: "-" = no data recorded; AWTF = Active Water Treatment Facility; LCO = Line Creek Operations; LAEMP = Local Aquatic Effects Monitoring Program; AOP = Advanced Oxidation Process.

[a] F = female; M = male; U = unknown (sex of fish could not be determined, either because fish was not sufficiently mature or samples were collected non-lethally and sex could not be determined based on non-lethal evaluation of physical characteristics).

[b] Ripe egg tissue was collected from one individual sampled non-lethally in 2019. Although westslope cutthroat trout spawn in the spring, this female released ripe eggs with minimal abdominal pressure during the collection of physical measures (length and weight).

[c] Ovary concentrations were estimated from muscle selenium concentrations based on the average ovary-to-muscle concentration relationship of 1.6:1 presented by Nautilus and Interior Reforestation (2011). Ovary selenium was estimated only for individuals lacking measured egg/ovary concentrations (if female) or if sex was unknown.

[d] DELT = Deformities, erosions, lesions, tumors. - = DELT observations were not recorded. DELT observations were initiated in 2017 following the start of AWTF operation.

Table C.27: Mean and Predicted Westslope Cutthroat Trout Ovary Selenium Tissue Concentrations, LCO LAEMP, 2002 to 2021

Area	Date	Ovary Tissue Selenium (mg/kg dw)	Prediction Interval (mg/kg dw)		
			Lower (2.5%)	Mean	Upper (97.5%)
RG_LILC3	1-Jun-12	13.3	5.24	11.0	23.1
	1-Sep-17	42.4	5.26	11.1	23.3
	1-Sep-19	12.6	5.24	11.0	23.1
RG_LIDSL	1-Apr-17	40.2	5.23	11.0	23.1
	1-Sep-17	54.4	5.23	11.0	23.1
	1-Aug-18	17.6	5.32	11.2	23.6
	1-Sep-21	18.4	5.24	11.0	23.1
RG_LIDCOM	1-Sep-18	40.0	5.33	11.2	23.7
	1-Sep-19	16.8	5.24	11.0	23.1
RG_LI8	1-Apr-02	15.3	5.25	11.0	23.0
	1-Apr-06	14.0	5.24	11.0	23.2
	1-Sep-09	19.4	5.24	11.0	23.1
	1-Sep-17	12.4	5.24	11.0	23.1
	1-Aug-18	14.1	5.23	11.0	23.1
	1-Sep-18	15.2	5.30	11.2	23.5
	1-Sep-19	16.4	5.24	11.0	23.1
RG_FO23	1-May-09	15.6	5.24	11.0	23.1
	1-May-12	13.2	5.24	11.0	23.1
	1-Sep-18	13.8	5.25	11.0	23.2
	1-Sep-21	13.9	5.23	11.0	23.1

Mean Concentration exceeds upper predicted limit.

Mean Concentration is below lower predicted limit.

Notes: WCT ovary tissue selenium concentrations for seven individual replicates are not shown as concurrent water samples were not available. mg/kg dw = milligrams per kilogram dry weight.

Table C.28: Concentrations of Selenium Species Measured in Water Samples from Line Creek and Fording River, 2021

Waterbody		Teck Water Station Code	Sample Date	Selenium Species (µg/L)									
				Selenate	Selenite	Dimethylselenoxide	Methylseleninic Acid	Selenocyanate	Selenomethionine	Selenosulphate	Methaneselenonic Acid	Unknown Species	Sum of Species
Line Creek	Reference	LC_LC1 (RG_LI24)	7-Apr-21	2.03	0.021	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.05
		LC_LC1 (RG_LI24)	26-Apr-21	1.81	0.029	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	1.84
		LC_LC1 (RG_LI24)	13-Jul-21	2.04	0.015	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	2.06
		LC_LC1 (RG_LI24)	16-Sep-21	3.06	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	3.08
		LC_LC1 (RG_LI24)	25-Oct-21	3.08	0.028	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	3.11
		LC_LC1 (RG_LI24)	4-Nov-21	2.88	0.032	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.91
		LC_LC1 (RG_LI24)	30-Nov-21	2.58	0.022	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	2.60
		LC_SLC (RG_SLINE)	18-Jan-21	1.59	0.019	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.61
		LC_SLC (RG_SLINE)	6-Apr-21	1.46	0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.48
		LC_SLC (RG_SLINE)	26-Apr-21	1.19	0.026	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	1.22
		LC_SLC (RG_SLINE)	6-Jul-21	0.766	0.035	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.80
		LC_SLC (RG_SLINE)	13-Jul-21	0.887	0.014	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	0.90
		LC_SLC (RG_SLINE)	15-Sep-21	1.41	0.019	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	1.43
		LC_SLC (RG_SLINE)	12-Oct-21	1.43	0.026	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.46
		LC_SLC (RG_SLINE)	30-Nov-21	1.16	0.018	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	1.18
Line Creek	Mine-exposed	LC_LCUSWLC (RG_LCUT)	5-Jan-21	56.4	0.079	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	56.48
		LC_LCUSWLC (RG_LCUT)	11-Jan-21	57	0.095	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	57.10
		LC_LCUSWLC (RG_LCUT)	18-Jan-21	63	0.085	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	63.09
		LC_LCUSWLC (RG_LCUT)	25-Jan-21	60	0.091	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	60.09
		LC_LCUSWLC (RG_LCUT)	1-Feb-21	61.1	0.096	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	61.20
		LC_LCUSWLC (RG_LCUT)	8-Feb-21	62.1	0.0815	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	62.18
		LC_LCUSWLC (RG_LCUT)	22-Feb-21	62	0.103	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	62.10
		LC_LCUSWLC (RG_LCUT)	4-Mar-21	62.2	0.208	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	62.41
		LC_LCUSWLC (RG_LCUT)	10-Mar-21	67.4	0.328	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	67.73
		LC_LCUSWLC (RG_LCUT)	16-Mar-21	64.8	0.091	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	64.89
		LC_LCUSWLC (RG_LCUT)	22-Mar-21	52.6	0.082	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	52.68
		LC_LCUSWLC (RG_LCUT)	29-Mar-21	40.8	0.073	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	40.87
		LC_LCUSWLC (RG_LCUT)	6-Apr-21	43.2	0.071	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	43.27
		LC_LCUSWLC (RG_LCUT)	12-Apr-21	44.5	0.081	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	44.58
		LC_LCUSWLC (RG_LCUT)	20-Apr-21	39.7	0.053	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	39.75
		LC_LCUSWLC (RG_LCUT)	27-Apr-21	42.1	0.075	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	42.18
		LC_LCUSWLC (RG_LCUT)	4-May-21	37.2	0.111	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	37.31
		LC_LCUSWLC (RG_LCUT)	11-May-21	25	0.084	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	25.08
		LC_LCUSWLC (RG_LCUT)	17-May-21	31.3	0.076	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	31.38
		LC_LCUSWLC (RG_LCUT)	27-May-21	21.6	0.099	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	21.70
		LC_LCUSWLC (RG_LCUT)	1-Jun-21	18.3	0.097	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	18.40
		LC_LCUSWLC (RG_LCUT)	10-Jun-21	17.7	0.077	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	17.78
		LC_LCUSWLC (RG_LCUT)	14-Jun-21	23.4	0.062	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	23.46
		LC_LCUSWLC (RG_LCUT)	21-Jun-21	22.5	0.074	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	22.57
		LC_LCUSWLC (RG_LCUT)	28-Jun-21	25.2	0.082	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	25.28
		LC_LCUSWLC (RG_LCUT)	6-Jul-21	28.9	0.079	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	28.98
		LC_LCUSWLC (RG_LCUT)	12-Jul-21	46.7	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	46.78
		LC_LCUSWLC (RG_LCUT)	20-Jul-21	31.8	0.069	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	31.87
		LC_LCUSWLC (RG_LCUT)	28-Jul-21	38.8	0.058	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	38.86
		LC_LCUSWLC (RG_LCUT)	4-Aug-21	34	0.068	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	34.07
		LC_LCUSWLC (RG_LCUT)	10-Aug-21	33.7	0.071	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	33.77
		LC_LCUSWLC (RG_LCUT)	16-Aug-21	40.2	0.095	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	40.30
		LC_LCUSWLC (RG_LCUT)	24-Aug-21	30.3	0.088	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	30.39
		LC_LCUSWLC (RG_LCUT)	31-Aug-21	32.5	0.085	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	32.59
		LC_LCUSWLC (RG_LCUT)	9-Sep-21	38.8	0.078	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	38.88
		LC_LCUSWLC (RG_LCUT)	10-Sep-21	51.3	0.087	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	51.39
		LC_LCUSWLC (RG_LCUT)	14-Sep-21	41	0.074	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	41.07
		LC_LCUSWLC (RG_LCUT)	16-Sep-21	38.7	0.081	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	38.78
		LC_LCUSWLC (RG_LCUT)	20-Sep-21	43.4	0.073	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	43.47
		LC_LCUSWLC (RG_LCUT)	27-Sep-21	43.4	0.097	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	43.50
		LC_LCUSWLC (RG_LCUT)	5-Oct-21	43.7	0.105	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	43.81
		LC_LCUSWLC (RG_LCUT)	14-Oct-21	41.2	0.112	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	41.31
		LC_LCUSWLC (RG_LCUT)	18-Oct-21	41.9	0.111	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	42.01
		LC_LCUSWLC (RG_LCUT)	25-Oct-21	44.1	0.141	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	44.24
		LC_LCUSWLC (RG_LCUT)	1-Nov-21	48.3	0.151	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	48.45
		LC_LCUSWLC (RG_LCUT)	8-Nov-21	46	0.142	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	46.14
		LC_LCUSWLC (RG_LCUT)	16-Nov-21	49.7	0.119	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	49.82
		LC_LCUSWLC (RG_LCUT)	22-Nov-21	54.1	0.099	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	54.20
		LC_LCUSWLC (RG_LCUT)	29-Nov-21	44	0.099	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	44.10
		LC_LCUSWLC (RG_LCUT)	1-Dec-21	49.4	0.097	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	49.50
		LC_LCUSWLC (RG_LCUT)	14-Dec-21	55.1	0.132	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	55.23
		LC_LC3 (RG_LILC3)	5-Jan-21	38.2	0.53	0.025	<0.01	<0.01	<0.01	<0.01	0.235	<0.01	38.99
		LC_LC3 (RG_LILC3)	11-Jan-21	39.6	0.523	0.021	<0.01	<0.01	<0.01	<0.01	0.325	<0.01	40.47
		LC_LC3 (RG_LILC3)	18-Jan-21	45.2	0.7	0.052	<0.01	<0.01	<0.01	0.016	0.374	<0.01	46.34
		LC_LC3 (RG_LILC3)	25-Jan-21	41.3	0.567	0.03	<0.01	<0.01	<0.01	<0.01	0.284	0.03	42.21
		LC_LC3 (RG_LILC3)	1-Feb-21	36.4	0.6	0.035	<0.01	0.028	<0.01	<0.01	0.236	<0.01	37.30
		LC_LC3 (RG_LILC3)	8-Feb-21	40.1	0.632	0.0375	<0.01	<0.01	<0.01	<0.01	0.238	<0.01	41.01
		LC_LC3 (RG_LILC3)	23-Feb-21	44.4	0.658	0.027	<0.01	<0.01	<0.01	<0.01	0.172	<0.01	45.26
		LC_LC3 (RG_LILC3)	2-Mar-21	44.1	0.61	0.018	0.011	<0.01	<0.01	<0.01	0.162	<0.01	44.90
		LC_LC3 (RG_LILC3)	9-Mar-21	45.8	0.468	<0.01	<0.01	<0.01	<0.01	<0.01	0.177	<0.01	46.45
		LC_LC3 (RG_LILC3)	16-Mar-21	51.8	0.606	0.016	0.012	<0.01	<0.01	<0.01	0.148	<0.01	52.58
		LC_LC3 (RG_LILC3)	23-Mar-21	48.4	0.439	0.019	<0.01	<0.01	<0.01	<0.01	0.091	<0.01	48.95
		LC_LC3 (RG_LILC3)	30-Mar-21	41.9	0.489	0.023	<0.01	<0.01	<0.01	<0.01	0.109	<0.01	42.52
		LC_LC3 (RG_LILC3)	5-Apr-21	40.9	0.376	<0.01	<0.01	<0.01	<0.01	<0.01	0.119	<0.01	41.40
		LC_LC3 (RG_LILC3)	13-Apr-21	40.9	0.352	0.013	<0.01	<0.01	<0.01	<0.01	0.09	<0.01	41.36
		LC_LC3 (RG_LILC3)	20-Apr-21	38.4	0.317	0.019	<0.01	<0.01	<0.01	<0.01	0.074	<0.01	38.81
		LC_LC3 (RG_LILC3)	27-Apr-21	43.5	0.306	0.0165	0.0125	<0.01	<0.01	<0.01	0.077	<0.01	43.91
		LC_LC3 (RG_LILC3)	4-May-21	38	0.261	<0.01	<0.01	<0.01	<0.01	<0.01	0.045	<0.01	38.31
		LC_LC3 (RG_LILC3)	11-May-21	42.8	0.177	<0.01	0.012	<0.01	<0.01	<0.01	0.023	<0.01	43.01
		LC_LC3 (RG_LILC3)	18-May-21	40.3	0.154	<0.01	<0.01	<0.01	<0.01	<0.01	0.015	<0.01	40.47
		LC_LC3 (RG_LILC3)	25-May-21	32.2	0.168	<0.01	0.017	<0.01	<0.01	<0.01	<0.01	<0.01	32.39
		LC_LC3 (RG_LILC3)	1-Jun-21	28.8	0.158	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	28.96
		LC_LC3 (RG_LILC3)	8-Jun-21	29.3	0.138	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	29.44
		LC_LC3 (RG_LILC3)	15-Jun-21	29.3	0.093	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	29.39
		LC_LC3 (RG_LILC3)	21-Jun-21	31.5	0.114	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	31.61
		LC_LC3 (RG_LILC3)	29-Jun-21	29.6	0.116	<0.01	0.0125	<0.01	<0.01	<0.01	<0.01	<0.01	29.73
		LC_LC3 (RG_LILC3)	6-Jul-21	45.4	0.098	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	45.50
		LC_LC3 (RG_LILC3)	12-Jul-21	35.2	0.094	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	35.29
		LC_LC3 (RG_LILC3)	20-Jul-21	29.6	0.172	<0.01	0.011	<0.01	<0.01	<0.01	0.02	<0.01	29.80
		LC_LC3 (RG_LILC3)	28-Jul-21	64.4	0.078	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	64.48
		LC_LC3 (RG_LILC3)	4-Aug-21	33.1	0.137	<0.01	<0.01	<0.01	<0.01	<0.01	0.022	<0.01	33.26

Note: "-" indicates that data is not available or was not measured.

Table C.28: Concentrations of Selenium Species Measured in Water Samples from Line Creek and Fording River, 2021

Waterbody		Teck Water Station Code	Sample Date	Selenium Species (µg/L)									
				Selenate	Selenite	Dimethylselenoxide	Methylseleninic Acid	Selenocyanate	Selenomethionine	Selenosulphate	Methaneselenonic Acid	Unknown Species	Sum of Species
Line Creek	Mine-exposed	LC_LC3 (RG_LILC3)	10-Aug-21	33.5	0.183	<0.01	<0.01	<0.01	<0.01	<0.01	0.029	<0.01	33.71
		LC_LC3 (RG_LILC3)	17-Aug-21	36.4	0.248	0.011	<0.01	<0.01	<0.01	<0.01	0.036	<0.01	36.70
		LC_LC3 (RG_LILC3)	24-Aug-21	33.4	0.153	<0.01	<0.01	<0.01	<0.01	<0.01	0.012	<0.01	33.57
		LC_LC3 (RG_LILC3)	31-Aug-21	33	0.44	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	<0.01	33.47
		LC_LC3 (RG_LILC3)	7-Sep-21	41.7	0.23	<0.01	0.011	<0.01	<0.01	<0.01	0.034	<0.01	41.98
		LC_LC3 (RG_LILC3)	9-Sep-21	37.1	0.179	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	37.28
		LC_LC3 (RG_LILC3)	14-Sep-21	37.3	0.209	0.012	<0.01	<0.01	<0.01	<0.01	0.024	<0.01	37.55
		LC_LC3 (RG_LILC3)	20-Sep-21	39.6	0.228	0.011	<0.01	<0.01	<0.01	<0.01	0.051	<0.01	39.89
		LC_LC3 (RG_LILC3)	27-Sep-21	64.7	0.125	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	64.83
		LC_LC3 (RG_LILC3)	5-Oct-21	36.1	0.301	0.015	<0.01	<0.01	<0.01	<0.01	0.057	<0.01	36.47
		LC_LC3 (RG_LILC3)	12-Oct-21	35.1	0.326	0.014	<0.01	<0.01	<0.01	<0.01	0.069	<0.01	35.51
		LC_LC3 (RG_LILC3)	19-Oct-21	36.5	0.469	0.017	<0.01	<0.01	<0.01	<0.01	0.144	<0.01	37.13
		LC_LC3 (RG_LILC3)	26-Oct-21	37.6	0.388	0.016	<0.01	<0.01	<0.01	<0.01	0.105	<0.01	38.11
		LC_LC3 (RG_LILC3)	2-Nov-21	42.4	0.378	0.015	0.011	<0.01	<0.01	<0.01	0.074	<0.01	42.88
		LC_LC3 (RG_LILC3)	9-Nov-21	38.5	0.303	0.012	<0.01	<0.01	<0.01	<0.01	0.069	<0.01	38.88
		LC_LC3 (RG_LILC3)	16-Nov-21	45.7	0.276	<0.01	<0.01	<0.01	<0.01	<0.01	0.049	<0.01	46.03
		LC_LC3 (RG_LILC3)	22-Nov-21	49.5	0.248	<0.01	<0.01	<0.01	<0.01	<0.01	0.034	<0.01	49.78
		LC_LC3 (RG_LILC3)	29-Nov-21	42.5	0.244	<0.01	<0.01	<0.01	<0.01	<0.01	0.041	<0.01	42.79
		LC_LC3 (RG_LILC3)	1-Dec-21	43.8	0.219	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	44.02
		LC_LC3 (RG_LILC3)	14-Dec-21	45.9	0.37	0.011	<0.01	<0.01	<0.01	<0.01	0.078	<0.01	46.36
		WL_DCP_SP24 (RG_LISP24)	27-Apr-21	33.1	0.214	<0.01	0.015	<0.01	<0.01	<0.01	-	<0.01	33.33
		WL_DCP_SP24 (RG_LISP24)	12-Jul-21	23.5	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	23.58
		WL_DCP_SP24 (RG_LISP24)	13-Sep-21	29.5	0.157	<0.01	0.014	<0.01	<0.01	<0.01	-	<0.01	29.67
		WL_DCP_SP24 (RG_LISP24)	30-Nov-21	31.7	0.178	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	31.88
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	5-Jan-21	34.6	0.341	<0.01	0.017	<0.01	<0.01	<0.01	0.045	<0.01	35.00
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	11-Jan-21	37.9	0.361	<0.01	0.032	<0.01	<0.01	<0.01	0.048	<0.01	38.34
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	18-Jan-21	40.6	0.455	0.012	0.019	<0.01	<0.01	<0.01	0.076	<0.01	41.16
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	25-Jan-21	36.9	0.391	0.015	0.02	<0.01	<0.01	<0.01	0.062	0.015	37.40
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	1-Feb-21	36.9	0.399	<0.01	0.018	<0.01	<0.01	<0.01	0.041	<0.01	37.36
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	8-Feb-21	38.3	0.335	<0.01	0.0115	<0.01	<0.01	<0.01	0.0405	<0.01	38.69
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	23-Feb-21	41.7	0.284	<0.01	0.012	<0.01	<0.01	<0.01	0.029	<0.01	42.03
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	2-Mar-21	43.3	0.29	<0.01	0.016	<0.01	<0.01	<0.01	0.026	<0.01	43.63
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	9-Mar-21	44.8	0.334	<0.01	0.025	<0.01	<0.01	<0.01	0.048	<0.01	45.21
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	16-Mar-21	47.1	0.32	<0.01	0.016	<0.01	<0.01	<0.01	0.038	<0.01	47.47
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	23-Mar-21	42.4	0.236	<0.01	<0.01	<0.01	<0.01	<0.01	0.024	<0.01	42.66
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	30-Mar-21	40.7	0.266	0.011	0.014	<0.01	<0.01	<0.01	0.033	<0.01	41.02
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	5-Apr-21	37.5	0.22	<0.01	0.013	<0.01	<0.01	<0.01	0.031	<0.01	37.76
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	13-Apr-21	39.3	0.207	<0.01	0.013	<0.01	<0.01	<0.01	0.025	<0.01	39.55
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	20-Apr-21	33.7	0.183	<0.01	<0.01	<0.01	<0.01	<0.01	0.018	<0.01	33.90
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	27-Apr-21	36	0.189	<0.01	0.015	<0.01	<0.01	<0.01	0.02	<0.01	36.22
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	4-May-21	28.5	0.148	<0.01	0.012	<0.01	<0.01	<0.01	0.017	<0.01	28.68
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	11-May-21	25.7	0.118	<0.01	<0.01	<0.01	<0.01	<0.01	0.015	<0.01	25.83
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	18-May-21	18.3	0.077	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	18.38
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	25-May-21	17.2	0.081	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	17.28
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	1-Jun-21	14.1	0.089	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	14.19
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	8-Jun-21	21	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	21.10
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	15-Jun-21	15.9	0.048	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	15.95
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	21-Jun-21	19.3	0.069	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	19.37
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	29-Jun-21	23.5	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	23.58
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	6-Jul-21	27.6	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	27.67
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	14-Jul-21	24.8	0.078	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	24.88
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	19-Jul-21	26.6	0.111	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	26.71
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	28-Jul-21	41	0.079	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	41.08
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	4-Aug-21	27.9	0.116	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	28.02
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	10-Aug-21	27.6	0.122	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	27.72
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	17-Aug-21	27.7	0.134	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	27.83
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	24-Aug-21	26.2	0.092	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	26.29
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	31-Aug-21	26.9	0.125	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	27.03
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	7-Sep-21	35.4	0.142	<0.01	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	35.55
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	14-Sep-21	32.2	0.131	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	32.33
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	20-Sep-21	33.6	0.153	<0.01	0.014	<0.01	<0.01	<0.01	<0.01	<0.01	33.77
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	27-Sep-21	48.7	0.133	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	48.83
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	5-Oct-21	33.1	0.168	<0.01	<0.01	<0.01	<0.01	<0.01	0.014	<0.01	33.28
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	12-Oct-21	32.6	0.182	<0.01	0.011	<0.01	<0.01	<0.01	0.014	<0.01	32.81
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	19-Oct-21	33	0.27	<0.01	0.014	<0.01	<0.01	<0.01	0.034	<0.01	33.32
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	26-Oct-21	33.3	0.236	<0.01	0.012	<0.01	<0.01	<0.01	0.023	<0.01	33.57
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	2-Nov-21	36.6	0.226	<0.01	0.014	<0.01	<0.01	<0.01	0.02	<0.01	36.86
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	9-Nov-21	29.9	0.182	<0.01	<0.01	<0.01	<0.01	<0.01	0.013	<0.01	30.10
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	16-Nov-21	23.6	0.124	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	23.72
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	22-Nov-21	36.7	0.143	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	36.84
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	29-Nov-21	28.8	0.145	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	28.95
		LC_LCDSSLCC (Compliance) (RG_LIDSL)	14-Dec-21	37.6	0.215	<0.01	<0.01	<0.01	<0.01	<0.01	0.016	<0.01	37.83
		LC_LCC (RG_LIDCOM)	29-Apr-21	31	0.176	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	31.18
		LC_LCC (RG_LIDCOM)	12-Jul-21	22.3	0.082	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	22.38
		LC_LCC (RG_LIDCOM)	13-Sep-21	27.8	0.12	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	27.92
		LC_LCC (RG_LIDCOM)	2-Dec-21	27.3	0.138	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	27.44
		LC_LC4 (RG_LI8)	5-Jan-21	27.1	0.122	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	27.23
		LC_LC4 (RG_LI8)	11-Jan-21	28.3	0.111	<0.01	<0.01	0.011	<0.01	<0.01	<0.01	<0.01	28.42
		LC_LC4 (RG_LI8)	18-Jan-21	31.4	0.173	<0.01	<0.01	<0.01	<0.01	0.024	0.025	<0.01	31.62
		LC_LC4 (RG_LI8)	25-Jan-21	27.8	0.111	<0.01	<0.01	<0.01	<0.01	<0.01	0.021	<0.01	27.93
		LC_LC4 (RG_LI8)	1-Feb-21	28	0.107	<0.01	<0.01	<0.01	<0.01	<0.01	0.013	<0.01	28.12
		LC_LC4 (RG_LI8)	8-Feb-21	28.8	0.102	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	28.90
		LC_LC4 (RG_LI8)	22-Feb-21	29.7	0.059	<0.01	<0.01	<0.01	<0.01	0.014	<0.01	<0.01	29.77
		LC_LC4 (RG_LI8)	4-Mar-21	30.6	0.087	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	30.69
		LC_LC4 (RG_LI8)	10-Mar-21	35.1	0.119	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	35.22
		LC_LC4 (RG_LI8)	16-Mar-21	28.8	0.08	<0.01	<0.01	<0.01	<0.01	<0.01	0.013	<0.01	28.89
		LC_LC4 (RG_LI8)	22-Mar-21	39.7	0.11	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	39.81
		LC_LC4 (RG_LI8)	30-Mar-21	32.3	0.089	<0.01	<0.01	0.018	<0.01	<0.01	0.015	<0.01	32.42
		LC_LC4 (RG_LI8)	5-Apr-21	31.5	0.127	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	31.64
		LC_LC4 (RG_LI8)	12-Apr-21	32.2	0.095	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	32.30
		LC_LC4 (RG_LI8)	20-Apr-21	25.9	0.074	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	25.97
		LC_LC4 (RG_LI8)	27-Apr-21	30.1	0.116	<0.01	<0.01	<0.01	<0.01	0.015	<0.01	<0.01	30.23
		LC_LC4 (RG_LI8)	28-Apr-21	29.7	0.173	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	29.87
		LC_LC4 (RG_LI8)	4-May-21	23.1	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	23.20
		LC_LC4 (RG_LI8)	11-May-21	19.5	0.105	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	19.61
		LC_LC4 (RG_LI8)	18-May-21	14.4	0.083	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	14.48

Note: "-" indicates that data is not available or was not measured.

Table C.28: Concentrations of Selenium Species Measured in Water Samples from Line Creek and Fording River, 2021

Waterbody		Teck Water Station Code	Sample Date	Selenium Species (µg/L)									
				Selenate	Selenite	Dimethylselenoxide	Methylseleninic Acid	Selenocyanate	Selenomethionine	Selenosulphate	Methaneselenonic Acid	Unknown Species	Sum of Species
Line Creek	Mine-exposed	LC_LC4 (RG_LI8)	25-May-21	14.4	0.082	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	14.48
		LC_LC4 (RG_LI8)	1-Jun-21	11.8	0.125	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	11.93
		LC_LC4 (RG_LI8)	8-Jun-21	17.6	0.093	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	17.69
		LC_LC4 (RG_LI8)	14-Jun-21	13.7	0.045	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	13.75
		LC_LC4 (RG_LI8)	22-Jun-21	16.8	0.043	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	16.84
		LC_LC4 (RG_LI8)	29-Jun-21	20.4	0.069	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	20.47
		LC_LC4 (RG_LI8)	6-Jul-21	21.3	0.047	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	21.35
		LC_LC4 (RG_LI8)	15-Jul-21	21.1	0.041	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	21.14
		LC_LC4 (RG_LI8)	20-Jul-21	22.4	0.063	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	22.46
		LC_LC4 (RG_LI8)	28-Jul-21	32.4	0.036	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	32.44
		LC_LC4 (RG_LI8)	4-Aug-21	22.7	0.062	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	22.76
		LC_LC4 (RG_LI8)	9-Aug-21	22.3	0.098	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	22.40
		LC_LC4 (RG_LI8)	16-Aug-21	27	0.058	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	27.06
		LC_LC4 (RG_LI8)	24-Aug-21	21.6	0.164	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	21.76
		LC_LC4 (RG_LI8)	31-Aug-21	23.6	0.204	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	23.80
		LC_LC4 (RG_LI8)	8-Sep-21	27	0.052	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	27.05
		LC_LC4 (RG_LI8)	11-Sep-21	24.6	0.055	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	24.66
		LC_LC4 (RG_LI8)	16-Sep-21	28	0.048	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	28.05
		LC_LC4 (RG_LI8)	20-Sep-21	27.6	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	27.67
		LC_LC4 (RG_LI8)	27-Sep-21	30.7	0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	30.74
		LC_LC4 (RG_LI8)	5-Oct-21	26.6	0.088	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	26.69
		LC_LC4 (RG_LI8)	13-Oct-21	26.3	0.097	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	26.40
		LC_LC4 (RG_LI8)	18-Oct-21	26.5	0.091	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	26.60
		LC_LC4 (RG_LI8)	25-Oct-21	26.8	0.093	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	26.90
		LC_LC4 (RG_LI8)	1-Nov-21	29.3	0.067	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	29.37
		LC_LC4 (RG_LI8)	8-Nov-21	29.3	0.068	<0.01	<0.01	<0.01	<0.01	0.014	<0.01	<0.01	29.38
		LC_LC4 (RG_LI8)	16-Nov-21	18.1	0.112	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	18.21
		LC_LC4 (RG_LI8)	22-Nov-21	31.1	0.072	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	31.17
		LC_LC4 (RG_LI8)	29-Nov-21	24.7	0.075	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	24.78
		LC_LC4 (RG_LI8)	2-Dec-21	19.3	0.074	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	19.37
		LC_LC4 (RG_LI8)	14-Dec-21	29.3	0.088	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	29.39
Fording River	Mine-exposed	LC_LC6 (RG_FRUL)	28-Apr-21	50.6	0.218	<0.01	0.0155	<0.01	<0.01	<0.01	-	<0.01	50.83
		LC_LC6 (RG_FRUL)	14-Jul-21	35.8	0.251	0.013	0.018	<0.01	<0.01	<0.01	-	<0.01	36.08
		LC_LC6 (RG_FRUL)	12-Sep-21	48.1	0.399	0.013	0.021	<0.01	<0.01	<0.01	-	<0.01	48.53
		LC_LC6 (RG_FRUL)	30-Nov-21	59.5	0.345	<0.01	0.013	<0.01	<0.01	<0.01	-	<0.01	59.86
		LC_LC5 (RG_FO23)	5-Jan-21	42.8	0.154	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	42.95
		LC_LC5 (RG_FO23)	6-Apr-21	56.5	0.199	<0.01	<0.01	<0.01	<0.01	0.018	<0.01	<0.01	56.72
		LC_LC5 (RG_FO23)	28-Apr-21	48	0.211	<0.01	0.016	<0.01	<0.01	<0.01	-	<0.01	48.23
		LC_LC5 (RG_FO23)	14-Jul-21	30.8	0.194	<0.01	0.016	<0.01	<0.01	<0.01	-	<0.01	31.01
		LC_LC5 (RG_FO23)	17-Aug-21	32.9	0.316	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	33.22
		LC_LC5 (RG_FO23)	24-Aug-21	35.6	0.248	<0.01	0.012	<0.01	<0.01	<0.01	<0.01	<0.01	35.86
		LC_LC5 (RG_FO23)	12-Sep-21	40.8	0.322	<0.01	0.015	<0.01	<0.01	<0.01	-	<0.01	41.14
		LC_LC5 (RG_FO23)	12-Oct-21	42.3	0.257	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	42.56
		LC_LC5 (RG_FO23)	1-Dec-21	44.1	0.238	<0.01	<0.01	<0.01	<0.01	<0.01	-	<0.01	44.34

Note: "-" indicates that data is not available or was not measured.

APPENDIX D
OTHER INFLUENCES

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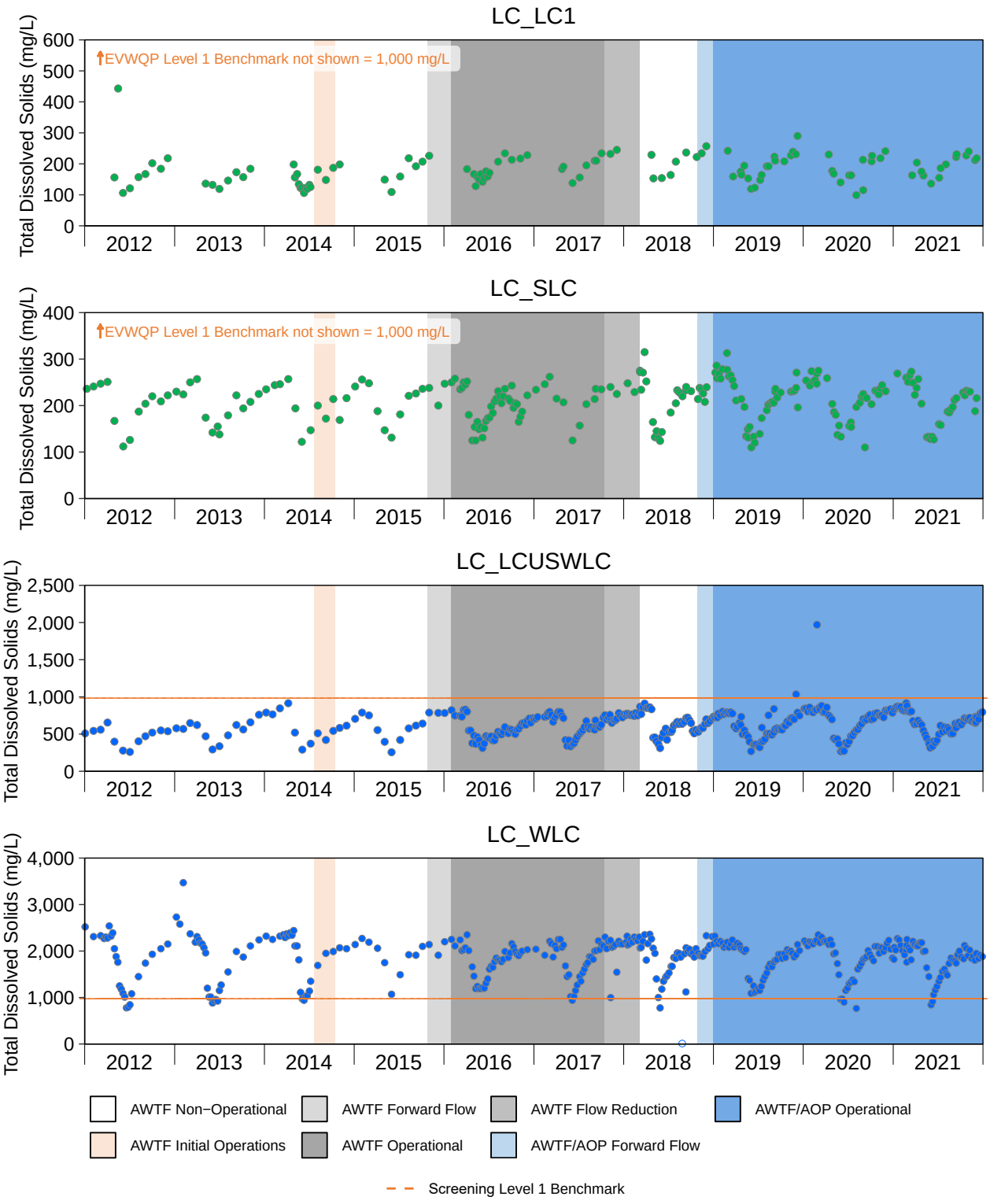

Figure D.1: Time Series Plots for Total Dissolved Solids Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018). Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

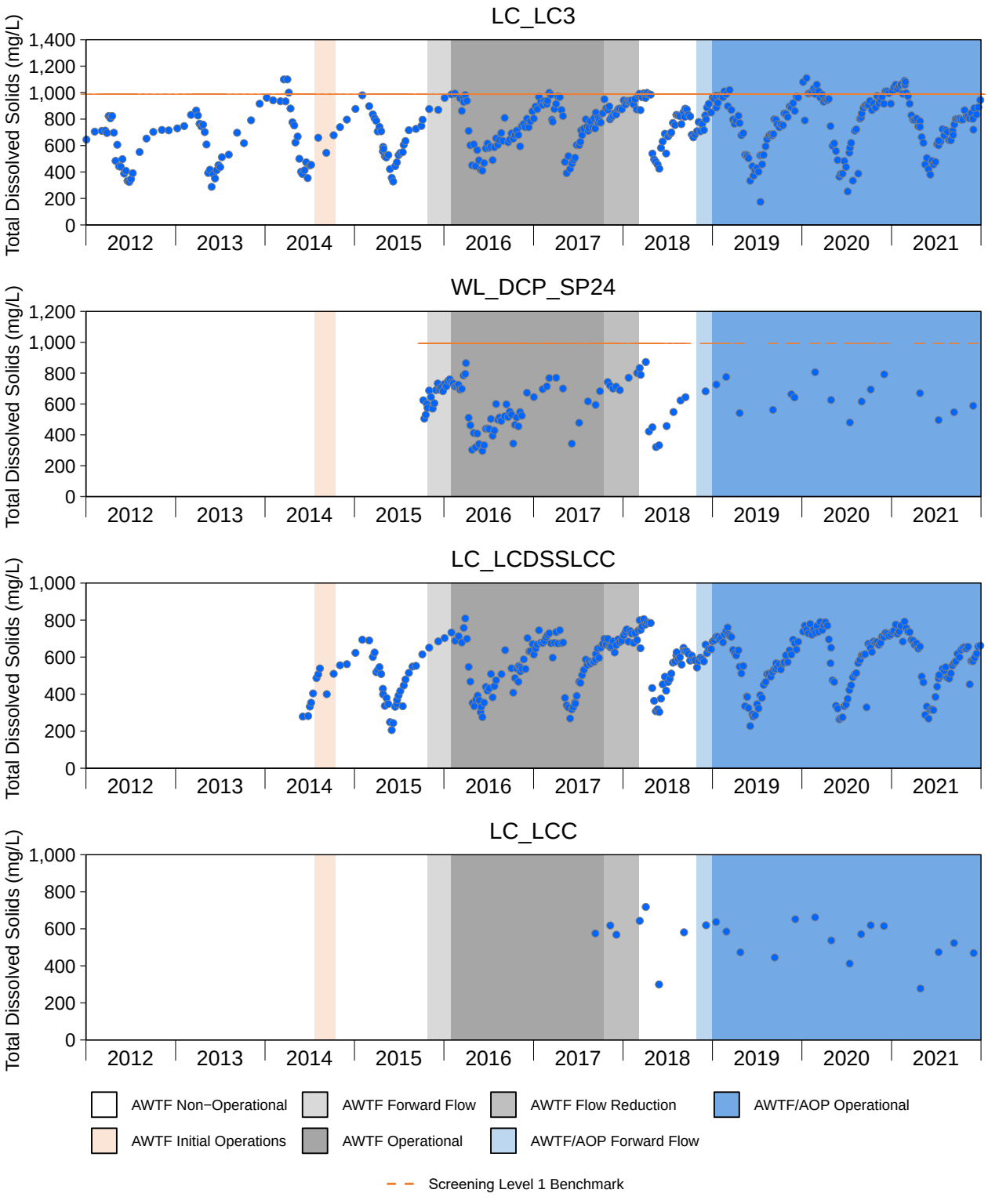

Figure D.1: Time Series Plots for Total Dissolved Solids Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

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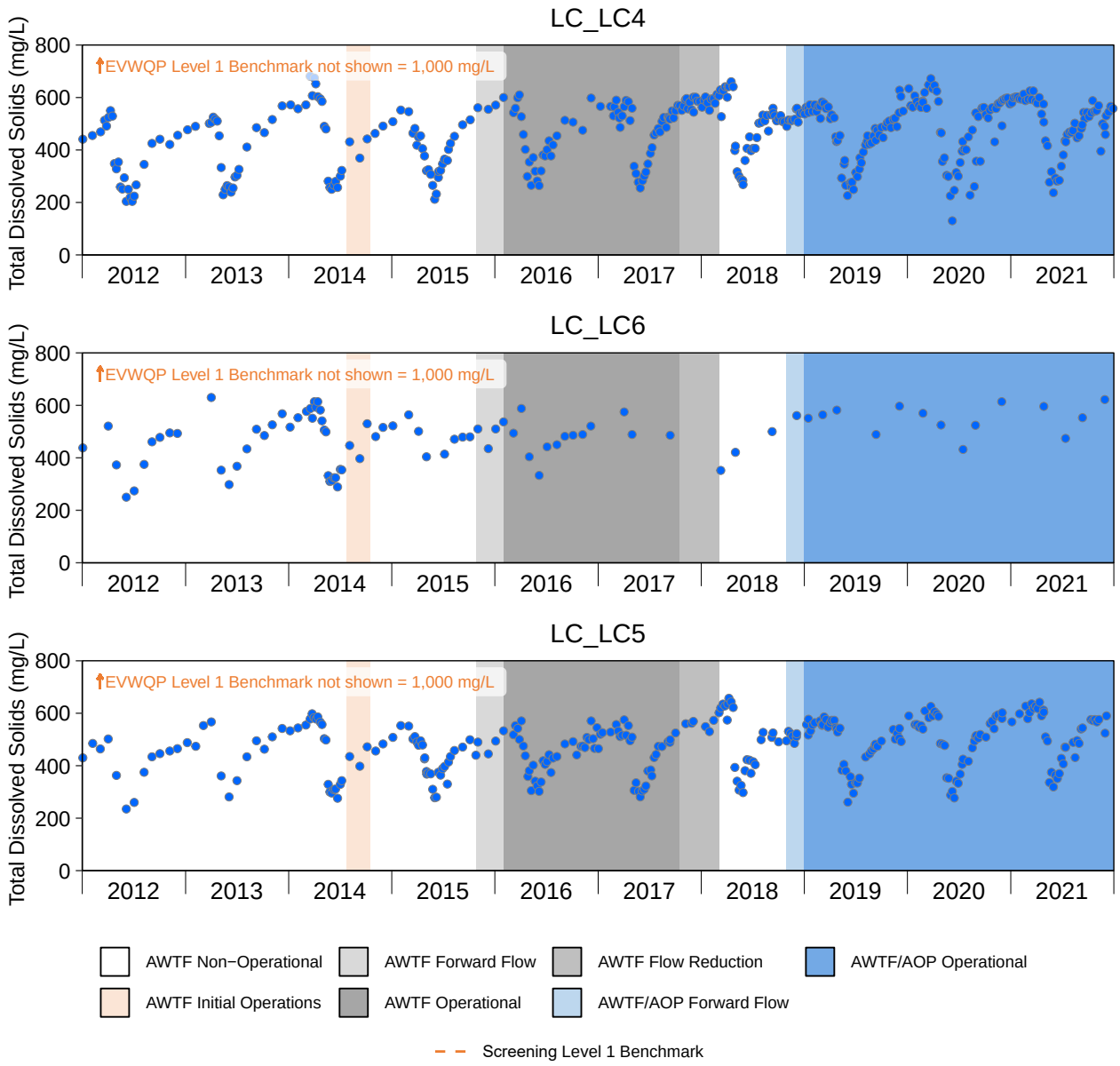

Figure D.1: Time Series Plots for Total Dissolved Solids Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

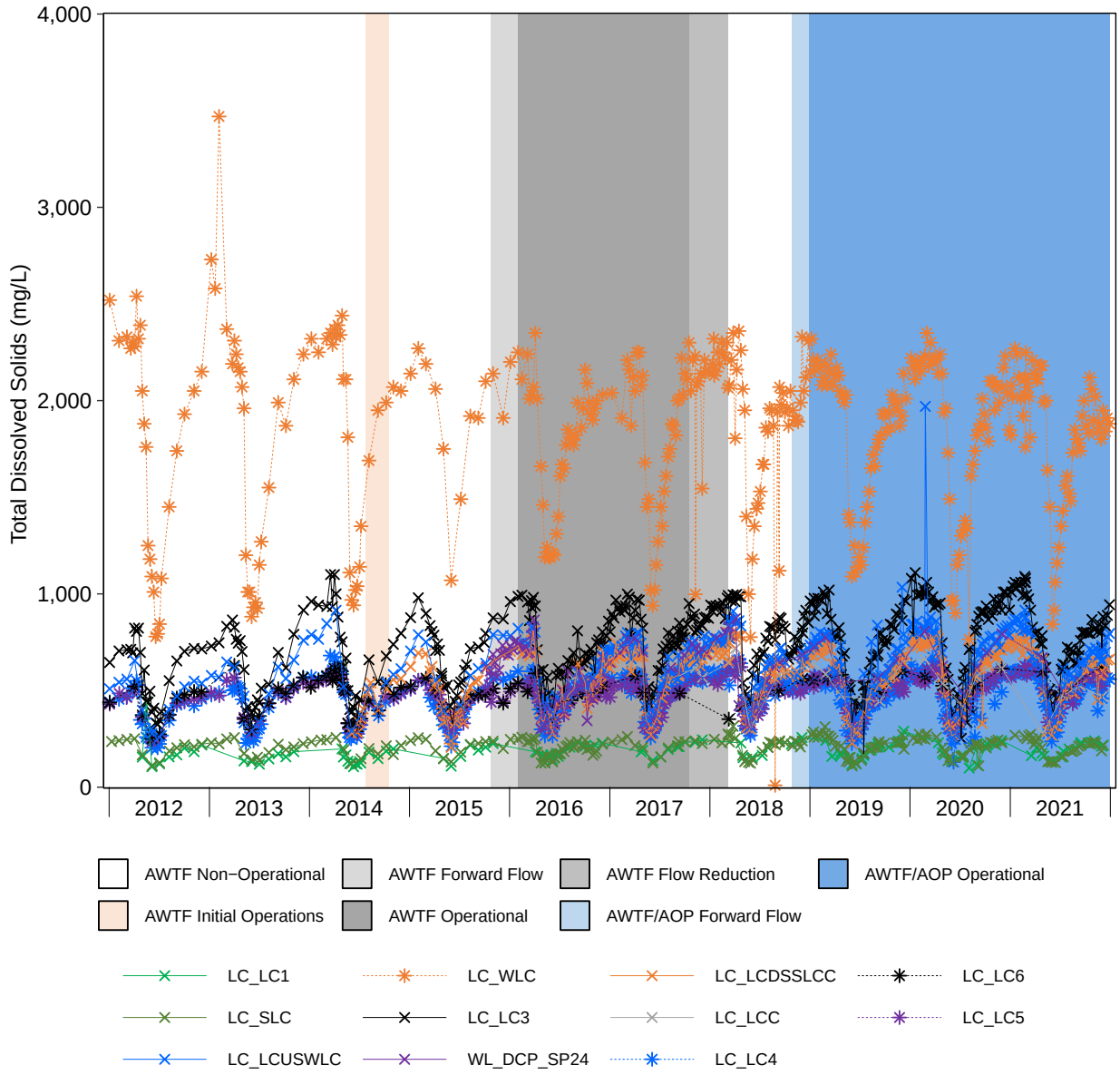

Figure D.2: Time Series Plots for Aqueous Total Dissolved Solids Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRL = 10 mg/L). West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine −exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

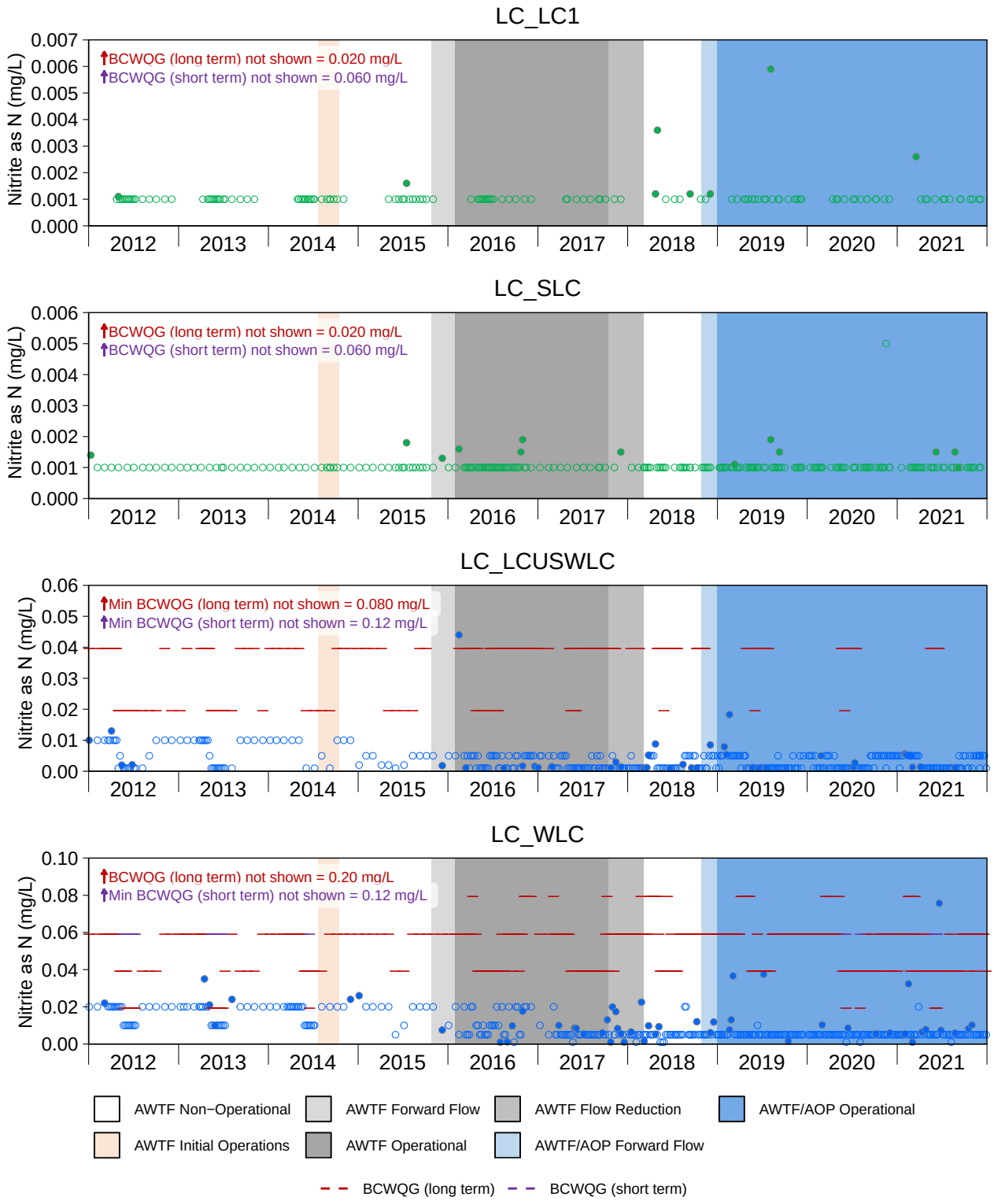

Figure D.3: Time Series Plots for Nitrite (as N) Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water chloride concentrations. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018). Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

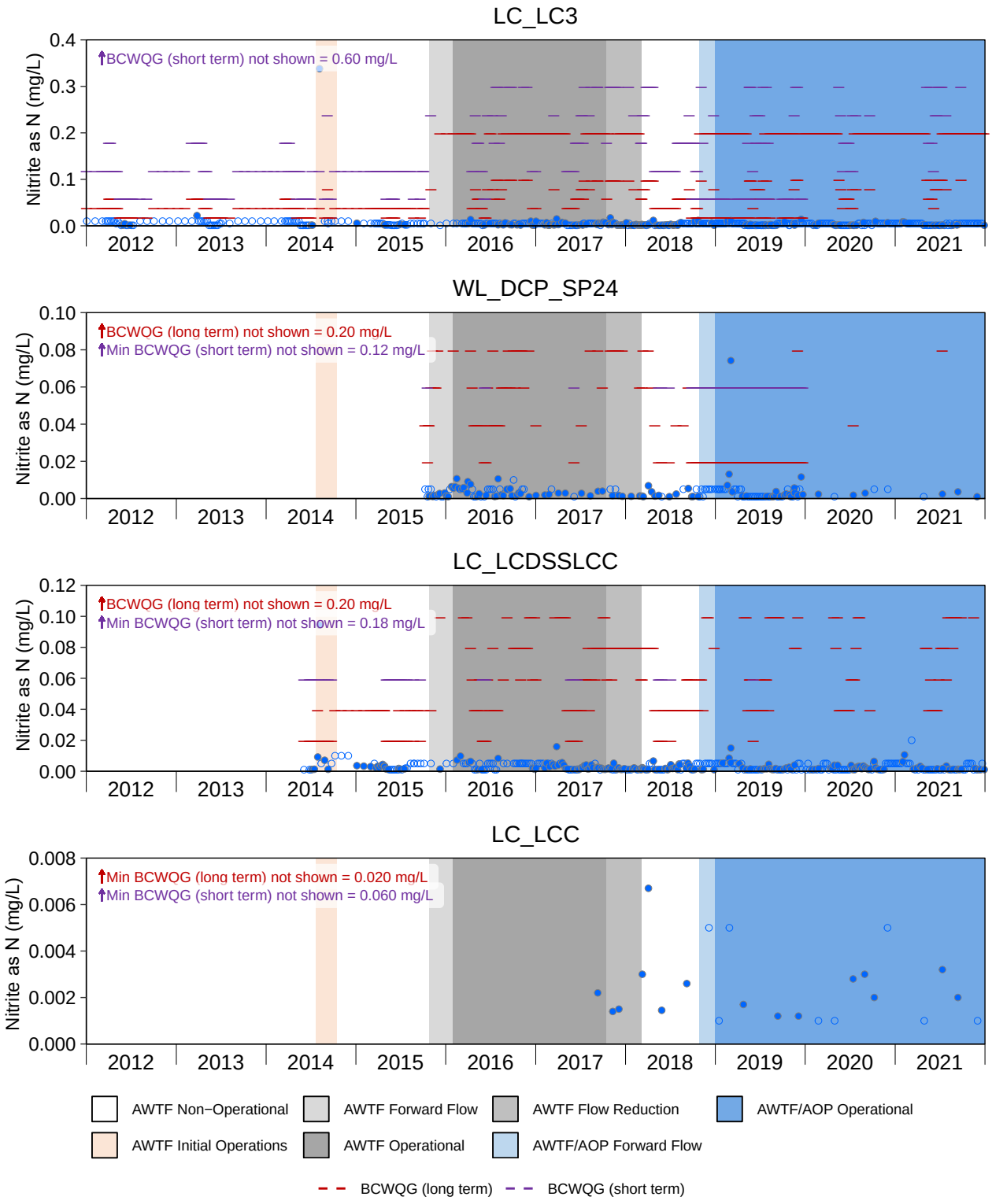

Figure D.3: Time Series Plots for Nitrite (as N) Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water chloride concentrations. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

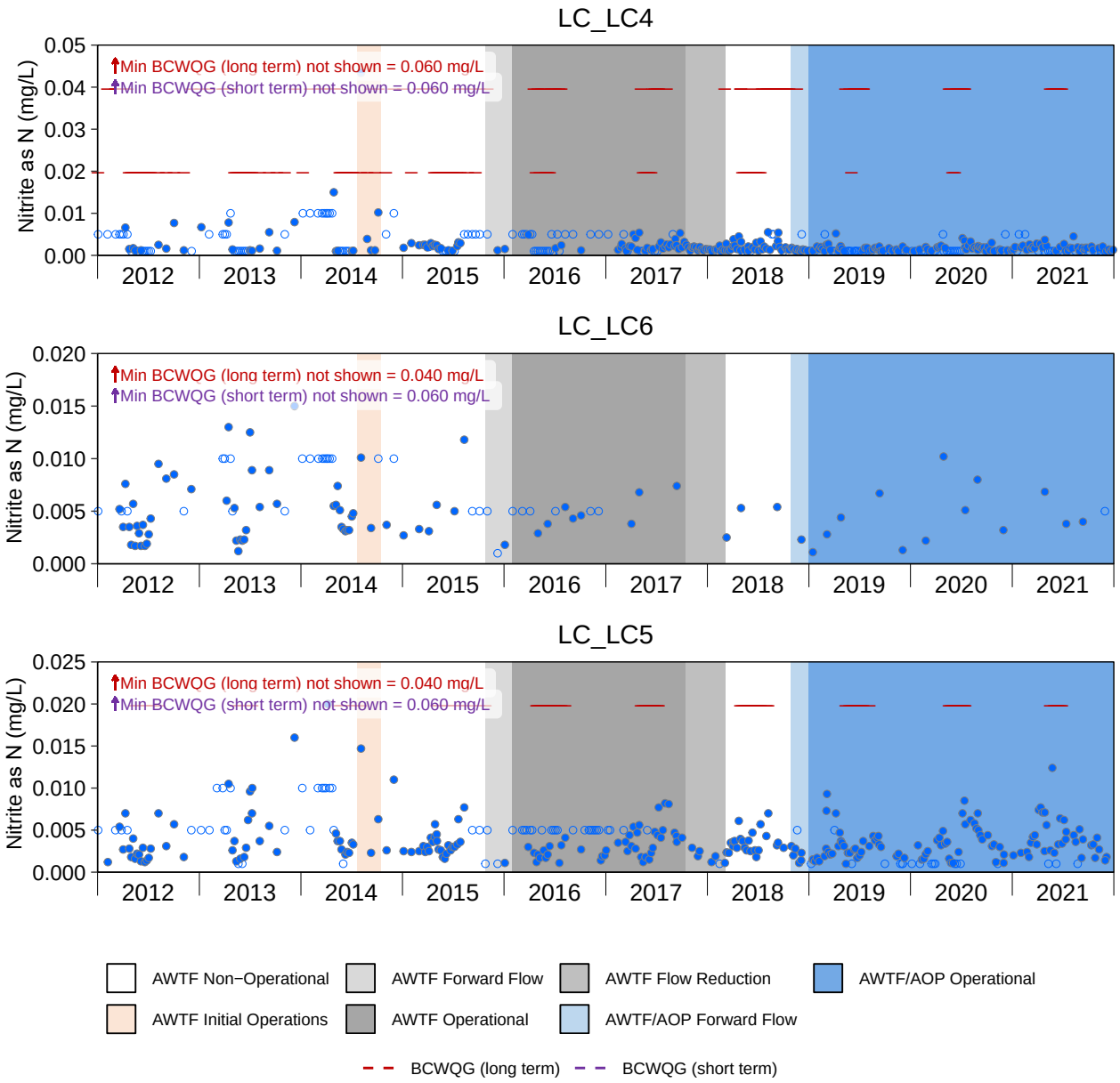

Figure D.3: Time Series Plots for Nitrite (as N) Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water chloride concentrations. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

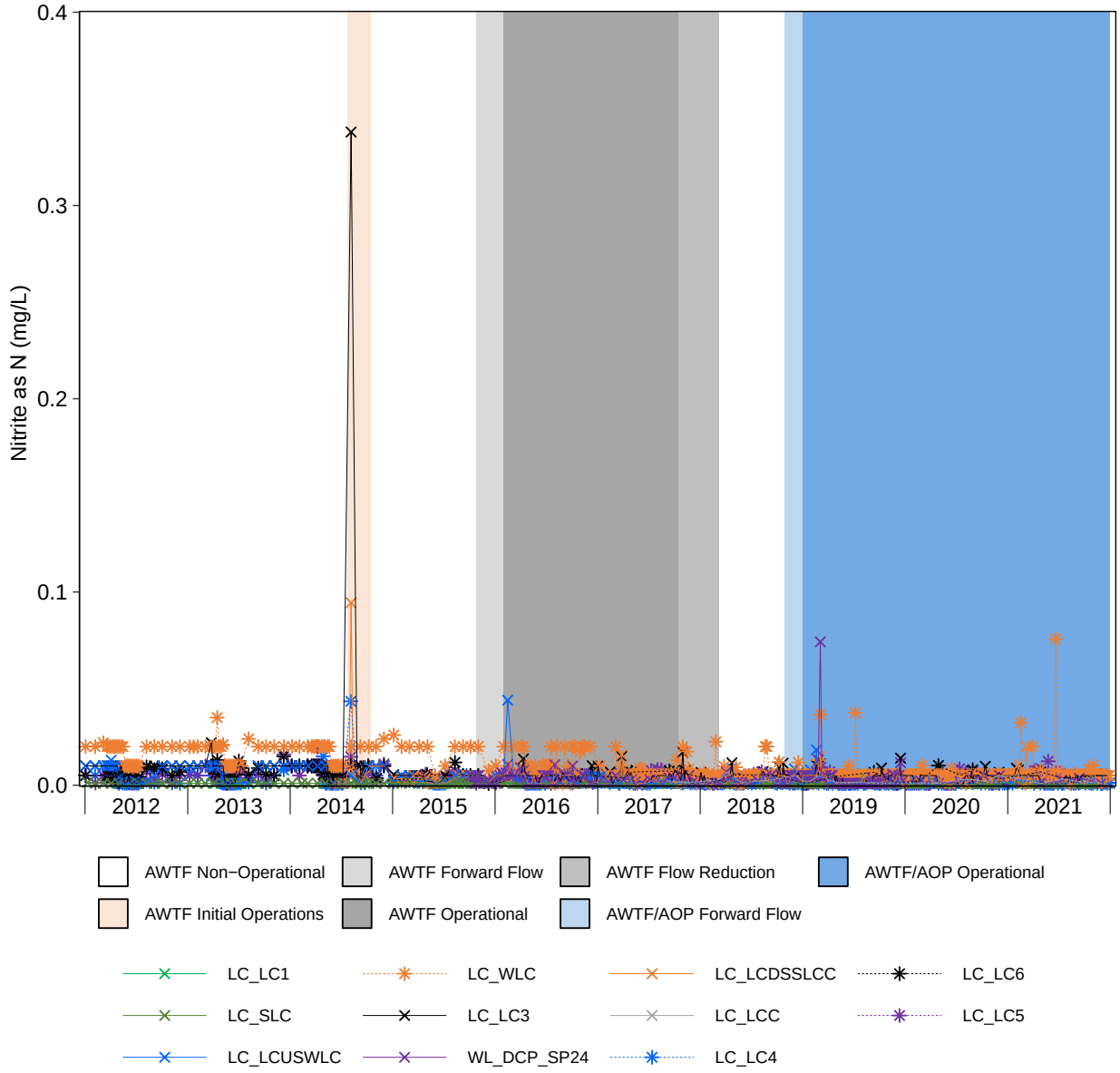

Figure D.4: Time Series Plots for Aqueous Nitrite (as N) Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRL ranged from 0.0010 to 0.020 mg/L). West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since September 2017.

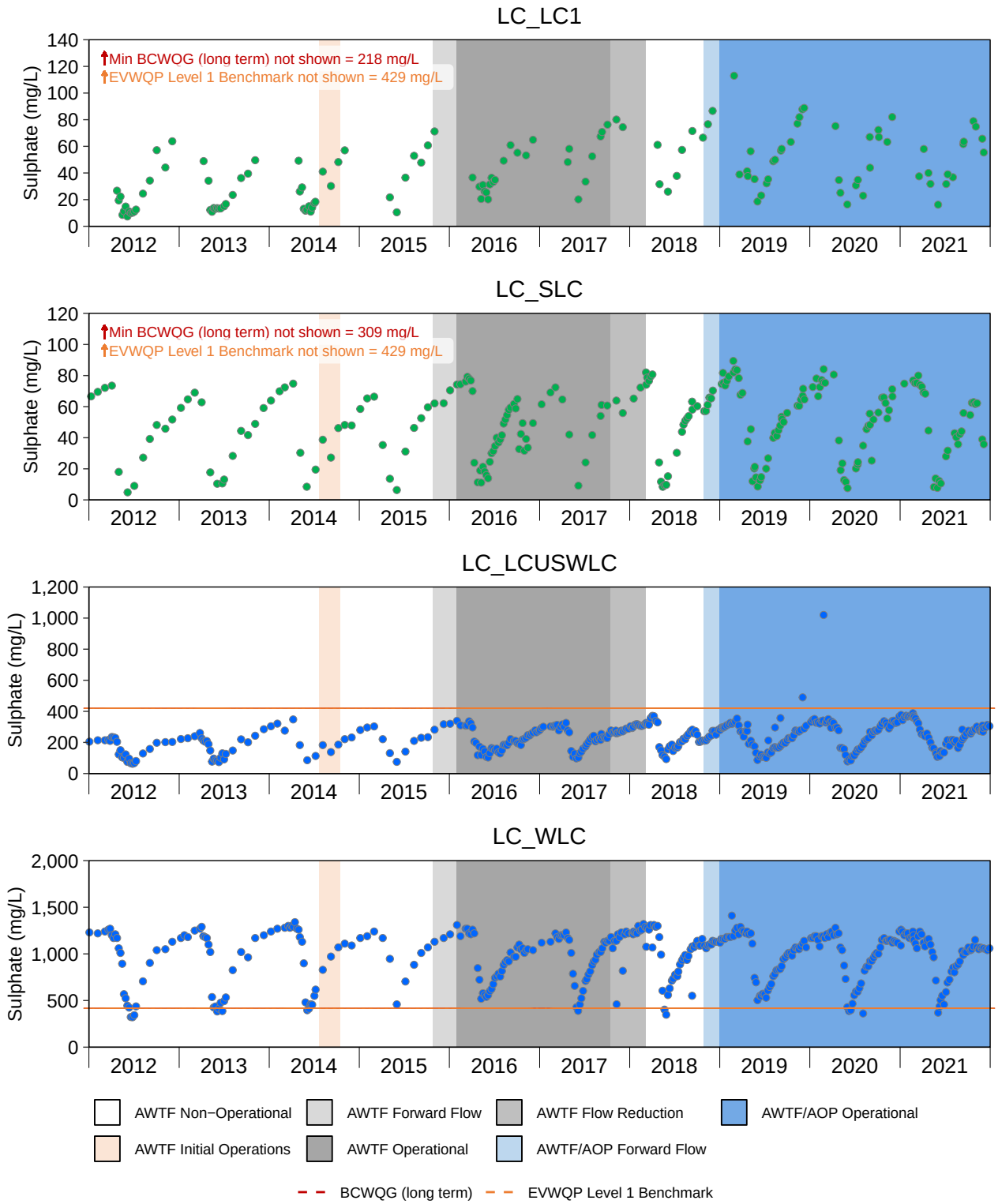

Figure D.5: Time Series Plots for Sulphate Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Guidelines are dependent on water hardness. EVWQP Level 1 Benchmark is shown in plots where the EVWQP Level 1 Benchmark and the BCWQG are equal. Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018). Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

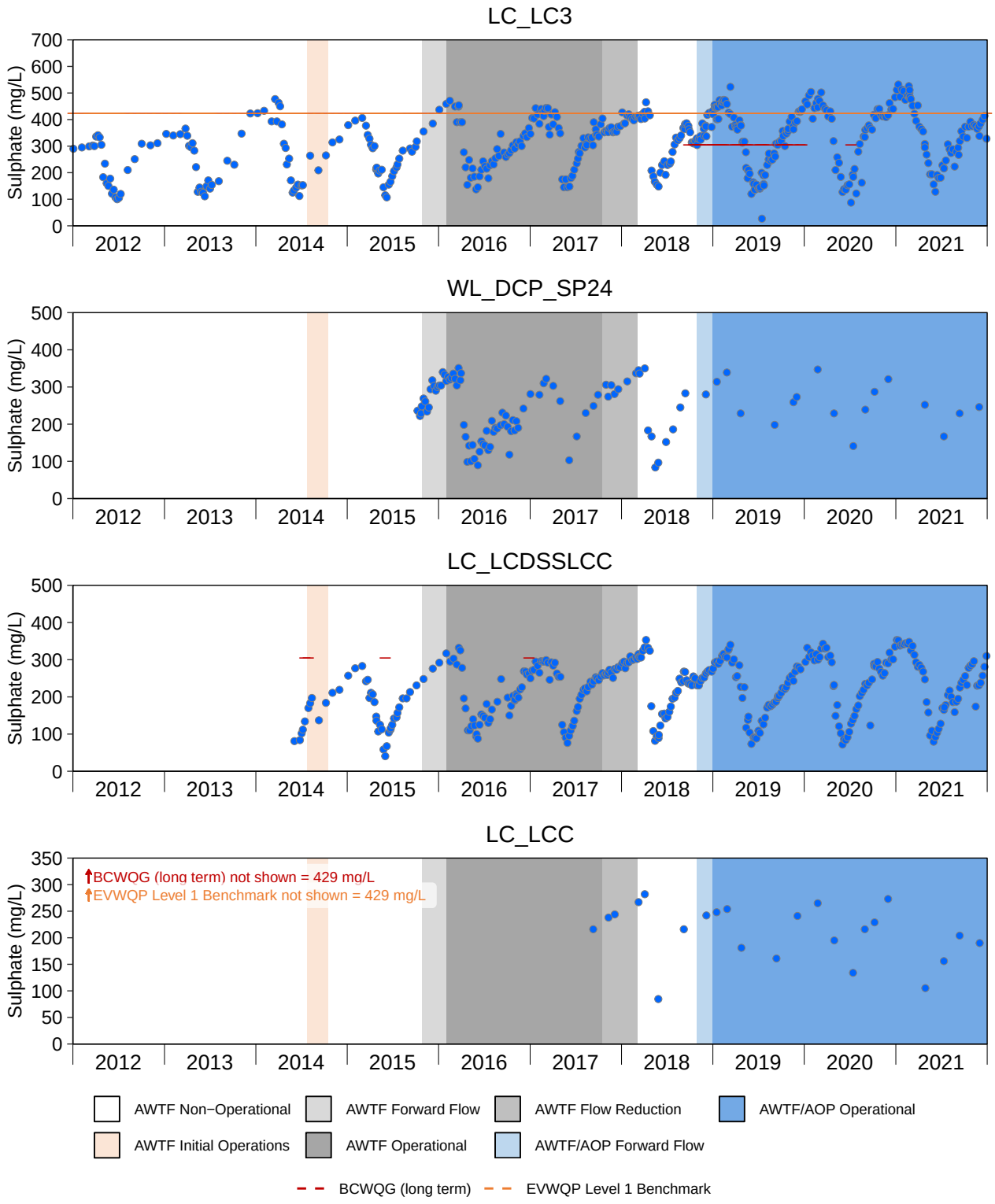

Figure D.5: Time Series Plots for Sulphate Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Guidelines are dependent on water hardness. EVWQP Level 1 Benchmark is shown in plots where the EVWQP Level 1 Benchmark and the BCWQG are equal. Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

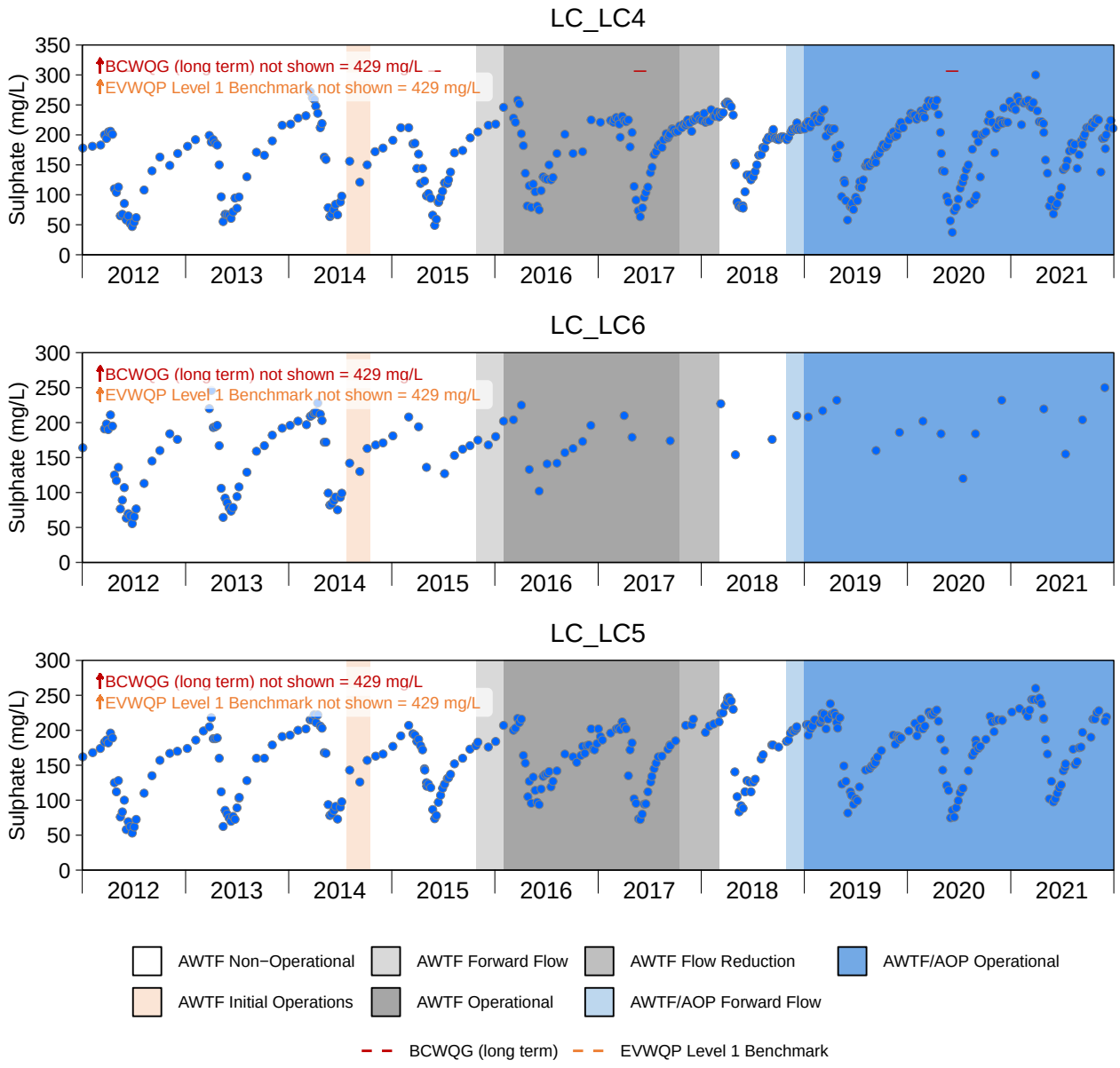

Figure D.5: Time Series Plots for Sulphate Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Guidelines are dependent on water hardness. EVWQP Level 1 Benchmark is shown in plots where the EVWQP Level 1 Benchmark and the BCWQG are equal. Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

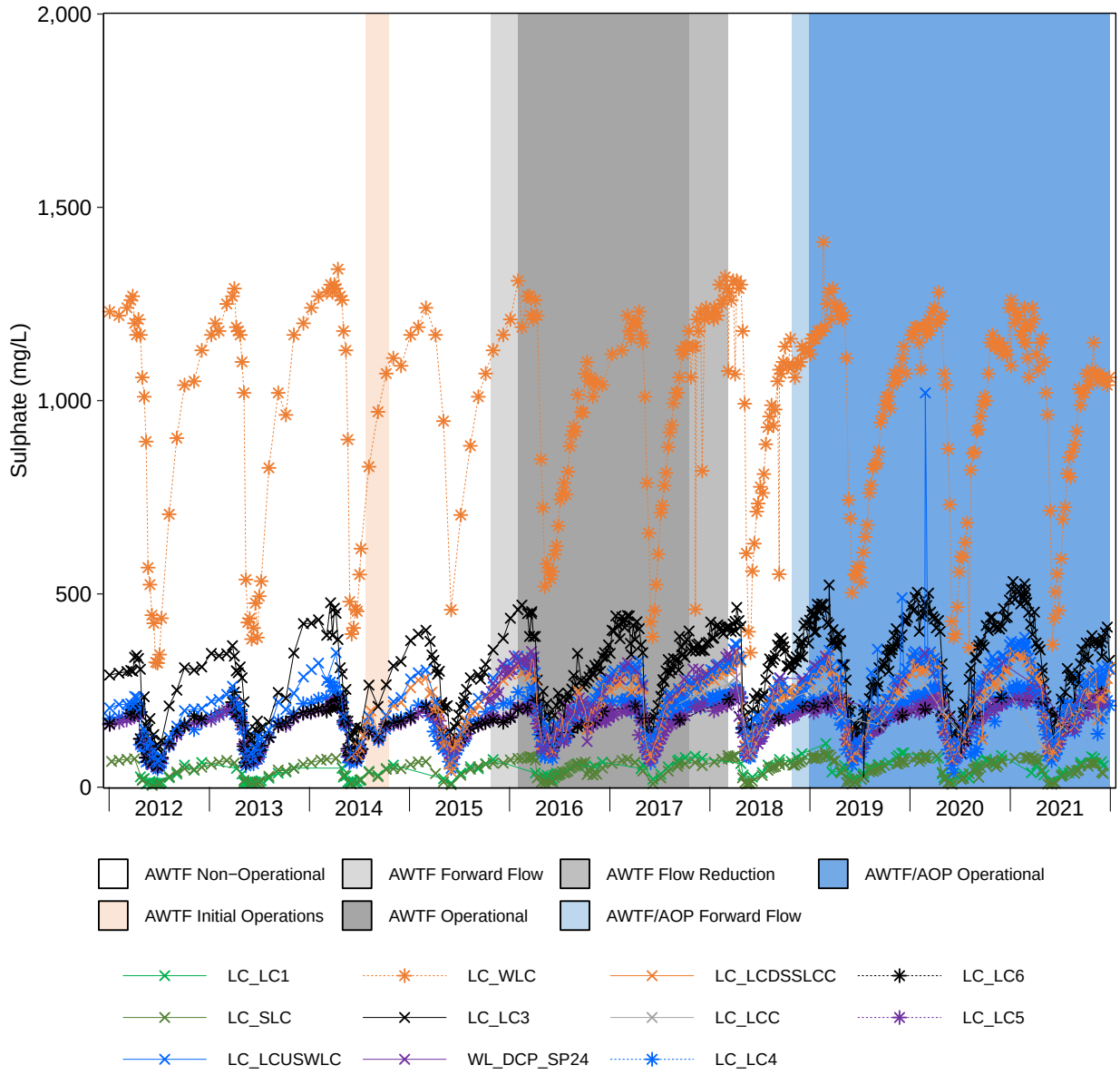

Figure D.6: Time Series Plots for Aqueous Sulphate Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations were above the LRL in all samples. Guidelines are dependent on water hardness. EVWQP Level 1 Benchmark is shown in plots where the EVWQP Level 1 Benchmark and the BCWQG are equal. West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine− exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since September 2017.

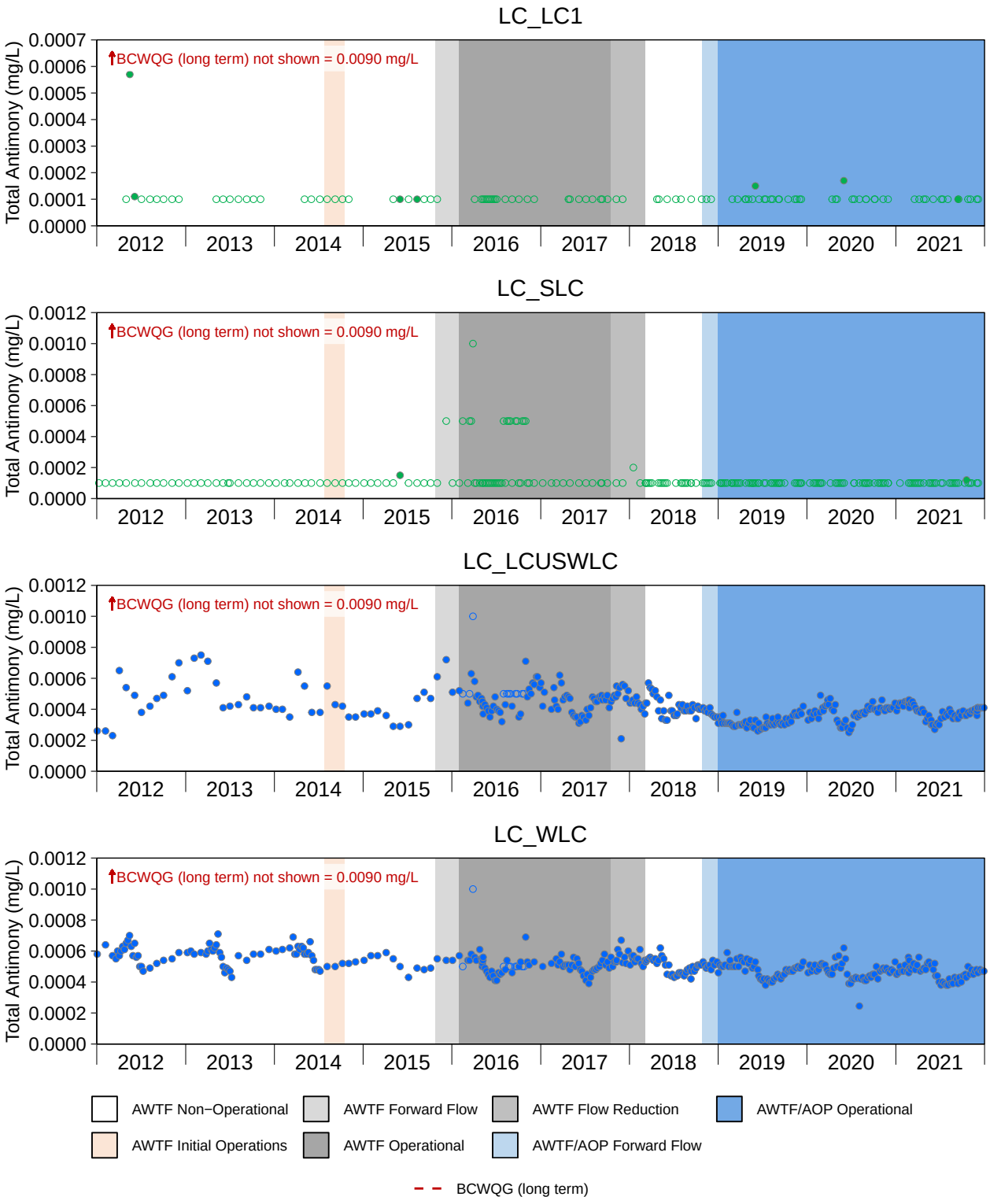

Figure D.7: Time Series Plots for Total Antimony Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018). Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

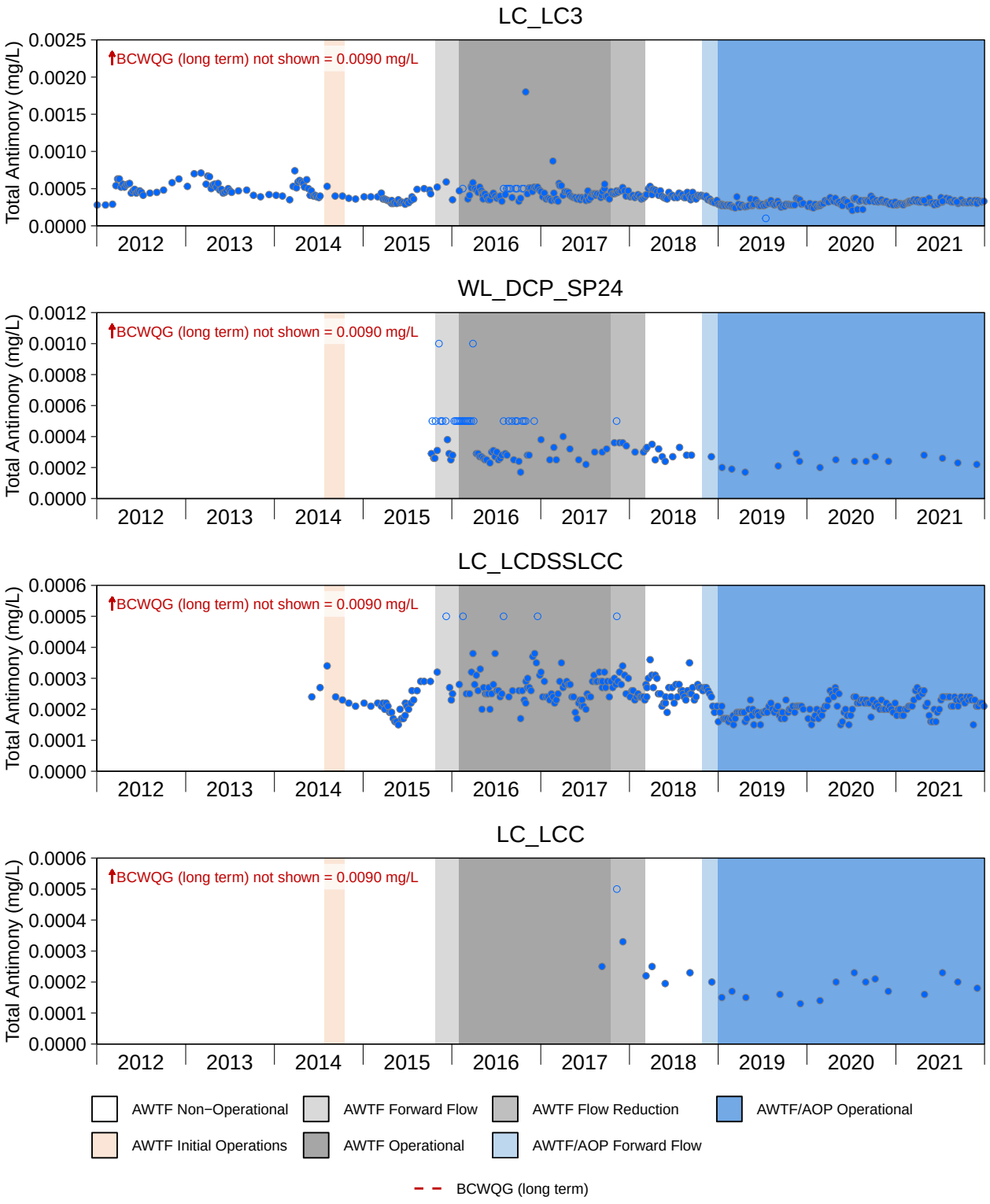

Figure D.7: Time Series Plots for Total Antimony Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

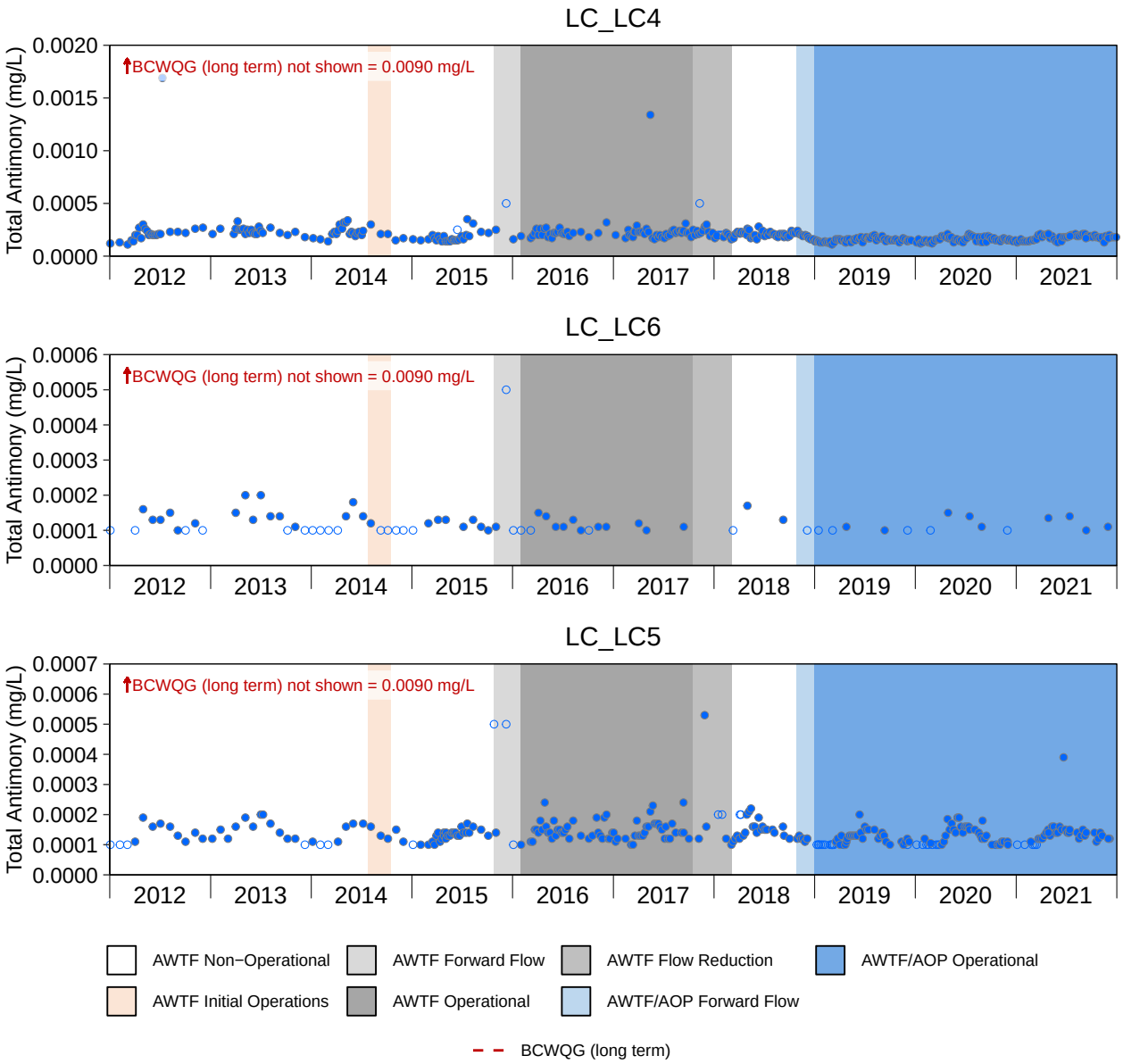

Figure D.7: Time Series Plots for Total Antimony Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

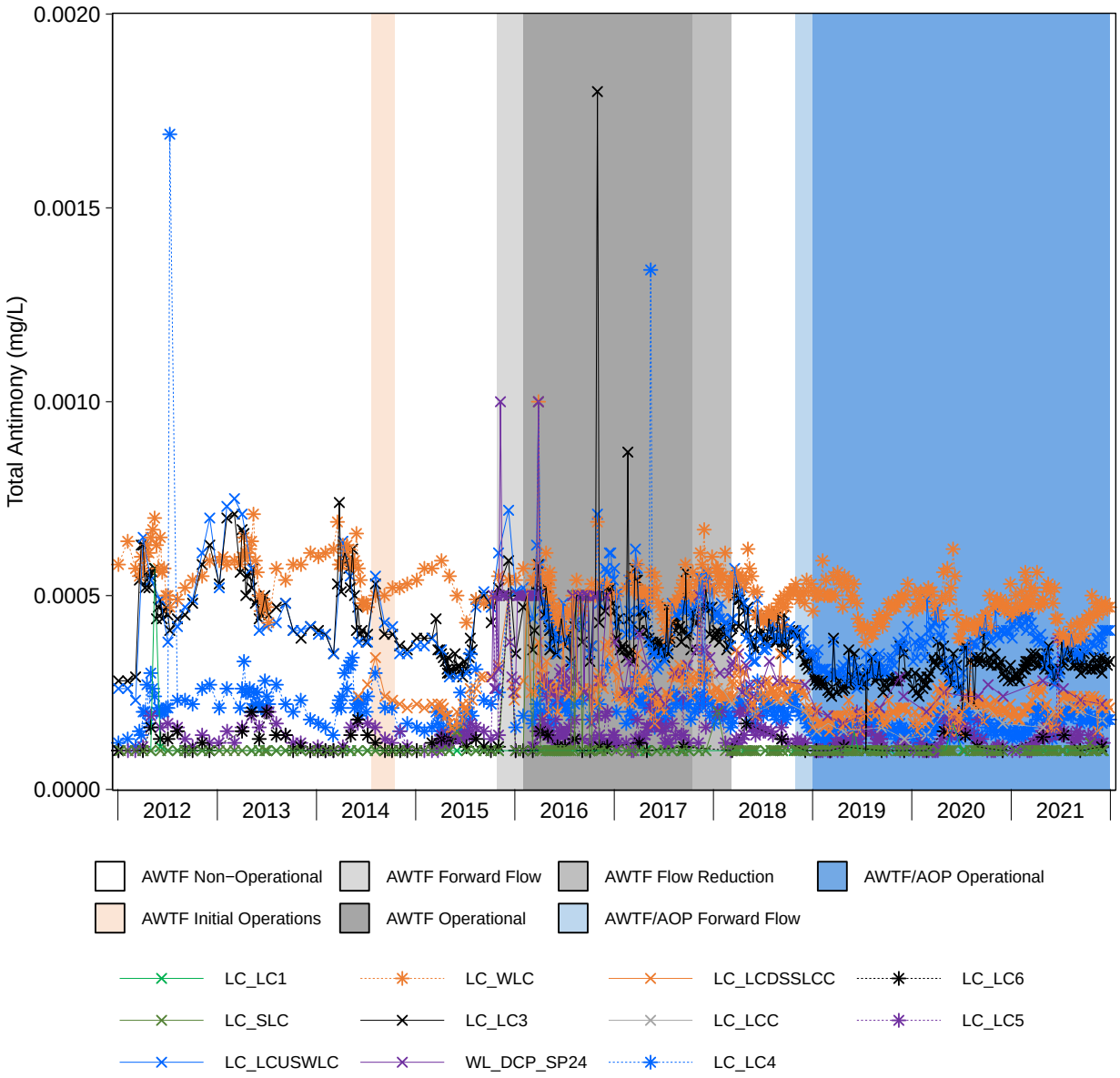

Figure D.8: Time Series Plots for Aqueous Total Antimony Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRL ranged from 0.00010 to 0.0010 mg/L). West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since September 2017.

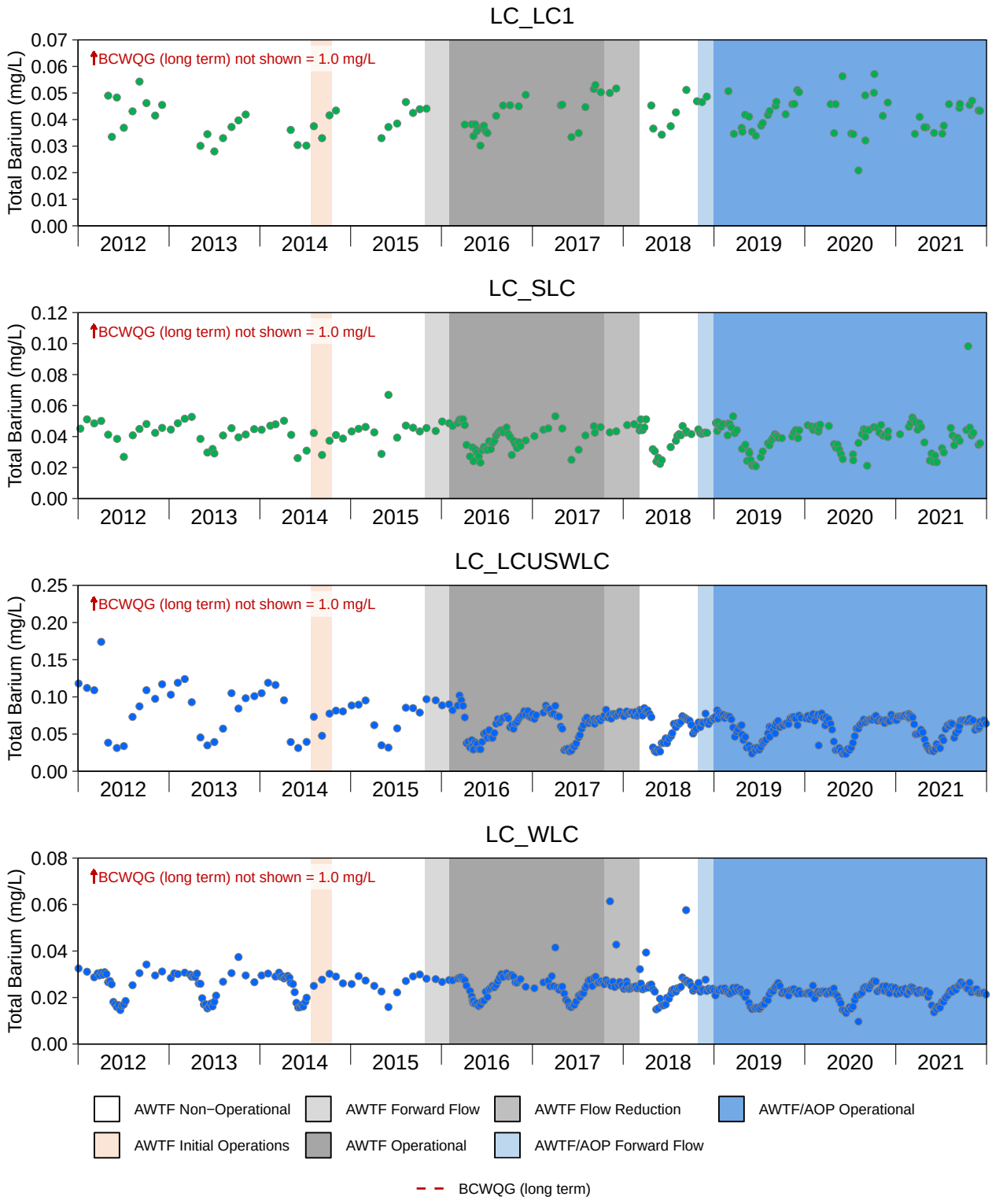

Figure D.9: Time Series Plots for Total Barium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018). Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

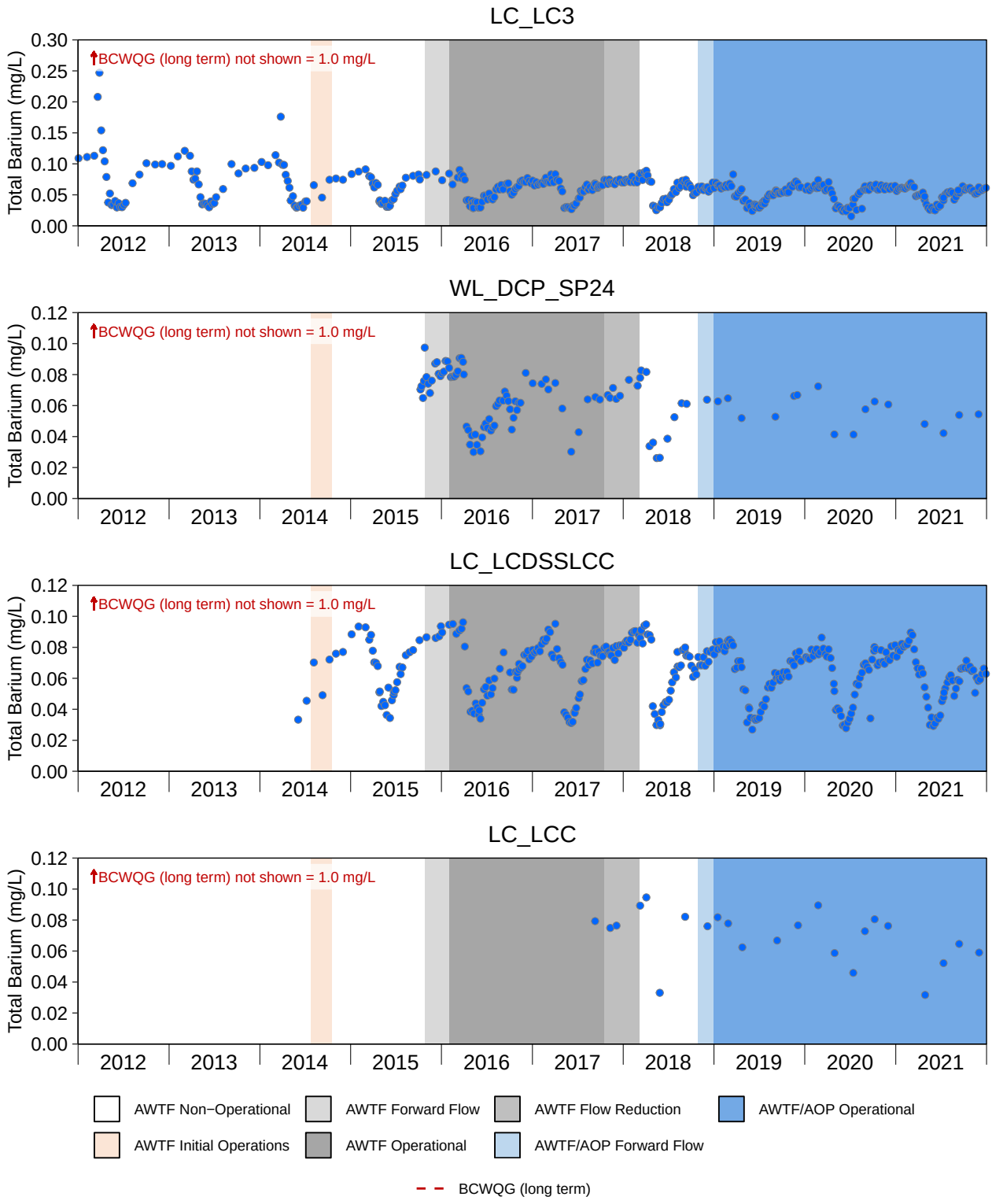

Figure D.9: Time Series Plots for Total Barium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

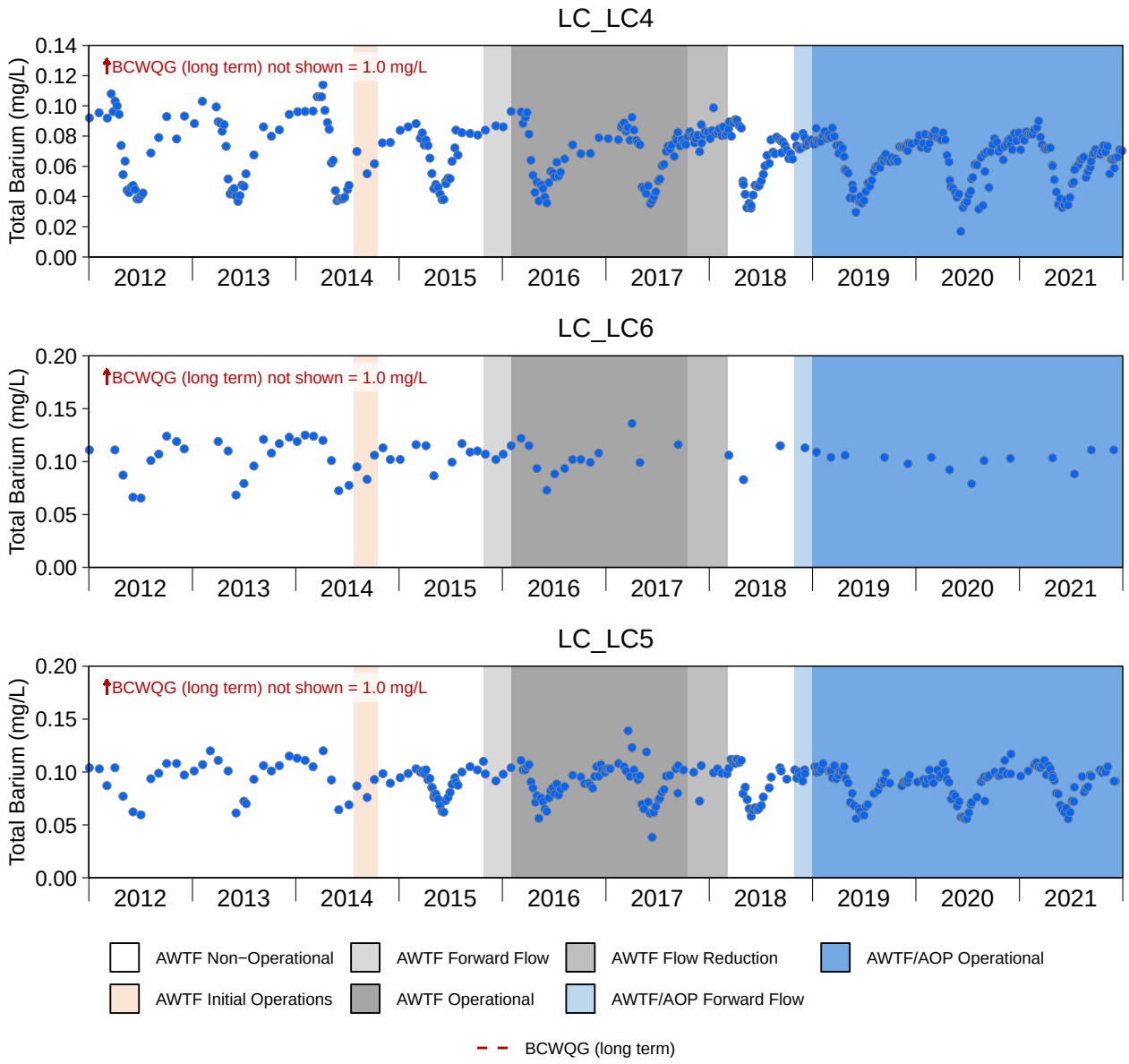

Figure D.9: Time Series Plots for Total Barium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

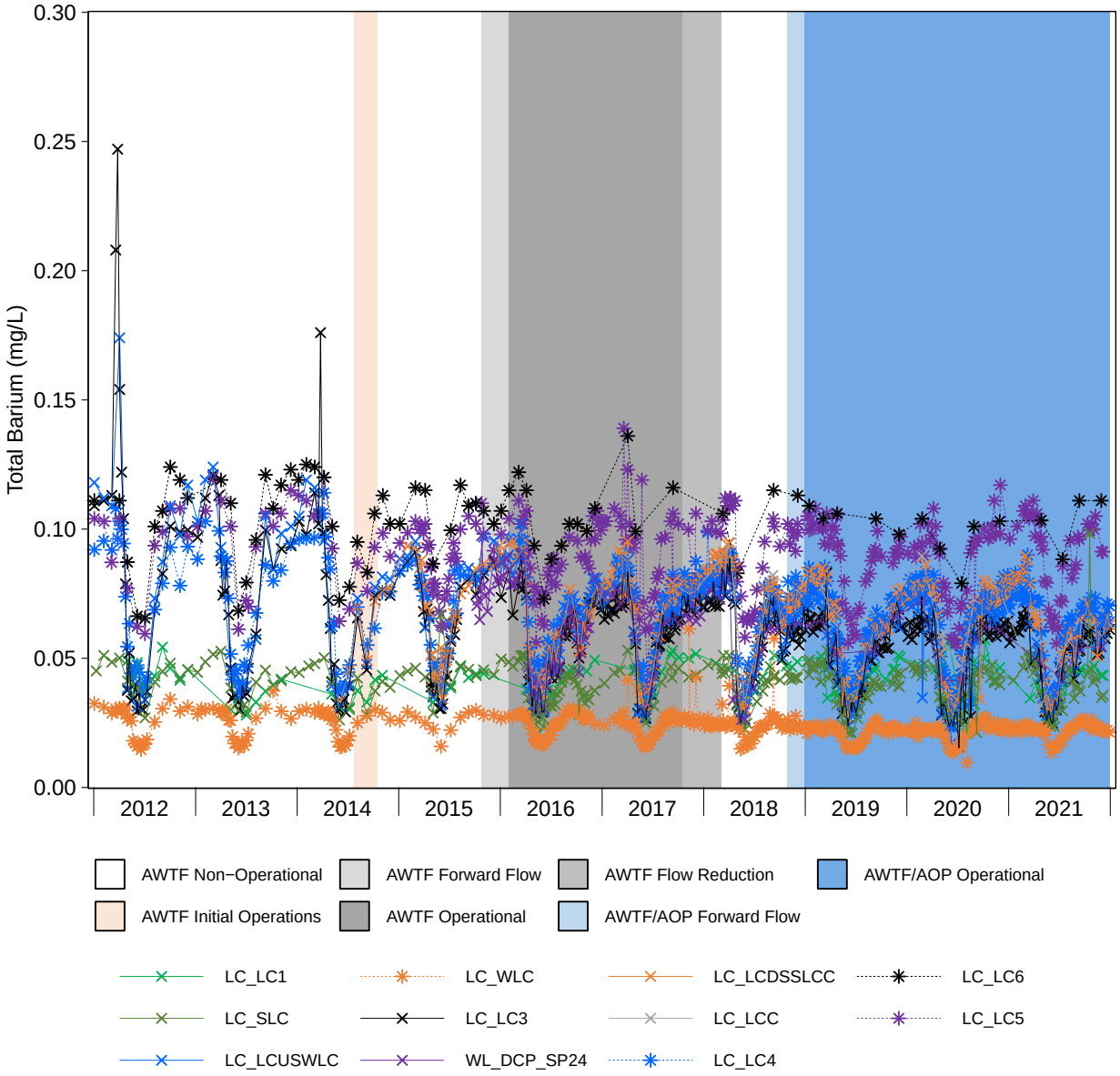

Figure D.10: Time Series Plots for Aqueous Total Barium Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations were above the LRL in all samples. West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine− exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

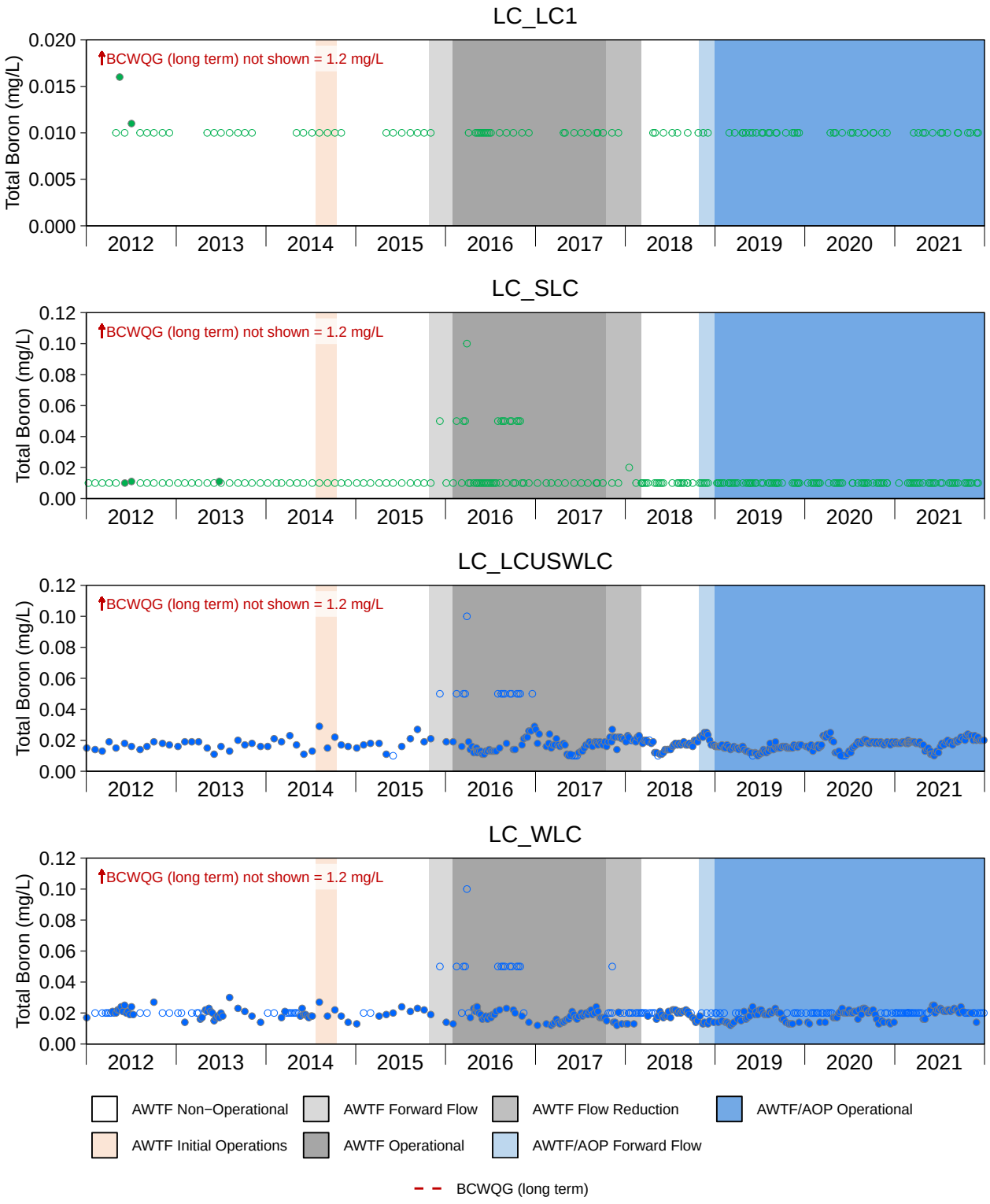

Figure D.11: Time Series Plots for Total Boron Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018). Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

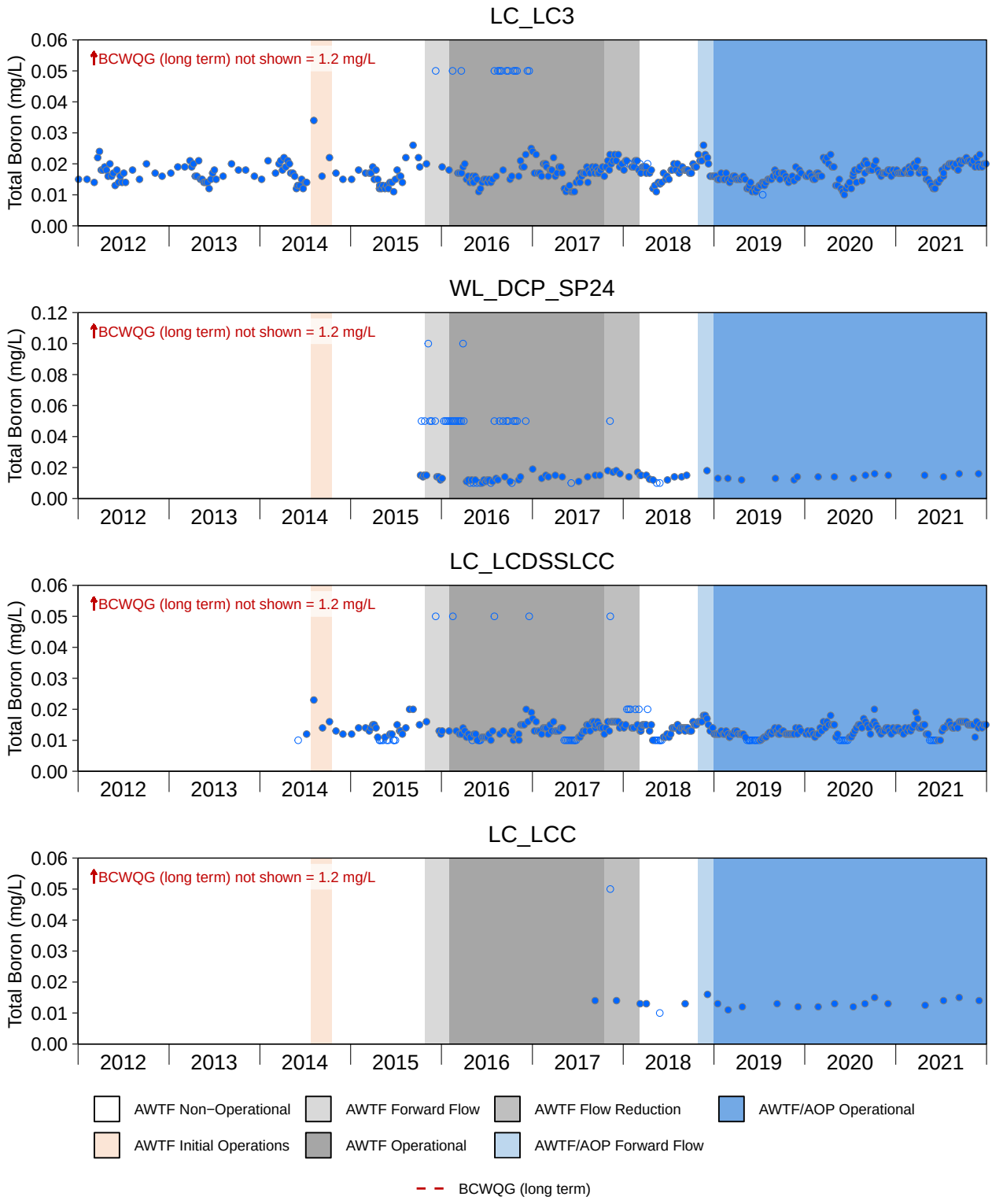

Figure D.11: Time Series Plots for Total Boron Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

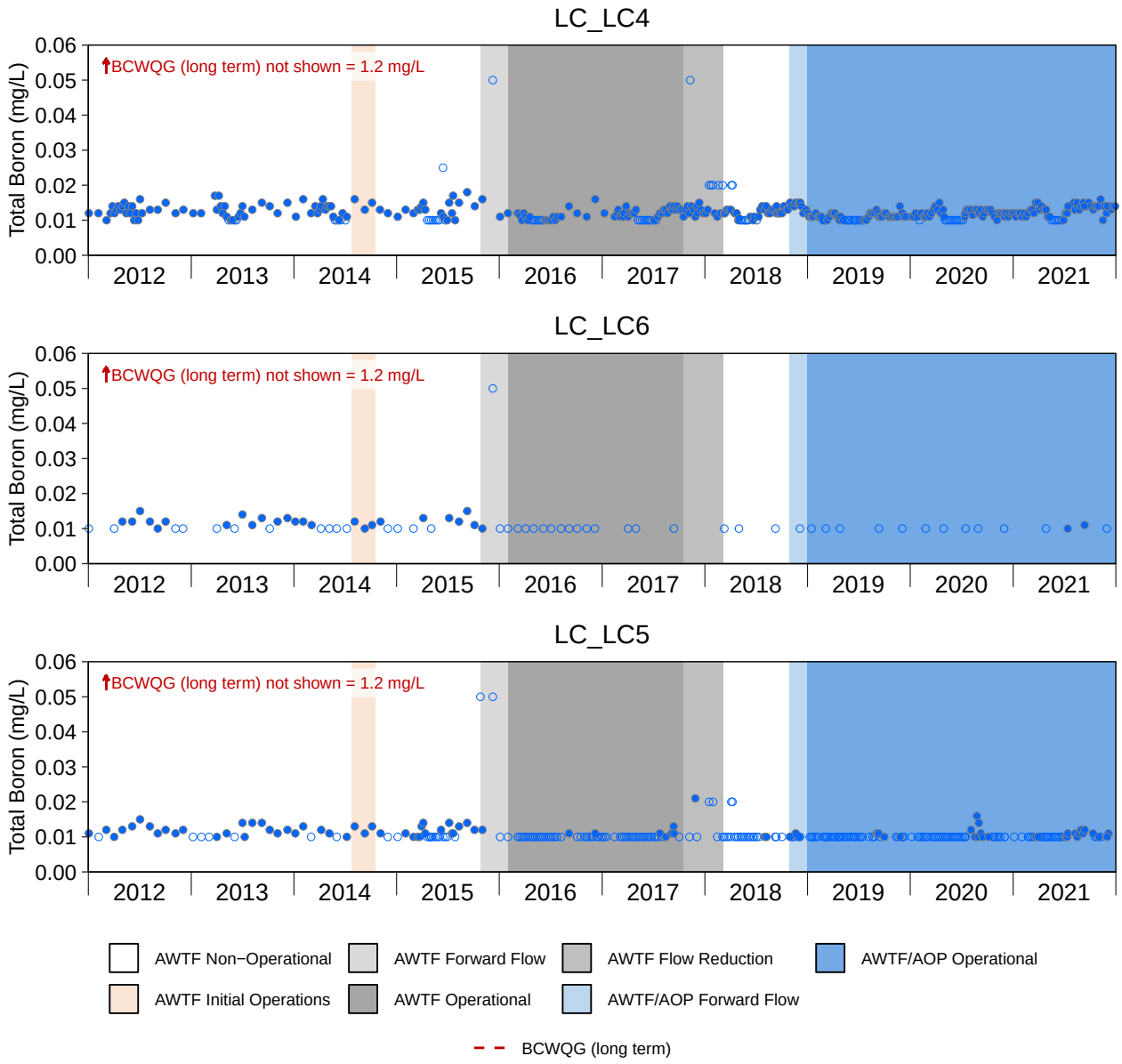

Figure D.11: Time Series Plots for Total Boron Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

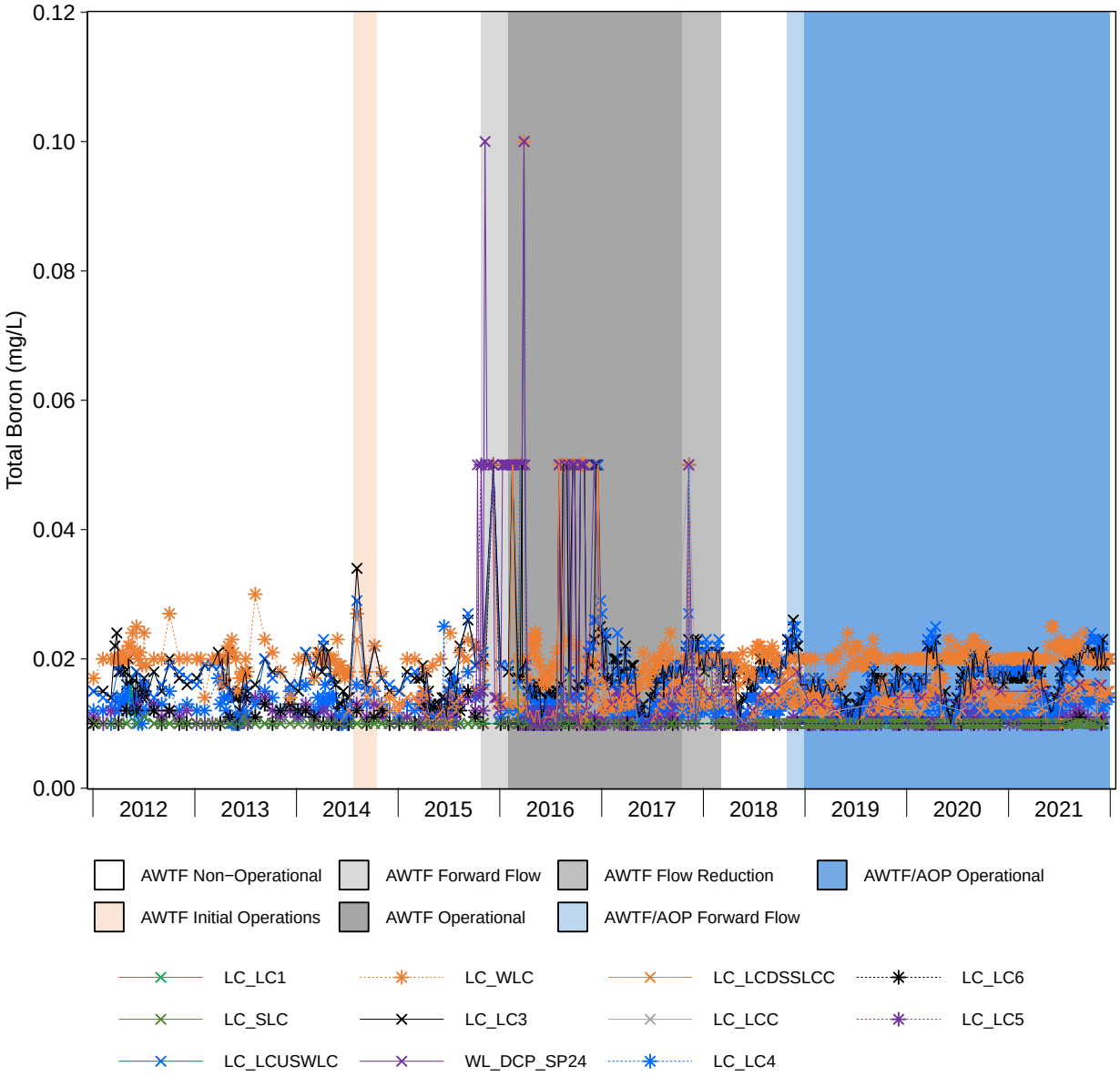

Figure D.12: Time Series Plots for Aqueous Total Boron Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL. West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

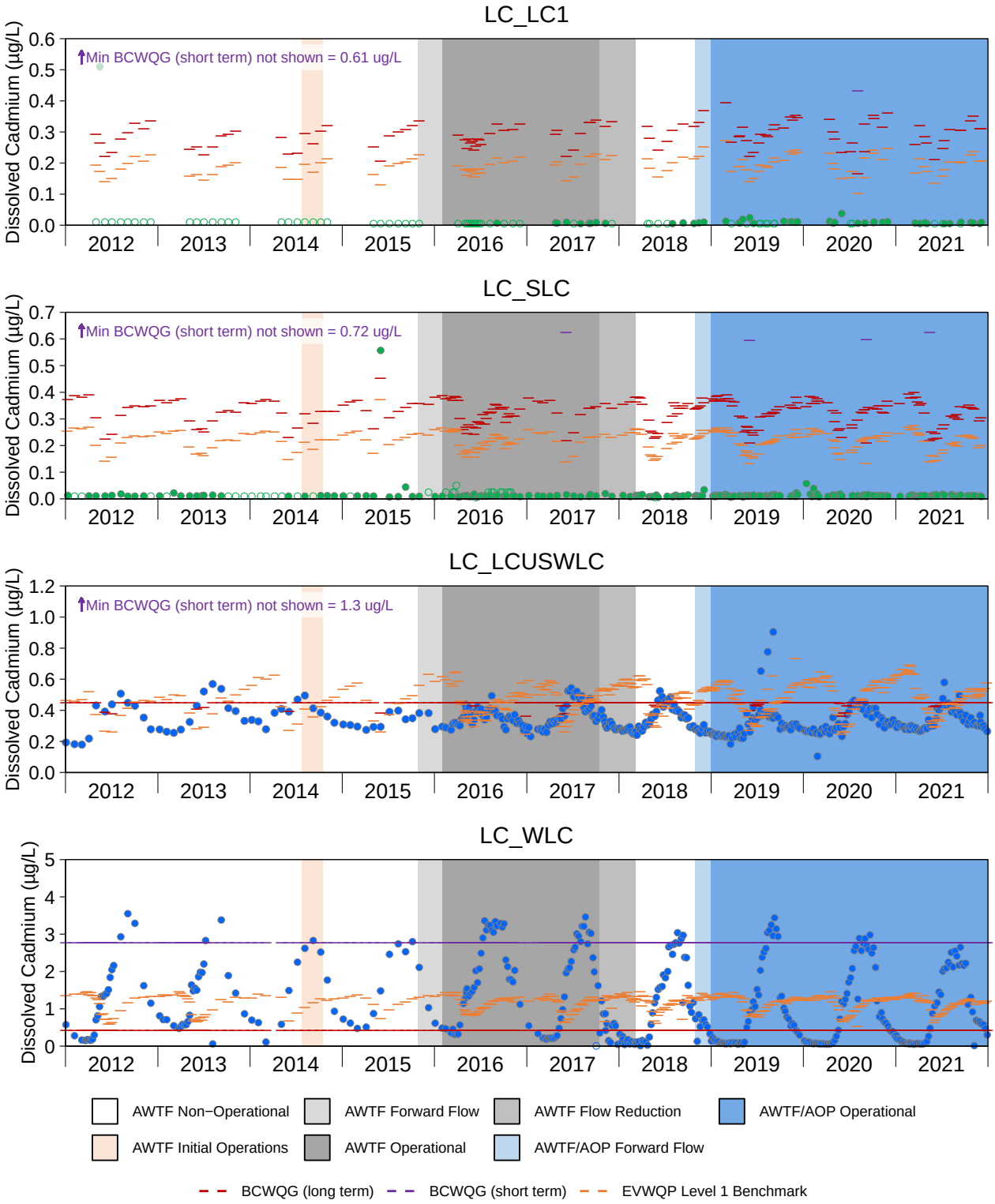

Figure D.13: Time Series Plots for Dissolved Cadmium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: otes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Constituent was plotted because it was identified as a mine −related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018). Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since September 2017.

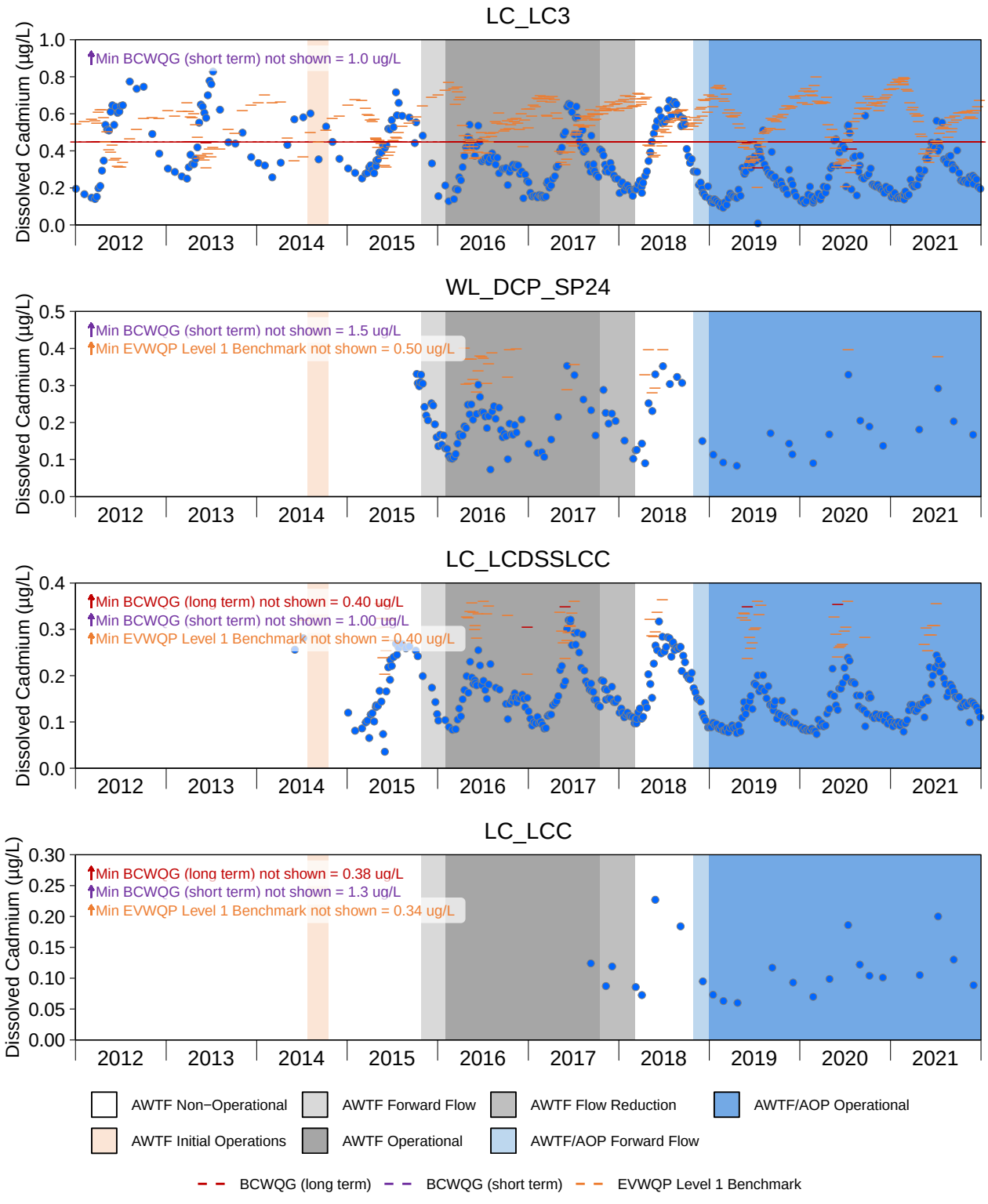

Figure D.13: Time Series Plots for Dissolved Cadmium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

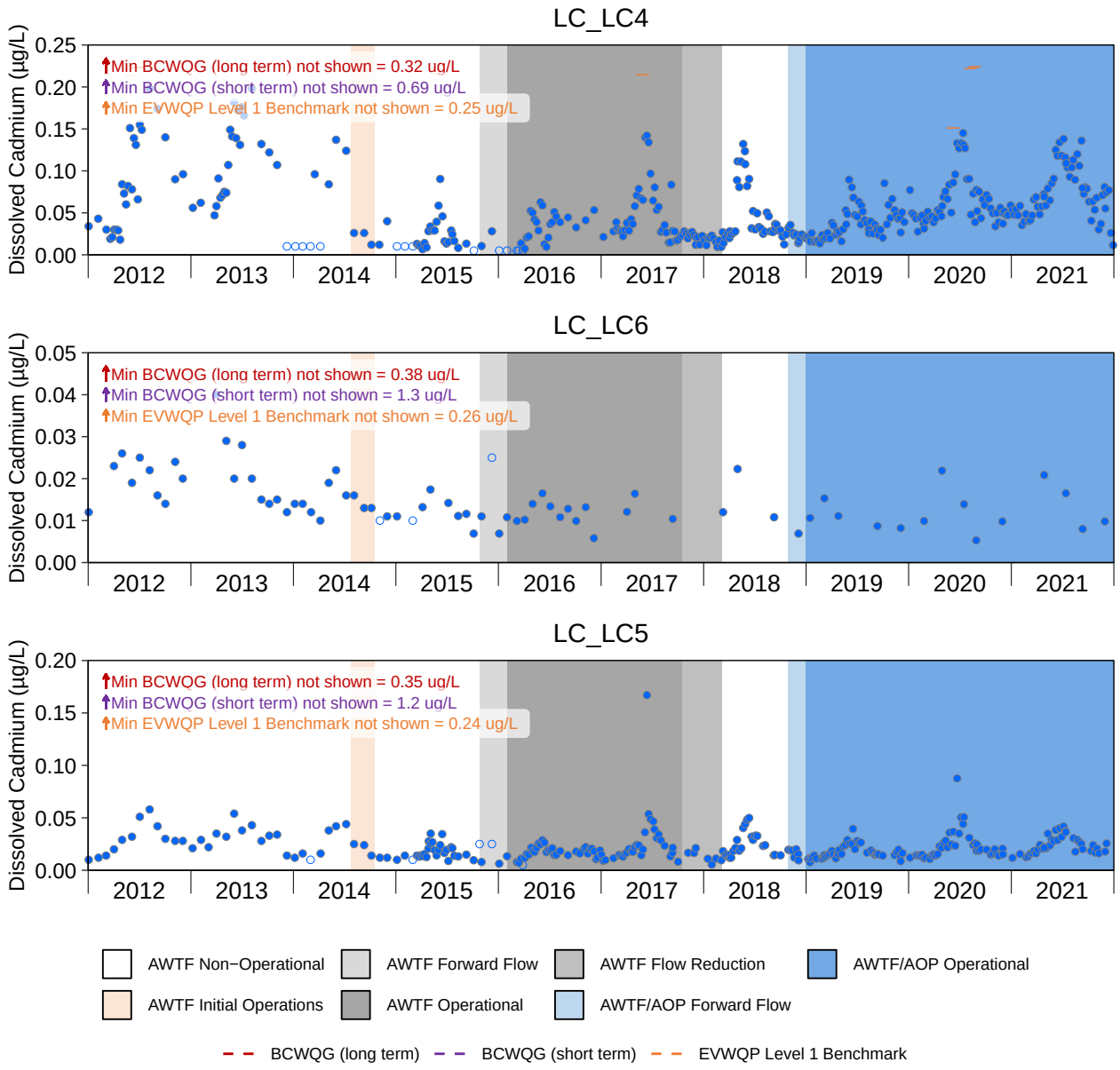

Figure D.13: Time Series Plots for Dissolved Cadmium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

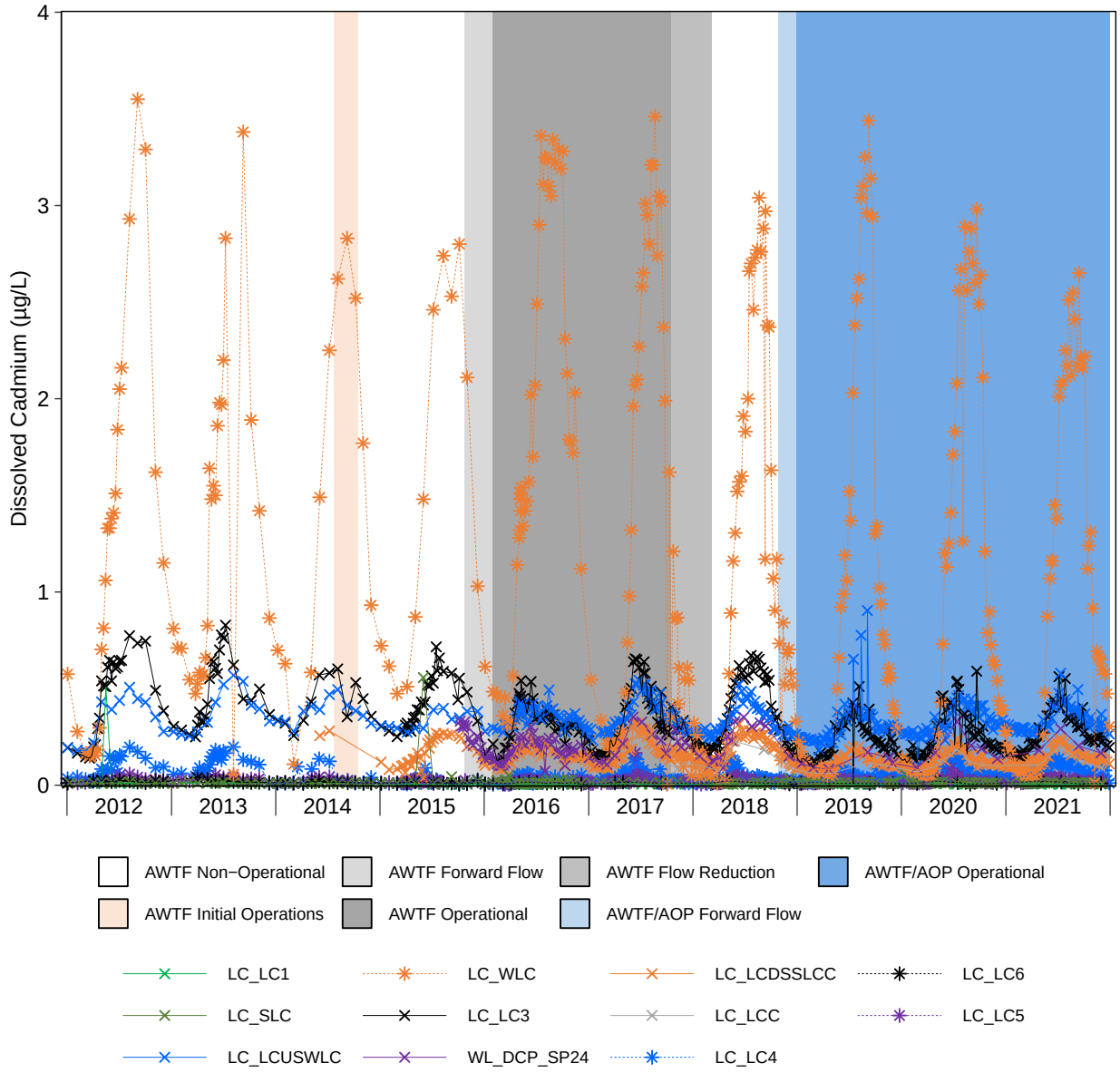

Figure D.14: Time Series Plots for Aqueous Dissolved Cadmium Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRL ranged from 0.0050 to 0.050 mg/L). West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since September 2017.

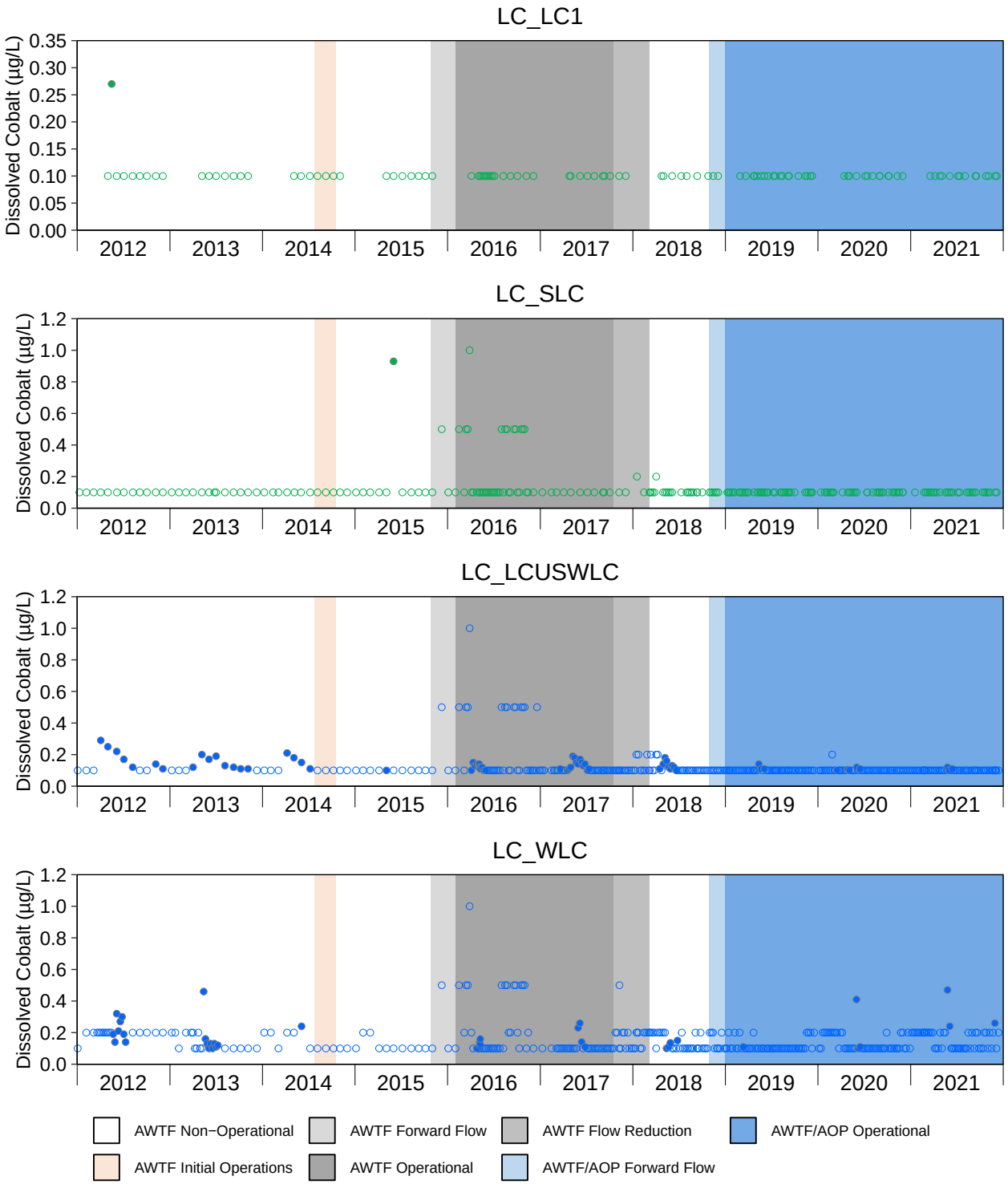

Figure D.15: Time Series Plots for Dissolved Cobalt Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018). Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

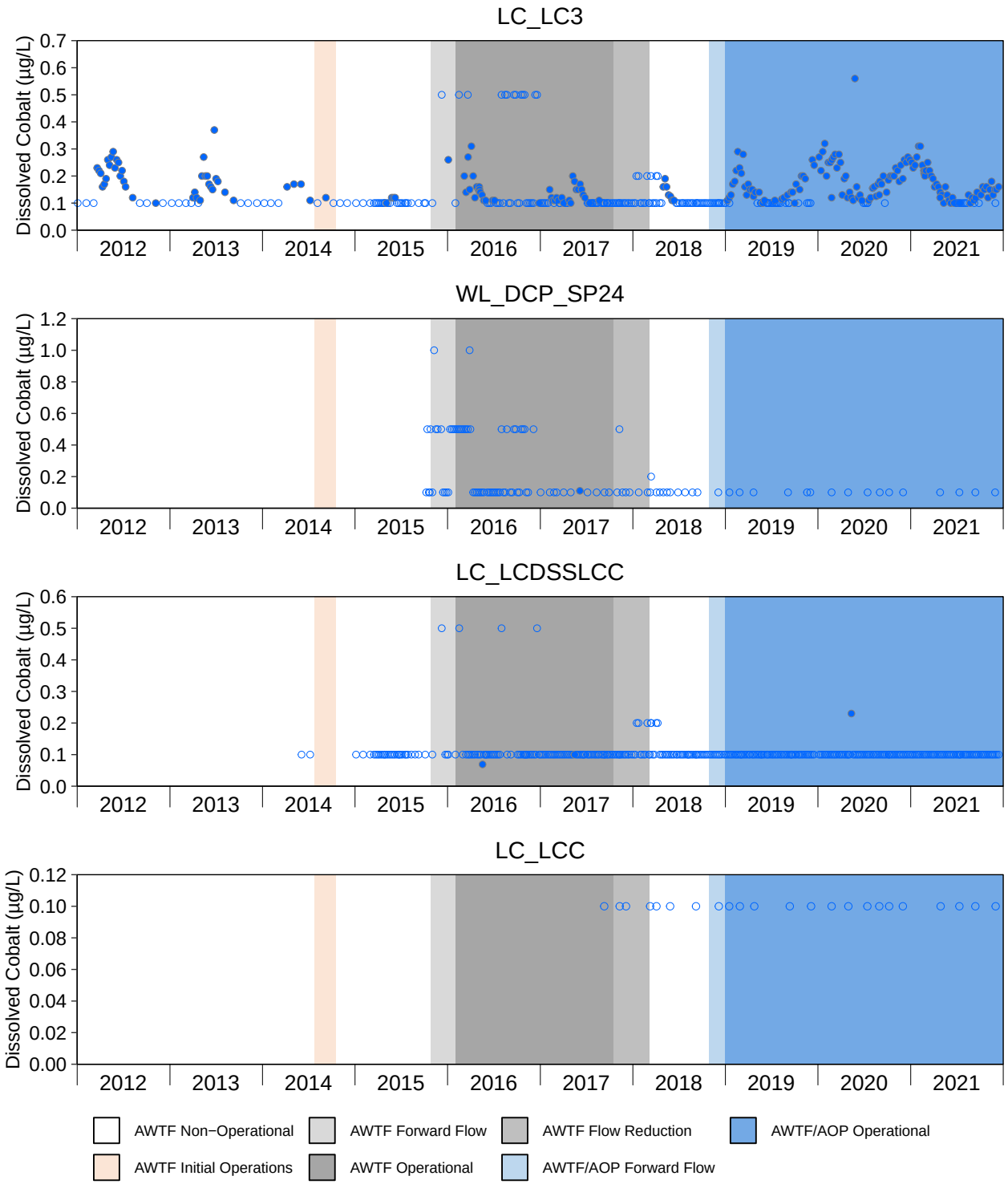

Figure D.15: Time Series Plots for Dissolved Cobalt Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

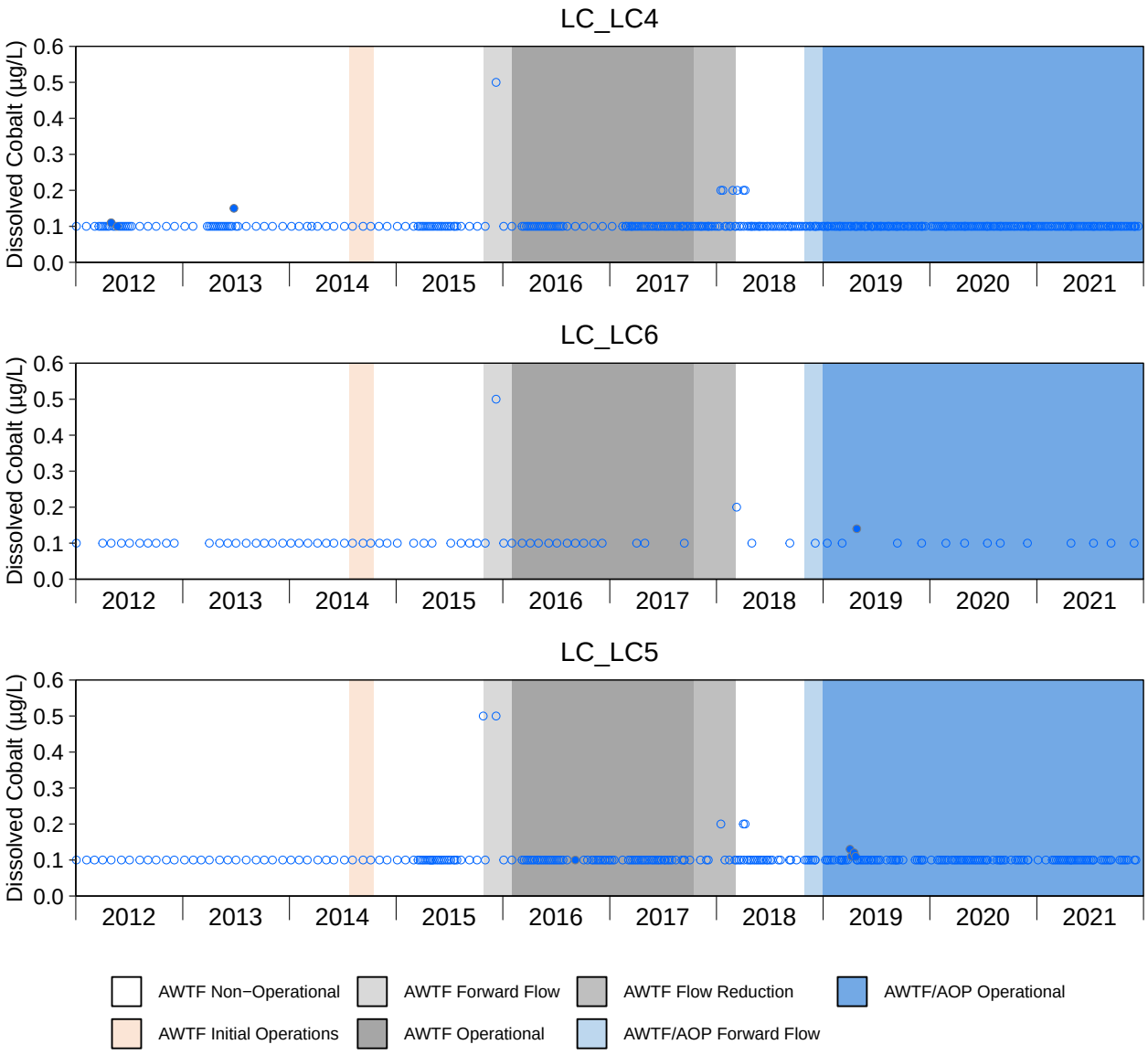

Figure D.15: Time Series Plots for Dissolved Cobalt Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

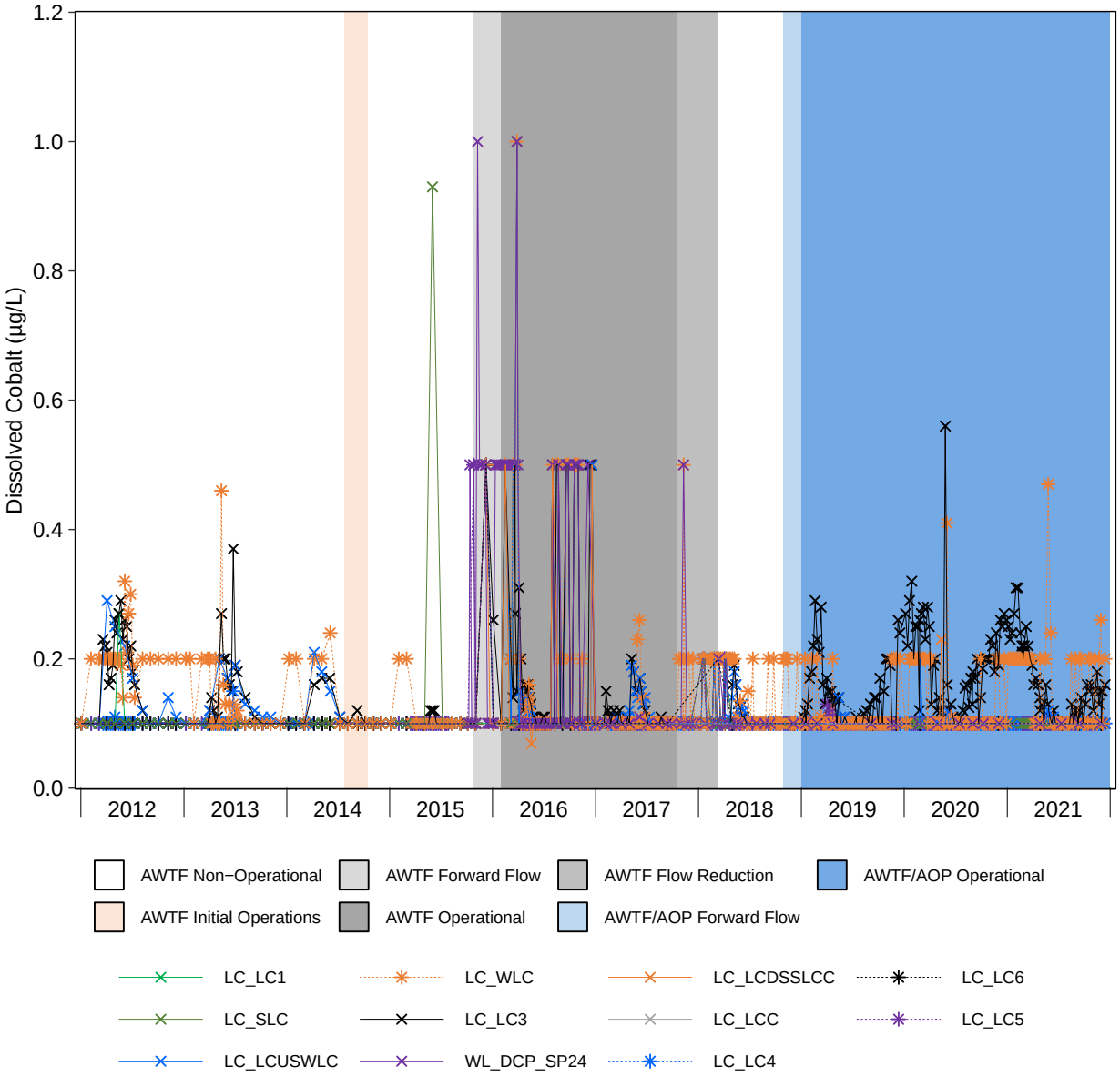

Figure D.16: Time Series Plots for Aqueous Dissolved Cobalt Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRL ranged from 0.10 and 1.0 mg/L). West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since September 2017.

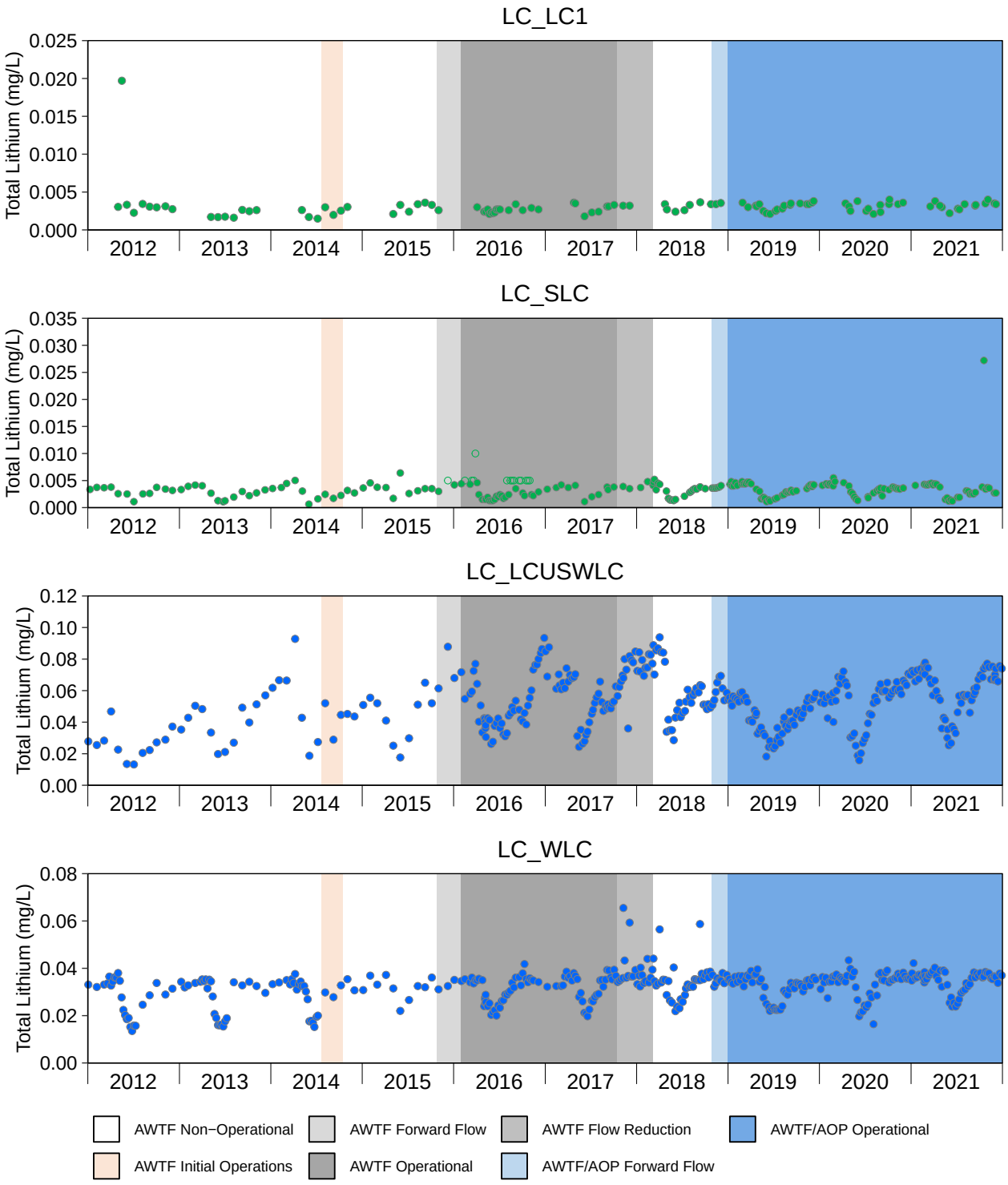

Figure D.17: Time Series Plots for Total Lithium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018). Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

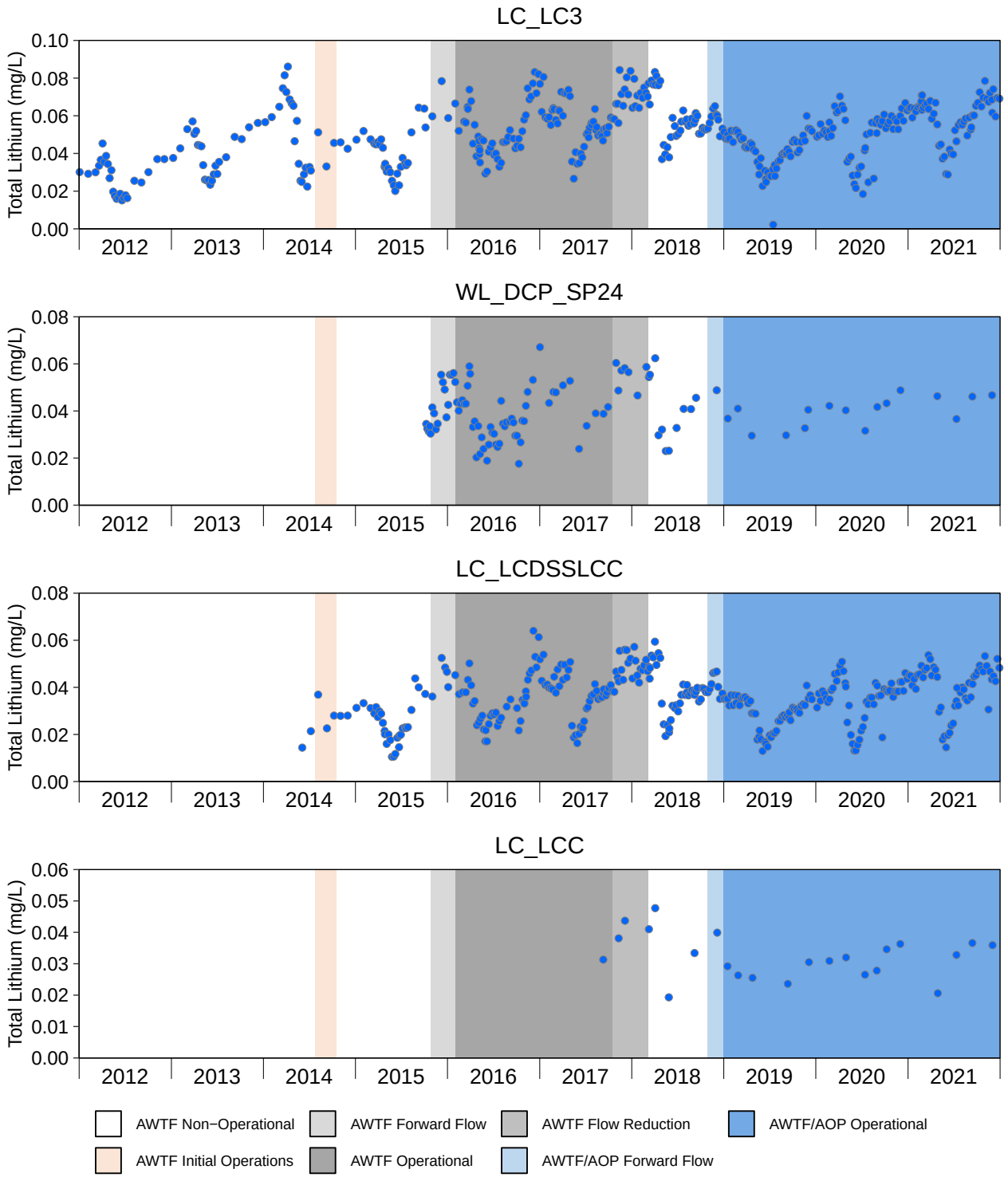

Figure D.17: Time Series Plots for Total Lithium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

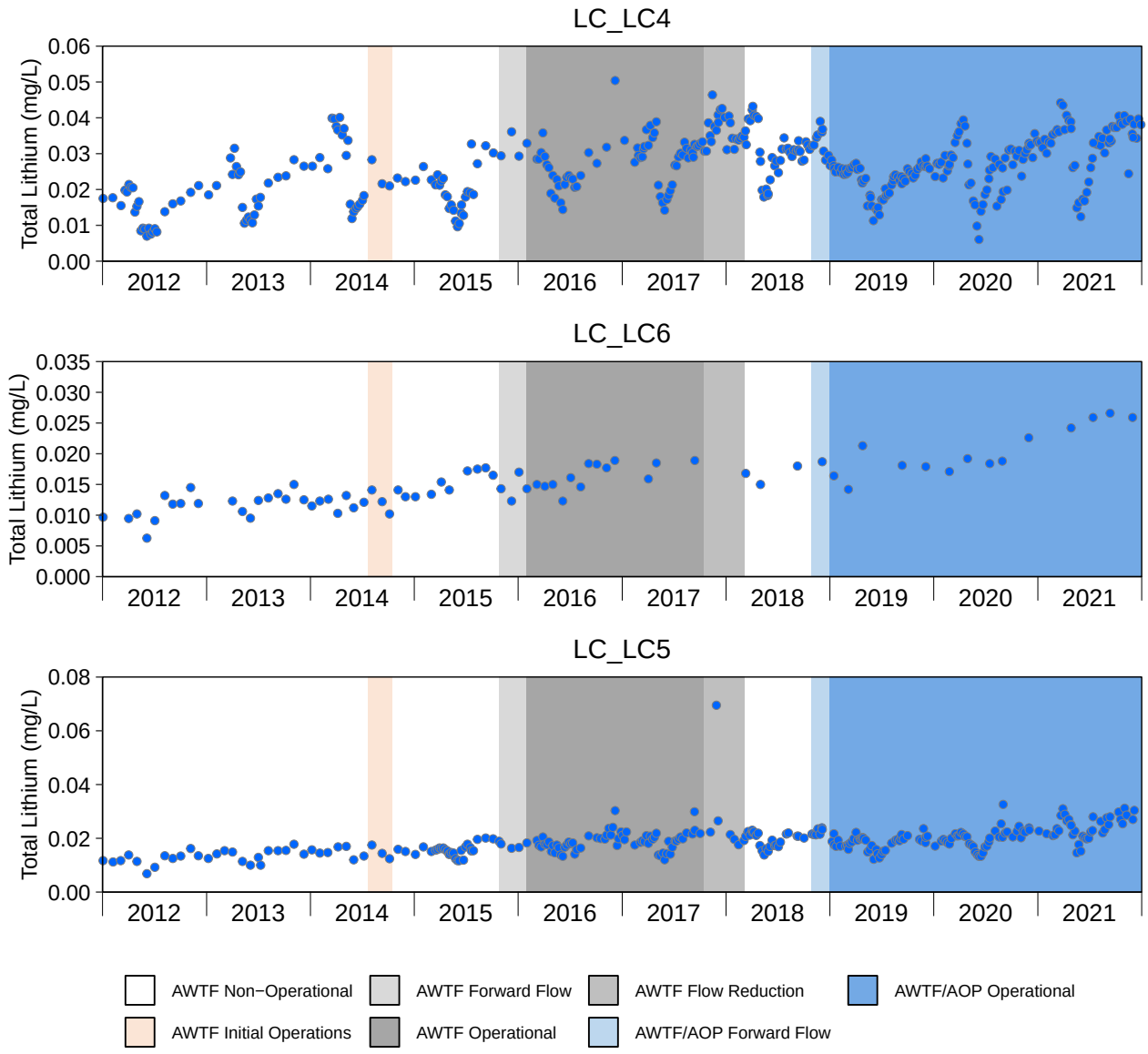

Figure D.17: Time Series Plots for Total Lithium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

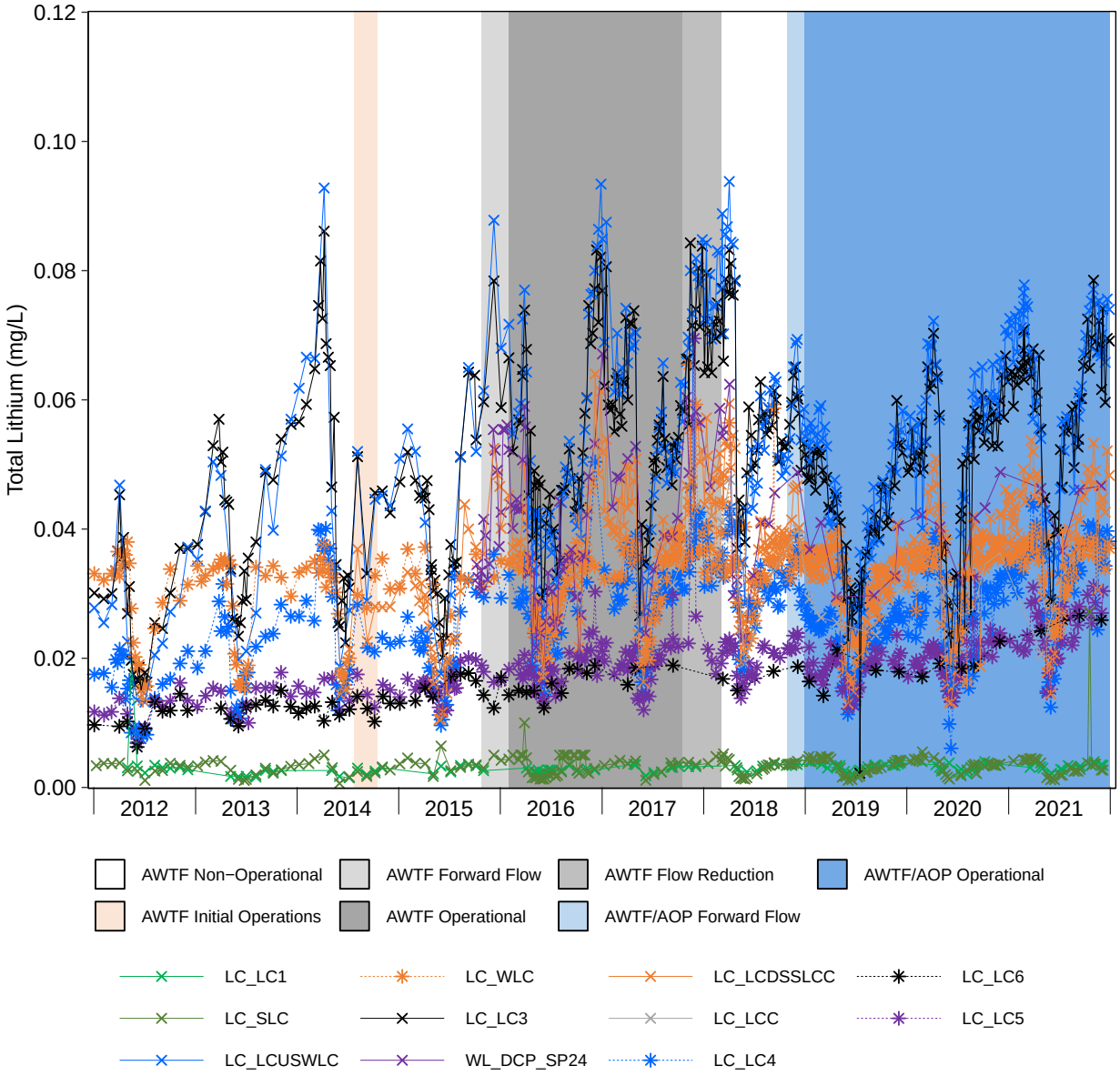

Figure D.18: Time Series Plots for Aqueous Total Lithium Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRL ranged from 0.0050 to 0.010 mg/L). West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

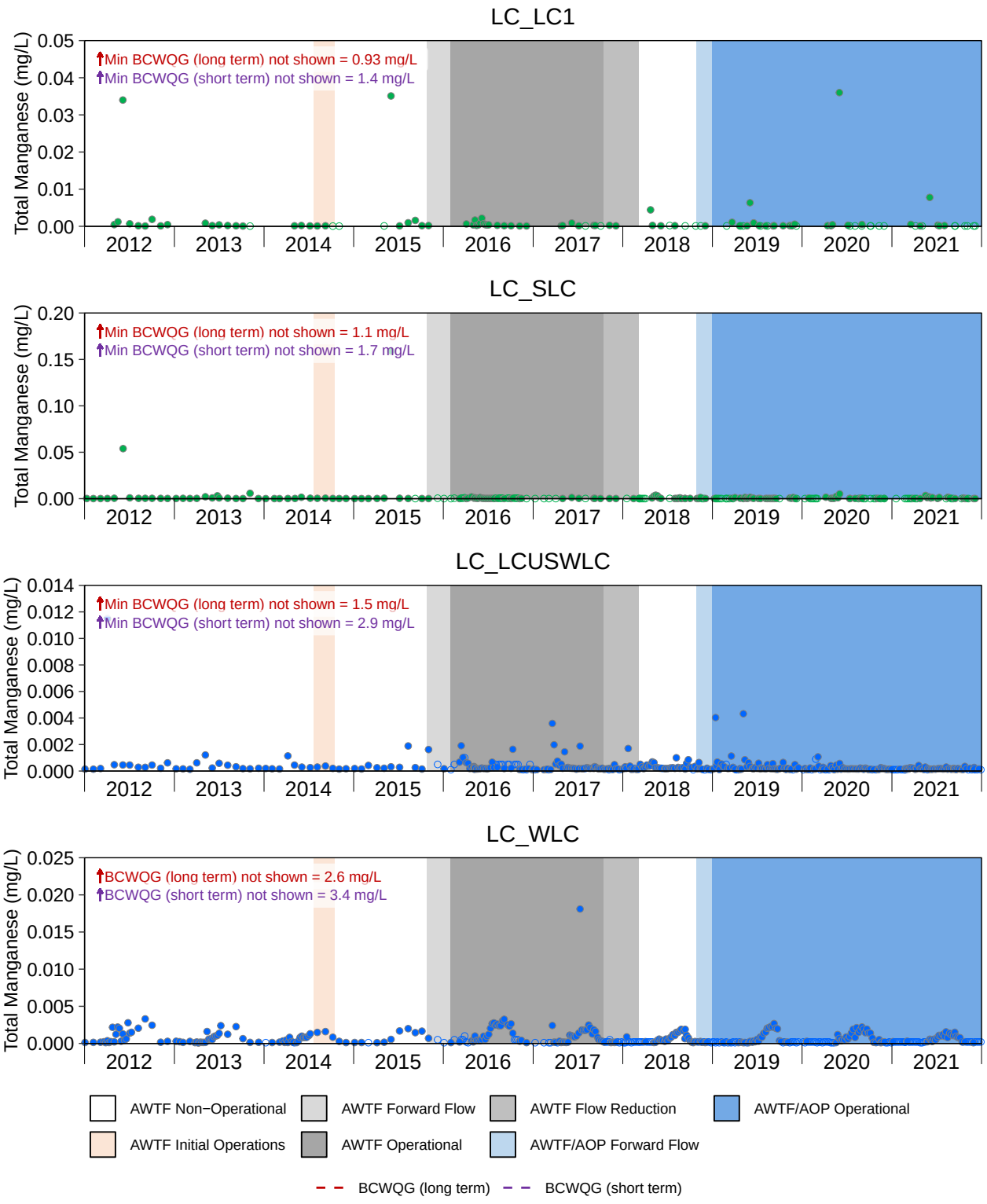

Figure D.19: Time Series Plots for Total Manganese Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018). Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

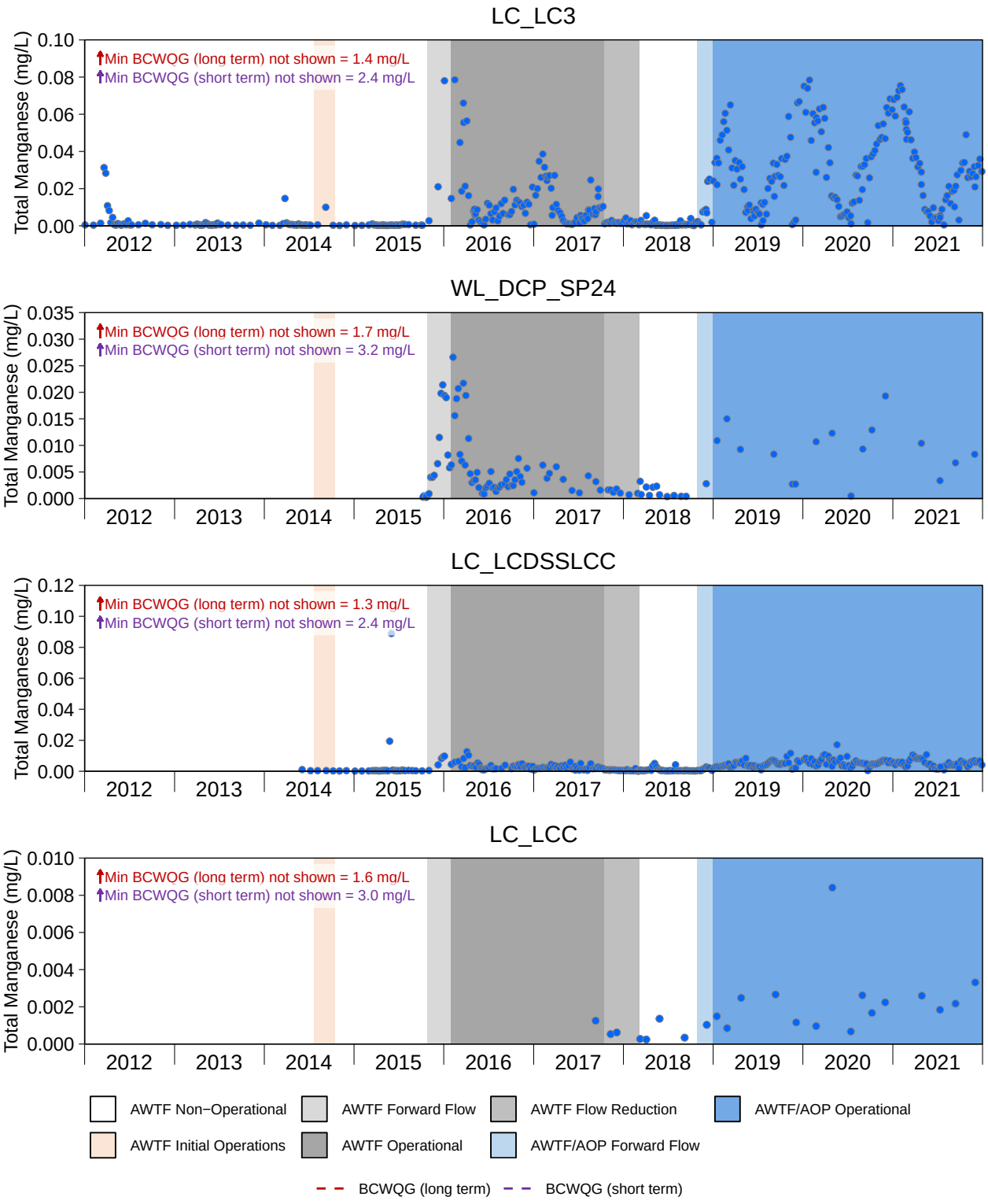

Figure D.19: Time Series Plots for Total Manganese Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

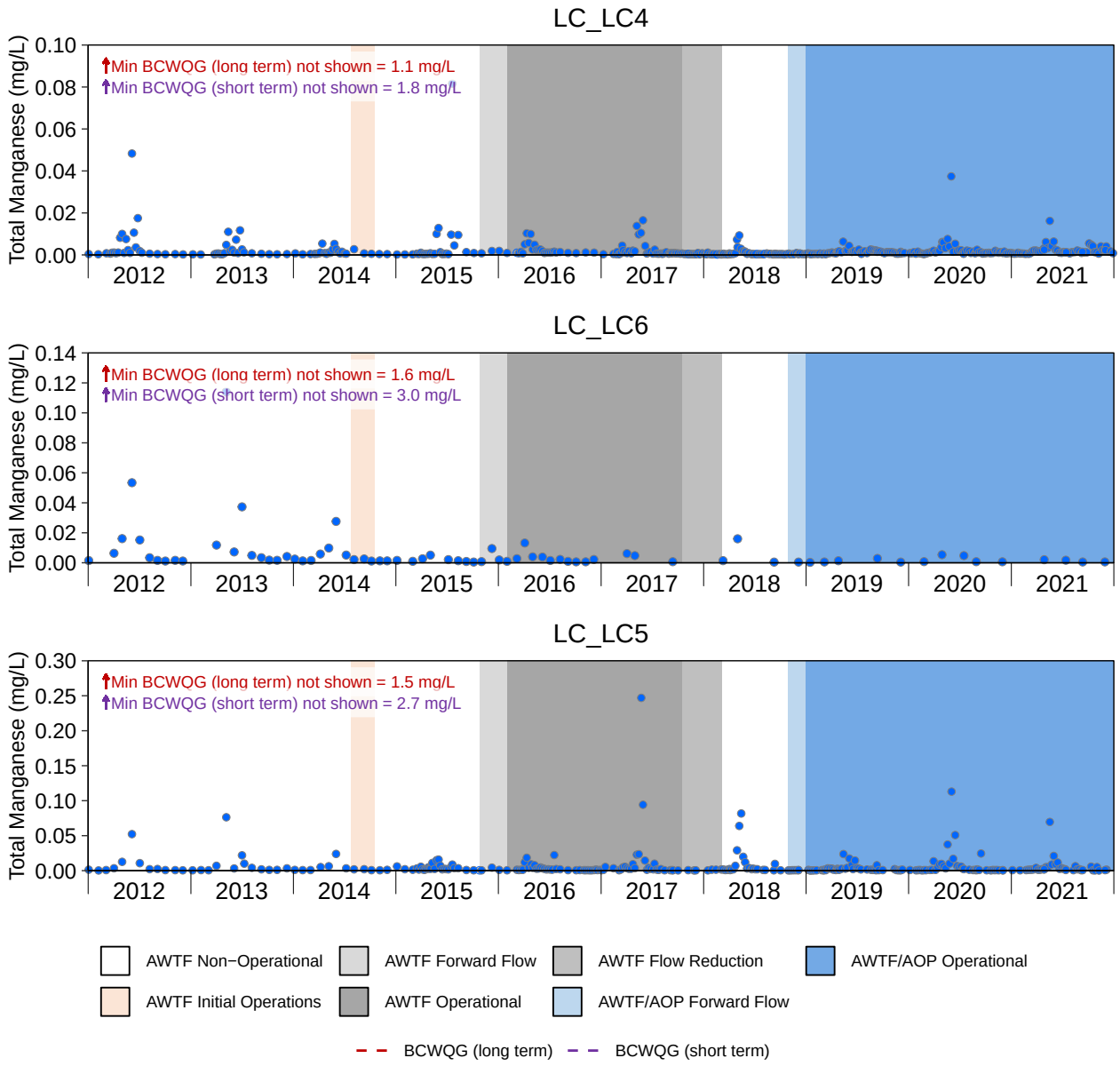

Figure D.19: Time Series Plots for Total Manganese Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

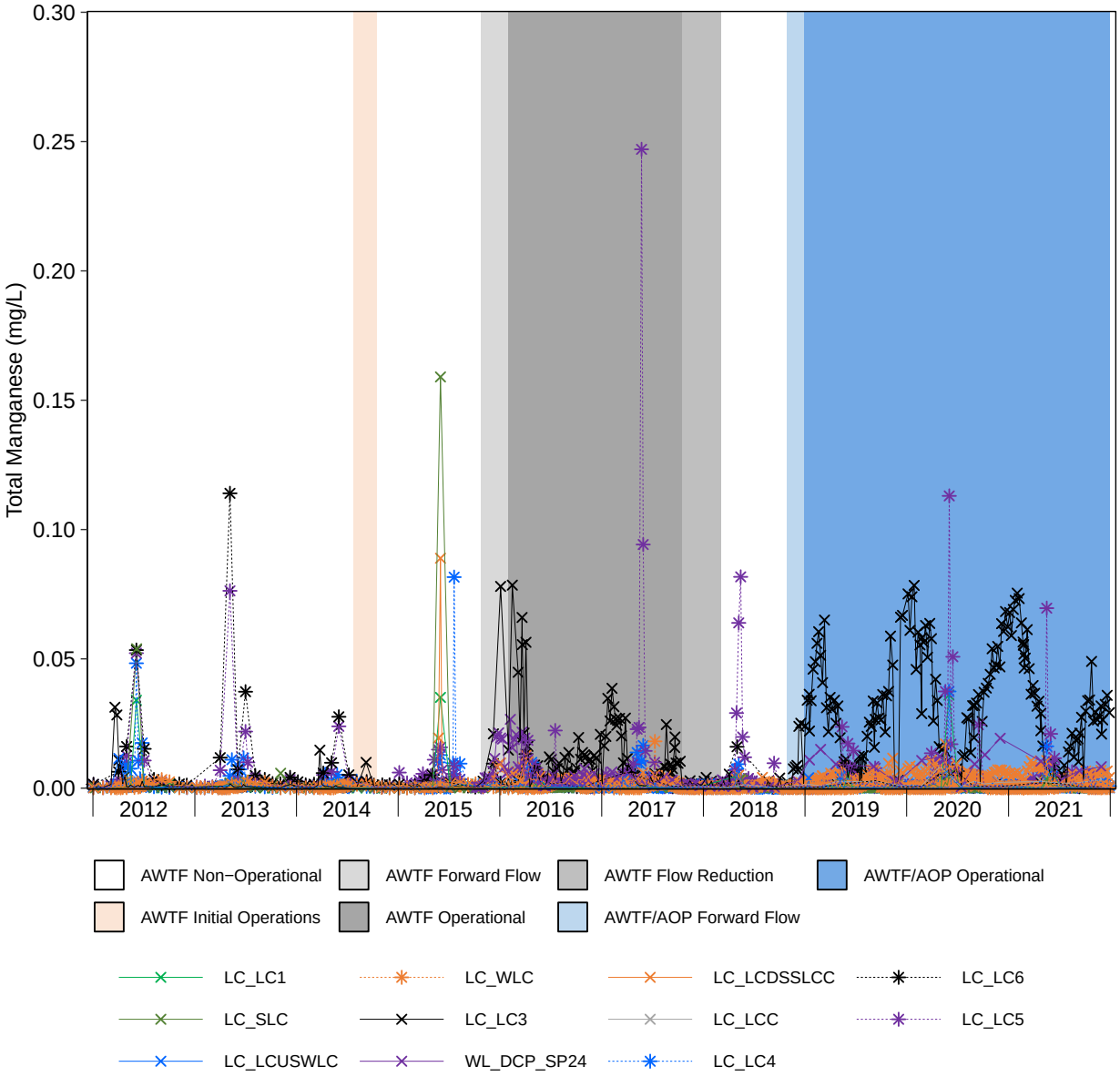

Figure D.20: Time Series Plots for Aqueous Total Manganese Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRL ranged from 0.000050 to 0.0010 mg/L). West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

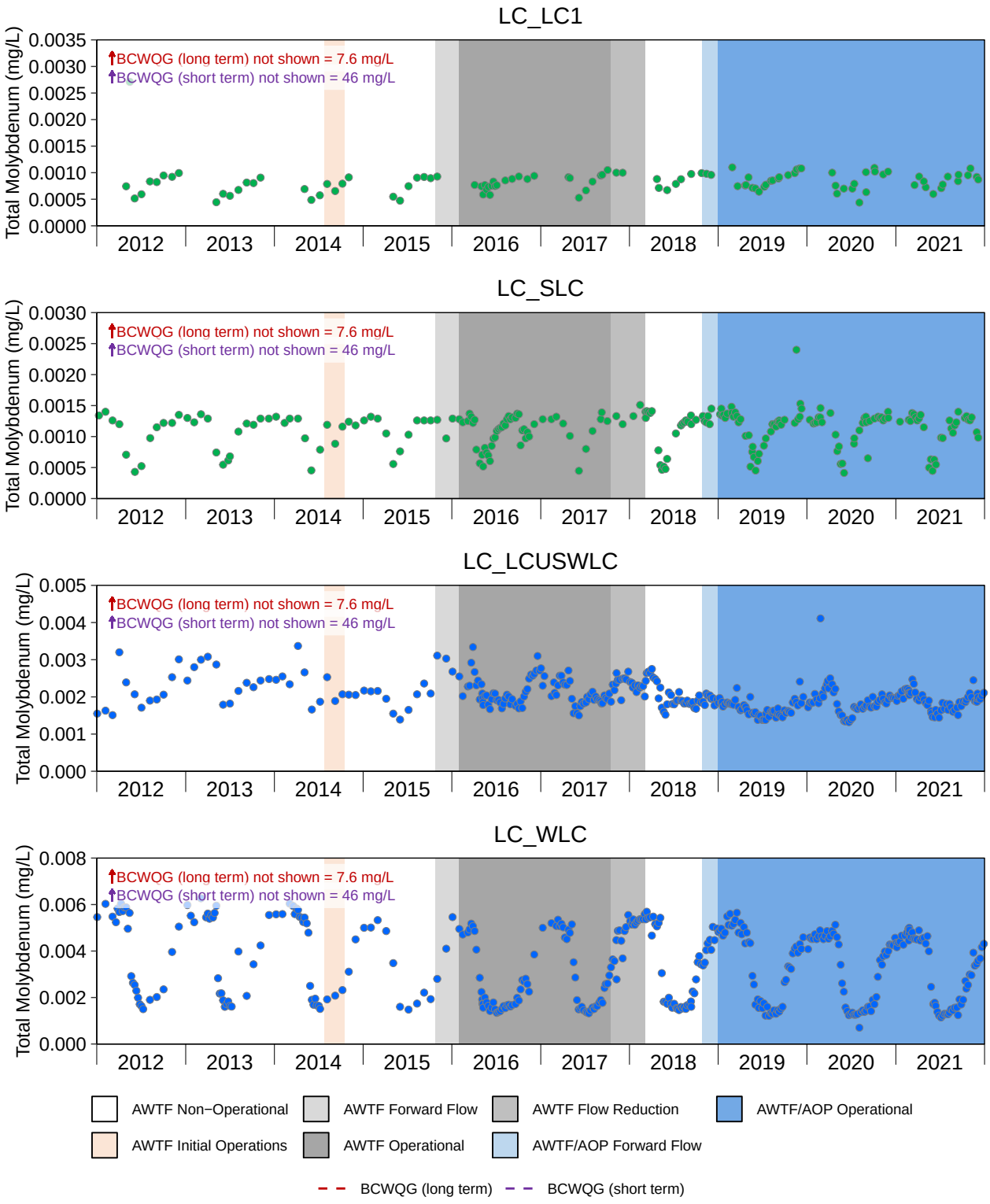

Figure D.21: Time Series Plots for Total Molybdenum Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018). Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

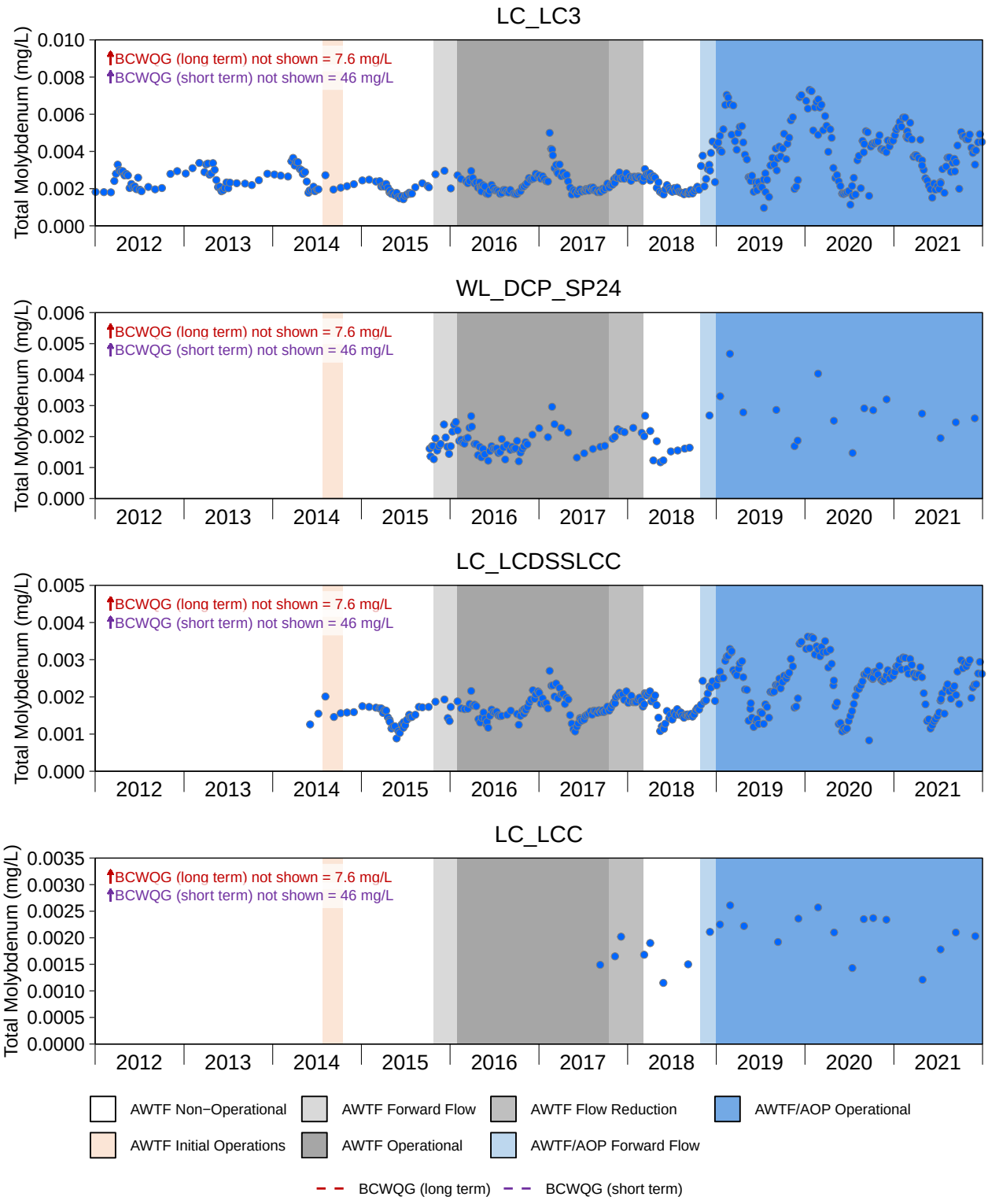

Figure D.21: Time Series Plots for Total Molybdenum Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

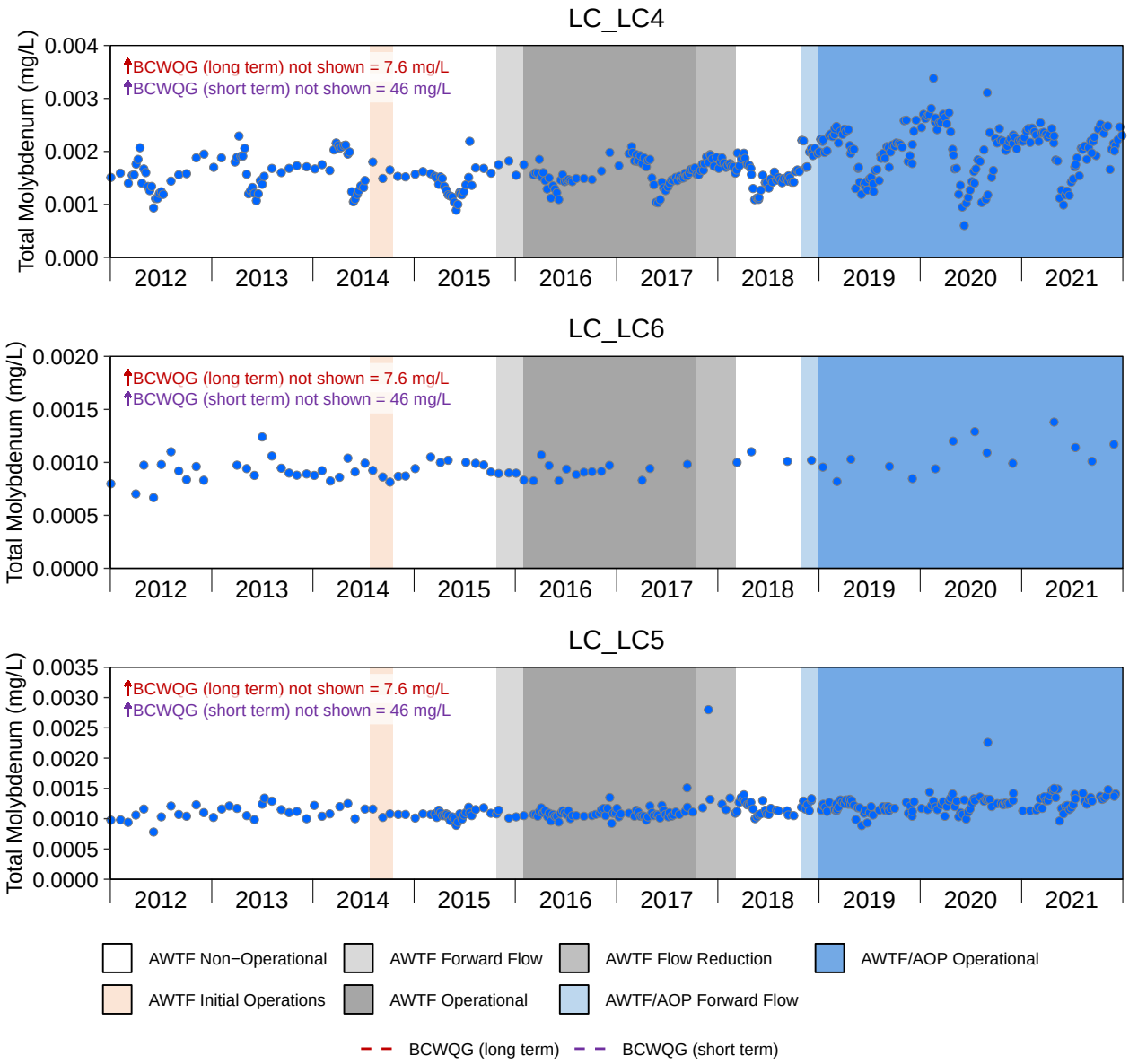

Figure D.21: Time Series Plots for Total Molybdenum Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

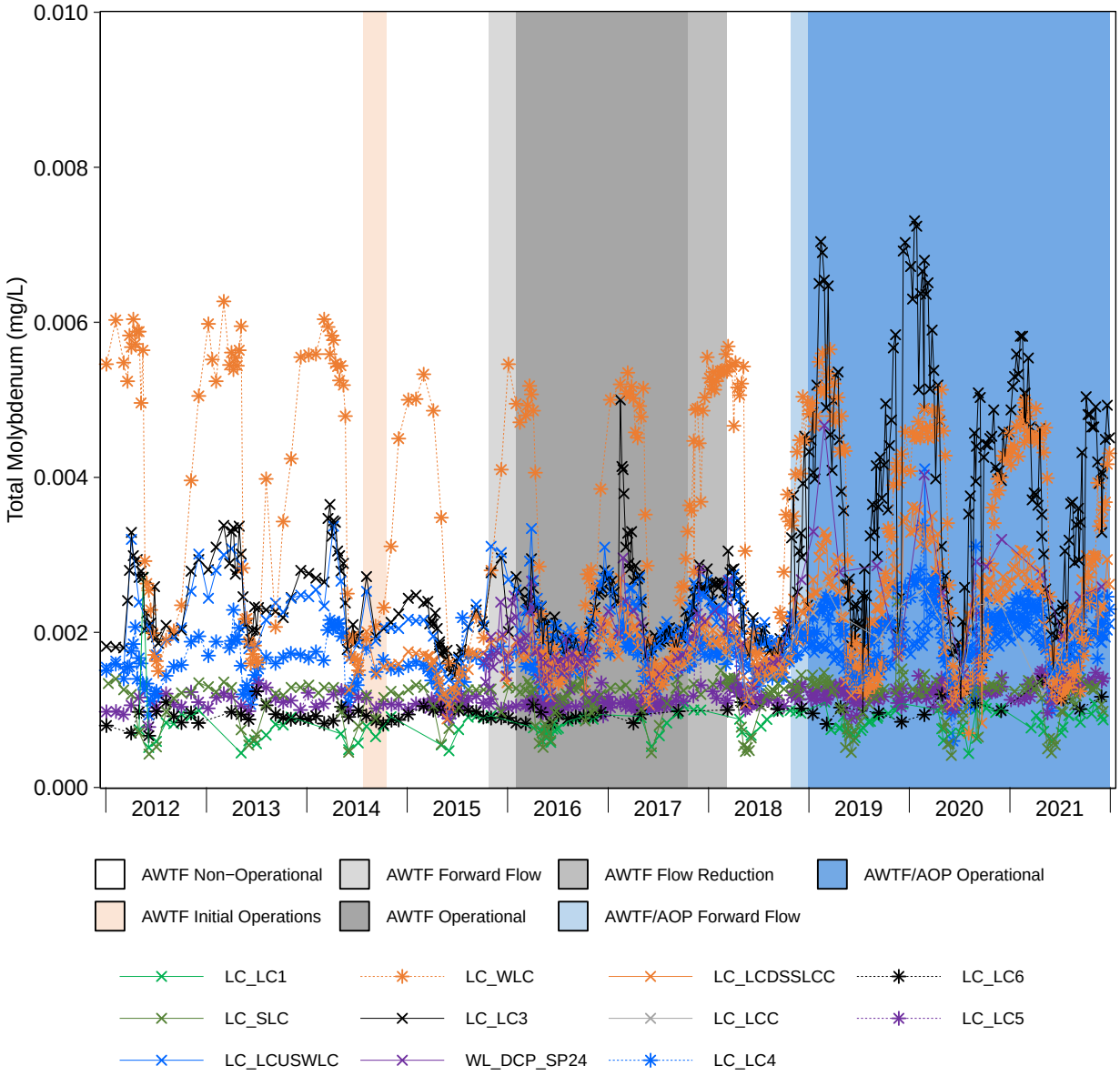

Figure D.22: Time Series Plots for Aqueous Total Molybdenum Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations were above the LRL in all samples. West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine− exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

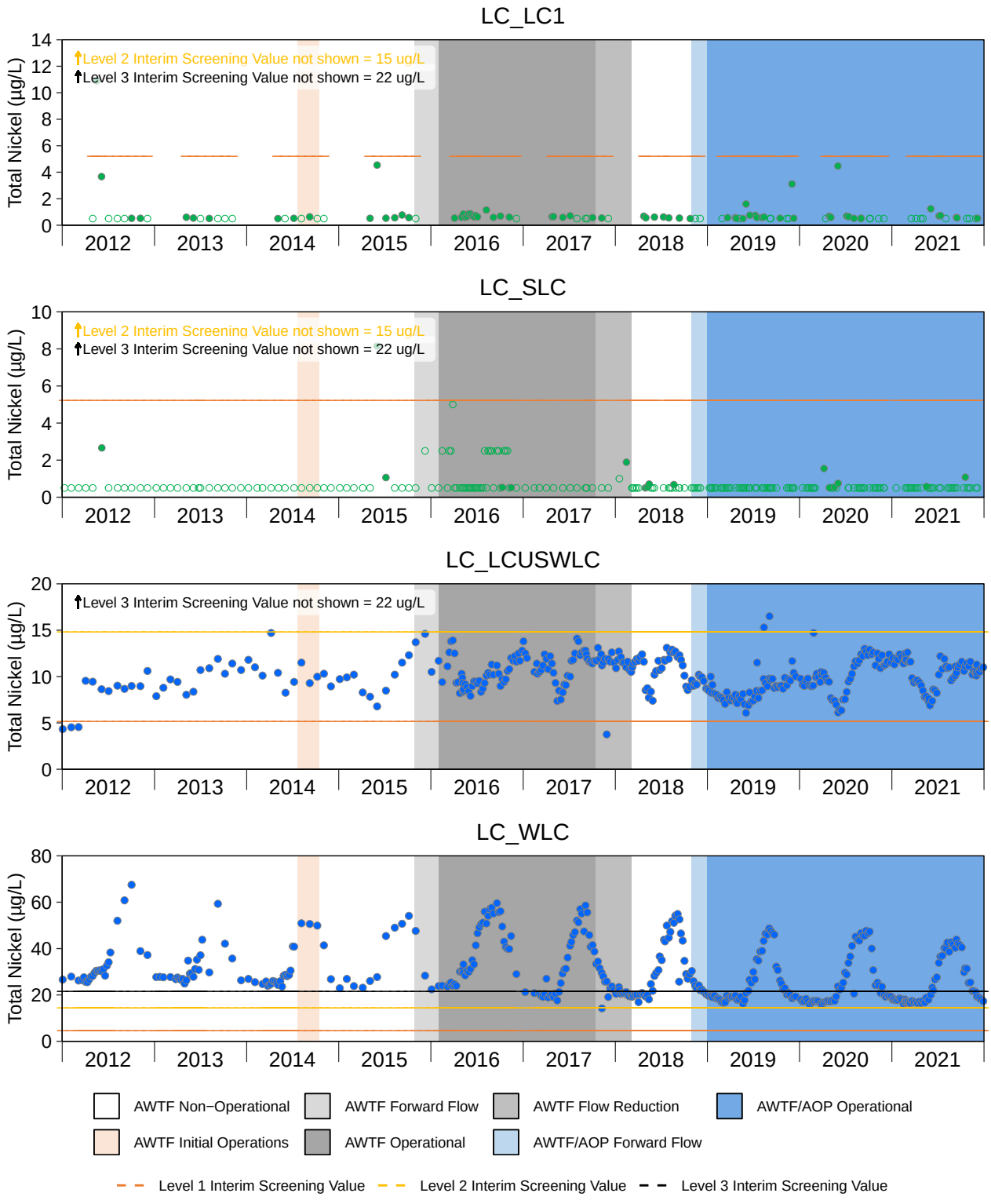

Figure D.23: Time Series Plots for Total Nickel Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018). Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

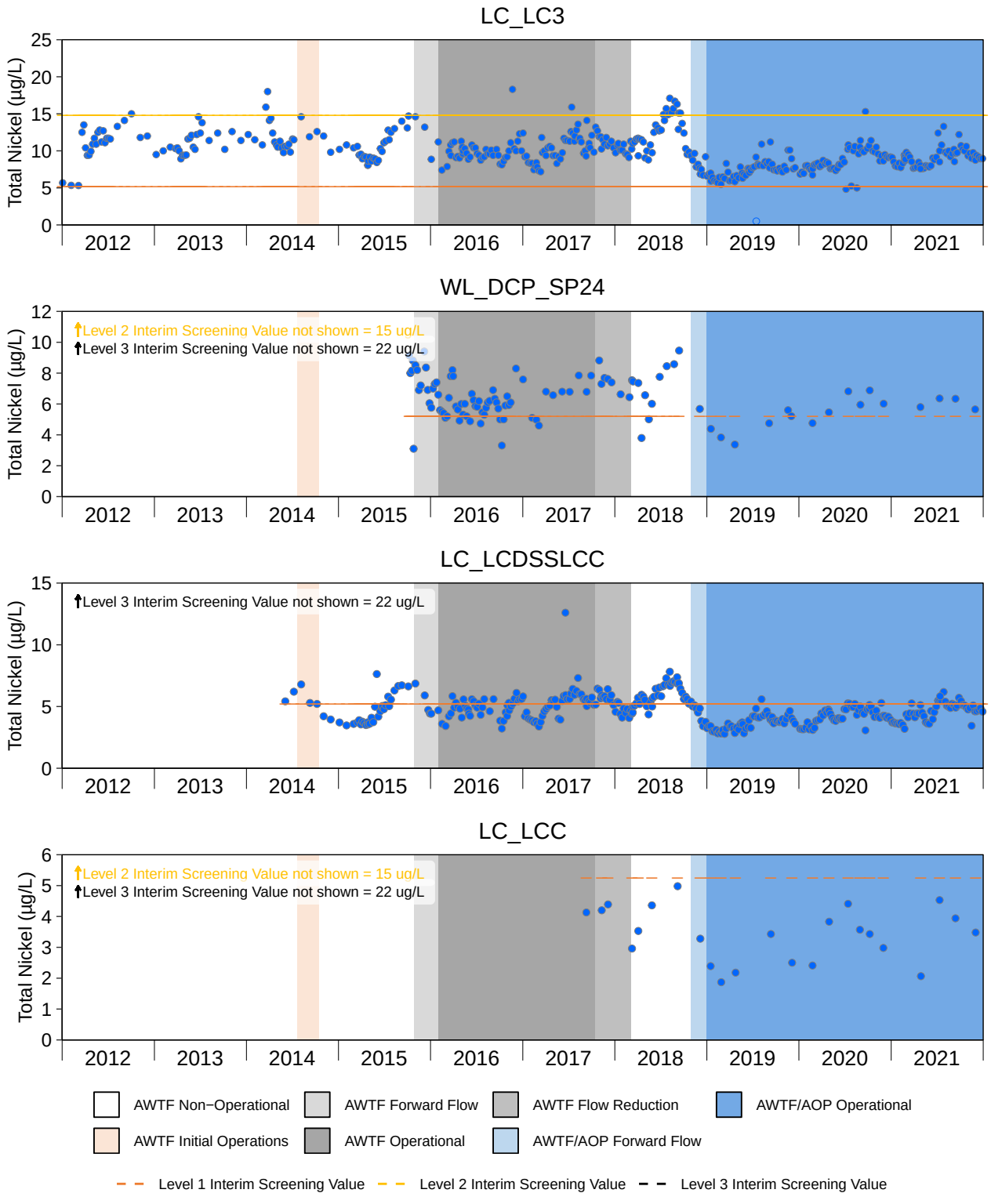

Figure D.23: Time Series Plots for Total Nickel Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

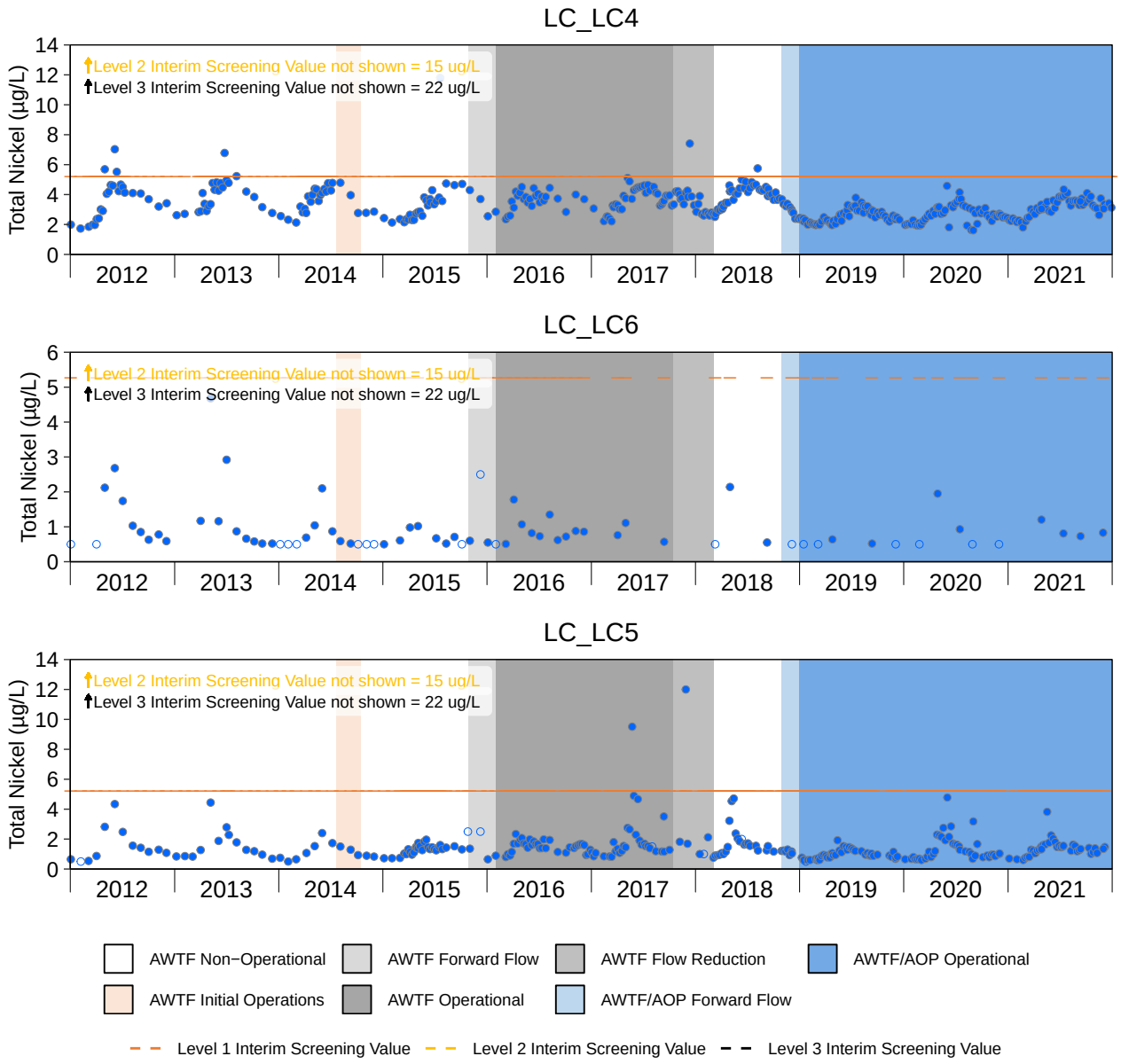

Figure D.23: Time Series Plots for Total Nickel Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

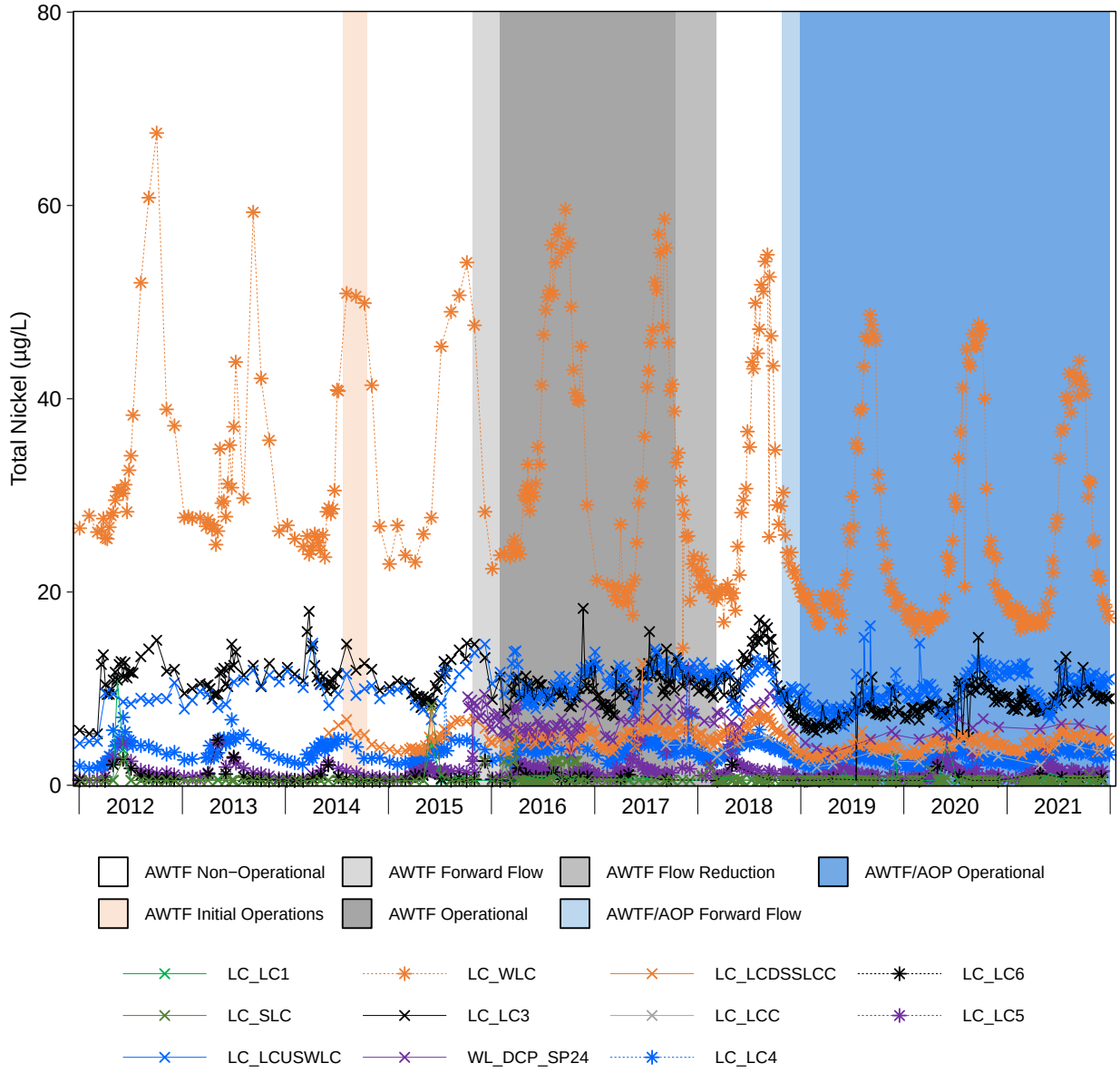

Figure D.24: Time Series Plots for Aqueous Total Nickel Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRL ranged from 0.50 to 5.0 mg/L). West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

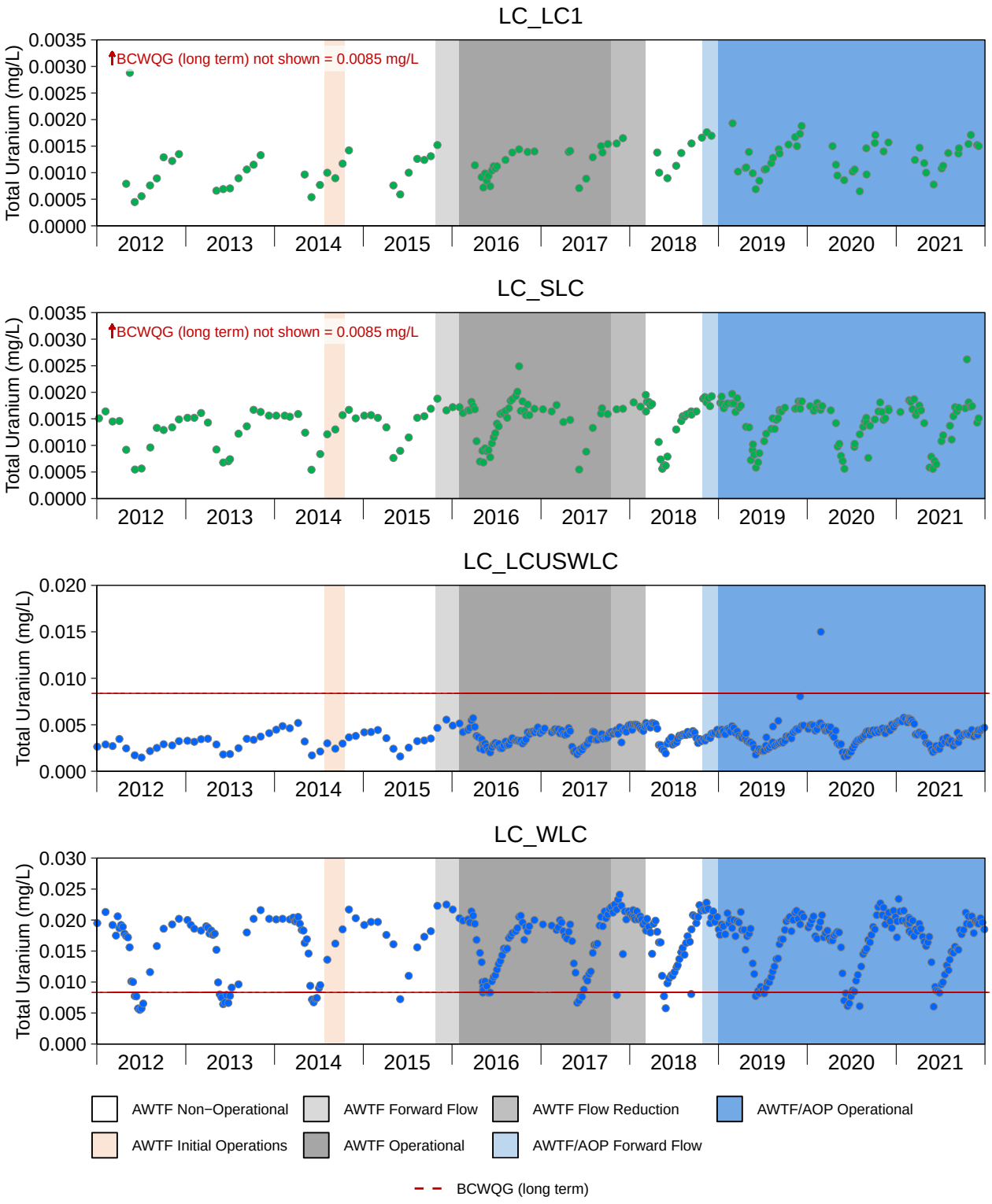

Figure D.25: Time Series Plots for Total Uranium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018). Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

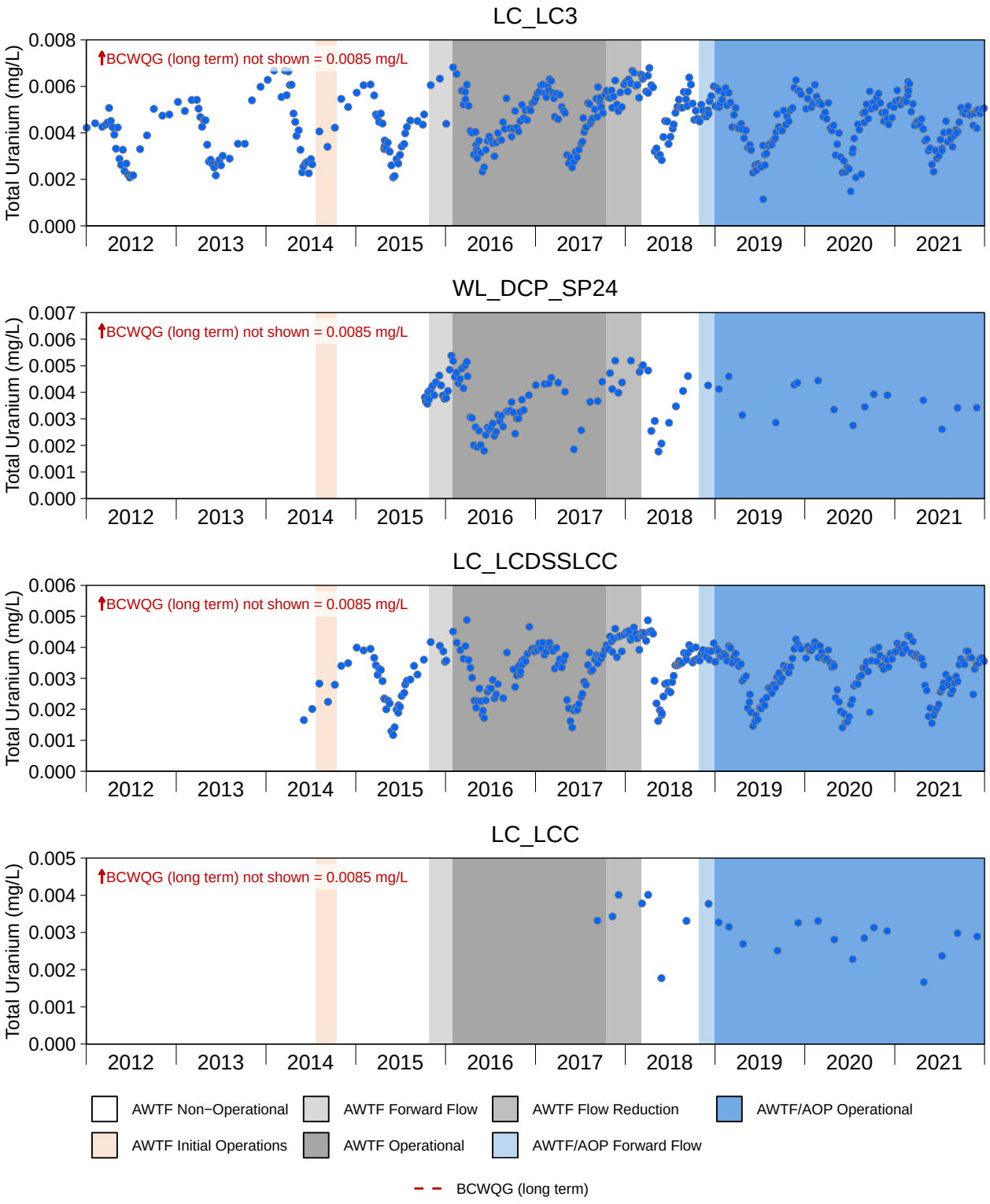

Figure D.25: Time Series Plots for Total Uranium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

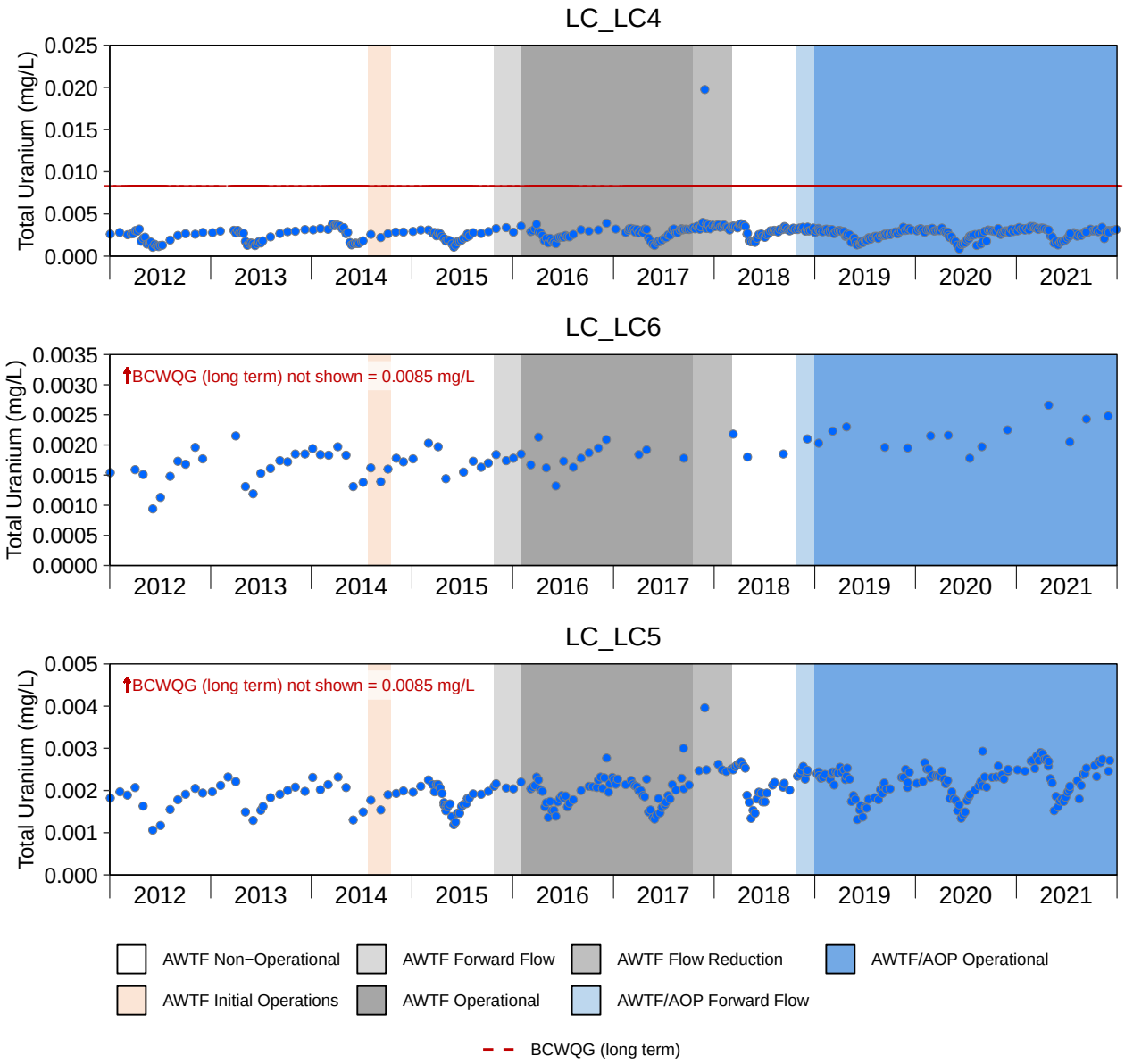

Figure D.25: Time Series Plots for Total Uranium Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Constituent was plotted because it was identified as a mine−related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

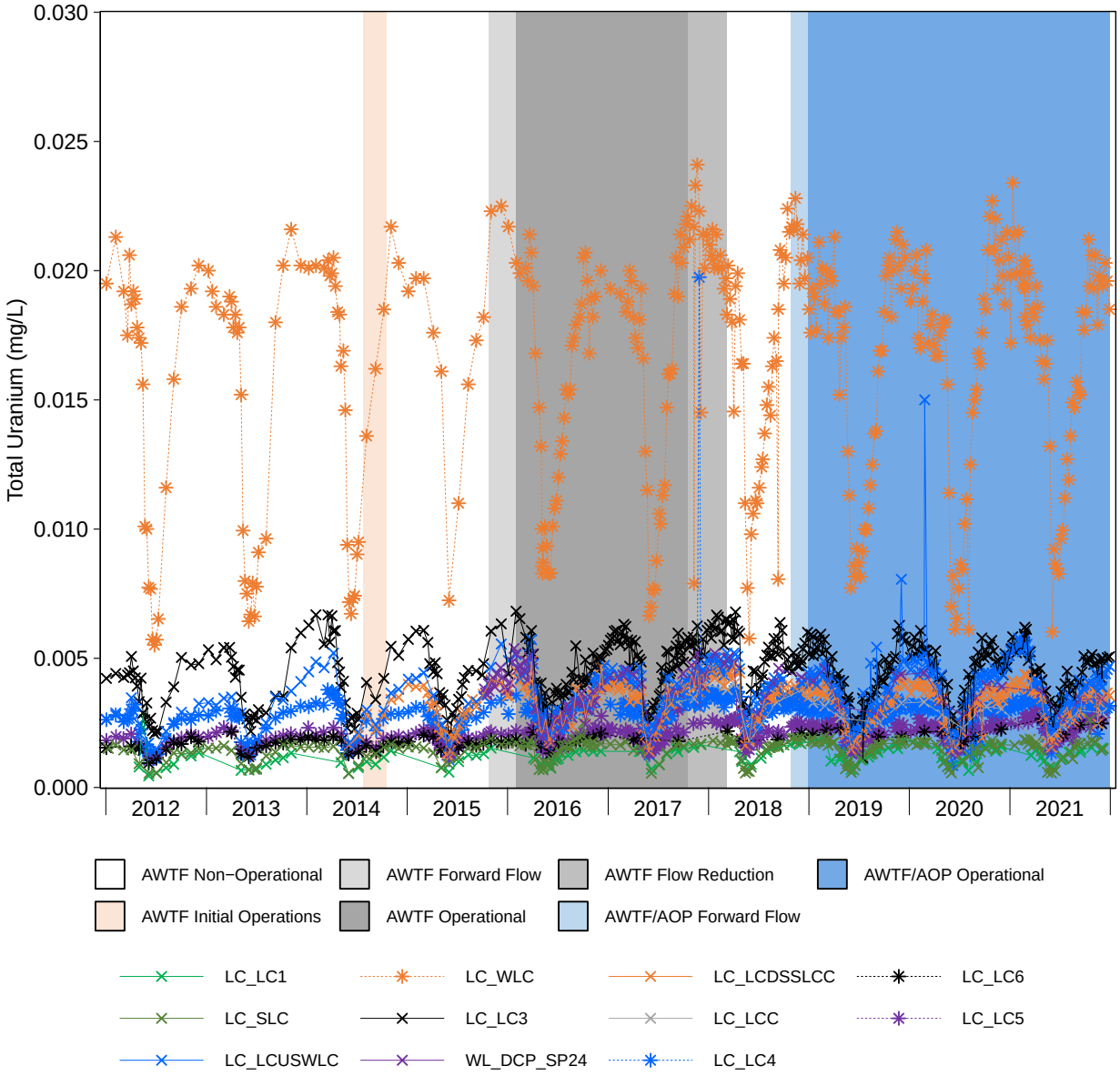

Figure D.26: Time Series Plots for Aqueous Total Uranium Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations were above the LRL in all samples. West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine− exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and
RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

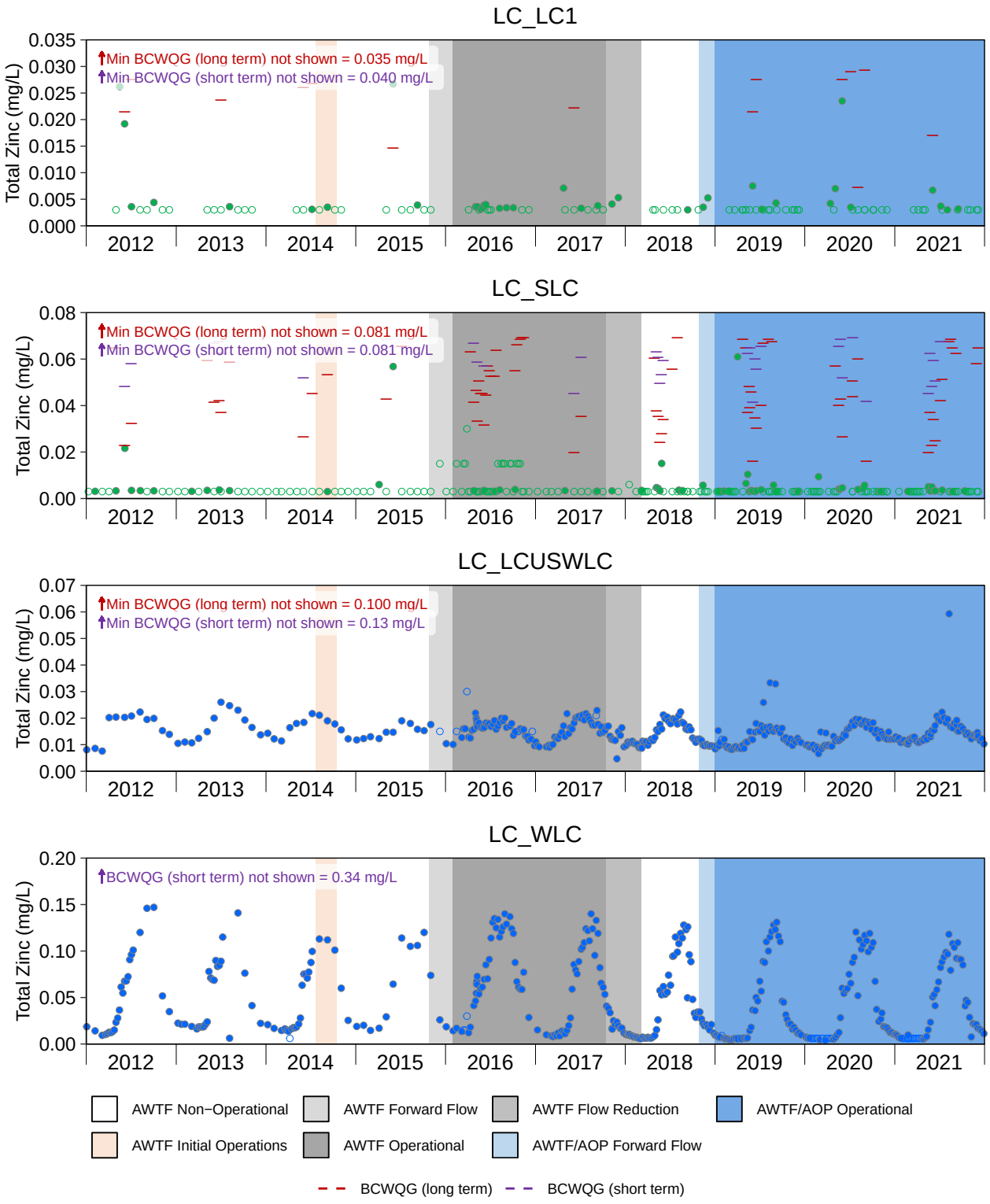

Figure D.27: Time Series Plots for Total Zinc Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Constituent was plotted because it was identified as a mine −related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018). Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

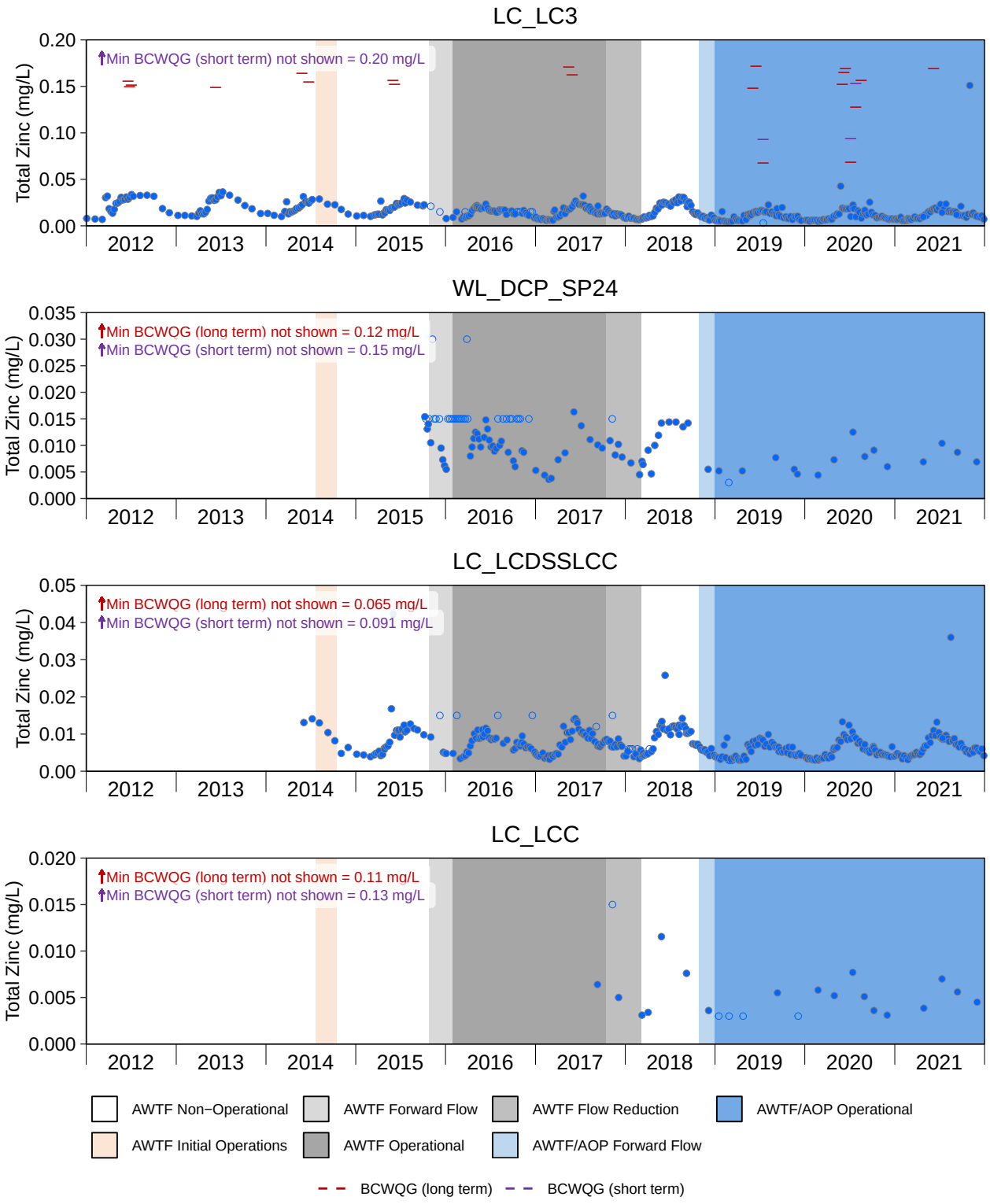

Figure D.27: Time Series Plots for Total Zinc Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Constituent was plotted because it was identified as a mine −related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

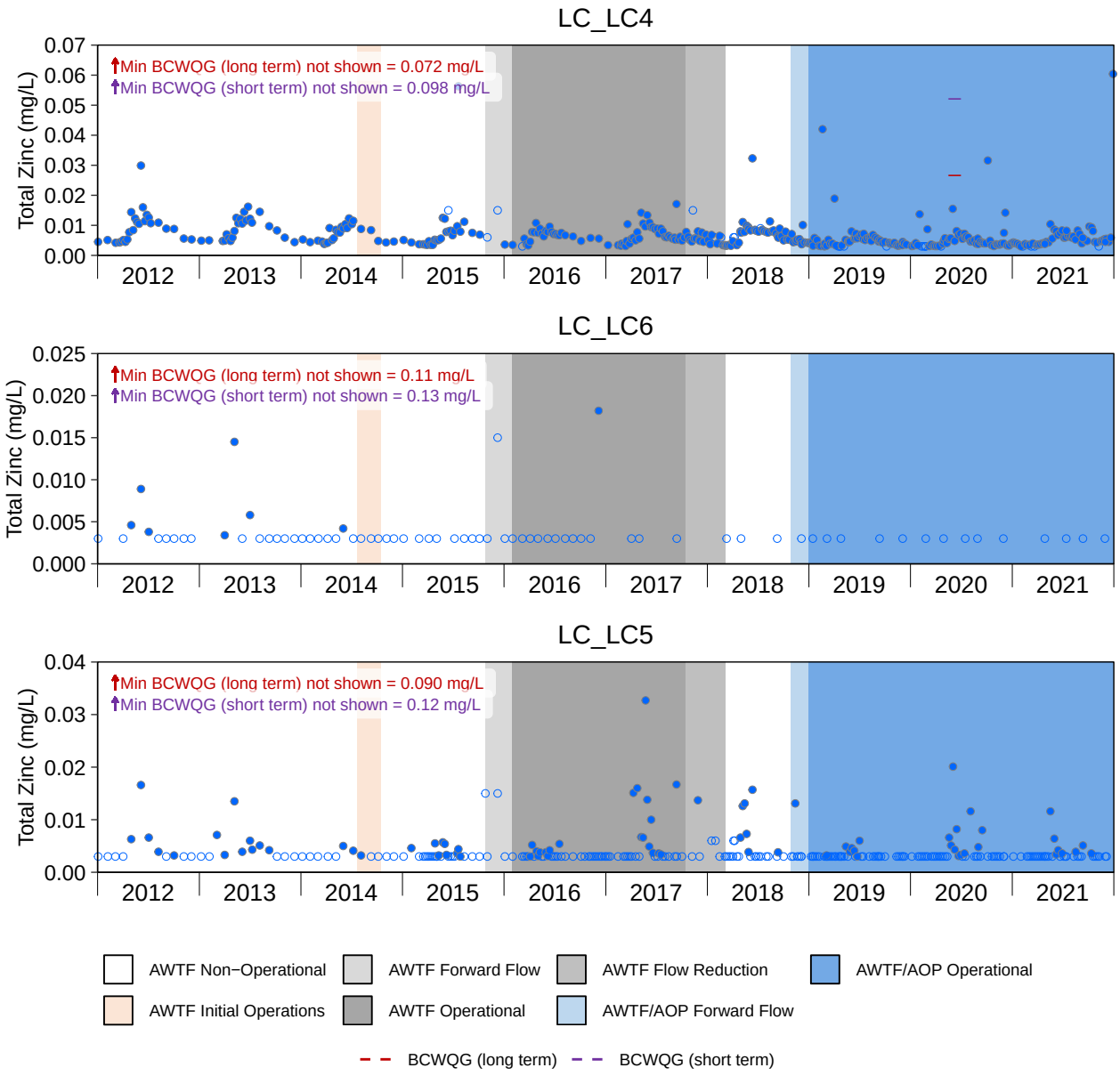

Figure D.27: Time Series Plots for Total Zinc Concentrations from Line Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water hardness. Constituent was plotted because it was identified as a mine −related constituent in the Adaptive Management Plan and an early warning trigger was defined (Azimuth 2018).

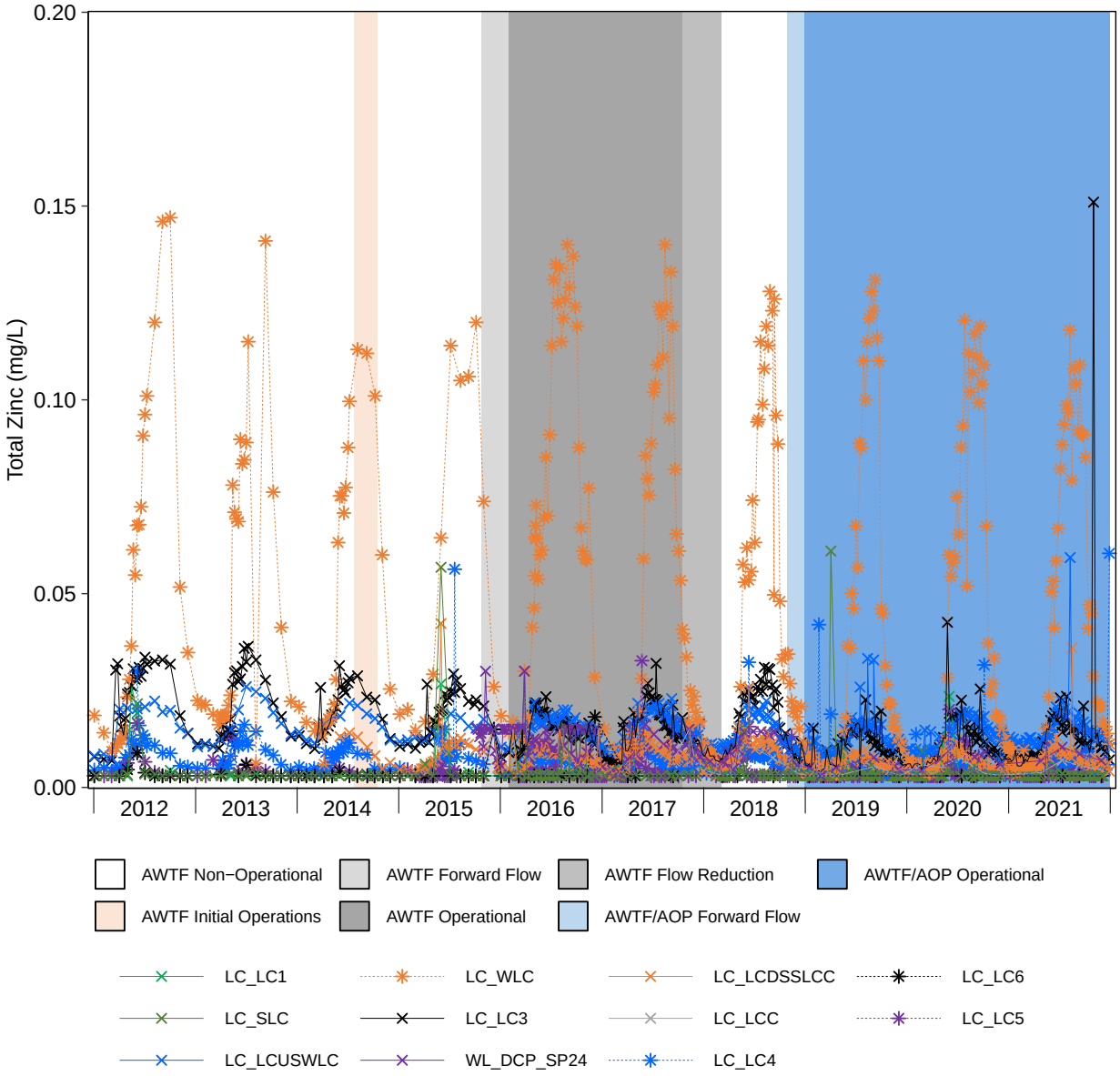

Figure D.28: Time Series Plots for Aqueous Total Zinc Concentrations from the Line Creek LAEMP Sampling Stations, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRL ranged from 0.0030 to 0.030 mg/L). West Line Creek (WLC) Active Water Treatment Facility (AWTF) operational timelines pertain only to mine−exposed monitoring areas located downstream of the AWTF discharge. Effluent from West Line Creek was diverted to the WLC AWTF when the AWTF was operational. Therefore, water quality measured routinely upstream of West Line Creek (LC_LCUSWLC) was most representative of water quality slightly further downstream at RG_LCUT during these operational periods. Water quality results from LC_LCUSWLC and RG_LCUT were combined during these periods for data interpretation. For periods when the AWTF was not operational, water quality results from LC_WLC and RG_LCUT were combined. Water quality at RG_LCUT has been monitored since Sept 2017.

Table D.1: Monthly Temperature (°C) Difference between 2020 and 2021 in Line Creek

Month	LC_LC1	LC_SLC	LC_LCUSWLC	LC_WLC	LC_LC3	LC_LCDSSLCC	LC_LCC	LC_LC4
January	-	-0.200	0.390	0.180	0	0.440	-	0.470
February	-	-2.76	-1.45	0.200	1.65	0.920	-	1.48
March	-	-0.200	-0.150	-0.190	0.800	0.400	-	0.400
April	1.3	-0.100	0.200	-0.100	0.400	1.00	0.400	1.20
May	2.9	-0.100	0.500	0.200	0.700	0.500	-	-0.200
June	0	1.50	0.400	0.400	0.600	1.60	-	0.900
July	2.20	2.30	1.10	0	0.500	3.40	1.90	0.520
August	2.90	0	3.00	0.211	0.200	-1.00	-	0.600
September	-2.36	-0.370	0.482	0.150	1.45	1.000	0.5[a]	0.938
October	-3.17	0.200	0.700	0.300	0.0500	-0.400	-	-1.00
November	1.50	0.850	0.564	0.127	0.141	-0.300	-	-1.20
December	-	0	0.550	0.1000	0.1000	0.200	1.80	2.10

Indicates an increase of >2°C from 2021 to 2020.

Notes: "-" indicates no data recorded. Temperature difference is shown as the difference between 2021 and 2020, meaning that a positive number indicates 2021 was warmer than 2020, while a negative number indicates 2021 was colder than 2020.

[a] The 2021 September water quality sample (n=1) was compared to the 2020 August water quality sample (n=1), as no water samples were taken in September at this area in 2020.

Table D.2: British Columbia Water Quality Guidelines (BCWQG), Site-Specific Elk Valley Water Quality Plan (EVWQP) Benchmarks, and Interim Screening Values for Parameters Assessed in Line Creek LAEMP, 2021

Variable		Units	British Columbia Water Quality Guidelines[a]				Site-Specific Benchmark[b]
			Long-term Average	Short-term Maximum	Year	Status	
Non-Metals	Total Alkalinity	mg/L	For dissolved calcium = < 4mg/L, BCWQG = <10 For dissolved calcium = 4 to 8 mg/L, BCWQG = 10 to 20 For dissolved calcium = > 8 mg/L, BCWQG = > 20	-	2015	Working	-
	Unionized Ammonia[c]	mg/L	pH and Temperature dependent (tabular)	pH and Temperature dependent (tabular)	2009	Approved	-
	Chloride	mg/L	150	600	2003	Approved	-
	Fluoride	mg/L	-	For hardness ≤ 10 mg/L, BCWQG = 0.4 For hardness > 10 mg/L, BCWQG = [-51.73 + 92.57 × log10(hardness)]×0.01 Maximum applicable hardness = 385 mg/L	1990	Approved	-
	Nitrate-N	mg/L	3	33	2009	Approved	Level 1 EVWQP benchmark= $10^{1.0003[\log(\text{hardness})]-1.52}$ Maximum applicable hardness = 500 mg/L Level 2 EVWQP benchmark= $10^{1.0003[\log(\text{hardness})]-1.38}$ Maximum applicable hardness = 500 mg/L
	Nitrite-N[d]	mg/L	0.02 to 0.20	0.06 to 0.60	2009	Approved	-
	Dissolved oxygen[e]	mg/L	For buried embryo/alevin life stages, BCWQG (water column) = 11 BCWQG (interstitial) = 8; for other life stages, BCWQG (water column) = 8	For buried embryo/alevin life stages, BCWQG (water column) = 9 BCWQG (interstitial) = 6 For other life stages, BCWQG (water column) = 5	1997	Approved	-
	pH[f]	pH units	6.5 - 9.0		1991	Approved	-
	Sulphate[g]	mg/L	128 to 429 Maximum applicable hardness = 250 mg/L	-	2013	Approved	Level 1 EVWQP Benchmark = BCWQG = 429
	Total Dissolved Solids	mg/L	-	-	-	-	Screening Level 1 Benchmark = 1,000
Metals and Metalloids	Antimony (III)	mg/L	0.009	-	2015	Working	-
	Arsenic	mg/L	-	0.005	2002	Approved	-
	Barium	mg/L	1	-	2015	Working	-
	Beryllium	mg/L	0.00013	-	2015	Working	-
	Boron	mg/L	1.2	-	2003	Approved	-
	Chromium[h]	mg/L	For Cr(VI), BCWQG = 0.001 For Cr(III), BCWQG = 0.0089	-	2015	Working	-
	Cobalt	µg/L	4	110	2004	Approved	-
	Iron	mg/L	-	1	2008	Approved	-
Total	Lead[g]	mg/L	For hardness ≤ 8 mg/L, none proposed For hardness 8 to 360 mg/L, BCWQG = 0.001×{3.31+ exp[1.273 × ln(hardness) - 4.704]} No more than 20% of samples in a 30-d period should be >1.5X the guideline. Maximum applicable hardness = 360 mg/L	For hardness ≤ 8 mg/L, BCWQG ≤ 0.003 For hardness 8 to 360 mg/L, BCWQG = 0.001×{exp[1.273 × ln(hardness) - 1.460]} Maximum applicable hardness = 360 mg/L	1987	Approved	-
	Manganese[g]	mg/L	For hardness 37 to 450 mg/L, BCWQG ≤ 0.004 × hardness + 0.605 Maximum applicable hardness = 450 mg/L	For hardness 25 to 259 mg/L, BCWQG ≤ 0.01102 × hardness + 0.54 Maximum applicable hardness = 259 mg/L	2001	Approved	-
	Mercury[i]	mg/L	MeHg ≤ 0.5% of THg, BCWQG = 0.00002 Else, BCWQG = [0.0001/(MeHg/THg)] OR When MeHg = 0.5% of THg, BCWQG= 0.00002 When MeHg = 1.0% of THg, BCWQG = 0.00001 When MeHg = 8.0% of THg, BCWQG= 0.00000125	-	2001	Approved	-
	Molybdenum	mg/L	7.6	46	2021	Approved	-
	Nickel	µg/L	-	-	-	-	Level 1 Interim Screening Value = 5.3 Level 2 Interim Screening Value = 15 Level 3 Interim Screening Value = 22
	Selenium	µg/L	2	-	2014	Approved	Level 1 EVWQP Benchmark = 19 Level 2 EVWQP Benchmark = 74
	Silver[f]	mg/L	For hardness ≤ 100 mg/L, BCWQG = 0.00005 For hardness > 100 mg/L, BCWQG = 0.0015	For hardness ≤ 100 mg/L, BCWQG = 0.0001 For hardness > 100 mg/L, BCWQG = 0.003	1996	Approved	-
	Thallium	mg/L	0.0008	-	1997	Working	-
	Uranium	mg/L	0.0085	-	2011	Working	-
	Zinc[g]	mg/L	For hardness ≤ 90 mg/L, BCWQG = 0.0075 For hardness 90 to 330 mg/L, BCWQG = [7.5 + 0.75 (hardness - 90)]×0.001; Maximum applicable hardness = 330 mg/L	For hardness ≤ 90 mg/L, BCWQG = 0.033 For hardness 90 to 500 mg/L, BCWQG = [33 + 0.75 (hardness - 90)]×0.001; Maximum applicable hardness = 500 mg/L	1999	Approved	-
Dissolved	Aluminum	mg/L	When pH ≥ 6.5, BCWQG = 0.05 When pH < 6.5, BCWQG = exp[1.6 - 3.327(median pH)+ 0.402(median pH)2]	When pH ≥ 6.5, BCWQG = 0.1 When pH < 6.5, BCWQG = exp[1.209 - 2.426(pH)+ 0.286 (pH)2]	2001	Approved	-
	Cadmium[g]	µg/L	For hardness = 3.4 to 285 mg/L, BCWQG = {exp[0.736×ln(hardness) - 4.943]} Maximum applicable hardness = 285 mg/L	For hardness = 7 to 455 mg/L, BCWQG = {exp[1.03×ln(hardness)-5.274]} Maximum applicable hardness = 455 mg/L	2015	Approved	Level 1 EVWQP Benchmark = $10^{0.83(\log(\text{hardness}))-2.53}$ Maximum applicable hardness = 285 mg/L
	Copper	mg/L	Biotic Ligand Model	Biotic Ligand Model	2019	Approved	-
	Iron	mg/L	-	BCWQG = 0.35 mg/L	2008	Approved	-

Note: "-" = no data available.

[a] British Columbia Working (BCMOECCS 2021a) or Accepted (BCMOECCS 2021b) Water Quality Guidelines for the Protection of Aquatic Life. For guidelines dependent on other analytes (e.g., hardness), guidelines were screened using concurrent values.

[b] When appropriate, site-specific Elk Valley Water Quality Plan Benchmarks (EVWQP; Teck 2014) or interim screening values were applied in addition to or instead of BC water quality guidelines. Interim screening values are displayed for nickel (Golder 2017b).

[c] Temperature and pH dependent; range of minimum and maximum values.

[d] Dependent on concurrent chloride, range of values reported (BCMOECCS 2021b).

[e] Dissolved oxygen guidelines represent a minimum value, and so exceedances were quantified below this guideline.

[f] Unrestricted change permitted within this pH range.

[g] For hardness-based guidelines, concurrent hardness values were used for calculating guidelines. If hardness values exceeding the maximum applicable hardness, then guidelines were determined using the maximum applicable hardness. If hardness values is lower than the minimum hardness, then guidelines were determined using the minimum hardness.

[h] Chromium(VI) is the dominant oxidation state in oxygenated environments, and so its guideline was applied.

[i] The most conservative guideline (0.00000125 mg/L) was applied.

Table D.3: Summary of Water Chemistry Data for Key Parameters for the Line Creek LAEMP Monitoring Stations, 2021

Station	Summary Statistic	Total Dissolved Solids (mg/L)	Lab pH	Field pH	Dissolved Oxygen (mg/L)	Alkalinity (mg/L)	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Ammonia (mg/L)	Sulphate (mg/L)	Total Chloride (mg/L)	Total Fluoride (mg/L)	Total Antimony (mg/L)	Total Arsenic (mg/L)	Total Barium (mg/L)	Total Beryllium (mg/L)	Total Boron (mg/L)	Total Chromium (mg/L)
LC_LC1	n	14	14	0	22	14	14	14	14	14	14	14	14	14	14	14	14	14
	Annual Minimum	136	7.98	-	9.72	99.3	0.0869	<0.001	<0.005	16.2	0.140	0.200	<0.0001	0.000130	0.0346	<0.00002	<0.01	0.000130
	Annual Maximum	240	8.38	-	12.0	135	0.229	0.00260	0.0163	78.9	0.350	0.432	0.000100	0.000300	0.0471	<0.00002	<0.01	0.000640
	Annual Mean	195	8.16	-	10.8	118	0.188	0.00111	0.00708	49.4	0.214	0.291	0.000100	0.000165	0.0409	<0.00002	<0.01	0.000246
	Annual Median	201	8.16	-	10.8	120	0.200	<0.001	<0.005	47.7	0.215	0.277	<0.0001	0.000155	0.0422	<0.00002	<0.01	0.000210
	% < LRL	0%	0%	-	0%	0%	0%	93%	64%	0%	0%	0%	93%	0%	0%	100%	100%	0%
	% > BCWQG[a]	-	-	-	0%	0%	0%	0%	0%	0%	0%	-	0%	-	0%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	0%	-	-	-	-
	% > Level 1 Benchmark	0%	-	-	-	-	0%	-	-	0%	-	-	-	-	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_SLC	n	30	30	0	29	30	30	30	30	30	30	30	30	30	30	30	30	30
	Annual Minimum	127	7.92	-	8.14	102	0.0477	<0.001	<0.005	7.73	0.100	0.136	<0.0001	<0.0001	0.0235	<0.00002	<0.01	0.000120
	Annual Maximum	273	8.48	-	12.7	163	0.206	0.00150	0.0264	80.0	0.770	0.387	0.000120	0.000190	0.0983	<0.00002	<0.01	0.000320
	Annual Mean	206	8.22	-	11.0	137	0.108	0.00103	0.00760	48.8	0.359	0.290	0.000101	0.000128	0.0411	<0.00002	<0.01	0.000173
	Annual Median	216	8.23	-	11.1	142	0.107	<0.001	<0.005	49.6	0.320	0.298	<0.0001	0.000120	0.0407	<0.00002	<0.01	0.000160
	% < LRL	0%	0%	-	0%	0%	0%	90%	70%	0%	0%	0%	97%	3%	0%	100%	100%	0%
	% > BCWQG[a]	-	-	-	0%	0%	0%	0%	0%	0%	0%	-	0%	-	0%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	0%	-	-	-	-
	% > Level 1 Benchmark	0%	-	-	-	-	0%	-	-	0%	-	-	-	-	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_LCUSWLC	n	60	61	0	61	61	61	61	61	61	61	61	61	61	61	61	61	61
	Annual Minimum	315	7.71	-	9.37	153	5.17	<0.001	<0.005	107	2.69	<0.1	0.000270	<0.0001	0.0268	<0.00002	0.0100	<0.0001
	Annual Maximum	916	8.46	-	11.9	269	20.4	0.00560	0.0211	388	14.4	0.369	0.000460	0.000190	0.0773	<0.00002	0.0240	<0.0004
	Annual Mean	651	8.15	-	10.4	215	13.6	0.00124	0.00701	261	8.30	0.191	0.000382	0.000135	0.0580	<0.00002	0.0183	0.000127
	Annual Median	655	8.16	-	10.3	220	13.0	<0.001	<0.005	269	8.47	0.189	0.000385	0.000130	0.0618	<0.00002	0.0190	0.000120
	% < LRL	0%	0%	-	0%	0%	0.0%	90%	70%	0%	0%	3%	0%	3%	0%	100%	0%	15%
	% > BCWQG[a]	-	-	-	0%	0%	100%	0%	0%	0%	0%	-	0%	-	0%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	0%	-	-	-	-
	% > Level 1 Benchmark	0%	-	-	-	-	34%	-	-	0%	-	-	-	-	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_WLC	n	57	57	0	57	57	57	57	57	57	57	57	57	57	57	57	57	57
	Annual Minimum	843	7.92	-	9.69	273	6.49	<0.001	<0.005	369	1.52	<0.1	0.000380	0.000130	0.0136	<0.00002	0.0140	<0.0001
	Annual Maximum	2,270	8.43	-	11.5	452	19.6	0.0757	0.0305	1,260	8.14	<0.4	0.000560	0.000370	0.0266	<0.00004	0.0250	<0.0003
	Annual Mean	1,834	8.20	-	10.8	354	14.9	0.00366	0.00696	1,000	4.08	0.149	0.000462	0.000231	0.0220	<0.00002	0.0178	0.000120
	Annual Median	1,900	8.20	-	10.7	350	15.2	0.00100	<0.005	1,060	4.10	0.144	0.000470	0.000230	0.0225	<0.00004	0.0160	<0.0001
	% < LRL	0%	0%	-	0%	0%	0.0%	82%	75%	0%	0%	21%	0%	18%	0%	100%	58%	86%
	% > BCWQG[a]	-	-	-	0%	0%	100%	2%	0%	98%	0%	-	0%	-	0%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	0%	-	-	-	-
	% > Level 1 Benchmark	96%	-	-	-	-	53%	-	-	98%	-	-	-	-	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

> 5% of samples exceed the guideline or benchmark.
> 50% of samples exceed the guideline or benchmark.
> 95% of samples exceed the guideline or benchmark.

Notes: "LRL" = laboratory reporting limit. "BCWQG" = British Columbia Working or Accepted Water Quality Guideline. For guidelines dependent on other analytes (e.g., hardness or chloride), guidelines were screened using concurrent concentrations. When concurrent hardness or chloride concentrations were not measured, the most conservative concentration observed for that station was used to estimate the guidelines or benchmark. All summary statistics are reported to 3 significant figures.

[a] Long-term average BCQWG for the Protection of Aquatic Life.
[b] Short-term maximum BCQWG for the Protection of Aquatic Life.

Table D.3: Summary of Water Chemistry Data for Key Parameters for the Line Creek LAEMP Monitoring Stations, 2021

Station	Summary Statistic	Total Dissolved Solids (mg/L)	Lab pH	Field pH	Dissolved Oxygen (mg/L)	Alkalinity (mg/L)	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Ammonia (mg/L)	Sulphate (mg/L)	Total Chloride (mg/L)	Total Fluoride (mg/L)	Total Antimony (mg/L)	Total Arsenic (mg/L)	Total Barium (mg/L)	Total Beryllium (mg/L)	Total Boron (mg/L)	Total Chromium (mg/L)
LC_LC3	n	60	60	0	60	60	60	60	60	60	60	60	60	60	60	60	60	60
	Annual Minimum	380	7.81	-	9.91	163	5.37	<0.001	<0.005	128	3.63	<0.1	0.000280	<0.0001	0.0248	<0.00002	0.0120	<0.0001
	Annual Maximum	1,090	8.54	-	13.2	271	14.4	0.00880	0.0217	532	70.5	0.301	0.000380	0.000210	0.0691	<0.00002	0.0230	0.000510
	Annual Mean	790	8.17	-	11.1	221	10.8	0.00156	0.00716	350	25.0	0.183	0.000323	0.000126	0.0522	<0.00002	0.0182	0.000141
	Annual Median	798	8.17	-	10.9	224	11.2	0.00100	<0.005	360	23.6	0.180	0.000320	0.000120	0.0549	<0.00002	0.0180	0.000130
	% < LRL	0%	0%	-	0%	0%	0%	78%	58%	0%	0%	7%	0%	18%	0%	100%	0%	10%
	% > BCWQG[a]	-	-	-	0%	0%	100%	0%	0%	25%	0%	-	0%	-	0%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	0%	-	-	-	-
	% > Level 1 Benchmark	18%	-	-	-	-	0%	-	-	25%	-	-	-	-	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WL_DCP_SP24	n	4	4	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Annual Minimum	496	8.13	-	10.6	169	7.33	<0.001	<0.005	167	6.71	0.188	0.000220	0.000110	0.0422	<0.00002	0.0140	0.000120
	Annual Maximum	670	8.42	-	11.3	207	10.4	0.00360	0.0224	252	12.8	0.262	0.000280	0.000120	0.0544	<0.00002	0.0160	0.000200
	Annual Mean	575	8.28	-	10.8	194	8.40	0.00200	0.00935	224	11.1	0.219	0.000248	0.000118	0.0496	<0.00002	0.0152	0.000155
	Annual Median	568	8.28	-	10.7	199	7.93	0.00170	<0.005	238	12.4	0.212	0.000245	0.000120	0.0510	<0.00002	0.0155	0.000150
	% < LRL	0%	0%	-	0%	0%	0.0%	25%	75%	0%	0%	0%	0%	0%	0%	100%	0%	0%
	% > BCWQG[a]	-	-	-	0%	0%	100%	0%	0%	0%	0%	-	0%	-	0%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	0%	-	-	-	-
	% > Level 1 Benchmark	0%	-	-	-	-	0%	-	-	0%	-	-	-	-	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_LCDSSLCC	n	53	53	0	53	53	53	53	53	53	53	53	53	53	53	53	53	53
	Annual Minimum	268	8.09	-	8.80	140	2.90	<0.001	<0.005	79.4	2.55	<0.1	0.000150	<0.0001	0.0292	<0.00002	<0.01	<0.0001
	Annual Maximum	792	8.55	-	13.1	255	11.7	<0.02	0.0298	353	25.7	<0.4	0.000270	0.000170	0.0896	<0.00002	0.0190	<0.0004
	Annual Mean	580	8.30	-	10.8	198	8.07	0.00157	0.00757	237	13.1	0.201	0.000217	0.000121	0.0605	<0.00002	0.0139	0.000143
	Annual Median	600	8.29	-	10.7	205	8.35	0.00100	<0.005	238	12.7	0.199	0.000220	0.000120	0.0624	<0.00002	0.0140	0.000130
	% < LRL	0%	0%	-	0%	0%	0.0%	60%	53%	0%	0%	4%	0%	13%	0%	100%	9%	6%
	% > BCWQG[a]	-	-	-	0%	0%	98%	0%	0%	0%	0%	-	0%	-	0%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	0%	-	-	-	-
	% > Level 1 Benchmark	0%	-	-	-	-	0%	-	-	0%	-	-	-	-	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_LCC	n	4	4	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Annual Minimum	278	6.86	-	10.4	98.0	4.12	<0.001	<0.005	105	5.40	0.0985	0.000160	0.000120	0.0316	<0.00002	0.0125	0.000140
	Annual Maximum	523	8.43	-	11.3	221	6.80	0.00320	0.0142	204	10.5	0.251	0.000230	0.000145	0.0646	<0.00002	0.0150	0.000150
	Annual Mean	436	7.95	-	10.9	173	5.91	0.00180	0.00761	164	8.15	0.195	0.000193	0.000129	0.0519	<0.00002	0.0139	0.000142
	Annual Median	472	8.26	-	10.9	186	6.36	0.00150	0.00565	173	8.35	0.215	0.000190	0.000125	0.0556	<0.00002	0.0140	0.000140
	% < LRL	0%	0%	-	0%	0%	0.0%	50%	50%	0%	0%	0%	0%	0%	0%	100%	0%	0%
	% > BCWQG[a]	-	-	-	0%	0%	100%	0%	0%	0%	0%	-	0%	-	0%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	0%	-	-	-	-
	% > Level 1 Benchmark	0%	-	-	-	-	0%	-	-	0%	-	-	-	-	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Notes: "LRL" = laboratory reporting limit. "BCWQG" = British Columbia Working or Accepted Water Quality Guideline. For guidelines dependent on other analytes (e.g., hardness or chloride), guidelines were screened using concurrent concentrations. When concurrent hardness or chloride concentrations were not measured, the most conservative concentration observed for that station was used to estimate the guidelines or benchmark. All summary statistics are reported to 3 significant figures.

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[b] Short-term maximum BCQWG for the Protection of Aquatic Life.

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Station	Summary Statistic	Total Dissolved Solids (mg/L)	Lab pH	Field pH	Dissolved Oxygen (mg/L)	Alkalinity (mg/L)	Nitrate-N (mg/L)	Nitrite-N (mg/L)	Ammonia (mg/L)	Sulphate (mg/L)	Total Chloride (mg/L)	Total Fluoride (mg/L)	Total Antimony (mg/L)	Total Arsenic (mg/L)	Total Barium (mg/L)	Total Beryllium (mg/L)	Total Boron (mg/L)	Total Chromium (mg/L)
LC_LC4	n	56	56	0	56	56	56	56	56	56	56	56	56	56	56	56	56	56
	Annual Minimum	237	7.93	-	8.50	131	2.43	<0.001	<0.005	68.1	2.20	<0.1	0.000130	<0.0001	0.0326	<0.00002	<0.01	0.000100
	Annual Maximum	625	8.49	-	14.9	223	10.6	<0.005	0.0680	300	18.0	0.337	0.000210	0.000200	0.0900	<0.00002	0.0160	<0.0004
	Annual Mean	499	8.33	-	11.1	184	6.38	0.00159	0.00884	192	10.4	0.232	0.000177	0.000126	0.0637	<0.00002	0.0128	0.000164
	Annual Median	528	8.34	-	10.9	188	6.43	0.00135	0.00500	202	10.6	0.230	0.000180	0.000120	0.0661	<0.00002	0.0130	0.000150
	% < LRL	0%	0%	-	0%	0%	0.0%	36%	50%	0%	0%	2%	0%	7%	0%	100%	11%	2%
	% > BCWQG[a]	-	-	-	0%	0%	96%	0%	0%	0%	0%	-	0%	-	0%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	0%	-	-	-	-
	% > Level 1 Benchmark	0%	-	-	-	-	0%	-	-	0%	-	-	-	-	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_LC6	n	4	4	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Annual Minimum	474	8.23	-	9.99	173	9.69	0.00380	<0.005	155	1.40	0.124	0.000100	<0.0001	0.0883	<0.00002	<0.01	<0.0001
	Annual Maximum	622	8.38	-	11.8	219	15.2	0.00685	0.00805	250	3.44	0.187	0.000140	0.000125	0.111	<0.00002	0.0110	0.000170
	Annual Mean	561	8.33	-	10.8	194	12.6	0.00464	0.00584	207	2.16	0.152	0.000121	0.000116	0.103	<0.00002	0.0102	0.000132
	Annual Median	574	8.36	-	10.8	193	12.8	0.00400	0.00515	212	1.91	0.149	0.000122	0.000120	0.107	<0.00002	0.0100	0.000130
	% < LRL	0%	0%	-	0%	0%	0.0%	25%	50%	0%	0%	0%	0%	25%	0%	100%	50%	25%
	% > BCWQG[a]	-	-	-	0%	0%	100%	0%	0%	0%	0%	-	0%	-	0%	0%	0%	0%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	0%	-	-	-	-
	% > Level 1 Benchmark	0%	-	-	-	-	50%	-	-	0%	-	-	-	-	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_LC5	n	38	38	0	37	38	38	38	38	38	38	38	38	38	38	38	38	38
	Annual Minimum	319	8.11	-	9.26	147	5.68	<0.001	<0.005	97.5	1.33	0.107	<0.0001	<0.0001	0.0557	<0.00002	<0.01	<0.0001
	Annual Maximum	642	8.55	-	13.1	221	13.9	0.0124	0.0246	260	6.27	0.253	0.000390	0.000510	0.111	0.0000560	0.0120	0.00102
	Annual Mean	521	8.32	-	11.0	189	10.3	0.00386	0.00770	188	4.00	0.179	0.000138	0.000142	0.0902	0.0000209	0.0103	0.000200
	Annual Median	556	8.32	-	10.8	194	10.9	0.00335	<0.005	205	4.14	0.182	0.000135	0.000120	0.0958	<0.00002	<0.01	0.000150
	% < LRL	0%	0%	-	0%	0%	0.0%	8%	61%	0%	0%	0%	13%	11%	0%	97%	61%	3%
	% > BCWQG[a]	-	-	-	0%	0%	100%	0%	0%	0%	0%	-	0%	-	0%	0%	0%	3%
	% > BCWQG[b]	-	-	-	0%	-	0%	0%	0%	-	0%	0%	-	0%	-	-	-	-
	% > Level 1 Benchmark	0%	-	-	-	-	3%	-	-	0%	-	-	-	-	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

> 5% of samples exceed the guideline or benchmark.
> 50% of samples exceed the guideline or benchmark.
> 95% of samples exceed the guideline or benchmark.

Notes: "LRL" = laboratory reporting limit. "BCWQG" = British Columbia Working or Accepted Water Quality Guideline. For guidelines dependent on other analytes (e.g., hardness or chloride), guidelines were screened using concurrent concentrations. When concurrent hardness or chloride concentrations were not measured, the most conservative concentration observed for that station was used to estimate the guidelines or benchmark. All summary statistics are reported to 3 significant figures.

[a] Long-term average BCQWG for the Protection of Aquatic Life.

[b] Short-term maximum BCQWG for the Protection of Aquatic Life.

Table D.3: Summary of Water Chemistry Data for Key Parameters for the Line Creek LAEMP Monitoring Stations, 2021

Station	Summary Statistic	Total Cobalt (µg/L)	Total Iron (mg/L)	Total Lead (mg/L)	Total Lithium (mg/L)	Total Manganese (mg/L)	Total Mercury (mg/L)	Total Molybdenum (mg/L)	Total Nickel (µg/L)	Total Selenium (µg/L)	Total Silver (mg/L)	Total Thallium (mg/L)	Total Uranium (mg/L)	Total Zinc (mg/L)	Dissolved Aluminum (mg/L)	Dissolved Cadmium (µg/L)	Dissolved Cobalt (µg/L)	Dissolved Copper (mg/L)	Dissolved Iron (mg/L)
LC_LC1	n	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14
	Annual Minimum	<0.1	<0.01	<0.00005	0.00220	<0.0001	<0.0000005	0.000598	<0.5	1.37	<0.00001	<0.00001	0.000777	<0.003	0.00100	<0.005	<0.1	<0.0002	<0.01
	Annual Maximum	<0.1	0.147	0.000183	0.00400	0.00777	0.00000157	0.00108	1.24	3.20	<0.00001	<0.00001	0.00171	0.00670	0.00360	0.00990	<0.1	<0.0002	<0.01
	Annual Mean	<0.1	0.0199	0.0000595	0.00322	0.000701	0.000000576	0.000849	0.595	2.31	<0.00001	<0.00001	0.00131	0.00333	0.00197	0.00658	<0.1	<0.0002	<0.01
	Annual Median	<0.1	<0.01	<0.00005	0.00325	<0.0001	<0.0000005	0.000856	<0.5	2.36	<0.00001	<0.00001	0.00136	<0.003	0.00170	0.00560	<0.1	<0.0002	<0.01
	% < LRL	100%	86%	93%	0%	57%	93%	0%	57%	0%	100%	100%	0%	71%	7%	21%	100%	100%	100%
	% > BCWQG[a]	0%	-	0%	-	0%	7%	0%	-	71%	0%	0%	0%	0%	0%	0%	-	0%	-
	% > BCWQG[b]	0%	0%	0%	-	0%	-	0%	-	-	0%	-	-	0%	0%	0%	-	0%	0%
	% > Level 1 Benchmark	-	-	-	-	-	-	-	0%	0%	-	-	-	-	-	0%	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	0%	0%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-
LC_SLC	n	30	30	30	30	30	29	30	30	30	30	30	30	30	30	30	30	30	30
	Annual Minimum	<0.1	<0.01	<0.00005	0.00120	<0.0001	<0.0000005	0.000446	<0.5	0.494	<0.00001	<0.00001	0.000558	<0.003	<0.001	0.00880	<0.1	<0.0002	<0.01
	Annual Maximum	<0.1	0.0940	0.0000790	0.0272	0.00341	0.00000191	0.00140	1.08	44.4	<0.00001	<0.00001	0.00262	0.00510	<0.005	0.0170	<0.1	0.000210	<0.01
	Annual Mean	<0.1	0.0174	0.0000510	0.00390	0.000496	0.000000643	0.00111	0.522	2.75	<0.00001	<0.00001	0.00147	0.00320	0.00152	0.0121	<0.1	0.000201	<0.01
	Annual Median	<0.1	<0.01	<0.00005	0.00325	0.000125	<0.0000005	0.00124	<0.5	1.46	<0.00001	<0.00001	0.00164	<0.003	0.00120	0.0120	<0.1	<0.0002	<0.01
	% < LRL	100%	77%	97%	0%	43%	72%	0%	93%	0%	100%	100%	0%	70%	43%	0%	100%	93%	100%
	% > BCWQG[a]	0%	-	0%	-	0%	3%	0%	-	3%	0%	0%	0%	0%	0%	0%	-	0%	-
	% > BCWQG[b]	0%	0%	0%	-	0%	-	0%	-	-	0%	-	-	0%	0%	0%	-	0%	0%
	% > Level 1 Benchmark	-	-	-	-	-	-	-	0%	3%	-	-	-	-	-	0%	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	0%	0%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-
LC_LCUSWLC	n	61	61	61	61	61	59	61	61	61	61	61	61	61	61	61	59	61	61
	Annual Minimum	<0.1	<0.01	<0.00005	0.0253	<0.0001	<0.0000005	0.00144	6.89	19.9	<0.00001	0.0000100	0.00206	0.0102	<0.001	0.265	<0.1	0.000220	<0.01
	Annual Maximum	0.120	0.0140	<0.00005	0.0778	0.000420	0.00000121	0.00247	12.6	73.3	<0.00001	0.0000190	0.00578	0.0593	0.0100	0.580	0.120	0.000890	0.0140
	Annual Mean	0.101	0.0101	<0.00005	0.0610	0.000160	0.000000558	0.00190	10.5	47.8	<0.00001	0.0000145	0.00400	0.0148	0.00152	0.334	0.101	0.000352	0.0101
	Annual Median	<0.1	<0.01	<0.00005	0.0664	0.000140	<0.0000005	0.00190	10.9	45.7	<0.00001	0.0000140	0.00397	0.0133	<0.001	0.310	<0.1	0.000310	<0.01
	% < LRL	90%	98%	100%	0%	25%	81%	0%	0%	0%	100%	0%	0%	0%	74%	0%	95%	0%	98%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	-	100%	0%	0%	0%	0%	0%	5%	-	16%	-
	% > BCWQG[b]	0%	0%	0%	-	0%	-	0%	-	-	0%	-	-	0%	0%	0%	-	0%	0%
	% > Level 1 Benchmark	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	13%	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	0%	0%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-
LC_WLC	n	57	57	57	57	57	54	57	57	59	57	57	57	57	57	57	54	57	57
	Annual Minimum	<0.1	<0.01	<0.00005	0.0238	<0.0001	<0.0000005	0.00114	16.1	168	<0.00001	0.0000200	0.00602	0.00530	<0.001	0.0122	<0.1	<0.0004	<0.01
	Annual Maximum	0.260	<0.02	<0.0001	0.0422	0.00156	0.00000176	0.00500	43.9	566	<0.00002	0.0000470	0.0234	0.118	0.00600	2.65	0.470	0.00456	0.0520
	Annual Mean	0.103	0.0101	0.0000533	0.0349	0.000384	0.00000102	0.00324	24.8	404	<0.00001	0.0000265	0.0169	0.0366	0.00164	0.881	0.112	0.000884	0.0117
	Annual Median	<0.2	<0.01	<0.00005	0.0363	0.000100	0.00000106	0.00368	18.8	425	<0.00002	0.0000260	0.0182	0.0157	<0.001	0.576	<0.2	0.000790	<0.01
	% < LRL	98%	98%	98%	0%	56%	2%	0%	0%	0%	100%	0%	0%	26%	70%	0%	94%	2%	89%
	% > BCWQG[a]	0%	-	0%	-	0%	4%	0%	-	100%	0%	0%	95%	0%	0%	54%	-	32%	-
	% > BCWQG[b]	0%	0%	0%	-	0%	-	0%	-	-	0%	-	-	0%	0%	0%	-	2%	0%
	% > Level 1 Benchmark	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	35%	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	39%	-	-	-	-	-	-	-	-	-	-

> 5% of samples exceed the guideline or benchmark.
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Notes: "LRL" = laboratory reporting limit. "BCWQG" = British Columbia Working or Accepted Water Quality Guideline. For guidelines dependent on other analytes (e.g., hardness or chloride), guidelines were screened using concurrent concentrations. When concurrent hardness or chloride concentrations were not measured, the most conservative concentration observed for that station was used to estimate the guidelines or benchmark. All summary statistics are reported to 3 significant figures.

[a] Long-term average BCQWG for the Protection of Aquatic Life.
[b] Short-term maximum BCQWG for the Protection of Aquatic Life.

Table D.3: Summary of Water Chemistry Data for Key Parameters for the Line Creek LAEMP Monitoring Stations, 2021

Station	Summary Statistic	Total Cobalt (µg/L)	Total Iron (mg/L)	Total Lead (mg/L)	Total Lithium (mg/L)	Total Manganese (mg/L)	Total Mercury (mg/L)	Total Molybdenum (mg/L)	Total Nickel (µg/L)	Total Selenium (µg/L)	Total Silver (mg/L)	Total Thallium (mg/L)	Total Uranium (mg/L)	Total Zinc (mg/L)	Dissolved Aluminum (mg/L)	Dissolved Cadmium (µg/L)	Dissolved Cobalt (µg/L)	Dissolved Copper (mg/L)	Dissolved Iron (mg/L)
LC_LC3	n	60	60	60	60	60	57	60	60	61	60	60	60	60	60	60	58	60	60
	Annual Minimum	<0.1	<0.01	<0.00005	0.0288	0.000500	<0.0000005	0.00151	7.57	29.2	<0.00001	<0.00001	0.00233	0.00550	<0.001	0.137	<0.1	<0.0002	<0.01
	Annual Maximum	0.320	0.222	0.000112	0.0785	0.0754	0.000000840	0.00582	13.3	71.2	<0.00001	0.0000180	0.00620	0.151	0.00530	0.562	0.310	0.00214	0.0680
	Annual Mean	0.177	0.0640	0.0000510	0.0590	0.0303	0.000000538	0.00384	9.14	43.8	<0.00001	0.0000119	0.00448	0.0141	0.00138	0.273	0.158	0.000343	0.0123
	Annual Median	0.160	0.0540	<0.00005	0.0620	0.0284	<0.0000005	0.00386	9.06	44.1	<0.00001	0.0000110	0.00450	0.0111	<0.001	0.253	0.145	0.000305	<0.01
	% < LRL	8%	7%	98%	0%	0%	82%	0%	0%	0%	100%	37%	0%	0%	72%	0%	17%	5%	87%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	-	100%	0%	0%	0%	0%	0%	3%	-	13%	-
	% > BCWQG[b]	0%	0%	0%	-	0%	-	0%	-	-	0%	-	-	0%	0%	0%	-	0%	0%
	% > Level 1 Benchmark	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	10%	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	0%	0%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-
WL_DCP_SP24	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Annual Minimum	<0.1	0.0110	<0.00005	0.0366	0.00337	<0.0000005	0.00195	5.65	24.9	<0.00001	<0.00001	0.00261	0.00690	<0.001	0.167	<0.1	0.000200	<0.01
	Annual Maximum	<0.1	0.0270	<0.00005	0.0467	0.0104	<0.0000005	0.00274	6.36	34.9	<0.00001	<0.00001	0.00370	0.0104	0.00190	0.292	<0.1	0.000300	<0.01
	Annual Mean	<0.1	0.0175	<0.00005	0.0439	0.00720	<0.0000005	0.00243	6.04	29.3	<0.00001	<0.00001	0.00328	0.00822	0.00122	0.211	<0.1	0.000265	<0.01
	Annual Median	<0.1	0.0160	<0.00005	0.0462	0.00752	<0.0000005	0.00252	6.07	28.7	<0.00001	<0.00001	0.00341	0.00780	<0.001	0.192	<0.1	0.000280	<0.01
	% < LRL	100%	0%	100%	0%	0%	100%	0%	0%	0%	100%	100%	0%	0%	75%	0%	100%	0%	100%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	-	100%	0%	0%	0%	0%	0%	0%	-	0%	-
	% > BCWQG[b]	0%	0%	0%	-	0%	-	0%	-	-	0%	-	-	0%	0%	0%	-	0%	0%
	% > Level 1 Benchmark	-	-	-	-	-	-	-	100%	100%	-	-	-	-	-	0%	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	0%	0%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-
LC_LCDSSLCC	n	53	53	53	53	53	51	53	53	54	53	53	53	53	53	53	51	53	53
	Annual Minimum	<0.1	<0.01	<0.00005	0.0145	0.000970	<0.0000005	0.00115	3.19	14.4	<0.00001	<0.00001	0.00155	0.00310	<0.001	0.0790	<0.1	<0.0002	<0.01
	Annual Maximum	0.150	0.0540	0.0000850	0.0537	0.0107	0.00000122	0.00306	6.18	49.2	<0.00001	0.0000110	0.00438	0.0360	0.00310	0.244	<0.1	0.000460	<0.01
	Annual Mean	0.101	0.0163	0.0000507	0.0400	0.00509	0.000000573	0.00233	4.61	34.5	<0.00001	0.0000100	0.00323	0.00706	0.00119	0.146	<0.1	0.000227	<0.01
	Annual Median	<0.1	0.0120	<0.00005	0.0435	0.00481	<0.0000005	0.00253	4.64	34.7	<0.00001	<0.00001	0.00345	0.00600	<0.001	0.138	<0.1	<0.0002	<0.01
	% < LRL	98%	32%	98%	0%	0%	76%	0%	0%	0%	100%	92%	0%	0%	70%	0%	100%	55%	100%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	-	100%	0%	0%	0%	0%	0%	0%	-	0%	-
	% > BCWQG[b]	0%	0%	0%	-	0%	-	0%	-	-	0%	-	-	0%	0%	0%	-	0%	0%
	% > Level 1 Benchmark	-	-	-	-	-	-	-	15%	96%	-	-	-	-	-	0%	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	0%	0%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-
LC_LCC	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Annual Minimum	<0.1	<0.01	<0.00005	0.0206	0.00184	<0.0000005	0.00121	2.06	20.9	<0.00001	<0.00001	0.00166	0.00385	<0.001	0.0886	<0.1	<0.0002	<0.01
	Annual Maximum	<0.1	0.0215	<0.00005	0.0366	0.00331	<0.0000005	0.00210	4.53	27.1	<0.00001	<0.00001	0.00298	0.00700	0.00250	0.200	<0.1	0.000340	<0.01
	Annual Mean	<0.1	0.0141	<0.00005	0.0315	0.00248	<0.0000005	0.00178	3.50	24.1	<0.00001	<0.00001	0.00248	0.00524	0.00158	0.131	<0.1	0.000248	<0.01
	Annual Median	<0.1	0.0125	<0.00005	0.0344	0.00238	<0.0000005	0.00190	3.71	24.3	<0.00001	<0.00001	0.00263	0.00505	0.00140	0.118	<0.1	0.000225	<0.01
	% < LRL	100%	50%	100%	0%	0%	100%	0%	0%	0%	100%	100%	0%	0%	25%	0%	100%	50%	100%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	-	100%	0%	0%	0%	0%	0%	0%	-	0%	-
	% > BCWQG[b]	0%	0%	0%	-	0%	-	0%	-	-	0%	-	-	0%	0%	0%	-	0%	0%
	% > Level 1 Benchmark	-	-	-	-	-	-	-	0%	100%	-	-	-	-	-	0%	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	0%	0%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-

> 5% of samples exceed the guideline or benchmark.
> 50% of samples exceed the guideline or benchmark.
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Notes: "LRL" = laboratory reporting limit. "BCWQG" = British Columbia Working or Accepted Water Quality Guideline. For guidelines dependent on other analytes (e.g., hardness or chloride), guidelines were screened using concurrent concentrations. When concurrent hardness or chloride concentrations were not measured, the most conservative concentration observed for that station was used to estimate the guidelines or benchmark. All summary statistics are reported to 3 significant figures.

[a] Long-term average BCQWG for the Protection of Aquatic Life.
[b] Short-term maximum BCQWG for the Protection of Aquatic Life.

Table D.3: Summary of Water Chemistry Data for Key Parameters for the Line Creek LAEMP Monitoring Stations, 2021

Station	Summary Statistic	Total Cobalt (µg/L)	Total Iron (mg/L)	Total Lead (mg/L)	Total Lithium (mg/L)	Total Manganese (mg/L)	Total Mercury (mg/L)	Total Molybdenum (mg/L)	Total Nickel (µg/L)	Total Selenium (µg/L)	Total Silver (mg/L)	Total Thallium (mg/L)	Total Uranium (mg/L)	Total Zinc (mg/L)	Dissolved Aluminum (mg/L)	Dissolved Cadmium (µg/L)	Dissolved Cobalt (µg/L)	Dissolved Copper (mg/L)	Dissolved Iron (mg/L)
LC_LC4	n	56	56	56	56	56	54	56	56	56	56	56	56	56	56	56	54	56	56
	Annual Minimum	<0.1	<0.01	<0.00005	0.0124	0.000500	<0.0000005	0.000988	1.80	11.8	<0.00001	<0.00001	0.00132	<0.003	<0.001	0.0115	<0.1	<0.0002	<0.01
	Annual Maximum	0.170	0.143	0.000121	0.0442	0.0162	<0.000005	0.00254	4.34	40.2	<0.00001	0.0000120	0.00352	0.0604	0.00560	0.138	<0.1	0.00475	0.0110
	Annual Mean	0.101	0.0187	0.0000513	0.0329	0.00219	0.000000600	0.00204	3.16	27.8	<0.00001	0.0000100	0.00279	0.00634	0.00153	0.0735	<0.1	0.000302	0.0100
	Annual Median	<0.1	<0.01	<0.00005	0.0343	0.00141	<0.0000005	0.00218	3.21	28.7	<0.00001	<0.00001	0.00299	0.00490	0.00120	0.0690	<0.1	<0.0002	<0.01
	% < LRL	98%	54%	98%	0%	0%	72%	0%	0%	0%	100%	98%	0%	7%	46%	0%	100%	70%	98%
	% > BCWQG[a]	0%	-	0%	-	0%	4%	0%	-	100%	0%	0%	0%	0%	0%	0%	-	2%	-
	% > BCWQG[b]	0%	0%	0%	-	0%	-	0%	-	-	0%	-	-	0%	0%	0%	-	0%	0%
	% > Level 1 Benchmark	-	-	-	-	-	-	-	0%	88%	-	-	-	-	-	0%	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	0%	0%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-
LC_LC6	n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
	Annual Minimum	<0.1	<0.01	<0.00005	0.0242	0.000550	<0.0000005	0.00101	0.730	40.2	<0.00001	<0.00001	0.00205	<0.003	<0.001	0.00800	<0.1	<0.0002	<0.01
	Annual Maximum	<0.1	0.0240	<0.00005	0.0266	0.00206	<0.0000005	0.00138	1.20	53.8	<0.00001	<0.00001	0.00266	<0.003	0.00630	0.0208	<0.1	<0.0002	<0.01
	Annual Mean	<0.1	0.0148	<0.00005	0.0256	0.00123	<0.0000005	0.00118	0.894	48.7	<0.00001	<0.00001	0.00240	<0.003	0.00232	0.0138	<0.1	<0.0002	<0.01
	Annual Median	<0.1	0.0125	<0.00005	0.0259	0.00115	<0.0000005	0.00116	0.820	50.3	<0.00001	<0.00001	0.00245	<0.003	<0.001	0.0132	<0.1	<0.0002	<0.01
	% < LRL	100%	50%	100%	0%	0%	100%	0%	0%	0%	100%	100%	0%	100%	75%	0%	100%	100%	100%
	% > BCWQG[a]	0%	-	0%	-	0%	0%	0%	-	100%	0%	0%	0%	0%	0%	0%	-	0%	-
	% > BCWQG[b]	0%	0%	0%	-	0%	-	0%	-	-	0%	-	-	0%	0%	0%	-	0%	0%
	% > Level 1 Benchmark	-	-	-	-	-	-	-	0%	100%	-	-	-	-	-	0%	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	0%	0%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-
LC_LC5	n	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38	38
	Annual Minimum	<0.1	<0.01	<0.00005	0.0146	0.000240	<0.0000005	0.000962	0.600	24.6	<0.00001	<0.00001	0.00152	<0.003	<0.001	0.0118	<0.1	<0.0002	<0.01
	Annual Maximum	0.590	0.900	0.000743	0.0312	0.0696	0.00000531	0.00150	3.82	60.9	0.0000160	0.0000280	0.00290	0.0116	<0.003	0.0417	<0.1	0.000670	<0.01
	Annual Mean	0.117	0.0671	0.0000804	0.0243	0.00496	0.000000733	0.00129	1.39	43.3	0.0000102	0.0000105	0.00235	0.00347	0.00123	0.0239	<0.1	0.000218	<0.01
	Annual Median	<0.1	0.0200	<0.00005	0.0242	0.00188	<0.0000005	0.00132	1.34	44.1	<0.00001	<0.00001	0.00246	<0.003	<0.001	0.0217	<0.1	<0.0002	<0.01
	% < LRL	89%	26%	79%	0%	0%	71%	0%	0%	0%	97%	95%	0%	79%	66%	0%	100%	82%	100%
	% > BCWQG[a]	0%	-	0%	-	0%	8%	0%	-	100%	0%	0%	0%	0%	0%	0%	-	0%	-
	% > BCWQG[b]	0%	0%	0%	-	0%	-	0%	-	-	0%	-	-	0%	0%	0%	-	0%	0%
	% > Level 1 Benchmark	-	-	-	-	-	-	-	0%	100%	-	-	-	-	-	0%	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	0%	0%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-	-

> 5% of samples exceed the guideline or benchmark.
> 50% of samples exceed the guideline or benchmark.
> 95% of samples exceed the guideline or benchmark.

Notes: "LRL" = laboratory reporting limit. "BCWQG" = British Columbia Working or Accepted Water Quality Guideline. For guidelines dependent on other analytes (e.g., hardness or chloride), guidelines were screened using concurrent concentrations. When concurrent hardness or chloride concentrations were not measured, the most conservative concentration observed for that station was used to estimate the guidelines or benchmark. All summary statistics are reported to 3 significant figures.

[a] Long-term average BCQWG for the Protection of Aquatic Life.

[b] Short-term maximum BCQWG for the Protection of Aquatic Life.

Table D.4: Acute Toxicity Results for Line Creek Operations, 2021

Water Station		*Daphnia magna*		*Oncorhynchus mykiss*	
Teck Code	**Description**	**Date**	**Percent Mortality**	**Date**	**Percent Mortality**
WL_BFWB_OUT_SP21	West Line Creek AWTF Effluent Outfall	25-Jan-21	0%	25-Jan-21	0%
		8-Feb-21	0%	8-Feb-21	10%
		22-Feb-21	0%	22-Feb-21	0%
		23-Feb-21	0%	23-Feb-21	0%
		24-Feb-21	0%	24-Feb-21	0%
		25-Feb-21	0%	25-Feb-21	0%
		26-Feb-21	0%	26-Feb-21	0%
		8-Mar-21	0%	8-Mar-21	0%
		22-Mar-21	0%	22-Mar-21	0%
		5-Apr-21	0%	5-Apr-21	0%
		19-Apr-21	0%	19-Apr-21	0%
		3-May-21	0%	3-May-21	0%
		17-May-21	0%	17-May-21	0%
		26-May-21	0%	26-May-21	0%
		31-May-21	0%	31-May-21	0%
		14-Jun-21	0%	14-Jun-21	0%
		28-Jun-21	0%	28-Jun-21	0%
		12-Jul-21	0%	12-Jul-21	0%
		26-Jul-21	0%	26-Jul-21	0%
		9-Aug-21	0%	9-Aug-21	0%
		23-Aug-21	0%	23-Aug-21	0%
		6-Sep-21	0%	6-Sep-21	0%
		20-Sep-21	0%	20-Sep-21	0%
		4-Oct-21	0%	4-Oct-21	0%
		19-Oct-21	0%	19-Oct-21	0%
		1-Nov-21	0%	1-Nov-21	0%
		15-Nov-21	0%	15-Nov-21	10%
		22-Nov-21	0%	22-Nov-21	0%
		29-Nov-21	0%	29-Nov-21	0%
		13-Dec-21	0%	13-Dec-21	0%
		28-Dec-21	0%	28-Dec-21	0%

APPENDIX E
BIOLOGICAL TRIGGERS

APPENDIX E BIOLOGICAL TRIGGERS

E1 INTRODUCTION

E1.1 Background

Biological triggers were developed and implemented to assist with identifying and communicating unexpected and potentially important changes in aquatic ecosystem conditions and are required as part of Teck's Adaptive Management Plan (AMP; Teck 2018). Biological triggers were developed in consultation with the EMC for a subset of the biological monitoring endpoints that are effective indicators of changes at the ecosystem level. The purpose of the biological triggers is to quickly identify biological monitoring areas where unexpected biological conditions may be occurring that may require management action. Additionally, information provided from the analysis of biological triggers may lead to responses under the AMP response framework.

Draft biological triggers were developed in the 2018 AMP (Teck 2018) under Management Question 5, with these initially reported on in 2021 in the 2020 LAEMP reports and RAEMP data package, and summarized in the 2020 Annual AMP Report (Teck 2021a). When the 2018 AMP was approved, there was an expectation that the 2018 AMP draft/interim biological triggers would be finalized, through engagement with the EMC, prior to December 15, 2021 AMP Update. The biological triggers were finalized in 2021 (Teck 2021b) and the methods applied in this report reflect the finalized biological triggers (Teck 2021b). It is important to note that the process and/or biological triggers may adjust over time as the purpose of the biological triggers is to be reflective of not only changes in the Elk Valley, but also the current state of knowledge in the area.

The finalized biological triggers (Teck 2021b) include three measurement endpoints:

- Percent EPT (% EPT; Ephemeroptera, Plecoptera, and Trichoptera) – based on travelling kick samples (CABIN protocol), generally three replicates per location per sampling event.
- Benthic invertebrate tissue selenium (BIT Se) – generally several replicates collected per location per sampling event, where each replicate is a composite sample of invertebrates (i.e., composite-taxa sample).
- Westslope cutthroat trout muscle tissue selenium (WCT Se) – generally 8 replicates collected per location per sampling event, where each replicate corresponds to a sample from a single fish.

Evaluation of these three biological trigger endpoints is complementary to the fulsome evaluation of biological endpoints that is integrated into the Local Aquatic Effects

Monitoring Program (LAEMP) and the Regional Aquatic Effects Monitoring Program (RAEMP) data evaluations. The more fulsome evaluation of biological endpoints is used to support answering the specific LAEMP and RAEMP study questions through the consideration of not only the endpoints used in the biological trigger evaluation, but also a full suite of additional biological, chemical, and physical endpoints. Biological triggers do not provide information on cause and effect, report on trends, or feed directly into decision-making processes. Instead, the biological triggers act to flag areas for further evaluation, which would then take place under existing monitoring programs, through the development of supporting studies or through the response framework, as necessary.

Biological monitoring data are compared to triggers annually, and summaries of the LAEMP and RAEMP trigger evaluations and responses are summarized within annual AMP reports.

E2 METHODS

E2.1 Overview

As outlined in Section E1.1, analyses for biological triggers are meant to be complementary to other analyses conducted in the LAEMPs and RAEMP. Biological trigger analyses included all three trigger endpoints (%EPT and BIT Se [collected under the 2021 LCO LAEMP], westslope cutthroat trout [WCT] muscle tissue Se at RG_FO23 and RG_LIDSL [collected under the RAEMP; Minnow 2021b]).

For the purpose of application of the biological triggers, expectations for the endpoints evaluated (%EPT, BIT Se, and WCT muscle tissue Se) were based on projected water quality, not on measured water quality. Thus, the triggers should detect biological results that were unexpected, regardless of whether those results are due to unexpected water quality or due to unexpected relationships between water quality and biological endpoints. Biological triggers were therefore only applied at locations where water quality projections were available. Specifically, five of the mine-exposed areas (RG_LCUT, RG_LILC3, RG_LIDSL, RG_LI8, and RG_FO23) and both reference areas (RG_LI24 and RG_SLINE) included in the LCO LAEMP were evaluated for biological trigger events. Data for other areas studied under the LCO LAEMP (RG_LIDCOM, RG_LISP24, and RG_FRUL) were not available to be evaluated relative to biological triggers but were assessed elsewhere as part of the main LCO LAEMP report.

Methodological details are discussed for each of the biological trigger metrics below.

E2.2 Percent EPT

Data for percent EPT were compared to:

- Normal range: The lower limit of habitat-adjusted normal range (2.5th percentile). Up-to-date limits of normal ranges[1] are provided in the RAEMP and LAEMPs, where they are recalculated as needed as new data become available (Teck 2019). The derivation of habitat-adjusted normal ranges is described in Appendix J of the 2020 RAEMP, and was based on consideration of more than 30 habitat, substrate, GIS, and land cover variables (Minnow 2020).
- Expectations: The lower limit of the range of %EPT corresponds to the predicted aquatic data integration tool (ADIT) score. The predicted ADIT scores correspond to potential effects on benthic invertebrate community (BIC) endpoints, based on

[1] The normal range will be updated as part of the three year reporting cycle of the RAEMP (Minnow 2021b).

relationships between water quality projections (for nitrate, sulphate and cadmium)[2] and invertebrate toxicity endpoints originally developed for the EVWQP (Teck 2014; Golder 2020a). A predicted ADIT score of 3 corresponds to 50% or greater effects to reproduction of the water flea *Ceriodaphnia dubia*, 2 corresponds to 20 to 50% effects, 1 corresponds to 10 to 20% effects, and 0 corresponds to effect levels of 10% or less. Once %EPT is actually measured, the measured results are converted to a measured ADIT score in relation to the habitat adjusted normal range as follows: An ADIT score of 0 corresponds to expected %EPT ≥ the 10th percentile of the habitat-adjusted normal range; an ADIT score of 1 corresponds to expected %EPT between the 10th percentile and the 2.5th percentile of the habitat-adjusted normal range (and is therefore identical in application to the lower limit of normal range); an ADIT score of 2 corresponds to expected %EPT between the 2.5th percentile and half of the 2.5th percentile of the habitat-adjusted normal range; finally, an ADIT score of 3 corresponds to expected %EPT ≤ half of the 2.5th percentile and ≥ 0. Individual replicate habitat-adjusted normal ranges were used at each location for establishing the %EPT limits associated with each ADIT score. In summary, this component of the biological trigger for %EPT asks whether the measured ADIT score – calculated based on measured %EPT relative to normal ranges – is greater than the ADIT score that was predicted based on water quality projections.

Benthic invertebrate community data for %EPT collected in the fall (September) for the 2021 LCO LAEMP were included in the biological trigger analysis.

E2.3 Benthic Invertebrate Tissue Selenium (BIT Se)

Data for BIT Se were compared to:

- Normal range: The upper limit of regional normal range (97.5th percentile) for individual replicates. Up-to-date limits of normal ranges[3] are provided in the RAEMP and LAEMPs, where they are recalculated as needed as new data become available (Teck 2019).
- Expectations: The upper limit of the 95% prediction interval based on the water to BIT bioaccumulation model for lotic environments. The model originally developed in the EVWQP (Golder 2014) was updated (Golder 2020b) and the updated data set was used to calculate prediction intervals for individual replicates. Methodology for estimating the upper limit of the 95% prediction for BIT Se (given any projected value

[2] Selenium was not included because selenium effects on BIC endpoints are not expected. Projections were based on the highest maximum monthly mean across all flow scenarios (low, average, and high).

[3] The normal range will be updated as part of the three-year reporting cycle of the RAEMP (Minnow 2021b).

of aqueous selenium) is discussed further in the Biological Trigger Development for the Elk Valley Adaptive Management Plan (Azimuth 2021 [In Preparation]).

Benthic invertebrate tissue selenium data from sampling events completed throughout 2021 for the LCO LAEMP (April, July, September, and November/December) were included in the biological trigger analysis although normal range information is based on fall (September) information.

Although effects benchmarks are not part of the trigger, they are relevant for interpreting potential significance and responses. Consequently, the level 1, 2 and 3 benchmarks for the most sensitive receptor (juvenile fish via dietary exposure) are included in plots (11, 18, and 26 mg/kg, respectively).

E2.4 Westslope cutthroat trout muscle tissue selenium (WCT Se)

Data for WCT muscle tissue Se were compared to:

- Normal range: The upper limit of regional normal range (97.5th percentile). Up-to-date limits of normal ranges[4] are provided in the RAEMP and LAEMPs, where they are recalculated as needed as new data become available (Teck 2019).
- Expectations: The upper limit of the 95% prediction interval based on bioaccumulation models. For a given selenium concentration in water, the best estimate of expected concentration in WCT muscle tissue is generated using a 2-step bioaccumulation model – water to invertebrates, and invertebrates to fish eggs –-after which a conversion factor is used to convert muscle selenium concentration from egg selenium concentrations. Prediction errors for new replicate samples (i.e., individual fish) are based on a different data set that relates fish directly to water. Methodology for estimating the upper limit of the 95% prediction interval for WCT muscle Se (given any projected value of aqueous selenium) is discussed further in the Biological Trigger Development for the Elk Valley Adaptive Management Plan (Azimuth 2021 [In Preparation]).

Although effects benchmarks are not part of the trigger, they are relevant for interpreting potential significance and responses. Consequently, the site-specific muscle benchmark are included in the plots (15.5 mg/kg dw; Nautilus Environmental and Interior Reforestation 2011).

[4] The normal range will be updated as part of the three-year reporting cycle of the RAEMP (Minnow 2021b).

E3 RESULTS

E3.1 Percent EPT

Individual replicates for the %EPT endpoint for each of the five mine-exposed areas (RG_LCUT, RG_LILC3, RG_LIDSL, RG_LI8, and RG_FO23) as well as the reference areas (RG_LI24 and RG_SLINE) were each assessed against their respective biological triggers for the September sampling period (Appendix Table E.1 and Appendix Figure E.1). Three mine-exposed areas (RG_LCUT [3 of 3 replicates], RG_LILC3 [5 of 5 replicates], and RG_FO23 [5 of 5 replicates] had % EPT results that were lower than the biological trigger value. RG_LILC3 (the area closest in downstream proximity to the AWTF) had %EPT ranging from 15.1 to 27.9% which is substantially lower than the lower 2.5th percentile prediction limit of the biological trigger (which ranged from 75.8 to 78.7%), while %EPT values from areas further downstream did not show the same magnitude of difference. Specifically, %EPT at RG_LIDSL and RG_LI8 did not reach the biological trigger (i.e., were higher than the trigger value). RG_FO23 had %EPT which was lower than the trigger (42.3 to 74.5 %EPT [reported value] compared to 74.3 to 75.6 %EPT [lower 2.5th percentile trigger prediction limit]; Table E.1) but this area is located in the Fording River downstream of Line Creek and did not follow the same spatial pattern observed in Line Creek (i.e., fewer results lower than the trigger with increasing distance from the ATWF) indicating the results were not AWTF-related. Replicates from the reference areas, RG_LI24 [5 of 5 replicates] and RG_SLINE [3 of 3 replicates], did not reach the biological trigger (i.e., were higher than the trigger value; Appendix Table E.1 and Appendix Figure E.1).

E3.2 Benthic Invertebrate Tissue Selenium (BIT Se)

Benthic invertebrate tissue selenium concentrations for each mine-exposed and reference area were assessed against their respective biological trigger for individual replicate samples from each of the four sampling events (April, July, September, and November/December; Appendix Table E.2 and Appendix Figure E.2). A single replicate exceeded the biological trigger at RG_LCUT in April (1 of 20 replicates at this area in 2021) and at RG_SLINE in November (1 of 20 replicates at this area in 2021) but otherwise no other replicates downstream of the AWTF discharge reached the biological trigger. These areas are located upstream of the AWTF discharge (and thus not influenced by the AWTF), and the single replicates from RG_LCUT and RG_SLINE exceeded the biological trigger by 3% (15.0 vs 14.5 mg/kg dw) and 4% (11.0 vs 10.6 mg/kg), respectively. It should be noted that with 40 replicates, 2 of 40 results would be expected to exceed the upper 95th prediction limit by chance. The remaining mine-exposed areas downstream of the outfall

(RG_LILC3, RG_LIDSL, RG_LI8, and RG_FO23) and reference area (RG_LI24) had selenium concentrations that were below the biological trigger (Appendix Table E.2, Appendix Figure E.2].

E3.3 Westslope cutthroat trout muscle tissue selenium (WCT Se)

Westslope cutthroat trout muscle tissue selenium concentrations for two of the five mine-exposed areas, RG_LIDSL and RG_FO23, were assessed against their respective biological trigger for individual replicates collected in the September sampling event (as collected for the RAEMP, Minnow 2021b). Four of the eight WCT muscle tissue samples collected at RG_LIDSL exceeded the biological trigger (Appendix Table E.3, Appendix Figure E.3). Concentrations in these tissue samples ranged from 16.0 to 18.0 mg/kg dw, which exceeded the upper 95% prediction limit of the biological trigger of 14.8 mg/kg dw by 8% to 22%. Tissue selenium concentration in the four remaining collected fish from RG_LIDSL had substantially lower selenium concentrations (4.3 to 7.1 mg/kg) and were all below the biological trigger. Tissue selenium concentrations in all eight replicates of the area further downstream, RG_FO23, were all below the biological trigger.

E4 SUMMARY

Each of the replicates at RG_LCUT, RG_LILC3, and RG_FO23 exceeded the %EPT biological trigger. The %EPT results for these mine-exposed areas were consistent with results classified as 'unexpected' in the most recent RAEMP (Minnow 2020). The biological trigger for benthic invertebrate tissue selenium concentrations was only exceeded in an individual replicate from both RG_LCUT and RG_SLINE (during the April and November sampling events, respectively). The biological trigger exceedance for these replicates was small (<4%) and does not likely represent the BIT Se concentrations for these areas, as the BIT Se concentration of the remaining four replicates for each area were well below the threshold. The WCT muscle selenium concentrations at RG_LIDSL exceeded the biological trigger in four of the eight replicates evaluated, while further downstream in Line Creek at RG_FO23, none of the eight replicates exceeded the biological trigger. Although the cause of the elevated muscle selenium concentrations at RG_LIDSL is currently unknown, it is likely that these fish were not confined to the area around RG_LIDSL as these fish can be highly mobile. A more comprehensive evaluation of WCT muscle Se concentrations will be undertaken as of part of the RAEMP program, and confirmation sampling will be conducted in September 2022 for that program.

The results from the biological triggers evaluation are consistent with the findings of the LCO LAEMP. Current biological triggers were sufficient to identify monitoring areas where biological responses are occurring, based on the integrated assessment conducted in the LAEMP, and no additional triggers are recommended at this time. Uncertainty, however, remains around the cause of the observed %EPT response as well as the elevated WCT Se concentrations in four of the eight replicates at RG_LIDSL. In an effort to resolve uncertainty around the combined and individual effects of water quality, habitat, and other mine-related stressors on benthic invertebrate communities in lotic areas in the Elk River watershed, Minnow is developing a predictive model for benthic invertebrate community endpoints. Uncertainty around the WCT Se concentrations will be further addressed in the RAEMP and through consultation with the Elk Valley Fish and Fish Habitat Monitoring Committee and Teck's Fish Monitoring Team. Uncertainties are expected to be reduced through these efforts, and additional monitoring or potential management responses will continue to be assessed through Teck's adaptive management framework.

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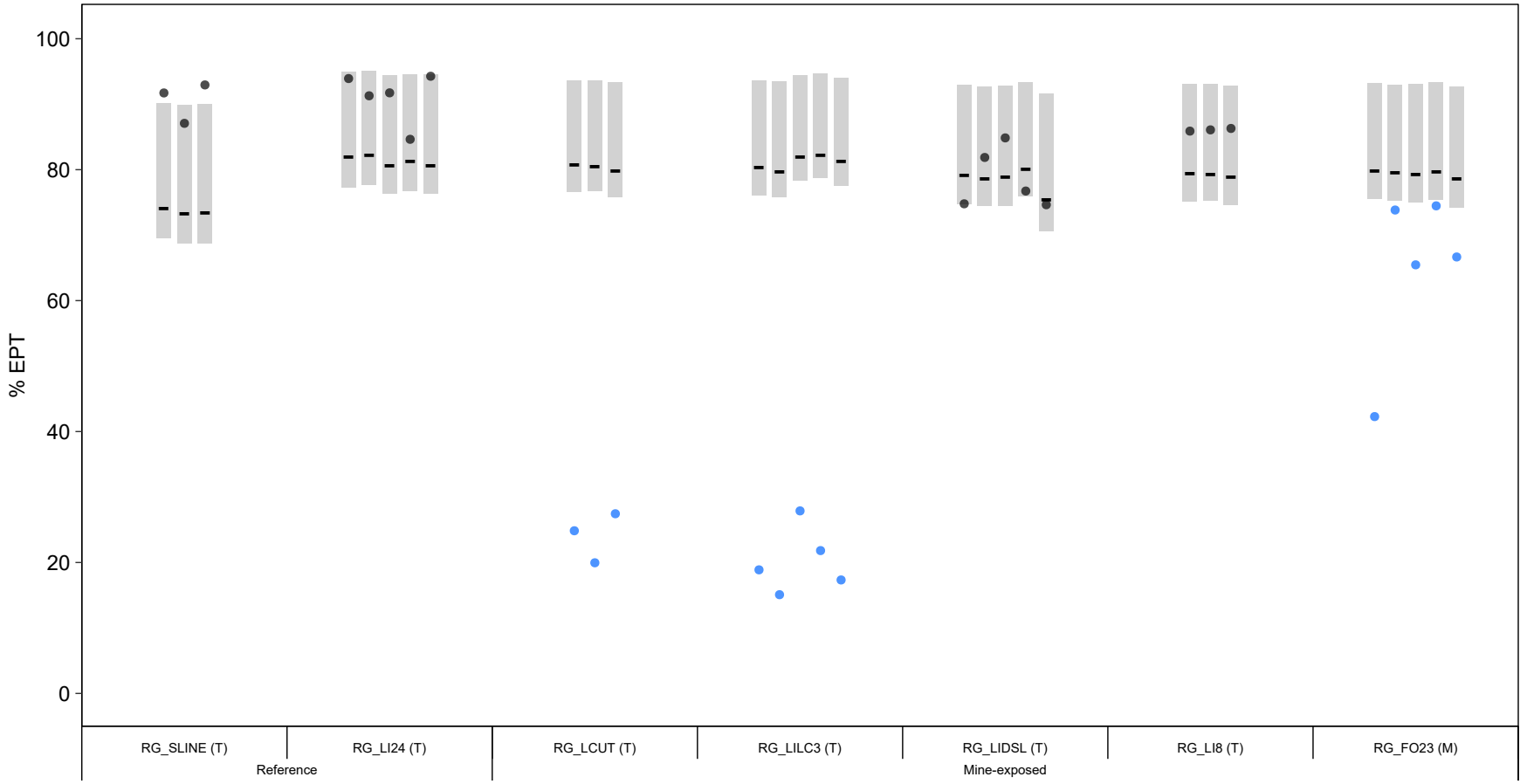

Figure E.1: Percent EPT (%EPT) Compared to Predicted Values, Line Creek LAEMP, 2021

Notes: EPT = Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisflies). Black bars indicate the lower limit of the predicted ADIT score for the location. Gray shading represents the habitat-adjusted normal range for each replicate. Blue dots represent values below the trigger (below 2.5th percentile of NR and below lower limit of predicted ADIT score). Black dots represent values that did not reach the biological trigger (i.e., were higher than the trigger value).
T = Tributary, M = Mainstem.

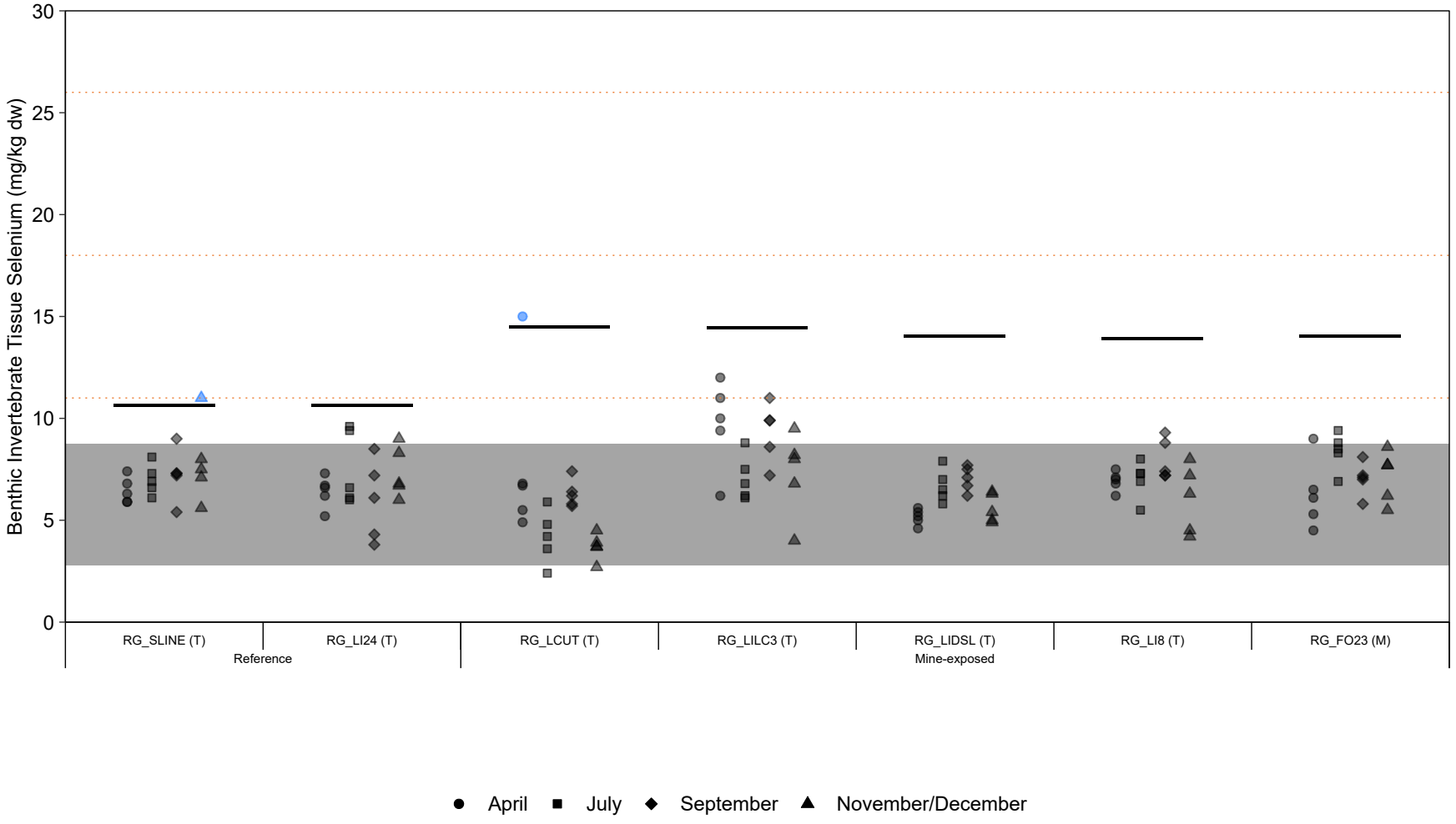

Figure E.2: Selenium Concentrations in Benthic Invertebrate Composite-Taxa Samples Compared to Predicted Values, Line Creek LAEMP, 2021

Notes: Black bars indicate the upper 95th prediction interval of the bioaccumulation model. Blue dots represent values exceeding the trigger (above the 97.5th percentile of normal range and above upper 95% prediction interval). Dotted lines indicate EVWQP benchmarks (11, 18, and 26 mg/kg respectively) for juvenile fish. Gray shading represents the reference area normal range defined as the 2.5th and 97.5th percentiles of the distribution of reference area data (pooled 1996 to 2019 data) reported in the RAEMP.

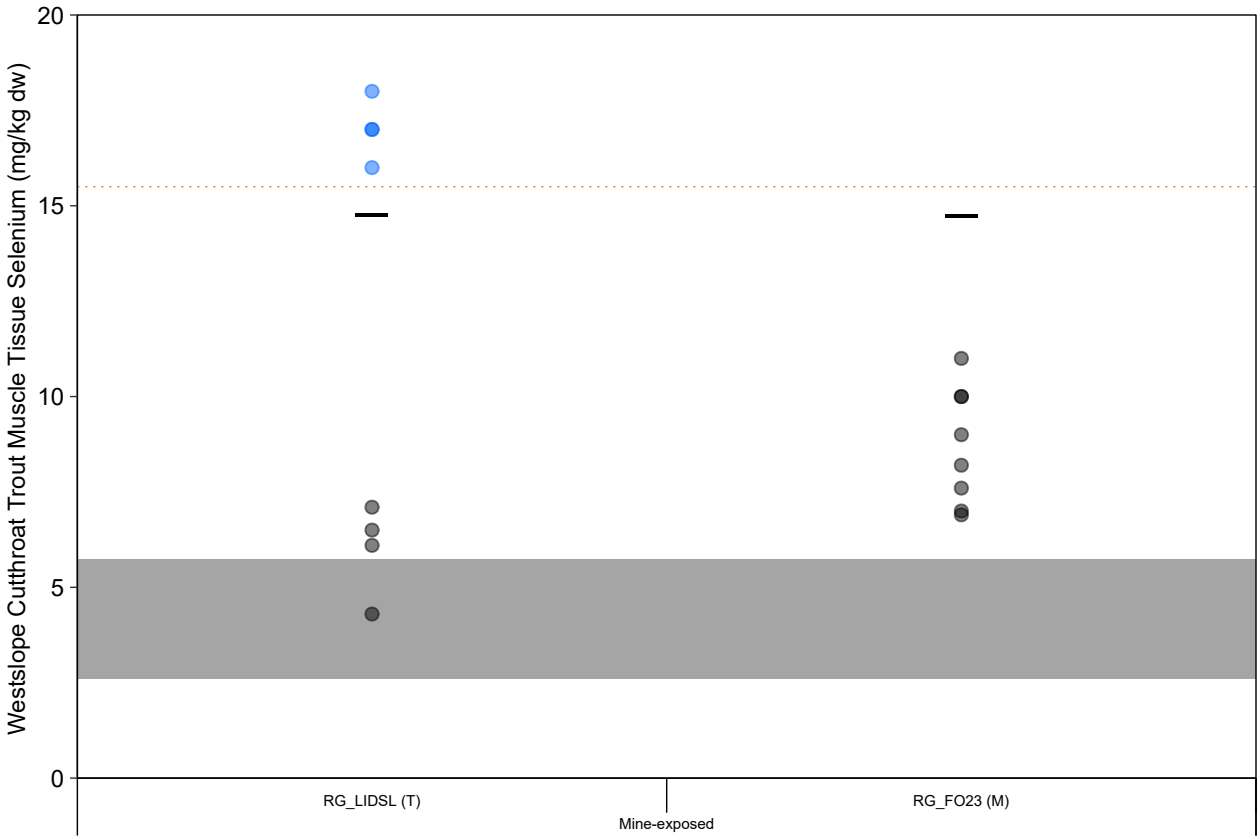

Figure E.3: Selenium Concentrations in Westslope Cutthroat Trout Samples Compared to Predicted Values, LCO LAEMP, 2021

Notes: Black bars indicate the upper 95th prediction interval of the bioaccumulation model. Blue dots represent values exceeding the trigger (above the 97.5th percentile of normal range and above upper 95% prediction interval). Dotted line indicates site-specific muscle benchmark (15.5 mg/kg respectively; Nautilus and Interior Reforestation 2011). Gray shading represents the reference area normal range defined as the 2.5th and 97.5th percentiles of the distribution of reference area data (pooled 1996 to 2019 data) reported in the RAEMP.

Table E.1: Biological trigger analysis for %EPT in Line Creek LAEMP, September 2021

Waterbody	Exposure	Area	Stream Type	Replicate	Reported Value	ADIT Value [a]	Lower 2.5th Percentile of the Habitat Adjusted Normal Range
Line Creek	Reference	RG_SLINE	T	1	91.7	74.1	69.5
		RG_SLINE	T	2	87.1	73.3	68.7
		RG_SLINE	T	3	92.9	73.4	68.8
		RG_LI24	T	1	93.9	82.0	77.3
		RG_LI24	T	2	91.3	82.2	77.7
		RG_LI24	T	3	91.7	80.7	76.3
		RG_LI24	T	4	84.6	81.3	76.7
		RG_LI24	T	5	94.3	80.7	76.3
	Mine-exposed	RG_LCUT	T	1	24.8	80.7	76.6
		RG_LCUT	T	2	20.0	80.5	76.7
		RG_LCUT	T	3	27.4	79.9	75.8
		RG_LILC3	T	1	18.9	80.3	76.0
		RG_LILC3	T	2	15.1	79.8	75.8
		RG_LILC3	T	3	27.9	82.0	78.3
		RG_LILC3	T	4	21.8	82.3	78.7
		RG_LILC3	T	5	17.3	81.4	77.6
		RG_LIDSL	T	1	74.8	79.1	74.7
		RG_LIDSL	T	2	81.9	78.7	74.5
		RG_LIDSL	T	3	84.9	79.0	74.5
		RG_LIDSL	T	4	76.7	80.1	76.0
		RG_LIDSL	T	5	74.6	75.4	70.7
		RG_LI8	T	1	85.9	79.5	75.2
		RG_LI8	T	2	86.1	79.3	75.3
		RG_LI8	T	3	86.3	78.9	74.6
Fording River	Mine-exposed	RG_FO23	M	1	42.3	79.8	75.6
		RG_FO23	M	2	73.8	79.6	75.4
		RG_FO23	M	3	65.5	79.3	75.0
		RG_FO23	M	4	74.5	79.8	75.4
		RG_FO23	M	5	66.7	78.6	74.3

Shaded cells signify those individual replicates that were associated with a biological trigger (i.e. lower than both the ADIT value [as based on predicted water quality] and the lower 2.5th percentile of habitat-adjusted normal range).

Notes: M= Mainstem and T = Tributary. ETP = Ephemeroptera (mayflies), Plecoptera (stoneflies), Trichoptera (caddisflies).

[a] Information pertaining to the calculation of the ADIT value is shown in Section E2.2. In short, all LCO areas evaluated had an ADIT score of 0, which corresponds to the 80% lower limit of the expected %EPT (as based on water quality projections).

Table E.2: Biological Trigger Analysis for Selenium Concentrations in Benthic Invertebrate Composite-Taxa Samples in Line Creek LAEMP, 2021

Waterbody		Stream Type	Area	Date	Predicted Selenium Water Concentration (mg/L)	Benthic Invertebrate Selenium Tissue		
						Upper 95% Prediction Limit (mg/kg dw)	Upper 97.5th Percentile of Normal Range (mg/kg dw)	Reported Concentration (mg/kg dw)
Line Creek	Reference	T	RG_SLINE	26-Apr-21	1.06	10.6	8.74	6.80
		T	RG_SLINE	26-Apr-21	1.06	10.6	8.74	5.90
		T	RG_SLINE	26-Apr-21	1.06	10.6	8.74	5.90
		T	RG_SLINE	26-Apr-21	1.06	10.6	8.74	6.30
		T	RG_SLINE	26-Apr-21	1.06	10.6	8.74	7.40
		T	RG_SLINE	13-Jul-21	1.06	10.6	8.74	7.30
		T	RG_SLINE	13-Jul-21	1.06	10.6	8.74	8.10
		T	RG_SLINE	13-Jul-21	1.06	10.6	8.74	6.10
		T	RG_SLINE	13-Jul-21	1.06	10.6	8.74	6.60
		T	RG_SLINE	13-Jul-21	1.06	10.6	8.74	6.90
		T	RG_SLINE	15-Sep-21	1.06	10.6	8.74	7.30
		T	RG_SLINE	15-Sep-21	1.06	10.6	8.74	7.20
		T	RG_SLINE	15-Sep-21	1.06	10.6	8.74	9.00
		T	RG_SLINE	15-Sep-21	1.06	10.6	8.74	5.40
		T	RG_SLINE	15-Sep-21	1.06	10.6	8.74	7.30
		T	RG_SLINE	29-Nov-21	1.06	10.6	8.74	7.10
		T	RG_SLINE	29-Nov-21	1.06	10.6	8.74	8.00
		T	RG_SLINE	29-Nov-21	1.06	10.6	8.74	5.60
		T	RG_SLINE	29-Nov-21	1.06	10.6	8.74	11.0
		T	RG_SLINE	29-Nov-21	1.06	10.6	8.74	7.50
		T	RG_LI24	26-Apr-21	1.06	10.6	8.74	6.70
		T	RG_LI24	26-Apr-21	1.06	10.6	8.74	6.20
		T	RG_LI24	26-Apr-21	1.06	10.6	8.74	7.30
		T	RG_LI24	26-Apr-21	1.06	10.6	8.74	6.60
		T	RG_LI24	26-Apr-21	1.06	10.6	8.74	5.20
		T	RG_LI24	13-Jul-21	1.06	10.6	8.74	9.60
		T	RG_LI24	13-Jul-21	1.06	10.6	8.74	6.10
		T	RG_LI24	13-Jul-21	1.06	10.6	8.74	6.60
		T	RG_LI24	13-Jul-21	1.06	10.6	8.74	9.40
		T	RG_LI24	13-Jul-21	1.06	10.6	8.74	6.00
		T	RG_LI24	16-Sep-21	1.06	10.6	8.74	7.20
		T	RG_LI24	16-Sep-21	1.06	10.6	8.74	6.10
		T	RG_LI24	16-Sep-21	1.06	10.6	8.74	3.80
		T	RG_LI24	16-Sep-21	1.06	10.6	8.74	4.30
		T	RG_LI24	16-Sep-21	1.06	10.6	8.74	8.50
		T	RG_LI24	30-Nov-21	1.06	10.6	8.74	6.80
		T	RG_LI24	30-Nov-21	1.06	10.6	8.74	6.00
		T	RG_LI24	30-Nov-21	1.06	10.6	8.74	8.30
		T	RG_LI24	30-Nov-21	1.06	10.6	8.74	9.00
		T	RG_LI24	30-Nov-21	1.06	10.6	8.74	6.70
	Mine-exposed	T	RG_LCUT	27-Apr-21	84.0	14.5	8.74	15.0
		T	RG_LCUT	27-Apr-21	84.0	14.5	8.74	6.70
		T	RG_LCUT	27-Apr-21	84.0	14.5	8.74	4.90
		T	RG_LCUT	27-Apr-21	84.0	14.5	8.74	6.80
		T	RG_LCUT	27-Apr-21	84.0	14.5	8.74	5.50
		T	RG_LCUT	12-Jul-21	84.0	14.5	8.74	3.60
		T	RG_LCUT	12-Jul-21	84.0	14.5	8.74	2.40

Shaded cells signify those individual replicates that were associated with a biological trigger (i.e. higher than both the upper 95% prediction limit [as based on predicted water quality] and the upper 97.5th percentile of normal range).

Notes: M= Mainstem. T = Tributary.

Table E.2: Biological Trigger Analysis for Selenium Concentrations in Benthic Invertebrate Composite-Taxa Samples in Line Creek LAEMP, 2021

Waterbody		Stream Type	Area	Date	Predicted Selenium Water Concentration (mg/L)	Benthic Invertebrate Selenium Tissue		
						Upper 95% Prediction Limit (mg/kg dw)	Upper 97.5th Percentile of Normal Range (mg/kg dw)	Reported Concentration (mg/kg dw)
Line Creek	Mine-exposed	T	RG_LCUT	12-Jul-21	84.0	14.5	8.74	4.80
		T	RG_LCUT	12-Jul-21	84.0	14.5	8.74	4.20
		T	RG_LCUT	12-Jul-21	84.0	14.5	8.74	5.90
		T	RG_LCUT	10-Sep-21	84.0	14.5	8.74	5.70
		T	RG_LCUT	10-Sep-21	84.0	14.5	8.74	6.20
		T	RG_LCUT	10-Sep-21	84.0	14.5	8.74	5.80
		T	RG_LCUT	10-Sep-21	84.0	14.5	8.74	7.40
		T	RG_LCUT	10-Sep-21	84.0	14.5	8.74	6.40
		T	RG_LCUT	01-Dec-21	84.0	14.5	8.74	4.50
		T	RG_LCUT	01-Dec-21	84.0	14.5	8.74	3.70
		T	RG_LCUT	01-Dec-21	84.0	14.5	8.74	3.70
		T	RG_LCUT	01-Dec-21	84.0	14.5	8.74	3.90
		T	RG_LCUT	01-Dec-21	84.0	14.5	8.74	2.70
		T	RG_LILC3	27-Apr-21	78.5	14.4	8.74	6.20
		T	RG_LILC3	27-Apr-21	78.5	14.4	8.74	10.0
		T	RG_LILC3	27-Apr-21	78.5	14.4	8.74	11.0
		T	RG_LILC3	27-Apr-21	78.5	14.4	8.74	12.0
		T	RG_LILC3	27-Apr-21	78.5	14.4	8.74	9.40
		T	RG_LILC3	12-Jul-21	78.5	14.4	8.74	6.10
		T	RG_LILC3	12-Jul-21	78.5	14.4	8.74	6.20
		T	RG_LILC3	12-Jul-21	78.5	14.4	8.74	8.80
		T	RG_LILC3	12-Jul-21	78.5	14.4	8.74	6.80
		T	RG_LILC3	12-Jul-21	78.5	14.4	8.74	7.50
		T	RG_LILC3	09-Sep-21	78.5	14.4	8.74	9.90
		T	RG_LILC3	09-Sep-21	78.5	14.4	8.74	8.60
		T	RG_LILC3	09-Sep-21	78.5	14.4	8.74	11.0
		T	RG_LILC3	10-Sep-21	78.5	14.4	8.74	7.20
		T	RG_LILC3	10-Sep-21	78.5	14.4	8.74	9.90
		T	RG_LILC3	01-Dec-21	78.5	14.4	8.74	9.50
		T	RG_LILC3	01-Dec-21	78.5	14.4	8.74	4.00
		T	RG_LILC3	01-Dec-21	78.5	14.4	8.74	6.80
		T	RG_LILC3	01-Dec-21	78.5	14.4	8.74	8.20
		T	RG_LILC3	01-Dec-21	78.5	14.4	8.74	8.00
		T	RG_LIDSL	27-Apr-21	53.9	14.0	8.74	5.00
		T	RG_LIDSL	27-Apr-21	53.9	14.0	8.74	5.20
		T	RG_LIDSL	27-Apr-21	53.9	14.0	8.74	5.40
		T	RG_LIDSL	27-Apr-21	53.9	14.0	8.74	5.60
		T	RG_LIDSL	27-Apr-21	53.9	14.0	8.74	4.60
		T	RG_LIDSL	14-Jul-21	53.9	14.0	8.74	7.90
		T	RG_LIDSL	14-Jul-21	53.9	14.0	8.74	5.80
		T	RG_LIDSL	14-Jul-21	53.9	14.0	8.74	7.00
		T	RG_LIDSL	14-Jul-21	53.9	14.0	8.74	6.20
		T	RG_LIDSL	14-Jul-21	53.9	14.0	8.74	6.50
		T	RG_LIDSL	14-Sep-21	53.9	14.0	8.74	7.10
		T	RG_LIDSL	14-Sep-21	53.9	14.0	8.74	6.20
		T	RG_LIDSL	14-Sep-21	53.9	14.0	8.74	7.70
		T	RG_LIDSL	14-Sep-21	53.9	14.0	8.74	6.70

Shaded cells signify those individual replicates that were associated with a biological trigger (i.e. higher than both the upper 95% prediction limit [as based on predicted water quality] and the upper 97.5th percentile of normal range).

Notes: M= Mainstem. T = Tributary.

Table E.2: Biological Trigger Analysis for Selenium Concentrations in Benthic Invertebrate Composite-Taxa Samples in Line Creek LAEMP, 2021

Waterbody		Stream Type	Area	Date	Predicted Selenium Water Concentration (mg/L)	Benthic Invertebrate Selenium Tissue		
						Upper 95% Prediction Limit (mg/kg dw)	Upper 97.5th Percentile of Normal Range (mg/kg dw)	Reported Concentration (mg/kg dw)
Line Creek	Mine-exposed	T	RG_LIDSL	14-Sep-21	53.9	14.0	8.74	7.50
		T	RG_LIDSL	29-Nov-21	53.9	14.0	8.74	5.00
		T	RG_LIDSL	29-Nov-21	53.9	14.0	8.74	6.40
		T	RG_LIDSL	29-Nov-21	53.9	14.0	8.74	5.40
		T	RG_LIDSL	29-Nov-21	53.9	14.0	8.74	4.90
		T	RG_LIDSL	29-Nov-21	53.9	14.0	8.74	6.30
		T	RG_LI8	28-Apr-21	46.7	13.9	8.74	6.20
		T	RG_LI8	28-Apr-21	46.7	13.9	8.74	7.10
		T	RG_LI8	28-Apr-21	46.7	13.9	8.74	7.00
		T	RG_LI8	28-Apr-21	46.7	13.9	8.74	6.80
		T	RG_LI8	28-Apr-21	46.7	13.9	8.74	7.50
		T	RG_LI8	15-Jul-21	46.7	13.9	8.74	7.30
		T	RG_LI8	15-Jul-21	46.7	13.9	8.74	7.30
		T	RG_LI8	15-Jul-21	46.7	13.9	8.74	6.90
		T	RG_LI8	15-Jul-21	46.7	13.9	8.74	8.00
		T	RG_LI8	15-Jul-21	46.7	13.9	8.74	5.50
		T	RG_LI8	11-Sep-21	46.7	13.9	8.74	9.30
		T	RG_LI8	11-Sep-21	46.7	13.9	8.74	7.40
		T	RG_LI8	11-Sep-21	46.7	13.9	8.74	7.20
		T	RG_LI8	11-Sep-21	46.7	13.9	8.74	8.80
		T	RG_LI8	11-Sep-21	46.7	13.9	8.74	7.20
		T	RG_LI8	2-Dec-21	46.7	13.9	8.74	4.20
		T	RG_LI8	2-Dec-21	46.7	13.9	8.74	6.30
		T	RG_LI8	2-Dec-21	46.7	13.9	8.74	4.50
		T	RG_LI8	2-Dec-21	46.7	13.9	8.74	8.00
		T	RG_LI8	2-Dec-21	46.7	13.9	8.74	7.20
Fording River	Mine-exposed	M	RG_FO23	28-Apr-21	52.8	14.0	8.74	9.00
		M	RG_FO23	28-Apr-21	52.8	14.0	8.74	6.50
		M	RG_FO23	28-Apr-21	52.8	14.0	8.74	6.10
		M	RG_FO23	28-Apr-21	52.8	14.0	8.74	4.50
		M	RG_FO23	28-Apr-21	52.8	14.0	8.74	5.30
		M	RG_FO23	14-Jul-21	52.8	14.0	8.74	9.40
		M	RG_FO23	14-Jul-21	52.8	14.0	8.74	6.90
		M	RG_FO23	14-Jul-21	52.8	14.0	8.74	8.30
		M	RG_FO23	14-Jul-21	52.8	14.0	8.74	8.80
		M	RG_FO23	14-Jul-21	52.8	14.0	8.74	8.50
		M	RG_FO23	12-Sep-21	52.8	14.0	8.74	8.10
		M	RG_FO23	12-Sep-21	52.8	14.0	8.74	7.20
		M	RG_FO23	12-Sep-21	52.8	14.0	8.74	5.80
		M	RG_FO23	12-Sep-21	52.8	14.0	8.74	7.00
		M	RG_FO23	12-Sep-21	52.8	14.0	8.74	7.10
		M	RG_FO23	1-Dec-21	52.8	14.0	8.74	7.70
		M	RG_FO23	1-Dec-21	52.8	14.0	8.74	7.70
		M	RG_FO23	1-Dec-21	52.8	14.0	8.74	6.20
		M	RG_FO23	1-Dec-21	52.8	14.0	8.74	8.60
		M	RG_FO23	1-Dec-21	52.8	14.0	8.74	5.50

Shaded cells signify those individual replicates that were associated with a biological trigger (i.e. higher than both the upper 95% prediction limit [as based on predicted water quality] and the upper 97.5th percentile of normal range).

Notes: M= Mainstem. T = Tributary.

Table E.3: Biological Trigger Analysis for Westslope Cutthroat Trout Muscle Selenium Concentrations, Line Creek LAEMP, 2021

Waterbody		Area	Date	Upper 95% Prediction Limit (mg/kg dw)	Westslope Cutthroat Trout Muscle Tissue		
					Upper 95% Prediction Limit (mg/kg dw)	Upper 97.5th Percentile of Normal Range (mg/kg dw)	Reported Concentration (mg/kg dw)
Line Creek	Mine-exposed	RG_LIDSL	13-Sep-21	53.9	14.8	11.3	18.0
		RG_LIDSL	13-Sep-21	53.9	14.8	11.3	17.0
		RG_LIDSL	13-Sep-21	53.9	14.8	11.3	17.0
		RG_LIDSL	13-Sep-21	53.9	14.8	11.3	16.0
		RG_LIDSL	13-Sep-21	53.9	14.8	11.3	7.10
		RG_LIDSL	13-Sep-21	53.9	14.8	11.3	6.50
		RG_LIDSL	13-Sep-21	53.9	14.8	11.3	6.10
		RG_LIDSL	13-Sep-21	53.9	14.8	11.3	4.30
Fording River	Mine-exposed	RG_FO23	13-Sep-21	52.8	14.7	11.3	11.0
		RG_FO23	14-Sep-21	52.8	14.7	11.3	10.0
		RG_FO23	14-Sep-21	52.8	14.7	11.3	10.0
		RG_FO23	13-Sep-21	52.8	14.7	11.3	9.00
		RG_FO23	13-Sep-21	52.8	14.7	11.3	8.20
		RG_FO23	14-Sep-21	52.8	14.7	11.3	7.60
		RG_FO23	14-Sep-21	52.8	14.7	11.3	7.00
		RG_FO23	14-Sep-21	52.8	14.7	11.3	6.90

Shaded cells signify those individual replicates that were associated with a biological trigger (i.e. higher than both the upper 95% prediction limit [as based on predicted water quality] and the upper 97.5th percentile of normal range).

APPENDIX F
SUPPORTING INFORMATION

APPENDIX F
SUPPORTING INFORMATION

Table F.1: *In Situ* Water Quality Taken at Biological Monitoring Areas in Line Creek and Fording River, September 2021

Field Parameters		Reference	Reference	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed
		RG_SLINE	RG_LI24	RG_LCUT	RG_LILC3	RG_LISP24	RG_LIDSL	RG_LIDCOM	RG_LI8	RG_FRUL	RG_FO23
Station 1	Date	15-Sep-21	16-Sep-21	11-Sep-21	10-Sep-21	13-Sep-21	14-Sep-21	13-Sep-21	11-Sep-21	12-Sep-21	12-Sep-21
	Temperature (°C)	5.2	3.2	7.2	7.6	8.3	6.5	7.1	7.8	9.6	9.1
	Dissolved Oxygen (mg/L)	11.17	11.31	11.14	10.98	10.59	9.7	10.65	10.77	10.21	10.18
	Dissolved Oxygen (%)	105.8	103.3	109.7	107.7	106.6	92.8	103.3	105	103.9	102
	Conductivity (µS/cm)	224.3	215	651	651	580	549	517	489	572	545
	Specific Conductivity (µS/cm)	361	369	990	976	850	850	790	729	811	780
	pH	8.1	8.28	7.65	8.03	8.13	8.06	8.23	8.34	8.36	8.2
Station 2	Date	15-Sep-21	16-Sep-21	11-Sep-21	10-Sep-21	-	14-Sep-21	-	11-Sep-21	12-Sep-21	12-Sep-21
	Temperature (°C)	5.3	3.2	7.3	8.9	-	6.9	-	8.3	9.7	9.3
	Dissolved Oxygen (mg/L)	11	10.63	10.94	10.87	-	9.74	-	10.77	10.21	10.42
	Dissolved Oxygen (%)	104.2	97	106.9	106.4	-	94.2	-	106.4	103.7	104.7
	Conductivity (µS/cm)	224.3	215.6	656	647	-	554	-	497.4	577	547
	Specific Conductivity (µS/cm)	360	369	990	984	-	850	-	729	814	780
	pH	8.12	8.24	7.68	8.04	-	8.11	-	8.39	8.42	8.24
Station 3	Date	15-Sep-21	16-Sep-21	11-Sep-21	10-Sep-21	-	14-Sep-21	-	11-Sep-21	12-Sep-21	12-Sep-21
	Temperature (°C)	5.6	3.4	6.4	8.8	-	8.2	-	9.2	10.1	9.6
	Dissolved Oxygen (mg/L)	11.17	11.35	10.5	10.63	-	9.42	-	10.39	10.02	10.19
	Dissolved Oxygen (%)	106.6	104.6	101.4	104	-	95	-	104.9	103.3	103.5
	Conductivity (µS/cm)	225.4	214.5	630	649	-	575	-	509	567	551
	Specific Conductivity (µS/cm)	358	365	980	988	-	850	-	730	792	780
	pH	8.18	8.35	7.51	8.01	-	8.15	-	8.45	8.45	8.28
Station 4	Date	-	16-Sep-21	-	10-Sep-21	-	14-Sep-21	-	-	-	12-Sep-21
	Temperature (°C)	-	3.9	-	7.1	-	8.7	-	-	-	9.9
	Dissolved Oxygen (mg/L)	-	10.77	-	10.58	-	9.55	-	-	-	10.08
	Dissolved Oxygen (%)	-	99.8	-	103.9	-	97.4	-	-	-	103.4
	Conductivity (µS/cm)	-	219	-	647	-	586	-	-	-	555
	Specific Conductivity (µS/cm)	-	367	-	982	-	850	-	-	-	780
	pH	-	8.51	-	8.02	-	8.23	-	-	-	8.3
Station 5	Date	-	16-Sep-21	-	10-Sep-21	-	14-Sep-21	-	-	-	12-Sep-21
	Temperature (°C)	-	4	-	7.7	-	9.1	-	-	-	9.9
	Dissolved Oxygen (mg/L)	-	10.92	-	10.67	-	9.47	-	-	-	10.01
	Dissolved Oxygen (%)	-	101.6	-	105.8	-	97.3	-	-	-	102.1
	Conductivity (µS/cm)	-	220.3	-	647	-	593	-	-	-	552
	Specific Conductivity (µS/cm)	-	367	-	967	-	850	-	-	-	780
	pH	-	8.42	-	8.01	-	8.23	-	-	-	8.3

Note: "-" indicates no data.

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_SLINE-1						RG_SLINE-2					
15-Sep-21						15-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0	0	7.5	-	1	0	0	0	3.5	-
2	0	0	0	4.6	-	2	0	0	0	5	-
3	0	0	0	11	-	3	-	-	-	0.2	-
4	0	0	0	5.2	-	4	0	0	0	1	-
5	0	0	0	9.1	-	5	0	0	0	16	-
6	0	0	0	12.4	-	6	0	0	0	6.5	-
7	0	0	0	3.8	-	7	-	-	-	0.2	-
8	0	0	0	7.5	-	8	0	0	0	0.5	-
9	0	0	0	20.1	-	9	0	0	0	14	-
10	0	0	0	11.3	0	10	0	0	0	1.5	0.5
11	0	0	0	28.4	-	11	0	0	0	4.5	-
12	0	0	0	11.4	-	12	0	0	0	1.5	-
13	0	0	0	9.1	-	13	0	0	0	16	-
14	0	0	0	6.6	-	14	0	0	0	6	-
15	0	0	0	7.2	-	15	0	0	0	7.5	-
16	0	0	0	6.5	-	16	0	0	0	9	-
17	0	0	0	7.5	-	17	0	0	0	6	-
18	0	0	0	17.3	-	18	0	0	0	7	-
19	0	0	0	9.1	-	19	0	0	0	4.5	-
20	0	0	0	6.9	0.25	20	0	0	0	8	0.5
21	0	0	0	8.4	-	21	0	0	0	20.5	-
22	0	0	0	3	-	22	0	0	0	12	-
23	0	0	0	6.1	-	23	0	0	0	37	-
24	0	0	0	6.7	-	24	0	0	0	6	-
25	0	0	0	3.1	-	25	0	0	0	28	-
26	0	0	0	6.2	-	26	0	0	0	27.5	-
27	0	0	0	10.8	-	27	0	0	0	15	-
28	0	0	0	14.6	-	28	0	0	0	17.5	-
29	0	0	0	23.1	-	29	0	0	0	7	-
30	0	0	0	11.4	0	30	0	0	0	5	0.5
31	0	0	0	17.5	-	31	0	0	0	11	-
32	0	0	0	14.4	-	32	0	0	0	6.5	-
33	0	0	0	26	-	33	0	0	0	3	-
34	0	0	0	11.2	-	34	0	0	0	6	-
35	0	0	0	9.5	-	35	0	0	0	3.5	-
36	0	0	0	6.8	-	36	0	0	0	17	-
37	0	0	0	22	-	37	0	0	0	3	-
38	0	0	0	7.8	-	38	0	0	0	9.5	-
39	0	0	0	13.5	-	39	0	0	0	16	-
40	0	0	0	7.2	0	40	0	0	0	6.5	0.25
41	0	0	0	16.4	-	41	0	0	0	16	-
42	0	0	0	12.1	-	42	0	0	0	3	-
43	0	0	0	4.2	-	43	0	0	0	7	-
44	0	0	0	8.3	-	44	0	0	0	5.5	-
45	0	0	0	27.4	-	45	0	0	0	5.5	-
46	0	0	0	7.2	-	46	0	0	0	10	-
47	0	0	0	10.1	-	47	0	0	0	13	-
48	0	0	0	25.1	-	48	0	0	0	19	-
49	0	0	0	18.3	-	49	0	0	0	10.5	-
50	0	0	0	6.5	0	50	0	0	0	14	0.5
51	0	0	0	6.8	-	51	0	0	0	6.5	-
52	0	0	0	5.5	-	52	0	0	0	10.5	-
53	0	0	0	14.8	-	53	0	0	0	9	-
54	0	0	0	10.4	-	54	0	0	0	6.5	-
55	0	0	0	13.6	-	55	0	0	0	7.5	-
56	0	0	0	12.1	-	56	0	0	0	7.5	-
57	0	0	0	5.6	-	57	0	0	0	5.5	-
58	0	0	0	8.5	-	58	-	-	-	0.2	-
59	0	0	0	11.2	-	59	0	0	0	1.5	-
60	0	0	0	3.3	0.25	60	0	0	0	3	0.25
61	0	0	0	30.5	-	61	0	0	0	3	-
62	0	0	0	10.3	-	62	0	0	0	8	-
63	0	0	0	7.5	-	63	0	0	0	4	-
64	0	0	0	4.2	-	64	0	0	0	2	-
65	0	0	0	13.5	-	65	0	0	0	4	-
66	0	0	0	10.5	-	66	0	0	0	4	-
67	0	0	0	5.1	-	67	0	0	0	4	-
68	0	0	0	7.4	-	68	0	0	0	6	-
69	0	0	0	7.2	-	69	0	0	0	12	-
70	0	0	0	11.3	0	70	0	0	0	8.5	0.75
71	0	0	0	10.6	-	71	0	0	0	10	-
72	0	0	0	5.8	-	72	0	0	0	7.5	-
73	0	0	0	11.3	-	73	0	0	0	20	-
74	0	0	0	12.6	-	74	0	0	0	26	-
75	0	0	0	9.2	-	75	0	0	0	12	-
76	0	0	0	6.4	-	76	0	0	0	6	-
77	0	0	0	8.4	-	77	0	0	0	7	-
78	0	0	0	14.1	-	78	0	0	0	6.5	-
79	0	0	0	9.4	-	79	0	0	0	8.5	-
80	0	0	0	5.6	0	80	0	0	0	7.5	0.5
81	0	0	0	7.2	-	81	0	0	0	6.5	-
82	0	0	0	13.1	-	82	0	0	0	6	-
83	0	0	0	39.3	-	83	0	0	0	7	-
84	0	0	0	10.2	-	84	0	0	0	4	-
85	0	0	0	4.6	-	85	-	-	-	0.2	-
86	0	0	0	10.4	-	86	0	0	0	9.5	-
87	0	0	0	11.2	-	87	0	0	0	4	-
88	0	0	0	8.5	-	88	0	0	0	9.5	-
89	0	0	0	11.2	-	89	0	0	0	4.5	-
90	0	0	0	4.1	0	90	0	0	0	4	0.5
91	0	0	0	10.5	-	91	0	0	0	6	-
92	0	0	0	15.4	-	92	0	0	0	7	-
93	0	0	0	10.2	-	93	0	0	0	5.5	-
94	0	0	0	7.1	-	94	0	0	0	31	-
95	0	0	0	4.3	-	95	0	0	0	24.5	-
96	0	0	0	5.2	-	96	0	0	0	12	-
97	0	0	0	5.8	-	97	0	0	0	4.5	-
98	0	0	0	2.3	-	98	0	0	0	6	-
99	0	0	0	1.8	-	99	0	0	0	6	-
100	0	0	0	7.1	0	100	0	0	0	6.5	0.75
Average Cic, Cip and Embed. =	0	0	0	10.5	0.05	Average Cic, Cip and Embed. =	0	0	0	8.68	0.50
Old Calcite Index (CI) =		0				Old Calcite Index (CI) =		0			
New Calcite Index (CI') =		0				New Calcite Index (CI') =		0			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_SLINE-3						RG_LI24-1					
15-Sep-21						16-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0	0	4.7	-	1	0	0	0	8.1	-
2	0	0	0	5.2	-	2	0	0	0	10.2	-
3	0	0	0	14.3	-	3	0	0	0	4.4	-
4	0	0	0	38	-	4	0	0	0	5.1	-
5	0	0	0	4.4	-	5	0	0	0	9	-
6	0	0	0	6	-	6	0	0	0	7.5	-
7	0	0	0	2.5	-	7	0	0	0	8.8	-
8	0	0	0	18.5	-	8	0	0	0	23.4	-
9	-	-	-	0.2	-	9	0	0	0	3.5	-
10	0	0	0	2.5	0.25	10	0	0	0	6.7	0
11	0	0	0	5.6	-	11	0	0	0	4.4	-
12	0	0	0	5.9	-	12	0	0	0	11	-
13	0	0	0	9.3	-	13	0	0	0	7.5	-
14	0	0	0	8.4	-	14	0	0	0	5.1	-
15	0	0	0	5.4	-	15	0	0	0	21	-
16	0	0	0	16.2	-	16	0	0	0	5.2	-
17	0	0	0	14.1	-	17	0	0	0	8.3	-
18	0	0	0	1.5	-	18	0	0	0	9.1	-
19	0	0	0	13.9	-	19	0	0	0	7	-
20	0	0	0	18.5	0.75	20	0	0	0	5.1	0.25
21	0	0	0	10.4	-	21	0	0	0	9.2	-
22	0	0	0	9.4	-	22	0	0	0	6.3	-
23	0	0	0	19.9	-	23	0	0	0	14.2	-
24	0	0	0	11.2	-	24	0	0	0	3.4	-
25	0	0	0	7.2	-	25	0	0	0	8.2	-
26	0	0	0	3.5	-	26	0	0	0	6.1	-
27	-	-	-	0.2	-	27	0	0	0	6	-
28	0	0	0	10.2	-	28	0	0	0	13.5	-
29	0	0	0	3.5	-	29	0	0	0	6.5	-
30	0	0	0	12.6	0.75	30	0	0	0	6.2	0.25
31	0	0	0	7.5	-	31	0	0	0	5.8	-
32	0	0	0	1	-	32	0	0	0	10.5	-
33	0	0	0	8	-	33	0	0	0	5.1	-
34	0	0	0	9.1	-	34	0	0	0	10.2	-
35	0	0	0	6.7	-	35	0	0	0	8.1	-
36	0	0	0	5.5	-	36	0	0	0	3	-
37	0	0	0	6.9	-	37	0	0	0	4.6	-
38	0	0	0	2.4	-	38	0	0	0	5.1	-
39	0	0	0	19.5	-	39	0	0	0	6	-
40	0	0	0	9.4	0.5	40	0	0	0	9.5	0
41	0	0	0	1.5	-	41	0	0	0	7.2	-
42	0	0	0	8.5	-	42	0	0	0	10.5	-
43	0	0	0	7.4	-	43	0	0	0	36.1	-
44	0	0	0	1	-	44	0	0	0	2	-
45	0	0	0	1.3	-	45	0	0	0	2.7	-
46	0	0	0	1.6	-	46	0	0	0	7.2	-
47	0	0	0	14.2	-	47	0	0	0	8.1	-
48	0	0	0	10.1	-	48	0	0	0	9.7	-
49	0	0	0	5	-	49	0	0	0	7.2	-
50	0	0	0	5.2	0.5	50	0	0	0	14.5	0.5
51	0	0	0	13.2	-	51	0	0	0	9.3	-
52	0	0	0	8.5	-	52	0	0	0	8.2	-
53	0	0	0	11	-	53	0	0	0	8.5	-
54	-	-	-	0.2	-	54	0	0	0	4.5	-
55	0	0	0	3.1	-	55	0	0	0	4.4	-
56	0	0	0	9.2	-	56	0	0	0	21	-
57	0	0	0	2.7	-	57	0	0	0	6.3	-
58	0	0	0	3.2	-	58	0	0	0	13	-
59	0	0	0	5	-	59	0	0	0	3.9	-
60	0	0	0	5	0.5	60	0	0	0	8.2	0.25
61	0	0	0	14	-	61	0	0	0	4.6	-
62	0	0	0	13.5	-	62	0	0	0	14.6	-
63	0	0	0	15	-	63	0	0	0	8.5	-
64	0	0	0	24.5	-	64	0	0	0	7.2	-
65	0	0	0	7.9	-	65	0	0	0	4.4	-
66	0	0	0	17.4	-	66	0	0	0	8.4	-
67	0	0	0	10	-	67	0	0	0	5.3	-
68	0	0	0	1.8	-	68	0	0	0	4	-
69	0	0	0	21	-	69	0	0	0	9.9	-
70	0	0	0	11.2	0.75	70	0	0	0	11.1	0.5
71	0	0	0	28	-	71	0	0	0	7.1	-
72	0	0	0	6.5	-	72	0	0	0	9	-
73	0	0	0	12.5	-	73	0	0	0	6.2	-
74	0	0	0	23.4	-	74	0	0	0	7.2	-
75	0	0	0	4.2	-	75	0	0	0	5.1	-
76	0	0	0	3.9	-	76	0	0	0	9.5	-
77	0	0	0	1.3	-	77	0	0	0	7.3	-
78	0	0	0	3.4	-	78	0	0	0	8	-
79	0	0	0	6	-	79	0	0	0	9.2	-
80	0	0	0	7.2	0.25	80	0	0	0	10	0.25
81	0	0	0	7.2	-	81	0	0	0	9.1	-
82	0	0	0	17.1	-	82	0	0	0	8.2	-
83	0	0	0	20.8	-	83	0	0	0	10.5	-
84	-	-	-	0.2	-	84	0	0	0	6.6	-
85	0	0	0	0.8	-	85	0	0	0	2.5	-
86	0	0	0	5.2	-	86	0	0	0	18.5	-
87	0	0	0	7.6	-	87	0	0	0	13.2	-
88	0	0	0	7	-	88	0	0	0	4.2	-
89	0	0	0	11	-	89	0	0	0	3.1	-
90	0	0	0	52	0.5	90	0	0	0	4.1	0.25
91	0	0	0	4.5	-	91	0	0	0	6.8	-
92	0	0	0	9.6	-	92	0	0	0	9.2	-
93	0	0	0	11.8	-	93	0	0	0	3.3	-
94	0	0	0	0.6	-	94	0	0	0	6	-
95	0	0	0	1.1	-	95	0	0	0	6.9	-
96	-	-	-	0.2	-	96	0	0	0	5.4	-
97	0	0	0	4.2	-	97	0	0	0	8.8	-
98	0	0	0	4.7	-	98	0	0	0	8.5	-
99	0	0	0	4	-	99	0	0	0	9	-
100	0	0	0	18	0.75	100	0	0	0	1.5	0.25
Average Cic, Cip and Embed. =	0	0	0	8.96	0.55	Average Cic, Cip and Embed. =	0	0	0	8.12	0.25
Old Calcite Index (CI) =		0				Old Calcite Index (CI) =		0			
New Calcite Index (CI') =		0				New Calcite Index (CI') =		0			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_LI24-2						RG_LI24-3					
16-Sep-21						16-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0	0	9.3	-	1	0	0	0	4.2	-
2	0	0	0	9	-	2	0	0	0	9	-
3	0	0	0	14.2	-	3	0	0	0	11.4	-
4	0	0	0	23.5	-	4	0	0	0	8	-
5	0	0	0	4.1	-	5	0	0	0	7.5	-
6	0	0	0	5.6	-	6	0	0	0	6.3	-
7	0	0	0	7.3	-	7	0	0	0	12.6	-
8	0	0	0	6.3	-	8	0	0	0	8.6	-
9	0	0	0	8.2	-	9	0	0	0	11.7	-
10	0	0	0	4.1	0.25	10	0	0	0	9.5	0.5
11	0	0	0	6.2	-	11	0	0	0	8.9	-
12	0	0	0	5.4	-	12	0	0	0	8.2	-
13	0	0	0	6.5	-	13	0	0	0	18.1	-
14	0	0	0	8.4	-	14	0	0	0	12.4	-
15	0	0	0	4.5	-	15	0	0	0	16.8	-
16	0	0	0	4.2	-	16	0	0	0	8.5	-
17	0	0	0	14.6	-	17	0	0	0	20	-
18	0	0	0	11.2	-	18	0	0	0	17.8	-
19	0	0	0	10.3	-	19	0	0	0	7.8	-
20	0	0	0	5.2	0	20	0	0	0	4	0.25
21	0	0	0	9.6	-	21	0	0	0	9.1	-
22	0	0	0	11.4	-	22	0	0	0	9	-
23	0	0	0	10.5	-	23	0	0	0	6.5	-
24	0	0	0	5.4	-	24	0	0	0	14.4	-
25	0	0	0	4.1	-	25	0	0	0	11	-
26	0	0	0	31.7	-	26	0	0	0	8.9	-
27	0	0	0	10.1	-	27	0	0	0	14	-
28	0	0	0	4.5	-	28	0	0	0	10.5	-
29	0	0	0	14.2	-	29	0	0	0	14.2	-
30	0	0	0	5.1	0.25	30	0	0	0	4.6	0.25
31	0	0	0	2.1	-	31	0	0	0	13.2	-
32	0	0	0	9.5	-	32	0	0	0	4.6	-
33	0	0	0	3.2	-	33	0	0	0	8.1	-
34	0	0	0	8.7	-	34	0	0	0	9.2	-
35	0	0	0	4.4	-	35	0	0	0	9.6	-
36	0	0	0	8.5	-	36	0	0	0	13.1	-
37	0	0	0	5.8	-	37	0	0	0	7.2	-
38	0	0	0	7.2	-	38	0	0	0	6	-
39	0	0	0	10.8	-	39	0	0	0	12.1	-
40	0	0	0	8.2	0.5	40	0	0	0	10.2	0.25
41	0	0	0	8.1	-	41	0	0	0	10.6	-
42	0	0	0	3.1	-	42	0	0	0	10.1	-
43	0	0	0	5.5	-	43	0	0	0	6	-
44	0	0	0	7.8	-	44	0	0	0	7.6	-
45	0	0	0	8.8	-	45	0	0	0	3.9	-
46	0	0	0	8.4	-	46	0	0	0	12	-
47	0	0	0	2.2	-	47	0	0	0	13.7	-
48	0	0	0	7.5	-	48	0	0	0	5.3	-
49	0	0	0	4.8	-	49	0	0	0	4.5	-
50	0	0	0	8.4	0.25	50	0	0	0	9.2	0.25
51	0	0	0	5.5	-	51	0	0	0	7	-
52	0	0	0	4.2	-	52	0	0	0	6.6	-
53	0	0	0	4.7	-	53	0	0	0	5.8	-
54	0	0	0	5.9	-	54	0	0	0	7.3	-
55	0	0	0	13.4	-	55	0	0	0	4.9	-
56	0	0	0	9.5	-	56	0	0	0	5.2	-
57	0	0	0	9.7	-	57	0	0	0	6.6	-
58	0	0	0	8.1	-	58	0	0	0	14.5	-
59	0	0	0	6	-	59	0	0	0	5.7	-
60	0	0	0	5.3	0.75	60	0	0	0	14.9	0.5
61	0	0	0	6.1	-	61	0	0	0	41	-
62	0	0	0	7.8	-	62	0	0	0	10.6	-
63	0	0	0	7.5	-	63	0	0	0	5.6	-
64	0	0	0	10.1	-	64	0	0	0	4.7	-
65	0	0	0	7.8	-	65	0	0	0	3.9	-
66	0	0	0	8.2	-	66	0	0	0	5	-
67	0	0	0	1	-	67	0	0	0	19.1	-
68	0	0	0	6.8	-	68	0	0	0	6.4	-
69	0	0	0	2.5	-	69	0	0	0	8	-
70	0	0	0	6.4	0.25	70	0	0	0	5.9	0.25
71	0	0	0	5.3	-	71	0	0	0	7.9	-
72	0	0	0	3.2	-	72	0	0	0	7.8	-
73	0	0	0	4.8	-	73	0	0	0	14.3	-
74	0	0	0	6.8	-	74	0	0	0	6	-
75	0	0	0	4.4	-	75	0	0	0	7.4	-
76	0	0	0	2.8	-	76	0	0	0	11.6	-
77	0	0	0	7.6	-	77	0	0	0	13.2	-
78	0	0	0	4.4	-	78	0	0	0	5.5	-
79	0	0	0	3.9	-	79	0	0	0	7.2	-
80	0	0	0	9	0	80	0	0	0	10.2	0.5
81	0	0	0	6.4	-	81	0	0	0	6	-
82	0	0	0	7.2	-	82	0	0	0	6.7	-
83	0	0	0	6.3	-	83	0	0	0	15.2	-
84	0	0	0	4.9	-	84	0	0	0	5.1	-
85	0	0	0	20.4	-	85	0	0	0	13.7	-
86	0	0	0	3.8	-	86	0	0	0	10	-
87	0	0	0	6.9	-	87	0	0	0	7.7	-
88	0	0	0	9.2	-	88	0	0	0	6	-
89	0	0	0	11.4	-	89	0	0	0	7.1	-
90	0	0	0	3.9	0	90	0	0	0	8	0.25
91	0	0	0	6.3	-	91	0	0	0	32	-
92	0	0	0	10.4	-	92	0	0	0	8.5	-
93	0	0	0	3.9	-	93	0	0	0	8	-
94	0	0	0	21.4	-	94	0	0	0	9.8	-
95	0	0	0	4.8	-	95	0	0	0	9.1	-
96	0	0	0	3.8	-	96	0	0	0	4	-
97	0	0	0	2.9	-	97	0	0	0	4.8	-
98	0	0	0	2.8	-	98	0	0	0	5	-
99	0	0	0	8.8	-	99	0	0	0	11	-
100	0	0	0	7.1	0.25	100	0	0	0	12.8	0.25
Average Cic, Cip and Embed. =	0	0	0	7.49	0.25	Average Cic, Cip and Embed. =	0	0	0	9.6	0.33
Old Calcite Index (CI) =		0				Old Calcite Index (CI) =		0			
New Calcite Index (CI') =		0				New Calcite Index (CI') =		0			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_LI24-4						RG_LI24-5					
16-Sep-21						16-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0	0	4.5	-	1	0	0	0	7	-
2	0	0	0	6.1	-	2	0	0	0	9.1	-
3	0	0	0	7.2	-	3	0	0	0	15	-
4	0	0	0	5.2	-	4	0	0	0	8.8	-
5	0	0	0	9.4	-	5	0	0	0	14.5	-
6	0	0	0	8.1	-	6	0	0	0	13.2	-
7	0	0	0	7.8	-	7	0	0	0	8.2	-
8	0	0	0	5.3	-	8	0	0	0	21.8	-
9	0	0	0	7.2	-	9	0	0	0	6.4	-
10	0	0	0	7.8	0.25	10	0	0	0	8.1	0.25
11	0	0	0	7.2	-	11	0	0	0	6.1	-
12	0	0	0	18.3	-	12	0	0	0	10	-
13	0	0	0	9.2	-	13	0	0	0	8.5	-
14	0	0	0	5.4	-	14	0	0	0	12.9	-
15	0	0	0	7.5	-	15	0	0	0	9.3	-
16	0	0	0	6.9	-	16	0	0	0	7.1	-
17	0	0	0	9.1	-	17	0	0	0	8.7	-
18	0	0	0	6.3	-	18	0	0	0	7.5	-
19	0	0	0	14.2	-	19	0	0	0	10.2	-
20	0	0	0	5	0.25	20	0	0	0	11	0.5
21	0	0	0	4.4	-	21	0	0	0	8.5	-
22	0	0	0	8.1	-	22	0	0	0	4.2	-
23	0	0	0	3.3	-	23	0	0	0	12.6	-
24	0	0	0	9.9	-	24	0	0	0	10.2	-
25	0	0	0	5.4	-	25	0	0	0	13.4	-
26	0	0	0	12.4	-	26	0	0	0	7	-
27	0	0	0	7.1	-	27	0	0	0	9.4	-
28	0	0	0	7.2	-	28	0	0	0	8	-
29	0	0	0	4.5	-	29	0	0	0	9	-
30	0	0	0	4.4	0.25	30	0	0	0	5	0.25
31	0	0	0	27.2	-	31	0	0	0	14.2	-
32	0	0	0	4.4	-	32	0	0	0	2.4	-
33	0	0	0	13.5	-	33	0	0	0	11.4	-
34	0	0	0	8.3	-	34	0	0	0	15.2	-
35	0	0	0	7.2	-	35	0	0	0	10	-
36	0	0	0	6	-	36	0	0	0	8.4	-
37	0	0	0	6.5	-	37	0	0	0	4.2	-
38	0	0	0	4.2	-	38	0	0	0	7	-
39	0	0	0	11.8	-	39	0	0	0	5.5	-
40	0	0	0	3	0	40	0	0	0	11.2	0.5
41	0	0	0	5.1	-	41	0	0	0	8.5	-
42	0	0	0	9.9	-	42	0	0	0	15	-
43	0	0	0	4.2	-	43	0	0	0	6.2	-
44	0	0	0	7.4	-	44	0	0	0	7.4	-
45	0	0	0	8.1	-	45	0	0	0	5	-
46	0	0	0	3.4	-	46	0	0	0	8.2	-
47	0	0	0	3.2	-	47	0	0	0	7	-
48	0	0	0	10	-	48	0	0	0	6	-
49	0	0	0	12.4	-	49	0	0	0	4.5	-
50	0	0	0	3.4	0	50	0	0	0	4.2	0.5
51	0	0	0	2.5	-	51	0	0	0	2.9	-
52	0	0	0	29.1	-	52	0	0	0	5.2	-
53	0	0	0	12.1	-	53	0	0	0	11.6	-
54	0	0	0	5.5	-	54	0	0	0	4	-
55	0	0	0	7.1	-	55	0	0	0	48	-
56	0	0	0	4.4	-	56	0	0	0	6.2	-
57	0	0	0	5	-	57	0	0	0	3.8	-
58	0	0	0	7.1	-	58	0	0	0	16	-
59	0	0	0	8.5	-	59	0	0	0	19.2	-
60	0	0	0	8.9	0.75	60	0	0	0	15	0.25
61	0	0	0	9.1	-	61	0	0	0	6.9	-
62	0	0	0	9.9	-	62	0	0	0	5.6	-
63	0	0	0	5.4	-	63	0	0	0	7.2	-
64	0	0	0	5.7	-	64	0	0	0	7	-
65	0	0	0	5.8	-	65	0	0	0	8	-
66	0	0	0	12.6	-	66	0	0	0	2.2	-
67	0	0	0	4.8	-	67	0	0	0	2.6	-
68	0	0	0	4.9	-	68	0	0	0	5.9	-
69	0	0	0	15	-	69	0	0	0	3.5	-
70	0	0	0	6.7	0.25	70	0	0	0	4.1	0.5
71	0	0	0	4.6	-	71	0	0	0	5.8	-
72	0	0	0	4.7	-	72	0	0	0	8.2	-
73	0	0	0	4.3	-	73	0	0	0	6.1	-
74	0	0	0	4.9	-	74	0	0	0	6.6	-
75	0	0	0	8.1	-	75	0	0	0	6.2	-
76	0	0	0	13.1	-	76	0	0	0	5.8	-
77	0	0	0	6.5	-	77	0	0	0	12.5	-
78	0	0	0	7.1	-	78	0	0	0	8.1	-
79	0	0	0	9.4	-	79	0	0	0	17	-
80	0	0	0	14.2	0.25	80	0	0	0	8.5	0.25
81	0	0	0	3.5	-	81	0	0	0	8	-
82	0	0	0	8.4	-	82	0	0	0	6.5	-
83	0	0	0	9.4	-	83	0	0	0	7.1	-
84	0	0	0	11.6	-	84	0	0	0	8.2	-
85	0	0	0	7.5	-	85	0	0	0	9	-
86	0	0	0	12.5	-	86	0	0	0	8.4	-
87	0	0	0	16.2	-	87	0	0	0	6.6	-
88	0	0	0	5.3	-	88	0	0	0	5	-
89	0	0	0	5.1	-	89	0	0	0	7.2	-
90	0	0	0	7.5	0	90	0	0	0	7.1	0
91	0	0	0	6	-	91	0	0	0	8.1	-
92	0	0	0	5.4	-	92	0	0	0	8	-
93	0	0	0	9.1	-	93	0	0	0	8.6	-
94	0	0	0	6.3	-	94	0	0	0	14.2	-
95	0	0	0	8.2	-	95	0	0	0	8.4	-
96	0	0	0	10.5	-	96	0	0	0	7.4	-
97	0	0	0	19.2	-	97	0	0	0	12	-
98	0	0	0	4.4	-	98	0	0	0	6.1	-
99	0	0	0	8.8	-	99	0	0	0	2.8	-
100	0	0	0	8.6	0.75	100	0	0	0	6	0
Average Cic, Cip and Embed. =	0	0	0	8.04	0.28	Average Cic, Cip and Embed. =	0	0	0	8.77	0.30
Old Calcite Index (CI) =		0				Old Calcite Index (CI) =		0			
New Calcite Index (CI') =		0				New Calcite Index (CI') =		0			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_LCUT-1						RG_LCUT-2					
11-Sep-21						11-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0.9	1	7.2	-	1	0	0.4	1	10.8	-
2	0	0.4	1	18.4	-	2	0	0.6	1	16.4	-
3	0	0.1	1	8.6	-	3	0	0.3	1	12.5	-
4	0	0.7	1	4.6	-	4	0	0.2	1	11.8	-
5	0	0.9	1	16.2	-	5	0	0.6	1	11.8	-
6	0	0.1	1	2.7	-	6	0	0.4	1	16.7	-
7	0	0.9	1	18	-	7	0	0.4	1	17.6	-
8	0	0.5	1	5	-	8	0	0.2	1	7.2	-
9	0	0.6	1	6.5	-	9	0	0.1	1	4.6	-
10	0	0.3	1	4.2	0	10	0	0.1	1	1.5	0
11	0	0.4	1	9.4	-	11	0	0.1	1	8.5	-
12	0	0.2	1	8.2	-	12	0	0.3	1	7.5	-
13	0	0.7	1	10.2	-	13	0	0.1	1	12	-
14	0	0.8	1	5	-	14	0	0.1	1	8.7	-
15	0	0.1	1	4.6	-	15	0	0.2	1	10.5	-
16	0	0.2	1	11.6	-	16	0	0.1	1	11.3	-
17	0	0.5	1	13.7	-	17	0	0.5	1	18.8	-
18	0	0.2	1	4.5	-	18	0	0.2	1	11.4	-
19	0	0.6	1	18	-	19	0	0.2	1	30.2	-
20	0	0.2	1	4.9	0	20	0	0.1	1	4	0
21	0	0.1	1	4.5	-	21	0	0.3	1	20.8	-
22	0	0.8	1	6.6	-	22	0	0.1	1	9.8	-
23	0	0.1	1	3	-	23	0	0.1	1	3.1	-
24	0	0.6	1	8.5	-	24	0	0.3	1	5.7	-
25	0	0.1	1	5.6	-	25	0	0.1	1	6.1	-
26	0	0.4	1	5.7	-	26	0	0.1	1	3.8	-
27	0	0.8	1	10.1	-	27	0	0.2	1	7	-
28	0	0.4	1	3.2	-	28	0	0.2	1	6.2	-
29	0	0.6	1	5.7	-	29	0	0.4	1	11.5	-
30	0	0.8	1	5.6	0	30	0	0.5	1	15.1	-
31	0	0.8	1	5.6	-	31	0	0.2	1	14.5	-
32	0	0.9	1	10.6	-	32	0	0.1	1	1.5	-
33	0	0.5	1	3.4	-	33	0	0.2	1	8.5	0.25
34	0	0.9	1	10	-	34	0	0.2	1	3	-
35	0	0.5	1	7.1	-	35	0	0.2	1	15.5	-
36	0	0.1	1	2.4	-	36	0	0.3	1	9	-
37	0	0.6	1	8.6	-	37	0	0.1	1	3.8	-
38	0	0.4	1	12.7	-	38	0	0.5	1	8.2	-
39	0	0.3	1	6.2	-	39	0	0.4	1	7.5	-
40	0	0.2	1	4.6	0.25	40	0	0.3	1	8.2	-
41	0	0.8	1	13	-	41	0	0.2	1	7.5	0
42	0	0.8	1	1.7	-	42	0	0.3	1	13.2	-
43	0	0.6	1	3.9	-	43	0	0.3	1	9.8	-
44	0	0.5	1	9	-	44	0	0.2	1	6.8	-
45	0	0.6	1	3.9	-	45	0	0.5	1	3.1	-
46	0	0.6	1	17	-	46	0	0.1	1	2.1	-
47	0	0.6	1	8.6	-	47	0	0.5	1	8.8	-
48	0	0.8	1	10.2	-	48	0	0.6	1	9.9	-
49	0	0.6	1	5.4	-	49	0	0.5	1	9.9	-
50	0	0.4	1	5.7	0.5	50	0	0.1	1	6.9	0
51	0	0.8	1	27.2	-	51	0	0.3	1	18.3	-
52	0	0.3	1	7.4	-	52	0	0.1	1	4	-
53	0	0.7	1	11	-	53	0	0.3	1	14.8	-
54	0	0.8	1	7	-	54	0	0.3	1	17.1	-
55	0	0.9	1	12	-	55	0	0.2	1	4.8	-
56	0	0.5	1	10.1	-	56	0	0.4	1	13	-
57	0	0.2	1	9.5	-	57	0	0.1	1	6.1	-
58	0	0.5	1	11.6	-	58	0	0.1	1	6	-
59	0	0.2	1	12	-	59	0	0.4	1	6.5	-
60	0	0.3	1	7.3	0.25	60	0	0.4	1	13.3	0
61	0	0.6	1	11.7	-	61	0	0.2	1	11.1	-
62	0	0.1	1	7.6	-	62	0	0.6	1	3	-
63	0	0.7	1	19.5	-	63	0	0.5	1	6.1	-
64	0	0.8	1	7.1	-	64	0	0.8	1	5.1	-
65	0	0.5	1	17.2	-	65	0	0.2	1	7.4	-
66	0	0.6	1	7.6	-	66	0	0.6	1	10	-
67	0	0.9	1	13.2	-	67	0	0.3	1	5.5	-
68	0	0.8	1	13	-	68	0	0.6	1	39.8	-
69	0	0.6	1	5.8	-	69	0	0.1	1	4.1	-
70	0	0.8	1	10	0.25	70	0	0.3	1	16.4	-
71	0	0.1	1	12.1	-	71	0	0.2	1	6.2	0.25
72	0	0.7	1	11.5	-	72	0	0.1	1	3.2	-
73	0	0.6	1	14.6	-	73	0	0.2	1	8.1	-
74	0	0.8	1	13	-	74	0	0.4	1	11.2	-
75	0	0.1	1	5.4	-	75	0	0.5	1	9.2	-
76	0	0.2	1	8	-	76	0	0.5	1	8.8	-
77	0	0.4	1	9	-	77	0	0.4	1	4.3	-
78	0	0.4	1	10.2	-	78	0	0.4	1	12.5	-
79	0	0.5	1	10	-	79	0	0.6	1	29.6	-
80	0	0.4	1	5.2	0.75	80	0	0.3	1	6.2	0
81	0	0.6	1	9.8	-	81	0	0.3	1	17.3	-
82	0	0.7	1	12.1	-	82	0	0	0	3.2	-
83	0	0.6	1	14	-	83	0	0.3	1	8.7	-
84	0	0.5	1	10	-	84	0	0.1	1	3.2	-
85	0	0.6	1	7.2	-	85	0	0.5	1	6.3	-
86	0	0.4	1	14	-	86	0	0	0	5.1	-
87	0	0.4	1	7.7	-	87	0	0	0	2.2	-
88	0	0.6	1	12.2	-	88	0	0.9	1	9.9	-
89	0	0.5	1	8.2	-	89	0	0.5	1	8.8	-
90	0	0.5	1	15.2	0.25	90	0	0.5	1	17.7	0
91	0	0.4	1	20.6	-	91	0	0.5	1	2.1	-
92	0	0.7	1	17.6	-	92	0	0.3	1	8.8	-
93	0	0.3	1	12.6	-	93	0	0.2	1	10.1	-
94	0	0.6	1	14.7	-	94	0	0.1	1	3.5	-
95	0	0.7	1	5.7	-	95	0	0.1	1	8.5	-
96	0	0.6	1	8.8	-	96	0	0.3	1	10.8	-
97	0	0.7	1	19.3	-	97	0	0.3	1	5.7	-
98	0	0.5	1	14.7	-	98	0	0.4	1	18.4	-
99	0	0.8	1	13	-	99	0	0.2	1	9.2	-
100	0	0.4	1	6	0.5	100	0	0.5	1	3.5	0
Average Cic, Cip and Embed. =	0	0.52	1.00	9.60	0.28	Average Cic, Cip and Embed. =	0	0.30	0.97	9.55	0.05
Old Calcite Index (CI) =		1.00				Old Calcite Index (CI) =		0.97			
New Calcite Index (CI') =		0.52				New Calcite Index (CI') =		0.30			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_LCUT-3						RG_LILC3-1					
11-Sep-21						10-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0.5	1	15.2	-	**1**	1	0.9	1	7.2	-
2	0	0.1	1	5.5	-	**2**	0	1	1	20	-
3	0	0	0	8.2	-	**3**	0	0.4	1	7.5	-
4	0	0.3	1	14.6	-	**4**	0	0.3	1	4.6	-
5	0	0.3	1	10.2	-	**5**	0	0.5	1	17.1	-
6	0	0.2	1	11.2	-	**6**	0	0.6	1	7.8	-
7	0	0.2	1	9.1	-	**7**	0	0.7	1	5.1	-
8	0	0.8	1	2.5	-	**8**	0	0.4	1	7.9	-
9	0	0.4	1	2.7	-	**9**	0	0.2	1	6.3	0.5
10	0	0.4	1	22.6	0	**10**	0	0.3	1	8.2	-
11	0	0	0	1.1	-	**11**	0	0.2	1	12.5	-
12	0	0.1	1	10.3	-	**12**	0	0.6	1	12.5	-
13	0	0.1	1	5.5	-	**13**	1	0.2	1	12.4	-
14	0	0.2	1	7.5	-	**14**	0	0	0	3.6	-
15	0	-	-	101	-	**15**	0	0.3	1	16.6	-
16	0	0.2	1	11.2	-	**16**	0	0.5	1	16.5	-
17	0	0.6	1	15.5	-	**17**	0	0.5	1	12.5	-
18	0	0.1	1	7.2	-	**18**	0	0.3	1	10.4	-
19	0	0.2	1	9.9	-	**19**	0	0.4	1	10.5	-
20	0	0.7	1	22.5	0.75	**20**	0	0	0	3	0.25
21	0	0.2	1	12.1	-	**21**	0	0.6	1	16.2	-
22	0	0.2	1	9.8	-	**22**	0	0.3	1	5.6	-
23	0	0.4	1	9.5	-	**23**	0	0.8	1	14.2	-
24	0	0.3	1	11.8	-	**24**	0	0.7	1	5.8	-
25	0	0.2	1	13.5	-	**25**	0	0.6	1	7.7	-
26	0	0.4	1	11.8	-	**26**	0	0.8	1	1.5	-
27	0	0.2	1	8.8	-	**27**	0	0.1	1	4.6	-
28	0	0.3	1	9.9	-	**28**	0	0.6	1	10.1	-
29	0	0	0	1.4	-	**29**	0	0.9	1	7.8	-
30	0	0.4	1	31.3	0.5	**30**	0	0.9	1	9.7	0.25
31	0	0.3	1	10.8	-	**31**	0	0.9	1	19	-
32	0	0.4	1	26.4	-	**32**	0	0.6	1	7.2	-
33	0	0.2	1	5.5	-	**33**	0	0.4	1	10.3	-
34	0	0.1	1	8.7	-	**34**	0	0.6	1	22.2	-
35	0	0.1	1	4.5	-	**35**	0	0.3	1	14	-
36	0	0.1	1	17	-	**36**	0	0.2	1	2.5	-
37	0	-	-	101	-	**37**	0	0.8	1	14.5	-
38	0	0.5	1	12.2	-	**38**	0	0.6	1	6.3	-
39	0	0.5	1	10.3	-	**39**	0	0	0	2.7	-
40	0	0.7	1	6.3	0	**40**	0	0.3	1	4.5	0
41	0	0.1	1	6.7	-	**41**	0	1	1	5.4	-
42	0	0.4	1	8.8	-	**42**	0	0.7	1	16	-
43	0	0.3	1	8.7	-	**43**	0	0.7	1	22	-
44	0	0.2	1	4.6	-	**44**	0	0.3	1	6.5	-
45	0	0.4	1	11.2	-	**45**	1	0.2	1	4.7	-
46	0	0.1	1	6.1	-	**46**	0	0.5	1	8.8	-
47	0	0.2	1	3.8	-	**47**	0	0.8	1	11.1	-
48	0	0.3	1	17.5	-	**48**	0	0	0	6.1	-
49	0	0.4	1	2.7	-	**49**	0	0	0	1.2	-
50	0	0.4	1	6.8	0	**50**	0	0.8	1	12.5	0.25
51	0	0.1	1	3.9	-	**51**	0	0.8	1	13.2	-
52	0	0.6	1	7.7	-	**52**	0	0.7	1	42	-
53	0	0.3	1	10.8	-	**53**	0	0.1	1	11.5	-
54	0	0.6	1	19.9	-	**54**	0	0.6	1	8.8	-
55	0	0.3	1	18.5	-	**55**	0	0.8	1	7.1	-
56	0	0.1	1	4.1	-	**56**	0	0.4	1	13.8	-
57	0	0.6	1	23.3	-	**57**	0	0	0	1	-
58	0	0.5	1	11.4	-	**58**	0	0.5	1	9.4	-
59	0	0.4	1	4.7	-	**59**	0	0.6	1	13.8	-
60	0	0.8	1	5.4	0.25	**60**	0	0.2	1	1.7	0.5
61	0	0.3	1	8.8	-	**61**	0	0	0	0.2	-
62	0	0.1	1	10.2	-	**62**	0	0.5	1	9	-
63	0	0.1	1	4.1	-	**63**	0	0.4	1	17	-
64	0	0.3	1	13.8	-	**64**	0	0.5	1	14	-
65	0	0.3	1	7.3	-	**65**	0	0.2	1	4.5	-
66	0	0	0	0.4	-	**66**	1	0.5	1	14.6	-
67	0	0.3	1	50.3	-	**67**	0	0.3	1	17	-
68	0	0.1	1	15.2	-	**68**	0	0.5	1	14.5	-
69	0	0.1	1	2.1	-	**69**	0	0.4	1	10.2	-
70	0	-	-	101	-	**70**	0	0.5	1	16.4	0.5
71	0	0.4	1	9.5	0	**71**	0	0	0	1.5	-
72	0	0.7	1	9.2	-	**72**	0	0.2	1	7.3	-
73	0	0.3	1	6.3	-	**73**	0	0	0	2.6	-
74	0	0.2	1	5.2	-	**74**	0	0.1	1	6	-
75	0	0.4	1	2.5	-	**75**	0	0.5	1	4.7	-
76	0	0.2	1	15.5	-	**76**	0	0.2	1	12.5	-
77	0	0.2	1	5.8	-	**77**	0	0.7	1	9.1	-
78	0	0.2	1	9.3	-	**78**	0	0.2	1	6.5	-
79	0	0.2	1	9.7	-	**79**	0	0.5	1	15	-
80	0	0.2	1	11.2	0	**80**	0	0.5	1	11	0.75
81	0	0.1	1	8.1	-	**81**	0	0	0	0.3	-
82	0	0.5	1	10.9	-	**82**	0	0.3	1	14	-
83	0	0.1	1	3.1	-	**83**	0	0	0	0.4	-
84	0	0.4	1	31.3	-	**84**	0	0.5	1	13.5	-
85	0	0.8	1	0.5	-	**85**	0	0	0	0.6	-
86	0	0.6	1	12.4	-	**86**	0	0	0	0.4	-
87	0	0.3	1	10.7	-	**87**	0	0.3	1	3.5	-
88	0	0.3	1	4.3	-	**88**	0	0.9	1	19.3	-
89	0	0.4	1	7.2	-	**89**	0	0.5	1	23	-
90	0	0.1	1	6.4	0	**90**	0	0.6	1	23	0.25
91	0	0.1	1	6.1	-	**91**	0	0.4	1	39	-
92	0	0.6	1	20.6	-	**92**	0	0.1	1	4.2	-
93	0	0.5	1	9.8	-	**93**	0	0	0	2.5	-
94	0	0	0	3.1	-	**94**	0	0.7	1	7.8	-
95	0	0.3	1	2.6	-	**95**	0	0.4	1	4.5	-
96	0	0.3	1	6.9	-	**96**	0	0.2	1	5.1	-
97	0	0.2	1	6.1	-	**97**	0	0	0	0.5	-
98	0	-	-	101	-	**98**	0	0.8	1	13.2	-
99	0	0.2	1	6.1	-	**99**	0	0.7	1	6.4	-
100	0	0.3	1	9.5	0	**100**	0	0.6	1	9.1	0.5
Average Cic, Cip and Embed. =	**0**	**0.30**	**0.95**	**13.7**	**0.15**	**Average Cic, Cip and Embed. =**	**0.04**	**0.43**	**0.85**	**9.89**	**0.38**
Old Calcite Index (CI) =		**0.95**				**Old Calcite Index (CI) =**		**0.89**			
New Calcite Index (CI') =		**0.30**				**New Calcite Index (CI') =**		**0.47**			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_LILC3-2						RG_LILC3-3					
10-Sep-21						10-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0.1	1	5.7	-	1	0	0.3	1	5.3	-
2	0	0.7	1	10.2	-	2	0	0.9	1	8.1	-
3	0	0.3	1	7.5	-	3	0	0.2	1	3.2	-
4	0	0	0	0.9	-	4	0	0.8	1	7.2	-
5	0	0.6	1	13	-	5	0	1	1	9.3	-
6	0	0	0	1.9	-	6	0	0.8	1	4.7	-
7	0	0.5	1	11.3	-	7	0	1	1	6.7	-
8	0	0.7	1	16.4	-	8	0	0	0	0.3	-
9	0	0.6	1	14.4	-	9	0	0.9	1	7.4	-
10	0	1	1	8.3	-	10	0	0.1	1	4.1	0.75
11	0	0.9	1	7.8	-	11	0	0.9	1	6	-
12	0	0.4	1	8.1	-	12	0	0.6	1	9.6	-
13	0	0.6	1	16.1	-	13	0	0.9	1	10	-
14	0	0.3	1	7.2	-	14	0	0.5	1	8.4	-
15	0	0.8	1	7.2	-	15	0	0	0	0.3	-
16	0	0.3	1	7.5	-	16	0	0.7	1	4	-
17	0	0	0	1.2	-	17	0	0.5	1	22.5	-
18	0	0	0	0.5	-	18	0	0.5	1	5.3	-
19	0	0.4	1	15.4	-	19	0	0.8	1	17.3	-
20	0	0.6	1	8.1	-	20	0	0.8	1	8.6	0.25
21	0	0.5	1	5.4	-	21	0	0.5	1	21	-
22	0	0.5	1	52	-	22	0	0.9	1	7	-
23	0	0.5	1	19.2	-	23	0	0.6	1	13.7	-
24	0	1	1	4.8	-	24	0	0.9	1	8.5	-
25	0	0.8	1	7.5	-	25	0	0.7	1	14.3	-
26	0	0	0	1.5	-	26	0	0.8	1	5	-
27	0	0.5	1	7.5	-	27	0	0	0	2	-
28	0	0.7	1	6.6	-	28	0	0.9	1	1.6	-
29	0	0.5	1	7.8	-	29	0	1	1	7.7	-
30	0	0.5	1	16	-	30	0	0.8	1	7	0
31	0	0.4	1	9	0	31	0	0.9	1	6.2	-
32	1	0.4	1	4.6	-	32	0	1	1	7	-
33	0	0.5	1	15.5	-	33	0	0.3	1	4.8	-
34	0	0	0	0.7	-	34	0	0.8	1	5.5	-
35	0	0.9	1	3.8	-	35	0	1	1	10.3	-
36	0	0.5	1	19.5	0.5	36	0	0.1	1	4.5	-
37	0	0.7	1	15.5	-	37	0	0.6	1	5	-
38	0	0	0	2.5	-	38	0	1	1	4.5	-
39	0	0	0	2.5	-	39	0	0.8	1	7.2	-
40	1	0.4	1	3.5	-	40	0	0.4	1	12.9	0.5
41	0	0.5	1	16.5	0.5	41	0	0.4	1	10.3	-
42	0	0.8	1	13.5	-	42	0	0.6	1	14	-
43	0	0.7	1	6.8	-	43	0	0.1	1	2	-
44	0	0.7	1	17	-	44	0	0.4	1	11	-
45	0	0.7	1	15	-	45	0	0.5	1	30.5	-
46	0	0.3	1	13.5	0.75	46	0	0.5	1	10.5	-
47	0	0.8	1	15	-	47	0	0.9	1	13.6	-
48	0	0.2	1	7	-	48	0	0.1	1	3.2	-
49	0	0	0	0.7	-	49	0	0.9	1	7.5	-
50	0	0.4	1	6	-	50	0	0	0	0.7	1
51	0	0.7	1	12	0.25	51	0	1	1	8	-
52	0	0.5	1	7	-	52	0	0.1	1	3.9	-
53	0	0.8	1	5.2	-	53	0	0.8	1	9	-
54	0	0.6	1	18	-	54	0	0.9	1	9.4	-
55	0	0.5	1	5.6	-	55	0	0.2	1	5	-
56	0	0.9	1	15.5	-	56	0	0.8	1	8.1	-
57	0	0.5	1	24.5	-	57	0	0.7	1	6	-
58	0	0	0	0.5	-	58	0	0.8	1	8.3	-
59	0	0.9	1	8	-	59	0	0.6	1	10.8	-
60	0	0.5	1	15.5	0.5	60	0	0.6	1	12.2	0.5
61	0	0.8	1	15	-	61	0	0.7	1	14.5	-
62	0	0	0	0.5	-	62	0	0.6	1	8.1	-
63	0	0.4	1	6.6	-	63	0	0.8	1	6.2	-
64	0	0.4	1	3	-	64	0	0.6	1	7.3	-
65	1	0.5	1	12	-	65	0	0.9	1	6.1	-
66	0	0.5	1	8.5	-	66	0	0.3	1	7	-
67	0	0.6	1	4.5	-	67	0	0.6	1	10.2	-
68	0	0.1	1	3.5	-	68	0	0.9	1	7	-
69	0	0.8	1	13.5	-	69	0	0.8	1	11.1	-
70	0	1	1	7.5	0	70	0	0.4	1	8	-
71	0	0.7	1	14.5	-	71	0	0.5	1	5.3	-
72	0	0.6	1	8.2	-	72	0	0.9	1	8.2	-
73	0	0.5	1	8.4	-	73	0	0.2	1	9.5	0.75
74	0	0.4	1	12.2	-	74	0	1	1	3.9	-
75	0	0.5	1	9	-	75	0	0.6	1	14.2	-
76	0	0.5	1	6.5	-	76	0	0.2	1	2.7	-
77	0	1	1	6.2	-	77	0	1	1	9	-
78	0	0.1	1	2.5	-	78	0	0.6	1	5.5	-
79	0	0.7	1	18	-	79	0	0	0	0.4	-
80	0	0.5	1	15.4	0.25	80	0	0.8	1	5	0
81	0	0.1	1	8.5	-	81	0	1	1	9.7	-
82	0	0.6	1	16.5	-	82	0	1	1	1.2	-
83	0	0.8	1	20.5	-	83	0	0.8	1	6.9	-
84	0	0.4	1	7.5	-	84	0	0.8	1	8	-
85	0	0.4	1	5	-	85	0	0.7	1	19.2	-
86	1	0.4	1	12	-	86	0	0.8	1	10.7	-
87	0	0.4	1	15.5	-	87	0	1	1	10.6	-
88	0	0.5	1	17	-	88	0	0.4	1	6.6	-
89	0	0.6	1	5.7	-	89	0	0.4	1	12	-
90	1	0.9	1	6	0.25	90	0	0.4	1	10.5	0.25
91	0	0.5	1	14.5	-	91	0	0.7	1	7.6	-
92	0	0.7	1	5	-	92	0	0.8	1	0.8	-
93	0	0.6	1	10.7	-	93	0	0.7	1	18.6	-
94	0	1	1	11	-	94	0	0.5	1	6.4	-
95	0	0.4	1	9	-	95	0	0.2	1	6	-
96	0	0	0	1.3	-	96	0	0.5	1	6.6	-
97	0	0.6	1	2.1	-	97	0	1	1	11.4	-
98	0	0.1	1	1.7	-	98	0	0.8	1	8.5	-
99	0	0.7	1	10	-	99	0	0.4	1	17	-
100	0	0.6	1	10.5	0.5	100	0	0.4	1	8.4	0.75
Average Cic, Cip and Embed. =	0.05	0.50	0.88	9.62	0.35	Average Cic, Cip and Embed. =	0	0.63	0.95	8.24	0.48
Old Calcite Index (CI) =		0.93				Old Calcite Index (CI) =		0.95			
New Calcite Index (CI') =		0.55				New Calcite Index (CI') =		0.63			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_LILC3-4						RG_LILC3-5					
10-Sep-21						10-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0.5	1	20	-	1	0	1	1	19.2	-
2	0	0.4	1	10.2	-	2	0	0.7	1	13	-
3	0	0.4	1	8.3	-	3	0	0.3	1	6.3	-
4	0	0.3	1	13	-	4	0	0.3	1	23	-
5	0	0.5	1	3.4	-	5	0	0.7	1	15.5	-
6	0	0.3	1	3.5	-	6	0	0.2	1	7.8	-
7	0	0.6	1	10.1	-	7	0	1	1	10.7	-
8	0	0.3	1	10.2	-	8	0	0.6	1	9.3	-
9	0	0.2	1	14.2	-	9	0	0	0	0.6	-
10	0	0.6	1	11.2	0.25	10	0	0.7	1	18.1	0.5
11	0	0.7	1	14.6	-	11	0	0	0	2.6	-
12	0	0.3	1	11.7	-	12	0	0.4	1	5.7	-
13	0	0.5	1	13.6	-	13	0	1	1	4.3	-
14	0	0	0	4.9	-	14	0	0.8	1	5	-
15	0	0.4	1	6.5	-	15	0	0	0	1.8	-
16	0	0.1	1	5.5	-	16	0	0.1	1	5.2	-
17	0	0.8	1	5.5	-	17	0	0	0	3.1	-
18	0	0	0	1.1	-	18	0	0.2	1	10.3	-
19	0	0.4	1	6.3	-	19	0	0.3	1	8.5	-
20	0	0.8	1	5.1	0	20	0	0	0	0.8	1
21	0	0.8	1	5.9	-	21	0	0.6	1	11.5	-
22	0	0.9	1	8.1	-	22	0	0.4	1	8	-
23	0	0.9	1	11.7	-	23	0	0.2	1	7.4	-
24	0	0.6	1	5.6	-	24	0	0	0	1.8	-
25	0	0.2	1	6.3	-	25	0	0.4	1	1.2	-
26	0	0.5	1	7	-	26	0	0.4	1	9.8	-
27	0	0.6	1	6.7	-	27	0	0.5	1	13	-
28	0	0.4	1	5.2	-	28	0	0.3	1	25	-
29	0	0.5	1	8.4	-	29	0	0.2	1	7.2	-
30	0	0.9	1	12.6	0	30	0	0.2	1	6	0
31	0	0.5	1	8.1	-	31	0	0.3	1	9	-
32	0	1	1	8	-	32	0	0.2	1	7	-
33	0	0.5	1	7.2	-	33	0	0.3	1	4.6	-
34	0	0	0	1.6	-	34	0	0.3	1	10.2	-
35	0	0.9	1	5	-	35	0	0.6	1	9	-
36	0	0.9	1	10.6	-	36	0	0.3	1	33	-
37	0	1	1	6.1	-	37	0	0.4	1	5	-
38	0	0	0	0.6	-	38	0	0.2	1	12.2	-
39	0	0.9	1	6.7	-	39	0	0.8	1	7	-
40	0	1	1	7.6	0	40	0	0.2	1	15.1	0.75
41	0	0	0	0.2	-	41	0	0.3	1	7.3	-
42	0	1	1	11	-	42	0	0.6	1	25.5	-
43	0	1	1	4.5	-	43	0	0.6	1	13	-
44	0	0.2	1	5.5	-	44	0	0.1	1	3.1	-
45	0	0.4	1	1.5	-	45	0	0.3	1	10	-
46	0	0.9	1	9.6	-	46	0	0.9	1	8.4	-
47	0	1	1	6.5	-	47	0	0.8	1	9	-
48	0	0.5	1	3.1	-	48	0	0	0	3.7	-
49	0	0.9	1	6	-	49	0	0.8	1	7	-
50	0	0.5	1	7.1	0.5	50	0	0.9	1	9.3	0.25
51	0	1	1	13.3	-	51	0	1	1	6	-
52	0	0.4	1	4.7	-	52	0	0.1	1	7.6	-
53	0	0.6	1	5.8	-	53	0	0.4	1	11	-
54	0	0.5	1	29	-	54	0	0.7	1	11.6	-
55	0	1	1	8.3	-	55	0	0.9	1	9	-
56	0	0.7	1	37.5	-	56	0	0.8	1	11	-
57	0	0.7	1	12.5	-	57	0	0.8	1	9.1	-
58	0	0.6	1	29	-	58	0	0.8	1	9.6	-
59	0	0.9	1	7	-	59	0	0.5	1	12	-
60	0	0	0	6.5	0.25	60	0	0.2	1	11.5	0.75
61	0	0.5	1	10.5	-	61	0	0.7	1	13.6	-
62	0	0	0	1.8	-	62	0	0.8	1	12	-
63	0	1	1	8.6	-	63	0	0.9	1	15.7	-
64	0	0.8	1	5.5	-	64	0	0.9	1	7.6	-
65	0	0.8	1	18.5	-	65	0	0.3	1	4.2	-
66	0	0.8	1	10.5	-	66	0	0.1	1	1.8	-
67	0	0.5	1	5	-	67	0	0.8	1	18	-
68	0	0.9	1	8.6	-	68	0	0.8	1	7.4	-
69	0	0.4	1	7.6	-	69	0	0.8	1	6.8	-
70	0	0.2	1	6	0.5	70	0	0.6	1	14.2	0.25
71	0	0.5	1	19.5	-	71	0	1	1	11	-
72	0	0.4	1	7.8	-	72	0	0.7	1	9.8	-
73	0	0.5	1	4	-	73	0	0.2	1	9	-
74	0	0.5	1	5.6	-	74	0	0.2	1	13.1	-
75	0	0.3	1	5	-	75	0	0.4	1	5.6	-
76	0	0.1	1	5.8	-	76	0	0.9	1	12.5	-
77	0	0.4	1	8	-	77	0	0.7	1	5.3	-
78	0	0.4	1	21.5	-	78	0	0.8	1	15.7	-
79	0	0.4	1	4.1	-	79	0	0.9	1	7.6	-
80	0	0.4	1	3.8	0.5	80	0	0.6	1	6.3	0
81	0	0.4	1	7.5	-	81	0	0.8	1	14	-
82	0	0.9	1	8.3	-	82	0	0.5	1	11.8	-
83	0	0.5	1	20.5	-	83	0	0.3	1	5.3	-
84	0	0.3	1	4.8	-	84	0	0.7	1	14.9	-
85	0	0	0	0.7	-	85	0	0.8	1	11.5	-
86	0	0	0	2.5	-	86	0	0.3	1	14	-
87	0	0.4	1	5	-	87	0	0.4	1	7	-
88	0	0.1	1	4.5	-	88	0	0.3	1	10.5	-
89	0	0.9	1	9	-	89	0	0.4	1	2.3	-
90	0	0.7	1	5.4	0.25	90	0	0.8	1	12.5	0.25
91	0	0.9	1	5.1	-	91	0	0.6	1	4.3	-
92	0	0.5	1	9.6	-	92	0	0.8	1	5	-
93	0	0.6	1	10.4	-	93	0	0.4	1	12	-
94	0	0.6	1	12.2	-	94	0	0.9	1	8.6	-
95	0	0.7	1	9	-	95	0	0.7	1	11	-
96	0	0	0	0.4	-	96	0	0.8	1	13	-
97	0	0.2	1	4.5	-	97	0	0.7	1	9	-
98	0	0.3	1	13	-	98	0	0.8	1	19.9	-
99	0	0.5	1	10.4	-	99	0	0.4	1	8	-
100	0	1	1	11	0	100	0	0.4	1	3.8	0
Average Cic, Cip and Embed. =	0	0.53	0.90	8.48	0.23	Average Cic, Cip and Embed. =	0	0.52	0.93	9.64	0.38
Old Calcite Index (CI) =		0.90				Old Calcite Index (CI) =		0.93			
New Calcite Index (CI') =		0.53				New Calcite Index (CI') =		0.52			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_LISP24-1						RG_LIDSL-1					
13-Sep-21						14-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0	0	7.5	-	1	0	0	0	13	-
2	0	0.1	1	9.1	-	2	0	0.1	1	7.2	-
3	0	0	0	8.2	-	3	0	0	0	6.7	-
4	0	0	0	11.1	-	4	0	0.1	1	15.8	-
5	0	0	0	6.1	-	5	0	0	0	4.7	-
6	0	0	0	3.2	-	6	0	0	0	6.4	-
7	0	0.1	1	9.5	-	7	0	0	0	9.1	-
8	0	0	0	7.2	-	8	0	0	0	12.6	-
9	0	0	0	9.5	-	9	0	0	0	9.3	-
10	0	0	0	8.5	0.25	10	0	0.1	1	10.2	0.25
11	0	0.1	1	11.2	-	11	0	0.1	1	10.1	-
12	0	0	0	9.5	-	12	0	0	0	5.6	-
13	0	0	0	5.5	-	13	0	0.1	1	8.7	-
14	0	0	0	9.3	-	14	0	0	0	6.1	-
15	0	0	0	5.2	-	15	0	0	0	5.3	-
16	0	0	0	16.5	-	16	0	0	0	5.6	-
17	0	0	0	7.2	-	17	0	0	0	8.2	-
18	0	0	0	14.8	-	18	0	0	0	20.4	-
19	0	0	0	8.1	-	19	0	0.1	1	12.1	-
20	0	0.1	1	15.3	0.5	20	0	0	0	17.3	0.5
21	0	0	0	7.2	-	21	0	0.1	1	9.3	-
22	0	0	0	9.8	-	22	0	0	0	12.2	-
23	0	0	0	6.2	-	23	0	0.1	1	8.1	-
24	0	0.1	1	9.1	-	24	0	0.2	1	20.3	-
25	0	0	0	6.6	-	25	0	0.2	1	12.6	-
26	0	0	0	6.2	-	26	0	0	0	5.3	-
27	0	0	0	5.2	-	27	0	0.2	1	15.3	-
28	0	0.1	1	10.1	-	28	0	0.1	1	11.1	-
29	0	0	0	8.2	-	29	0	0	0	20.4	-
30	0	0	0	6.3	0	30	0	0	0	12.2	0.25
31	0	0	0	13.8	-	31	0	0	0	8.5	-
32	0	0	0	12.8	-	32	0	0	0	3.6	-
33	0	0	0	2.4	-	33	0	0.1	1	15.2	-
34	0	0	0	10.9	-	34	0	0	0	1.2	-
35	0	0.1	1	8.8	-	35	0	0	0	12.1	-
36	0	0	0	6.5	-	36	0	0	0	6.5	-
37	0	0	0	10.2	-	37	0	0	0	8.2	-
38	0	0	0	5.5	-	38	0	0	0	3	-
39	0	-	-	101	-	39	0	0	0	10.1	-
40	0	0	0	0.8	0	40	0	0	0	7.4	0.25
41	0	0.2	1	14.2	-	41	0	0	0	9.6	-
42	0	0	0	10.8	-	42	0	0	0	9.3	-
43	0	0	0	12.5	-	43	0	0	0	7.5	-
44	0	0	0	13.1	-	44	0	0.1	1	5.9	-
45	0	0	0	5.8	-	45	0	0	0	19.2	-
46	0	0	0	2.8	-	46	0	0	0	6.6	-
47	0	0	0	9.2	-	47	0	0.1	1	7.1	-
48	0	0	0	5.5	-	48	0	0	0	10.2	-
49	0	0	0	6.2	-	49	0	0	0	10	-
50	0	0	0	3.3	0	50	0	0.1	1	9.1	0.25
51	0	0	0	3.4	-	51	0	0	0	7.8	-
52	0	0.2	1	14.2	-	52	0	0	0	9.1	-
53	0	0	0	10.2	-	53	0	0	0	5.6	-
54	0	0	0	28.3	-	54	0	0	0	22.6	-
55	0	0	0	3.3	-	55	0	0	0	1.3	-
56	0	0	0	7.2	-	56	0	0.1	1	18.1	-
57	0	0	0	6.1	-	57	0	0	0	9.2	-
58	0	0	0	2.5	-	58	0	0	0	7.1	-
59	0	0.2	1	44	-	59	0	0.3	1	25.5	-
60	0	0	0	11.2	0.25	60	0	0	0	8.1	0
61	0	0	0	3.3	-	61	0	0	0	7.5	-
62	0	0	0	0.8	-	62	0	0	0	4.3	-
63	0	0	0	9.1	-	63	0	0.1	1	6.1	-
64	0	0	0	3.3	-	64	0	0.1	1	9.1	-
65	0	0	0	8.8	-	65	0	0.2	1	28.2	-
66	0	0.3	1	16	-	66	0	0	0	4.1	-
67	0	0	0	11.4	-	67	0	0	0	8.4	-
68	0	0	0	10.8	-	68	0	0	0	6.5	-
69	0	0	0	14.2	-	69	0	0	0	12.6	-
70	0	0	0	2	0	70	0	0	0	5.1	0
71	0	0.1	1	17.2	-	71	0	0	0	4.3	-
72	0	0	0	11.8	-	72	0	0	0	7.6	-
73	0	0	0	9.2	-	73	0	0	0	8.2	-
74	0	0	0	10.1	-	74	0	0.3	1	40	-
75	0	0.2	1	15.5	-	75	0	0.1	1	8.5	-
76	0	0.1	1	10.5	-	76	0	0	0	5.1	-
77	0	0	0	11.5	-	77	0	0	0	11.8	-
78	0	0	0	3.8	-	78	0	0	0	1.6	-
79	0	0	0	9.1	-	79	0	0	0	3.7	-
80	0	0	0	4.5	0	80	0	0	0	4.6	0.75
81	0	0	0	7.1	-	81	0	0	0	10.1	-
82	0	0	0	8.2	-	82	0	0	0	17.9	-
83	0	0	0	0.5	-	83	0	0.1	1	13.5	-
84	0	0	0	7.3	-	84	0	0	0	8.5	-
85	0	0	0	6.8	-	85	0	0	0	15.9	-
86	0	0	0	9.8	-	86	0	0	0	2.4	-
87	0	0	0	14.8	-	87	0	0	0	6.6	-
88	0	0	0	6.8	-	88	0	0	0	8.7	-
89	0	0	0	4.3	-	89	0	0	0	9.9	-
90	0	0	0	6.8	0	90	0	0	0	1.3	0
91	0	0	0	4.4	-	91	0	0.1	1	6.1	-
92	0	0	0	12.5	-	92	0	0	0	1.3	-
93	0	0	0	3.3	-	93	0	0	0	10.8	-
94	0	0	0	6	-	94	0	0	0	5.6	-
95	0	0.1	1	7.2	-	95	0	0	0	7.6	-
96	0	0	0	5.1	-	96	0	0	0	14.2	-
97	0	0	0	1.1	-	97	0	0.1	1	10.3	-
98	0	0.1	1	10.8	-	98	0	0	0	37	-
99	0	0	0	9.3	-	99	0	0.1	1	10.8	-
100	0	0.1	1	8.5	-	100	0	0	0	9.6	0
Average Cic, Cip and Embed. =	0	0.02	0.17	9.67	0.11	Average Cic, Cip and Embed. =	0	0.04	0.27	10.0	0.23
Old Calcite Index (CI) =		0.17				Old Calcite Index (CI) =		0.27			
New Calcite Index (CI') =		0.02				New Calcite Index (CI') =		0.04			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_LIDSL-2						RG_LIDSL-3					
14-Sep-21						14-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0	0	10.5	-	1	0	0	0	9.2	-
2	0	0.1	1	18.5	-	2	0	0.1	1	10.8	-
3	0	0	0	2.8	-	3	0	0.2	1	14.2	-
4	0	0	0	4.8	-	4	0	0	0	12	-
5	0	0	0	12.2	-	5	0	0	0	8.5	-
6	0	0	0	9.9	-	6	0	0.2	1	14.8	-
7	0	0	0	12.5	-	7	0	0.1	1	9.6	-
8	0	0	0	3.7	-	8	0	0	0	7.4	-
9	0	0	0	1.2	-	9	0	0	0	16.9	-
10	0	0	0	16	0.25	10	0	0.1	1	16.8	0.25
11	0	0	0	6	-	11	0	0	0	1.6	-
12	0	0.1	1	12.7	-	12	0	0	0	9	-
13	0	0	0	4.6	-	13	0	0	0	6.2	-
14	0	0	0	20	-	14	0	0	0	8	-
15	0	0	0	19.5	-	15	0	0	0	8.3	-
16	0	0	0	5.2	-	16	0	0	0	21.5	-
17	0	0	0	6.2	-	17	0	0	0	8.3	-
18	0	0	0	6.5	-	18	0	0	0	6.5	-
19	0	0	0	28	-	19	0	0	0	10.2	-
20	0	0	0	8.7	0.5	20	0	0	0	11.5	0.25
21	0	0.1	1	24	-	21	0	0	0	10.7	-
22	0	0	0	11	-	22	0	0	0	5.2	-
23	0	0	0	0.3	-	23	0	0	0	9.6	-
24	0	0	0	7.5	-	24	0	0	0	9.3	-
25	0	0	0	5.1	-	25	0	0	0	5	-
26	0	0	0	8.1	-	26	0	0.1	1	10.1	-
27	0	0	0	22.5	-	27	0	0	0	26	-
28	0	0.1	1	11.2	-	28	0	0.1	1	16.5	-
29	0	0.1	1	11.3	-	29	0	0	0	12.3	-
30	0	0.1	1	8.2	0.5	30	0	0.2	1	20	0.5
31	0	0	0	18	-	31	0	0	0	6.5	-
32	0	0	0	3	-	32	0	0.1	1	15	-
33	0	0	0	13.2	-	33	0	0.1	1	7.6	-
34	0	0.1	1	11.7	-	34	0	0	0	14	-
35	0	0	0	5.2	-	35	0	0	0	5	-
36	0	0	0	8.5	-	36	0	0	0	28.5	-
37	0	0	0	12.1	-	37	0	0	0	9.8	-
38	0	0.4	1	50.5	-	38	0	0.1	1	9.6	-
39	0	0.1	1	9.2	-	39	0	0	0	8.7	-
40	0	0.3	1	11.5	0.25	40	0	0	0	5.1	0
41	0	0	0	5.5	-	41	0	0.2	1	34	-
42	0	0.1	1	13.2	-	42	0	0	0	10.1	-
43	0	0	0	8.1	-	43	0	0	0	11.4	-
44	0	0.5	1	19.5	-	44	0	0	0	10.7	-
45	0	0	0	14.2	-	45	0	0	0	6.1	-
46	0	0	0	10.1	-	46	0	0	0	10.2	-
47	0	0.1	1	10.9	-	47	0	0	0	6.5	-
48	0	0	0	3.1	-	48	0	0	0	7.4	-
49	0	0	0	6.2	-	49	0	0.2	1	20	0.25
50	0	0.4	1	10.5	0	50	0	0	0	27.3	-
51	0	0.1	1	5.5	-	51	0	0	0	10.6	-
52	0	0.1	1	11.8	-	52	0	0	0	11.2	-
53	0	0.1	1	14.1	-	53	0	0	0	10.5	-
54	0	0	0	12	-	54	0	0	0	8.1	-
55	0	0	0	4.2	-	55	0	0	0	8.6	-
56	0	0	0	9.1	-	56	0	0	0	8.8	-
57	0	0	0	7.2	-	57	0	0	0	9.1	-
58	0	0.3	1	23.5	-	58	0	0	0	2.6	-
59	0	0.1	1	44.5	-	59	0	0	0	6.6	-
60	0	0	0	8	-	60	0	0	0	9.1	0.25
61	0	0	0	3.3	-	61	0	0.1	1	25.2	-
62	0	0.1	1	10.1	0	62	0	0	0	6.2	-
63	0	0	0	4.3	-	63	0	0.1	1	19.5	-
64	0	0	0	6.3	-	64	0	0.2	1	34.7	-
65	0	0	0	7.4	-	65	0	0	0	3.2	-
66	0	0	0	6.2	-	66	0	0	0	10.1	-
67	0	0	0	5	-	67	0	0	0	0.2	-
68	0	0.1	1	12	-	68	0	0	0	2.1	-
69	0	0	0	7.9	-	69	0	0	0	9.2	-
70	0	0	0	7.2	-	70	0	0	0	10.3	0
71	0	0	0	5.5	-	71	0	0	0	23	-
72	0	0	0	15	-	72	0	0.1	1	9.5	-
73	0	0	0	0.5	1	73	0	0	0	14.4	-
74	0	0.1	1	14.2	-	74	0	0	0	16.3	-
75	0	0	0	4.8	-	75	0	0	0	18	-
76	0	0	0	8.1	-	76	0	0	0	15.2	-
77	0	0	0	8.2	-	77	0	0	0	10.4	-
78	0	0	0	9.1	-	78	0	0	0	8.5	-
79	0	0.5	1	29	-	79	0	0	0	9.5	-
80	0	0	0	7.2	0.25	80	0	0	0	7.6	0
81	0	0	0	7.4	-	81	0	0	0	7.7	-
82	0	0.1	1	6	-	82	0	0	0	4.2	-
83	0	0	0	5.5	-	83	0	0	0	7.7	-
84	0	0.2	1	19.5	-	84	0	0	0	8.6	-
85	0	0.1	1	14.5	-	85	0	0	0	8.4	-
86	0	0	0	6.5	-	86	0	0	0	8.5	-
87	0	0	0	13.2	-	87	0	0	0	10.6	-
88	0	0	0	4.2	-	88	0	0	0	7	-
89	0	0	0	16.8	-	89	0	0	0	7.1	-
90	0	0	0	6.2	0	90	0	0	0	6.1	0
91	0	0	0	8.2	-	91	0	0	0	6.3	-
92	0	0.1	1	15.5	-	92	0	0	0	11.1	-
93	0	0	0	19.1	-	93	0	0	0	7.5	-
94	0	0	0	3.6	-	94	0	0	0	6.4	-
95	0	0	0	7.2	-	95	0	0	0	5.6	-
96	0	0.1	1	8.5	-	96	0	0	0	8.5	-
97	0	0	0	5.5	-	97	0	0	0	11.1	-
98	0	0	0	1.7	-	98	0	0.2	1	45.5	-
99	0	0	0	11.5	-	99	0	0	0	5.9	-
100	0	0.3	1	15	0.75	100	0	0.2	1	4.5	0.75
Average Cic, Cip and Embed. =	0	0.05	0.29	10.7	0.35	Average Cic, Cip and Embed. =	0	0.03	0.19	11.2	0.23
Old Calcite Index (CI) =		0.29				Old Calcite Index (CI) =		0.19			
New Calcite Index (CI') =		0.05				New Calcite Index (CI') =		0.03			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_LIDSL-4						RG_LIDSL-5					
14-Sep-21						14-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0	0	9	-	1	0	0	0	9.3	-
2	0	0.1	1	9.2	-	2	0	0.3	1	28	-
3	0	0	0	7	-	3	0	0	0	4	-
4	0	0	0	9.2	-	4	0	0	0	5.2	-
5	0	0.2	1	45.3	-	5	0	0	0	1.2	-
6	0	0	0	3.2	-	6	0	0	0	3.3	-
7	0	0.1	1	11.3	-	7	0	0	0	22.5	-
8	0	0	0	7.5	-	8	0	0	0	7.8	-
9	0	0	0	10.5	-	9	0	0	0	10.4	-
10	0	0	0	5.3	0	10	0	0	0	4.5	0.75
11	0	0	0	11.7	-	11	0	0	0	2.1	-
12	0	0	0	9.9	-	12	0	0	0	8.3	-
13	0	0	0	6.5	-	13	0	0	0	17.5	-
14	0	0	0	7.4	-	14	0	0	0	19.5	-
15	0	0	0	14.2	-	15	0	0	0	1.8	-
16	0	0	0	28.1	-	16	0	0	0	10.2	-
17	0	0	0	8.5	-	17	0	0	0	15	-
18	0	0	0	6.2	-	18	0	0.1	1	25	-
19	0	0	0	2.5	-	19	0	0	0	24.5	-
20	0	0.1	1	5.1	0	20	0	0	0	26	0.25
21	0	0	0	13.1	-	21	0	0.3	1	25.5	-
22	0	0	0	13.6	-	22	0	0	0	2.7	-
23	0	0	0	9	-	23	0	0.3	1	27.2	-
24	0	0.1	1	7.2	-	24	0	0.1	1	8.5	-
25	0	0	0	6.9	-	25	0	0	0	6.2	-
26	0	0	0	4.1	-	26	0	0	0	10.9	-
27	0	0.1	1	8.1	-	27	0	0	0	11.5	-
28	0	0	0	36.4	-	28	0	0.2	1	17.8	-
29	0	0.1	1	7	-	29	0	0	0	3.6	-
30	0	0	0	16.4	0.25	30	0	0.3	1	40	0.25
31	0	0	0	7.1	-	31	0	0	0	20	-
32	0	0	0	4.8	-	32	0	0.1	1	14	-
33	0	0	0	10.5	-	33	0	0	0	7.3	-
34	0	0	0	11.2	-	34	0	0.2	1	14	-
35	0	0	0	9.1	-	35	0	0.1	1	12.5	-
36	0	0.2	1	16.2	-	36	0	0.4	1	20	-
37	0	0.1	1	10.8	-	37	0	0.5	1	18	-
38	0	0	0	6.5	-	38	0	0.5	1	9	-
39	0	0	0	3.8	-	39	0	0.5	1	13	-
40	0	0	0	9.8	0	40	0	0	0	3.5	0
41	0	0	0	8.8	-	41	0	0.3	1	33	-
42	0	0	0	9.9	-	42	0	0	0	15.5	-
43	0	0	0	8.4	-	43	0	0	0	9.1	-
44	0	0	0	25.2	-	44	0	0	0	11.2	-
45	0	0	0	11.1	-	45	0	0.2	1	14.8	-
46	0	0	0	9.7	-	46	0	0	0	13.5	-
47	0	0	0	10.5	-	47	0	0.6	1	36	-
48	0	0	0	20.1	-	48	0	0	0	5.5	-
49	0	0	0	10	-	49	0	0.1	1	12.3	-
50	0	0	0	20.1	0.25	50	0	0	0	13.5	0.5
51	0	0	0	11.9	-	51	0	0	0	14.5	-
52	0	0	0	9.2	-	52	0	0	0	2.2	-
53	0	0.1	1	9.6	-	53	0	0.1	1	18.2	-
54	0	0	0	8.1	-	54	0	0.1	1	18.2	-
55	0	0.1	1	9.3	-	55	0	0	0	5.8	-
56	0	0.2	1	10.1	-	56	0	0	0	7.8	-
57	0	0	0	22.4	-	57	0	0	0	24.5	-
58	0	0	0	11.4	-	58	0	0.1	1	9.3	-
59	0	0	0	7.1	-	59	0	0	0	7.3	-
60	0	0	0	13.6	0.25	60	0	0	0	3.8	0
61	0	0	0	8.9	-	61	0	0	0	1.9	-
62	0	0	0	7.5	-	62	0	0	0	7.2	-
63	0	0	0	9	-	63	0	0	0	0.5	-
64	0	0.1	1	10.2	-	64	0	0	0	8	-
65	0	0	0	9.6	-	65	0	0	0	14	-
66	0	0	0	10	-	66	0	0	0	23.5	-
67	0	0	0	7.1	-	67	0	0	0	12.6	-
68	0	0.1	1	20.4	-	68	0	0	0	6.3	-
69	0	0.2	1	43	-	69	0	0	0	5.2	-
70	0	0	0	4.4	0.25	70	0	0	0	10.2	0.75
71	0	0	0	9.4	-	71	0	0	0	8	-
72	0	0	0	8	-	72	0	0	0	4.2	-
73	0	0	0	10.1	-	73	0	0	0	10.4	-
74	0	0	0	7.5	-	74	0	0	0	5.5	-
75	0	0	0	1.1	-	75	0	0	0	6.1	-
76	0	0	0	8.1	-	76	0	0	0	7	-
77	0	0	0	7.6	-	77	0	0.3	1	45.5	-
78	0	0.3	1	1.1	-	78	0	0.1	1	9.5	-
79	0	0	0	13.1	-	79	0	0	0	1.7	-
80	0	0	0	7.6	0	80	0	0	0	5.9	0.25
81	0	0	0	5.4	-	81	0	0	0	2.8	-
82	0	0	0	5.9	-	82	0	0	0	1.1	-
83	0	0	0	1.6	-	83	0	0.2	1	8.5	-
84	0	0	0	10	-	84	0	0.1	1	11	-
85	0	0	0	12.2	-	85	0	0	0	13.5	-
86	0	0	0	18.6	-	86	0	0.5	1	20	-
87	0	0	0	9	-	87	0	0.1	1	12.5	-
88	0	0	0	6.1	-	88	0	0	0	12.5	-
89	0	0	0	6.1	-	89	0	0.2	1	25.5	-
90	0	0	0	12.4	0.25	90	0	0	0	8.8	0.25
91	0	0	0	10.2	-	91	0	0	0	4.1	-
92	0	0	0	5.5	-	92	0	0.1	1	11.5	-
93	0	0.1	1	11.2	-	93	0	0.2	1	18.2	-
94	0	0	0	13	-	94	0	0.3	1	34	-
95	0	0.2	1	20.2	-	95	0	0	0	4.1	-
96	0	0	0	10.6	-	96	0	0.3	1	75	-
97	0	0	0	9.8	-	97	0	0.3	1	9.5	-
98	0	0	0	4.9	-	98	0	0	0	5	-
99	0	0	0	6	-	99	0	0	0	4.2	-
100	0	0	0	5.9	0	100	0	0.4	1	19	0.5
Average Cic, Cip and Embed. =	0	0.03	0.18	10.6	0.13	Average Cic, Cip and Embed. =	0	0.09	0.34	13.0	0.35
Old Calcite Index (CI) =		0.18				Old Calcite Index (CI) =		0.34			
New Calcite Index (CI') =		0.03				New Calcite Index (CI') =		0.09			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_LIDCOM-1						RG_LI8-1					
13-Sep-21						11-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0	0	5.2	-	1	0	0	0	1.3	-
2	0	0	0	9.1	-	2	0	0.2	1	1.2	-
3	0	0	0	10.2	-	3	0	0.1	1	3.4	-
4	0	0	0	5.1	-	4	0	0	0	12.1	-
5	0	0.2	1	17.8	-	5	0	0.1	1	14.6	-
6	0	0	0	9.5	-	6	0	0	0	2.5	-
7	0	0.1	1	9.8	-	7	0	0	0	10.5	-
8	0	0	0	6.2	-	8	0	0.3	1	7.7	-
9	0	0	0	3.5	-	9	0	0.4	1	8.9	-
10	0	0	0	7.1	0	10	0	0.1	1	5.9	0
11	0	0	0	10.8	-	11	0	0.3	1	4.1	-
12	0	0	0	7.2	-	12	0	0	0	6.8	-
13	0	0.1	1	11	-	13	0	0	0	7.9	-
14	0	0	0	9.5	-	14	0	0	0	8.9	-
15	0	0	0	10.5	-	15	0	0.2	1	14.1	-
16	0	0	0	4.3	-	16	0	0.2	1	8.1	-
17	0	0	0	10.8	-	17	0	0	0	12.2	-
18	0	0	0	2.2	-	18	0	0.1	1	12.1	-
19	0	0	0	14.8	-	19	0	0	0	6.3	-
20	0	0	0	11.2	0	20	0	0	0	10	0.25
21	0	0	0	9.8	-	21	0	0.1	1	10.2	-
22	0	-	-	101	-	22	0	0.4	1	16.1	-
23	0	0	0	5	-	23	0	0.2	1	11.4	-
24	0	0.1	1	9.3	-	24	0	0.3	1	7.4	-
25	0	0	0	11.2	-	25	0	0.1	1	7.6	-
26	0	0	0	8.2	-	26	0	0.1	1	9.6	-
27	0	0	0	8.2	-	27	0	0.2	1	8.6	-
28	0	0	0	10.3	-	28	0	0.3	1	13.4	-
29	0	0	0	8.5	-	29	0	0.1	1	10.1	-
30	0	0	0	14.1	0	30	0	0.2	1	6.6	0.25
31	0	0	0	8.5	-	31	0	0.2	1	8.9	-
32	0	0	0	6.7	-	32	0	0.1	1	6	-
33	0	0.1	1	11.1	-	33	0	0.1	1	4.5	-
34	0	0.1	1	10.3	-	34	0	0.3	1	13.2	-
35	0	0	0	6.2	-	35	0	0.4	1	16.5	-
36	0	0	0	10.8	-	36	0	0.3	1	10.2	-
37	0	0	0	8.2	-	37	0	0.3	1	21.4	-
38	0	0	0	15.5	-	38	0	0.4	1	9.8	-
39	0	0	0	7.4	-	39	0	0.3	1	14.1	-
40	0	0	0	4.6	0	40	0	0.1	1	7.8	0.5
41	0	0	0	9.2	-	41	0	0.3	1	12.4	-
42	0	0	0	7.6	-	42	0	0.1	1	11	-
43	0	0	0	7.5	-	43	0	0.1	1	13.3	-
44	0	0	0	12.4	-	44	0	0.3	1	11.7	-
45	0	0	0	7.2	-	45	0	0.1	1	7	-
46	0	0	0	7.5	-	46	0	0.2	1	7.8	-
47	0	0.3	1	21.1	-	47	0	0.1	1	7.3	-
48	0	0.2	1	16.2	-	48	0	0.2	1	5.1	-
49	0	0	0	17.3	-	49	0	0.3	1	12.3	-
50	0	0	0	13.5	0	50	0	0.1	1	12.1	0.25
51	0	0	0	8.1	-	51	0	0.1	1	10.2	-
52	0	0.3	1	21.3	-	52	0	0.3	1	7.8	-
53	0	0	0	5.3	-	53	0	0.4	1	6.1	-
54	0	0	0	16.5	-	54	0	0.3	1	9.8	-
55	0	0	0	6.2	-	55	0	0.1	1	6.2	-
56	0	0	0	3.5	-	56	0	0.1	1	7.9	-
57	0	-	-	101	-	57	0	0.1	1	7.1	-
58	0	0	0	6.9	-	58	0	0.1	1	17.6	-
59	0	0	0	7.1	-	59	0	0.1	1	12.4	-
60	0	0	0	8.2	0	60	0	0	0	8.6	0
61	0	0	0	7.3	-	61	0	0.1	1	8.3	-
62	0	0.1	1	29.2	-	62	0	0.1	1	6.1	-
63	0	0	0	8.1	-	63	0	0.2	1	11.2	-
64	0	0	0	6.3	-	64	0	0.1	1	10.2	-
65	0	0	0	5.3	-	65	0	0.2	1	14.2	-
66	0	0.2	1	14.5	-	66	0	0.1	1	9.8	-
67	0	0	0	6.2	-	67	0	0.2	1	5.2	-
68	0	0	0	8.5	-	68	0	0.2	1	9.8	-
69	0	0	0	8.4	-	69	0	0	0	3	-
70	0	0	0	4.4	0.25	70	0	0	0	2.8	0
71	0	0	0	4.6	-	71	0	0.1	1	4.5	-
72	0	0	0	4.2	-	72	0	0	0	7.4	-
73	0	0	0	7.3	-	73	0	0	0	18.5	-
74	0	0.2	1	42.2	-	74	0	0.1	1	6.8	-
75	0	0.1	1	7.5	-	75	0	0	0	4.6	-
76	0	0	0	9.3	-	76	0	0	0	2.6	-
77	0	0	0	7.2	-	77	0	0	0	2.1	-
78	0	0	0	7.6	-	78	0	0.2	1	6.1	-
79	0	0.2	1	7.2	-	79	0	0.3	1	7.2	-
80	0	0	0	4.2	0	80	0	0.1	1	12.1	0.25
81	0	0	0	6.5	-	81	0	0	0	6.6	-
82	0	0	0	6.4	-	82	0	0.1	1	8.1	-
83	0	0	0	9.3	-	83	0	0	0	5.6	-
84	0	0	0	3.8	-	84	0	0	0	7.1	-
85	0	0	0	8.8	-	85	0	0.1	1	13.2	-
86	0	0	0	7.2	-	86	0	0.1	1	9.2	-
87	0	0.2	1	14.3	-	87	0	0.3	1	6.1	-
88	0	0	0	6.6	-	88	0	0.3	1	12.8	-
89	0	0	0	11.1	-	89	0	0.1	1	13.2	-
90	0	0	0	14.2	0	90	0	0.1	1	8.6	0.25
91	0	0	0	4.8	-	91	0	0.1	1	8.7	-
92	0	0	0	15.2	-	92	0	0	0	10.3	-
93	0	0	0	11.6	-	93	0	0.1	1	15.6	-
94	0	0	0	7.3	-	94	0	0	0	7	-
95	0	0	0	6.2	-	95	0	0	0	10.3	-
96	0	0	0	7.3	-	96	0	0	0	6.2	-
97	0	0	0	7.1	-	97	0	0.2	1	11.6	-
98	0	0.1	1	10.1	-	98	0	0.1	1	6.2	-
99	0	0	0	7.3	-	99	0	0.1	1	12.2	-
100	0	0	0	6.1	0.25	100	0	0.1	1	8.7	0
Average Cic, Cip and Embed. =	0	0.03	0.16	11.3	0.05	Average Cic, Cip and Embed. =	0	0.14	0.75	9.06	0.18
Old Calcite Index (CI) =		0.16				Old Calcite Index (CI) =		0.75			
New Calcite Index (CI') =		0.03				New Calcite Index (CI') =		0.14			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_LI8-2						RG_LI8-3					
11-Sep-21						11-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0	0	13	-	1	0	0.2	1	8.3	-
2	0	0.1	1	11.2	-	2	0	0	0	10.5	-
3	0	0.1	1	11.5	-	3	0	0	0	8.1	-
4	0	0	0	4.7	-	4	0	0	0	6.9	-
5	0	0	0	6.1	-	5	0	0	0	6.1	-
6	0	0	0	8.2	-	6	0	0	0	9.9	-
7	0	0	0	4.6	-	7	0	0	0	8.8	-
8	0	0	0	8.6	-	8	0	0	0	9.2	-
9	0	0	0	7.1	-	9	0	0.1	1	7.1	-
10	0	0	0	4.9	0.25	10	0	0	0	12.2	0
11	0	0.1	1	11.1	-	11	0	0	0	8.6	-
12	0	0	0	8.9	-	12	0	0.2	1	24.2	-
13	0	0	0	7.9	-	13	0	0.1	1	16.8	-
14	0	0.1	1	9.7	-	14	0	0	0	9.3	-
15	0	0.1	1	12.6	-	15	0	0	0	10.7	-
16	0	0	0	8.9	-	16	0	0	0	7.2	-
17	0	0	0	12.6	-	17	0	0	0	7.9	-
18	0	0.1	1	9.7	-	18	0	0.2	1	14.6	-
19	0	0	0	15.1	-	19	0	0	0	7.9	-
20	0	0	0	6.4	0	20	0	0.1	1	10.5	0.5
21	0	0	0	11.9	-	21	0	0.3	1	13.3	-
22	0	0	0	10.1	-	22	0	0	0	5.2	-
23	0	0	0	11.6	-	23	0	0	0	10.3	-
24	0	0	0	11	-	24	0	0.3	1	10.3	-
25	0	0	0	14.1	-	25	0	0.3	1	23.3	-
26	0	0	0	8.1	-	26	0	0	0	7.4	-
27	0	0	0	8.2	-	27	0	0.1	1	22.4	-
28	0	0	0	5.6	-	28	0	0	0	7.6	-
29	0	0	0	13.1	-	29	0	0	0	7.1	-
30	0	0	0	5	0.5	30	0	0.2	1	17.7	0.25
31	0	0	0	6.8	-	31	0	0	0	14.1	-
32	0	0.4	1	7.2	-	32	0	0	0	9.3	-
33	0	0.1	1	11.4	-	33	0	0	0	10.2	-
34	0	0	0	7.5	-	34	0	0	0	9.3	-
35	0	0.1	1	7.8	-	35	0	0	0	4.7	-
36	0	-	-	101	-	36	0	0	0	9.4	-
37	0	0	0	8.4	-	37	0	0	0	11.7	-
38	0	0	0	16.5	-	38	0	0	0	10.4	-
39	0	0	0	7.5	-	39	0	-	-	101	-
40	0	0.4	1	15.2	0.25	40	0	0	0	9.9	-
41	0	0	0	10.2	-	41	0	0	0	7.9	0
42	0	0	0	7.1	-	42	0	0.1	1	26.6	-
43	0	0.1	1	9.2	-	43	0	0	0	10.6	-
44	0	0	0	7	-	44	0	0	0	8	-
45	0	0	0	5.8	-	45	0	0	0	7.2	-
46	0	0	0	12.6	-	46	0	0	0	10.8	-
47	0	0	0	8.9	-	47	0	0	0	25.4	-
48	0	0	0	11.6	-	48	0	0	0	10.9	-
49	0	0	0	8.4	-	49	0	0.4	1	9.2	-
50	0	0.1	1	10.6	0.5	50	0	0	0	9.3	0
51	0	0.1	1	9.5	-	51	0	0	0	7.6	-
52	0	0	0	9.1	-	52	0	0	0	13.3	-
53	0	0	0	5.6	-	53	0	0	0	9.2	-
54	0	0	0	7.8	-	54	0	0	0	10.2	-
55	0	0	0	10	-	55	0	0	0	9.8	-
56	0	0.1	1	7.2	-	56	0	0	0	12.5	-
57	0	0	0	12.1	-	57	0	0	0	4.2	-
58	0	0	0	10.2	-	58	0	0	0	13.8	-
59	0	0	0	12.2	-	59	0	0	0	15.5	-
60	0	0	0	9.8	0.5	60	0	0	0	10	0
61	0	0	0	8.2	-	61	0	0	0	5.6	-
62	0	0	0	6.4	-	62	0	0	0	10.9	-
63	0	0	0	11.4	-	63	0	0	0	8.8	-
64	0	0	0	12.1	-	64	0	0	0	10.4	-
65	0	0	0	9.3	-	65	0	0	0	12.6	-
66	0	0	0	21.4	-	66	0	0	0	13.1	-
67	0	0	0	7.2	-	67	0	0	0	11	-
68	0	0	0	6.8	-	68	0	0	0	12.2	-
69	0	0	0	11.6	-	69	0	0	0	9.7	-
70	0	0.1	1	9.8	0	70	0	0	0	5	0
71	0	0	0	10.4	-	71	0	0	0	1.8	-
72	0	-	-	101	-	72	0	0	0	13.1	-
73	0	0.2	1	8.9	-	73	0	0	0	5.8	-
74	0	0.4	1	5.8	-	74	0	0	0	10.5	-
75	0	0.1	1	6	-	75	0	0	0	11.2	-
76	0	0.1	1	12.1	-	76	0	0	0	5.3	-
77	0	0.4	1	11.2	-	77	0	0	0	8.2	-
78	0	0	0	6.8	-	78	0	0	0	11.4	-
79	0	0	0	16.6	-	79	0	0	0	10.7	-
80	0	0	0	10	0	80	0	0	0	6.1	-
81	0	0.3	1	18.2	-	81	0	0	0	10.4	-
82	0	0	0	9.6	-	82	0	0	0	9.9	-
83	0	0	0	8.7	-	83	0	0	0	4.9	-
84	0	0.1	1	10.8	-	84	0	0	0	0.8	-
85	0	0	0	7.4	-	85	0	0	0	6.2	-
86	0	0.4	1	10.4	-	86	0	0	0	12.7	-
87	0	0	0	10.8	-	87	0	0.1	1	9.4	-
88	0	0.4	1	8	-	88	0	0.3	1	17.4	-
89	0	0.5	1	9.8	-	89	0	0	0	15.1	-
90	0	0.2	1	14.2	0.5	90	0	0	0	6.2	0.25
91	0	0.1	1	6	-	91	0	0.4	1	10.7	-
92	0	-	-	101	-	92	0	0.2	1	22.3	-
93	0	0	0	5.5	-	93	0	0	0	11.3	-
94	0	0	0	10.1	-	94	0	0.4	1	17.2	-
95	0	0.1	1	9.2	-	95	0	0	0	12.8	-
96	0	0	0	10.4	-	96	0	0	0	4.8	-
97	0	0	0	9.7	-	97	0	0	0	2.5	-
98	0	0	0	12.2	-	98	0	0	0	9.2	-
99	0	0	0	7.7	-	99	0	0	0	7.8	-
100	0	0	0	8.7	0.5	100	0	0	0	14.6	0
Average Cic, Cip and Embed. =	0	0.06	0.29	12.4	0.30	Average Cic, Cip and Embed. =	0	0.04	0.18	11.4	0.11
Old Calcite Index (CI) =		0.29				Old Calcite Index (CI) =		0.18			
New Calcite Index (CI') =		0.06				New Calcite Index (CI') =		0.04			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_FRUL-1						RG_FRUL-2					
12-Sep-21						12-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0	0	1.9	-	1	0	0	0	7.5	-
2	0	0	0	2.8	-	2	0	0	0	1.3	-
3	0	0	0	2.2	-	3	0	0	0	2.8	-
4	0	0	0	2.4	-	4	0	0	0	6.3	-
5	0	0	0	5.3	-	5	0	0	0	9	-
6	0	0	0	3	-	6	0	0	0	2.5	-
7	0	0	0	3.4	-	7	0	0	0	21	-
8	0	0	0	2.1	-	8	0	0	0	21.5	-
9	0	0	0	4.1	-	9	0	0	0	5.5	-
10	0	0	0	4.4	0	10	0	0	0	34	0.75
11	0	0	0	5.5	-	11	0	0	0	25	-
12	0	0	0	4.6	-	12	0	0	0	9.2	-
13	0	0	0	7.2	-	13	0	0	0	6.8	-
14	0	0	0	3	-	14	0	0	0	2.6	-
15	0	0	0	9.2	-	15	0	0	0	6.3	-
16	0	0	0	6.6	-	16	0	0	0	2	-
17	0	0	0	5.2	-	17	0	0	0	5	-
18	0	0	0	4	-	18	0	0	0	32	-
19	0	0	0	7	-	19	0	0	0	15.8	-
20	0	0	0	4.5	0.5	20	0	0	0	0.2	1
21	0	0	0	6.1	-	21	0	0	0	5	-
22	0	0	0	4.5	-	22	0	0	0	11.5	-
23	0	0	0	7.3	-	23	0	0	0	3	-
24	0	0	0	7.4	-	24	0	0	0	10.5	-
25	0	0	0	7.3	-	25	0	0	0	10	-
26	0	0	0	10.4	-	26	0	0	0	6.2	-
27	0	0	0	2.4	-	27	0	0	0	15	-
28	0	0	0	7.3	-	28	0	0	0	14	-
29	0	0	0	10.4	-	29	0	0	0	7	-
30	0	0	0	7.5	0.25	30	0	0	0	23.5	0.25
31	0	0	0	2.2	-	31	0	0	0	11.2	-
32	0	0	0	5.4	-	32	0	0	0	2.6	-
33	0	0.1	1	11	-	33	0	0	0	4.5	-
34	0	0	0	3.7	-	34	-	-	-	-	-
35	0	0	0	9.8	-	35	0	0	0	6.2	-
36	0	0	0	15	-	36	0	0	0	3.7	-
37	0	0	0	9.6	-	37	0	0	0	4.8	-
38	0	0	0	12	-	38	0	0	0	4.6	-
39	0	0	0	9.5	-	39	0	0	0	4	-
40	0	0	0	4.6	0	40	0	0	0	24.5	0.75
41	0	0	0	38	-	41	0	0	0	4.2	-
42	0	0	0	5.2	-	42	0	0	0	6.7	-
43	0	0	0	5.7	-	43	0	0	0	9.5	-
44	0	0	0	14.2	-	44	0	0	0	5.7	-
45	0	0	0	7.1	-	45	0	0	0	12	-
46	0	0	0	5.3	-	46	0	0	0	17.5	-
47	0	0	0	4.4	-	47	0	0	0	11	-
48	0	0	0	6.1	-	48	0	0	0	5	-
49	0	0	0	3	-	49	0	0	0	5.8	-
50	0	0	0	13	0	50	0	0	0	20	0.75
51	0	0	0	6	-	51	0	0	0	5.3	-
52	0	0	0	2.6	-	52	0	0	0	14.5	-
53	0	0	0	2.1	-	53	0	0	0	5	-
54	0	0	0	0.8	-	54	0	0	0	5.6	-
55	0	0	0	2	-	55	0	0	0	3	-
56	0	0	0	3.6	-	56	0	0	0	3.5	-
57	0	0	0	10.5	-	57	0	0	0	1.9	-
58	0	0	0	6.1	-	58	0	0	0	6.2	-
59	0	0	0	2.6	-	59	0	0	0	7.8	-
60	0	0	0	5.5	-	60	0	0	0	2.5	0
61	0	0	0	0.7	-	61	0	0	0	7.1	-
62	0	0	0	8.7	0	62	0	0	0	7.5	-
63	0	0.2	1	9.3	-	63	0	0	0	7.8	-
64	0	0	0	3.1	-	64	0	0	0	5.2	-
65	0	0	0	5	-	65	0	0	0	3.4	-
66	0	0	0	1.4	-	66	0	0	0	3.2	-
67	0	0	0	5.9	-	67	0	0	0	27.5	-
68	0	0	0	4	-	68	0	0	0	4.8	-
69	0	0	0	12.4	-	69	0	0	0	10.5	-
70	0	0	0	13.6	0	70	0	0	0	5	0.5
71	0	0	0	4.8	-	71	0	0	0	11.3	-
72	0	0	0	11.7	-	72	0	0	0	7	-
73	0	0	0	5.6	-	73	0	0	0	6.4	-
74	0	0	0	4.7	-	74	0	0	0	8	-
75	0	0	0	9.7	-	75	0	0	0	8.5	-
76	0	0	0	4.1	-	76	0	0	0	1.8	-
77	0	0	0	7.6	-	77	0	0	0	8	-
78	0	0	0	0.8	-	78	0	0	0	14.5	-
79	0	0	0	9.6	-	79	0	0	0	17.4	-
80	0	0	0	7.1	0.5	80	0	0	0	5	0
81	0	0	0	15.3	-	81	0	0	0	9.4	-
82	0	0	0	10	-	82	0	0	0	9.3	-
83	0	0	0	6.2	-	83	0	0	0	15.2	-
84	0	0	0	2.9	-	84	0	0	0	7.4	-
85	0	0	0	15.1	-	85	0	0	0	7.3	-
86	0	0	0	4.1	-	86	0	0	0	5	-
87	0	0	0	9.6	-	87	0	0	0	13.5	-
88	0	0	0	13.8	-	88	0	0	0	13.2	-
89	0	0	0	2.1	-	89	0	0	0	11.5	-
90	0	0	0	9.2	0.75	90	0	0	0	1.9	0.5
91	0	0	0	5.4	-	91	0	0	0	0.8	-
92	0	0	0	9.9	-	92	0	0	0	1.1	-
93	0	0	0	3.1	-	93	0	0	0	5	-
94	0	0	0	6.8	-	94	0	0	0	11.3	-
95	0	0	0	10.1	-	95	0	0	0	5	-
96	0	0	0	12.2	-	96	0	0	0	4.8	-
97	0	0	0	6	-	97	0	0	0	4.9	-
98	0	0	0	3.5	-	98	0	0	0	11.1	-
99	0	0	0	3.2	-	99	0	0	0	5.8	-
100	0	0	0	7.2	0	100	0	0	0	6.4	-
Average Cic, Cip and Embed. =	0	0	0.02	6.71	0.20	Average Cic, Cip and Embed. =	0	0	0	8.69	0.50
Old Calcite Index (CI) =		0.02				Old Calcite Index (CI) =		0			
New Calcite Index (CI') =		0				New Calcite Index (CI') =		0			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_FRUL-3						RG_FO23-1					
12-Sep-21						12-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0	0	8.1	-	1	0	1	1	20	-
2	0	0	0	3.7	-	2	0	0.1	1	15.2	-
3	0	0	0	4.5	-	3	0	0.2	1	20.4	-
4	0	0	0	5	-	4	0	0.1	1	9.4	-
5	0	0	0	3.9	-	5	0	0.3	1	5.6	-
6	0	0	0	2.4	-	6	0	0	0	7.2	-
7	0	0	0	9.8	-	7	0	0.1	1	4.9	-
8	0	0	0	0.2	-	8	0	0.1	1	9.5	-
9	0	0	0	5.4	-	9	0	0.5	1	8.7	-
10	0	0	0	9.4	0	10	0	0.5	1	11.3	0.5
11	0	0	0	27	-	11	0	0.2	1	10.8	-
12	0	0	0	7.9	-	12	0	0.1	1	10.7	-
13	0	0	0	3.9	-	13	0	0.2	1	7.8	-
14	0	0	0	13.9	-	14	0	0.6	1	9.1	-
15	0	0	0	7.2	-	15	0	0	0	8.9	-
16	0	0	0	12.5	-	16	0	0.4	1	5.4	-
17	0	0	0	11.2	-	17	0	0.1	1	6.8	-
18	0	0	0	36.5	-	18	0	0.2	1	29.2	-
19	0	0	0	3.7	-	19	0	0	0	17.1	-
20	0	0	0	15.2	0.25	20	0	0.7	1	8.9	0.25
21	0	0	0	2.2	-	21	0	0.1	1	9.8	-
22	0	0	0	12.2	-	22	0	0.3	1	12.7	-
23	0	0	0	10.8	-	23	0	0.1	1	10.8	-
24	0	0	0	4.5	-	24	0	0.2	1	8.2	-
25	0	0	0	12	-	25	0	0.1	1	7.5	-
26	0	0	0	18.4	-	26	0	0	0	8.9	-
27	0	0	0	28	-	27	0	0.1	1	8.8	-
28	0	0	0	5.8	-	28	0	0.2	1	12.5	-
29	0	0	0	24	-	29	0	0.1	1	8.4	-
30	0	0	0	16.5	0.25	30	0	0.3	1	8.4	0
31	0	0	0	28	-	31	0	0.2	1	6.8	-
32	0	0	0	13.5	-	32	0	0.3	1	10.7	-
33	0	0	0	25	-	33	0	0.1	1	9.5	-
34	0	0	0	25	-	34	0	0	0	4.1	-
35	0	0	0	9.6	-	35	0	0.1	1	10.5	-
36	0	0	0	10.5	-	36	0	0.1	1	6.4	-
37	0	0	0	8.5	-	37	0	0.1	1	9.7	-
38	0	0	0	9.6	-	38	0	0.1	1	11.4	-
39	0	0	0	7	-	39	0	0.4	1	13.3	-
40	0	0	0	7.2	0	40	0	0.1	1	7.2	0.25
41	0	0	0	3.4	-	41	0	0	0	6.7	-
42	0	0	0	4	-	42	0	0.1	1	6.5	-
43	0	0	0	3	-	43	0	0.1	1	7.4	-
44	0	0	0	12.8	-	44	0	0.1	1	6.2	-
45	0	0	0	4.3	-	45	0	0.2	1	7.3	-
46	0	0	0	15	-	46	0	0	0	6.4	-
47	0	0	0	10.5	-	47	0	0.6	1	22.7	-
48	0	0	0	16.5	-	48	0	0.1	1	7.5	-
49	0	0	0	4.3	-	49	0	0.2	1	8.7	-
50	0	0	0	6.9	0.25	50	0	0	0	7.8	0
51	0	0	0	7.4	-	51	0	0.4	1	12.4	-
52	0	0	0	7.4	-	52	0	0.1	1	13.8	-
53	0	0	0	1.6	-	53	0	0.3	1	11.7	-
54	0	0	0	7.8	-	54	0	0.3	1	11.2	-
55	0	0	0	4.6	-	55	0	0.4	1	6.3	-
56	0	0	0	26.5	-	56	0	0.3	1	14.4	-
57	0	0	0	12.6	-	57	0	0.1	1	8.1	-
58	0	0	0	26.5	-	58	0	0.2	1	9.3	-
59	0	0	0	9	-	59	0	0	0	9.6	-
60	0	0	0	16.5	0.25	60	0	0.1	1	11.2	0.25
61	0	0	0	7.6	-	61	0	0	0	10.1	-
62	0	0	0	5.5	-	62	0	0.1	1	13.1	-
63	0	0	0	15.5	-	63	0	0.2	1	14.5	-
64	0	0	0	12.1	-	64	0	0	0	11.2	-
65	0	0	0	2.4	-	65	0	0	0	6.7	-
66	0	0	0	12	-	66	0	0.1	1	7.1	-
67	0	0	0	0.3	-	67	0	0	0	6.2	-
68	0	0	0	5.8	-	68	0	0.2	1	12.8	-
69	0	0	0	12	-	69	0	0	0	8.1	-
70	0	0	0	19	0.25	70	0	0.1	1	9.2	0.25
71	0	0	0	12	-	71	0	0.1	1	8.9	-
72	0	0	0	18	-	72	0	0.1	1	10.8	-
73	0	0	0	8	-	73	0	0	0	6.1	-
74	0	0	0	15.2	-	74	0	0.1	1	11.5	-
75	0	0	0	4	-	75	0	0.1	1	5.4	-
76	0	0	0	14	-	76	0	0.1	1	8.2	-
77	0	0	0	9.5	-	77	0	0	0	11.9	-
78	0	0	0	5.3	-	78	0	0.2	1	3.5	-
79	0	0	0	7.3	-	79	0	0.3	1	6.8	-
80	0	0	0	13.3	0.25	80	0	0.1	1	8.5	0.5
81	0	0	0	5.5	-	81	0	0.1	1	6.3	-
82	0	0	0	12.3	-	82	0	0.2	1	15	-
83	0	0	0	16.1	-	83	0	0	0	8.1	-
84	0	0	0	25.5	-	84	0	0.1	1	13.5	-
85	0	0	0	20.3	-	85	0	0.1	1	6.6	-
86	0	0	0	3	-	86	0	0.1	1	9.1	-
87	0	0	0	5.6	-	87	0	0.1	1	6.5	-
88	0	0	0	1.6	-	88	0	0	0	7.2	-
89	0	0	0	5.2	-	89	0	0.1	1	9.5	-
90	0	0	0	38	0.5	90	0	0.1	1	10.7	0.75
91	0	0	0	7	-	91	0	0.2	1	9.1	-
92	0	0	0	4.6	-	92	0	0.1	1	7.6	-
93	0	0	0	4.5	-	93	0	0.1	1	11.5	-
94	0	0	0	7.3	-	94	0	0.1	1	4.6	-
95	0	0	0	14.1	-	95	0	0.3	1	10	-
96	0	0	0	9.2	-	96	0	0	0	8.7	-
97	0	0	0	29	-	97	0	0.1	1	13.5	-
98	0	0	0	16	-	98	0	0.1	1	3.8	-
99	0	0	0	10.1	-	99	0	0.1	1	8	-
100	0	0	0	6.6	0.5	100	0	0.1	1	4.3	0.5
Average Cic, Cip and Embed. =	0	0	0	11.1	0.25	Average Cic, Cip and Embed. =	0	0.16	0.81	9.62	0.33
Old Calcite Index (CI) =		0				Old Calcite Index (CI) =		0.81			
New Calcite Index (CI') =		0				New Calcite Index (CI') =		0.16			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_FO23-2						RG_FO23-3					
12-Sep-21						12-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0.4	1	8.1	-	1	0	0	0	5.8	-
2	0	0	0	8.1	-	2	0	0	0	8.3	-
3	0	0.1	1	7.8	-	3	0	0	0	9.2	-
4	0	0.1	1	5.7	-	4	0	0.1	1	9.6	-
5	0	0.2	1	5.3	-	5	0	0	0	7.1	-
6	0	0.1	1	9.2	-	6	0	0	0	10.7	-
7	0	0.1	1	9.8	-	7	0	0	0	9.7	-
8	0	0.1	1	9	-	8	0	0.1	1	16.3	-
9	0	0.1	1	9.8	-	9	0	0.1	1	6.4	-
10	0	0.1	1	10.1	0	10	0	0.2	1	11.4	0.25
11	0	0	0	12.1	-	11	0	0	0	8.9	-
12	0	0.1	1	7.1	-	12	0	0	0	7.7	-
13	0	0	0	7.3	-	13	0	0.1	1	5.6	-
14	0	0	0	7.6	-	14	0	0	0	6.8	-
15	0	0	0	8.9	-	15	0	0	0	8.3	-
16	0	0	0	10.5	-	16	0	0.3	1	6.8	-
17	0	0.1	1	9.8	-	17	0	0	0	7.4	-
18	0	0.1	1	13.1	-	18	0	0.1	1	11.5	-
19	0	0.1	1	11.4	-	19	0	0	0	9	-
20	0	0.4	1	11.8	0.5	20	0	0	0	1.6	0
21	0	0.1	1	13	-	21	0	0	0	5.3	-
22	0	0	0	14.6	-	22	0	0	0	5.1	-
23	0	0.1	1	16.2	-	23	0	0	0	8.6	-
24	0	0.1	1	11.6	-	24	0	0.2	1	9.8	-
25	0	0.1	1	10.1	-	25	0	0	0	6.3	-
26	0	0	0	8.6	-	26	0	0.5	1	15.5	-
27	0	0.1	1	5.8	-	27	0	0	0	1.7	-
28	0	0.1	1	7.1	-	28	0	0	0	0.5	-
29	0	0	0	6.1	-	29	0	0	0	1	-
30	0	0.1	1	13	0.25	30	0	0	0	3.4	0.5
31	0	0.1	1	9.5	-	31	0	0	0	0.5	-
32	0	0	0	10.6	-	32	0	0.1	1	12.7	-
33	0	0.1	1	7.6	-	33	0	0	0	5.9	-
34	0	0.1	1	9.1	-	34	0	0	0	7.8	-
35	0	0.1	1	10	-	35	0	0	0	5.6	-
36	0	0.1	1	6.5	-	36	0	0.1	1	6.7	-
37	0	0.1	1	8.2	-	37	0	0.1	1	7.1	-
38	0	0	0	10.8	-	38	0	0.2	1	8.4	-
39	0	0.1	1	5.3	-	39	0	0	0	6.3	-
40	0	0.1	1	9.7	0	40	0	0.2	1	24.8	0.25
41	0	0	0	9.2	-	41	0	0.1	1	14.4	-
42	0	0.1	1	7.2	-	42	0	0	0	2.7	-
43	0	0	0	9.7	-	43	0	0	0	10.6	-
44	0	0	0	29.2	-	44	0	0.1	1	15.1	-
45	0	0.1	1	11.8	-	45	0	0.1	1	22.5	-
46	0	0	0	6.1	-	46	0	0.2	1	13.1	-
47	0	0	0	5.2	-	47	0	0	0	5.4	-
48	0	0	0	7.2	-	48	0	0	0	4.2	-
49	0	0.1	1	8.3	-	49	0	0	0	2.5	-
50	0	0.1	1	8.7	0.25	50	0	0.1	1	7.4	0
51	0	0.2	1	14.8	-	51	0	0	0	10.5	-
52	0	0.1	1	9.1	-	52	0	0.1	1	11.3	-
53	0	0.1	1	13.6	-	53	0	0	0	5.4	-
54	0	0.1	1	11.1	-	54	0	0.2	1	4.8	-
55	0	0	0	9.2	-	55	0	0.1	1	12.1	-
56	0	0	0	9.5	-	56	0	0	0	4.9	-
57	0	0	0	8.9	-	57	0	0	0	10.8	-
58	0	0.2	1	10.1	-	58	0	0	0	9.4	-
59	0	0.1	1	7.9	-	59	0	0.1	1	2.7	-
60	0	0	0	12	0.25	60	0	0	0	2.1	0.25
61	0	0	0	10.6	-	61	0	0	0	2.8	-
62	0	0	0	12.2	-	62	0	0	0	1.7	-
63	0	0	0	15.6	-	63	0	0	0	0.6	-
64	0	0	0	9.1	-	64	0	0	0	2.3	-
65	0	0	0	14.2	-	65	0	0	0	5.4	-
66	0	0.1	1	15.1	-	66	0	0	0	19.1	-
67	0	0	0	11.6	-	67	0	0	0	7.9	-
68	0	0.1	1	12.2	-	68	0	0	0	4.6	-
69	0	0	0	15.9	-	69	0	0	0	6.8	-
70	0	0	0	12.5	0	70	0	0	0	7.9	0.5
71	0	0.1	1	8.4	-	71	0	0	0	3.4	-
72	0	0.2	1	12.8	-	72	0	0	0	2.8	-
73	0	0	0	8.1	-	73	0	0	0	6.9	-
74	0	0	0	9.2	-	74	0	0.1	1	7.7	-
75	0	0	0	8.8	-	75	0	0	0	4.1	-
76	0	0.1	1	18.3	-	76	0	0	0	5.2	-
77	0	0.1	1	30.3	-	77	0	0	0	3.9	-
78	0	0.1	1	11.3	-	78	0	0	0	3.1	-
79	0	0.2	1	12.8	-	79	0	0	0	8.2	-
80	0	0.1	1	11.5	0.25	80	0	0	0	8.5	0
81	0	0.2	1	12.2	-	81	0	0	0	10.4	-
82	0	0.1	1	11.4	-	82	0	0	0	2.8	-
83	0	0	0	6.6	-	83	0	0	0	2.1	-
84	0	0	0	7.4	-	84	0	0	0	9.9	-
85	0	0	0	12.5	-	85	0	0.1	1	7.5	-
86	0	0.1	1	15	-	86	0	0.2	1	2.2	-
87	0	0.2	1	11.5	-	87	0	0	0	3.1	-
88	0	0	0	11.1	-	88	0	0	0	11.2	-
89	0	0	0	11.3	-	89	0	0	0	10.1	-
90	0	0	0	5.5	0	90	0	0	0	5.6	0.25
91	0	0	0	10	-	91	0	0	0	1.7	-
92	0	0.1	1	9.4	-	92	0	0	0	1.2	-
93	0	0.1	1	7	-	93	0	0	0	5.3	-
94	0	0	0	9	-	94	0	0.2	1	8.1	-
95	0	0.1	1	12.8	-	95	0	0.1	1	4.2	-
96	0	0	0	4.2	-	96	0	0	0	4.8	-
97	0	0.2	1	19.5	-	97	0	0	0	5.7	-
98	0	0.1	1	11.2	-	98	0	0.1	1	14.2	-
99	0	0.1	1	10.8	-	99	0	0	0	3.9	-
100	0	0.1	1	9.4	0	100	0	0	0	5.4	0.5
Average Cic, Cip and Embed. =	0	0.07	0.59	10.5	0.15	Average Cic, Cip and Embed. =	0	0.04	0.29	7.15	0.25
Old Calcite Index (CI) =		0.59				Old Calcite Index (CI) =		0.29			
New Calcite Index (CI') =		0.07				New Calcite Index (CI') =		0.04			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.2: Pebble Counts and Calcite Measurements at Areas in Line Creek and Fording River, September 2021

RG_FO23-4						RG_FO23-5					
12-Sep-21						12-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embeddedness (%)
1	0	0	0	6.3	-	1	0	0	0	5	-
2	0	0	0	8.1	-	2	0	0	0	2.6	-
3	0	0	0	4.5	-	3	0	0	0	5.2	-
4	0	0	0	5.2	-	4	0	0	0	2.9	-
5	0	0.1	1	5.9	-	5	0	0	0	5.4	-
6	0	0	0	5.8	-	6	0	0	0	8.6	-
7	0	0	0	4.5	-	7	0	0	0	4.9	-
8	0	0	0	10.5	-	8	0	0.1	1	15.2	-
9	0	0.1	1	7.5	-	9	0	0	0	6	-
10	0	0.1	1	11.6	0	10	0	1	1	6.9	0
11	0	0	0	4.8	-	11	0	0.1	1	9.2	-
12	0	0.1	1	12	-	12	0	0	0	5.8	-
13	0	0.1	1	7.5	-	13	0	0	0	12.6	-
14	0	0	0	7	-	14	0	0	0	12.3	-
15	0	0	0	5.1	-	15	0	0	0	7.4	-
16	0	0.1	1	10.6	-	16	0	0.2	1	9.2	-
17	0	0	0	12.2	-	17	0	0	0	8.6	-
18	0	0	0	10.5	-	18	0	0	0	12.1	-
19	0	0	0	4.1	-	19	0	0	0	9.1	-
20	0	0	0	9.3	0	20	0	0	0	8	0.5
21	0	0.2	1	12	-	21	0	0.1	1	9.3	-
22	0	0.1	1	9.1	-	22	0	0.1	1	5.8	-
23	0	0	0	3.1	-	23	0	0.1	1	4.1	-
24	0	0	0	4.1	-	24	0	0.1	1	6.5	-
25	0	0	0	10.2	-	25	0	0	0	5.2	-
26	0	0	0	12	-	26	0	0	0	9.1	-
27	0	0	0	6.4	-	27	0	0.1	1	10.3	-
28	0	0	0	5.2	-	28	0	0.1	1	8.2	-
29	0	0	0	4.1	-	29	0	0	0	7.2	-
30	0	0	0	7.3	0	30	0	0.2	1	19.6	0.25
31	0	0.1	1	14.5	-	31	0	0	0	1.5	-
32	0	0	0	10.2	-	32	0	0.1	1	5.1	-
33	0	0.1	1	8.5	-	33	0	0.1	1	17.8	-
34	0	0	0	9.4	-	34	0	0	0	12.6	-
35	0	0.2	1	13.2	-	35	0	0	0	6.2	-
36	0	0	0	7.1	-	36	0	0	0	8.3	-
37	0	0.1	1	13.9	-	37	0	0.1	1	8.3	-
38	0	0	0	10.8	-	38	0	0	0	11	-
39	0	0	0	4.6	-	39	0	0	0	8.5	-
40	0	0	0	4.6	0.25	40	0	0	0	10.6	0
41	0	0	0	9.6	-	41	0	0	0	14.2	-
42	0	0	0	8.2	-	42	0	0	0	5.8	-
43	0	0	0	10	-	43	0	0.1	1	8.1	-
44	0	0	0	15.5	-	44	0	0.1	1	7.6	-
45	0	0	0	10.6	-	45	0	0	0	7.9	-
46	0	0.1	1	5.7	-	46	0	0	0	9.5	-
47	0	0.1	1	11.2	-	47	0	0.1	1	9.6	-
48	0	0.1	1	9.1	-	48	0	0	0	14.1	-
49	0	0.1	1	3.1	-	49	0	0	0	7.8	-
50	0	0	0	9.8	0	50	0	0.1	1	14.2	0.5
51	0	0.1	1	4.1	-	51	0	0	0	7.5	-
52	0	0	0	6.1	-	52	0	0.1	1	20.2	-
53	0	0	0	19.4	-	53	0	0.1	1	9.6	-
54	0	0	0	7.2	-	54	0	0.1	1	7.5	-
55	0	0	0	7.7	-	55	0	0	0	9.1	-
56	0	0	0	8.2	-	56	0	0.1	1	6	-
57	0	0.1	1	5.4	-	57	0	0	0	6.5	-
58	0	0	0	21.5	-	58	0	0	0	8.9	-
59	0	0	0	3.5	-	59	0	0.1	1	9.9	-
60	0	0.1	1	10.2	0	60	0	0	0	4.2	0.25
61	0	0	0	5.3	-	61	0	0.1	1	13.5	-
62	0	0.1	1	6.5	-	62	0	0	0	12	-
63	0	0.1	1	3.2	-	63	0	0.1	1	4.8	-
64	0	0.1	1	8.5	-	64	0	0.1	1	13	-
65	0	0	0	7.2	-	65	0	0.1	1	10.6	-
66	0	0.1	1	5.6	-	66	0	0.1	1	7.6	-
67	0	0	0	3.6	-	67	0	0	0	4.2	-
68	0	0	0	7.6	-	68	0	0	0	4.7	-
69	0	0	0	2.1	-	69	0	0	0	24	-
70	0	0	0	10.2	0	70	0	0.1	1	11.6	0.5
71	0	0	0	2.9	-	71	0	0.1	1	8.1	-
72	0	0	0	1.1	-	72	0	0.1	1	10.1	-
73	0	0.1	1	4.5	-	73	0	0	0	38.1	-
74	0	0	0	0.7	-	74	0	0	0	7.5	-
75	0	0.1	1	10.6	-	75	0	0	0	6.2	-
76	0	0	0	1.2	-	76	0	0	0	9	-
77	0	0.1	1	9.7	-	77	0	0	0	9.5	-
78	0	0.1	1	13.8	-	78	0	0.2	1	7	-
79	0	0	0	7.1	-	79	0	0	0	6.1	-
80	0	0	0	8.7	0.25	80	0	0.1	1	8.9	0.75
81	0	0.1	1	8.1	-	81	0	0	0	24.3	-
82	0	0	0	5.1	-	82	0	0	0	6.1	-
83	0	0	0	8.2	-	83	0	0.1	1	10.2	-
84	0	0	0	7.5	-	84	0	0.1	1	7.5	-
85	0	0.2	1	5.3	-	85	0	0	0	15.2	-
86	0	0	0	16.4	-	86	0	0	0	5.7	-
87	0	0	0	9.7	-	87	0	0	0	8.2	-
88	0	0.1	1	3.2	-	88	0	0	0	7.3	-
89	0	0	0	7	-	89	0	0.1	1	12.7	-
90	0	0	0	3.5	0.25	90	0	0	0	11.5	0.25
91	0	0	0	4.8	-	91	0	0.2	1	15	-
92	0	0.1	1	27.6	-	92	0	0	0	5.6	-
93	0	0	0	4.8	-	93	0	0.1	1	12.1	-
94	0	0	0	5.4	-	94	0	0	0	5.2	-
95	0	0	0	5	-	95	0	0	0	11.6	-
96	0	0.1	1	7.6	-	96	0	0	0	19.5	-
97	0	0	0	7.9	-	97	0	0.1	1	10.5	-
98	0	0	0	8.1	-	98	0	0	0	9.1	-
99	0	0	0	37	-	99	0	0.1	1	9.2	-
100	0	0	0	9.2	0	100	0	0	0	15.9	0.25
Average Cic, Cip and Embed. =	0	0.04	0.32	8.21	0.08	Average Cic, Cip and Embed. =	0	0.05	0.40	9.59	0.33
Old Calcite Index (CI) =		0.32				Old Calcite Index (CI) =		0.40			
New Calcite Index (CI') =		0.04				New Calcite Index (CI') =		0.05			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Cic = calcite index concretion. Cip = calcite index

Table F.3: Hess Sample Depth and Flow Information at Areas in Line Creek and Fording River, September 2021

Area	Replicate	Date	Associated K&S Sample	Easting	Northing	Depth (cm)	Flow (m/s)
RG_LI24	1	16-Sep-21	1	662080	5538365	14	0.340
RG_LI24	2	16-Sep-21	2	662107	5538285	14	0.445
RG_LI24	3	16-Sep-21	3	662180	5538403	11	0.345
RG_LI24	4	16-Sep-21	4	662202	5538389	23	0.343
RG_LI24	5	16-Sep-21	5	662223	5538431	20	0.383
RG_SLINE	1	15-Sep-21	1	661080	5531418	19	0.343
RG_SLINE	2	15-Sep-21	2	661136	5531372	12	0.383
RG_SLINE	3	15-Sep-21	2	661149	5531356	12	0.26
RG_SLINE	4	15-Sep-21	3	661191	5531337	11	0.345
RG_SLINE	5	15-Sep-21	3	661177	5531399	12	0.322
RG_LILC3	1	09-Sep-21	1	659851	5531714	16	0.329
RG_LILC3	2	09-Sep-21	1	659851	5531726	26	0.279
RG_LILC3	3	09-Sep-21	2	659891	5531771	31	0.353
RG_LILC3	4	09-Sep-21	2	659895	5531777	18	0.345
RG_LILC3	5	09-Sep-21	3	659931	5531841	22	0.315
RG_LILC3	6	09-Sep-21	3	659941	5531836	16	0.276
RG_LILC3	7	10-Sep-21	4	659961	5531873	16	0.375
RG_LILC3	8	10-Sep-21	4	659965	5531871	15	0.389
RG_LILC3	9	10-Sep-21	5	659965	5531891	22	0.284
RG_LILC3	10	15-Sep-21	5	659967	5531897	15	0.439
RG_LIDSL	1	14-Sep-21	1	659263	5530527	34	0.324
RG_LIDSL	2	14-Sep-21	1	659272	5530527	17	0.429
RG_LIDSL	3	14-Sep-21	2	659291	5530585	15	0.374
RG_LIDSL	4	14-Sep-21	2	659306	5530594	21	0.42
RG_LIDSL	5	14-Sep-21	3	659317	5530627	16	0.449
RG_LIDSL	6	14-Sep-21	3	659316	5530626	26	0.464
RG_LIDSL	7	14-Sep-21	4	659342	5530664	17	0.446
RG_LIDSL	8	14-Sep-21	4	659342	5530677	12	0.296
RG_LIDSL	9	14-Sep-21	5	659365	5530723	17	0.404
RG_LIDSL	10	14-Sep-21	5	659351	5530711	17	0.287

Notes: "-" indicates no data. K&S = 3-Minute Kick and Sweep Benthic Invertebrate Community Sampling.

Table F.4: Supporting Measures Associated with 3-Minute Kick and Sweep Benthic Invertebrate Community Sampling at Areas in Line Creek and Fording River, September 2021

Station Parameters		Reference	Reference	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed
		RG_SLINE	RG_LI24	RG_LCUT	RG_LILC3	RG_LISP24	RG_LIDSL	RG_LIDCOM	RG_LI8	RG_FRUL	RG_FO23
Station 1	Easting	661080	662084	660113	659849	659673	659262	658183	655453	654518	652808
	Northing	5531418	5538370	5532141	5531716	5531169	5530538	5529815	5528953	5530129	5528334
	Date	15-Sep-21	16-Sep-21	11-Sep-21	10-Sep-21	13-Sep-21	14-Sep-21	13-Sep-21	11-Sep-21	12-Sep-21	12-Sep-21
	Number of Jars	1	1	1	1	1	1	1	1	1	1
	Total Kick Distance (m)	14	16	28	28	20	24	30	22	21	10
	Number of Transects	2.5	4	4	3.5	2	2.5	3	2	3	6
Station 2	Easting	661132	662123	660148	659893	-	659288	-	655499	654549	652856
	Northing	5531380	5538389	5532155	5531779	-	5530577	-	5528889	5530169	5528378
	Date	15-Sep-21	16-Sep-21	11-Sep-21	10-Sep-21	-	14-Sep-21	-	11-Sep-21	12-Sep-21	12-Sep-21
	Number of Jars	1	1	1	1	-	1	-	1	1	1
	Total Kick Distance (m)	10	17	24	28	-	24	-	22	20	15
	Number of Transects	2	4	4	4.5	-	2.5	-	2	4	4
Station 3	Easting	661191	662165	660104	659926	-	659316	-	655555	654553	652950
	Northing	5531337	5538411	5532170	5531830	-	5530615	-	5528832	5530220	5528532
	Date	15-Sep-21	16-Sep-21	11-Sep-21	10-Sep-21	-	14-Sep-21	-	11-Sep-21	12-Sep-21	12-Sep-21
	Number of Jars	1	1	1	2	-	1	-	1	1	1
	Total Kick Distance (m)	15	20	24	28	-	21	-	26	24	6
	Number of Transects	2	4	4	4	-	2.5	-	2	4	4
Station 4	Easting	-	662205	-	659962	-	659345	-	-	-	652929
	Northing	-	5538393	-	5531868	-	5530663	-	-	-	5528648
	Date	-	16-Sep-21	-	10-Sep-21	-	14-Sep-21	-	-	-	12-Sep-21
	Number of Jars	-	1	-	2	-	1	-	-	-	1
	Total Kick Distance (m)	-	18	-	30	-	18	-	-	-	12
	Number of Transects	-	4	-	4	-	2.5	-	-	-	3
Station 5	Easting	-	662221	-	659967	-	659361	-	-	-	652933
	Northing	-	5538429	-	5531892	-	5530715	-	-	-	5520766
	Date	-	16-Sep-21	-	10-Sep-21	-	14-Sep-21	-	-	-	12-Sep-21
	Number of Jars	-	1	-	2	-	1	-	-	-	1
	Total Kick Distance (m)	-	16	-	18	-	22	-	-	-	8
	Number of Transects	-	4	-	4	-	2.5	-	-	-	5

Note: "-" = Not sampled.

Table F.5: Depth and Velocity Associated with 3-Minute Kick and Sweep Benthic Invertebrate Community Sampling at Areas in Line Creek and Fording River, September 2021

		Replicate	1	2	3	4	5	Mean
Reference		RG_SLINE						
	1	Depth (cm)	22	33	27	14	14	22
		Velocity (m/s)	0.312	0.233	0.4999	0.276	0.534	0.37098
		Bankfull Width (m)	5.81					-
		Wetted Width (m)	5.05					-
		Bankfull-Wetted Depth (cm)	-					-
	2	Depth (cm)	19	13	9	20	23	16.8
		Velocity (m/s)	0.422	0.489	0.556	0.709	0.577	0.5506
		Bankfull Width (m)	8.57					-
		Wetted Width (m)	6.52					-
		Bankfull-Wetted Depth (cm)	-					-
	3	Depth (cm)	19	10	17	15	29	18
		Velocity (m/s)	0.225	0.41	0.503	0.532	0.761	0.4862
		Bankfull Width (m)	8.7					-
		Wetted Width (m)	4.5					-
		Bankfull-Wetted Depth (cm)	42					-
		RG_LI24						
	1	Depth (cm)	17	16	15	17	16	16.2
		Velocity (m/s)	0.536	0.801	0.153	0.432	0.163	0.417
		Bankfull Width (m)	7.49					-
		Wetted Width (m)	4.12					-
		Bankfull-Wetted Depth (cm)	-					-
	2	Depth (cm)	13	14	18	18	19	16.4
		Velocity (m/s)	0.397	0.272	0.2648	0.585	0.436	0.39096
		Bankfull Width (m)	6.77					-
		Wetted Width (m)	4.21					-
		Bankfull-Wetted Depth (cm)	-					-
	3	Depth (cm)	12	15	16	12	15	14
		Velocity (m/s)	0.315	0.221	0.344	0.377	0.615	0.3744
		Bankfull Width (m)	10.74					-
		Wetted Width (m)	10.12					-
		Bankfull-Wetted Depth (cm)	-					-
	4	Depth (cm)	15	19	23	20	21	19.6
		Velocity (m/s)	0.28	0.493	0.516	0.525	0.411	0.445
		Bankfull Width (m)	7.34					-
		Wetted Width (m)	3.15					-
		Bankfull-Wetted Depth (cm)	-					-
	5	Depth (cm)	12	17	19	14	15	15.4
		Velocity (m/s)	0.308	0.655	0.447	0.328	0.389	0.4254
		Bankfull Width (m)	4.9					-
		Wetted Width (m)	3.82					-
		Bankfull-Wetted Depth (cm)	64					-
Mine-Exposed		RG_LCUT						
	1	Depth (cm)	10	19	21	26	14	18
		Velocity (m/s)	0.204	0.56	0.557	0.821	0.469	0.5222
		Bankfull Width (m)	7.14					-
		Wetted Width (m)	4.42					-
		Bankfull-Wetted Depth (cm)	-					-
	2	Depth (cm)	19.1	16.2	26.8	19.5	13	18.92
		Velocity (m/s)	0.256	0.246	0.56	0.72	0.462	0.4488
		Bankfull Width (m)	7.62					-
		Wetted Width (m)	6.2					-
		Bankfull-Wetted Depth (cm)	-					-
	3	Depth (cm)	13.8	19.3	25.6	30.8	12.4	20.38
		Velocity (m/s)	0.244	0.412	0.434	0.833	0.268	0.4382
		Bankfull Width (m)	6.62					-
		Wetted Width (m)	6.02					-
		Bankfull-Wetted Depth (cm)	26					-
		RG_LILC3						
	1	Depth (cm)	22	29	25	35	33	28.8
		Velocity (m/s)	0.265	0.893	0.588	0.218	0.301	0.453
		Bankfull Width (m)	6.43					-
		Wetted Width (m)	6.12					-
		Bankfull-Wetted Depth (cm)	-					-
	2	Depth (cm)	23	27	36	30	39	31
		Velocity (m/s)	0.397	0.335	0.774	0.91	0.695	0.6222
		Bankfull Width (m)	7.21					-
		Wetted Width (m)	6.31					-
		Bankfull-Wetted Depth (cm)	-					-

Note: "-" = Not sampled.

Table F.5: Depth and Velocity Associated with 3-Minute Kick and Sweep Benthic Invertebrate Community Sampling at Areas in Line Creek and Fording River, September 2021

		Replicate	1	2	3	4	5	Mean
Mine-Exposed	**3**	Depth (cm)	16	26	25	22	17	21.2
		Velocity (m/s)	0.215	0.678	0.912	0.546	0.609	0.592
		Bankfull Width (m)	9.29					-
		Wetted Width (m)	8.42					-
		Bankfull-Wetted Depth (cm)	-					-
	4	Depth (cm)	10	29	29	11	12	18.2
		Velocity (m/s)	0.32	0.623	0.529	0.406	0.257	0.427
		Bankfull Width (m)	13.26					-
		Wetted Width (m)	10.82					-
		Bankfull-Wetted Depth (cm)	30					-
	5	Depth (cm)	8	20	24	22	23	19.4
		Velocity (m/s)	0.122	0.601	0.516	0.648	0.67	0.5114
		Bankfull Width (m)	5.52					-
		Wetted Width (m)	4.61					-
		Bankfull-Wetted Depth (cm)	-					-
	RG_LISP24							
	1	Depth (cm)	24	17	19	29	38	25.4
		Velocity (m/s)	0.556	0.445	0.49	0.337	0.685	0.5026
		Bankfull Width (m)	11.92					-
		Wetted Width (m)	10.41					-
		Bankfull-Wetted Depth (cm)	38					-
	RG_LIDSL							
	1	Depth (cm)	23.4	39.8	35.2	42.7	34	35.02
		Velocity (m/s)	0.531	0.619	0.768	0.732	0.409	0.6118
		Bankfull Width (m)	12.2					-
		Wetted Width (m)	11.7					-
		Bankfull-Wetted Depth (cm)	-					-
	2	Depth (cm)	12	22	27	31	26	23.6
		Velocity (m/s)	0.459	0.122	1.012	0.686	0.438	0.5434
		Bankfull Width (m)	16.2					-
		Wetted Width (m)	14.5					-
		Bankfull-Wetted Depth (cm)	-					-
	3	Depth (cm)	23	47	23	25	25	28.6
		Velocity (m/s)	0.024	0.198	0.533	0.788	0.424	0.3934
		Bankfull Width (m)	14					-
		Wetted Width (m)	8.8					-
		Bankfull-Wetted Depth (cm)	-					-
	4	Depth (cm)	36	23	27	27	20	26.6
		Velocity (m/s)	0.711	0.348	0.628	0.517	0.406	0.522
		Bankfull Width (m)	12.71					-
		Wetted Width (m)	10.62					-
		Bankfull-Wetted Depth (cm)	-					-
	5	Depth (cm)	28	32	28	38	30	31.2
		Velocity (m/s)	0.304	0.397	0.973	0.406	0.759	0.5678
		Bankfull Width (m)	10					-
		Wetted Width (m)	8.3					-
		Bankfull-Wetted Depth (cm)	38					-
	RG_LIDCOM							
	1	Depth (cm)	36.4	5.8	13.1	31.4	37.5	24.84
		Velocity (m/s)	0.774	0.525	0.448	0.606	0.696	0.6098
		Bankfull Width (m)	13.05					-
		Wetted Width (m)	12.29					-
		Bankfull-Wetted Depth (cm)	26					-
	RG_LI8							
	1	Depth (cm)	31.2	26.8	25.3	24.1	29.6	27.4
		Velocity (m/s)	0.538	0.644	0.506	0.72	0.753	0.6322
		Bankfull Width (m)	12.75					-
		Wetted Width (m)	10.62					-
		Bankfull-Wetted Depth (cm)	-					-
	2	Depth (cm)	38.8	28.1	32	34.3	32.3	33.1
		Velocity (m/s)	0.844	0.514	0.443	0.609	0.859	0.6538
		Bankfull Width (m)	12.22					-
		Wetted Width (m)	11.03					-
		Bankfull-Wetted Depth (cm)	-					-
	3	Depth (cm)	14.8	28.6	27.2	31.8	24.8	25.44
		Velocity (m/s)	0.438	0.47	0.755	0.845	0.492	0.6
		Bankfull Width (m)	13.31					-
		Wetted Width (m)	12.46					-
		Bankfull-Wetted Depth (cm)	21					-

Note: "-" = Not sampled.

Table F.5: Depth and Velocity Associated with 3-Minute Kick and Sweep Benthic Invertebrate Community Sampling at Areas in Line Creek and Fording River, September 2021

	Replicate		1	2	3	4	5	Mean
Mine-Exposed	RG_FRUL							
	1	Depth (cm)	10	16	23	25	20	18.8
		Velocity (m/s)	0.401	0.762	1.129	1.534	1.085	0.9822
		Bankfull Width (m)	21.8					-
		Wetted Width (m)	19.3					-
		Bankfull-Wetted Depth (cm)	-					-
	2	Depth (cm)	14	23	37	30	44	29.6
		Velocity (m/s)	0.542	0.443	0.939	1.329	1.172	0.885
		Bankfull Width (m)	19.4					-
		Wetted Width (m)	13.7					-
		Bankfull-Wetted Depth (cm)	35					-
	3	Depth (cm)	16.5	22.5	29	41	41	30
		Velocity (m/s)	0.313	0.313	0.767	1.329	1.329	0.8102
		Bankfull Width (m)	17.1					-
		Wetted Width (m)	14.3					-
		Bankfull-Wetted Depth (cm)	-					-
	RG_FO23							
	1	Depth (cm)	7	28	44	56	70	41
		Velocity (m/s)	0.111	0.313	0.364	0.435	0.587	0.362
		Bankfull Width (m)	26.6					-
		Wetted Width (m)	24.8					-
		Bankfull-Wetted Depth (cm)	24					-
	2	Depth (cm)	26	11	25	33	34	25.8
		Velocity (m/s)	0.162	0.314	0.194	0.395	0.857	0.3844
		Bankfull Width (m)	28.2					-
		Wetted Width (m)	27.2					-
		Bankfull-Wetted Depth (cm)	-					-
	3	Depth (cm)	16	4.3	31.3	32.5	35	23.82
		Velocity (m/s)	0.603	0.646	0.718	0.837	0.737	0.7082
		Bankfull Width (m)	28.2					-
		Wetted Width (m)	24.4					-
		Bankfull-Wetted Depth (cm)	-					-
	4	Depth (cm)	14.6	21.4	31.4	37.8	49	30.84
		Velocity (m/s)	0.348	0.583	0.456	0.588	0.756	0.5462
		Bankfull Width (m)	18.9					-
		Wetted Width (m)	17.8					-
		Bankfull-Wetted Depth (cm)	-					-
	5	Depth (cm)	43	36.5	29	30	20.5	31.8
		Velocity (m/s)	0.209	0.636	0.64	0.582	0.673	0.548
		Bankfull Width (m)	26.5					-
		Wetted Width (m)	24.3					-
		Bankfull-Wetted Depth (cm)	-					-

Note: "-" = Not sampled.

Table F.6: Habitat Information Associated with Mine-exposed and Reference Areas Sampled during the Benthic Invertebrate Survey 2021

Station ID		Reference	Reference	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed	Mine-Exposed
		RG_SLINE	RG_LI24	RG_LCUT	RG_LILC3	RG_LISP24	RG_LIDSL	RG_LIDCOM	RG_LI8	RG_FRUL	RG_FO23
Waterbody		South Line Creek	Line Creek	Line Creek	Line Creek	Line Creek	Line Creek	Line Creek	Line Creek	Fording River	Fording River
Date Sampled		15-Sep-21	16-Sep-21	11-Sep-21	10-Sep-21	13-Sep-21	14-Sep-21	13-Sep-21	11-Sep-21	12-Sep-21	12-Sep-21
Weather		Cloudy	Sunny	Smokey, overcast	Smokey, cloud free	Sunny	Partly cloudy, warm	-	Rainy, then sunny	Cool, overcast, rainy	Partly cloudy, rainy
Air Temperature (°C)		17	19	-	-	18	21	-	-	10	-
Habitat Characteristics											
Surrounding Land Use		Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining	Mining, Other
Length of Reach Assessed (m)		100	50	50	50	100	100	100	100	100	100
Substrate	% Bedrock	0	0	0	0	0	0	0	0	0	0
	% Boulder	5	20	40	20	10	30	10	20	20	15
	% Cobble	45	70	50	70	70	40	80	70	50	50
	% Gravel	35	10	10	10	20	15	10	10	20	15
	% Sand	10	0	0	0	0	10	0	0	10	15
	% Fines	5	0	0	0	0	5	0	0	0	5
Water Clarity		Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear	Clear
Water Colour		Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless
Vegetation											
Canopy Coverage (%)		1-25	26-50	1-25	0	0	1-25	0	51-75	1-25	0
Streamside Vegetation		Coniferous Trees, Deciduous trees, Ferns/Grasses, Shrubs	Coniferous Trees, Deciduous trees, Ferns/Grasses, Shrubs	Coniferous Trees, Deciduous trees, Ferns/Grasses, Shrubs	Coniferous Trees, Deciduous trees, Ferns/Grasses, Shrubs	Coniferous Trees, Deciduous trees, Ferns/Grasses, Shrubs	Coniferous Trees, Ferns/Grasses, Shrubs	Coniferous Trees, Deciduous trees, Ferns/Grasses, Shrubs	Coniferous Trees, Deciduous trees, Ferns/Grasses, Shrubs	Coniferous Trees, Ferns/Grasses, Shrubs	Coniferous Trees, Deciduous trees, Ferns/Grasses, Shrubs
Dominant Vegetation		-	-	Shrubs	Shrubs	Shrubs	Coniferous trees	Shrubs	Deciduous trees	Shrubs	Coniferous trees
Macrophyte Coverage (%)		1-25	1-25	0	1-25	26-50	0	1-25	0	0	0
Dominant Macrophyte		Moss	Moss (heavy on some rocks)	moss, very sparse coverage	Moss (sparse coverage)	Moss (moderate)	-	Moss (moderate to low)	-	-	-
Periphyton Cover (1-5)		2, 2, 2, 2, 2	2, 2, 2, 2, 2	3, 3, 3, 3, 3	3, 3, 3, 3, 3	3, 3, 3, 3, 4	4, 3, 3, 2, 3	3, 3, 3, 3, 3	2, 2, 2, 2, 3	2, 2, 1, 2, 2	3, 3, 3, 2, 2
Comments		-	-	-	-	-	-	-	-	-	-

Note: "-" indicates no data available.

APPENDIX G
LABORATORY REPORTS

APPENDIX G
LABORATORY REPORTS

WATER CHEMISTRY

ALS Laboratory Report CG2101066

(Finalized May 4, 2021)

CERTIFICATE OF ANALYSIS

Work Order	: **CG2101066**	Page	: 1 of 7
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: 250 425 8202	Telephone	: +1 403 407 1800
Project	: Regional Effects Program	Date Samples Received	: 27-Apr-2021 09:05
PO	: VPO00748510	Date Analysis Commenced	: 27-Apr-2021
C-O-C number	: Regional Effects Program	Issue Date	: 04-May-2021 17:50
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Arishna Nand	Lab Assistant	Inorganics, Calgary, Alberta
Elke Tabora		Inorganics, Calgary, Alberta
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Jorden Fanson	Analyst	Inorganics, Calgary, Alberta
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Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Saron Kim	Analyst	Metals, Burnaby, British Columbia
Shirley Li		Inorganics, Calgary, Alberta

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LI24_WS_LAEMP_LCO_2021-04_NP	RG_SLINE_WS_LAEMP_LCO_2021-04_NP	RG_FBLANK_WS_LAEMP_LCO_2021-04_NP	----	----
					Client sampling date / time	26-Apr-2021 11:05	26-Apr-2021 14:00	26-Apr-2021 11:00	----	----
						CG2101066-001	CG2101066-002	CG2101066-003	--------	--------
						Result	Result	Result	----	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	<2.0	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		118	140	<1.0	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		118	140	<1.0	----	----
conductivity	----	E100	2.0	µS/cm		301	339	<2.0	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		153	180	<0.50	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV		314	328	448	----	----
pH	----	E108	0.10	pH units		8.17	8.24	5.35	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L		175	204	<10	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L		<1.0	<1.0	<1.0	----	----
turbidity	----	E121	0.10	NTU		<0.10	0.14	<0.10	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	<0.0050	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	<0.050	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.21	0.27	<0.10	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.319	0.338	<0.020	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.062	0.147	<0.050	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.184	0.0764	<0.0050	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		0.0011	0.0014	<0.0010	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		<0.0020	<0.0020	<0.0020	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		40.0	44.6	<0.30	----	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		1.06	1.20	<0.50	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		0.76	1.00	<0.50	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.23	3.76	<0.10	----	----
cation sum	----	EC101	0.10	meq/L		3.14	3.64	<0.10	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LI24_WS_LAEMP_LCO_2021-04_NP	RG_SLINE_WS_LAEMP_LCO_2021-04_NP	RG_FBLANK_WS_LAEMP_LCO_2021-04_NP	----	----
					Client sampling date / time	26-Apr-2021 11:05	26-Apr-2021 14:00	26-Apr-2021 11:00	----	----
						CG2101066-001	CG2101066-002	CG2101066-003	--------	--------
						Result	Result	Result	----	----
Ion Balance										
ion balance (cations/anions ratio)	----	EC101	0.010	%		97.2	96.8	100	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		1.41	1.62	<0.010	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		<0.0030	<0.0030	<0.0030	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00016	0.00012	<0.00010	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0371	0.0362	<0.00010	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	<0.020	<0.020	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	<0.010	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.0099	0.0124	<0.0050	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		43.0	47.2	<0.050	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00020	0.00016	<0.00010	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	<0.10	<0.10	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
iron, total	7439-89-6	E420	0.010	mg/L		<0.010	<0.010	<0.010	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0032	0.0038	<0.0010	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		11.5	14.9	<0.0050	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00010	0.00012	<0.00010	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	<0.00050	<0.00050	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000836	0.00115	<0.000050	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
potassium, total	7440-09-7	E420	0.050	mg/L		0.290	0.382	<0.050	----	----
selenium, total	7782-49-2	E420	0.050	µg/L		1.92	1.27	<0.050	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		1.74	2.03	<0.10	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, total	17341-25-2	E420	0.050	mg/L		1.54	0.748	<0.050	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.163	0.170	<0.00020	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		15.0	16.3	<0.50	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LI24_WS_LAEMP_LCO_2021-04_NP	RG_SLINE_WS_LAEMP_LCO_2021-04_NP	RG_FBLANK_WS_LAEMP_LCO_2021-04_NP	----	----
					Client sampling date / time	26-Apr-2021 11:05	26-Apr-2021 14:00	26-Apr-2021 11:00	----	----
						CG2101066-001	CG2101066-002	CG2101066-003	--------	--------
						Result	Result	Result	----	----
Total Metals										
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00118	0.00142	<0.000010	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	<0.0030	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0017	<0.0010	<0.0010	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00015	0.00012	<0.00010	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0402	0.0393	<0.00010	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L		<0.020	<0.020	<0.020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	<0.010	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L		0.0081	0.0131	<0.0050	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		43.0	47.3	<0.050	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00018	0.00014	<0.00010	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L		<0.10	<0.10	<0.10	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0031	0.0036	<0.0010	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		11.2	15.0	<0.0050	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000844	0.00110	<0.000050	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		0.282	0.380	<0.050	----	----
selenium, dissolved	7782-49-2	E421	0.050	µg/L		2.17	1.36	<0.050	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		1.59	1.90	<0.050	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_LI24_WS_LAEMP_LCO_2021-04_NP	RG_SLINE_WS_LAEMP_LCO_2021-04_NP	RG_FBLANK_WS_LAEMP_LCO_2021-04_NP	----	----
Client sampling date / time					26-Apr-2021 11:05	26-Apr-2021 14:00	26-Apr-2021 11:00	----	----
					CG2101066-001	CG2101066-002	CG2101066-003	--------	--------
					Result	Result	Result	----	----
Dissolved Metals									
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L	1.48	0.743	<0.050	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.162	0.166	<0.00020	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	14.7	15.9	<0.50	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	<0.00030	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00120	0.00142	<0.000010	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0020	0.0020	<0.0010	----	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	----	----

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

QUALITY CONTROL REPORT

Work Order	: **CG2101066**	Page	: 1 of 18
Client	: Teck Coal Limited	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 250 425 8202	Telephone	: +1 403 407 1800
Project	: Regional Effects Program	Date Samples Received	: 27-Apr-2021 09:05
PO	: VPO00748510	Date Analysis Commenced	: 27-Apr-2021
C-O-C number	: Regional Effects Program	Issue Date	: 04-May-2021 17:50
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Arishna Nand	Lab Assistant	Inorganics, Calgary, Alberta
Elke Tabora		Inorganics, Calgary, Alberta
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Jorden Fanson	Analyst	Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Maria Tuguinay	Lab Assistant	Inorganics, Calgary, Alberta
Naeun Kim	Analyst	Inorganics, Calgary, Alberta
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Saron Kim	Analyst	Metals, Burnaby, British Columbia
Shirley Li		Inorganics, Calgary, Alberta

General Comments

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

Key :

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 186649)											
CG2101064-003	Anonymous	turbidity	----	E121	0.10	NTU	15.2	14.8	2.66%	15%	----
Physical Tests (QC Lot: 188177)											
CG2101064-008	Anonymous	solids, total dissolved [TDS]	----	E162	10	mg/L	<10	<10	0	Diff <2x LOR	----
Physical Tests (QC Lot: 188190)											
CG2101065-001	Anonymous	conductivity	----	E100	2.0	µS/cm	275	272	1.10%	10%	----
Physical Tests (QC Lot: 188191)											
CG2101065-001	Anonymous	pH	----	E108	0.10	pH units	8.08	8.12	0.494%	4%	----
Physical Tests (QC Lot: 188192)											
CG2101065-001	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	111	110	0.999%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	111	110	0.999%	20%	----
Physical Tests (QC Lot: 188201)											
CG2101065-001	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 189797)											
CG2101065-001	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	354	349	1.34%	15%	----
Anions and Nutrients (QC Lot: 186178)											
CG2101064-005	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0131	0.0132	0.387%	20%	----
Anions and Nutrients (QC Lot: 186394)											
CG2101065-006	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 186395)											
CG2101065-006	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	<0.30	<0.30	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 186396)											
CG2101065-006	Anonymous	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 186397)											
CG2101065-006	Anonymous	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 186398)											
CG2101065-006	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 186399)											
CG2101065-006	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 187643)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 187643) - continued											
CG2101064-005	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	3.33	3.51	5.41%	20%	----
Anions and Nutrients (QC Lot: 189667)											
CG2101065-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0101	0.0089	0.0012	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 190216)											
CG2101065-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0114	0.0118	0.0004	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 189497)											
CG2101062-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.10	1.23	0.13	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 189498)											
CG2101062-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.31	1.24	0.08	Diff <2x LOR	----
Total Metals (QC Lot: 187030)											
CG2101062-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0147	0.0153	0.0006	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00017	0.00014	0.00003	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0462	0.0469	1.49%	20%	----
		beryllium, total	7440-41-7	E420	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	0.0170 µg/L	0.0000167	0.0000003	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	78.4	77.9	0.651%	20%	----
		cobalt, total	7440-48-4	E420	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.016	0.017	0.0007	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0072	0.0071	0.0001	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	44.0	44.0	0.00122%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00173	0.00164	5.19%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000878	0.000909	3.50%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00098	0.00082	0.00015	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	0.956	0.956	0.0628%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	40.0 µg/L	0.0411	2.69%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	1.79	1.85	3.24%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	1.64	1.68	2.33%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.117	0.117	0.150%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	68.0	69.2	1.68%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 187030) - continued											
CG2101062-001	Anonymous	thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	0.00033	0.00003	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00250	0.00249	0.323%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
Total Metals (QC Lot: 187031)											
CG2101062-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00015	0.00014	0.000008	Diff <2x LOR	----
Total Metals (QC Lot: 189793)											
CG2101062-001	Anonymous	mercury, total	7439-97-6	E508-L	0.00050	ng/L	<0.00050 µg/L	<0.50	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 186880)											
CG2101066-001	RG_LI24_WS_LAEMP_LCO_2021-04_NP	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00018	0.00019	0.00001	Diff <2x LOR	----
Dissolved Metals (QC Lot: 186881)											
CG2101066-001	RG_LI24_WS_LAEMP_LCO_2021-04_NP	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0017	0.0018	0.0001	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00015	0.00016	0.000002	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0402	0.0406	0.891%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0050	mg/L	0.0081 µg/L	0.0000087	0.0000006	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	43.0	42.2	2.02%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0031	0.0031	0.000008	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	11.2	11.5	2.88%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000844	0.000858	1.56%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.282	0.289	0.007	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.050	mg/L	2.17 µg/L	0.00217	0.204%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	1.59	1.58	0.568%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 186881) - continued											
CG2101066-001	RG_LI24_WS_LAEMP_LCO_2021-04_NP	silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	1.48	1.53	3.69%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.162	0.164	1.29%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	14.7	14.3	2.92%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00120	0.00119	0.498%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0020	0.0019	0.0002	Diff <2x LOR	----
Dissolved Metals (QC Lot: 188913)											
CG2101064-006	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 186649)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 188171)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 188172)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 188177)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 188190)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 188192)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 188201)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Anions and Nutrients (QCLot: 186178)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 186394)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 186395)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 186396)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 186397)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 186398)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 186399)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 187643)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 189667)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 189667) - continued						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 190216)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Organic / Inorganic Carbon (QCLot: 189497)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 189498)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 187030)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 187030) - continued						
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 187031)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 189793)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 186880)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 186881)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 186881) - continued						
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 188913)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 186649)									
turbidity	----	E121	0.1	NTU	200 NTU	99.0	85.0	115	----
Physical Tests (QCLot: 188171)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	97.2	85.0	115	----
Physical Tests (QCLot: 188172)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	103	85.0	115	----
Physical Tests (QCLot: 188177)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	102	85.0	115	----
Physical Tests (QCLot: 188190)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	103	90.0	110	----
Physical Tests (QCLot: 188191)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 188192)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	103	85.0	115	----
Physical Tests (QCLot: 188201)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	105	85.0	115	----
Physical Tests (QCLot: 189797)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	100	95.4	104	----
Anions and Nutrients (QCLot: 186178)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.1 mg/L	95.0	80.0	120	----
Anions and Nutrients (QCLot: 186394)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	98.2	90.0	110	----
Anions and Nutrients (QCLot: 186395)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	99.3	90.0	110	----
Anions and Nutrients (QCLot: 186396)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	98.1	85.0	115	----
Anions and Nutrients (QCLot: 186397)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	96.5	90.0	110	----
Anions and Nutrients (QCLot: 186398)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	99.9	90.0	110	----
Anions and Nutrients (QCLot: 186399)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 187643)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 187643) - continued									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	87.5	75.0	125	----
Anions and Nutrients (QCLot: 189667)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.1 mg/L	89.4	85.0	115	----
Anions and Nutrients (QCLot: 190216)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	103	80.0	120	----
Organic / Inorganic Carbon (QCLot: 189497)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	95.2	80.0	120	----
Organic / Inorganic Carbon (QCLot: 189498)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	101	80.0	120	----
Total Metals (QCLot: 187030)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	102	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	103	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	98.1	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	96.6	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	102	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	94.5	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	98.7	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	97.1	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	99.8	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	98.0	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	94.4	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	101	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	98.4	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	98.1	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	99.1	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	105	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	95.6	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	104	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	100	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	103	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	106	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	90.9	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 187030) - continued									
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	94.6	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	95.8	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	100	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	95.7	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	98.6	80.0	120	----
Total Metals (QCLot: 187031)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
Total Metals (QCLot: 189793)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	100	80.0	120	----
Dissolved Metals (QCLot: 186880)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
Dissolved Metals (QCLot: 186881)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	101	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	106	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	100	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	107	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	94.6	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	96.7	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	93.8	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	97.7	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	97.6	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	99.4	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	98.6	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	98.0	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	97.9	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	90.9	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	97.7	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	99.0	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	98.2	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	97.7	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	92.6	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	104	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	102	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 186881) - continued									
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	105	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	86.5	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	99.1	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	97.4	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	103	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	97.6	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	100	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	102	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	101	80.0	120	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 186178)										
CG2101064-006	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0502 mg/L	0.05 mg/L	100	70.0	130	----
Anions and Nutrients (QCLot: 186394)										
CG2101065-006	Anonymous	fluoride	16984-48-8	E235.F	1.13 mg/L	1 mg/L	113	75.0	125	----
Anions and Nutrients (QCLot: 186395)										
CG2101065-006	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	114 mg/L	100 mg/L	114	75.0	125	----
Anions and Nutrients (QCLot: 186396)										
CG2101065-006	Anonymous	bromide	24959-67-9	E235.Br-L	0.499 mg/L	0.5 mg/L	99.8	75.0	125	----
Anions and Nutrients (QCLot: 186397)										
CG2101065-006	Anonymous	chloride	16887-00-6	E235.Cl-L	115 mg/L	100 mg/L	115	75.0	125	----
Anions and Nutrients (QCLot: 186398)										
CG2101065-006	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.84 mg/L	2.5 mg/L	114	75.0	125	----
Anions and Nutrients (QCLot: 186399)										
CG2101065-006	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.597 mg/L	0.5 mg/L	119	75.0	125	----
Anions and Nutrients (QCLot: 187643)										
CG2101064-006	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	1.85 mg/L	2.5 mg/L	74.1	70.0	130	----
Anions and Nutrients (QCLot: 189667)										
CG2101065-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0998 mg/L	0.1 mg/L	99.8	75.0	125	----
Anions and Nutrients (QCLot: 190216)										
CG2101065-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0546 mg/L	0.0676 mg/L	80.8	70.0	130	----
Organic / Inorganic Carbon (QCLot: 189497)										
CG2101062-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	21.4 mg/L	23.9 mg/L	89.7	70.0	130	----
Organic / Inorganic Carbon (QCLot: 189498)										
CG2101062-001	Anonymous	carbon, total organic [TOC]	----	E355-L	22.7 mg/L	23.9 mg/L	95.1	70.0	130	----
Total Metals (QCLot: 187030)										
CG2101062-001	Anonymous	aluminum, total	7429-90-5	E420	0.195 mg/L	0.2 mg/L	97.4	70.0	130	----
		antimony, total	7440-36-0	E420	0.0198 mg/L	0.02 mg/L	98.8	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0197 mg/L	0.02 mg/L	98.5	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 187030) - continued										
CG2101062-001	Anonymous	beryllium, total	7440-41-7	E420	0.0402 mg/L	0.04 mg/L	100	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00907 mg/L	0.01 mg/L	90.7	70.0	130	----
		boron, total	7440-42-8	E420	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00411 mg/L	0.004 mg/L	103	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0192 mg/L	0.02 mg/L	96.0	70.0	130	----
		copper, total	7440-50-8	E420	0.0189 mg/L	0.02 mg/L	94.5	70.0	130	----
		iron, total	7439-89-6	E420	1.97 mg/L	2 mg/L	98.4	70.0	130	----
		lead, total	7439-92-1	E420	0.0185 mg/L	0.02 mg/L	92.3	70.0	130	----
		lithium, total	7439-93-2	E420	0.0982 mg/L	0.1 mg/L	98.2	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0189 mg/L	0.02 mg/L	94.7	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		nickel, total	7440-02-0	E420	0.0375 mg/L	0.04 mg/L	93.8	70.0	130	----
		potassium, total	7440-09-7	E420	4.03 mg/L	4 mg/L	101	70.0	130	----
		selenium, total	7782-49-2	E420	0.0415 mg/L	0.04 mg/L	104	70.0	130	----
		silicon, total	7440-21-3	E420	9.32 mg/L	10 mg/L	93.2	70.0	130	----
		silver, total	7440-22-4	E420	0.00391 mg/L	0.004 mg/L	97.9	70.0	130	----
		sodium, total	17341-25-2	E420	2.04 mg/L	2 mg/L	102	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00358 mg/L	0.004 mg/L	89.4	70.0	130	----
		tin, total	7440-31-5	E420	0.0192 mg/L	0.02 mg/L	96.0	70.0	130	----
		titanium, total	7440-32-6	E420	0.0393 mg/L	0.04 mg/L	98.2	70.0	130	----
		uranium, total	7440-61-1	E420	0.00380 mg/L	0.004 mg/L	95.0	70.0	130	----
		vanadium, total	7440-62-2	E420	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		zinc, total	7440-66-6	E420	0.380 mg/L	0.4 mg/L	95.0	70.0	130	----
Total Metals (QCLot: 187031)										
CG2101062-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0401 mg/L	0.04 mg/L	100	70.0	130	----
Total Metals (QCLot: 189793)										
CG2101062-002	Anonymous	mercury, total	7439-97-6	E508-L	4.04 ng/L	5 ng/L	80.8	70.0	130	----
Dissolved Metals (QCLot: 186880)										
CG2101066-001	RG_LI24_WS_LAEMP_LCO_2021-04_NP	chromium, dissolved	7440-47-3	E421.Cr-L	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----
Dissolved Metals (QCLot: 186881)										

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 186881) - continued										
CG2101066-001	RG_LI24_WS_LAEMP_LCO_2021-04_NP	aluminum, dissolved	7429-90-5	E421	0.199 mg/L	0.2 mg/L	99.5	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0201 mg/L	0.02 mg/L	100	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0198 mg/L	0.02 mg/L	99.3	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0380 mg/L	0.04 mg/L	94.9	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00832 mg/L	0.01 mg/L	83.2	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.096 mg/L	0.1 mg/L	96.5	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00396 mg/L	0.004 mg/L	98.9	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0187 mg/L	0.02 mg/L	93.4	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0188 mg/L	0.02 mg/L	94.0	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.85 mg/L	2 mg/L	92.7	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0191 mg/L	0.02 mg/L	95.6	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0889 mg/L	0.1 mg/L	88.9	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0190 mg/L	0.02 mg/L	94.9	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0370 mg/L	0.04 mg/L	92.6	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.87 mg/L	4 mg/L	96.7	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0400 mg/L	0.04 mg/L	100	70.0	130	----
		silicon, dissolved	7440-21-3	E421	8.37 mg/L	10 mg/L	83.7	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00398 mg/L	0.004 mg/L	99.6	70.0	130	----
		sodium, dissolved	17341-25-2	E421	1.88 mg/L	2 mg/L	94.0	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	17.0 mg/L	20 mg/L	85.1	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00374 mg/L	0.004 mg/L	93.6	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0191 mg/L	0.02 mg/L	95.5	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0401 mg/L	0.04 mg/L	100	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00376 mg/L	0.004 mg/L	94.1	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0972 mg/L	0.1 mg/L	97.2	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.396 mg/L	0.4 mg/L	99.1	70.0	130	----
Dissolved Metals (QCLot: 188913)										
CG2101064-007	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000992 mg/L	0.0001 mg/L	99.2	70.0	130	----

Teck

COC ID: **Regional Effects Program**

TURNAROUND TIME: Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Regional Effects Program			Lab Name	ALS Calgary			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Cait Good			Lab Contact	Lyuda Shvets			Email 1: cait.good@teck.com	X	X	X
Email	cait.good@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2: carlie.meyer@teck.com	X	X	X
Address	421 Pine Avenue			Address	2559 29 Street NE			Email 3: teckcoal@equisonline.com			X
								Email 4: kbatchelar@minnow.ca	X	X	X
ity	Sparwood	Province	BC	City	Calgary	Province	AB	Email 5: Carla.FroymanParker@teck.com	X	X	X
de	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada				
er	250-425-8202			Phone Number	403-407-1800			PO number	VPO748510		

Environmental Division
Calgary
Work Order Reference
CG2101066

Telephone : +1 403 407 1800

SAMPLE DETAILS / ANALYSIS REQUESTED

Filtered - F: Field, L: Lab, FL: Field & Lab, N: None

Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	FIL	N	Y	N	Y	Y	N	N
								PRESERV.	NONE	H2SO4	H2SO4	HCl	HNO3	HNO3	NONE
								ANALYSIS	HG-T-U-CVAF-VA	ALS_Package-DOC	ALS_Package-TKN/TOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA
RG_LI24_WS_LAEMP_LCO.2021-04_NP	RG_LI24	WS	NO	2021/04/26	11:05	G	7		X	X	X	X	X	X	X
RG_SLJNE_WS_LAEMP_LCO.2021-04_NP	RG_SLJNE	WS	NO	2021/04/26	14:00	G	7		X	X	X	X	X	X	X
RG_FBLANK_WS_LAEMP_LCO.2021-04_NP	RG_FBLANK	WS	NO	2021/04/26	11:00	G	7		X	X	X	X	X	X	X
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
VPO748510	Rich Smith/Lotic environmental	2021/04/26/1630		4/27

SERVICE REQUEST (rush - subject to availability)

Regular (default) X	Sampler's Name	Rich Smith	Mobile # 403-586-3241
Priority (2-3 business days) - 50% surcharge	Sampler's Signature		Date/Time 2021/04/26 / 16:30
Emergency (1 Business Day) - 100% surcharge			
For Emergency <1 Day, ASAP or Weekend - Contact ALS			

WATER CHEMISTRY

ALS Laboratory Report CG2101100

(Finalized May 7, 2021)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **CG2101100**	Page	: 1 of 6
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: 250 425 8202	Telephone	: +1 403 407 1800
Project	: Regional Effects Program	Date Samples Received	: 28-Apr-2021 08:50
PO	: VPO00748510	Date Analysis Commenced	: 29-Apr-2021
C-O-C number	: Regional Effects Program	Issue Date	: 07-May-2021 12:10
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Elke Tabora		Inorganics, Calgary, Alberta
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Jorden Fanson	Analyst	Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Naeun Kim	Analyst	Inorganics, Calgary, Alberta
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Shirley Li		Inorganics, Calgary, Alberta

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LCUT_WS_LAEMP_LCO_2021-04_NP	RG_LILC3_WS_LAEMP_LCO_2021-04_NP	RG_LISP24_WS_LAEMP_LCO_2021-04_NP	RG_RIVER_WS_LAEMP_LCO_2021-04_NP	----
					Client sampling date / time	27-Apr-2021 10:15	27-Apr-2021 12:22	27-Apr-2021 14:20	27-Apr-2021 10:00	----
						CG2101100-001	CG2101100-002	CG2101100-003	CG2101100-004	--------
						Result	Result	Result	Result	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	<2.0	<2.0	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		206	213	198	204	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		206	213	198	204	----
conductivity	----	E100	2.0	µS/cm		938	991	884	940	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		547	563	509	556	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV		327	458	427	440	----
pH	----	E108	0.10	pH units		8.15	8.14	8.22	8.19	----
solids, total dissolved [TDS]	----	E162	10	mg/L		722	741	670	717	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
turbidity	----	E121	0.10	NTU		0.24	0.41	0.26	0.30	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0166	<0.0050	<0.0050	0.0071	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		8.12	15.1	12.7	8.05	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.217	0.213	0.235	0.214	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		14.4	12.6	10.4	14.4	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0024	<0.0010	<0.0010	<0.0010	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		0.0020	0.0014	<0.0010	<0.0010	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0028	0.0038	0.0032	0.0042	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		268	295	252	267	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		1.35	1.37	1.62	1.28	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		0.91	1.38	1.68	1.15	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		11.0	11.7	10.3	10.9	----
cation sum	----	EC101	0.10	meq/L		11.4	11.7	10.6	11.6	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LCUT_WS_LAEMP_LCO_2021-04_NP	RG_LILC3_WS_LAEMP_LCO_2021-04_NP	RG_LISP24_WS_LAEMP_LCO_2021-04_NP	RG_RIVER_WS_LAEMP_LCO_2021-04_NP	----
					Client sampling date / time	27-Apr-2021 10:15	27-Apr-2021 12:22	27-Apr-2021 14:20	27-Apr-2021 10:00	----
						CG2101100-001	CG2101100-002	CG2101100-003	CG2101100-004	--------
						Result	Result	Result	Result	----
Ion Balance										
ion balance (cations/anions ratio)	----	EC101	0.010	%		104	100	103	106	----
ion balance (cation-anion difference)	----	EC101	0.010	%		1.78	<0.010	1.44	3.11	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0064	0.0973	0.0069	0.0086	----
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00039	0.00034	0.00028	0.00039	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00014	0.00016	0.00012	0.00015	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0417	0.0473	0.0481	0.0425	----
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	<0.020	<0.020	<0.020	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, total	7440-42-8	E420	0.010	mg/L		0.017	0.017	0.015	0.017	----
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.344	0.273	0.184	0.352	----
calcium, total	7440-70-2	E420	0.050	mg/L		119	123	111	118	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00013	0.00030	0.00015	0.00016	----
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	0.25	<0.10	<0.10	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
iron, total	7439-89-6	E420	0.010	mg/L		<0.010	0.096	0.027	<0.010	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0586	0.0554	0.0463	0.0599	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		51.5	54.9	48.7	51.4	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00010	0.0289	0.0104	0.00012	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00202	0.00324	0.00274	0.00206	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00915	0.00757	0.00580	0.00918	----
potassium, total	7440-09-7	E420	0.050	mg/L		1.71	1.82	1.59	1.72	----
selenium, total	7782-49-2	E420	0.050	µg/L		53.9	49.0	40.4	53.0	----
silicon, total	7440-21-3	E420	0.10	mg/L		2.28	2.44	2.16	2.13	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, total	17341-25-2	E420	0.050	mg/L		8.04	9.37	8.20	8.00	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.226	0.224	0.218	0.232	----
sulfur, total	7704-34-9	E420	0.50	mg/L		102	112	95.0	100	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LCUT_WS_LAEMP_LCO_2021-04_NP	RG_LILC3_WS_LAEMP_LCO_2021-04_NP	RG_LISP24_WS_LAEMP_LCO_2021-04_NP	RG_RIVER_WS_LAEMP_LCO_2021-04_NP	----
					Client sampling date / time	27-Apr-2021 10:15	27-Apr-2021 12:22	27-Apr-2021 14:20	27-Apr-2021 10:00	----
						CG2101100-001	CG2101100-002	CG2101100-003	CG2101100-004	--------
						Result	Result	Result	Result	----
Total Metals										
thallium, total	7440-28-0	E420	0.000010	mg/L		0.000015	0.000012	<0.000010	0.000013	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	0.00365	<0.00030	<0.00030	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00427	0.00417	0.00370	0.00419	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0130	0.0096	0.0069	0.0130	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0010	0.0026	0.0019	0.0012	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00037	0.00032	0.00027	0.00038	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		<0.00010	0.00011	<0.00010	0.00010	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0434	0.0487	0.0483	0.0449	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L		<0.020	<0.020	<0.020	<0.020	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.017	0.017	0.014	0.017	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L		0.341	0.298	0.181	0.375	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		128	131	120	127	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00012	<0.00010	0.00012	0.00013	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L		<0.10	0.12	<0.10	<0.10	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00030	0.00027	0.00020	0.00030	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	0.016	<0.010	<0.010	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0613	0.0562	0.0414	0.0597	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		55.3	57.2	50.8	58.1	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		<0.00010	0.0119	0.00700	<0.00010	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00195	0.00280	0.00265	0.00196	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00948	0.00714	0.00547	0.00925	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		1.71	1.74	1.56	1.80	----
selenium, dissolved	7782-49-2	E421	0.050	µg/L		53.0	48.7	39.2	52.9	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.09	2.03	1.96	2.10	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_LCUT_WS_LAEMP_LCO_2021-04_NP	RG_LILC3_WS_LAEMP_LCO_2021-04_NP	RG_LISP24_WS_LAEMP_LCO_2021-04_NP	RG_RIVER_WS_LAEMP_LCO_2021-04_NP	----
Client sampling date / time					27-Apr-2021 10:15	27-Apr-2021 12:22	27-Apr-2021 14:20	27-Apr-2021 10:00	----
					CG2101100-001	CG2101100-002	CG2101100-003	CG2101100-004	--------
					Result	Result	Result	Result	----
Dissolved Metals									
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L	8.83	10.2	8.89	9.13	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.233	0.232	0.216	0.239	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	96.7	106	88.2	97.5	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000012	<0.000010	<0.000010	0.000011	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00408	0.00400	0.00348	0.00407	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0128	0.0093	0.0063	0.0131	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	----

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **CG2101100**	Page	: 1 of 18
Client	: Teck Coal Limited	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 250 425 8202	Telephone	: +1 403 407 1800
Project	: Regional Effects Program	Date Samples Received	: 28-Apr-2021 08:50
PO	: VPO00748510	Date Analysis Commenced	: 29-Apr-2021
C-O-C number	: Regional Effects Program	Issue Date	: 07-May-2021 12:10
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Elke Tabora		Inorganics, Calgary, Alberta
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Jorden Fanson	Analyst	Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Naeun Kim	Analyst	Inorganics, Calgary, Alberta
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Shirley Li		Inorganics, Calgary, Alberta

General Comments

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

Key :

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 188153)											
CG2101072-001	Anonymous	turbidity	----	E121	0.10	NTU	<0.10	<0.10	0	Diff <2x LOR	----
Physical Tests (QC Lot: 188423)											
CG2101099-006	Anonymous	turbidity	----	E121	0.10	NTU	0.47	0.48	0.008	Diff <2x LOR	----
Physical Tests (QC Lot: 189583)											
CG2101094-002	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	465	466	0.107%	20%	----
Physical Tests (QC Lot: 189803)											
CG2101099-001	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 189819)											
CG2101094-003	Anonymous	pH	----	E108	0.10	pH units	7.65	7.65	0.00%	4%	----
Physical Tests (QC Lot: 189820)											
CG2101094-003	Anonymous	conductivity	----	E100	2.0	µS/cm	1700	1720	0.878%	10%	----
Physical Tests (QC Lot: 189821)											
CG2101099-004	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 189822)											
CG2101100-004	RG_RIVER_WS_LAEMP_LCO_2021-04_NP	pH	----	E108	0.10	pH units	8.19	8.18	0.122%	4%	----
Physical Tests (QC Lot: 189823)											
CG2101100-004	RG_RIVER_WS_LAEMP_LCO_2021-04_NP	conductivity	----	E100	2.0	µS/cm	940	936	0.426%	10%	----
Physical Tests (QC Lot: 191127)											
CG2101096-001	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	342	335	1.95%	15%	----
Anions and Nutrients (QC Lot: 187626)											
CG2101080-010	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0094	0.0093	0.0001	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 187983)											
CG2101080-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.106	0.092	0.014	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 187985)											
CG2101080-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	72.7	73.1	0.576%	20%	----
Anions and Nutrients (QC Lot: 187988)											
CG2101101-004	Anonymous	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 187989)											
CG2101101-004	Anonymous	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 187990)											
CG2101101-004	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	0.0066	0.0016	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 187991)											
CG2101101-004	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 188674)											
CG2101072-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 190448)											
CG2101094-003	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0026	0.0037	0.0010	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 190449)											
CG2101100-004	RG_RIVER_WS_LAEMP_LCO_2021-04_NP	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0042	0.0038	0.0003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 190726)											
CG2101094-003	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0053	0.0051	0.0002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 190727)											
CG2101100-004	RG_RIVER_WS_LAEMP_LCO_2021-04_NP	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0071	<0.0050	0.0021	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 190566)											
CG2101085-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.84	2.15	0.31	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 190568)											
CG2101085-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.58	1.67	0.08	Diff <2x LOR	----
Total Metals (QC Lot: 188893)											
CG2101095-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00010	<0.00010	0.000005	Diff <2x LOR	----
Total Metals (QC Lot: 188894)											
CG2101095-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0090	0.0114	0.0024	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.108	0.108	0.522%	20%	----
		beryllium, total	7440-41-7	E420	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.010	<0.010	0.00006	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	0.0428 µg/L	0.0000419	0.0000009	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	63.2	61.7	2.40%	20%	----
		cobalt, total	7440-48-4	E420	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00613	0.00570	7.41%	20%	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.110	0.118	7.14%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 188894) - continued											
CG2101095-001	Anonymous	lead, total	7439-92-1	E420	0.000050	mg/L	0.000156	0.000156	0.0000006	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0063	0.0061	0.0001	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	15.6	16.0	2.69%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00911	0.00936	2.71%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00122	0.00120	2.06%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	0.669	0.675	0.834%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	7.91 µg/L	0.00776	1.86%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	2.93	2.92	0.614%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	3.59	3.62	0.862%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.234	0.240	2.42%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	17.9	17.9	0.136%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	0.00019	0.00018	0.000009	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000758	0.000752	0.849%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
Total Metals (QC Lot: 191387)											
CG2101097-003	Anonymous	mercury, total	7439-97-6	E508-L	0.00050	ng/L	<0.00050 µg/L	<0.50	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 188915)											
CG2101098-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 188916)											
CG2101098-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0021	0.0025	0.0004	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00013	0.00013	0.000001	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00014	0.00014	0.000005	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0638	0.0621	2.71%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.018	0.018	0.0002	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0050	mg/L	0.0181 µg/L	0.0000183	0.0000002	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	123	128	3.96%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00041	0.00037	0.00004	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 188916) - continued											
CG2101098-001	Anonymous	iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0151	0.0151	0.203%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	69.4	67.2	3.22%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00336	0.00325	3.26%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00137	0.00132	3.09%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00115	0.00111	0.00004	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.48	1.45	1.78%	20%	----
		selenium, dissolved	7782-49-2	E421	0.050	mg/L	62.9 µg/L	0.0619	1.57%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.27	3.24	0.839%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	7.06	6.94	1.75%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.334	0.336	0.487%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	138	135	1.95%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00255	0.00252	0.953%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 190750)											
CG2101100-001	RG_LCUT_WS_LAEMP_LCO_2021-04_NP	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 188153)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 188423)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 189578)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 189583)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 189803)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Physical Tests (QCLot: 189820)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 189821)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 189823)						
conductivity	----	E100	1	µS/cm	<1.0	----
Anions and Nutrients (QCLot: 187626)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 187983)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 187985)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 187988)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 187989)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 187990)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 187991)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 188674)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 188674) - continued						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 190448)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 190449)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 190726)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 190727)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 190566)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 190568)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 188893)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 188894)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 188894) - continued						
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 191387)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 188915)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 188916)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 188916) - continued						
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 190750)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 188153)									
turbidity	----	E121	0.1	NTU	200 NTU	100.0	85.0	115	----
Physical Tests (QCLot: 188423)									
turbidity	----	E121	0.1	NTU	200 NTU	99.4	85.0	115	----
Physical Tests (QCLot: 189578)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	90.9	85.0	115	----
Physical Tests (QCLot: 189583)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	103	85.0	115	----
Physical Tests (QCLot: 189803)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	95.9	85.0	115	----
Physical Tests (QCLot: 189819)									
pH	----	E108	----	pH units	7 pH units	101	98.6	101	----
Physical Tests (QCLot: 189820)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	103	90.0	110	----
Physical Tests (QCLot: 189821)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	102	85.0	115	----
Physical Tests (QCLot: 189822)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 189823)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	103	90.0	110	----
Physical Tests (QCLot: 191127)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	101	95.4	104	----
Anions and Nutrients (QCLot: 187626)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.1 mg/L	93.6	80.0	120	----
Anions and Nutrients (QCLot: 187983)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	105	90.0	110	----
Anions and Nutrients (QCLot: 187985)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	106	90.0	110	----
Anions and Nutrients (QCLot: 187988)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	110	85.0	115	----
Anions and Nutrients (QCLot: 187989)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 187990)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 187990) - continued									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 187991)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	109	90.0	110	----
Anions and Nutrients (QCLot: 188674)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	82.7	75.0	125	----
Anions and Nutrients (QCLot: 190448)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	105	80.0	120	----
Anions and Nutrients (QCLot: 190449)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	102	80.0	120	----
Anions and Nutrients (QCLot: 190726)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.1 mg/L	107	85.0	115	----
Anions and Nutrients (QCLot: 190727)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.1 mg/L	96.6	85.0	115	----
Organic / Inorganic Carbon (QCLot: 190566)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	116	80.0	120	----
Organic / Inorganic Carbon (QCLot: 190568)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	109	80.0	120	----
Total Metals (QCLot: 188893)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	99.7	80.0	120	----
Total Metals (QCLot: 188894)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	98.4	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	104	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	98.8	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	97.3	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	97.6	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	104	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	94.2	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	101	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	99.0	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	96.6	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	102	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	96.3	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	96.2	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 188894) - continued									
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	99.1	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	102	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	99.0	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	104	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	100	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	101	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	100	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	103	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	101	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	99.3	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	93.6	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	101	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	99.2	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	101	80.0	120	----
Total Metals (QCLot: 191387)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	95.2	80.0	120	----
Dissolved Metals (QCLot: 188915)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
Dissolved Metals (QCLot: 188916)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	106	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	101	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	104	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	107	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	94.4	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	109	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	97.5	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	106	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	98.3	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	104	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	97.5	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	100	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	90.9	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	101	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 188916) - continued									
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	99.8	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	101	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	105	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	109	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	100.0	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	101	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	104	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	108	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	102	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	99.1	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	102	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	100.0	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	98.7	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	111	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	105	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	106	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	99.8	80.0	120	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 187626)										
CG2101083-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0484 mg/L	0.05 mg/L	96.9	70.0	130	----
Anions and Nutrients (QCLot: 187983)										
CG2101080-002	Anonymous	fluoride	16984-48-8	E235.F	1.05 mg/L	1 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 187985)										
CG2101080-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	94.9 mg/L	100 mg/L	94.9	75.0	125	----
Anions and Nutrients (QCLot: 187988)										
CG2101101-004	Anonymous	bromide	24959-67-9	E235.Br-L	0.557 mg/L	0.5 mg/L	111	75.0	125	----
Anions and Nutrients (QCLot: 187989)										
CG2101101-004	Anonymous	chloride	16887-00-6	E235.Cl-L	104 mg/L	100 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 187990)										
CG2101101-004	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.55 mg/L	2.5 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 187991)										
CG2101101-004	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.559 mg/L	0.5 mg/L	112	75.0	125	----
Anions and Nutrients (QCLot: 188674)										
CG2101072-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.59 mg/L	2.5 mg/L	103	70.0	130	----
Anions and Nutrients (QCLot: 190448)										
CG2101095-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0607 mg/L	0.0676 mg/L	89.8	70.0	130	----
Anions and Nutrients (QCLot: 190449)										
CG2101101-003	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0564 mg/L	0.0676 mg/L	83.5	70.0	130	----
Anions and Nutrients (QCLot: 190726)										
CG2101095-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.108 mg/L	0.1 mg/L	108	75.0	125	----
Anions and Nutrients (QCLot: 190727)										
CG2101101-003	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0981 mg/L	0.1 mg/L	98.1	75.0	125	----
Organic / Inorganic Carbon (QCLot: 190566)										
CG2101085-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	21.9 mg/L	23.9 mg/L	91.5	70.0	130	----
Organic / Inorganic Carbon (QCLot: 190568)										
CG2101085-001	Anonymous	carbon, total organic [TOC]	----	E355-L	23.0 mg/L	23.9 mg/L	96.3	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 188893)										
CG2101095-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0393 mg/L	0.04 mg/L	98.2	70.0	130	----
Total Metals (QCLot: 188894)										
CG2101095-001	Anonymous	aluminum, total	7429-90-5	E420	0.195 mg/L	0.2 mg/L	97.7	70.0	130	----
		antimony, total	7440-36-0	E420	0.0194 mg/L	0.02 mg/L	97.0	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0196 mg/L	0.02 mg/L	98.1	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0376 mg/L	0.04 mg/L	94.1	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00957 mg/L	0.01 mg/L	95.7	70.0	130	----
		boron, total	7440-42-8	E420	0.099 mg/L	0.1 mg/L	98.7	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00412 mg/L	0.004 mg/L	103	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0193 mg/L	0.02 mg/L	96.6	70.0	130	----
		copper, total	7440-50-8	E420	0.0181 mg/L	0.02 mg/L	90.7	70.0	130	----
		iron, total	7439-89-6	E420	1.92 mg/L	2 mg/L	96.2	70.0	130	----
		lead, total	7439-92-1	E420	0.0191 mg/L	0.02 mg/L	95.3	70.0	130	----
		lithium, total	7439-93-2	E420	0.0921 mg/L	0.1 mg/L	92.1	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0190 mg/L	0.02 mg/L	95.1	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0199 mg/L	0.02 mg/L	99.7	70.0	130	----
		nickel, total	7440-02-0	E420	0.0384 mg/L	0.04 mg/L	95.9	70.0	130	----
		potassium, total	7440-09-7	E420	3.98 mg/L	4 mg/L	99.4	70.0	130	----
		selenium, total	7782-49-2	E420	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		silicon, total	7440-21-3	E420	9.19 mg/L	10 mg/L	91.9	70.0	130	----
		silver, total	7440-22-4	E420	0.00392 mg/L	0.004 mg/L	98.0	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	20.5 mg/L	20 mg/L	103	70.0	130	----
		thallium, total	7440-28-0	E420	0.00379 mg/L	0.004 mg/L	94.7	70.0	130	----
		tin, total	7440-31-5	E420	0.0196 mg/L	0.02 mg/L	98.2	70.0	130	----
		titanium, total	7440-32-6	E420	0.0376 mg/L	0.04 mg/L	94.0	70.0	130	----
		uranium, total	7440-61-1	E420	0.00402 mg/L	0.004 mg/L	100	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0998 mg/L	0.1 mg/L	99.8	70.0	130	----
		zinc, total	7440-66-6	E420	0.389 mg/L	0.4 mg/L	97.2	70.0	130	----
Total Metals (QCLot: 191387)										
CG2101097-004	Anonymous	mercury, total	7439-97-6	E508-L	4.76 ng/L	5 ng/L	95.3	70.0	130	----
Dissolved Metals (QCLot: 188915)										

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 188915) - continued										
CG2101098-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0396 mg/L	0.04 mg/L	99.1	70.0	130	----
Dissolved Metals (QCLot: 188916)										
CG2101098-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.213 mg/L	0.2 mg/L	106	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0194 mg/L	0.02 mg/L	97.1	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0373 mg/L	0.04 mg/L	93.3	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00844 mg/L	0.01 mg/L	84.4	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.096 mg/L	0.1 mg/L	95.9	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00386 mg/L	0.004 mg/L	96.4	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0189 mg/L	0.02 mg/L	94.7	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0188 mg/L	0.02 mg/L	93.8	70.0	130	----
		iron, dissolved	7439-89-6	E421	2.00 mg/L	2 mg/L	100	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0178 mg/L	0.02 mg/L	89.0	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0898 mg/L	0.1 mg/L	89.8	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0194 mg/L	0.02 mg/L	96.8	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0198 mg/L	0.02 mg/L	99.1	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0370 mg/L	0.04 mg/L	92.4	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.90 mg/L	4 mg/L	97.6	70.0	130	----
		selenium, dissolved	7782-49-2	E421	ND mg/L	0.04 mg/L	ND	70.0	130	----
		silicon, dissolved	7440-21-3	E421	8.97 mg/L	10 mg/L	89.7	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00382 mg/L	0.004 mg/L	95.4	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00362 mg/L	0.004 mg/L	90.4	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0189 mg/L	0.02 mg/L	94.5	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0411 mg/L	0.04 mg/L	103	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00364 mg/L	0.004 mg/L	91.1	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.100 mg/L	0.1 mg/L	100	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.402 mg/L	0.4 mg/L	100	70.0	130	----
Dissolved Metals (QCLot: 190750)										
CG2101100-002	RG_LILC3_WS_LAEMP_LCO_2021-04_NP	mercury, dissolved	7439-97-6	E509	0.0000989 mg/L	0.0001 mg/L	98.9	70.0	130	----

Teck

COC ID: **Regional Effects Program** | TURNAROUND TIME: Regular

PROJECT/CLIENT INFO		LABORATORY		OTHER INFO			
Facility Name	Regional Effects Program	Lab Name	ALS Calgary	Report Format / Distribution	Excel	PDF	EDD
Project Manager	Cait Good	Lab Contact	Lyuda Shvets	Email 1: cait.good@teck.com	X	X	X
Email	cait.good@teck.com	Email	Lyudmyla.Shvets@ALSGlobal.com	Email 2: carlie.meyer@teck.com	X	X	X
Address	421 Pine Avenue	Address	2559 29 Street NE	Email 3: teckcoal@equisonline.com			X
				Email 4: [redacted]			
Sparwood	Province BC	City	Calgary Province AB	Email 5: Carle.FroymanParker@teck.com	X	X	X
V0B 2G0	Country Canada	Postal Code	T1Y 7B5 Country Canada	Tyler.mehler@mmm.ca	X	X	X
250-425-8202		Phone Number	403-407-1800	PO number	VPO748510		

Environmental Division
Calgary
Work Order Reference
CG2101100

Telephone : +1 403 407 1800

SAMPLE DETAILS								ANALYSIS REQUESTED											
								Filtered - F: Field, L: Lab, FL: Field & Lab, N: None											
								BTL	N	Y	N	Y	Y	N	N				
								PRESERV.	NONE	H2SO4	H2SO4	HCl	HNO3	HNO3	NONE				
Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	HG-T-U-CVAF-VA	ALS_Package-DOC	ALS_Package-TKN/TOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA				
RG_LCUT_WS_LAEMP_LCO_2021-04_NP	RG_LCUT	WS	NO	21/04/27	10:15	G	7		X	X	X	X	X	X	X				
RG_LILC3_WS_LAEMP_LCO_2021-04_NP	RG_LILC3	WS	NO	21/04/27	12:22	G	7		X	X	X	X	X	X	X				
RG_LISP24_WS_LAEMP_LCO_2021-04_NP	RG_LISP24	WS	NO	21/04/27	14:20	G	7		X	X	X	X	X	X	X				
RG_RIVER_WS_LAEMP_LCO_2021-04_NP	RG_RIVER	WS	NO	21/04/27	10:00	G	7		X	X	X	X	X	X	X				
		WS	NO			G													
		WS	NO			G													
		WS	NO			G													
		WS	NO			G													
		WS	NO			G													
		WS	NO			G													

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
VPO748510	Rick Smith / Lotic Environmental	21/04/27 16:15		27/04 8:50

SERVICE REQUEST (rush - subject to availability)					
Regular (default)	X	Sampler's Name	Rick Smith	Mobile #	403-586-3241
Priority (2-3 business days) - 50% surcharge		Sampler's Signature		Date/Time	21/04/27 16:15
Emergency (1 Business Day) - 100% surcharge					
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

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WATER CHEMISTRY

ALS Laboratory Report CG2101142

(Finalized May 7, 2021)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **CG2101142**	Page	: 1 of 7
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: 250 425 8202	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 30-Apr-2021 09:40
PO	: VPO00748510	Date Analysis Commenced	: 30-Apr-2021
C-O-C number	: Regional Effects Program	Issue Date	: 07-May-2021 18:16
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Elke Tabora		Inorganics, Calgary, Alberta
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
James Diacon	Laboratory Analyst	Metals, Calgary, Alberta
Jorden Fanson	Analyst	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Naeun Kim	Analyst	Inorganics, Calgary, Alberta
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Saron Kim	Analyst	Metals, Burnaby, British Columbia
Shirley Li		Inorganics, Calgary, Alberta

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	----	----	----
					Client sampling date / time	29-Apr-2021 08:30	29-Apr-2021 10:00	----	----	----
						CG2101142-001	CG2101142-002	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		185	<1.0	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		9.6	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		195	<1.0	----	----	----
conductivity	----	E100	2.0	µS/cm		821	<2.0	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		444	<0.50	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV		487	474	----	----	----
pH	----	E108	0.10	pH units		8.34	5.38	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L		545	<10	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L		1.3	<1.0	----	----	----
turbidity	----	E121	0.10	NTU		1.54	<0.10	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0187	0.0096 RRV	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		10.7	<0.10	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.177	<0.020	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		<0.050	<0.050	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		8.24	<0.0050	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		<0.0010	<0.0010	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0032	<0.0020	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		210	<0.30	----	----	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		<0.50	----	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		<0.50	<0.50	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		9.17	<0.10	----	----	----
cation sum	----	EC101	0.10	meq/L		9.25	<0.10	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	----	----	----
					Client sampling date / time	29-Apr-2021 08:30	29-Apr-2021 10:00	----	----	----
						CG2101142-001	CG2101142-002	--------	--------	--------
						Result	Result	----	----	----
Ion Balance										
ion balance (cations/anions ratio)	----	EC101	0.010	%		101	100	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		0.434	<0.010	----	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0312	<0.0030	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00022	<0.00010	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00019	<0.00010	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0632	<0.00010	----	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	<0.020	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L		0.015	<0.010	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.120	<0.0050	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		108	<0.050	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00020	<0.00010	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	<0.10	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L		0.033	<0.010	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0402	<0.0010	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		45.7	<0.0050	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00509	<0.00010	----	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	<0.00050	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00237	<0.000050	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00363	<0.00050	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L		1.31	<0.050	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L		33.8	<0.050	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		2.24	<0.10	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L		7.45	<0.050	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.209	<0.00020	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		77.0	<0.50	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	----	----	----
					Client sampling date / time	29-Apr-2021 08:30	29-Apr-2021 10:00	----	----	----
						CG2101142-001	CG2101142-002	--------	--------	--------
						Result	Result	----	----	----
Total Metals										
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00060 DLM	<0.00030	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00332	<0.000010	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00060	<0.00050	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0047	<0.0030	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0017	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00022	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00012	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0654	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L		<0.020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.013	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L		0.105	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		100	<0.050	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L		<0.10	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0396	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		47.1	<0.0050	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00237	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00229	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00375	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		1.41	<0.050	----	----	----
selenium, dissolved	7782-49-2	E421	0.050	µg/L		34.6	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.14	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	----	----	----
					Client sampling date / time	29-Apr-2021 08:30	29-Apr-2021 10:00	----	----	----
						CG2101142-001	CG2101142-002	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	----	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		8.08	<0.050	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.229	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		81.4	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00321	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0042	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Laboratory	----	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2101142**	Page	: 1 of 14
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 250 425 8202	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 30-Apr-2021 09:40
PO	: VPO00748510	Issue Date	: 07-May-2021 18:16
C-O-C number	: Regional Effects Program		
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

Key

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

Summary of Outliers

Outliers : Quality Control Samples

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

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E298	29-Apr-2021	06-May-2021	----	8 days	✓	06-May-2021	28 days	1 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E298	29-Apr-2021	06-May-2021	----	8 days	✓	06-May-2021	28 days	1 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E235.Br-L	29-Apr-2021	----	----	----		30-Apr-2021	28 days	2 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E235.Br-L	29-Apr-2021	----	----	----		30-Apr-2021	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E235.Cl-L	29-Apr-2021	----	----	----		30-Apr-2021	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E235.Cl-L	29-Apr-2021	----	----	----		30-Apr-2021	28 days	2 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE										
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E378-U	29-Apr-2021	----	----	----		30-Apr-2021	3 days	2 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E378-U	29-Apr-2021	----	----	----		30-Apr-2021	3 days	2 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E235.F	29-Apr-2021	----	----	----		30-Apr-2021	28 days	2 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E235.F	29-Apr-2021	----	----	----		30-Apr-2021	28 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E235.NO3-L	29-Apr-2021	----	----	----		30-Apr-2021	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E235.NO3-L	29-Apr-2021	----	----	----		30-Apr-2021	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E235.NO2-L	29-Apr-2021	----	----	----		30-Apr-2021	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E235.NO2-L	29-Apr-2021	----	----	----		30-Apr-2021	3 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E235.SO4	29-Apr-2021	----	----	----		30-Apr-2021	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E235.SO4	29-Apr-2021	----	----	----		30-Apr-2021	28 days	2 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E318	29-Apr-2021	04-May-2021	----	5 days	✓	04-May-2021	28 days	1 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E318	29-Apr-2021	04-May-2021	----	5 days	✓	04-May-2021	28 days	1 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E372-U	29-Apr-2021	06-May-2021	----	7 days	✓	06-May-2021	28 days	1 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E372-U	29-Apr-2021	06-May-2021	----	7 days	✓	06-May-2021	28 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E421.Cr-L	29-Apr-2021	03-May-2021	----	5 days	✓	03-May-2021	180 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E509	29-Apr-2021	05-May-2021	----	7 days	✓	05-May-2021	28 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E421	29-Apr-2021	03-May-2021	----	5 days	✓	03-May-2021	180 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E421	29-Apr-2021	05-May-2021	----	6 days	✓	05-May-2021	180 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E358-L	29-Apr-2021	06-May-2021	----	8 days	✓	06-May-2021	28 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E355-L	29-Apr-2021	06-May-2021	----	8 days	✓	06-May-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E355-L	29-Apr-2021	06-May-2021	----	8 days	✓	06-May-2021	28 days	1 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E283	29-Apr-2021	----	----	----		04-May-2021	14 days	6 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E283	29-Apr-2021	----	----	----		04-May-2021	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E290	29-Apr-2021	----	----	----		04-May-2021	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E290	29-Apr-2021	----	----	----		04-May-2021	14 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E100	29-Apr-2021	----	----	----		04-May-2021	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E100	29-Apr-2021	----	----	----		04-May-2021	28 days	6 days	✓
Physical Tests : ORP by Electrode										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E125	29-Apr-2021	----	----	----		07-May-2021	0.34 hrs	188 hrs	× EHTR-FM

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : ORP by Electrode										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E125	29-Apr-2021	----	----	----		07-May-2021	0.34 hrs	189 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E108	29-Apr-2021	----	----	----		04-May-2021	0.25 hrs	121 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E108	29-Apr-2021	----	----	----		04-May-2021	0.25 hrs	122 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E162	29-Apr-2021	----	----	----		05-May-2021	7 days	6 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E162	29-Apr-2021	----	----	----		05-May-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E160-L	29-Apr-2021	----	----	----		05-May-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E160-L	29-Apr-2021	----	----	----		05-May-2021	7 days	7 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E121	29-Apr-2021	----	----	----		01-May-2021	3 days	2 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E121	29-Apr-2021	----	----	----		01-May-2021	3 days	2 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E420.Cr-L	29-Apr-2021	----	----	----		03-May-2021	180 days	5 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E420.Cr-L	29-Apr-2021	----	----	----		03-May-2021	180 days	5 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E508-L	29-Apr-2021	----	----	----		07-May-2021	28 days	9 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E508-L	29-Apr-2021	----	----	----		07-May-2021	28 days	9 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	E420	29-Apr-2021	----	----	----		03-May-2021	180 days	5 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_TRIP_WS_LAEMP_LCO_2021-04_NP	E420	29-Apr-2021	----	----	----		03-May-2021	180 days	5 days	✓

Legend & Qualifier Definitions

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

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	190701	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	189851	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	192160	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	188795	1	5	20.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	188796	1	5	20.0	5.0	✓
Conductivity in Water	E100	189850	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	190046	1	4	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	191556	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	190045	2	11	18.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	192298	1	15	6.6	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	188493	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	188793	1	5	20.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	188797	1	5	20.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	188798	1	5	20.0	5.0	✓
ORP by Electrode	E125	192847	1	20	5.0	5.0	✓
pH by Meter	E108	189849	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	188794	1	5	20.0	5.0	✓
TDS by Gravimetry	E162	191138	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	189392	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	189675	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	193036	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	189393	1	18	5.5	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	192300	1	16	6.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	191248	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	188935	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	190701	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	189851	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	192160	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	188795	1	5	20.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	188796	1	5	20.0	5.0	✓
Conductivity in Water	E100	189850	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	190046	1	4	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	191556	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	190045	1	11	9.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	192298	1	15	6.6	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	188493	1	20	5.0	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	188793	1	5	20.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	188797	1	5	20.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	188798	1	5	20.0	5.0	✓
ORP by Electrode	E125	192847	1	20	5.0	5.0	✓
pH by Meter	E108	189849	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	188794	1	5	20.0	5.0	✓
TDS by Gravimetry	E162	191138	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	189392	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	189675	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	193036	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	189393	1	18	5.5	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	192300	1	16	6.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	191248	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	191133	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	188935	1	20	5.0	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	190701	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	189851	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	192160	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	188795	1	5	20.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	188796	1	5	20.0	5.0	✓
Conductivity in Water	E100	189850	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	190046	1	4	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	191556	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	190045	1	11	9.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	192298	1	15	6.6	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	188493	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	188793	1	5	20.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	188797	1	5	20.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	188798	1	5	20.0	5.0	✓
Sulfate in Water by IC	E235.SO4	188794	1	5	20.0	5.0	✓
TDS by Gravimetry	E162	191138	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	189392	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	189675	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	193036	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	189393	1	18	5.5	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	192300	1	16	6.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	191248	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	191133	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	188935	1	20	5.0	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	192160	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	188795	1	5	20.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	188796	1	5	20.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	190046	1	4	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	191556	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	190045	1	11	9.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	192298	1	15	6.6	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	188493	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	188793	1	5	20.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	188797	1	5	20.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	188798	1	5	20.0	5.0	✓
Sulfate in Water by IC	E235.SO4	188794	1	5	20.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	189392	1	9	11.1	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	189675	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	193036	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	189393	1	18	5.5	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	192300	1	16	6.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	191248	1	20	5.0	5.0	✓

Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Calgary - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Calgary - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Calgary - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
ORP by Electrode	E125 Calgary - Environmental	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed, measured in mV. For high accuracy test results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L Calgary - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Calgary - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC (Low Level)	E235.Cl-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Calgary - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH 8.3

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U Calgary - Environmental	Water	APHA 4500-P E (mod)	Dissolved Orthophosphate is determined colourimetrically on a water sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAFS.
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Calgary - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **CG2101142**	Page	: 1 of 22
Client	: Teck Coal Limited	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 250 425 8202	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 30-Apr-2021 09:40
PO	: VPO00748510	Date Analysis Commenced	: 30-Apr-2021
C-O-C number	: Regional Effects Program	Issue Date	: 07-May-2021 18:16
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Elke Tabora		Inorganics, Calgary, Alberta
Gloria Chan	Lab Analyst	Metals, Burnaby, British Columbia
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
James Diacon	Laboratory Analyst	Metals, Calgary, Alberta
Jorden Fanson	Analyst	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Naeun Kim	Analyst	Inorganics, Calgary, Alberta
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Saron Kim	Analyst	Metals, Burnaby, British Columbia

General Comments

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

Key :

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 188935)											
CG2101126-021	Anonymous	turbidity	----	E121	0.10	NTU	26.3	26.0	1.15%	15%	----
Physical Tests (QC Lot: 189849)											
CG2101136-001	Anonymous	pH	----	E108	0.10	pH units	8.19	8.20	0.122%	4%	----
Physical Tests (QC Lot: 189850)											
CG2101136-001	Anonymous	conductivity	----	E100	2.0	µS/cm	1390	1380	0.648%	10%	----
Physical Tests (QC Lot: 189851)											
CG2101136-001	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	352	425	18.8%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	352	348	0.972%	20%	----
Physical Tests (QC Lot: 190701)											
CG2101126-021	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	68.1	67.5	0.885%	20%	----
Physical Tests (QC Lot: 191138)											
CG2101126-021	Anonymous	solids, total dissolved [TDS]	----	E162	40	mg/L	3040	3060	0.557%	20%	----
Physical Tests (QC Lot: 192847)											
CG2101126-027	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	354	354	0.00%	15%	----
Anions and Nutrients (QC Lot: 188493)											
CG2101136-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0016	0.0015	0.0002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 188793)											
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	fluoride	16984-48-8	E235.F	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 188794)											
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	<0.30	<0.30	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 188795)											
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 188796)											
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 188797)											
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 188798)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 188798) - continued											
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 189675)											
CG2101128-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 191248)											
CG2101126-021	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 192160)											
CG2101126-021	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0500	mg/L	1.21	1.22	0.321%	20%	----
Organic / Inorganic Carbon (QC Lot: 192298)											
CG2101128-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.81	1.02	0.21	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 192300)											
CG2101128-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.91	1.84	0.07	Diff <2x LOR	----
Total Metals (QC Lot: 189392)											
CG2101125-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00013	0.00012	0.000010	Diff <2x LOR	----
Total Metals (QC Lot: 189393)											
CG2101125-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0139	0.0131	0.0008	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00106	0.00100	5.01%	20%	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00025	0.00025	0.000004	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0668	0.0652	2.47%	20%	----
		beryllium, total	7440-41-7	E420	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.016	0.015	0.0004	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	0.0982 µg/L	0.0000957	2.57%	20%	----
		calcium, total	7440-70-2	E420	0.050	mg/L	65.3	63.7	2.55%	20%	----
		cobalt, total	7440-48-4	E420	0.10	mg/L	0.23 µg/L	0.00023	0.0000002	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00520	0.00473	0.00046	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000192	0.000193	0.0000007	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0452	0.0443	1.95%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	42.8	41.5	3.10%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00844	0.00831	1.60%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00304	0.00294	0.00010	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	1.79	1.71	4.95%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	206 µg/L	0.208	0.903%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	0.67	0.66	0.003	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 189393) - continued											
CG2101125-001	Anonymous	silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	2.82	2.79	1.14%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.0962	0.0942	2.13%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	62.7	63.4	1.14%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00039	0.00049	0.00010	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00383	0.00378	1.45%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00057	0.00062	0.00005	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0066	0.0067	0.0001	Diff <2x LOR	----
Total Metals (QC Lot: 193036)											
CG2101128-001	Anonymous	mercury, total	7439-97-6	E508-L	0.00050	ng/L	<0.00050 µg/L	0.58	0.08	Diff <2x LOR	----
Dissolved Metals (QC Lot: 190045)											
CG2101126-027	Anonymous	zinc, dissolved	7440-66-6	E421	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
CG2101126-027	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0020	mg/L	0.0025	<0.0020	0.0005	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00020	mg/L	0.00033	0.00028	0.00005	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00020	mg/L	0.00950	0.00920	3.31%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.040	mg/L	<0.040 µg/L	<0.000040	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.020	mg/L	0.099	0.097	0.002	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0100	mg/L	<0.0100 µg/L	<0.0000100	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.100	mg/L	496	491	1.11%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.20	mg/L	26.4 µg/L	0.0252	4.56%	20%	----
		copper, dissolved	7440-50-8	E421	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.020	mg/L	2.76	2.60	5.97%	20%	----
		lead, dissolved	7439-92-1	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0020	mg/L	0.122	0.121	0.884%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0100	mg/L	266	249	6.66%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00020	mg/L	0.684	0.652	4.81%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000100	mg/L	0.000588	0.000614	0.000026	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00100	mg/L	0.129	0.122	5.04%	20%	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	12.8	12.3	4.42%	20%	----
		selenium, dissolved	7782-49-2	E421	0.100	mg/L	<0.100 µg/L	0.000144	0.000044	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.100	mg/L	3.56	3.45	3.01%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 190045) - continued											
CG2101126-027	Anonymous	silver, dissolved	7440-22-4	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.100	mg/L	8.27	7.76	6.29%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00040	mg/L	0.630	0.626	0.536%	20%	----
		sulfur, dissolved	7704-34-9	E421	1.00	mg/L	583	584	0.203%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000020	mg/L	0.0338	0.0333	1.53%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 190046)											
CG2101126-027	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00020	mg/L	0.00120	0.00108	0.00012	Diff <2x LOR	----
Dissolved Metals (QC Lot: 190813)											
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 190813) - continued											
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	strontium, dissolved	7440-24-6	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 191556)											
CG2101126-025	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 188935)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 189850)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 189851)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 190701)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Physical Tests (QCLot: 191133)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 191138)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 188493)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 188793)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 188794)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 188795)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 188796)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 188797)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 188798)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 189675)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 191248)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 192160)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 192160) - continued						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 192298)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 192300)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 189392)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 189393)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 189393) - continued						
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 193036)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 190045)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 190045) - continued						
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 190046)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 190813)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 191556)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 191556) - continued						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 188935)									
turbidity	----	E121	0.1	NTU	200 NTU	100	85.0	115	----
Physical Tests (QCLot: 189849)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 189850)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	104	90.0	110	----
Physical Tests (QCLot: 189851)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	103	85.0	115	----
Physical Tests (QCLot: 190701)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	98.2	85.0	115	----
Physical Tests (QCLot: 191133)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	97.7	85.0	115	----
Physical Tests (QCLot: 191138)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	98.7	85.0	115	----
Physical Tests (QCLot: 192847)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	102	95.4	104	----
Anions and Nutrients (QCLot: 188493)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.1 mg/L	94.0	80.0	120	----
Anions and Nutrients (QCLot: 188793)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	90.2	90.0	110	----
Anions and Nutrients (QCLot: 188794)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	96.0	90.0	110	----
Anions and Nutrients (QCLot: 188795)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	109	85.0	115	----
Anions and Nutrients (QCLot: 188796)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	96.4	90.0	110	----
Anions and Nutrients (QCLot: 188797)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	97.4	90.0	110	----
Anions and Nutrients (QCLot: 188798)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	97.7	90.0	110	----
Anions and Nutrients (QCLot: 189675)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	82.7	75.0	125	----
Anions and Nutrients (QCLot: 191248)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 191248) - continued									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	97.7	80.0	120	----
Anions and Nutrients (QCLot: 192160)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.1 mg/L	108	85.0	115	----
Organic / Inorganic Carbon (QCLot: 192298)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	88.1	80.0	120	----
Organic / Inorganic Carbon (QCLot: 192300)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	95.2	80.0	120	----
Total Metals (QCLot: 189392)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	97.7	80.0	120	----
Total Metals (QCLot: 189393)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	100.0	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	108	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	98.6	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	101	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	103	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	100	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	102	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	99.6	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	98.2	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	98.8	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	102	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	99.9	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	99.2	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	106	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	100	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	101	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	98.5	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	101	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	103	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	106	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	97.3	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 189393) - continued									
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	100.0	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	103	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	96.2	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	105	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	100	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	99.6	80.0	120	----
Total Metals (QCLot: 193036)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	104	80.0	120	----
Dissolved Metals (QCLot: 190045)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	101	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	104	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	98.9	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	98.0	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	102	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	109	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	97.3	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	95.7	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	95.6	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	98.5	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	103	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	97.6	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	99.8	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	96.9	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	100	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	103	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	98.5	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	99.0	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	101	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	110	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	107	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	104	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	95.9	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 190045) - continued									
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	103	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	98.9	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	101	80.0	120	----
Dissolved Metals (QCLot: 190046)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
Dissolved Metals (QCLot: 190813)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	97.0	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	98.7	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	92.7	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	95.1	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	109	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	97.4	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	108	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	93.2	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	94.6	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	95.8	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	94.1	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	99.3	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	96.8	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	112	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	97.6	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	96.2	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	97.2	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	91.5	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	93.9	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	87.6	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	96.3	60.0	140	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	98.1	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	97.6	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	99.9	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	99.6	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	96.7	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	95.5	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	91.6	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	94.2	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	95.8	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 190813) - continued									
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	90.0	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	96.6	80.0	120	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 188493)										
CG2101137-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0456 mg/L	0.05 mg/L	91.3	70.0	130	----
Anions and Nutrients (QCLot: 188793)										
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	fluoride	16984-48-8	E235.F	0.923 mg/L	1 mg/L	92.3	75.0	125	----
Anions and Nutrients (QCLot: 188794)										
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	sulfate (as SO4)	14808-79-8	E235.SO4	92.1 mg/L	100 mg/L	92.1	75.0	125	----
Anions and Nutrients (QCLot: 188795)										
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	bromide	24959-67-9	E235.Br-L	0.494 mg/L	0.5 mg/L	98.8	75.0	125	----
Anions and Nutrients (QCLot: 188796)										
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	chloride	16887-00-6	E235.Cl-L	92.4 mg/L	100 mg/L	92.4	75.0	125	----
Anions and Nutrients (QCLot: 188797)										
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	nitrate (as N)	14797-55-8	E235.NO3-L	2.31 mg/L	2.5 mg/L	92.4	75.0	125	----
Anions and Nutrients (QCLot: 188798)										
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	nitrite (as N)	14797-65-0	E235.NO2-L	0.481 mg/L	0.5 mg/L	96.3	75.0	125	----
Anions and Nutrients (QCLot: 189675)										
CG2101130-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	ND mg/L	2.5 mg/L	ND	70.0	130	----
Anions and Nutrients (QCLot: 191248)										
CG2101126-022	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0561 mg/L	0.0676 mg/L	83.0	70.0	130	----
Anions and Nutrients (QCLot: 192160)										
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	ammonia, total (as N)	7664-41-7	E298	0.105 mg/L	0.1 mg/L	105	75.0	125	----
Organic / Inorganic Carbon (QCLot: 192298)										
CG2101128-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	28.1 mg/L	23.9 mg/L	117	70.0	130	----
Organic / Inorganic Carbon (QCLot: 192300)										
CG2101128-001	Anonymous	carbon, total organic [TOC]	----	E355-L	22.7 mg/L	23.9 mg/L	94.8	70.0	130	----
Total Metals (QCLot: 189392)										
CG2101125-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0373 mg/L	0.04 mg/L	93.2	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 189393)										
CG2101125-001	Anonymous	aluminum, total	7429-90-5	E420	0.183 mg/L	0.2 mg/L	91.4	70.0	130	----
		antimony, total	7440-36-0	E420	0.0190 mg/L	0.02 mg/L	94.8	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0190 mg/L	0.02 mg/L	95.0	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0385 mg/L	0.04 mg/L	96.3	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00915 mg/L	0.01 mg/L	91.5	70.0	130	----
		boron, total	7440-42-8	E420	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00389 mg/L	0.004 mg/L	97.2	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0184 mg/L	0.02 mg/L	92.0	70.0	130	----
		copper, total	7440-50-8	E420	0.0177 mg/L	0.02 mg/L	88.5	70.0	130	----
		iron, total	7439-89-6	E420	1.89 mg/L	2 mg/L	94.5	70.0	130	----
		lead, total	7439-92-1	E420	0.0176 mg/L	0.02 mg/L	88.1	70.0	130	----
		lithium, total	7439-93-2	E420	0.0910 mg/L	0.1 mg/L	91.0	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0188 mg/L	0.02 mg/L	94.0	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0194 mg/L	0.02 mg/L	97.1	70.0	130	----
		nickel, total	7440-02-0	E420	0.0365 mg/L	0.04 mg/L	91.2	70.0	130	----
		potassium, total	7440-09-7	E420	3.68 mg/L	4 mg/L	92.1	70.0	130	----
		selenium, total	7782-49-2	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		silicon, total	7440-21-3	E420	9.40 mg/L	10 mg/L	94.0	70.0	130	----
		silver, total	7440-22-4	E420	0.00386 mg/L	0.004 mg/L	96.6	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00360 mg/L	0.004 mg/L	90.0	70.0	130	----
		tin, total	7440-31-5	E420	0.0197 mg/L	0.02 mg/L	98.6	70.0	130	----
		titanium, total	7440-32-6	E420	0.0381 mg/L	0.04 mg/L	95.4	70.0	130	----
		uranium, total	7440-61-1	E420	0.00370 mg/L	0.004 mg/L	92.6	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0963 mg/L	0.1 mg/L	96.3	70.0	130	----
		zinc, total	7440-66-6	E420	0.376 mg/L	0.4 mg/L	94.0	70.0	130	----
Total Metals (QCLot: 193036)										
CG2101137-001	Anonymous	mercury, total	7439-97-6	E508-L	4.11 ng/L	5 ng/L	82.2	70.0	130	----
Dissolved Metals (QCLot: 190045)										
CG2101126-027	Anonymous	aluminum, dissolved	7429-90-5	E421	0.389 mg/L	0.4 mg/L	97.3	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0393 mg/L	0.04 mg/L	98.2	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 190045) - continued										
CG2101126-027	Anonymous	arsenic, dissolved	7440-38-2	E421	0.0430 mg/L	0.04 mg/L	107	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0393 mg/L	0.04 mg/L	98.2	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0771 mg/L	0.08 mg/L	96.4	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.0191 mg/L	0.02 mg/L	95.4	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.190 mg/L	0.2 mg/L	95.0	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00787 mg/L	0.008 mg/L	98.3	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	8 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0367 mg/L	0.04 mg/L	91.8	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0370 mg/L	0.04 mg/L	92.4	70.0	130	----
		iron, dissolved	7439-89-6	E421	3.82 mg/L	4 mg/L	95.6	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0385 mg/L	0.04 mg/L	96.3	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.183 mg/L	0.2 mg/L	91.3	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.04 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0402 mg/L	0.04 mg/L	101	70.0	130	----
		nickel, dissolved	7440-02-0	E421	ND mg/L	0.08 mg/L	ND	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	8 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0906 mg/L	0.08 mg/L	113	70.0	130	----
		silicon, dissolved	7440-21-3	E421	18.0 mg/L	20 mg/L	90.3	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00665 mg/L	0.008 mg/L	83.2	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	40 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00768 mg/L	0.008 mg/L	96.0	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0393 mg/L	0.04 mg/L	98.2	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0853 mg/L	0.08 mg/L	107	70.0	130	----
		uranium, dissolved	7440-61-1	E421	ND mg/L	0.008 mg/L	ND	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.208 mg/L	0.2 mg/L	104	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.779 mg/L	0.8 mg/L	97.4	70.0	130	----
Dissolved Metals (QCLot: 190046)										
CG2101126-027	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0807 mg/L	0.08 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 190813)										
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	aluminum, dissolved	7429-90-5	E421	2.05 mg/L	2 mg/L	103	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.200 mg/L	0.2 mg/L	100	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.199 mg/L	0.2 mg/L	99.5	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.197 mg/L	0.2 mg/L	98.3	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 190813) - continued										
CG2101142-002	RG_TRIP_WS_LAEMP_LCO_2021-04_NP	beryllium, dissolved	7440-41-7	E421	0.457 mg/L	0.4 mg/L	114	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		boron, dissolved	7440-42-8	E421	1.16 mg/L	1 mg/L	116	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
		calcium, dissolved	7440-70-2	E421	40.3 mg/L	40 mg/L	101	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.205 mg/L	0.2 mg/L	102	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.204 mg/L	0.2 mg/L	102	70.0	130	----
		iron, dissolved	7439-89-6	E421	20.2 mg/L	20 mg/L	101	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.204 mg/L	0.2 mg/L	102	70.0	130	----
		lithium, dissolved	7439-93-2	E421	1.17 mg/L	1 mg/L	117	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	10.0 mg/L	10 mg/L	100	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.203 mg/L	0.2 mg/L	102	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.197 mg/L	0.2 mg/L	98.4	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.404 mg/L	0.4 mg/L	101	70.0	130	----
		potassium, dissolved	7440-09-7	E421	39.7 mg/L	40 mg/L	99.3	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.398 mg/L	0.4 mg/L	99.4	70.0	130	----
		silicon, dissolved	7440-21-3	E421	101 mg/L	100 mg/L	101	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.0413 mg/L	0.04 mg/L	103	70.0	130	----
		sodium, dissolved	17341-25-2	E421	21.8 mg/L	20 mg/L	109	70.0	130	----
		strontium, dissolved	7440-24-6	E421	0.202 mg/L	0.2 mg/L	101	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	219 mg/L	200 mg/L	110	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.0403 mg/L	0.04 mg/L	101	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.196 mg/L	0.2 mg/L	97.8	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.404 mg/L	0.4 mg/L	101	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.0400 mg/L	0.04 mg/L	100	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	1.00 mg/L	1 mg/L	100	70.0	130	----
		zinc, dissolved	7440-66-6	E421	4.08 mg/L	4 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 191556)										
CG2101126-026	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000969 mg/L	0.0001 mg/L	96.9	70.0	130	----

Page 1 of 1

Teck

COC ID: Regional Effects Program

TURNAROUND TIME: Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Regional Effects Program			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Cait Good			Lab Contact	Lyuda Shvets			Email 1:	cait.good@teck.com	X	X	X
Email	cait.good@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	carlie.meyer@teck.com	X	X	X
Address	421 Pine Avenue			Address	2559 29 Street NE			Email 3:	teckcoal@equisonline.com			X
								Email 4:	[redacted]	X	X	X
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 5:	Carla.FroymanParker@teck.com	X	X	X
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada	Tyler.Inshler@minnes.ca				
Phone Number	250-425-8202			Phone Number	403-407-1800			PO number	PO0748510			

SAMPLE DETAILS / **ANALYSIS REQUESTED** (Filtered - F: Field, L: Lab, FL: Field & Lab, N: None)

Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	FIL	N	Y	N	Y	Y	N	N
								PRESERV.	NONE	H2SO4	H2SO4	HCl	HNO3	HNO3	NONE
								ANALYSIS	HG-T-U-CVAF-VA	ALS_Package-DOC	ALS_Package-TKN/TOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA
RG-LIDCOM-WS-LAEMP-LCO-2021-04-NP	RG-LIXCOM	WS	NO	21/04/29	08:30	G	7		X	X	X	X	X	X	X
RG-TRIP-WS-LAEMP-LCO-2021-04-NP	RG LIXCOM	WS	NO	21/04/29	10:00	G	4		X		X			X	X
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									

Environmental Division
Calgary
Work Order Reference
CG2101142

Telephone : +1 403 407 1800

STRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Rick Smith / Lotic Environmental	21/04/29 10:31		30/04 9:46

SERVICE REQUEST (rush - subject to availability)

Regular (default)	X
Priority (2-3 business days) - 50% surcharge	
Emergency (1 Business Day) - 100% surcharge	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	

Sampler's Name	Rick Smith	Mobile #	
Sampler's Signature		Date/Time	21/04/29 10:31

4

WATER CHEMISTRY

ALS Laboratory Report CG2101123

(Finalized May 7, 2021)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **CG2101123**	Page	: 1 of 6
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: 250 425 8202	Telephone	: +1 403 407 1800
Project	: Regional Effects Program	Date Samples Received	: 29-Apr-2021 09:10
PO	: VPO00748510	Date Analysis Commenced	: 29-Apr-2021
C-O-C number	: Regional Effects Program	Issue Date	: 07-May-2021 17:20
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Elke Tabora		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Jorden Fanson	Analyst	Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Naeun Kim	Analyst	Inorganics, Calgary, Alberta
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Shirley Li		Inorganics, Calgary, Alberta

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_FRUL_WS_LAEMP_LCO_2021-04_NP	RG_FO23_WS_LAEMP_LCO_2021-04_NP	RG_LI8_WS_LAEMP_LCO_2021-04_NP	----	----
					Client sampling date / time	28-Apr-2021 09:40	28-Apr-2021 11:50	28-Apr-2021 14:20	----	----
						CG2101123-001	CG2101123-002	CG2101123-003	--------	--------
						Result	Result	Result	----	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	<2.0	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		189	188	174	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		10.0	10.4	9.6	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		199	199	183	----	----
conductivity	----	E100	2.0	µS/cm		864	846	796	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		473	454	407	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV		496	490	490	----	----
pH	----	E108	0.10	pH units		8.35	8.35	8.36	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L		588	604	506	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L		2.1	2.0	2.4	----	----
turbidity	----	E121	0.10	NTU		0.83	0.62	0.31	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0063	0.0098	0.0065	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	<0.050	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		2.47	4.41	10.2	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.118	0.145	0.210	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		<0.050	<0.050	<0.050	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		13.6	12.0	7.87	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0066	0.0071	0.0037	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		<0.0010	<0.0010	<0.0010	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0020	0.0028	<0.0020	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		222	217	204	----	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		1.83	1.43	1.17	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		1.58	1.47	1.27	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		9.65	9.48	8.76	----	----
cation sum	----	EC101	0.10	meq/L		9.60	9.27	8.45	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_FRUL_WS_LAEMP_LCO_2021-04_NP	RG_FO23_WS_LAEMP_LCO_2021-04_NP	RG_LI8_WS_LAEMP_LCO_2021-04_NP	----	----
					Client sampling date / time	28-Apr-2021 09:40	28-Apr-2021 11:50	28-Apr-2021 14:20	----	----
						CG2101123-001	CG2101123-002	CG2101123-003	--------	--------
						Result	Result	Result	----	----
Ion Balance										
ion balance (cations/anions ratio)	----	EC101	0.010	%		99.5	97.8	96.5	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		0.260	1.12	1.80	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0199	0.0241	0.0098	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00013	0.00014	0.00021	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00012	0.00013	0.00012	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.112	0.0948	0.0602	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	<0.020	<0.020	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	0.013	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.0223	0.0344	0.103	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		112	104	99.4	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00013	0.00021	0.00013	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	<0.10	<0.10	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
iron, total	7439-89-6	E420	0.010	mg/L		0.024	0.024	0.011	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0236	0.0248	0.0370	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		47.9	45.0	41.5	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00234	0.00178	0.00244	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	<0.00050	<0.00050	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00126	0.00150	0.00229	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00109	0.00132	0.00304	----	----
potassium, total	7440-09-7	E420	0.050	mg/L		1.42	1.34	1.29	----	----
selenium, total	7782-49-2	E420	0.050	µg/L		58.6	51.9	32.9	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		2.02	2.11	2.11	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, total	17341-25-2	E420	0.050	mg/L		2.65	3.57	6.86	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.171	0.182	0.211	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		87.2	85.4	79.5	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_FRUL_WS_LAEMP_LCO_2021-04_NP	RG_FO23_WS_LAEMP_LCO_2021-04_NP	RG_LI8_WS_LAEMP_LCO_2021-04_NP	----	----
					Client sampling date / time	28-Apr-2021 09:40	28-Apr-2021 11:50	28-Apr-2021 14:20	----	----
						CG2101123-001	CG2101123-002	CG2101123-003	--------	--------
						Result	Result	Result	----	----
Total Metals										
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00060 DLM	<0.00090 DLM	<0.00060 DLM	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00263	0.00269	0.00309	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	0.0038	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00012	0.00014	0.00019	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		<0.00010	<0.00010	0.00011	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.113	0.104	0.0598	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L		<0.020	<0.020	<0.020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	0.010	0.013	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L		0.0203	0.0214	0.0692	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		111	108	95.4	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L		<0.10	<0.10	<0.10	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0246	0.0273	0.0383	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		47.6	44.9	40.9	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00070	0.00058	0.00129	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00130	0.00158	0.00229	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00107	0.00124	0.00289	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		1.40	1.31	1.25	----	----
selenium, dissolved	7782-49-2	E421	0.050	µg/L		60.6	52.6	32.9	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		1.94	2.04	2.00	----	----

Analytical Results

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

					Client sample ID	RG_FRUL_WS_LAEMP_LCO_2021-04_NP	RG_FO23_WS_LAEMP_LCO_2021-04_NP	RG_LI8_WS_LAEMP_LCO_2021-04_NP	----	----
					Client sampling date / time	28-Apr-2021 09:40	28-Apr-2021 11:50	28-Apr-2021 14:20	----	----
Analyte	CAS Number	Method	LOR	Unit		CG2101123-001	CG2101123-002	CG2101123-003	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		2.64	3.59	6.79	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.163	0.184	0.200	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		85.5	85.4	75.7	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00271	0.00290	0.00307	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	0.0026	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----

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

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **CG2101123**	Page	: 1 of 18
Client	: Teck Coal Limited	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 250 425 8202	Telephone	: +1 403 407 1800
Project	: Regional Effects Program	Date Samples Received	: 29-Apr-2021 09:10
PO	: VPO00748510	Date Analysis Commenced	: 29-Apr-2021
C-O-C number	: Regional Effects Program	Issue Date	: 07-May-2021 17:21
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Elke Tabora		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Jorden Fanson	Analyst	Inorganics, Calgary, Alberta
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Naeun Kim	Analyst	Inorganics, Calgary, Alberta
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Shirley Li		Inorganics, Calgary, Alberta

General Comments

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

Key :

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 188427)											
CG2101119-001	Anonymous	turbidity	----	E121	0.10	NTU	0.90	0.90	0.003	Diff <2x LOR	----
Physical Tests (QC Lot: 189843)											
CG2101120-002	Anonymous	conductivity	----	E100	2.0	µS/cm	740	727	1.77%	10%	----
Physical Tests (QC Lot: 189844)											
CG2101120-002	Anonymous	pH	----	E108	0.10	pH units	8.12	8.16	0.491%	4%	----
Physical Tests (QC Lot: 189845)											
CG2101120-002	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	280	288	2.61%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	280	288	2.61%	20%	----
Physical Tests (QC Lot: 190394)											
CG2101119-001	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	128	123	5	Diff <2x LOR	----
Physical Tests (QC Lot: 190539)											
CG2101120-002	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 191938)											
CG2101120-001	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	346	333	4.00%	15%	----
Anions and Nutrients (QC Lot: 188491)											
CG2101120-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 188787)											
CG2101124-006	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 188788)											
CG2101124-006	Anonymous	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 188789)											
CG2101124-006	Anonymous	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 188790)											
CG2101124-006	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 188791)											
CG2101124-006	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 188792)											
CG2101124-006	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	<0.30	<0.30	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 188806)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 188806) - continued											
CG2101120-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.130	0.131	0.001	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 191242)											
CG2101119-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0100	mg/L	0.0188	0.0189	0.0001	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 191313)											
CG2101120-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0129	0.0154	0.0025	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 190996)											
CG2101115-002	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 190997)											
CG2101123-002	RG_FO23_WS_LAEMP_LCO_2021-04_NP	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.43	1.45	0.02	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 190998)											
CG2101115-002	Anonymous	carbon, total organic [TOC]	----	E355-L	5.00	mg/L	38.6	41.4	2.74	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 190999)											
CG2101123-002	RG_FO23_WS_LAEMP_LCO_2021-04_NP	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.47	1.40	0.08	Diff <2x LOR	----
Total Metals (QC Lot: 188893)											
CG2101095-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00010	<0.00010	0.000005	Diff <2x LOR	----
Total Metals (QC Lot: 188894)											
CG2101095-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0090	0.0114	0.0024	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.108	0.108	0.522%	20%	----
		beryllium, total	7440-41-7	E420	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.010	<0.010	0.00006	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	0.0428 µg/L	0.0000419	0.0000009	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	63.2	61.7	2.40%	20%	----
		cobalt, total	7440-48-4	E420	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00613	0.00570	7.41%	20%	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.110	0.118	7.14%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000156	0.000156	0.0000006	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0063	0.0061	0.0001	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	15.6	16.0	2.69%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00911	0.00936	2.71%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00122	0.00120	2.06%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 188894) - continued											
CG2101095-001	Anonymous	potassium, total	7440-09-7	E420	0.050	mg/L	0.669	0.675	0.834%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	7.91 µg/L	0.00776	1.86%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	2.93	2.92	0.614%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	3.59	3.62	0.862%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.234	0.240	2.42%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	17.9	17.9	0.136%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	0.00019	0.00018	0.000009	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000758	0.000752	0.849%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
Total Metals (QC Lot: 192102)											
CG2101119-001	Anonymous	mercury, total	7439-97-6	E508-L	0.00050	ng/L	0.00266 µg/L	2.61	0.05	Diff <2x LOR	----
Dissolved Metals (QC Lot: 188921)											
CG2101097-003	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 188922)											
CG2101097-003	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0013	0.0017	0.0004	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0307	0.0299	2.47%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0050	mg/L	0.0347 µg/L	0.0000311	0.0000036	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	97.5	92.3	5.46%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0172	0.0162	6.46%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	41.0	40.9	0.407%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00741	0.00726	2.06%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00107	0.000989	7.64%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 188922) - continued											
CG2101097-003	Anonymous	nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00192	0.00187	0.00005	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.16	1.14	1.77%	20%	----
		selenium, dissolved	7782-49-2	E421	0.050	mg/L	41.6 µg/L	0.0410	1.46%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	1.40	1.40	0.0562%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	0.763	0.755	1.04%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.140	0.130	6.82%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	85.0	84.5	0.661%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00191	0.00184	3.53%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0012	0.0017	0.0005	Diff <2x LOR	----
Dissolved Metals (QC Lot: 191151)											
CG2101116-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 188427)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 189843)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 189845)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 190388)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 190394)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 190539)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Anions and Nutrients (QCLot: 188491)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 188787)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 188788)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 188789)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 188790)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 188791)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 188792)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 188806)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 191242)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 191313)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 191313) - continued						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 190996)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 190997)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 190998)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 190999)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 188893)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 188894)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 188894) - continued						
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 192102)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 188921)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 188922)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 188922) - continued						
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 191151)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 188427)									
turbidity	----	E121	0.1	NTU	200 NTU	100.0	85.0	115	----
Physical Tests (QCLot: 189843)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	105	90.0	110	----
Physical Tests (QCLot: 189844)									
pH	----	E108	----	pH units	7 pH units	99.8	98.6	101	----
Physical Tests (QCLot: 189845)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	105	85.0	115	----
Physical Tests (QCLot: 190388)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	96.2	85.0	115	----
Physical Tests (QCLot: 190394)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	94.4	85.0	115	----
Physical Tests (QCLot: 190539)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	104	85.0	115	----
Physical Tests (QCLot: 191938)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	102	95.4	104	----
Anions and Nutrients (QCLot: 188491)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.1 mg/L	106	80.0	120	----
Anions and Nutrients (QCLot: 188787)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	93.3	90.0	110	----
Anions and Nutrients (QCLot: 188788)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	106	85.0	115	----
Anions and Nutrients (QCLot: 188789)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	96.8	90.0	110	----
Anions and Nutrients (QCLot: 188790)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	97.5	90.0	110	----
Anions and Nutrients (QCLot: 188791)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	97.8	90.0	110	----
Anions and Nutrients (QCLot: 188792)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	96.1	90.0	110	----
Anions and Nutrients (QCLot: 188806)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	81.9	75.0	125	----
Anions and Nutrients (QCLot: 191242)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 191242) - continued									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	100	80.0	120	----
Anions and Nutrients (QCLot: 191313)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.1 mg/L	102	85.0	115	----
Organic / Inorganic Carbon (QCLot: 190996)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	102	80.0	120	----
Organic / Inorganic Carbon (QCLot: 190997)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	105	80.0	120	----
Organic / Inorganic Carbon (QCLot: 190998)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	119	80.0	120	----
Organic / Inorganic Carbon (QCLot: 190999)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	110	80.0	120	----
Total Metals (QCLot: 188893)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	99.7	80.0	120	----
Total Metals (QCLot: 188894)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	98.4	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	104	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	98.8	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	97.3	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	97.6	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	104	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	94.2	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	101	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	99.0	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	96.6	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	102	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	96.3	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	96.2	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	99.1	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	102	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	99.0	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	104	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 188894) - continued									
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	100	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	101	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	100	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	103	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	101	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	99.3	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	93.6	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	101	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	99.2	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	101	80.0	120	----
Total Metals (QCLot: 192102)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	107	80.0	120	----
Dissolved Metals (QCLot: 188921)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	94.8	80.0	120	----
Dissolved Metals (QCLot: 188922)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	97.6	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	99.8	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	96.8	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	98.2	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	97.3	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	97.3	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	96.3	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	98.3	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	98.6	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	97.9	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	97.0	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	99.8	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	96.5	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	97.0	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	95.1	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	97.2	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	98.8	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	96.8	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	98.4	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	96.8	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	97.0	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 188922) - continued									
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	100	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	99.6	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	95.5	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	92.8	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	98.4	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	93.7	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	93.2	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	101	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	98.4	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	106	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	100	80.0	120	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 188491)										
CG2101120-003	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0475 mg/L	0.05 mg/L	95.0	70.0	130	----
Anions and Nutrients (QCLot: 188787)										
CG2101124-006	Anonymous	fluoride	16984-48-8	E235.F	0.912 mg/L	1 mg/L	91.2	75.0	125	----
Anions and Nutrients (QCLot: 188788)										
CG2101124-006	Anonymous	bromide	24959-67-9	E235.Br-L	0.563 mg/L	0.5 mg/L	113	75.0	125	----
Anions and Nutrients (QCLot: 188789)										
CG2101124-006	Anonymous	chloride	16887-00-6	E235.Cl-L	92.4 mg/L	100 mg/L	92.4	75.0	125	----
Anions and Nutrients (QCLot: 188790)										
CG2101124-006	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.31 mg/L	2.5 mg/L	92.4	75.0	125	----
Anions and Nutrients (QCLot: 188791)										
CG2101124-006	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.482 mg/L	0.5 mg/L	96.4	75.0	125	----
Anions and Nutrients (QCLot: 188792)										
CG2101124-006	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	92.3 mg/L	100 mg/L	92.3	75.0	125	----
Anions and Nutrients (QCLot: 188806)										
CG2101120-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.62 mg/L	2.5 mg/L	105	70.0	130	----
Anions and Nutrients (QCLot: 191242)										
CG2101119-003	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0648 mg/L	0.0676 mg/L	95.9	70.0	130	----
Anions and Nutrients (QCLot: 191313)										
CG2101124-006	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0986 mg/L	0.1 mg/L	98.6	75.0	125	----
Organic / Inorganic Carbon (QCLot: 190996)										
CG2101115-002	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	22.6 mg/L	23.9 mg/L	94.5	70.0	130	----
Organic / Inorganic Carbon (QCLot: 190997)										
CG2101123-002	RG_FO23_WS_LAEMP_LCO_2021-04_NP	carbon, dissolved organic [DOC]	----	E358-L	26.3 mg/L	23.9 mg/L	110	70.0	130	----
Organic / Inorganic Carbon (QCLot: 190998)										
CG2101115-002	Anonymous	carbon, total organic [TOC]	----	E355-L	ND mg/L	23.9 mg/L	ND	70.0	130	----
Organic / Inorganic Carbon (QCLot: 190999)										
CG2101123-002	RG_FO23_WS_LAEMP_LCO_2021-04_NP	carbon, total organic [TOC]	----	E355-L	26.2 mg/L	23.9 mg/L	110	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 188893)										
CG2101095-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0393 mg/L	0.04 mg/L	98.2	70.0	130	----
Total Metals (QCLot: 188894)										
CG2101095-001	Anonymous	aluminum, total	7429-90-5	E420	0.195 mg/L	0.2 mg/L	97.7	70.0	130	----
		antimony, total	7440-36-0	E420	0.0194 mg/L	0.02 mg/L	97.0	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0196 mg/L	0.02 mg/L	98.1	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0376 mg/L	0.04 mg/L	94.1	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00957 mg/L	0.01 mg/L	95.7	70.0	130	----
		boron, total	7440-42-8	E420	0.099 mg/L	0.1 mg/L	98.7	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00412 mg/L	0.004 mg/L	103	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0193 mg/L	0.02 mg/L	96.6	70.0	130	----
		copper, total	7440-50-8	E420	0.0181 mg/L	0.02 mg/L	90.7	70.0	130	----
		iron, total	7439-89-6	E420	1.92 mg/L	2 mg/L	96.2	70.0	130	----
		lead, total	7439-92-1	E420	0.0191 mg/L	0.02 mg/L	95.3	70.0	130	----
		lithium, total	7439-93-2	E420	0.0921 mg/L	0.1 mg/L	92.1	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0190 mg/L	0.02 mg/L	95.1	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0199 mg/L	0.02 mg/L	99.7	70.0	130	----
		nickel, total	7440-02-0	E420	0.0384 mg/L	0.04 mg/L	95.9	70.0	130	----
		potassium, total	7440-09-7	E420	3.98 mg/L	4 mg/L	99.4	70.0	130	----
		selenium, total	7782-49-2	E420	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		silicon, total	7440-21-3	E420	9.19 mg/L	10 mg/L	91.9	70.0	130	----
		silver, total	7440-22-4	E420	0.00392 mg/L	0.004 mg/L	98.0	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	20.5 mg/L	20 mg/L	103	70.0	130	----
		thallium, total	7440-28-0	E420	0.00379 mg/L	0.004 mg/L	94.7	70.0	130	----
		tin, total	7440-31-5	E420	0.0196 mg/L	0.02 mg/L	98.2	70.0	130	----
		titanium, total	7440-32-6	E420	0.0376 mg/L	0.04 mg/L	94.0	70.0	130	----
		uranium, total	7440-61-1	E420	0.00402 mg/L	0.004 mg/L	100	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0998 mg/L	0.1 mg/L	99.8	70.0	130	----
		zinc, total	7440-66-6	E420	0.389 mg/L	0.4 mg/L	97.2	70.0	130	----
Total Metals (QCLot: 192102)										
CG2101119-002	Anonymous	mercury, total	7439-97-6	E508-L	4.82 ng/L	5 ng/L	96.4	70.0	130	----
Dissolved Metals (QCLot: 188921)										

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 188921) - continued										
CG2101097-003	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0372 mg/L	0.04 mg/L	93.0	70.0	130	----
Dissolved Metals (QCLot: 188922)										
CG2101097-003	Anonymous	aluminum, dissolved	7429-90-5	E421	0.187 mg/L	0.2 mg/L	93.6	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0192 mg/L	0.02 mg/L	96.0	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0191 mg/L	0.02 mg/L	95.6	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0368 mg/L	0.04 mg/L	92.0	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00789 mg/L	0.01 mg/L	78.9	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.093 mg/L	0.1 mg/L	93.0	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00378 mg/L	0.004 mg/L	94.5	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0183 mg/L	0.02 mg/L	91.5	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0179 mg/L	0.02 mg/L	89.4	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.85 mg/L	2 mg/L	92.6	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0176 mg/L	0.02 mg/L	87.8	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0914 mg/L	0.1 mg/L	91.4	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0180 mg/L	0.02 mg/L	89.8	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0189 mg/L	0.02 mg/L	94.5	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0360 mg/L	0.04 mg/L	90.0	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.72 mg/L	4 mg/L	93.0	70.0	130	----
		selenium, dissolved	7782-49-2	E421	ND mg/L	0.04 mg/L	ND	70.0	130	----
		silicon, dissolved	7440-21-3	E421	8.47 mg/L	10 mg/L	84.7	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00374 mg/L	0.004 mg/L	93.6	70.0	130	----
		sodium, dissolved	17341-25-2	E421	1.91 mg/L	2 mg/L	95.3	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00359 mg/L	0.004 mg/L	89.8	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0180 mg/L	0.02 mg/L	90.2	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0368 mg/L	0.04 mg/L	92.0	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00366 mg/L	0.004 mg/L	91.5	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0961 mg/L	0.1 mg/L	96.1	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.410 mg/L	0.4 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 191151)										
CG2101119-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000978 mg/L	0.0001 mg/L	97.8	70.0	130	----

Teck

Page 1 of 1

COC ID: **Regional Effects Program**

TURNAROUND TIME: Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Regional Effects Program			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Cait Good			Lab Contact	Lyuda Shvets			Email 1:	cait.good@teck.com	X	X	X
Email	cait.good@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	carlie.meyer@teck.com	X	X	X
	e Avenue			Address	2559 29 Street NE			Email 3:	teckcoal@equisonline.com			X
								Email 4:	[redacted]	X		X
	Sparwood	Province	BC	City	Calgary	Province	AB	Email 5:	Carla.FroymanParker@teck.com	X	X	X
	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada	Email 6:	tyler.mehler@minnow.ca			
	-8202			Phone Number	403-407-1800			PO number	VPO748510			

Environmental Division
Calgary
Work Order Reference
CG2101123

Telephone : +1 403 407 1800

SAMPLE DETAILS / ANALYSIS REQUESTED

Filtered - F: Field, L: Lab, FL: Field & Lab, N: None

Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	FIL	N	Y	N	Y	Y	N	N
								PRESERV.	NONE	H2SO4	H2SO4	HCl	HNO3	HNO3	NONE
								ANALYSIS	HG-T-U-CVAF-VA	ALS_Package-DOC	ALS_Package-TKN/TOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA
RG-FRUL-WS-LAEMP-LCO-2021-04-NP	RG-FRUL	WS	NO	21/04/28	09:40	G	7		X	X	X	X	X	X	X
RG-F023-WS-LAEMP-LCO-2021-04-NP	RG-FRUL	WS	NO	21/04/28	11:50	G	7		X	X	X	X	X	X	X
RG-LI8-WS-LAEMP-LCO-2021-04-NP	RG-LI8	WS	NO	21/04/28	14:20	G	7		X	X	X	X	X	X	X
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
VPO748510	Rick Smith	21/04/28 16:20		4/29/21

SERVICE REQUEST (rush - subject to availability)					
Regular (default)	X	Sampler's Name	Rick Smith	Mobile #	403-586-3241
Priority (2-3 business days) - 50% surcharge		Sampler's Signature		Date/Time	21/04/28 16:20
Emergency (1 Business Day) - 100% surcharge					
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

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WATER CHEMISTRY

ALS Laboratory Report CG2102562

(Finalized July 30, 2021)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **CG2102562**	Page	: 1 of 7
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: 250 425 8202 / 250 425 2555	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 14-Jul-2021 09:00
PO	: VPO00748510	Date Analysis Commenced	: 14-Jul-2021
C-O-C number	: Regional Effects Program	Issue Date	: 30-Jul-2021 15:49
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Elke Tabora		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Ilnaz Badbezanchi	Team Leader - Metals preparation	Metals, Burnaby, British Columbia
Jorden Fanson	Analyst	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Naeun Kim	Analyst	Inorganics, Calgary, Alberta
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Sara Niroomand		Inorganics, Calgary, Alberta
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Sristika Chand	Lab Analyst	Metals, Burnaby, British Columbia

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Qualifiers

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_SLINE_WS_LAEMP_LCO_2021-07_NP	RG_LI24_WS_LAEMP_LCO_2021-07_NP	----	----	----
					Client sampling date / time	13-Jul-2021 08:35	13-Jul-2021 12:55	----	----	----
						CG2102562-001	CG2102562-002	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		117	105	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		117	105	----	----	----
conductivity	----	E100	2.0	µS/cm		272	265	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		149	144	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV		457	452	----	----	----
pH	----	E108	0.10	pH units		8.22	8.23	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L		158	186	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L		3.7	<1.0	----	----	----
turbidity	----	E121	0.10	NTU		0.27	0.21	----	----	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L		143	128	----	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L		<1.0	<1.0	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.0163	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.24	0.22	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.239	0.261	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.366	0.118	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.114	0.130	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		0.0034	0.0019	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0276	<0.0020	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		31.7	39.0	----	----	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		0.64	<0.50	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		1.24	<0.50	----	----	----
Ion Balance										

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_SLINE_WS_LAEMP_LCO_2021-07_NP	RG_LI24_WS_LAEMP_LCO_2021-07_NP	----	----	----
					Client sampling date / time	13-Jul-2021 08:35	13-Jul-2021 12:55	----	----	----
						CG2102562-001	CG2102562-002	--------	--------	--------
						Result	Result	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.02	2.94	----	----	----
cation sum	----	EC101	0.10	meq/L		3.01	2.94	----	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%		99.7	100	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		0.166	<0.010	----	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0135	0.0039	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00012	0.00016	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0297	0.0377	----	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	<0.020	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.0242	0.0070	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		39.0	38.1	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00021	0.00031	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	<0.10	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L		0.015	<0.010	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0019	0.0027	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		11.1	9.57	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00127	0.00012	----	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	<0.00050	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000975	0.000777	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		<0.00050	0.00073	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L		0.316	0.245	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L		1.14	2.34	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		1.74	1.51	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L		0.519	1.18	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.102	0.116	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_SLINE_WS_LAEMP_LCO_2021-07_NP	RG_LI24_WS_LAEMP_LCO_2021-07_NP	----	----	----
					Client sampling date / time	13-Jul-2021 08:35	13-Jul-2021 12:55	----	----	----
						CG2102562-001	CG2102562-002	--------	--------	--------
						Result	Result	----	----	----
Total Metals										
sulfur, total	7704-34-9	E420	0.50	mg/L		10.6	13.2	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	<0.00030	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00119	0.00113	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0036	<0.0030	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0014	0.0025	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00011	0.00013	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0325	0.0403	----	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L		<0.020	<0.020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L		0.0139	0.0052	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		40.5	41.5	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00016	0.00018	----	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L		<0.10	<0.10	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0020	0.0030	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		11.6	9.82	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00107	0.000816	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	0.00064	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		0.332	0.246	----	----	----
selenium, dissolved	7782-49-2	E421	0.050	µg/L		0.977	2.46	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		1.75	1.51	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_SLINE_WS_LAEMP_LCO_2021-07_NP	RG_LI24_WS_LAEMP_LCO_2021-07_NP	----	----	----
					Client sampling date / time	13-Jul-2021 08:35	13-Jul-2021 12:55	----	----	----
						CG2102562-001	CG2102562-002	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		0.525	1.16	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.113	0.125	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		10.9	13.6	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00124	0.00119	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0029	0.0044 DTC	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

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

WATER CHEMISTRY

ALS Laboratory Report CG2102545

(Finalized July 25, 2021)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **CG2102545**	Page	: 1 of 11
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: 250 425 8202 / 250 425 2555	Telephone	: +1 403 407 1800
Project	: Regional Effects Program	Date Samples Received	: 13-Jul-2021 08:50
PO	: VPO00748510	Date Analysis Commenced	: 13-Jul-2021
C-O-C number	: Regional Effects Program	Issue Date	: 25-Jul-2021 15:22
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 7		
No. of samples analysed	: 7		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Elke Tabora		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
James Diacon	Laboratory Analyst	Metals, Calgary, Alberta
Jorden Fanson	Analyst	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Naeun Kim	Analyst	Inorganics, Calgary, Alberta
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Saron Kim	Analyst	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Sample Comments

Sample	Client Id	*Comment*
CG2102545-007	RG_TRIP_WS_LAEMP_LCO_2021-07_NP	Sample 007: Water sample(s) for dissolved mercury analysis was received broken
CG2102545-007	RG_TRIP_WS_LAEMP_LCO_2021-07_NP	Sample 7: Water sample for dissolved mercury analysis was not submitted in glass or PTFE container with HCl preservative. Results may be biased low.

Qualifiers

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LCUT_WS_LAEMP_LCO_2021-07_NP	RG_RIVER_WS_LAEMP_LCO_2021-07_NP	RG_LILC3_WS_LAEMP_LCO_2021-07_NP	RG_FBLANK_WS_LAEMP_LCO_2021-07_NP	RG_LISP24_WS_LAEMP_LCO_2021-07_NP
					Client sampling date / time	12-Jul-2021 09:15	12-Jul-2021 09:45	12-Jul-2021 11:15	12-Jul-2021 12:55	12-Jul-2021 13:30
						CG2102545-001	CG2102545-002	CG2102545-003	CG2102545-004	CG2102545-005
						Result	Result	Result	Result	Result
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		4.2	3.6	<2.0	<2.0	<2.0
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		204	204	190	<1.0	162
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	6.6
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		204	204	190	<1.0	169
conductivity	----	E100	2.0	µS/cm		904	900	798	<2.0	650
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		492	486	422	<0.50	349
oxidation-reduction potential [ORP]	----	E125	0.10	mV		442	448	468	430	421
pH	----	E108	0.10	pH units		8.15	8.20	8.23	5.47	8.34
solids, total dissolved [TDS]	----	E162	10	mg/L		716	704	636	<10	496
solids, total suspended [TSS]	----	E160-L	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
turbidity	----	E121	0.10	NTU		0.10	0.22	0.23	<0.10	0.22
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.0139	0.0092	<0.0050	0.0224
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.250 DLDS	<0.250 DLDS	<0.050	<0.050	<0.050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		7.78	8.07	8.96	<0.10	6.71
fluoride	16984-48-8	E235.F	0.020	mg/L		0.162	0.174	0.173	<0.020	0.188
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		15.4	16.0	9.83	<0.0050	7.33
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0050 DLDS	<0.0050 DLDS	0.0015	<0.0010	0.0024
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		259	264	216	<0.30	167
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		0.57	0.58	0.63	<0.50	0.71
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		0.80	0.84	0.87	<0.50	0.92
Ion Balance										
anion sum	----	EC101	0.10	meq/L		10.8	11.0	9.26	<0.10	7.58
cation sum	----	EC101	0.10	meq/L		10.3	10.2	8.80	<0.10	7.26
ion balance (cations/anions ratio)	----	EC101	0.010	%		95.4	92.7	95.0	100	95.8

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LCUT_WS_LAEMP_LCO_2021-07_NP	RG_RIVER_WS_LAEMP_LCO_2021-07_NP	RG_LILC3_WS_LAEMP_LCO_2021-07_NP	RG_FBLANK_WS_LAEMP_LCO_2021-07_NP	RG_LISP24_WS_LAEMP_LCO_2021-07_NP
					Client sampling date / time	12-Jul-2021 09:15	12-Jul-2021 09:45	12-Jul-2021 11:15	12-Jul-2021 12:55	12-Jul-2021 13:30
						CG2102545-001	CG2102545-002	CG2102545-003	CG2102545-004	CG2102545-005
						Result	Result	Result	Result	Result
Ion Balance										
ion balance (cation-anion difference)	----	EC101	0.010	%		2.37	3.77	2.55	<0.010	2.16
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		<0.0030	0.0034	0.0052	<0.0030	0.0043
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00043	0.00045	0.00033	<0.00010	0.00026
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00011	0.00012	<0.00010	<0.00010	0.00012
barium, total	7440-39-3	E420	0.00010	mg/L		0.0389	0.0399	0.0452	<0.00010	0.0422
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	<0.020	<0.020	<0.020	<0.020
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		0.020	0.020	0.017	<0.010	0.014
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.663	0.693	0.392	<0.0050	0.280
calcium, total	7440-70-2	E420	0.050	mg/L		111	111	94.1	<0.050	81.7
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00013	0.00014	0.00015	<0.00010	0.00020
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	<0.10	<0.10	<0.10	<0.10
copper, total	7440-50-8	E420	0.00050	mg/L		0.00059	0.00051	<0.00050	<0.00050	<0.00050
iron, total	7439-89-6	E420	0.010	mg/L		<0.010	<0.010	0.017	<0.010	0.011
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0678	0.0678	0.0464	<0.0010	0.0366
magnesium, total	7439-95-4	E420	0.0050	mg/L		50.7	51.0	43.8	<0.0050	35.0
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00019	0.00014	0.00444	<0.00010	0.00337
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00198	0.00204	0.00229	<0.000050	0.00195
nickel, total	7440-02-0	E420	0.00050	mg/L		0.0136	0.0142	0.00851	<0.00050	0.00636
potassium, total	7440-09-7	E420	0.050	mg/L		1.80	1.81	1.48	<0.050	1.20
selenium, total	7782-49-2	E420	0.050	µg/L		52.5	53.0	36.4	<0.050	26.4
silicon, total	7440-21-3	E420	0.10	mg/L		2.13	2.07	2.10	<0.10	2.10
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	17341-25-2	E420	0.050	mg/L		9.08	9.42	7.06	<0.050	5.48
strontium, total	7440-24-6	E420	0.00020	mg/L		0.243	0.249	0.205	<0.00020	0.180
sulfur, total	7704-34-9	E420	0.50	mg/L		92.4	90.8	77.7	<0.50	61.1
thallium, total	7440-28-0	E420	0.000010	mg/L		0.000018	0.000017	0.000010	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LCUT_WS_LAEMP_LCO_2021-07_NP	RG_RIVER_WS_LAEMP_LCO_2021-07_NP	RG_LILC3_WS_LAEMP_LCO_2021-07_NP	RG_FBLANK_WS_LAEMP_LCO_2021-07_NP	RG_LISP24_WS_LAEMP_LCO_2021-07_NP
					Client sampling date / time	12-Jul-2021 09:15	12-Jul-2021 09:45	12-Jul-2021 11:15	12-Jul-2021 12:55	12-Jul-2021 13:30
						CG2102545-001	CG2102545-002	CG2102545-003	CG2102545-004	CG2102545-005
						Result	Result	Result	Result	Result
Total Metals										
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00396	0.00396	0.00324	<0.000010	0.00261
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0249	0.0247	0.0143	<0.0030	0.0104
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		<0.0010	0.0024	0.0018	<0.0010	<0.0010
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00042	0.00042	0.00032	<0.00010	0.00024
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00014	0.00014	0.00014	<0.00010	0.00013
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0419	0.0411	0.0469	<0.00010	0.0447
beryllium, dissolved	7440-41-7	E421	0.020	µg/L		<0.020	<0.020	<0.020	<0.020	<0.020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.019	0.019	0.016	<0.010	0.013
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L		0.693	0.678	0.400	<0.0050	0.292
calcium, dissolved	7440-70-2	E421	0.050	mg/L		108	107	93.1	<0.050	79.5
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00017	0.00014	0.00012	<0.00010	0.00012
cobalt, dissolved	7440-48-4	E421	0.10	µg/L		<0.10	<0.10	<0.10	<0.10	<0.10
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00051	0.00057	0.00036	<0.00020	0.00029
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0720	0.0689	0.0480	<0.0010	0.0366
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		54.1	53.1	46.0	<0.0050	36.6
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00015	0.00025	0.00396	<0.00010	0.00257
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00194	0.00192	0.00211	<0.000050	0.00184
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.0146	0.0142	0.00886	<0.00050	0.00640
potassium, dissolved	7440-09-7	E421	0.050	mg/L		2.06	2.02	1.66	<0.050	1.34
selenium, dissolved	7782-49-2	E421	0.050	µg/L		63.8	59.5	47.3	<0.050	30.2
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.16	2.14	2.21	<0.050	2.04
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	17341-25-2	E421	0.050	mg/L		9.70	9.78	7.46	<0.050	5.73
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.232	0.229	0.191	<0.00020	0.168

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LCUT_WS_LAEMP_LCO_2021-07_NP	RG_RIVER_WS_LAEMP_LCO_2021-07_NP	RG_LILC3_WS_LAEMP_LCO_2021-07_NP	RG_FBLANK_WS_LAEMP_LCO_2021-07_NP	RG_LISP24_WS_LAEMP_LCO_2021-07_NP
					Client sampling date / time	12-Jul-2021 09:15	12-Jul-2021 09:45	12-Jul-2021 11:15	12-Jul-2021 12:55	12-Jul-2021 13:30
						CG2102545-001	CG2102545-002	CG2102545-003	CG2102545-004	CG2102545-005
						Result	Result	Result	Result	Result
Dissolved Metals										
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		99.4	95.9	85.0	<0.50	62.0
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		0.000020	0.000023	0.000015	<0.000010	0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00404	0.00400	0.00324	<0.000010	0.00266
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0281	0.0287	0.0167	<0.0010	0.0114
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP	RG_TRIP_WS_LAEMP_LCO_2021-07_NP	----	----	----
					Client sampling date / time	12-Jul-2021 15:00	12-Jul-2021 16:00	----	----	----
						CG2102545-006	CG2102545-007	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		157	<1.0	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		11.0	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		168	<1.0	----	----	----
conductivity	----	E100	2.0	µS/cm		622	<2.0	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		333	<0.50	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV		430	434	----	----	----
pH	----	E108	0.10	pH units		8.43	5.39	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L		474	<10	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L		<1.0	<1.0	----	----	----
turbidity	----	E121	0.10	NTU		0.24	<0.10	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.0274 RRV	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		6.40	<0.10	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.184	<0.020	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.116	<0.050	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		6.49	<0.0050	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0032	<0.0010	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		0.0018	<0.0010	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0022	<0.0020	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		156	<0.30	----	----	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		0.74	----	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		1.03	<0.50	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		7.26	<0.10	----	----	----
cation sum	----	EC101	0.10	meq/L		6.93	<0.10	----	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%		95.4	100 RRV	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		2.32	<0.010	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP	RG_TRIP_WS_LAEMP_LCO_2021-07_NP	----	----	----
					Client sampling date / time	12-Jul-2021 15:00	12-Jul-2021 16:00	----	----	----
						CG2102545-006	CG2102545-007	--------	--------	--------
						Result	Result	----	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0054	<0.0030	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00023	<0.00010	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00012	<0.00010	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0522	<0.00010	----	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	<0.020	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L		0.014	<0.010	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.188	<0.0050	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		79.5	<0.050	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00014	<0.00010	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	<0.10	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L		<0.010	<0.010	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0328	<0.0010	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		33.3	<0.0050	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00184	<0.00010	----	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	<0.00050	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00178	<0.000050	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00453	<0.00050	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L		1.15	<0.050	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L		25.5	<0.050	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		2.16	<0.10	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L		5.20	<0.050	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.181	<0.00020	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		55.3	<0.50	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	<0.00030	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00237	<0.000010	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP	RG_TRIP_WS_LAEMP_LCO_2021-07_NP	----	----	----
					Client sampling date / time	12-Jul-2021 15:00	12-Jul-2021 16:00	----	----	----
						CG2102545-006	CG2102545-007	--------	--------	--------
						Result	Result	----	----	----
Total Metals										
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0070	<0.0030	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0011	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00021	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00014	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0558	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L		<0.020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.013	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L		0.200	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		75.8	<0.050	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00023	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L		<0.10	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00025	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0315	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		35.0	<0.0050	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00123	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00178	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00456	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		1.29	<0.050	----	----	----
selenium, dissolved	7782-49-2	E421	0.050	µg/L		29.2	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.16	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	----	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		5.43	<0.050	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.170	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		58.2	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP	RG_TRIP_WS_LAEMP_LCO_2021-07_NP	----	----	----
					Client sampling date / time	12-Jul-2021 15:00	12-Jul-2021 16:00	----	----	----
						CG2102545-006	**CG2102545-007**	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00246	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0074	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Laboratory	----	----	----

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

WATER CHEMISTRY

ALS Laboratory Report CG2102605

(Finalized July 28, 2021)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **CG2102605**	Page	: 1 of 6
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: 250 425 8202 / 250 425 2555	Telephone	: +1 403 407 1800
Project	: Regional Effects Program	Date Samples Received	: 15-Jul-2021 08:40
PO	: VPO00748510	Date Analysis Commenced	: 15-Jul-2021
C-O-C number	: Regional Effects Program	Issue Date	: 28-Jul-2021 10:53
Sampler	: RICK SMIT		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Elke Tabora		Inorganics, Calgary, Alberta
Jorden Fanson	Analyst	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Naeun Kim	Analyst	Inorganics, Calgary, Alberta
Owen Cheng		Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Vladka Stamenova	Analyst	Inorganics, Calgary, Alberta

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
TKNI	*TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	RG_FRUL_WS_LAEMP_LCO_2021_07_NP	RG_FO23_WS_LAEMP_LCO_2021_07_NP	----	----
					Client sampling date / time	14-Jul-2021 14:00	14-Jul-2021 09:00	14-Jul-2021 11:15	----	----
						CG2102605-001	CG2102605-002	CG2102605-003	--------	--------
						Result	Result	Result	----	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	<2.0	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		168	166	162	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		2.8	7.0	7.8	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		171	173	170	----	----
conductivity	----	E100	2.0	µS/cm		673	647	635	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		373	375	364	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV		442	431	447	----	----
pH	----	E108	0.10	pH units		8.31	8.36	8.38	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L		503	474	470	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L		<1.0	1.3	<1.0	----	----
turbidity	----	E121	0.10	NTU		1.06	0.88	0.34	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	0.0053	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	<0.050	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		6.95	1.40	2.76	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.231	0.187	0.205	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.055 TKNI	<0.050 TKNI	0.386 TKNI	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		7.37	9.69	8.49	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0018	0.0038	0.0048	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		0.0020	<0.0010	0.0011	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		<0.0020	<0.0020	<0.0020	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		172	155	152	----	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		3.07	4.25	3.96	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		3.77	3.61	4.62	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		7.73	7.42	7.26	----	----
cation sum	----	EC101	0.10	meq/L		7.74	7.62	7.44	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%		100	103	102	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	RG_FRUL_WS_LAEMP_LCO_2021_07_NP	RG_FO23_WS_LAEMP_LCO_2021_07_NP	----	----
					Client sampling date / time	14-Jul-2021 14:00	14-Jul-2021 09:00	14-Jul-2021 11:15	----	----
						CG2102605-001	CG2102605-002	CG2102605-003	--------	--------
						Result	Result	Result	----	----
Ion Balance										
ion balance (cation-anion difference)	----	EC101	0.010	%		0.065	1.33	1.22	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0035	0.0099	0.0058	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00024	0.00014	0.00015	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00012	0.00012	0.00011	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0508	0.0883	0.0856	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	<0.020	<0.020	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, total	7440-42-8	E420	0.010	mg/L		0.014	0.010	0.011	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.255	0.0144	0.0432	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		88.9	85.4	86.7	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00016	0.00014	0.00021	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	<0.10	<0.10	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
iron, total	7439-89-6	E420	0.010	mg/L		<0.010	0.015	<0.010	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0398	0.0259	0.0280	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		39.0	37.5	38.3	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00292	0.00173	0.00098	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	<0.00050	<0.00050	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00194	0.00114	0.00133	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00583	0.00081	0.00155	----	----
potassium, total	7440-09-7	E420	0.050	mg/L		1.31	1.34	1.33	----	----
selenium, total	7782-49-2	E420	0.050	µg/L		30.7	42.8	37.4	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		2.27	1.88	1.96	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, total	17341-25-2	E420	0.050	mg/L		5.98	2.12	3.16	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.188	0.132	0.155	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		63.4	55.6	54.5	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		0.000010	<0.000010	<0.000010	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	RG_FRUL_WS_LAEMP_LCO_2021_07_NP	RG_FO23_WS_LAEMP_LCO_2021_07_NP	----	----
					Client sampling date / time	14-Jul-2021 14:00	14-Jul-2021 09:00	14-Jul-2021 11:15	----	----
						CG2102605-001	CG2102605-002	CG2102605-003	--------	--------
						Result	Result	Result	----	----
Total Metals										
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00269	0.00205	0.00210	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0089	<0.0030	<0.0030	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0014	<0.0010	<0.0010	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00024	0.00012	0.00013	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00011	0.00011	0.00010	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0542	0.0922	0.0868	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L		<0.020	<0.020	<0.020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.015	0.011	0.011	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L		0.234	0.0165	0.0364	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		86.6	85.1	84.6	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00016	0.00014	0.00014	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L		<0.10	<0.10	<0.10	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00027	<0.00020	<0.00020	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0366	0.0238	0.0251	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		38.1	39.4	37.1	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00214	0.00053	0.00113	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00197	0.00122	0.00132	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00607	0.00084	0.00147	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		1.37	1.44	1.33	----	----
selenium, dissolved	7782-49-2	E421	0.050	µg/L		31.4	46.1	40.9	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.21	1.89	2.00	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		5.66	2.16	3.05	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.181	0.135	0.148	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	RG_FRUL_WS_LAEMP_LCO_2021_07_NP	RG_FO23_WS_LAEMP_LCO_2021_07_NP	----	----
					Client sampling date / time	14-Jul-2021 14:00	14-Jul-2021 09:00	14-Jul-2021 11:15	----	----
						CG2102605-001	CG2102605-002	CG2102605-003	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		63.5	56.6	56.1	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00284	0.00207	0.00216	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0104	<0.0010	0.0012	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2102605**	Page	: 1 of 17
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 250 425 8202 / 250 425 2555	Telephone	: +1 403 407 1800
Project	: Regional Effects Program	Date Samples Received	: 15-Jul-2021 08:40
PO	: VPO00748510	Issue Date	: 28-Jul-2021 10:53
C-O-C number	: Regional Effects Program		
Sampler	: RICK SMIT		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

Key

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

Summary of Outliers

Outliers : Quality Control Samples

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

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_FO23_WS_LAEMP_LCO_2021_07_NP	E298	14-Jul-2021	16-Jul-2021	----	----		16-Jul-2021	28 days	2 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E298	14-Jul-2021	16-Jul-2021	----	----		16-Jul-2021	28 days	2 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E298	14-Jul-2021	16-Jul-2021	----	----		16-Jul-2021	28 days	2 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
RG_FO23_WS_LAEMP_LCO_2021_07_NP	E235.Br-L	14-Jul-2021	----	----	----		15-Jul-2021	28 days	1 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E235.Br-L	14-Jul-2021	----	----	----		15-Jul-2021	28 days	1 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E235.Br-L	14-Jul-2021	----	----	----		15-Jul-2021	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
RG_FO23_WS_LAEMP_LCO_2021_07_NP	E235.Cl-L	14-Jul-2021	----	----	----		15-Jul-2021	28 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E235.Cl-L	14-Jul-2021	----	----	----		15-Jul-2021	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E235.Cl-L	14-Jul-2021	----	----	----		15-Jul-2021	28 days	1 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_FO23_WS_LAEMP_LCO_2021_07_NP	E378-U	14-Jul-2021	----	----	----		17-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E378-U	14-Jul-2021	----	----	----		17-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E378-U	14-Jul-2021	----	----	----		17-Jul-2021	3 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_FO23_WS_LAEMP_LCO_2021_07_NP	E235.F	14-Jul-2021	----	----	----		15-Jul-2021	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E235.F	14-Jul-2021	----	----	----		15-Jul-2021	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E235.F	14-Jul-2021	----	----	----		15-Jul-2021	28 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_FO23_WS_LAEMP_LCO_2021_07_NP	E235.NO3-L	14-Jul-2021	----	----	----		15-Jul-2021	3 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E235.NO3-L	14-Jul-2021	----	----	----		15-Jul-2021	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E235.NO3-L	14-Jul-2021	----	----	----		15-Jul-2021	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
RG_FO23_WS_LAEMP_LCO_2021_07_NP	E235.NO2-L	14-Jul-2021	----	----	----		15-Jul-2021	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E235.NO2-L	14-Jul-2021	----	----	----		15-Jul-2021	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E235.NO2-L	14-Jul-2021	----	----	----		15-Jul-2021	3 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_FO23_WS_LAEMP_LCO_2021_07_NP	E235.SO4	14-Jul-2021	----	----	----		15-Jul-2021	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E235.SO4	14-Jul-2021	----	----	----		15-Jul-2021	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E235.SO4	14-Jul-2021	----	----	----		15-Jul-2021	28 days	1 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_FO23_WS_LAEMP_LCO_2021_07_NP	E318	14-Jul-2021	19-Jul-2021	----	----		19-Jul-2021	28 days	5 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E318	14-Jul-2021	19-Jul-2021	----	----		19-Jul-2021	28 days	5 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E318	14-Jul-2021	19-Jul-2021	----	----		19-Jul-2021	28 days	5 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_FO23_WS_LAEMP_LCO_2021_07_NP	E372-U	14-Jul-2021	21-Jul-2021	----	----		21-Jul-2021	28 days	7 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E372-U	14-Jul-2021	21-Jul-2021	----	----		21-Jul-2021	28 days	7 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E372-U	14-Jul-2021	21-Jul-2021	----	----		21-Jul-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_FO23_WS_LAEMP_LCO_2021_07_NP	E421.Cr-L	14-Jul-2021	20-Jul-2021	----	----		20-Jul-2021	180 days	6 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E421.Cr-L	14-Jul-2021	20-Jul-2021	----	----		20-Jul-2021	180 days	6 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E421.Cr-L	14-Jul-2021	20-Jul-2021	----	----		20-Jul-2021	180 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_FO23_WS_LAEMP_LCO_2021_07_NP	E509	14-Jul-2021	21-Jul-2021	----	----		21-Jul-2021	28 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E509	14-Jul-2021	21-Jul-2021	----	----		21-Jul-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E509	14-Jul-2021	21-Jul-2021	----	----		21-Jul-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_FO23_WS_LAEMP_LCO_2021_07_NP	E421	14-Jul-2021	20-Jul-2021	----	----		20-Jul-2021	180 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E421	14-Jul-2021	20-Jul-2021	----	----		20-Jul-2021	180 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E421	14-Jul-2021	20-Jul-2021	----	----		20-Jul-2021	180 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_FO23_WS_LAEMP_LCO_2021_07_NP	E358-L	14-Jul-2021	21-Jul-2021	----	----		21-Jul-2021	28 days	7 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E358-L	14-Jul-2021	21-Jul-2021	----	----		21-Jul-2021	28 days	7 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E358-L	14-Jul-2021	21-Jul-2021	----	----		21-Jul-2021	28 days	7 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_FO23_WS_LAEMP_LCO_2021_07_NP	E355-L	14-Jul-2021	21-Jul-2021	----	----		21-Jul-2021	28 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E355-L	14-Jul-2021	21-Jul-2021	----	----		21-Jul-2021	28 days	7 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E355-L	14-Jul-2021	21-Jul-2021	----	----		21-Jul-2021	28 days	7 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_FO23_WS_LAEMP_LCO_2021_07_NP	E283	14-Jul-2021	----	----	----		15-Jul-2021	14 days	1 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E283	14-Jul-2021	----	----	----		15-Jul-2021	14 days	1 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E283	14-Jul-2021	----	----	----		15-Jul-2021	14 days	1 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_FO23_WS_LAEMP_LCO_2021_07_NP	E290	14-Jul-2021	----	----	----		18-Jul-2021	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E290	14-Jul-2021	----	----	----		18-Jul-2021	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E290	14-Jul-2021	----	----	----		18-Jul-2021	14 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_FO23_WS_LAEMP_LCO_2021_07_NP	E100	14-Jul-2021	----	----	----		18-Jul-2021	28 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E100	14-Jul-2021	----	----	----		18-Jul-2021	28 days	4 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E100	14-Jul-2021	----	----	----		18-Jul-2021	28 days	4 days	✓
Physical Tests : ORP by Electrode										
HDPE RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E125	14-Jul-2021	----	----	----		22-Jul-2021	0.34 hrs	193 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_FO23_WS_LAEMP_LCO_2021_07_NP	E125	14-Jul-2021	----	----	----		22-Jul-2021	0.34 hrs	196 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E125	14-Jul-2021	----	----	----		22-Jul-2021	0.34 hrs	198 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E108	14-Jul-2021	----	----	----		18-Jul-2021	0.25 hrs	101 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E108	14-Jul-2021	----	----	----		18-Jul-2021	0.25 hrs	96 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_FO23_WS_LAEMP_LCO_2021_07_NP	E108	14-Jul-2021	----	----	----		18-Jul-2021	0.25 hrs	99 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE RG_FO23_WS_LAEMP_LCO_2021_07_NP	E162	14-Jul-2021	----	----	----		21-Jul-2021	7 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TDS by Gravimetry										
HDPE RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E162	14-Jul-2021	----	----	----		21-Jul-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E162	14-Jul-2021	----	----	----		21-Jul-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] RG_FO23_WS_LAEMP_LCO_2021_07_NP	E160-L	14-Jul-2021	----	----	----		21-Jul-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E160-L	14-Jul-2021	----	----	----		21-Jul-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E160-L	14-Jul-2021	----	----	----		21-Jul-2021	7 days	7 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E121	14-Jul-2021	----	----	----		16-Jul-2021	3 days	2 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_FO23_WS_LAEMP_LCO_2021_07_NP	E121	14-Jul-2021	----	----	----		17-Jul-2021	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E121	14-Jul-2021	----	----	----		17-Jul-2021	3 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_FO23_WS_LAEMP_LCO_2021_07_NP	E420.Cr-L	14-Jul-2021	----	----	----		20-Jul-2021	180 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E420.Cr-L	14-Jul-2021	----	----	----		20-Jul-2021	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E420.Cr-L	14-Jul-2021	----	----	----		20-Jul-2021	180 days	7 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_FO23_WS_LAEMP_LCO_2021_07_NP	E508-L	14-Jul-2021	----	----	----		21-Jul-2021	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E508-L	14-Jul-2021	----	----	----		21-Jul-2021	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E508-L	14-Jul-2021	----	----	----		21-Jul-2021	28 days	7 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_FO23_WS_LAEMP_LCO_2021_07_NP	E420	14-Jul-2021	----	----	----		20-Jul-2021	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	E420	14-Jul-2021	----	----	----		20-Jul-2021	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_FRUL_WS_LAEMP_LCO_2021_07_NP	E420	14-Jul-2021	----	----	----		20-Jul-2021	180 days	7 days	✓

Legend & Qualifier Definitions

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

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	244392	1	16	6.2	5.0	✓
Alkalinity Species by Titration	E290	246363	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	244998	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	244519	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	244520	1	17	5.8	5.0	✓
Conductivity in Water	E100	246362	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	247425	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	247973	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	247424	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	248406	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	245723	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	244517	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	244521	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	244522	1	17	5.8	5.0	✓
ORP by Electrode	E125	248640	1	19	5.2	5.0	✓
pH by Meter	E108	246361	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	244518	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	247986	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	247528	1	3	33.3	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	246122	1	14	7.1	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	248519	1	13	7.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	247527	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	248407	1	18	5.5	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	247198	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	245294	2	34	5.8	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	244392	1	16	6.2	5.0	✓
Alkalinity Species by Titration	E290	246363	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	244998	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	244519	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	244520	1	17	5.8	5.0	✓
Conductivity in Water	E100	246362	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	247425	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	247973	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	247424	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	248406	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	245723	1	20	5.0	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	244517	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	244521	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	244522	1	17	5.8	5.0	✓
ORP by Electrode	E125	248640	1	19	5.2	5.0	✓
pH by Meter	E108	246361	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	244518	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	247986	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	247528	1	3	33.3	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	246122	1	14	7.1	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	248519	1	13	7.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	247527	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	248407	1	18	5.5	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	247198	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	247982	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	245294	2	34	5.8	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	244392	1	16	6.2	5.0	✓
Alkalinity Species by Titration	E290	246363	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	244998	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	244519	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	244520	1	17	5.8	5.0	✓
Conductivity in Water	E100	246362	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	247425	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	247973	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	247424	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	248406	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	245723	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	244517	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	244521	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	244522	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	244518	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	247986	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	247528	1	3	33.3	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	246122	1	14	7.1	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	248519	1	13	7.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	247527	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	248407	1	18	5.5	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	247198	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	247982	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	245294	2	34	5.8	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	244998	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	244519	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	244520	1	17	5.8	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	247425	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	247973	1	16	6.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	247424	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	248406	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	245723	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	244517	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	244521	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	244522	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	244518	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	247528	1	3	33.3	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	246122	1	14	7.1	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	248519	1	13	7.6	5.0	✓
Total Metals in Water by CRC ICPMS	E420	247527	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	248407	1	18	5.5	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	247198	1	20	5.0	5.0	✓

Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Calgary - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Calgary - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Calgary - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
ORP by Electrode	E125 Calgary - Environmental	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed, measured in mV. For high accuracy test results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L Calgary - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Calgary - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC (Low Level)	E235.Cl-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Calgary - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH 8.3

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U Calgary - Environmental	Water	APHA 4500-P E (mod)	Dissolved Orthophosphate is determined colourimetrically on a water sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAFS.
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
	Vancouver - Environmental			

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **CG2102605**	Page	: 1 of 18
Client	: Teck Coal Limited	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 250 425 8202 / 250 425 2555	Telephone	: +1 403 407 1800
Project	: Regional Effects Program	Date Samples Received	: 15-Jul-2021 08:40
PO	: VPO00748510	Date Analysis Commenced	: 15-Jul-2021
C-O-C number	: Regional Effects Program	Issue Date	: 28-Jul-2021 10:53
Sampler	: RICK SMIT		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Elke Tabora		Inorganics, Calgary, Alberta
Jorden Fanson	Analyst	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Naeun Kim	Analyst	Inorganics, Calgary, Alberta
Owen Cheng		Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Vladka Stamenova	Analyst	Inorganics, Calgary, Alberta

General Comments

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

Key :

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 244392)											
CG2102599-001	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	11.9	12.5	0.6	Diff <2x LOR	----
Physical Tests (QC Lot: 245294)											
CG2102594-001	Anonymous	turbidity	----	E121	0.10	NTU	0.70	0.77	0.07	Diff <2x LOR	----
Physical Tests (QC Lot: 245296)											
CG2102589-036	Anonymous	turbidity	----	E121	0.10	NTU	11.2	11.6	3.50%	15%	----
Physical Tests (QC Lot: 246361)											
CG2102596-001	Anonymous	pH	----	E108	0.10	pH units	8.08	8.11	0.370%	4%	----
Physical Tests (QC Lot: 246362)											
CG2102596-001	Anonymous	conductivity	----	E100	2.0	µS/cm	448	437	2.48%	10%	----
Physical Tests (QC Lot: 246363)											
CG2102596-001	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	2.0	mg/L	163	163	0.245%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	2.0	mg/L	163	163	0.245%	20%	----
Physical Tests (QC Lot: 247986)											
CG2102589-036	Anonymous	solids, total dissolved [TDS]	----	E162	40	mg/L	2920	2950	1.12%	20%	----
Physical Tests (QC Lot: 248640)											
CG2102598-003	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	460	459	0.196%	15%	----
Anions and Nutrients (QC Lot: 244517)											
CG2102605-001	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	fluoride	16984-48-8	E235.F	0.020	mg/L	0.231	0.226	2.19%	20%	----
Anions and Nutrients (QC Lot: 244518)											
CG2102605-001	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	172	171	0.371%	20%	----
Anions and Nutrients (QC Lot: 244519)											
CG2102605-001	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 244520)											
CG2102605-001	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	6.95	6.93	0.243%	20%	----
Anions and Nutrients (QC Lot: 244521)											
CG2102605-001	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	7.37	7.27	1.36%	20%	----
Anions and Nutrients (QC Lot: 244522)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 244522) - continued											
CG2102605-001	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0018	0.0021	0.0003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 244998)											
CG2102605-001	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 245723)											
CG2102596-004	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 246122)											
CG2102604-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.50	mg/L	97.5	91.8	5.97%	20%	----
Anions and Nutrients (QC Lot: 247198)											
CG2102596-006	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 248406)											
CG2102595-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.87	2.00	0.13	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 248407)											
CG2102595-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	2.20	2.21	0.01	Diff <2x LOR	----
Total Metals (QC Lot: 247527)											
CG2102605-001	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0035	0.0052	0.0017	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00024	0.00024	0.000010	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00012	0.00012	0.000002	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0508	0.0498	1.88%	20%	----
		beryllium, total	7440-41-7	E420	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.014	0.014	0.00003	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	0.255 µg/L	0.000237	7.42%	20%	----
		calcium, total	7440-70-2	E420	0.050	mg/L	88.9	88.2	0.787%	20%	----
		cobalt, total	7440-48-4	E420	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0398	0.0386	3.13%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	39.0	38.4	1.56%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00292	0.00286	1.91%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00194	0.00188	2.98%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00583	0.00586	0.564%	20%	----
		potassium, total	7440-09-7	E420	0.050	mg/L	1.31	1.30	0.990%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	30.7 µg/L	0.0298	2.68%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 247527) - continued											
CG2102605-001	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	silicon, total	7440-21-3	E420	0.10	mg/L	2.27	2.20	3.28%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	5.98	5.94	0.586%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.188	0.185	1.43%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	63.4	60.9	4.14%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	0.000010	<0.000010	0.00000004	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00269	0.00274	1.91%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0089	0.0090	0.0002	Diff <2x LOR	----
Total Metals (QC Lot: 247528)											
CG2102605-001	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00016	0.00014	0.00001	Diff <2x LOR	----
Total Metals (QC Lot: 248519)											
CG2102592-001	Anonymous	mercury, total	7439-97-6	E508-L	0.00050	ng/L	<0.00050 µg/L	<0.50	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 247424)											
CG2102589-033	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0020	mg/L	0.0030	0.0029	0.00007	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00020	mg/L	0.00061	0.00069	0.00007	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00020	mg/L	0.0103	0.00989	4.03%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.040	mg/L	<0.040 µg/L	<0.000040	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.020	mg/L	0.086	0.086	0.0005	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0100	mg/L	0.0573 µg/L	0.0000543	0.0000030	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.100	mg/L	472	471	0.256%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.20	mg/L	67.9 µg/L	0.0672	0.975%	20%	----
		copper, dissolved	7440-50-8	E421	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.020	mg/L	0.615	0.615	0.0553%	20%	----
		lead, dissolved	7439-92-1	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0020	mg/L	0.121	0.118	2.23%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0100	mg/L	243	239	1.76%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00020	mg/L	0.820	0.820	0.0286%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000100	mg/L	0.00136	0.00138	1.04%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00100	mg/L	0.341	0.342	0.229%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 247424) - continued											
CG2102589-033	Anonymous	potassium, dissolved	7440-09-7	E421	0.100	mg/L	6.80	6.77	0.483%	20%	----
		selenium, dissolved	7782-49-2	E421	0.100	mg/L	<0.100 µg/L	<0.000100	0	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.100	mg/L	3.70	3.59	3.04%	20%	----
		silver, dissolved	7440-22-4	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.100	mg/L	5.84	5.84	0.0188%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00040	mg/L	0.473	0.468	0.993%	20%	----
		sulfur, dissolved	7704-34-9	E421	1.00	mg/L	564	558	1.00%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000020	mg/L	0.000154	0.000148	0.000005	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000020	mg/L	0.0337	0.0343	1.92%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0020	mg/L	0.0991	0.100	1.32%	20%	----
Dissolved Metals (QC Lot: 247425)											
CG2102589-033	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 247973)											
CG2102589-034	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 244392)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Physical Tests (QCLot: 245294)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 245296)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 246362)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 246363)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 247982)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 247986)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 244517)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 244518)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 244519)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 244520)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 244521)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 244522)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 244998)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 245723)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 246122)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 246122) - continued						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 247198)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Organic / Inorganic Carbon (QCLot: 248406)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 248407)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 247527)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 247527) - continued						
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 247528)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 248519)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 247424)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 247424) - continued						
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 247425)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 247973)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 244392)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	109	85.0	115	----
Physical Tests (QCLot: 245294)									
turbidity	----	E121	0.1	NTU	200 NTU	96.8	85.0	115	----
Physical Tests (QCLot: 245296)									
turbidity	----	E121	0.1	NTU	200 NTU	97.4	85.0	115	----
Physical Tests (QCLot: 246361)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 246362)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	100	90.0	110	----
Physical Tests (QCLot: 246363)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	95.9	85.0	115	----
Physical Tests (QCLot: 247982)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	87.6	85.0	115	----
Physical Tests (QCLot: 247986)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	102	85.0	115	----
Physical Tests (QCLot: 248640)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	102	95.4	104	----
Anions and Nutrients (QCLot: 244517)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 244518)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 244519)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	99.2	85.0	115	----
Anions and Nutrients (QCLot: 244520)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 244521)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 244522)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 244998)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	95.4	85.0	115	----
Anions and Nutrients (QCLot: 245723)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 245723) - continued									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.1 mg/L	104	80.0	120	----
Anions and Nutrients (QCLot: 246122)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	94.6	75.0	125	----
Anions and Nutrients (QCLot: 247198)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	100	80.0	120	----
Organic / Inorganic Carbon (QCLot: 248406)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	106	80.0	120	----
Organic / Inorganic Carbon (QCLot: 248407)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	108	80.0	120	----
Total Metals (QCLot: 247527)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	109	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	102	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	105	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	110	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	99.1	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	108	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	97.8	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	103	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	99.5	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	104	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	99.8	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	104	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	109	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	102	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	97.7	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	105	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	108	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	101	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	97.0	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	110	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	93.9	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 247527) - continued									
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	107	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	93.8	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	101	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	100	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	106	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	103	80.0	120	----
Total Metals (QCLot: 247528)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
Total Metals (QCLot: 248519)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	98.8	80.0	120	----
Dissolved Metals (QCLot: 247424)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	99.4	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	97.5	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	96.2	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	96.3	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	99.4	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	96.4	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	91.3	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	98.7	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	97.0	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	95.8	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	99.1	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	96.5	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	97.4	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	98.2	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	96.4	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	99.2	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	96.1	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	101	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	95.0	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	95.2	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	98.0	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	97.1	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	98.0	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	93.6	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 247424) - continued									
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	98.6	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	92.2	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	89.3	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	94.6	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	98.4	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	94.0	80.0	120	----
Dissolved Metals (QCLot: 247425)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	96.5	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	99.3	80.0	120	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 244517)										
CG2102606-005	Anonymous	fluoride	16984-48-8	E235.F	1.06 mg/L	1 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 244518)										
CG2102606-005	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	109 mg/L	100 mg/L	109	75.0	125	----
Anions and Nutrients (QCLot: 244519)										
CG2102606-005	Anonymous	bromide	24959-67-9	E235.Br-L	0.494 mg/L	0.5 mg/L	98.9	75.0	125	----
Anions and Nutrients (QCLot: 244520)										
CG2102606-005	Anonymous	chloride	16887-00-6	E235.Cl-L	107 mg/L	100 mg/L	107	75.0	125	----
Anions and Nutrients (QCLot: 244521)										
CG2102606-005	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.66 mg/L	2.5 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 244522)										
CG2102606-005	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.549 mg/L	0.5 mg/L	110	75.0	125	----
Anions and Nutrients (QCLot: 244998)										
CG2102606-005	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.114 mg/L	0.1 mg/L	114	75.0	125	----
Anions and Nutrients (QCLot: 245723)										
CG2102596-005	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0519 mg/L	0.05 mg/L	104	70.0	130	----
Anions and Nutrients (QCLot: 246122)										
CG2102605-001	RG_LIDSL_WS_LAEMP_LCO_2021_07_NP	Kjeldahl nitrogen, total [TKN]	----	E318	2.75 mg/L	2.5 mg/L	110	70.0	130	----
Anions and Nutrients (QCLot: 247198)										
CG2102598-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0572 mg/L	0.0676 mg/L	84.7	70.0	130	----
Organic / Inorganic Carbon (QCLot: 248406)										
CG2102595-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	23.7 mg/L	23.9 mg/L	99.2	70.0	130	----
Organic / Inorganic Carbon (QCLot: 248407)										
CG2102595-001	Anonymous	carbon, total organic [TOC]	----	E355-L	25.6 mg/L	23.9 mg/L	107	70.0	130	----
Total Metals (QCLot: 247527)										
CG2102605-002	RG_FRUL_WS_LAEMP_LCO_2021_07_NP	aluminum, total	7429-90-5	E420	0.199 mg/L	0.2 mg/L	99.6	70.0	130	----
		antimony, total	7440-36-0	E420	0.0193 mg/L	0.02 mg/L	96.5	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0196 mg/L	0.02 mg/L	97.9	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 247527) - continued										
CG2102605-002	RG_FRUL_WS_LAEMP_LCO_2021_07_NP	barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0359 mg/L	0.04 mg/L	89.8	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00950 mg/L	0.01 mg/L	95.0	70.0	130	----
		boron, total	7440-42-8	E420	0.107 mg/L	0.1 mg/L	107	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00380 mg/L	0.004 mg/L	95.0	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0188 mg/L	0.02 mg/L	94.0	70.0	130	----
		copper, total	7440-50-8	E420	0.0184 mg/L	0.02 mg/L	91.8	70.0	130	----
		iron, total	7439-89-6	E420	1.92 mg/L	2 mg/L	96.2	70.0	130	----
		lead, total	7439-92-1	E420	0.0184 mg/L	0.02 mg/L	92.0	70.0	130	----
		lithium, total	7439-93-2	E420	0.0967 mg/L	0.1 mg/L	96.7	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0195 mg/L	0.02 mg/L	97.6	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0194 mg/L	0.02 mg/L	97.1	70.0	130	----
		nickel, total	7440-02-0	E420	0.0374 mg/L	0.04 mg/L	93.5	70.0	130	----
		potassium, total	7440-09-7	E420	3.96 mg/L	4 mg/L	99.1	70.0	130	----
		selenium, total	7782-49-2	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		silicon, total	7440-21-3	E420	8.82 mg/L	10 mg/L	88.2	70.0	130	----
		silver, total	7440-22-4	E420	0.00375 mg/L	0.004 mg/L	93.6	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00356 mg/L	0.004 mg/L	88.9	70.0	130	----
		tin, total	7440-31-5	E420	0.0188 mg/L	0.02 mg/L	94.0	70.0	130	----
		titanium, total	7440-32-6	E420	0.0384 mg/L	0.04 mg/L	96.1	70.0	130	----
		uranium, total	7440-61-1	E420	0.00390 mg/L	0.004 mg/L	97.5	70.0	130	----
		vanadium, total	7440-62-2	E420	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		zinc, total	7440-66-6	E420	0.353 mg/L	0.4 mg/L	88.3	70.0	130	----
Total Metals (QCLot: 247528)										
CG2102605-002	RG_FRUL_WS_LAEMP_LCO_2021_07_NP	chromium, total	7440-47-3	E420.Cr-L	0.0391 mg/L	0.04 mg/L	97.7	70.0	130	----
Total Metals (QCLot: 248519)										
CG2102592-002	Anonymous	mercury, total	7439-97-6	E508-L	4.93 ng/L	5 ng/L	98.6	70.0	130	----
Dissolved Metals (QCLot: 247424)										
CG2102589-034	Anonymous	aluminum, dissolved	7429-90-5	E421	0.202 mg/L	0.2 mg/L	101	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0208 mg/L	0.02 mg/L	104	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 247424) - continued										
CG2102589-034	Anonymous	arsenic, dissolved	7440-38-2	E421	0.0219 mg/L	0.02 mg/L	109	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0378 mg/L	0.04 mg/L	94.6	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00904 mg/L	0.01 mg/L	90.4	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.095 mg/L	0.1 mg/L	95.2	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00407 mg/L	0.004 mg/L	102	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0189 mg/L	0.02 mg/L	94.6	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0184 mg/L	0.02 mg/L	91.9	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.95 mg/L	2 mg/L	97.5	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0190 mg/L	0.02 mg/L	95.3	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0983 mg/L	0.1 mg/L	98.3	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0217 mg/L	0.02 mg/L	108	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0364 mg/L	0.04 mg/L	91.0	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0473 mg/L	0.04 mg/L	118	70.0	130	----
		silicon, dissolved	7440-21-3	E421	10.0 mg/L	10 mg/L	100	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00404 mg/L	0.004 mg/L	101	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00370 mg/L	0.004 mg/L	92.4	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0205 mg/L	0.02 mg/L	103	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0406 mg/L	0.04 mg/L	101	70.0	130	----
		uranium, dissolved	7440-61-1	E421	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.105 mg/L	0.1 mg/L	105	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.380 mg/L	0.4 mg/L	95.1	70.0	130	----
Dissolved Metals (QCLot: 247425)										
CG2102589-034	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 247973)										
CG2102589-035	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000982 mg/L	0.0001 mg/L	98.2	70.0	130	----

Teck

Page 1 of 1

COC ID: **Regional Effects Program**

TURNAROUND TIME: Regular

PROJECT/CLIENT INFO		LABORATORY		OTHER INFO	
Facility Name	Regional Effects Program	Lab Name	ALS Calgary	Report Format / Distribution	Excel / PDF / EDD
Project Manager	Cait Good	Lab Contact	Lyuda Shvets	Email 1:	cait.good@teck.com
Email	cait.good@teck.com	Email	Lyudmyla.Shvets@ALSGlobal.com	Email 2:	Danika.Geryla@teck.com
Address	421 Pine Avenue	Address	2559 29 Street NE	Email 3:	teckcoal@equisonline.com
				Email 4:	tyler.mahler@minnow.ca
Sparwood	Province BC	City	Calgary Province AB	Email 5:	Carla.FroymanParker@teck.com
V0B 2G0	Country Canada	Postal Code	T1Y 7B5 Country Canada		
0-425-8202		Phone Number	403-407-1800	PO number	VPO748510

Environmental Division
Calgary
Work Order Reference
CG2102605

Telephone : +1 403 407 1800

505

SAMPLE DETAILS / ANALYSIS REQUESTED

Filtered - F: Field, L: Lab, FL: Field & Lab, N: None

Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	FIL	N	Y	N	Y	Y	N	N
								PRESERV.	NONE	H2SO4	H2SO4	HCl	HNO3	HNO3	NONE
								ANALYSIS	HG-T-U-CVAF-VA	ALS_Package-DOC	ALS_Package-TKN/TOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA
RG_LIDSL_WS_LAEMP_Lco_2021-07_NP	RG_LIDSL	WS	No	2021-07-14	14:00	G	7		✓	✓	✓	✓	✓	✓	✓
RG_FRYL_WS_LAEMP_Lco_2021-07_NP	RG_FRYL	WS	No	2021-07-14	09:00	G	7		✓	✓	✓	✓	✓	✓	✓
RG_F023_WS_LAEMP_Lco_2021-07_NP	RG_F023	WS	No	2021-07-14	11:15	G	7		✓	✓	✓	✓	✓	✓	✓

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
VPO748510	Rick Smit / Lotic environmental	2021 07 14 16:00		7/15 8:40

SERVICE REQUEST (rush - subject to availability)

- Regular (default) X
- Priority (2-3 business days) - 50% surcharge
- Emergency (1 Business Day) - 100% surcharge
- For Emergency <1 Day, ASAP or Weekend - Contact ALS

Sampler's Name	Rick Smit	Mobile #	403-586-3241
Sampler's Signature		Date/Time	2021 07 14 16:00

WATER CHEMISTRY

ALS Laboratory Report CG2102635

(Finalized July 27, 2021)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **CG2102635**	Page	: 1 of 6
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: 250 425 8202 / 250 425 2555	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 16-Jul-2021 09:00
PO	: VPO00748510	Date Analysis Commenced	: 16-Jul-2021
C-O-C number	: REGIONAL EFFECTS PROGRAM	Issue Date	: 27-Jul-2021 16:06
Sampler	: RICK SMIT		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Ilnaz Badbezanchi	Team Leader - Metals preparation	Metals, Burnaby, British Columbia
Jorden Fanson	Analyst	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
TKNI	*TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_LI8_WS_LAEMP_LCO_2021-07_NP	----	----	----	----
					Client sampling date / time: 15-Jul-2021 08:15	----	----	----	----
					CG2102635-001	--------	--------	--------	--------
					Result	----	----	----	----
Physical Tests									
acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	----	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	166	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	166	----	----	----	----
conductivity	----	E100	2.0	µS/cm	619	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	348	----	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV	456	----	----	----	----
pH	----	E108	0.10	pH units	8.29	----	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	431	----	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L	1.6	----	----	----	----
turbidity	----	E121	0.10	NTU	0.28	----	----	----	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	202	----	----	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	<1.0	----	----	----	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	----	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0094	----	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L	6.37	----	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	0.321	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.237 TKNI	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	6.34	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	----	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0010	----	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	147	----	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.32	----	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.60	----	----	----	----
Ion Balance									

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LI8_WS_LAEMP_LCO_2021-07_NP	----	----	----	----
					Client sampling date / time	15-Jul-2021 08:15	----	----	----	----
						CG2102635-001	--------	--------	--------	--------
						Result	----	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		7.03	----	----	----	----
cation sum	----	EC101	0.10	meq/L		7.23	----	----	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%		103	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		1.40	----	----	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0052	----	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00019	----	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00012	----	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0578	----	----	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	----	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	----	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L		0.014	----	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.163	----	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		86.4	----	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00023	----	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	----	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	----	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L		<0.010	----	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	----	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0330	----	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		36.3	----	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00125	----	----	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	----	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00175	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00434	----	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L		1.18	----	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L		25.2	----	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		2.20	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	----	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L		5.61	----	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.174	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LI8_WS_LAEMP_LCO_2021-07_NP	----	----	----	----
					Client sampling date / time	15-Jul-2021 08:15	----	----	----	----
						CG2102635-001	--------	--------	--------	--------
						Result	----	----	----	----
Total Metals										
sulfur, total	7704-34-9	E420	0.50	mg/L		56.0	----	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	----	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	----	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	----	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00268	----	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	----	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0082	----	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0018	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00018	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		<0.00010	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0590	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L		<0.020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.014	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L		0.109	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		81.6	----	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00024	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L		<0.10	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00024	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0322	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		35.1	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00084	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00173	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00440	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		1.24	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.050	µg/L		26.6	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.10	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LI8_WS_LAEMP_LCO_2021-07_NP	----	----	----	----
					Client sampling date / time	15-Jul-2021 08:15	----	----	----	----
						CG2102635-001	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	----	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		5.60	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.174	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		52.5	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00252	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0067	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2102635**	Page	: 1 of 12
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 250 425 8202 / 250 425 2555	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 16-Jul-2021 09:00
PO	: VPO00748510	Issue Date	: 27-Jul-2021 16:06
C-O-C number	: REGIONAL EFFECTS PROGRAM		
Sampler	: RICK SMIT		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

Key

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

Summary of Outliers

Outliers : Quality Control Samples

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

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_LI8_WS_LAEMP_LCO_2021-07_NP	E298	15-Jul-2021	22-Jul-2021	----	----		22-Jul-2021	28 days	7 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_LI8_WS_LAEMP_LCO_2021-07_NP	E235.Br-L	15-Jul-2021	----	----	----		17-Jul-2021	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_LI8_WS_LAEMP_LCO_2021-07_NP	E235.Cl-L	15-Jul-2021	----	----	----		17-Jul-2021	28 days	2 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_LI8_WS_LAEMP_LCO_2021-07_NP	E378-U	15-Jul-2021	----	----	----		17-Jul-2021	3 days	2 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_LI8_WS_LAEMP_LCO_2021-07_NP	E235.F	15-Jul-2021	----	----	----		17-Jul-2021	28 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_LI8_WS_LAEMP_LCO_2021-07_NP	E235.NO3-L	15-Jul-2021	----	----	----		17-Jul-2021	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_LI8_WS_LAEMP_LCO_2021-07_NP	E235.NO2-L	15-Jul-2021	----	----	----		17-Jul-2021	3 days	2 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_LI8_WS_LAEMP_LCO_2021-07_NP	E235.SO4	15-Jul-2021	----	----	----		17-Jul-2021	28 days	2 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_LI8_WS_LAEMP_LCO_2021-07_NP	E318	15-Jul-2021	20-Jul-2021	----	----		20-Jul-2021	28 days	5 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_LI8_WS_LAEMP_LCO_2021-07_NP	E372-U	15-Jul-2021	22-Jul-2021	----	----		22-Jul-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
RG_LI8_WS_LAEMP_LCO_2021-07_NP	E421.Cr-L	15-Jul-2021	21-Jul-2021	----	----		21-Jul-2021	180 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
RG_LI8_WS_LAEMP_LCO_2021-07_NP	E509	15-Jul-2021	22-Jul-2021	----	----		22-Jul-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
RG_LI8_WS_LAEMP_LCO_2021-07_NP	E421	15-Jul-2021	21-Jul-2021	----	----		21-Jul-2021	180 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
RG_LI8_WS_LAEMP_LCO_2021-07_NP	E358-L	15-Jul-2021	22-Jul-2021	----	----		22-Jul-2021	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid)										
RG_LI8_WS_LAEMP_LCO_2021-07_NP	E355-L	15-Jul-2021	22-Jul-2021	----	----		22-Jul-2021	28 days	8 days	✓
Physical Tests : Acidity by Titration										
HDPE										
RG_LI8_WS_LAEMP_LCO_2021-07_NP	E283	15-Jul-2021	----	----	----		16-Jul-2021	14 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE RG_LI8_WS_LAEMP_LCO_2021-07_NP	E290	15-Jul-2021	----	----	----		18-Jul-2021	14 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_LI8_WS_LAEMP_LCO_2021-07_NP	E100	15-Jul-2021	----	----	----		18-Jul-2021	28 days	3 days	✓
Physical Tests : ORP by Electrode										
HDPE RG_LI8_WS_LAEMP_LCO_2021-07_NP	E125	15-Jul-2021	----	----	----		23-Jul-2021	0.34 hrs	196 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_LI8_WS_LAEMP_LCO_2021-07_NP	E108	15-Jul-2021	----	----	----		18-Jul-2021	0.25 hrs	78 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE RG_LI8_WS_LAEMP_LCO_2021-07_NP	E162	15-Jul-2021	----	----	----		22-Jul-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] RG_LI8_WS_LAEMP_LCO_2021-07_NP	E160-L	15-Jul-2021	----	----	----		22-Jul-2021	7 days	7 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_LI8_WS_LAEMP_LCO_2021-07_NP	E121	15-Jul-2021	----	----	----		17-Jul-2021	3 days	2 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_LI8_WS_LAEMP_LCO_2021-07_NP	E420.Cr-L	15-Jul-2021	----	----	----		21-Jul-2021	180 days	6 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_LI8_WS_LAEMP_LCO_2021-07_NP	E508-L	15-Jul-2021	----	----	----		21-Jul-2021	28 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
RG_LI8_WS_LAEMP_LCO_2021-07_NP	E420	15-Jul-2021	----	----	----		21-Jul-2021	180 days	6 days	✓

Legend & Qualifier Definitions

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

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	245365	1	14	7.1	5.0	✓
Alkalinity Species by Titration	E290	246339	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	249613	1	17	5.8	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	245757	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	245758	1	20	5.0	5.0	✓
Conductivity in Water	E100	246337	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	248325	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	248894	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	248326	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	249711	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	245770	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	245761	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	245759	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	245760	1	20	5.0	5.0	✓
ORP by Electrode	E125	249657	1	20	5.0	5.0	✓
pH by Meter	E108	246338	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	245756	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	248921	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	247647	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	246232	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	248537	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	247646	1	19	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	249714	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	248042	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	245748	1	9	11.1	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	245365	1	14	7.1	5.0	✓
Alkalinity Species by Titration	E290	246339	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	249613	1	17	5.8	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	245757	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	245758	1	20	5.0	5.0	✓
Conductivity in Water	E100	246337	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	248325	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	248894	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	248326	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	249711	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	245770	1	20	5.0	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	245761	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	245759	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	245760	1	20	5.0	5.0	✓
ORP by Electrode	E125	249657	1	20	5.0	5.0	✓
pH by Meter	E108	246338	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	245756	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	248921	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	247647	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	246232	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	248537	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	247646	1	19	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	249714	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	248042	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	248906	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	245748	1	9	11.1	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	245365	1	14	7.1	5.0	✓
Alkalinity Species by Titration	E290	246339	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	249613	1	17	5.8	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	245757	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	245758	1	20	5.0	5.0	✓
Conductivity in Water	E100	246337	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	248325	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	248894	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	248326	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	249711	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	245770	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	245761	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	245759	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	245760	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	245756	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	248921	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	247647	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	246232	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	248537	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	247646	1	19	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	249714	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	248042	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	248906	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	245748	1	9	11.1	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	249613	1	17	5.8	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	245757	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	245758	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	248325	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	248894	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	248326	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	249711	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	245770	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	245761	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	245759	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	245760	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	245756	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	247647	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	246232	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	248537	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	247646	1	19	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	249714	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	248042	1	20	5.0	5.0	✓

Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Calgary - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Calgary - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Calgary - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
ORP by Electrode	E125 Calgary - Environmental	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed, measured in mV. For high accuracy test results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L Calgary - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Calgary - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC (Low Level)	E235.Cl-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Calgary - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH 8.3

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U Calgary - Environmental	Water	APHA 4500-P E (mod)	Dissolved Orthophosphate is determined colourimetrically on a water sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAFS.
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **CG2102635**	Page	: 1 of 17
Client	: Teck Coal Limited	Laboratory	: Calgary - Environmental
Contact	: Cait Good	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: 250 425 8202 / 250 425 2555	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 16-Jul-2021 09:00
PO	: VPO00748510	Date Analysis Commenced	: 16-Jul-2021
C-O-C number	: REGIONAL EFFECTS PROGRAM	Issue Date	: 27-Jul-2021 16:06
Sampler	: RICK SMIT		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Laboratory Department*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Ilnaz Badbezanchi	Team Leader - Metals preparation	Metals, Burnaby, British Columbia
Jorden Fanson	Analyst	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

General Comments

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

Key :

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 245365)											
CG2102629-001	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 245748)											
CG2102635-001	RG_LI8_WS_LAEMP_LCO_2021-07_NP	turbidity	----	E121	0.10	NTU	0.28	0.34	0.06	Diff <2x LOR	----
Physical Tests (QC Lot: 246337)											
CG2102624-005	Anonymous	conductivity	----	E100	2.0	µS/cm	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 246338)											
CG2102624-005	Anonymous	pH	----	E108	0.10	pH units	5.71	5.49	3.93%	4%	----
Physical Tests (QC Lot: 246339)											
CG2102624-005	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 248921)											
CG2102623-005	Anonymous	solids, total dissolved [TDS]	----	E162	10	mg/L	<10	<10	0	Diff <2x LOR	----
Physical Tests (QC Lot: 249657)											
CG2102628-002	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	432	425	1.59%	15%	----
Anions and Nutrients (QC Lot: 245756)											
CG2102623-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	768	764	0.583%	20%	----
Anions and Nutrients (QC Lot: 245757)											
CG2102623-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.250	mg/L	<0.250	<0.250	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 245758)											
CG2102623-001	Anonymous	chloride	16887-00-6	E235.Cl-L	0.50	mg/L	26.1	26.0	0.558%	20%	----
Anions and Nutrients (QC Lot: 245759)											
CG2102623-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	19.7	19.7	0.0274%	20%	----
Anions and Nutrients (QC Lot: 245760)											
CG2102623-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	0.347	0.334	3.82%	20%	----
Anions and Nutrients (QC Lot: 245761)											
CG2102623-001	Anonymous	fluoride	16984-48-8	E235.F	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 245770)											
CG2102619-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0020	0.0022	0.0002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 246232)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 246232) - continued											
CG2102628-004	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 248042)											
CG2102626-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 249613)											
CG2102624-005	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0058	0.0062	0.0003	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 249711)											
CG2102623-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	3.67	3.87	0.20	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 249714)											
CG2102623-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	30.1	31.2	3.65%	20%	----
Total Metals (QC Lot: 247646)											
CG2102599-006	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00045	0.00046	0.00001	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0264	0.0278	5.24%	20%	----
		beryllium, total	7440-41-7	E420	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.016	0.016	0.00008	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	0.493 µg/L	0.000484	1.66%	20%	----
		calcium, total	7440-70-2	E420	0.050	mg/L	170	175	2.50%	20%	----
		cobalt, total	7440-48-4	E420	0.10	mg/L	0.16 µg/L	0.00017	0.000005	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00078	0.00079	0.00001	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000054	0.000056	0.000002	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0521	0.0507	2.78%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	89.7	87.9	2.06%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00172	0.00170	0.885%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00207	0.00212	2.37%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.0104	0.0106	1.40%	20%	----
		potassium, total	7440-09-7	E420	0.050	mg/L	3.12	3.16	1.13%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	214 µg/L	0.219	2.13%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	1.84	1.84	0.193%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	1.16	1.16	0.250%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.126	0.131	3.61%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	166	166	0.118%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 247646) - continued											
CG2102599-006	Anonymous	thallium, total	7440-28-0	E420	0.000010	mg/L	0.000021	0.000022	0.000001	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00411	0.00422	2.61%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.258	0.261	0.914%	20%	----
Total Metals (QC Lot: 247647)											
CG2102599-006	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Total Metals (QC Lot: 248537)											
CG2102606-001	Anonymous	mercury, total	7439-97-6	E508-L	0.00050	ng/L	0.00419 µg/L	3.72	0.47	Diff <2x LOR	----
Dissolved Metals (QC Lot: 248325)											
CG2102619-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00013	0.00013	0.000003	Diff <2x LOR	----
Dissolved Metals (QC Lot: 248326)											
CG2102619-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00012	0.00011	0.000005	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00013	0.00011	0.00002	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0557	0.0543	2.51%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.025	0.024	0.001	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0050	mg/L	0.0824 µg/L	0.0000728	12.4%	20%	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	147	143	2.54%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.0216	0.0212	1.81%	20%	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000150	0.000146	0.000004	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0576	0.0554	4.01%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	64.4	63.6	1.33%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00029	0.00033	0.00004	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000705	0.000681	3.40%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00098	0.00101	0.00003	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	2.45	2.41	1.65%	20%	----
		selenium, dissolved	7782-49-2	E421	0.050	mg/L	57.4 µg/L	0.0577	0.640%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.49	3.36	3.88%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 248326) - continued											
CG2102619-001	Anonymous	sodium, dissolved	17341-25-2	E421	0.050	mg/L	13.5	13.4	0.867%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.336	0.334	0.402%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	116	113	2.63%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000018	0.000019	0.0000005	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00166	0.00160	3.75%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0228	0.0223	2.09%	20%	----
Dissolved Metals (QC Lot: 248894)											
CG2102624-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 245365)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Physical Tests (QCLot: 245748)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 246337)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 246339)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 248906)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 248921)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 245756)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 245757)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 245758)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 245759)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 245760)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 245761)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 245770)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 246232)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 248042)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 249613)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 249613) - continued						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 249711)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 249714)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 247646)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	MBRR
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 247646) - continued						
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 247647)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 248537)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 248325)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 248326)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 248326) - continued						
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 248894)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Qualifiers

Qualifier	Description
MBRR	*Initial MB for this submission had positive results for flagged analyte (data not shown). Low level samples were repeated with new QC (2nd MB results shown). High level results (>5x initial MB level) and non-detect results were reported and are defensible*

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 245365)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	101	85.0	115	----
Physical Tests (QCLot: 245748)									
turbidity	----	E121	0.1	NTU	200 NTU	96.4	85.0	115	----
Physical Tests (QCLot: 246337)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	98.4	90.0	110	----
Physical Tests (QCLot: 246338)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 246339)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	97.3	85.0	115	----
Physical Tests (QCLot: 248906)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	95.9	85.0	115	----
Physical Tests (QCLot: 248921)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	98.6	85.0	115	----
Physical Tests (QCLot: 249657)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	101	95.4	104	----
Anions and Nutrients (QCLot: 245756)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 245757)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	100	85.0	115	----
Anions and Nutrients (QCLot: 245758)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 245759)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 245760)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 245761)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	108	90.0	110	----
Anions and Nutrients (QCLot: 245770)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.1 mg/L	110	80.0	120	----
Anions and Nutrients (QCLot: 246232)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	79.3	75.0	125	----
Anions and Nutrients (QCLot: 248042)									

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Anions and Nutrients (QCLot: 248042) - continued									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	90.6	80.0	120	----
Anions and Nutrients (QCLot: 249613)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	101	85.0	115	----
Organic / Inorganic Carbon (QCLot: 249711)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	106	80.0	120	----
Organic / Inorganic Carbon (QCLot: 249714)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	109	80.0	120	----
Total Metals (QCLot: 247646)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	104	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	103	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	106	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	109	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	92.8	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	100	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	99.0	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	102	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	99.4	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	108	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	98.0	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	98.1	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	100	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	106	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	106	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	107	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	106	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	105	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	110	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	108	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	110	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	97.0	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	100	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 247646) - continued									
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	99.6	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	106	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	105	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	98.6	80.0	120	----
Total Metals (QCLot: 247647)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
Total Metals (QCLot: 248537)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	98.8	80.0	120	----
Dissolved Metals (QCLot: 248325)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
Dissolved Metals (QCLot: 248326)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	104	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	96.8	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	98.2	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	101	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	101	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	92.7	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	101	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	97.6	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	102	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	98.2	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	96.4	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	99.7	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	99.3	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	100	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	109	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	98.1	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	97.7	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	101	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	109	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	99.8	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	87.7	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 248326) - continued									
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	100	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	98.1	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	102	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	98.3	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	100	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	103	80.0	120	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 245756)										
CG2102623-006	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	105 mg/L	100 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 245757)										
CG2102623-006	Anonymous	bromide	24959-67-9	E235.Br-L	0.555 mg/L	0.5 mg/L	111	75.0	125	----
Anions and Nutrients (QCLot: 245758)										
CG2102623-006	Anonymous	chloride	16887-00-6	E235.Cl-L	111 mg/L	100 mg/L	111	75.0	125	----
Anions and Nutrients (QCLot: 245759)										
CG2102623-006	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.61 mg/L	2.5 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 245760)										
CG2102623-006	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.528 mg/L	0.5 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 245761)										
CG2102623-006	Anonymous	fluoride	16984-48-8	E235.F	1.17 mg/L	1 mg/L	117	75.0	125	----
Anions and Nutrients (QCLot: 245770)										
CG2102623-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0470 mg/L	0.05 mg/L	94.1	70.0	130	----
Anions and Nutrients (QCLot: 246232)										
CG2102629-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.37 mg/L	2.5 mg/L	94.9	70.0	130	----
Anions and Nutrients (QCLot: 248042)										
CG2102626-003	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0558 mg/L	0.0676 mg/L	82.5	70.0	130	----
Anions and Nutrients (QCLot: 249613)										
CG2102626-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	4.32 mg/L	5 mg/L	86.4	75.0	125	----
Organic / Inorganic Carbon (QCLot: 249711)										
CG2102623-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	27.0 mg/L	23.9 mg/L	113	70.0	130	----
Organic / Inorganic Carbon (QCLot: 249714)										
CG2102623-001	Anonymous	carbon, total organic [TOC]	----	E355-L	ND mg/L	23.9 mg/L	ND	70.0	130	----
Total Metals (QCLot: 247646)										
CG2102624-001	Anonymous	aluminum, total	7429-90-5	E420	0.418 mg/L	0.4 mg/L	104	70.0	130	----
		antimony, total	7440-36-0	E420	0.0419 mg/L	0.04 mg/L	105	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0453 mg/L	0.04 mg/L	113	70.0	130	----
		barium, total	7440-39-3	E420	0.0409 mg/L	0.04 mg/L	102	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 247646) - continued										
CG2102624-001	Anonymous	beryllium, total	7440-41-7	E420	0.0795 mg/L	0.08 mg/L	99.4	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0192 mg/L	0.02 mg/L	96.1	70.0	130	----
		boron, total	7440-42-8	E420	0.205 mg/L	0.2 mg/L	102	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00827 mg/L	0.008 mg/L	103	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	8 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		copper, total	7440-50-8	E420	0.0371 mg/L	0.04 mg/L	92.8	70.0	130	----
		iron, total	7439-89-6	E420	4.06 mg/L	4 mg/L	101	70.0	130	----
		lead, total	7439-92-1	E420	0.0378 mg/L	0.04 mg/L	94.6	70.0	130	----
		lithium, total	7439-93-2	E420	ND mg/L	0.2 mg/L	ND	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0438 mg/L	0.04 mg/L	110	70.0	130	----
		nickel, total	7440-02-0	E420	ND mg/L	0.08 mg/L	ND	70.0	130	----
		potassium, total	7440-09-7	E420	ND mg/L	8 mg/L	ND	70.0	130	----
		selenium, total	7782-49-2	E420	0.0901 mg/L	0.08 mg/L	113	70.0	130	----
		silicon, total	7440-21-3	E420	20.6 mg/L	20 mg/L	103	70.0	130	----
		silver, total	7440-22-4	E420	0.00821 mg/L	0.008 mg/L	103	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	40 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00727 mg/L	0.008 mg/L	90.8	70.0	130	----
		tin, total	7440-31-5	E420	0.0410 mg/L	0.04 mg/L	103	70.0	130	----
		titanium, total	7440-32-6	E420	0.0870 mg/L	0.08 mg/L	109	70.0	130	----
		uranium, total	7440-61-1	E420	ND mg/L	0.008 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.217 mg/L	0.2 mg/L	108	70.0	130	----
		zinc, total	7440-66-6	E420	0.767 mg/L	0.8 mg/L	95.9	70.0	130	----
Total Metals (QCLot: 247647)										
CG2102624-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0828 mg/L	0.08 mg/L	104	70.0	130	----
Total Metals (QCLot: 248537)										
CG2102606-002	Anonymous	mercury, total	7439-97-6	E508-L	4.53 ng/L	5 ng/L	90.7	70.0	130	----
Dissolved Metals (QCLot: 248325)										
CG2102619-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0384 mg/L	0.04 mg/L	95.9	70.0	130	----
Dissolved Metals (QCLot: 248326)										
CG2102619-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.186 mg/L	0.2 mg/L	93.2	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 248326) - continued										
CG2102619-002	Anonymous	antimony, dissolved	7440-36-0	E421	0.0190 mg/L	0.02 mg/L	94.8	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0190 mg/L	0.02 mg/L	95.1	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0357 mg/L	0.04 mg/L	89.2	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00856 mg/L	0.01 mg/L	85.6	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.085 mg/L	0.1 mg/L	85.5	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00380 mg/L	0.004 mg/L	95.0	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0182 mg/L	0.02 mg/L	91.2	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0184 mg/L	0.02 mg/L	91.8	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.67 mg/L	2 mg/L	83.5	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0184 mg/L	0.02 mg/L	92.3	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0871 mg/L	0.1 mg/L	87.1	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0180 mg/L	0.02 mg/L	90.1	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0194 mg/L	0.02 mg/L	97.0	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0365 mg/L	0.04 mg/L	91.3	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.97 mg/L	4 mg/L	99.2	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0365 mg/L	0.04 mg/L	91.3	70.0	130	----
		silicon, dissolved	7440-21-3	E421	7.85 mg/L	10 mg/L	78.5	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00371 mg/L	0.004 mg/L	92.9	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00369 mg/L	0.004 mg/L	92.4	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0191 mg/L	0.02 mg/L	95.6	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0386 mg/L	0.04 mg/L	96.6	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00370 mg/L	0.004 mg/L	92.6	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0977 mg/L	0.1 mg/L	97.7	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.366 mg/L	0.4 mg/L	91.6	70.0	130	----
Dissolved Metals (QCLot: 248894)										
CG2102624-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.000101 mg/L	0.0001 mg/L	101	70.0	130	----

Teck

COC ID: **Regional Effects Program** | TURNAROUND TIME: Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Regional Effects Program			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Cait Good			Lab Contact	Lyuda Shvets			Email 1:	cait.good@teck.com	✓		
Email	cait.good@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	Danika.Gerylo@teck.com			
Address	421 Pine Avenue			Address	2559 29 Street NE			Email 3:	teckcoal@equisonline.com			
								Email 4:	tyler.mahler@minnow.ca			
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 5:	Carla.FroymanParker@teck.com			
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada					
Phone Number	250-425-8202			Phone Number	403-407-1800			PO number	WPO748510			

SAMPLE DETAILS / ANALYSIS REQUESTED (Filtered - F: Field, L: Lab, FL: Field & Lab, N: None)

Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	FIL	N	Y	N	Y	Y	N	N
								PRESERV	NONE	H2SO4	H2SO4	HCl	HNO3	HNO3	NONE
								ANALYSIS	HG-T-U-CVAF-VA	ALS_Package-DOC	ALS_Package-TKN/TOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA
RG_LIB_WS_LAEMP_Loo_2021-07_NP	RG_LIB	WS	ND	2021/07/15	08:15	G	7		X	X	X	X	X	X	X

Environmental Division
Calgary
Work Order Reference
CG2102635

Telephone : +1 403 407 1800

INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
	Rick Smit / Lotic environmental	2021/07/15 / 10:00	9:00 GT	July 16

SERVICE REQUEST (rush - subject to availability)

Regular (default)	X
Priority (2-3 business days) - 50% surcharge	
Emergency (1 Business Day) - 100% surcharge	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	

Sampler's Name	Rick Smit	Mobile #	403-586-3241
Sampler's Signature		Date/Time	2021 07 15 / 10:00

30C

WATER CHEMISTRY

ALS Laboratory Report CG2104190

(Finalized October 6, 2021)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **CG2104190**	Page	: 1 of 6
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 17-Sep-2021 10:00
PO	: VPO00748510	Date Analysis Commenced	: 18-Sep-2021
C-O-C number	: September LCO LAEMP 2021	Issue Date	: 06-Oct-2021 16:23
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dion Chan	Lab Assistant	Metals, Burnaby, British Columbia
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Ilnaz Badbezanchi	Team Leader - Metals preparation	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	----	----	----	----
					Client sampling date / time: 15-Sep-2021 08:15	----	----	----	----
					CG2104190-001	--------	--------	--------	--------
					Result	----	----	----	----
Physical Tests									
acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	----	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	127	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	8.6	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	136	----	----	----	----
conductivity	----	E100	2.0	µS/cm	357	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	200	----	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV	448	----	----	----	----
pH	----	E108	0.10	pH units	8.45	----	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	216	----	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L	<1.0	----	----	----	----
turbidity	----	E121	0.10	NTU	0.13	----	----	----	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	155	----	----	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	5.2	----	----	----	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	----	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	----	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.34	----	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	0.368	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.136	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	----	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	----	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	55.9	----	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.41	----	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.49	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	----	----	----	----
Client sampling date / time					15-Sep-2021 08:15	----	----	----	----
					CG2104190-001	--------	--------	--------	--------
					Result	----	----	----	----
Ion Balance									
anion sum	----	EC101	0.10	meq/L	3.92	----	----	----	----
cation sum	----	EC101	0.10	meq/L	4.03	----	----	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%	103	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%	1.38	----	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0037	----	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	----	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00010	----	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0372	----	----	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L	<0.020	----	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	----	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L	<0.010	----	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0137	----	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	45.7	----	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00012	----	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	----	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	----	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L	<0.010	----	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	----	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0028	----	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	15.1	----	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00014	----	----	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L	<0.00050	----	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00140	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	----	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	0.353	----	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L	1.45	----	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L	2.04	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	----	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L	0.695	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	----	----	----	----
					Client sampling date / time: 15-Sep-2021 08:15	----	----	----	----
					CG2104190-001	--------	--------	--------	--------
					Result	----	----	----	----
Total Metals									
strontium, total	7440-24-6	E420	0.00020	mg/L	0.159	----	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	20.1	----	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	----	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	----	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	----	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00171	----	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	----	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	----	----	----	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0012	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00011	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0416	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L	<0.020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L	0.0143	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L	53.2	----	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00016	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L	<0.10	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0030	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	16.2	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00014	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00142	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.404	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	----	----	----	----
					Client sampling date / time	15-Sep-2021 08:15	----	----	----	----
						CG2104190-001	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
selenium, dissolved	7782-49-2	E421	0.050	µg/L		1.70	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		1.93	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	----	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		0.790	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.159	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		18.8	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00186	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0030	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2104190**	Page	: 1 of 12
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 17-Sep-2021 10:00
PO	: VPO00748510	Issue Date	: 06-Oct-2021 16:24
C-O-C number	: September LCO LAEMP 2021		
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

Key

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

Summary of Outliers

Outliers : Quality Control Samples

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

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E298	15-Sep-2021	28-Sep-2021	----	----		28-Sep-2021	28 days	13 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E235.Br-L	15-Sep-2021	----	----	----		18-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E235.Cl-L	15-Sep-2021	----	----	----		18-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E378-U	15-Sep-2021	----	----	----		18-Sep-2021	3 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E235.F	15-Sep-2021	----	----	----		18-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E235.NO3-L	15-Sep-2021	----	----	----		18-Sep-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E235.NO2-L	15-Sep-2021	----	----	----		18-Sep-2021	3 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E235.SO4	15-Sep-2021	----	----	----		18-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E318	15-Sep-2021	27-Sep-2021	----	----		27-Sep-2021	28 days	13 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E372-U	15-Sep-2021	22-Sep-2021	----	----		22-Sep-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E421.Cr-L	15-Sep-2021	23-Sep-2021	----	----		23-Sep-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid)										
RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E509	15-Sep-2021	23-Sep-2021	----	----		23-Sep-2021	28 days	8 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid)										
RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E421	15-Sep-2021	23-Sep-2021	----	----		23-Sep-2021	180 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E358-L	15-Sep-2021	27-Sep-2021	----	----		29-Sep-2021	28 days	14 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid)										
RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E355-L	15-Sep-2021	27-Sep-2021	----	----		29-Sep-2021	28 days	14 days	✓
Physical Tests : Acidity by Titration										
HDPE										
RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E283	15-Sep-2021	----	----	----		28-Sep-2021	14 days	13 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E290	15-Sep-2021	----	----	----		28-Sep-2021	14 days	13 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E100	15-Sep-2021	----	----	----		28-Sep-2021	28 days	13 days	✓
Physical Tests : ORP by Electrode										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E125	15-Sep-2021	----	----	----		25-Sep-2021	0.34 hrs	246 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E108	15-Sep-2021	----	----	----		28-Sep-2021	0.25 hrs	315 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E162	15-Sep-2021	----	----	----		22-Sep-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E160-L	15-Sep-2021	----	----	----		22-Sep-2021	7 days	7 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E121	15-Sep-2021	----	----	----		18-Sep-2021	3 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E420.Cr-L	15-Sep-2021	----	----	----		23-Sep-2021	180 days	9 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E508-L	15-Sep-2021	----	----	----		24-Sep-2021	28 days	9 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid)										
RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	E420	15-Sep-2021	----	----	----		23-Sep-2021	180 days	9 days	✓

Legend & Qualifier Definitions

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

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	304859	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	304723	1	15	6.6	5.0	✓
Ammonia by Fluorescence	E298	305207	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	296270	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	296271	1	16	6.2	5.0	✓
Conductivity in Water	E100	304722	1	15	6.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	300110	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	300938	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	300109	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	303820	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	296209	1	14	7.1	5.0	✓
Fluoride in Water by IC	E235.F	296268	1	16	6.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	296272	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	296273	1	16	6.2	5.0	✓
ORP by Electrode	E125	302475	1	20	5.0	5.0	✓
pH by Meter	E108	304721	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	296269	1	16	6.2	5.0	✓
TDS by Gravimetry	E162	298977	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	300563	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	304121	1	19	5.2	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	301411	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	300562	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	303828	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	297810	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	296170	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	304859	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	304723	1	15	6.6	5.0	✓
Ammonia by Fluorescence	E298	305207	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	296270	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	296271	1	16	6.2	5.0	✓
Conductivity in Water	E100	304722	1	15	6.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	300110	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	300938	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	300109	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	303820	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	296209	1	14	7.1	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	296268	1	16	6.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	296272	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	296273	1	16	6.2	5.0	✓
ORP by Electrode	E125	302475	1	20	5.0	5.0	✓
pH by Meter	E108	304721	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	296269	1	16	6.2	5.0	✓
TDS by Gravimetry	E162	298977	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	300563	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	304121	1	19	5.2	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	301411	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	300562	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	303828	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	297810	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	298276	1	13	7.6	5.0	✓
Turbidity by Nephelometry	E121	296170	1	20	5.0	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	304859	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	304723	1	15	6.6	5.0	✓
Ammonia by Fluorescence	E298	305207	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	296270	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	296271	1	16	6.2	5.0	✓
Conductivity in Water	E100	304722	1	15	6.6	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	300110	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	300938	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	300109	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	303820	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	296209	1	14	7.1	5.0	✓
Fluoride in Water by IC	E235.F	296268	1	16	6.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	296272	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	296273	1	16	6.2	5.0	✓
Sulfate in Water by IC	E235.SO4	296269	1	16	6.2	5.0	✓
TDS by Gravimetry	E162	298977	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	300563	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	304121	1	19	5.2	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	301411	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	300562	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	303828	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	297810	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	298276	1	13	7.6	5.0	✓
Turbidity by Nephelometry	E121	296170	1	20	5.0	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	305207	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	296270	1	16	6.2	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	296271	1	16	6.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	300110	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	300938	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	300109	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	303820	1	19	5.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	296209	1	14	7.1	5.0	✓
Fluoride in Water by IC	E235.F	296268	1	16	6.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	296272	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	296273	1	16	6.2	5.0	✓
Sulfate in Water by IC	E235.SO4	296269	1	16	6.2	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	300563	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	304121	1	19	5.2	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	301411	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	300562	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	303828	1	19	5.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	297810	1	20	5.0	5.0	✓

Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Calgary - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Calgary - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Calgary - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
ORP by Electrode	E125 Calgary - Environmental	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed, measured in mV. For high accuracy test results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L Calgary - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Calgary - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC (Low Level)	E235.Cl-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Calgary - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH 8.3

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U Calgary - Environmental	Water	APHA 4500-P E (mod)	Dissolved Orthophosphate is determined colourimetrically on a water sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAFS.
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **CG2104190**	Page	: 1 of 18
Client	: Teck Coal Limited	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 17-Sep-2021 10:00
PO	: VPO00748510	Date Analysis Commenced	: 18-Sep-2021
C-O-C number	: September LCO LAEMP 2021	Issue Date	: 06-Oct-2021 16:23
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dion Chan	Lab Assistant	Metals, Burnaby, British Columbia
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
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Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
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Sara Niroomand		Inorganics, Calgary, Alberta
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

General Comments

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

Key :

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 296170)											
CG2104162-002	Anonymous	turbidity	----	E121	0.10	NTU	0.28	0.26	0.01	Diff <2x LOR	----
Physical Tests (QC Lot: 298977)											
CG2104186-002	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	248	252	1.80%	20%	----
Physical Tests (QC Lot: 302475)											
CG2104181-010	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	464	462	0.518%	15%	----
Physical Tests (QC Lot: 304721)											
CG2104186-002	Anonymous	pH	----	E108	0.10	pH units	8.48	8.53	0.588%	4%	----
Physical Tests (QC Lot: 304722)											
CG2104186-005	Anonymous	conductivity	----	E100	2.0	µS/cm	454	457	0.659%	10%	----
Physical Tests (QC Lot: 304723)											
CG2104186-005	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	136	136	0.0737%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	7.8	7.4	0.4	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	144	143	0.349%	20%	----
Physical Tests (QC Lot: 304859)											
CG2104186-005	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 296209)											
CG2104188-018	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0019	0.0024	0.0005	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 296268)											
CG2104186-007	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 296269)											
CG2104186-007	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	<0.30	<0.30	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 296270)											
CG2104186-007	Anonymous	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 296271)											
CG2104186-007	Anonymous	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 296272)											
CG2104186-007	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	0.0061	0.0011	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 296273)											
CG2104186-007	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 297810)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 297810) - continued											
CG2104189-003	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 304121)											
CG2104136-003	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 305207)											
CG2104171-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0087	<0.0050	0.0037	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 303820)											
CG2104186-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.23	1.35	0.12	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 303828)											
CG2104186-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.45	1.30	0.14	Diff <2x LOR	----
Total Metals (QC Lot: 300562)											
CG2104166-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	8.63	8.82	2.14%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00174	0.00176	1.23%	20%	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.0115	0.0117	2.32%	20%	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.532	0.540	1.46%	20%	----
		beryllium, total	7440-41-7	E420	0.020	mg/L	0.818 µg/L	0.000804	1.66%	20%	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	0.000225	0.000232	0.000008	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.030	0.030	0.0004	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	2.04 µg/L	0.00206	0.785%	20%	----
		calcium, total	7440-70-2	E420	0.050	mg/L	235	234	0.574%	20%	----
		cobalt, total	7440-48-4	E420	0.10	mg/L	9.70 µg/L	0.00985	1.52%	20%	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.0332	0.0330	0.376%	20%	----
		iron, total	7439-89-6	E420	0.010	mg/L	27.6	28.5	3.39%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.0126	0.0127	0.888%	20%	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0328	0.0328	0.0523%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	68.3	67.8	0.792%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	1.64	1.62	1.06%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00284	0.00299	5.41%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.0310	0.0314	1.35%	20%	----
		potassium, total	7440-09-7	E420	0.050	mg/L	5.08	5.04	0.813%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	1.06 µg/L	0.00103	3.36%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	16.6	17.0	1.95%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	0.000748	0.000769	2.77%	20%	----
		sodium, total	17341-25-2	E420	0.050	mg/L	13.8	13.5	2.02%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.671	0.683	1.76%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	22.0	21.6	2.04%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 300562) - continued											
CG2104166-001	Anonymous	thallium, total	7440-28-0	E420	0.000010	mg/L	0.000489	0.000507	3.52%	20%	----
		tin, total	7440-31-5	E420	0.00010	mg/L	0.00239	0.00241	0.732%	20%	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.0293	0.0304	3.67%	20%	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00499	0.00492	1.44%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.0328	0.0335	1.89%	20%	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.144	0.143	0.604%	20%	----
Total Metals (QC Lot: 300563)											
CG2104166-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.0248	0.0254	2.28%	20%	----
Total Metals (QC Lot: 301411)											
CG2104186-001	Anonymous	mercury, total	7439-97-6	E508-L	0.00050	ng/L	<0.00050 µg/L	<0.50	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 300109)											
CG2104166-004	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		beryllium, dissolved	7440-41-7	E421	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0050	mg/L	<0.0050 µg/L	<0.0000050	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.050	mg/L	<0.050 µg/L	<0.000050	0	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 300109) - continued											
CG2104166-004	Anonymous	sulfur, dissolved	7704-34-9	E421	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 300110)											
CG2104166-004	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 300938)											
CG2104188-014	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 296170)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 298276)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 298977)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 304722)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 304723)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 304859)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Anions and Nutrients (QCLot: 296209)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 296268)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 296269)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 296270)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 296271)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 296272)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 296273)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 297810)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 304121)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 305207)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 305207) - continued						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 303820)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 303828)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 300562)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 300562) - continued						
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 300563)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 301411)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 300109)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 300109) - continued						
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 300110)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 300938)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 296170)									
turbidity	----	E121	0.1	NTU	200 NTU	97.8	85.0	115	----
Physical Tests (QCLot: 298276)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	93.8	85.0	115	----
Physical Tests (QCLot: 298977)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	99.4	85.0	115	----
Physical Tests (QCLot: 302475)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	101	95.4	104	----
Physical Tests (QCLot: 304721)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 304722)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 304723)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	99.6	85.0	115	----
Physical Tests (QCLot: 304859)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	100	85.0	115	----
Anions and Nutrients (QCLot: 296209)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.02 mg/L	98.6	80.0	120	----
Anions and Nutrients (QCLot: 296268)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	106	90.0	110	----
Anions and Nutrients (QCLot: 296269)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 296270)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	107	85.0	115	----
Anions and Nutrients (QCLot: 296271)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 296272)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	105	90.0	110	----
Anions and Nutrients (QCLot: 296273)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	106	90.0	110	----
Anions and Nutrients (QCLot: 297810)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	98.8	80.0	120	----
Anions and Nutrients (QCLot: 304121)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 304121) - continued									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	99.9	75.0	125	----
Anions and Nutrients (QCLot: 305207)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	97.2	85.0	115	----
Organic / Inorganic Carbon (QCLot: 303820)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	102	80.0	120	----
Organic / Inorganic Carbon (QCLot: 303828)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	106	80.0	120	----
Total Metals (QCLot: 300562)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	108	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	110	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	102	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	97.3	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	100	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	95.5	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	99.7	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	96.9	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	99.6	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	103	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	99.3	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	99.0	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	104	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	100.0	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	105	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	99.0	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	103	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	102	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	106	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	104	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	97.8	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	105	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	109	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	100	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	97.6	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 300562) - continued									
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	103	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	101	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	101	80.0	120	----
Total Metals (QCLot: 300563)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
Total Metals (QCLot: 301411)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	97.6	80.0	120	----
Dissolved Metals (QCLot: 300109)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	109	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	102	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	112	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	110	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	98.4	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	106	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	92.5	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	108	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	98.0	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	111	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	110	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	102	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	95.8	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	106	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	109	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	102	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	110	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	108	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	111	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	95.8	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	101	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	111	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	98.8	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	103	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	103	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	100	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 300109) - continued									
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	106	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	104	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	110	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	112	80.0	120	----
Dissolved Metals (QCLot: 300110)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	111	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	93.1	80.0	120	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 296209)										
CG2104188-019	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0557 mg/L	0.05 mg/L	111	70.0	130	----
Anions and Nutrients (QCLot: 296268)										
CG2104186-007	Anonymous	fluoride	16984-48-8	E235.F	1.07 mg/L	1 mg/L	107	75.0	125	----
Anions and Nutrients (QCLot: 296269)										
CG2104186-007	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	104 mg/L	100 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 296270)										
CG2104186-007	Anonymous	bromide	24959-67-9	E235.Br-L	0.544 mg/L	0.5 mg/L	109	75.0	125	----
Anions and Nutrients (QCLot: 296271)										
CG2104186-007	Anonymous	chloride	16887-00-6	E235.Cl-L	105 mg/L	100 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 296272)										
CG2104186-007	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.63 mg/L	2.5 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 296273)										
CG2104186-007	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.538 mg/L	0.5 mg/L	108	75.0	125	----
Anions and Nutrients (QCLot: 297810)										
CG2104189-004	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0520 mg/L	0.0676 mg/L	76.9	70.0	130	----
Anions and Nutrients (QCLot: 304121)										
CG2104138-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.50 mg/L	2.5 mg/L	99.8	70.0	130	----
Anions and Nutrients (QCLot: 305207)										
CG2104181-006	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0829 mg/L	0.1 mg/L	82.9	75.0	125	----
Organic / Inorganic Carbon (QCLot: 303820)										
CG2104186-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	28.4 mg/L	23.9 mg/L	119	70.0	130	----
Organic / Inorganic Carbon (QCLot: 303828)										
CG2104186-001	Anonymous	carbon, total organic [TOC]	----	E355-L	27.8 mg/L	23.9 mg/L	116	70.0	130	----
Total Metals (QCLot: 300562)										
CG2104166-002	Anonymous	aluminum, total	7429-90-5	E420	ND mg/L	0.2 mg/L	ND	70.0	130	----
		antimony, total	7440-36-0	E420	0.0425 mg/L	0.04 mg/L	106	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0388 mg/L	0.04 mg/L	96.9	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 300562) - continued										
CG2104166-002	Anonymous	beryllium, total	7440-41-7	E420	0.0729 mg/L	0.08 mg/L	91.1	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0189 mg/L	0.02 mg/L	94.5	70.0	130	----
		boron, total	7440-42-8	E420	0.180 mg/L	0.2 mg/L	90.0	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00750 mg/L	0.008 mg/L	93.7	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0357 mg/L	0.04 mg/L	89.2	70.0	130	----
		copper, total	7440-50-8	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		iron, total	7439-89-6	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		lead, total	7439-92-1	E420	0.0363 mg/L	0.04 mg/L	90.8	70.0	130	----
		lithium, total	7439-93-2	E420	0.187 mg/L	0.2 mg/L	93.4	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0434 mg/L	0.04 mg/L	108	70.0	130	----
		nickel, total	7440-02-0	E420	0.0694 mg/L	0.08 mg/L	86.8	70.0	130	----
		potassium, total	7440-09-7	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		selenium, total	7782-49-2	E420	0.0778 mg/L	0.08 mg/L	97.2	70.0	130	----
		silicon, total	7440-21-3	E420	ND mg/L	10 mg/L	ND	70.0	130	----
		silver, total	7440-22-4	E420	0.00836 mg/L	0.008 mg/L	104	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00711 mg/L	0.008 mg/L	88.8	70.0	130	----
		tin, total	7440-31-5	E420	0.0395 mg/L	0.04 mg/L	98.8	70.0	130	----
		titanium, total	7440-32-6	E420	0.0794 mg/L	0.08 mg/L	99.3	70.0	130	----
		uranium, total	7440-61-1	E420	0.00756 mg/L	0.008 mg/L	94.6	70.0	130	----
		vanadium, total	7440-62-2	E420	0.197 mg/L	0.2 mg/L	98.5	70.0	130	----
		zinc, total	7440-66-6	E420	0.729 mg/L	0.8 mg/L	91.2	70.0	130	----
Total Metals (QCLot: 300563)										
CG2104166-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0743 mg/L	0.08 mg/L	92.9	70.0	130	----
Total Metals (QCLot: 301411)										
CG2104186-002	Anonymous	mercury, total	7439-97-6	E508-L	4.83 ng/L	5 ng/L	96.6	70.0	130	----
Dissolved Metals (QCLot: 300109)										
CG2104171-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.209 mg/L	0.2 mg/L	105	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0229 mg/L	0.02 mg/L	114	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 300109) - continued										
CG2104171-001	Anonymous	beryllium, dissolved	7440-41-7	E421	0.0379 mg/L	0.04 mg/L	94.8	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00906 mg/L	0.01 mg/L	90.6	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.092 mg/L	0.1 mg/L	92.6	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00436 mg/L	0.004 mg/L	109	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0216 mg/L	0.02 mg/L	108	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0214 mg/L	0.02 mg/L	107	70.0	130	----
		iron, dissolved	7439-89-6	E421	2.04 mg/L	2 mg/L	102	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0198 mg/L	0.02 mg/L	98.8	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0921 mg/L	0.1 mg/L	92.1	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0214 mg/L	0.02 mg/L	107	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0430 mg/L	0.04 mg/L	108	70.0	130	----
		potassium, dissolved	7440-09-7	E421	4.42 mg/L	4 mg/L	111	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0467 mg/L	0.04 mg/L	117	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.19 mg/L	10 mg/L	91.9	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00409 mg/L	0.004 mg/L	102	70.0	130	----
		sodium, dissolved	17341-25-2	E421	2.50 mg/L	2 mg/L	125	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	20.3 mg/L	20 mg/L	101	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00404 mg/L	0.004 mg/L	101	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0430 mg/L	0.04 mg/L	107	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00411 mg/L	0.004 mg/L	103	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.111 mg/L	0.1 mg/L	111	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.439 mg/L	0.4 mg/L	110	70.0	130	----
Dissolved Metals (QCLot: 300110)										
CG2104171-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0442 mg/L	0.04 mg/L	110	70.0	130	----
Dissolved Metals (QCLot: 300938)										
CG2104188-015	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000993 mg/L	0.0001 mg/L	99.3	70.0	130	----

Teck

Page 1 of 1

COC ID: September LCO LAEMP 2021 | TURNAROUND TIME:

PROJECT/CLIENT INFO				LABORATORY			
Facility Name / Job#	REP			Lab Name	ALS Calgary		
Project Manager	Cybele Heddle			Lab Contact	Lyudmyla Shvets		
Email	[redacted]			Email	lyudmyla.shvets@alsglobal.com		
Address	421 Pine Avenue			Address	2559 29 Street NE		
City	Sparwood	Province	BC	City	Calgary	Province	AB
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada
Phone Number	250-425-8202			Phone Number	1 403 407 1794		

Excel | PDF | EDD

SAMPLE DETAILS | ANALYSIS REQUESTED

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Preserved	N	F	N	N	F	N	F				
										H2SO4	H2SO4		HCL	HNO3	HNO3				
								Analysis	TECKCOAL-ROUTINE-VA	ALS_Package-DOC	ALS_Package-TKN/TOC	HG-T-U-CVAF-VA	HG-D-CVAF-VA	TECKCOAL-MET-T-VA	TECKCOAL-MET-D-VA				
RG_SLINE_WS_LAEMP_LCO_2021-09-15_NP	RG_SLINE	WS	No	9/15/2021	815	G	7		X	X	X	X	X	X	X				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

ALS PO 748510

RELINQUISHED BY/AFFILIATION: Jennifer Ings/Minnow

DATE/TIME: ##########

ACCEPTED BY/AFFILIATION

NB OF BOTTLES RETURNED/DESCRIPTION

Regular (default) x
Priority (2-3 business days) - 50% surcharge
Emergency (1 Business Day) - 100% surcharge
For Emergency <1 Day, ASAP or Weekend - Contact ALS

Sampler's Name	Jennifer Ings	Mobile #	519-500-3444
Sampler's Signature	[signature]	Date/Time	September 16, 2021

Environmental Division
Calgary
Work Order Reference
CG2104190

Telephone : +1 403 407 1800

WATER CHEMISTRY

ALS Laboratory Report CG2104208

(Finalized October 12, 2021)

CERTIFICATE OF ANALYSIS

Work Order	: **CG2104208**	Page	: 1 of 7
Amendment	: **1**		
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 18-Sep-2021 09:05
PO	: VPO00748510	Date Analysis Commenced	: 19-Sep-2021
C-O-C number	: SEPTEMBER LCO LAEMP 2021	Issue Date	: 12-Oct-2021 10:24
Sampler	: JENNIFER INGS		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 1		
No. of samples analysed	: 1		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dion Chan	Lab Assistant	Metals, Burnaby, British Columbia
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Ilnaz Badbezanchi	Team Leader - Metals preparation	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Oscar Ruiz	Lab Assistant	Inorganics, Calgary, Alberta
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DTMF	*Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.*
HTA	*Analytical holding time was exceeded.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_LI24_WS_LAEMP_LCO_2021-09-16_NP	----	----	----	----
					Client sampling date / time: 16-Sep-2021 09:31	----	----	----	----
					CG2104208-001	--------	--------	--------	--------
					Result	----	----	----	----
Physical Tests									
acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	----	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	113	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	4.2	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	118	----	----	----	----
conductivity	----	E100	2.0	µS/cm	342	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	167	----	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV	463	----	----	----	----
pH	----	E108	0.10	pH units	8.32	----	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	231	----	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L	<1.0	----	----	----	----
turbidity	----	E121	0.10	NTU	<0.10	----	----	----	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	138	----	----	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	2.5	----	----	----	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	----	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0064	----	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L	0.35	----	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	0.362	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.219	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	----	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010 HTA	----	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	63.5	----	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.86	----	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.97	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LI24_WS_LAEMP_LCO_2021-09-16_NP	----	----	----	----
					Client sampling date / time	16-Sep-2021 09:31	----	----	----	----
						CG2104208-001	--------	--------	--------	--------
						Result	----	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.72	----	----	----	----
cation sum	----	EC101	0.10	meq/L		3.41	----	----	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%		91.7	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		4.35	----	----	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		<0.0030	----	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	----	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00013	----	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0459	----	----	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	----	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	----	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	----	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.0077	----	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		44.6	----	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00031	----	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	----	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	----	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L		<0.010	----	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	----	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0033	----	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		12.9	----	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		<0.00010	----	----	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	----	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000961	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00056	----	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L		0.245	----	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L		3.24	----	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		1.51	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	----	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L		1.34	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_LI24_WS_LAEMP_LCO_2021-09-16_NP	----	----	----	----
					Client sampling date / time: 16-Sep-2021 09:31	----	----	----	----
					CG2104208-001	--------	--------	--------	--------
					Result	----	----	----	----
Total Metals									
strontium, total	7440-24-6	E420	0.00020	mg/L	0.183	----	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	20.2	----	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	----	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	----	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	----	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00146	----	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	----	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	0.0032	----	----	----	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0028	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00012	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0472	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L	<0.020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L	0.0099	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L	46.2	----	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00021	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L	<0.10	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0034	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	12.6	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00023 DTMF	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000900	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00055	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.280	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LI24_WS_LAEMP_LCO_2021-09-16_NP	----	----	----	----
					Client sampling date / time	16-Sep-2021 09:31	----	----	----	----
						CG2104208-001	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
selenium, dissolved	7782-49-2	E421	0.050	µg/L		3.20	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		1.60	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	----	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		1.36	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.156	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		20.1	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00145	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0035	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----

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

WATER CHEMISTRY

ALS Laboratory Report CG2104006

(Finalized September 30, 2021)

CERTIFICATE OF ANALYSIS

Work Order	: **CG2104006**	Page	: 1 of 7
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REP	Date Samples Received	: 11-Sep-2021 10:15
PO	: VPO00748510	Date Analysis Commenced	: 12-Sep-2021
C-O-C number	: September LCO LAEMP 2021	Issue Date	: 30-Sep-2021 12:41
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Dion Chan	Lab Assistant	Metals, Burnaby, British Columbia
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Ilnaz Badbezanchi	Team Leader - Metals preparation	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
Vladka Stamenova	Analyst	Inorganics, Calgary, Alberta

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
RRV	*Reported result verified by repeat analysis.*
TKNI	*TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LILC3_WS_LAEMP_LCO_2021-09-09_NP	RG_RIVER_WS_2021-09-09_NP	RG_FBLANK_WS_2021-09-09_NP	RG_LCUT_WS_2021-09-10_NP	----
					Client sampling date / time	09-Sep-2021 10:36	09-Sep-2021 10:36	09-Sep-2021 10:36	10-Sep-2021 12:54	----
						CG2104006-001	CG2104006-002	CG2104006-003	CG2104006-004	--------
						Result	Result	Result	Result	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	2.0	<2.0	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		205	199	<1.0	204	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		12.6	14.6	<1.0	11.6	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		217	214	<1.0	216	----
conductivity	----	E100	2.0	µS/cm		945	946	<2.0	935	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		515	508	<0.50	520	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV		446	434	480	473	----
pH	----	E108	0.10	pH units		8.37	8.38	5.06	8.36	----
solids, total dissolved [TDS]	----	E162	10	mg/L		680	690	<10	642	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
turbidity	----	E121	0.10	NTU		0.14	0.16	<0.10	0.19	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L		250	243	<1.0	249	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L		7.6	8.8	<1.0	7.0	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	<0.0050 RRV	0.0082	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	<0.050	<0.250 DLDS	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		14.3	14.3	<0.10	8.65	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.166	0.169	<0.020	0.189	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.248 TKNI	<0.050 TKNI	<0.050	<0.050 TKNI	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		9.76	9.78	<0.0050	13.1	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0018	0.0014	<0.0010	<0.0050 DLDS	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		0.0012	0.0012	<0.0010	0.0022	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0022	0.0025	<0.0020	0.0025	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		267	267	<0.30	283	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		1.05	1.31	<0.50	1.02	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		0.99	1.36	<0.50	1.09	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LILC3_WS_LAEMP_LCO_2021-09-09_NP	RG_RIVER_WS_2021-09-09_NP	RG_FBLANK_WS_2021-09-09_NP	RG_LCUT_WS_2021-09-10_NP	----
					Client sampling date / time	09-Sep-2021 10:36	09-Sep-2021 10:36	09-Sep-2021 10:36	10-Sep-2021 12:54	----
						CG2104006-001	CG2104006-002	CG2104006-003	CG2104006-004	--------
						Result	Result	Result	Result	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		11.0	10.9	<0.10	11.4	----
cation sum	----	EC101	0.10	meq/L		10.8	10.6	<0.10	10.8	----
ion balance (cations/anions ratio)	----	EC101	0.010	%		98.2	97.2	100	94.7	----
ion balance (cation-anion difference)	----	EC101	0.010	%		0.917	1.40	<0.010	2.70	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0045	<0.0030	<0.0030	<0.0030	----
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00032	0.00031	<0.00010	0.00035	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00010	<0.00010	<0.00010	0.00012	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0573	0.0571	<0.00010	0.0550	----
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	<0.020	<0.020	<0.020	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, total	7440-42-8	E420	0.010	mg/L		0.018	0.019	<0.010	0.020	----
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.296	0.322	<0.0050	0.506	----
calcium, total	7440-70-2	E420	0.050	mg/L		116	116	<0.050	115	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00011	0.00011	<0.00010	<0.00010	----
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	<0.10	<0.10	<0.10	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
iron, total	7439-89-6	E420	0.010	mg/L		0.020	0.020	<0.010	<0.010	----
lead, total	7439-92-1	E420	0.000050	mg/L		0.000112	<0.000050	<0.000050	<0.000050	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0539	0.0534	<0.0010	0.0611	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		52.0	51.0	<0.0050	50.3	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0102	0.0100	<0.00010	0.00014	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00293	0.00299	<0.000050	0.00171	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00855	0.00831	<0.00050	0.0111	----
potassium, total	7440-09-7	E420	0.050	mg/L		1.72	1.68	<0.050	1.78	----
selenium, total	7782-49-2	E420	0.050	µg/L		39.4	39.4	<0.050	53.9	----
silicon, total	7440-21-3	E420	0.10	mg/L		2.22	2.23	<0.10	2.20	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, total	17341-25-2	E420	0.050	mg/L		8.72	8.50	<0.050	8.39	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LILC3_WS_LAEMP_LCO_2021-09-09_NP	RG_RIVER_WS_2021-09-09_NP	RG_FBLANK_WS_2021-09-09_NP	RG_LCUT_WS_2021-09-10_NP	----
					Client sampling date / time	09-Sep-2021 10:36	09-Sep-2021 10:36	09-Sep-2021 10:36	10-Sep-2021 12:54	----
						CG2104006-001	CG2104006-002	CG2104006-003	CG2104006-004	--------
						Result	Result	Result	Result	----
Total Metals										
strontium, total	7440-24-6	E420	0.00020	mg/L		0.214	0.217	<0.00020	0.222	----
sulfur, total	7704-34-9	E420	0.50	mg/L		95.4	96.6	<0.50	91.0	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	0.000014	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00400	0.00405	<0.000010	0.00415	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0119	0.0120	<0.0030	0.0192	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0010	<0.0010	<0.0010	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00030	0.00030	<0.00010	0.00037	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0590	0.0575	<0.00010	0.0562	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L		<0.020	<0.020	<0.020	<0.020	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.018	0.018	<0.010	0.020	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L		0.299	0.276	<0.0050	0.495	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		116	117	<0.050	120	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L		<0.10	<0.10	<0.10	<0.10	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00044	0.00027	<0.00020	0.00038	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0556	0.0535	<0.0010	0.0637	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		54.7	52.4	<0.0050	53.6	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00936	0.00903	<0.00010	0.00012	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00295	0.00293	<0.000050	0.00180	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00834	0.00812	<0.00050	0.0109	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		1.90	1.81	<0.050	2.00	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LILC3_WS_LAEMP_LCO_2021-09-09_NP	RG_RIVER_WS_2021-09-09_NP	RG_FBLANK_WS_2021-09-09_NP	RG_LCUT_WS_2021-09-10_NP	----
					Client sampling date / time	09-Sep-2021 10:36	09-Sep-2021 10:36	09-Sep-2021 10:36	10-Sep-2021 12:54	----
						CG2104006-001	CG2104006-002	CG2104006-003	CG2104006-004	--------
						Result	Result	Result	Result	----
Dissolved Metals										
selenium, dissolved	7782-49-2	E421	0.050	µg/L		41.9	41.4	<0.050	57.7	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.05	2.08	<0.050	2.14	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		9.66	9.41	<0.050	9.43	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.223	0.217	<0.00020	0.242	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		96.2	96.8	<0.50	92.8	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		0.000012	0.000012	<0.000010	0.000020	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00362	0.00363	<0.000010	0.00386	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0117	0.0120	<0.0010	0.0196	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	----

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

WATER CHEMISTRY

ALS Laboratory Report CG2104078

(Finalized September 29, 2021)

CERTIFICATE OF ANALYSIS

Work Order	: **CG2104078**	Page	: 1 of 7
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 14-Sep-2021 10:30
PO	: VPO00748510	Date Analysis Commenced	: 15-Sep-2021
C-O-C number	: September LCO LAEMP 2021	Issue Date	: 29-Sep-2021 17:34
Sampler	: Jennifer Ings		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 3		
No. of samples analysed	: 3		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dion Chan	Lab Assistant	Metals, Burnaby, British Columbia
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kim Jensen	Department Manager - Metals	Metals, Burnaby, British Columbia
Maria Tuguinay	Lab Assistant	Inorganics, Calgary, Alberta
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia
Vladka Stamenova	Analyst	Inorganics, Calgary, Alberta

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
HTA	*Analytical holding time was exceeded.*
TKNI	*TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_LI8_WS_LAEMP_LCO_2021-09-11_NP	RG_FRUL_WS_LAEMP_LCO_2021-09-12_NP	RG_FO23_WS_LAEMP_LCO_2021-09-12_NP	----	----
				Client sampling date / time	11-Sep-2021 12:10	12-Sep-2021 08:23	12-Sep-2021 07:40	----	----
					CG2104078-001	CG2104078-002	CG2104078-003	--------	--------
					Result	Result	Result	----	----
Physical Tests									
acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	<2.0	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	169	175	173	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	12.4	11.4	10.8	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	<1.0	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	181	187	184	----	----
conductivity	----	E100	2.0	µS/cm	711	785	760	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	370	422	401	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV	501	452	473	----	----
pH	----	E108	0.10	pH units	8.40	8.38	8.38	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	496	553	544	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L	1.1	<1.0	<1.0	----	----
turbidity	----	E121	0.10	NTU	0.20 HTA	0.21	0.16	----	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	206	214	211	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	7.4	6.8	6.5	----	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	<1.0	<1.0	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	0.0053	0.0174	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	<0.050	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L	9.00	1.81	3.87	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	0.258	0.167	0.193	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.345 TKNI	0.282 TKNI	0.297 TKNI	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	6.13 HTA	12.8	10.8	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010 HTA	0.0040	0.0039	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010 HTA	<0.0010	<0.0010	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0030	<0.0020	0.0026	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	184	204	197	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.09	1.42	1.66	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.99	1.33	1.39	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LI8_WS_LAEMP_LCO_2021-09-11_NP	RG_FRUL_WS_LAEMP_LCO_2021-09-12_NP	RG_FO23_WS_LAEMP_LCO_2021-09-12_NP	----	----
					Client sampling date / time	11-Sep-2021 12:10	12-Sep-2021 08:23	12-Sep-2021 07:40	----	----
						CG2104078-001	CG2104078-002	CG2104078-003	--------	--------
						Result	Result	Result	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		8.15	8.96	8.67	----	----
cation sum	----	EC101	0.10	meq/L		7.69	8.56	8.20	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%		94.4	95.5	94.6	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		2.90	2.28	2.79	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0046	<0.0030	0.0048	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00017	0.00010	0.00014	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00014	0.00012	0.00011	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0632	0.111	0.0960	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	<0.020	<0.020	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, total	7440-42-8	E420	0.010	mg/L		0.014	0.011	0.012	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.126	0.0073	0.0306	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		86.3	97.0	93.2	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00013	0.00012	0.00016	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	<0.10	<0.10	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	0.00051	----	----
iron, total	7439-89-6	E420	0.010	mg/L		<0.010	<0.010	<0.010	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0341	0.0266	0.0280	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		36.4	41.2	39.7	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00144	0.00055	0.00081	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	<0.00050	<0.00050	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00197	0.00101	0.00129	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00355	0.00073	0.00134	----	----
potassium, total	7440-09-7	E420	0.050	mg/L		1.20	1.46	1.47	----	----
selenium, total	7782-49-2	E420	0.050	µg/L		24.6	49.4	39.8	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		2.17	2.27	2.22	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, total	17341-25-2	E420	0.050	mg/L		5.99	2.35	3.53	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LI8_WS_LAEMP_LCO_2021-09-11_NP	RG_FRUL_WS_LAEMP_LCO_2021-09-12_NP	RG_FO23_WS_LAEMP_LCO_2021-09-12_NP	----	----
					Client sampling date / time	11-Sep-2021 12:10	12-Sep-2021 08:23	12-Sep-2021 07:40	----	----
						CG2104078-001	CG2104078-002	CG2104078-003	--------	--------
						Result	Result	Result	----	----
Total Metals										
strontium, total	7440-24-6	E420	0.00020	mg/L		0.188	0.155	0.166	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		58.1	66.3	61.8	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00283	0.00243	0.00253	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0058	<0.0030	0.0051	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00017	0.00011	0.00012	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0612	0.110	0.0922	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L		<0.020	<0.020	<0.020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.013	0.010	0.011	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L		0.0794	0.0080	0.0201	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		86.4	97.4	91.0	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00016	0.00014	0.00014	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L		<0.10	<0.10	<0.10	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	<0.00020	<0.00020	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	<0.010	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0338	0.0267	0.0274	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		37.5	43.3	42.2	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00061	0.00029	0.00025	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00191	0.000992	0.00123	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00325	0.00060	0.00118	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		1.13	1.40	1.33	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LI8_WS_LAEMP_LCO_2021-09-11_NP	RG_FRUL_WS_LAEMP_LCO_2021-09-12_NP	RG_FO23_WS_LAEMP_LCO_2021-09-12_NP	----	----
					Client sampling date / time	11-Sep-2021 12:10	12-Sep-2021 08:23	12-Sep-2021 07:40	----	----
						CG2104078-001	CG2104078-002	CG2104078-003	--------	--------
						Result	Result	Result	----	----
Dissolved Metals										
selenium, dissolved	7782-49-2	E421	0.050	µg/L		26.7	50.2	43.7	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.22	2.21	2.20	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		6.02	2.44	3.57	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.189	0.154	0.169	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		61.8	66.3	65.5	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00248	0.00215	0.00219	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0043	0.0021	0.0013	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----

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

WATER CHEMISTRY

ALS Laboratory Report CG2104115

(Finalized October 6, 2021)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **CG2104115**	Page	: 1 of 7
Amendment	: **1**		
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 15-Sep-2021 08:30
PO	: VPO00748510	Date Analysis Commenced	: 16-Sep-2021
C-O-C number	: September LCO LAEMP 2021	Issue Date	: 06-Oct-2021 10:16
Sampler	: ----		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Saron Kim	Analyst	Metals, Burnaby, British Columbia
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
HTD	*Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.*
TKNI	*TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LISP24_WS_LAEMP_LCO_2021-09-13_NP	RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_NP	----	----	----
					Client sampling date / time	13-Sep-2021 14:50	13-Sep-2021 11:02	----	----	----
						CG2104115-001	CG2104115-002	--------	--------	--------
						Result	Result	----	----	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		184	185	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		15.8	18.4	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		200	204	----	----	----
conductivity	----	E100	2.0	µS/cm		835	776	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		449	409	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV		445	466	----	----	----
pH	----	E108	0.10	pH units		8.42	8.43	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L		547	523	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L		<1.0	1.0	----	----	----
turbidity	----	E121	0.10	NTU		<0.10	<0.10	----	----	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L		225	226	----	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L		9.5	11.0	----	----	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L		<1.0	<1.0	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	0.0063	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		12.2	10.3	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.262	0.246	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.316 TKNI	0.361 TKNI	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		7.82 HTD	6.80 HTD	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0036 HTD	0.0020 HTD	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		<0.0010	<0.0010	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		<0.0020	0.0025	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		229	204	----	----	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		<0.50	<0.50	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_LISP24_WS_LAEMP_LCO_2021-09-13_NP	Client sample ID: RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_NP	Client sample ID: ----	Client sample ID: ----	Client sample ID: ----
Client sampling date / time					13-Sep-2021 14:50	13-Sep-2021 11:02	----	----	----
					CG2104115-001	CG2104115-002	--------	--------	--------
					Result	Result	----	----	----
Organic / Inorganic Carbon									
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	<0.50	<0.50	----	----	----
Ion Balance									
anion sum	----	EC101	0.10	meq/L	9.68	9.11	----	----	----
cation sum	----	EC101	0.10	meq/L	9.32	8.48	----	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%	96.3	93.1	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%	1.89	3.58	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0102	<0.0030	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00023	0.00020	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00012	0.00012	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0539	0.0646	----	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L	<0.020	<0.020	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L	0.016	0.015	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.220	0.132	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	103	95.2	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00015	0.00014	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	<0.10	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L	0.014	<0.010	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0461	0.0366	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	45.3	40.5	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00673	0.00217	----	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L	<0.00050	<0.00050	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00246	0.00210	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00634	0.00394	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	1.45	1.28	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L	30.3	28.5	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_LISP24_WS_LAEMP_LCO_2021-09-13_NP	Client sample ID: RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_NP	Client sample ID: ----	Client sample ID: ----	Client sample ID: ----
					Client sampling date / time: 13-Sep-2021 14:50	Client sampling date / time: 13-Sep-2021 11:02	----	----	----
					CG2104115-001	CG2104115-002	--------	--------	--------
					Result	Result	----	----	----
Total Metals									
silicon, total	7440-21-3	E420	0.10	mg/L	2.21	2.34	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L	7.40	6.41	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L	0.199	0.195	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	78.9	69.8	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00341	0.00298	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	0.0087	0.0056	----	----	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	<0.0010	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00022	0.00019	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00010	0.00010	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0539	0.0657	----	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L	<0.020	<0.020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L	0.015	0.014	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L	0.203	0.130	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L	104	94.5	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00011	0.00012	----	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L	<0.10	<0.10	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00027	0.00034	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0454	0.0396	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	45.9	42.0	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00536	0.00130	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_LISP24_WS_LAEMP_LCO_2021-09-13_NP	Client sample ID: RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_NP	Client sample ID: ----	Client sample ID: ----	Client sample ID: ----
Client sampling date / time					13-Sep-2021 14:50	13-Sep-2021 11:02	----	----	----
					CG2104115-001	CG2104115-002	--------	--------	--------
					Result	Result	----	----	----
Dissolved Metals									
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00242	0.00207	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00606	0.00393	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.44	1.30	----	----	----
selenium, dissolved	7782-49-2	E421	0.050	µg/L	32.2	29.9	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.08	2.27	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L	7.38	6.46	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.199	0.193	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	72.2	64.9	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00323	0.00280	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0080	0.0056	----	----	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	----	----	----

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

WATER CHEMISTRY

ALS Laboratory Report CG2106222

(Finalized December 9, 2021)

CERTIFICATE OF ANALYSIS

Work Order	: **CG2106222**	Page	: 1 of 11
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 01-Dec-2021 08:45
PO	: VPO00748510	Date Analysis Commenced	: 01-Dec-2021
C-O-C number	: Regional Effects Program	Issue Date	: 09-Dec-2021 17:31
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 6		
No. of samples analysed	: 6		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Monica Ko	Lab Assistant	Metals, Burnaby, British Columbia
Parnian Sane	Analsyt	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia
Vladka Stamenova	Analyst	Inorganics, Calgary, Alberta

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
RRV	*Reported result verified by repeat analysis.*
TKNI	*TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_SLINE_WS_LAEMP_LCO_2021-12_NP	RG_RIVER_WS_LAEMP_LCO_2021-12_NP	RG_LI24_WS_LAEMP_LCO_2021-12_NP	RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	RG_LISP24_WS_LAEMP_LCO_2021-12_NP
					Client sampling date / time	30-Nov-2021 13:15	30-Nov-2021 14:00	30-Nov-2021 11:15	30-Nov-2021 13:00	30-Nov-2021 14:30
						CG2106222-001	CG2106222-002	CG2106222-003	CG2106222-004	CG2106222-005
						Result	Result	Result	Result	Result
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		115	172	107	<1.0	170
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		140	210	130	<1.0	207
conductivity	----	E100	2.0	µS/cm		312	845	343	<2.0	846
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		158	441	171	<0.50	438
oxidation-reduction potential [ORP]	----	E125	0.10	mV		443	483	462	536	420
pH	----	E108	0.10	pH units		8.05	8.14	7.99	5.53	8.13
solids, total dissolved [TDS]	----	E162	10	mg/L		188	576	212	<10	588
solids, total suspended [TSS]	----	E160-L	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
turbidity	----	E121	0.10	NTU		0.15	0.16	<0.10	<0.10	0.10
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L		140	210	130	<1.0	207
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	<1.0
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		0.18	12.8	0.22	<0.10	12.8
fluoride	16984-48-8	E235.F	0.020	mg/L		0.249	0.192	0.307	<0.020	0.190
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.062	0.171 TKNI	0.056	<0.050	0.315 TKNI
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0823	8.02	0.217	<0.0050	8.04
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	0.0010
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		0.0026	0.0021	0.0023	<0.0010	0.0020
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0028	0.0024	<0.0020	<0.0020	0.0027
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		38.9	246	65.7	<0.30	246
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		2.03	0.83	0.97	<0.50	0.91
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		1.87	0.81	0.73	<0.50	0.97

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_SLINE_WS_LAEMP_LCO_2021-12_NP	RG_RIVER_WS_LAEMP_LCO_2021-12_NP	RG_LI24_WS_LAEMP_LCO_2021-12_NP	RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	RG_LISP24_WS_LAEMP_LCO_2021-12_NP
					Client sampling date / time	30-Nov-2021 13:15	30-Nov-2021 14:00	30-Nov-2021 11:15	30-Nov-2021 13:00	30-Nov-2021 14:30
						CG2106222-001	CG2106222-002	CG2106222-003	CG2106222-004	CG2106222-005
						Result	Result	Result	Result	Result
Ion Balance										
anion sum	----	EC101	0.10	meq/L		3.63	10.3	4.00	<0.10	10.2
cation sum	----	EC101	0.10	meq/L		3.21	9.20	3.49	<0.10	9.15
ion balance (cations/anions ratio)	----	EC101	0.010	%		88.4	89.3	87.2	100	89.7
ion balance (cation-anion difference)	----	EC101	0.010	%		6.14	5.64	6.81	<0.010	5.43
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0041	<0.0030	<0.0030	<0.0030	<0.0030
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	0.00022	<0.00010	<0.00010	0.00022
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00012	0.00012	0.00016	<0.00010	0.00011
barium, total	7440-39-3	E420	0.00010	mg/L		0.0347	0.0524	0.0434	<0.00010	0.0544
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	<0.020	<0.020	<0.020	<0.020
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	0.016	<0.010	<0.010	0.016
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.0111	0.181	0.0080	<0.0050	0.170
calcium, total	7440-70-2	E420	0.050	mg/L		44.1	102	48.1	<0.050	102
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00012	0.00010	0.00018	<0.00010	0.00012
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	<0.10	<0.10	<0.10	<0.10
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, total	7439-89-6	E420	0.010	mg/L		<0.010	0.020	<0.010	<0.010	0.018
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0027	0.0462	0.0035	<0.0010	0.0467
magnesium, total	7439-95-4	E420	0.0050	mg/L		13.2	49.1	13.2	<0.0050	49.0
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00011	0.00819	<0.00010	0.00012 RRV	0.00832
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00107	0.00257	0.000920	<0.000050	0.00259
nickel, total	7440-02-0	E420	0.00050	mg/L		<0.00050	0.00548	<0.00050	<0.00050	0.00565
potassium, total	7440-09-7	E420	0.050	mg/L		0.353	1.44	0.291	<0.050	1.49
selenium, total	7782-49-2	E420	0.050	µg/L		1.08	35.0	2.62	<0.050	32.8
silicon, total	7440-21-3	E420	0.10	mg/L		1.84	2.10	1.64	<0.10	2.08
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	17341-25-2	E420	0.050	mg/L		0.756	8.21	1.58	<0.050	8.40

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_SLINE_WS_LAEMP_LCO_2021-12_NP	RG_RIVER_WS_LAEMP_LCO_2021-12_NP	RG_LI24_WS_LAEMP_LCO_2021-12_NP	RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	RG_LISP24_WS_LAEMP_LCO_2021-12_NP
Client sampling date / time					30-Nov-2021 13:15	30-Nov-2021 14:00	30-Nov-2021 11:15	30-Nov-2021 13:00	30-Nov-2021 14:30
					CG2106222-001	CG2106222-002	CG2106222-003	CG2106222-004	CG2106222-005
					Result	Result	Result	Result	Result
Total Metals									
strontium, total	7440-24-6	E420	0.00020	mg/L	0.137	0.201	0.178	<0.00020	0.202
sulfur, total	7704-34-9	E420	0.50	mg/L	12.8	87.8	21.8	<0.50	88.5
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00143	0.00343	0.00152	<0.000010	0.00342
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	0.0073	<0.0030	<0.0030	0.0069
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0020	<0.0010	0.0015	<0.0010	<0.0010
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	0.00021	<0.00010	<0.00010	0.00021
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00011	<0.00010	0.00014	<0.00010	0.00011
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0335	0.0514	0.0438	<0.00010	0.0515
beryllium, dissolved	7440-41-7	E421	0.020	µg/L	<0.020	<0.020	<0.020	<0.020	<0.020
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	0.014	<0.010	<0.010	0.014
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L	0.0108	0.154	0.0056	<0.0050	0.167
calcium, dissolved	7440-70-2	E421	0.050	mg/L	41.8	100	46.8	<0.050	99.0
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00015	<0.00010	0.00017	<0.00010	<0.00010
cobalt, dissolved	7440-48-4	E421	0.10	µg/L	<0.10	<0.10	<0.10	<0.10	<0.10
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	0.00021	<0.00020	<0.00020	0.00030
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0025	0.0434	0.0032	<0.0010	0.0436
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	13.1	46.4	13.1	<0.0050	46.4
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00011	0.00636	<0.00010	<0.00010	0.00646
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00102	0.00250	0.000919	<0.000050	0.00252
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	0.00528	<0.00050	<0.00050	0.00529
potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.374	1.51	0.305	<0.050	1.53

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_SLINE_WS_LAEMP_LCO_2021-12_NP	RG_RIVER_WS_LAEMP_LCO_2021-12_NP	RG_LI24_WS_LAEMP_LCO_2021-12_NP	RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	RG_LISP24_WS_LAEMP_LCO_2021-12_NP
					Client sampling date / time	30-Nov-2021 13:15	30-Nov-2021 14:00	30-Nov-2021 11:15	30-Nov-2021 13:00	30-Nov-2021 14:30
						CG2106222-001	CG2106222-002	CG2106222-003	CG2106222-004	CG2106222-005
						Result	Result	Result	Result	Result
Dissolved Metals										
selenium, dissolved	7782-49-2	E421	0.050	µg/L		1.11	36.4	2.94	<0.050	36.0
silicon, dissolved	7440-21-3	E421	0.050	mg/L		1.91	2.19	1.64	<0.050	2.06
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	17341-25-2	E421	0.050	mg/L		0.766	8.16	1.61	<0.050	8.16
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.139	0.209	0.184	<0.00020	0.208
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		12.7	85.6	21.8	<0.50	85.1
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	<0.00030	<0.00030
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00141	0.00336	0.00148	<0.000010	0.00328
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0027	0.0063	0.0024	<0.0010	0.0060
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	Field
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	Field

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_FRUL_WS_LAEMP_LCO_2021-12_NP	----	----	----	----
					Client sampling date / time	30-Nov-2021 09:15	----	----	----	----
					CG2106222-006	--------	--------	--------	--------	--------
					Result	----	----	----	----	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	----	----	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	179	----	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	----	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	----	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	219	----	----	----	----	----
conductivity	----	E100	2.0	µS/cm	857	----	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	457	----	----	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV	424	----	----	----	----	----
pH	----	E108	0.10	pH units	8.23	----	----	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	622	----	----	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L	1.1	----	----	----	----	----
turbidity	----	E121	0.10	NTU	0.22	----	----	----	----	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	219	----	----	----	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	<1.0	----	----	----	----	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	----	----	----	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	----	----	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.250 DLDS	----	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L	2.01	----	----	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	0.124	----	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.295 TKNI	----	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	15.2	----	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0050 DLDS	----	----	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0013	----	----	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	----	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	250	----	----	----	----	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.30	----	----	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.14	----	----	----	----	----
Ion Balance										

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_FRUL_WS_LAEMP_LCO_2021-12_NP	----	----	----	----
Client sampling date / time					30-Nov-2021 09:15	----	----	----	----
					CG2106222-006	--------	--------	--------	--------
					Result	----	----	----	----
Ion Balance									
anion sum	----	EC101	0.10	meq/L	10.7	----	----	----	----
cation sum	----	EC101	0.10	meq/L	9.29	----	----	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%	86.8	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%	7.05	----	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0034	----	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00011	----	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	<0.00010	----	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.111	----	----	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L	<0.020	----	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	----	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L	<0.010	----	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0111	----	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	105	----	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	<0.00010	----	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	----	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	----	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L	<0.010	----	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	----	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0259	----	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	49.5	----	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00058	----	----	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L	<0.00050	----	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00117	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00083	----	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	1.36	----	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L	54.4	----	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L	2.00	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	----	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L	2.78	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_FRUL_WS_LAEMP_LCO_2021-12_NP	----	----	----	----
					Client sampling date / time: 30-Nov-2021 09:15	----	----	----	----
					CG2106222-006	--------	--------	--------	--------
					Result	----	----	----	----
Total Metals									
strontium, total	7440-24-6	E420	0.00020	mg/L	0.168	----	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	81.9	----	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	----	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	----	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	----	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00248	----	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	----	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	----	----	----	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0063	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.105	----	----	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L	<0.020	----	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	----	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	----	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L	0.0098	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L	103	----	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00010	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L	<0.10	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	----	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	----	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	----	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0248	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	48.6	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00058	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00108	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00081	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.45	----	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_FRUL_WS_LAEMP_LCO_2021-12_NP	----	----	----	----
					Client sampling date / time	30-Nov-2021 09:15	----	----	----	----
						CG2106222-006	--------	--------	--------	--------
						Result	----	----	----	----
Dissolved Metals										
selenium, dissolved	7782-49-2	E421	0.050	µg/L		62.4	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.04	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	----	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		2.69	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.169	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		80.8	----	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	----	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	----	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	----	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00240	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	----	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	----	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	----	----	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2106222**	Page	: 1 of 26
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 01-Dec-2021 08:45
PO	: VPO00748510	Issue Date	: 09-Dec-2021 17:32
C-O-C number	: Regional Effects Program		
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 6		
No. of samples analysed	: 6		

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

Key

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

Summary of Outliers

Outliers : Quality Control Samples

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

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E298	30-Nov-2021	02-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E298	30-Nov-2021	02-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_LI24_WS_LAEMP_LCO_2021-12_NP	E298	30-Nov-2021	02-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E298	30-Nov-2021	02-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E298	30-Nov-2021	02-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E298	30-Nov-2021	02-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E235.Br-L	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E235.Br-L	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_LI24_WS_LAEMP_LCO_2021-12_NP	E235.Br-L	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E235.Br-L	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E235.Br-L	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E235.Br-L	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E235.Cl-L	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E235.Cl-L	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_LI24_WS_LAEMP_LCO_2021-12_NP	E235.Cl-L	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E235.Cl-L	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E235.Cl-L	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E235.Cl-L	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E378-U	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E378-U	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_LI24_WS_LAEMP_LCO_2021-12_NP	E378-U	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E378-U	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E378-U	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E378-U	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E235.F	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E235.F	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_LI24_WS_LAEMP_LCO_2021-12_NP	E235.F	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E235.F	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E235.F	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E235.F	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E235.NO3-L	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E235.NO3-L	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_LI24_WS_LAEMP_LCO_2021-12_NP	E235.NO3-L	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E235.NO3-L	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E235.NO3-L	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E235.NO3-L	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E235.NO2-L	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E235.NO2-L	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_LI24_WS_LAEMP_LCO_2021-12_NP	E235.NO2-L	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E235.NO2-L	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E235.NO2-L	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E235.NO2-L	30-Nov-2021	----	----	----		01-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E235.SO4	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E235.SO4	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_LI24_WS_LAEMP_LCO_2021-12_NP	E235.SO4	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E235.SO4	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E235.SO4	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E235.SO4	30-Nov-2021	----	----	----		01-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E318	30-Nov-2021	02-Dec-2021	----	----		06-Dec-2021	28 days	6 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E318	30-Nov-2021	02-Dec-2021	----	----		06-Dec-2021	28 days	6 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_LI24_WS_LAEMP_LCO_2021-12_NP	E318	30-Nov-2021	02-Dec-2021	----	----		06-Dec-2021	28 days	6 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E318	30-Nov-2021	02-Dec-2021	----	----		06-Dec-2021	28 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E318	30-Nov-2021	02-Dec-2021	----	----		06-Dec-2021	28 days	6 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E318	30-Nov-2021	02-Dec-2021	----	----		06-Dec-2021	28 days	6 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E372-U	30-Nov-2021	08-Dec-2021	----	----		08-Dec-2021	28 days	8 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E372-U	30-Nov-2021	08-Dec-2021	----	----		08-Dec-2021	28 days	8 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_LI24_WS_LAEMP_LCO_2021-12_NP	E372-U	30-Nov-2021	08-Dec-2021	----	----		08-Dec-2021	28 days	8 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E372-U	30-Nov-2021	08-Dec-2021	----	----		08-Dec-2021	28 days	8 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E372-U	30-Nov-2021	08-Dec-2021	----	----		08-Dec-2021	28 days	8 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E372-U	30-Nov-2021	08-Dec-2021	----	----		08-Dec-2021	28 days	8 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E421.Cr-L	30-Nov-2021	03-Dec-2021	----	----		04-Dec-2021	180 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E421.Cr-L	30-Nov-2021	03-Dec-2021	----	----		04-Dec-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_LI24_WS_LAEMP_LCO_2021-12_NP	E421.Cr-L	30-Nov-2021	03-Dec-2021	----	----		04-Dec-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E421.Cr-L	30-Nov-2021	03-Dec-2021	----	----		04-Dec-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E421.Cr-L	30-Nov-2021	03-Dec-2021	----	----		04-Dec-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E421.Cr-L	30-Nov-2021	03-Dec-2021	----	----		04-Dec-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E509	30-Nov-2021	03-Dec-2021	----	----		03-Dec-2021	28 days	3 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_LI24_WS_LAEMP_LCO_2021-12_NP	E509	30-Nov-2021	03-Dec-2021	----	----		03-Dec-2021	28 days	3 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E509	30-Nov-2021	03-Dec-2021	----	----		03-Dec-2021	28 days	3 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E509	30-Nov-2021	03-Dec-2021	----	----		03-Dec-2021	28 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E509	30-Nov-2021	03-Dec-2021	----	----		03-Dec-2021	28 days	3 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E509	30-Nov-2021	04-Dec-2021	----	----		04-Dec-2021	28 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E421	30-Nov-2021	03-Dec-2021	----	----		04-Dec-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E421	30-Nov-2021	03-Dec-2021	----	----		04-Dec-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_LI24_WS_LAEMP_LCO_2021-12_NP	E421	30-Nov-2021	03-Dec-2021	----	----		04-Dec-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E421	30-Nov-2021	03-Dec-2021	----	----		04-Dec-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E421	30-Nov-2021	03-Dec-2021	----	----		04-Dec-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E421	30-Nov-2021	03-Dec-2021	----	----		04-Dec-2021	180 days	4 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E358-L	30-Nov-2021	01-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E358-L	30-Nov-2021	01-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_LI24_WS_LAEMP_LCO_2021-12_NP	E358-L	30-Nov-2021	01-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E358-L	30-Nov-2021	01-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E358-L	30-Nov-2021	01-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E358-L	30-Nov-2021	01-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E355-L	30-Nov-2021	01-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E355-L	30-Nov-2021	01-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_LI24_WS_LAEMP_LCO_2021-12_NP	E355-L	30-Nov-2021	01-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E355-L	30-Nov-2021	01-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E355-L	30-Nov-2021	01-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E355-L	30-Nov-2021	01-Dec-2021	----	----		02-Dec-2021	28 days	2 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E283	30-Nov-2021	----	----	----		02-Dec-2021	14 days	2 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E283	30-Nov-2021	----	----	----		02-Dec-2021	14 days	2 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_LI24_WS_LAEMP_LCO_2021-12_NP	E283	30-Nov-2021	----	----	----		02-Dec-2021	14 days	2 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E283	30-Nov-2021	----	----	----		02-Dec-2021	14 days	2 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E283	30-Nov-2021	----	----	----		02-Dec-2021	14 days	2 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E283	30-Nov-2021	----	----	----		02-Dec-2021	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E290	30-Nov-2021	----	----	----		02-Dec-2021	14 days	2 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E290	30-Nov-2021	----	----	----		02-Dec-2021	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_LI24_WS_LAEMP_LCO_2021-12_NP	E290	30-Nov-2021	----	----	----		02-Dec-2021	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E290	30-Nov-2021	----	----	----		02-Dec-2021	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E290	30-Nov-2021	----	----	----		02-Dec-2021	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E290	30-Nov-2021	----	----	----		02-Dec-2021	14 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E100	30-Nov-2021	----	----	----		02-Dec-2021	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E100	30-Nov-2021	----	----	----		02-Dec-2021	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_LI24_WS_LAEMP_LCO_2021-12_NP	E100	30-Nov-2021	----	----	----		02-Dec-2021	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E100	30-Nov-2021	----	----	----		02-Dec-2021	28 days	2 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E100	30-Nov-2021	----	----	----		02-Dec-2021	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E100	30-Nov-2021	----	----	----		02-Dec-2021	28 days	2 days	✓
Physical Tests : ORP by Electrode										
HDPE RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E125	30-Nov-2021	----	----	----		08-Dec-2021	0.25 hrs	189 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E125	30-Nov-2021	----	----	----		08-Dec-2021	0.25 hrs	189 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E125	30-Nov-2021	----	----	----		08-Dec-2021	0.25 hrs	190 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E125	30-Nov-2021	----	----	----		08-Dec-2021	0.25 hrs	190 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_LI24_WS_LAEMP_LCO_2021-12_NP	E125	30-Nov-2021	----	----	----		08-Dec-2021	0.25 hrs	192 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E125	30-Nov-2021	----	----	----		08-Dec-2021	0.25 hrs	194 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E108	30-Nov-2021	----	----	----		02-Dec-2021	0.25 hrs	50 hrs	× EHTR-FM

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E108	30-Nov-2021	----	----	----		02-Dec-2021	0.25 hrs	50 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E108	30-Nov-2021	----	----	----		02-Dec-2021	0.25 hrs	51 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E108	30-Nov-2021	----	----	----		02-Dec-2021	0.25 hrs	51 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_LI24_WS_LAEMP_LCO_2021-12_NP	E108	30-Nov-2021	----	----	----		02-Dec-2021	0.25 hrs	53 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E108	30-Nov-2021	----	----	----		02-Dec-2021	0.25 hrs	55 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E162	30-Nov-2021	----	----	----		05-Dec-2021	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E162	30-Nov-2021	----	----	----		05-Dec-2021	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_LI24_WS_LAEMP_LCO_2021-12_NP	E162	30-Nov-2021	----	----	----		05-Dec-2021	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E162	30-Nov-2021	----	----	----		05-Dec-2021	7 days	5 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TDS by Gravimetry										
HDPE RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E162	30-Nov-2021	----	----	----		05-Dec-2021	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E162	30-Nov-2021	----	----	----		05-Dec-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E160-L	30-Nov-2021	----	----	----		05-Dec-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E160-L	30-Nov-2021	----	----	----		05-Dec-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_LI24_WS_LAEMP_LCO_2021-12_NP	E160-L	30-Nov-2021	----	----	----		05-Dec-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E160-L	30-Nov-2021	----	----	----		05-Dec-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E160-L	30-Nov-2021	----	----	----		05-Dec-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E160-L	30-Nov-2021	----	----	----		05-Dec-2021	7 days	5 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E121	30-Nov-2021	----	----	----		02-Dec-2021	3 days	2 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Turbidity by Nephelometry										
HDPE RG_LI24_WS_LAEMP_LCO_2021-12_NP	E121	30-Nov-2021	----	----	----		02-Dec-2021	3 days	2 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E121	30-Nov-2021	----	----	----		03-Dec-2021	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E121	30-Nov-2021	----	----	----		03-Dec-2021	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E121	30-Nov-2021	----	----	----		03-Dec-2021	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E121	30-Nov-2021	----	----	----		03-Dec-2021	3 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E420.Cr-L	30-Nov-2021	----	----	----		03-Dec-2021	180 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E420.Cr-L	30-Nov-2021	----	----	----		03-Dec-2021	180 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_LI24_WS_LAEMP_LCO_2021-12_NP	E420.Cr-L	30-Nov-2021	----	----	----		03-Dec-2021	180 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E420.Cr-L	30-Nov-2021	----	----	----		03-Dec-2021	180 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E420.Cr-L	30-Nov-2021	----	----	----		03-Dec-2021	180 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E420.Cr-L	30-Nov-2021	----	----	----		03-Dec-2021	180 days	3 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E508-L	30-Nov-2021	----	----	----		05-Dec-2021	28 days	5 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E508-L	30-Nov-2021	----	----	----		05-Dec-2021	28 days	5 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_LI24_WS_LAEMP_LCO_2021-12_NP	E508-L	30-Nov-2021	----	----	----		05-Dec-2021	28 days	5 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E508-L	30-Nov-2021	----	----	----		05-Dec-2021	28 days	5 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E508-L	30-Nov-2021	----	----	----		05-Dec-2021	28 days	5 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E508-L	30-Nov-2021	----	----	----		05-Dec-2021	28 days	5 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	E420	30-Nov-2021	----	----	----		03-Dec-2021	180 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_FRUL_WS_LAEMP_LCO_2021-12_NP	E420	30-Nov-2021	----	----	----		03-Dec-2021	180 days	3 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_LI24_WS_LAEMP_LCO_2021-12_NP	E420	30-Nov-2021	----	----	----		03-Dec-2021	180 days	3 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_LISP24_WS_LAEMP_LCO_2021-12_NP	E420	30-Nov-2021	----	----	----		03-Dec-2021	180 days	3 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_RIVER_WS_LAEMP_LCO_2021-12_NP	E420	30-Nov-2021	----	----	----		03-Dec-2021	180 days	3 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_SLINE_WS_LAEMP_LCO_2021-12_NP	E420	30-Nov-2021	----	----	----		03-Dec-2021	180 days	3 days	✓

Legend & Qualifier Definitions

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

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	357733	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	358239	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	357719	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	357339	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	357340	1	17	5.8	5.0	✓
Conductivity in Water	E100	358238	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	358310	1	10	10.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	358750	2	37	5.4	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	358311	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	357111	1	15	6.6	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	357211	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	357343	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	357341	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	357342	1	17	5.8	5.0	✓
ORP by Electrode	E125	361156	1	20	5.0	5.0	✓
pH by Meter	E108	358237	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	357338	1	17	5.8	5.0	✓
TDS by Gravimetry	E162	358039	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	358274	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	358343	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	359884	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	358275	2	19	10.5	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	357112	1	15	6.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	357344	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	357735	2	34	5.8	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	357733	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	358239	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	357719	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	357339	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	357340	1	17	5.8	5.0	✓
Conductivity in Water	E100	358238	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	358310	1	10	10.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	358750	2	37	5.4	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	358311	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	357111	1	15	6.6	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	357211	1	20	5.0	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	357343	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	357341	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	357342	1	17	5.8	5.0	✓
ORP by Electrode	E125	361156	1	20	5.0	5.0	✓
pH by Meter	E108	358237	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	357338	1	17	5.8	5.0	✓
TDS by Gravimetry	E162	358039	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	358274	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	358343	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	359884	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	358275	1	19	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	357112	1	15	6.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	357344	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	358035	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	357735	2	34	5.8	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	357733	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	358239	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	357719	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	357339	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	357340	1	17	5.8	5.0	✓
Conductivity in Water	E100	358238	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	358310	1	10	10.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	358750	2	37	5.4	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	358311	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	357111	1	15	6.6	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	357211	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	357343	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	357341	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	357342	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	357338	1	17	5.8	5.0	✓
TDS by Gravimetry	E162	358039	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	358274	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	358343	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	359884	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	358275	1	19	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	357112	1	15	6.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	357344	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	358035	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	357735	2	34	5.8	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	357719	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	357339	1	17	5.8	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	357340	1	17	5.8	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	358310	1	10	10.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	358750	2	37	5.4	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	358311	1	18	5.5	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	357111	1	15	6.6	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	357211	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	357343	1	17	5.8	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	357341	1	17	5.8	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	357342	1	17	5.8	5.0	✓
Sulfate in Water by IC	E235.SO4	357338	1	17	5.8	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	358274	1	19	5.2	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	358343	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	359884	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	358275	1	19	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	357112	1	15	6.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	357344	1	20	5.0	5.0	✓

Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Calgary - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Calgary - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Calgary - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
ORP by Electrode	E125 Calgary - Environmental	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed, measured in mV. For high accuracy test results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L Calgary - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Calgary - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC (Low Level)	E235.Cl-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Calgary - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH 8.3

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U Calgary - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a flow analyzer on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAFS.
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **CG2106222**	Page	: 1 of 18
Client	: Teck Coal Limited	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 01-Dec-2021 08:45
PO	: VPO00748510	Date Analysis Commenced	: 01-Dec-2021
C-O-C number	: Regional Effects Program	Issue Date	: 09-Dec-2021 17:31
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 6		
No. of samples analysed	: 6		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
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Parnian Sane	Analsyt	Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia
Vladka Stamenova	Analyst	Inorganics, Calgary, Alberta

General Comments

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

Key :

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 357733)											
CG2106222-001	RG_SLINE_WS_LAEMP_LCO_2021-12_NP	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 357735)											
CG2106216-001	Anonymous	turbidity	----	E121	0.10	NTU	1.44	1.37	5.41%	15%	----
Physical Tests (QC Lot: 358039)											
CG2106218-005	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	1260	1270	0.911%	20%	----
Physical Tests (QC Lot: 358237)											
CG2106218-001	Anonymous	pH	----	E108	0.10	pH units	7.35	7.37	0.272%	4%	----
Physical Tests (QC Lot: 358238)											
CG2106218-001	Anonymous	conductivity	----	E100	2.0	µS/cm	2440	2430	0.411%	10%	----
Physical Tests (QC Lot: 358239)											
CG2106218-001	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	423	425	0.541%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	516	519	0.541%	20%	----
Physical Tests (QC Lot: 358666)											
CG2106208-002	Anonymous	turbidity	----	E121	0.10	NTU	0.52	0.54	0.02	Diff <2x LOR	----
Physical Tests (QC Lot: 361156)											
CG2106218-005	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	476	470	1.20%	15%	----
Anions and Nutrients (QC Lot: 357211)											
CG2106220-005	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0025	0.0026	0.00005	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 357338)											
CG2106216-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	791	789	0.277%	20%	----
Anions and Nutrients (QC Lot: 357339)											
CG2106216-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.050	mg/L	0.128	0.133	0.005	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 357340)											
CG2106216-001	Anonymous	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	7.40	7.39	0.204%	20%	----
Anions and Nutrients (QC Lot: 357341)											
CG2106216-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.427	0.426	0.258%	20%	----
Anions and Nutrients (QC Lot: 357342)											
CG2106216-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0566	0.0562	0.709%	20%	----
Anions and Nutrients (QC Lot: 357343)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 357343) - continued											
CG2106216-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.167	0.166	0.0009	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 357344)											
CG2106222-001	RG_SLINE_WS_LAEMP_LCO_2021-12_NP	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0028	0.0027	0.0002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 357719)											
CG2106216-007	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0250	mg/L	0.186	0.186	0.0003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 358343)											
CG2106176-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.091	0.099	0.008	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 357111)											
CG2106210-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.81	0.70	0.10	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 357112)											
CG2106210-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	2.46	2.82	0.35	Diff <2x LOR	----
Total Metals (QC Lot: 358274)											
CG2106177-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00195	0.00224	14.0%	20%	----
Total Metals (QC Lot: 358275)											
CG2106177-001	Anonymous	iron, total	7439-89-6	E420	0.010	mg/L	1.41	1.45	2.72%	20%	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.0134	0.0134	0.109%	20%	----
CG2106177-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	1.12	1.30	14.6%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00024	0.00028	0.00003	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00095	0.00108	13.4%	20%	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0445	0.0474	6.34%	20%	----
		beryllium, total	7440-41-7	E420	0.020	mg/L	0.104 µg/L	0.000126	0.000022	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	0.0645 µg/L	0.0000737	13.3%	20%	----
		calcium, total	7440-70-2	E420	0.050	mg/L	67.7	67.8	0.162%	20%	----
		cobalt, total	7440-48-4	E420	0.10	mg/L	0.52 µg/L	0.00065	0.00013	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00423	0.00463	0.00040	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.00820	0.00842	2.72%	20%	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0045	0.0047	0.0002	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	32.4	33.8	4.04%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0258	0.0297	14.2%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00158	0.00164	3.60%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00393	0.00485	0.00092	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	1.31	1.41	7.23%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	14.4 µg/L	0.0141	1.70%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 358275) - continued											
CG2106177-001	Anonymous	silicon, total	7440-21-3	E420	0.10	mg/L	4.46	4.62	3.50%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	0.000036	0.000044	0.000008	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	1.58	1.61	2.07%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.108	0.110	1.70%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	29.5	30.1	2.09%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	0.000085	0.000103	0.000018	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	0.00023	0.00026	0.00003	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00165	0.00166	1.15%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00308	0.00351	0.00043	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0290	0.0343	16.9%	20%	----
Total Metals (QC Lot: 359884)											
CG2106222-001	RG_SLINE_WS_LAEMP_LCO_2021-12_NP	mercury, total	7439-97-6	E508-L	0.00050	ng/L	<0.00050 µg/L	<0.50	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 358310)											
CG2106174-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 358311)											
CG2106174-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0020	mg/L	0.0026	<0.0020	0.0006	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00020	mg/L	0.00023	0.00023	0.0000002	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00020	mg/L	0.0423	0.0432	1.92%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.040	mg/L	<0.040 µg/L	<0.000040	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.020	mg/L	0.022	0.022	0.0001	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0100	mg/L	0.0463 µg/L	0.0000447	0.0000016	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.100	mg/L	292	289	1.03%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.20	mg/L	<0.20 µg/L	<0.00020	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0020	mg/L	0.0388	0.0387	0.285%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0100	mg/L	190	186	2.16%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00020	mg/L	0.00051	0.00050	0.000002	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000100	mg/L	0.00158	0.00157	0.535%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00100	mg/L	0.00777	0.00761	0.00016	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	2.62	2.60	0.674%	20%	----
		selenium, dissolved	7782-49-2	E421	0.100	mg/L	233 µg/L	0.236	1.17%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 358311) - continued											
CG2106174-001	Anonymous	silicon, dissolved	7440-21-3	E421	0.100	mg/L	3.67	3.60	1.88%	20%	----
		silver, dissolved	7440-22-4	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.100	mg/L	12.5	12.5	0.493%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00040	mg/L	0.669	0.671	0.279%	20%	----
		sulfur, dissolved	7704-34-9	E421	1.00	mg/L	456	450	1.39%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000020	mg/L	0.00924	0.00925	0.0518%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 358750)											
CG2106207-005	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 359639)											
CG2106202-008	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 357733)						
acidity (as CaCO3)	----	E283	2	mg/L	2.0	----
Physical Tests (QCLot: 357735)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 358035)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 358039)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 358238)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 358239)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 358666)						
turbidity	----	E121	0.1	NTU	<0.10	----
Anions and Nutrients (QCLot: 357211)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 357338)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 357339)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 357340)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 357341)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 357342)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 357343)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 357344)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 357719)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 357719) - continued						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 358343)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Organic / Inorganic Carbon (QCLot: 357111)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 357112)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 358274)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 358275)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 358275) - continued						
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 359884)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 358310)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 358311)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 358311) - continued						
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 358750)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 359639)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 357733)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	109	85.0	115	----
Physical Tests (QCLot: 357735)									
turbidity	----	E121	0.1	NTU	200 NTU	102	85.0	115	----
Physical Tests (QCLot: 358035)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	93.1	85.0	115	----
Physical Tests (QCLot: 358039)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	93.2	85.0	115	----
Physical Tests (QCLot: 358237)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 358238)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 358239)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	102	85.0	115	----
Physical Tests (QCLot: 358666)									
turbidity	----	E121	0.1	NTU	200 NTU	104	85.0	115	----
Physical Tests (QCLot: 361156)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	102	95.4	104	----
Anions and Nutrients (QCLot: 357211)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.02 mg/L	107	80.0	120	----
Anions and Nutrients (QCLot: 357338)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 357339)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	102	85.0	115	----
Anions and Nutrients (QCLot: 357340)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 357341)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 357342)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 357343)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	98.2	90.0	110	----
Anions and Nutrients (QCLot: 357344)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 357344) - continued									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.02 mg/L	98.9	80.0	120	----
Anions and Nutrients (QCLot: 357719)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	98.5	85.0	115	----
Anions and Nutrients (QCLot: 358343)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	95.9	75.0	125	----
Organic / Inorganic Carbon (QCLot: 357111)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	92.2	80.0	120	----
Organic / Inorganic Carbon (QCLot: 357112)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	98.7	80.0	120	----
Total Metals (QCLot: 358274)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
Total Metals (QCLot: 358275)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	102	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	104	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	105	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	99.2	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	101	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	96.1	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	105	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	99.7	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	98.9	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	97.6	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	105	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	102	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	108	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	103	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	103	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	93.6	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	107	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 358275) - continued									
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	103	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	102	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	104	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	102	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	102	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	99.0	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	106	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	102	80.0	120	----
Total Metals (QCLot: 359884)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	83.8	80.0	120	----
Dissolved Metals (QCLot: 358310)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	97.8	80.0	120	----
Dissolved Metals (QCLot: 358311)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	94.2	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	100	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	99.6	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	97.5	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	98.5	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	95.3	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	94.4	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	96.4	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	99.2	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	96.2	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	97.4	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	103	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	96.7	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	95.3	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	99.7	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	97.4	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	98.2	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	108	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	103	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	97.8	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	91.8	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	105	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 358311) - continued									
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	104	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	97.9	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	101	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	95.0	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	96.8	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	95.4	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	98.6	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	98.6	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	98.6	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	104	80.0	120	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 357211)										
CG2106220-009	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0498 mg/L	0.05 mg/L	99.6	70.0	130	----
Anions and Nutrients (QCLot: 357338)										
CG2106222-004	RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	sulfate (as SO4)	14808-79-8	E235.SO4	101 mg/L	100 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 357339)										
CG2106222-004	RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	bromide	24959-67-9	E235.Br-L	0.491 mg/L	0.5 mg/L	98.2	75.0	125	----
Anions and Nutrients (QCLot: 357340)										
CG2106222-004	RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	chloride	16887-00-6	E235.Cl-L	98.8 mg/L	100 mg/L	98.8	75.0	125	----
Anions and Nutrients (QCLot: 357341)										
CG2106222-004	RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	nitrate (as N)	14797-55-8	E235.NO3-L	2.47 mg/L	2.5 mg/L	98.8	75.0	125	----
Anions and Nutrients (QCLot: 357342)										
CG2106222-004	RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	nitrite (as N)	14797-65-0	E235.NO2-L	0.496 mg/L	0.5 mg/L	99.3	75.0	125	----
Anions and Nutrients (QCLot: 357343)										
CG2106222-004	RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	fluoride	16984-48-8	E235.F	0.939 mg/L	1 mg/L	93.9	75.0	125	----
Anions and Nutrients (QCLot: 357344)										
CG2106222-002	RG_RIVER_WS_LAEMP_LCO_2021-12_NP	phosphorus, total	7723-14-0	E372-U	0.0550 mg/L	0.0676 mg/L	81.3	70.0	130	----
Anions and Nutrients (QCLot: 357719)										
CG2106218-007	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.111 mg/L	0.1 mg/L	111	75.0	125	----
Anions and Nutrients (QCLot: 358343)										
CG2106176-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.24 mg/L	2.5 mg/L	89.5	70.0	130	----
Organic / Inorganic Carbon (QCLot: 357111)										
CG2106210-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	23.9 mg/L	23.9 mg/L	100	70.0	130	----
Organic / Inorganic Carbon (QCLot: 357112)										
CG2106210-001	Anonymous	carbon, total organic [TOC]	----	E355-L	24.3 mg/L	23.9 mg/L	102	70.0	130	----
Total Metals (QCLot: 358274)										
CG2106177-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 358275)										
CG2106177-002	Anonymous	aluminum, total	7429-90-5	E420	0.196 mg/L	0.2 mg/L	98.1	70.0	130	----
		antimony, total	7440-36-0	E420	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0369 mg/L	0.04 mg/L	92.3	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0100 mg/L	0.01 mg/L	100	70.0	130	----
		boron, total	7440-42-8	E420	0.096 mg/L	0.1 mg/L	96.2	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00400 mg/L	0.004 mg/L	99.9	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0188 mg/L	0.02 mg/L	94.0	70.0	130	----
		copper, total	7440-50-8	E420	0.0200 mg/L	0.02 mg/L	99.8	70.0	130	----
		iron, total	7439-89-6	E420	1.90 mg/L	2 mg/L	95.2	70.0	130	----
		lead, total	7439-92-1	E420	0.0186 mg/L	0.02 mg/L	93.2	70.0	130	----
		lithium, total	7439-93-2	E420	0.0909 mg/L	0.1 mg/L	90.9	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0190 mg/L	0.02 mg/L	94.9	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0198 mg/L	0.02 mg/L	99.2	70.0	130	----
		nickel, total	7440-02-0	E420	0.0366 mg/L	0.04 mg/L	91.5	70.0	130	----
		potassium, total	7440-09-7	E420	3.74 mg/L	4 mg/L	93.6	70.0	130	----
		selenium, total	7782-49-2	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		silicon, total	7440-21-3	E420	9.03 mg/L	10 mg/L	90.3	70.0	130	----
		silver, total	7440-22-4	E420	0.00378 mg/L	0.004 mg/L	94.4	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00371 mg/L	0.004 mg/L	92.8	70.0	130	----
		tin, total	7440-31-5	E420	0.0195 mg/L	0.02 mg/L	97.5	70.0	130	----
		titanium, total	7440-32-6	E420	0.0371 mg/L	0.04 mg/L	92.8	70.0	130	----
		uranium, total	7440-61-1	E420	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0993 mg/L	0.1 mg/L	99.3	70.0	130	----
		zinc, total	7440-66-6	E420	0.372 mg/L	0.4 mg/L	93.1	70.0	130	----
Total Metals (QCLot: 359884)										
CG2106222-002	RG_RIVER_WS_LAEMP_LCO_2021-12_NP	mercury, total	7439-97-6	E508-L	4.13 ng/L	5 ng/L	82.5	70.0	130	----
Dissolved Metals (QCLot: 358310)										
CG2106180-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0382 mg/L	0.04 mg/L	95.5	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 358311)										
CG2106180-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.193 mg/L	0.2 mg/L	96.3	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0199 mg/L	0.02 mg/L	99.4	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0385 mg/L	0.04 mg/L	96.2	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00889 mg/L	0.01 mg/L	88.9	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.092 mg/L	0.1 mg/L	91.7	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00378 mg/L	0.004 mg/L	94.5	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0187 mg/L	0.02 mg/L	93.6	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0182 mg/L	0.02 mg/L	91.1	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.94 mg/L	2 mg/L	97.0	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0181 mg/L	0.02 mg/L	90.3	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0892 mg/L	0.1 mg/L	89.2	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0374 mg/L	0.04 mg/L	93.4	70.0	130	----
		potassium, dissolved	7440-09-7	E421	4.17 mg/L	4 mg/L	104	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0406 mg/L	0.04 mg/L	102	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.27 mg/L	10 mg/L	92.7	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00314 mg/L	0.004 mg/L	78.5	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	21.8 mg/L	20 mg/L	109	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00361 mg/L	0.004 mg/L	90.3	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0194 mg/L	0.02 mg/L	96.9	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0405 mg/L	0.04 mg/L	101	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00385 mg/L	0.004 mg/L	96.3	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.1000 mg/L	0.1 mg/L	100.0	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.381 mg/L	0.4 mg/L	95.2	70.0	130	----
Dissolved Metals (QCLot: 358750)										
CG2106207-006	Anonymous	mercury, dissolved	7439-97-6	E509	0.000100 mg/L	0.0001 mg/L	100	70.0	130	----
Dissolved Metals (QCLot: 359639)										
CG2106202-009	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000992 mg/L	0.0001 mg/L	99.2	70.0	130	----

Teck

COC ID: **Regional Effects Program** | TURNAROUND TIME: Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Regional Effects Program			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Cybele Heddle			Lab Contact	Lyuda Shvets			Email 1:	Cybele.Heddle@Teck.com	X	X	X
Email	cait.good@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	Jessica.Ritz@teck.com	X	X	X
Address	421 Pine Avenue			Address	2559 29 Street NE			Email 3:	teckcoal@equisonline.com			X
								Email 4:	tyler.mehler@minnow.ca	X	X	X
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 5:				
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada					
Phone Number	250-425-8202			Phone Number	403-407-1800			PO number	VPO748510			

SAMPLE DETAILS / ANALYSIS REQUESTED

Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	HG-T-U-CVAF-VA	ALS_Package-DOC	ALS_Package-TKN/TOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA
								N	Y	N	Y	Y	N	N
								NONE	H2SO4	H2SO4	HCl	HNO3	HNO3	NONE
RG_SLINE_WS_LAEMP_LCO_2021-12_NP	RG_SLINE	WS	NO	30-Nov-21	13:15:00	G	7	X	X	X	X	X	X	X
RG_RIVER_WS_LAEMP_LCO_2021-12_NP	RG_RIVER	WS	NO	30-Nov-21	14:00:00	G	7	X	X	X	X	X	X	X
RG_LI24_WS_LAEMP_LCO_2021-12_NP	RG_LI24	WS	NO	30-Nov-21	11:15:00	G	7	X	X	X	X	X	X	X
RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	RG_FBLANK	WS	NO	30-Nov-21	13:00:00	G	7	X	X	X	X	X	X	X
RG_LISP24_WS_LAEMP_LCO_2021-12_NP	RG_LISP24	WS	NO	30-Nov-21	14:30:00	G	7	X	X	X	X	X	X	X
RG_FRUL_WS_LAEMP_LCO_2021-12_NP	RG_FRUL	WS	NO	30-Nov-21	9:15:00	G	7	X	X	X	X	X	X	X

Environmental Division
Calgary
Work Order Reference
CG2106222

Telephone : +1 403 407 1800

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
VPO748510	Rick Smit/Lotic Environmental	November 30, 2021		

SERVICE REQUEST (rush - subject to availability)

Regular (default)	X
Priority (2-3 business days) - 50% surcharge	
Emergency (1 Business Day) - 100% surcharge	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	

Sampler's Name	Rick Smit	Mobile #	403-586-3241
Sampler's Signature		Date/Time	November 30, 2021

WATER CHEMISTRY

ALS Laboratory Report CG2106271

(Finalized December 13, 2021)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **CG2106271**	Page	: 1 of 7
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 02-Dec-2021 09:00
PO	: VPO00748510	Date Analysis Commenced	: 02-Dec-2021
C-O-C number	: Regional Effects Program	Issue Date	: 13-Dec-2021 12:08
Sampler	: ----		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Elke Tabora		Inorganics, Calgary, Alberta
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Millicent Brentnall	Laboratory Analyst	Metals, Calgary, Alberta
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Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Shirley Li		Metals, Calgary, Alberta

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Sample Comments

Sample	Client Id	*Comment*
CG2106271-004	RG_TRIP_WS_LAEMP_LCO_2021-12_NP	RG_TRIP - NO BOTTLES FOR DOC, DISSOLVED METALS, Hg

Qualifiers

Qualifier	*Description*
DLDS	*Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.*
TKNI	*TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_FO23_WS_LAEMP_LCO_2021-12_NP	RG_LCUT_WS_LAEMP_LCO_2021-12_NP	RG_LILC3_WS_LAEMP_LCO_2021-12_NP	RG_TRIP_WS_LAEMP_LCO_2021-12_NP	----
					Client sampling date / time	01-Dec-2021 08:45	01-Dec-2021 11:00	01-Dec-2021 12:45	01-Dec-2021 15:00	----
						CG2106271-001	CG2106271-002	CG2106271-003	CG2106271-004	--------
						Result	Result	Result	Result	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	<2.0	<2.0	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L		219	250	246	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		219	250	246	<1.0	----
conductivity	----	E100	2.0	µS/cm		802	1020	1070	<2.0	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L		427	539	584	<0.50	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV		422	428	434	493	----
pH	----	E108	0.10	pH units		8.26	8.08	8.16	5.46	----
solids, total dissolved [TDS]	----	E162	10	mg/L		524	732	720	<10	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
turbidity	----	E121	0.10	NTU		0.31	0.13	0.21	<0.10	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L		267	305	300	<1.0	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L		<1.0	<1.0	<1.0	<1.0	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.250 DLDS	<0.250 DLDS	<0.050	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L		5.11	10.1	19.2	<0.10	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.216	0.246	0.242	<0.020	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.424 TKNI	0.402 TKNI	0.353 TKNI	<0.050	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		11.1	14.4	12.0	<0.0050	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0014	<0.0050 DLDS	<0.0050 DLDS	<0.0010	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		0.0013	0.0030	0.0020	<0.0010	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		<0.0020	0.0023	0.0030	<0.0020	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		213	309	338	<0.30	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		1.04	0.91	0.77	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		0.92	0.60	0.79	<0.50	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_FO23_WS_LAEMP_LCO_2021-12_NP	RG_LCUT_WS_LAEMP_LCO_2021-12_NP	RG_LILC3_WS_LAEMP_LCO_2021-12_NP	RG_TRIP_WS_LAEMP_LCO_2021-12_NP	----
					Client sampling date / time	01-Dec-2021 08:45	01-Dec-2021 11:00	01-Dec-2021 12:45	01-Dec-2021 15:00	----
						CG2106271-001	CG2106271-002	CG2106271-003	CG2106271-004	--------
						Result	Result	Result	Result	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		9.76	12.8	13.4	<0.10	----
cation sum	----	EC101	0.10	meq/L		8.71	11.3	12.2	<0.10	----
ion balance (cations/anions ratio)	----	EC101	0.010	%		89.2	88.3	91.0	100	----
ion balance (cation-anion difference)	----	EC101	0.010	%		5.68	6.22	4.69	<0.010	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0071	<0.0030	0.0049	<0.0030	----
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00012	0.00036	0.00030	<0.00010	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00010	0.00011	0.00012	<0.00010	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0913	0.0574	0.0623	<0.00010	----
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	<0.020	<0.020	<0.020	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, total	7440-42-8	E420	0.010	mg/L		0.010	0.021	0.019	<0.010	----
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.0290	0.376	0.273	<0.0050	----
calcium, total	7440-70-2	E420	0.050	mg/L		98.7	124	128	<0.050	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00032	<0.00010	<0.00010	<0.00010	----
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	<0.10	0.14	<0.10	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
iron, total	7439-89-6	E420	0.010	mg/L		0.013	<0.010	0.049	<0.010	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0270	0.0674	0.0616	<0.0010	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		45.5	56.5	67.2	<0.0050	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00076	0.00012	0.0209	<0.00010	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00137	0.00187	0.00329	<0.000050	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00135	0.0106	0.00874	<0.00050	----
potassium, total	7440-09-7	E420	0.050	mg/L		1.23	1.90	2.03	<0.050	----
selenium, total	7782-49-2	E420	0.050	µg/L		45.6	57.0	48.1	<0.050	----
silicon, total	7440-21-3	E420	0.10	mg/L		2.09	2.20	2.19	<0.10	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, total	17341-25-2	E420	0.050	mg/L		3.99	10.4	12.0	<0.050	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_FO23_WS_LAEMP_LCO_2021-12_NP	RG_LCUT_WS_LAEMP_LCO_2021-12_NP	RG_LILC3_WS_LAEMP_LCO_2021-12_NP	RG_TRIP_WS_LAEMP_LCO_2021-12_NP	----
Client sampling date / time					01-Dec-2021 08:45	01-Dec-2021 11:00	01-Dec-2021 12:45	01-Dec-2021 15:00	----
					CG2106271-001	CG2106271-002	CG2106271-003	CG2106271-004	--------
					Result	Result	Result	Result	----
Total Metals									
strontium, total	7440-24-6	E420	0.00020	mg/L	0.174	0.237	0.234	<0.00020	----
sulfur, total	7704-34-9	E420	0.50	mg/L	74.2	104	117	<0.50	----
thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	0.000014	0.000010	<0.000010	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	----
titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00246	0.00387	0.00420	<0.000010	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	0.0136	0.0102	<0.0030	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0014	<0.0010	<0.0010	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00012	0.00038	0.00031	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0880	0.0551	0.0579	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L	<0.020	<0.020	<0.020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	0.020	0.020	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L	0.0178	0.367	0.221	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L	98.5	123	130	<0.050	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	<0.00010	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L	<0.10	<0.10	<0.10	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	0.00030	0.00023	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	<0.010	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0273	0.0757	0.0690	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	43.9	56.4	62.9	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00029	<0.00010	0.0144	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00134	0.00189	0.00321	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00129	0.00997	0.00789	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.22	1.93	1.96	<0.050	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_FO23_WS_LAEMP_LCO_2021-12_NP	RG_LCUT_WS_LAEMP_LCO_2021-12_NP	RG_LILC3_WS_LAEMP_LCO_2021-12_NP	RG_TRIP_WS_LAEMP_LCO_2021-12_NP	----
					Client sampling date / time	01-Dec-2021 08:45	01-Dec-2021 11:00	01-Dec-2021 12:45	01-Dec-2021 15:00	----
						CG2106271-001	CG2106271-002	CG2106271-003	CG2106271-004	--------
						Result	Result	Result	Result	----
Dissolved Metals										
selenium, dissolved	7782-49-2	E421	0.050	µg/L		44.1	57.2	47.7	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.12	2.21	2.21	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L		3.63	10.2	11.3	<0.050	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.177	0.242	0.232	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		75.1	108	119	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	0.000015	<0.000010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00268	0.00441	0.00446	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0021	0.0132	0.0098	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Laboratory	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2106271**	Page	: 1 of 21
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 02-Dec-2021 09:00
PO	: VPO00748510	Issue Date	: 13-Dec-2021 12:08
C-O-C number	: Regional Effects Program		
Sampler	: ----		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

Key

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

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Laboratory Control Sample (LCS) Recoveries								
Dissolved Metals	QC-MRG3-3593150 02	----	sulfur, dissolved	7704-34-9	E421	74.3 % MES	80.0-120%	Recovery less than lower control limit

Result Qualifiers

Qualifier	Description
MES	*Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).*

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_FO23_WS_LAEMP_LCO_2021-12_NP	E298	01-Dec-2021	02-Dec-2021	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E298	01-Dec-2021	02-Dec-2021	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E298	01-Dec-2021	02-Dec-2021	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E298	01-Dec-2021	02-Dec-2021	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_FO23_WS_LAEMP_LCO_2021-12_NP	E235.Br-L	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E235.Br-L	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E235.Br-L	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E235.Br-L	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_FO23_WS_LAEMP_LCO_2021-12_NP	E235.Cl-L	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E235.Cl-L	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E235.Cl-L	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E235.Cl-L	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_FO23_WS_LAEMP_LCO_2021-12_NP	E378-U	01-Dec-2021	----	----	----		02-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E378-U	01-Dec-2021	----	----	----		02-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E378-U	01-Dec-2021	----	----	----		02-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E378-U	01-Dec-2021	----	----	----		02-Dec-2021	3 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_FO23_WS_LAEMP_LCO_2021-12_NP	E235.F	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E235.F	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E235.F	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E235.F	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_FO23_WS_LAEMP_LCO_2021-12_NP	E235.NO3-L	01-Dec-2021	----	----	----		02-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E235.NO3-L	01-Dec-2021	----	----	----		02-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E235.NO3-L	01-Dec-2021	----	----	----		02-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E235.NO3-L	01-Dec-2021	----	----	----		02-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_FO23_WS_LAEMP_LCO_2021-12_NP	E235.NO2-L	01-Dec-2021	----	----	----		02-Dec-2021	3 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E235.NO2-L	01-Dec-2021	----	----	----		02-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E235.NO2-L	01-Dec-2021	----	----	----		02-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E235.NO2-L	01-Dec-2021	----	----	----		02-Dec-2021	3 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_FO23_WS_LAEMP_LCO_2021-12_NP	E235.SO4	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E235.SO4	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E235.SO4	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E235.SO4	01-Dec-2021	----	----	----		02-Dec-2021	28 days	1 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E318	01-Dec-2021	03-Dec-2021	----	----		08-Dec-2021	28 days	7 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E318	01-Dec-2021	03-Dec-2021	----	----		08-Dec-2021	28 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E318	01-Dec-2021	03-Dec-2021	----	----		08-Dec-2021	28 days	7 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
RG_FO23_WS_LAEMP_LCO_2021-12_NP	E318	01-Dec-2021	03-Dec-2021	----	----		08-Dec-2021	28 days	8 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_FO23_WS_LAEMP_LCO_2021-12_NP	E372-U	01-Dec-2021	08-Dec-2021	----	----		08-Dec-2021	28 days	7 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E372-U	01-Dec-2021	08-Dec-2021	----	----		08-Dec-2021	28 days	7 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E372-U	01-Dec-2021	08-Dec-2021	----	----		08-Dec-2021	28 days	7 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid)										
RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E372-U	01-Dec-2021	08-Dec-2021	----	----		08-Dec-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
RG_FO23_WS_LAEMP_LCO_2021-12_NP	E421.Cr-L	01-Dec-2021	07-Dec-2021	----	----		07-Dec-2021	180 days	6 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E421.Cr-L	01-Dec-2021	07-Dec-2021	----	----		07-Dec-2021	180 days	6 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid)										
RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E421.Cr-L	01-Dec-2021	07-Dec-2021	----	----		07-Dec-2021	180 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_FO23_WS_LAEMP_LCO_2021-12_NP	E509	01-Dec-2021	09-Dec-2021	----	----		09-Dec-2021	28 days	8 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E509	01-Dec-2021	09-Dec-2021	----	----		09-Dec-2021	28 days	8 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E509	01-Dec-2021	09-Dec-2021	----	----		09-Dec-2021	28 days	8 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_FO23_WS_LAEMP_LCO_2021-12_NP	E421	01-Dec-2021	07-Dec-2021	----	----		07-Dec-2021	180 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E421	01-Dec-2021	07-Dec-2021	----	----		07-Dec-2021	180 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E421	01-Dec-2021	07-Dec-2021	----	----		07-Dec-2021	180 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E421	01-Dec-2021	07-Dec-2021	----	----		07-Dec-2021	180 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_FO23_WS_LAEMP_LCO_2021-12_NP	E358-L	01-Dec-2021	02-Dec-2021	----	----		04-Dec-2021	28 days	3 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E358-L	01-Dec-2021	02-Dec-2021	----	----		04-Dec-2021	28 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E358-L	01-Dec-2021	02-Dec-2021	----	----		04-Dec-2021	28 days	3 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_FO23_WS_LAEMP_LCO_2021-12_NP	E355-L	01-Dec-2021	02-Dec-2021	----	----		04-Dec-2021	28 days	3 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E355-L	01-Dec-2021	02-Dec-2021	----	----		04-Dec-2021	28 days	3 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E355-L	01-Dec-2021	02-Dec-2021	----	----		04-Dec-2021	28 days	3 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E355-L	01-Dec-2021	02-Dec-2021	----	----		04-Dec-2021	28 days	3 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_FO23_WS_LAEMP_LCO_2021-12_NP	E283	01-Dec-2021	----	----	----		03-Dec-2021	14 days	2 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E283	01-Dec-2021	----	----	----		03-Dec-2021	14 days	2 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E283	01-Dec-2021	----	----	----		03-Dec-2021	14 days	2 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E283	01-Dec-2021	----	----	----		03-Dec-2021	14 days	2 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE RG_FO23_WS_LAEMP_LCO_2021-12_NP	E290	01-Dec-2021	----	----	----		03-Dec-2021	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E290	01-Dec-2021	----	----	----		03-Dec-2021	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E290	01-Dec-2021	----	----	----		03-Dec-2021	14 days	2 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E290	01-Dec-2021	----	----	----		03-Dec-2021	14 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_FO23_WS_LAEMP_LCO_2021-12_NP	E100	01-Dec-2021	----	----	----		03-Dec-2021	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E100	01-Dec-2021	----	----	----		03-Dec-2021	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E100	01-Dec-2021	----	----	----		03-Dec-2021	28 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E100	01-Dec-2021	----	----	----		03-Dec-2021	28 days	2 days	✓
Physical Tests : ORP by Electrode										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E125	01-Dec-2021	----	----	----		06-Dec-2021	0.25 hrs	120 hrs	× EHTR-FM

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : ORP by Electrode										
HDPE RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E125	01-Dec-2021	----	----	----		06-Dec-2021	0.25 hrs	122 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E125	01-Dec-2021	----	----	----		06-Dec-2021	0.25 hrs	124 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_FO23_WS_LAEMP_LCO_2021-12_NP	E125	01-Dec-2021	----	----	----		06-Dec-2021	0.25 hrs	126 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E108	01-Dec-2021	----	----	----		03-Dec-2021	0.25 hrs	48 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E108	01-Dec-2021	----	----	----		03-Dec-2021	0.25 hrs	51 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E108	01-Dec-2021	----	----	----		03-Dec-2021	0.25 hrs	52 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_FO23_WS_LAEMP_LCO_2021-12_NP	E108	01-Dec-2021	----	----	----		03-Dec-2021	0.25 hrs	55 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE RG_FO23_WS_LAEMP_LCO_2021-12_NP	E162	01-Dec-2021	----	----	----		07-Dec-2021	7 days	6 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E162	01-Dec-2021	----	----	----		07-Dec-2021	7 days	6 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TDS by Gravimetry										
HDPE RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E162	01-Dec-2021	----	----	----		07-Dec-2021	7 days	6 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E162	01-Dec-2021	----	----	----		07-Dec-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_FO23_WS_LAEMP_LCO_2021-12_NP	E160-L	01-Dec-2021	----	----	----		06-Dec-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E160-L	01-Dec-2021	----	----	----		06-Dec-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E160-L	01-Dec-2021	----	----	----		06-Dec-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E160-L	01-Dec-2021	----	----	----		06-Dec-2021	7 days	5 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_FO23_WS_LAEMP_LCO_2021-12_NP	E121	01-Dec-2021	----	----	----		03-Dec-2021	3 days	2 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E121	01-Dec-2021	----	----	----		04-Dec-2021	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E121	01-Dec-2021	----	----	----		04-Dec-2021	3 days	3 days	✓

Matrix: **Water**

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Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Turbidity by Nephelometry										
HDPE RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E121	01-Dec-2021	----	----	----		04-Dec-2021	3 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_FO23_WS_LAEMP_LCO_2021-12_NP	E420.Cr-L	01-Dec-2021	----	----	----		04-Dec-2021	180 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E420.Cr-L	01-Dec-2021	----	----	----		04-Dec-2021	180 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E420.Cr-L	01-Dec-2021	----	----	----		04-Dec-2021	180 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E420.Cr-L	01-Dec-2021	----	----	----		06-Dec-2021	180 days	5 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_FO23_WS_LAEMP_LCO_2021-12_NP	E508-L	01-Dec-2021	----	----	----		05-Dec-2021	28 days	4 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E508-L	01-Dec-2021	----	----	----		05-Dec-2021	28 days	4 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E508-L	01-Dec-2021	----	----	----		05-Dec-2021	28 days	4 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E508-L	01-Dec-2021	----	----	----		05-Dec-2021	28 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_FO23_WS_LAEMP_LCO_2021-12_NP	E420	01-Dec-2021	----	----	----		04-Dec-2021	180 days	3 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_LCUT_WS_LAEMP_LCO_2021-12_NP	E420	01-Dec-2021	----	----	----		04-Dec-2021	180 days	3 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_LILC3_WS_LAEMP_LCO_2021-12_NP	E420	01-Dec-2021	----	----	----		04-Dec-2021	180 days	3 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_TRIP_WS_LAEMP_LCO_2021-12_NP	E420	01-Dec-2021	----	----	----		06-Dec-2021	180 days	5 days	✓

Legend & Qualifier Definitions

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

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	358733	2	29	6.9	5.0	✓
Alkalinity Species by Titration	E290	359053	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	357999	1	19	5.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	357859	1	4	25.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	357860	1	4	25.0	5.0	✓
Conductivity in Water	E100	359054	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	359316	1	4	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	363135	1	19	5.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	359315	1	5	20.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	358107	1	12	8.3	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	357939	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	357857	1	4	25.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	357855	1	5	20.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	357856	1	5	20.0	5.0	✓
ORP by Electrode	E125	360388	1	16	6.2	5.0	✓
pH by Meter	E108	359055	1	16	6.2	5.0	✓
Sulfate in Water by IC	E235.SO4	357858	1	4	25.0	5.0	✓
TDS by Gravimetry	E162	360083	2	36	5.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	359291	2	19	10.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	359247	1	19	5.2	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	359884	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	359290	3	37	8.1	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	358108	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	357949	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	358781	3	51	5.8	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	358733	2	29	6.9	5.0	✓
Alkalinity Species by Titration	E290	359053	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	357999	1	19	5.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	357859	1	4	25.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	357860	1	4	25.0	5.0	✓
Conductivity in Water	E100	359054	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	359316	1	4	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	363135	1	19	5.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	359315	1	5	20.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	358107	1	12	8.3	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	357939	1	20	5.0	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	357857	1	4	25.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	357855	1	5	20.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	357856	1	5	20.0	5.0	✓
ORP by Electrode	E125	360388	1	16	6.2	5.0	✓
pH by Meter	E108	359055	1	16	6.2	5.0	✓
Sulfate in Water by IC	E235.SO4	357858	1	4	25.0	5.0	✓
TDS by Gravimetry	E162	360083	2	36	5.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	359291	2	19	10.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	359247	1	19	5.2	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	359884	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	359290	2	37	5.4	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	358108	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	357949	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	360080	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	358781	3	51	5.8	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	358733	2	29	6.9	5.0	✓
Alkalinity Species by Titration	E290	359053	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	357999	1	19	5.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	357859	1	4	25.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	357860	1	4	25.0	5.0	✓
Conductivity in Water	E100	359054	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	359316	1	4	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	363135	1	19	5.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	359315	1	5	20.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	358107	1	12	8.3	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	357939	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	357857	1	4	25.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	357855	1	5	20.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	357856	1	5	20.0	5.0	✓
Sulfate in Water by IC	E235.SO4	357858	1	4	25.0	5.0	✓
TDS by Gravimetry	E162	360083	2	36	5.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	359291	2	19	10.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	359247	1	19	5.2	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	359884	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	359290	2	37	5.4	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	358108	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	357949	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	360080	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	358781	3	51	5.8	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	357999	1	19	5.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	357859	1	4	25.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	357860	1	4	25.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	359316	1	4	25.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	363135	1	19	5.2	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	359315	1	5	20.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	358107	1	12	8.3	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	357939	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	357857	1	4	25.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	357855	1	5	20.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	357856	1	5	20.0	5.0	✓
Sulfate in Water by IC	E235.SO4	357858	1	4	25.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	359291	2	19	10.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	359247	1	19	5.2	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	359884	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	359290	2	37	5.4	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	358108	1	13	7.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	357949	1	20	5.0	5.0	✓

Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Calgary - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Calgary - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Calgary - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
ORP by Electrode	E125 Calgary - Environmental	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed, measured in mV. For high accuracy test results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L Calgary - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Calgary - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC (Low Level)	E235.Cl-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Calgary - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH 8.3

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U Calgary - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a flow analyzer on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAFS.
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **CG2106271**	Page	: 1 of 26
Client	: Teck Coal Limited	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 02-Dec-2021 09:00
PO	: VPO00748510	Date Analysis Commenced	: 02-Dec-2021
C-O-C number	: Regional Effects Program	Issue Date	: 13-Dec-2021 12:08
Sampler	: ----		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Elke Tabora		Inorganics, Calgary, Alberta
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
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Owen Cheng		Metals, Burnaby, British Columbia
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
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Sara Niroomand		Inorganics, Calgary, Alberta

General Comments

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

Key :

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 358733)											
CG2106184-004	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	8.9	8.1	0.8	Diff <2x LOR	----
Physical Tests (QC Lot: 358734)											
CG2106271-003	RG_LILC3_WS_LAEMP_LCO_2021-12_NP	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 358781)											
CG2106184-007	Anonymous	turbidity	----	E121	0.10	NTU	<0.10	<0.10	0	Diff <2x LOR	----
Physical Tests (QC Lot: 359053)											
CG2106269-001	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	481	476	0.940%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	481	476	0.940%	20%	----
Physical Tests (QC Lot: 359054)											
CG2106270-001	Anonymous	conductivity	----	E100	2.0	µS/cm	2600	2620	0.766%	10%	----
Physical Tests (QC Lot: 359055)											
CG2106270-001	Anonymous	pH	----	E108	0.10	pH units	7.92	7.93	0.126%	4%	----
Physical Tests (QC Lot: 359451)											
CG2106265-001	Anonymous	turbidity	----	E121	0.10	NTU	0.74	0.73	0.008	Diff <2x LOR	----
Physical Tests (QC Lot: 359470)											
CG2106265-017	Anonymous	turbidity	----	E121	0.10	NTU	8.14	8.07	0.864%	15%	----
Physical Tests (QC Lot: 360083)											
CG2106265-019	Anonymous	solids, total dissolved [TDS]	----	E162	40	mg/L	1520	1480	2.60%	20%	----
Physical Tests (QC Lot: 360084)											
CG2106271-003	RG_LILC3_WS_LAEMP_LCO_2021-12_NP	solids, total dissolved [TDS]	----	E162	20	mg/L	720	735	1.99%	20%	----
Physical Tests (QC Lot: 360388)											
CG2106265-021	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	460	455	1.16%	15%	----
Anions and Nutrients (QC Lot: 357855)											
CG2106270-003	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.100	mg/L	198	199	0.389%	20%	----
Anions and Nutrients (QC Lot: 357856)											
CG2106270-003	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0200	mg/L	<0.0200	<0.0200	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 357857)											
CG2106271-001	RG_FO23_WS_LAEMP_LCO_2021-12_NP	fluoride	16984-48-8	E235.F	0.020	mg/L	0.216	0.213	1.59%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 357858)											
CG2106271-001	RG_FO23_WS_LAEMP_LCO_2021-12_NP	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	213	213	0.0739%	20%	----
Anions and Nutrients (QC Lot: 357859)											
CG2106271-001	RG_FO23_WS_LAEMP_LCO_2021-12_NP	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 357860)											
CG2106271-001	RG_FO23_WS_LAEMP_LCO_2021-12_NP	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	5.11	5.10	0.263%	20%	----
Anions and Nutrients (QC Lot: 357939)											
CG2106266-006	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 357949)											
CG2106266-005	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	<0.0020	<0.0020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 357999)											
CG2106266-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0204	0.0206	0.0002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 359247)											
CG2106218-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 358107)											
CG2106266-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 358108)											
CG2106266-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
Total Metals (QC Lot: 359290)											
CG2106271-001	RG_FO23_WS_LAEMP_LCO_2021-12_NP	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0071	0.0074	0.0003	Diff <2x LOR	----
CG2106271-001	RG_FO23_WS_LAEMP_LCO_2021-12_NP	antimony, total	7440-36-0	E420	0.00010	mg/L	0.00012	0.00012	0.000007	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00010	0.00010	0.000003	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0913	0.0930	1.82%	20%	----
		beryllium, total	7440-41-7	E420	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.010	0.010	0.0005	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	0.0290 µg/L	0.0000258	0.0000033	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	98.7	101	2.20%	20%	----
		cobalt, total	7440-48-4	E420	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.013	0.014	0.001	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0270	0.0278	2.99%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	45.5	46.5	1.99%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 359290) - continued											
CG2106271-001	RG_FO23_WS_LAEMP_LCO_2021-12_NP	manganese, total	7439-96-5	E420	0.00010	mg/L	0.00076	0.00094	0.00018	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00137	0.00140	2.20%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00135	0.00141	0.00006	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	1.23	1.27	2.75%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	45.6 µg/L	0.0457	0.186%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	2.09	2.12	1.47%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	3.99	4.01	0.635%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.174	0.178	2.24%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	74.2	76.2	2.60%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00246	0.00247	0.394%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
Total Metals (QC Lot: 359291)											
CG2106271-001	RG_FO23_WS_LAEMP_LCO_2021-12_NP	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00032	0.00042	0.00010	Diff <2x LOR	----
Total Metals (QC Lot: 359884)											
CG2106222-001	Anonymous	mercury, total	7439-97-6	E508-L	0.00050	ng/L	<0.00050 µg/L	<0.50	0	Diff <2x LOR	----
Total Metals (QC Lot: 360264)											
YL2101733-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0797	0.0817	2.45%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00033	0.00030	0.00002	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0697	0.0706	1.35%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	0.000026	0.000023	0.000002	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.375	0.380	1.28%	20%	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.000258	0.000273	5.71%	20%	----
		calcium, total	7440-70-2	E420	0.050	mg/L	159	160	0.914%	20%	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00586	0.00599	2.17%	20%	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00233	0.00234	0.000007	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.260	0.262	0.958%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 360264) - continued											
YL2101733-001	Anonymous	lithium, total	7439-93-2	E420	0.0010	mg/L	0.0328	0.0307	6.58%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	33.8	33.7	0.326%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.554	0.563	1.56%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00319	0.00320	0.388%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.0402	0.0411	2.16%	20%	----
		potassium, total	7440-09-7	E420	0.050	mg/L	9.79	10.5	6.82%	20%	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000054	0.000059	0.000005	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	0.99	1.00	0.007	Diff <2x LOR	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	140	141	0.256%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	2.82	2.85	0.977%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	50.8	49.9	1.83%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	0.000066	0.000066	0.0000003	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00110	0.00097	0.00013	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00142	0.00146	2.09%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0312	0.0322	3.42%	20%	----
Total Metals (QC Lot: 360265)											
YL2101733-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00013	0.00012	0.000005	Diff <2x LOR	----
Dissolved Metals (QC Lot: 359315)											
YL2101733-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0659	0.0648	1.56%	20%	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00025	0.00023	0.00002	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0611	0.0643	5.18%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	0.000022	0.000002	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.335	0.342	2.17%	20%	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	0.000229	0.000231	0.751%	20%	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	148	153	2.99%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00530	0.00557	4.82%	20%	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00192	0.00196	0.00004	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.230	0.234	1.81%	20%	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0296	0.0300	1.38%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 359315) - continued											
YL2101733-001	Anonymous	magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	29.2	30.0	2.97%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.490	0.510	3.97%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00298	0.00307	3.07%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.0357	0.0370	3.59%	20%	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	9.18	9.52	3.66%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000100	mg/L	<0.000100	0.000173	0.000073	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	0.875	0.909	3.86%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	118	121	2.11%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	2.77	2.78	0.596%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	47.0	47.9	1.94%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	0.000061	0.000063	0.000002	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.00126	0.00132	4.15%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0268	0.0276	3.10%	20%	----
Dissolved Metals (QC Lot: 359316)											
YL2101733-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 361013)											
CG2106216-006	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		beryllium, dissolved	7440-41-7	E421	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0050	mg/L	<0.0050 µg/L	<0.0000050	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	0.0079	0.0082	0.0003	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 361013) - continued											
CG2106216-006	Anonymous	manganese, dissolved	7439-96-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.050	mg/L	<0.050 µg/L	<0.000050	0	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
		thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0023	0.0025	0.0002	Diff <2x LOR	----
Dissolved Metals (QC Lot: 363135)											
CG2106266-004	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 358733)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Physical Tests (QCLot: 358734)						
acidity (as CaCO3)	----	E283	2	mg/L	2.1	----
Physical Tests (QCLot: 358781)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 359053)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 359054)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 359451)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 359470)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 360080)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 360083)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 360084)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 357855)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 357856)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 357857)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 357858)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 357859)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 357860)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 357860) - continued						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 357939)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 357949)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 357999)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 359247)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Organic / Inorganic Carbon (QCLot: 358107)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 358108)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 359290)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 359290) - continued						
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 359291)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 359884)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Total Metals (QCLot: 360264)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 360264) - continued						
sodium, total	17341-25-2	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 360265)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 359315)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 359315) - continued						
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 359316)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 361013)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 361013) - continued						
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 363135)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 358733)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	105	85.0	115	----
Physical Tests (QCLot: 358734)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	102	85.0	115	----
Physical Tests (QCLot: 358781)									
turbidity	----	E121	0.1	NTU	200 NTU	103	85.0	115	----
Physical Tests (QCLot: 359053)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	108	85.0	115	----
Physical Tests (QCLot: 359054)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	101	90.0	110	----
Physical Tests (QCLot: 359055)									
pH	----	E108	----	pH units	7 pH units	99.0	98.6	101	----
Physical Tests (QCLot: 359451)									
turbidity	----	E121	0.1	NTU	200 NTU	106	85.0	115	----
Physical Tests (QCLot: 359470)									
turbidity	----	E121	0.1	NTU	200 NTU	102	85.0	115	----
Physical Tests (QCLot: 360080)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	91.4	85.0	115	----
Physical Tests (QCLot: 360083)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	94.6	85.0	115	----
Physical Tests (QCLot: 360084)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	90.8	85.0	115	----
Physical Tests (QCLot: 360388)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	101	95.4	104	----
Anions and Nutrients (QCLot: 357855)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 357856)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 357857)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	106	90.0	110	----
Anions and Nutrients (QCLot: 357858)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 357859)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 357859) - continued									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	94.5	85.0	115	----
Anions and Nutrients (QCLot: 357860)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 357939)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.02 mg/L	98.8	80.0	120	----
Anions and Nutrients (QCLot: 357949)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.02 mg/L	97.3	80.0	120	----
Anions and Nutrients (QCLot: 357999)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	98.6	85.0	115	----
Anions and Nutrients (QCLot: 359247)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	109	75.0	125	----
Organic / Inorganic Carbon (QCLot: 358107)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	93.4	80.0	120	----
Organic / Inorganic Carbon (QCLot: 358108)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	97.6	80.0	120	----
Total Metals (QCLot: 359290)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	103	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	107	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	106	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	107	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	101	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	99.5	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	96.7	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	108	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	104	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	102	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	99.4	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	99.6	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	107	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	107	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 359290) - continued									
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	106	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	100	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	97.1	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	108	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	105	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	98.6	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	103	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	101	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	102	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	97.3	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	106	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	104	80.0	120	----
Total Metals (QCLot: 359291)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
Total Metals (QCLot: 359884)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	83.8	80.0	120	----
Total Metals (QCLot: 360264)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	106	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	108	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	105	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	98.3	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	104	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	98.6	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	102	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	93.5	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	107	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	92.3	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	103	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	103	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	103	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 360264) - continued									
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	97.1	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	101	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	106	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	105	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	114	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	104	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	98.5	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	102	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	110	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	104	80.0	120	----
Total Metals (QCLot: 360265)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
Dissolved Metals (QCLot: 359315)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	103	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	104	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	107	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	100	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	96.3	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	107	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	101	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	102	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	104	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	103	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	101	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	102	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	104	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	96.4	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	105	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	93.7	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 359315) - continued									
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	115	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	# 74.3	80.0	120	MES
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	98.4	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	102	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	101	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	116	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	105	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	98.4	80.0	120	----
Dissolved Metals (QCLot: 359316)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
Dissolved Metals (QCLot: 361013)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	96.4	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	100	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	94.0	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	96.8	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	93.2	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	95.4	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	94.0	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	97.8	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	97.6	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	96.4	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	94.4	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	102	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	94.5	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	95.3	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	96.5	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	95.6	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	102	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	94.8	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	97.8	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	91.7	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	92.4	60.0	140	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	94.5	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	97.8	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	101	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	91.4	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 361013) - continued									
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	93.3	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	98.5	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	98.2	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	92.5	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	96.4	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	92.6	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	105	80.0	120	----

Qualifiers

Qualifier	Description
MES	*Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).*

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 357855)										
CG2106271-004	RG_TRIP_WS_LAEMP_LCO_2021-12_NP	nitrate (as N)	14797-55-8	E235.NO3-L	2.57 mg/L	2.5 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 357856)										
CG2106271-004	RG_TRIP_WS_LAEMP_LCO_2021-12_NP	nitrite (as N)	14797-65-0	E235.NO2-L	0.518 mg/L	0.5 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 357857)										
CG2106271-004	RG_TRIP_WS_LAEMP_LCO_2021-12_NP	fluoride	16984-48-8	E235.F	1.07 mg/L	1 mg/L	107	75.0	125	----
Anions and Nutrients (QCLot: 357858)										
CG2106271-004	RG_TRIP_WS_LAEMP_LCO_2021-12_NP	sulfate (as SO4)	14808-79-8	E235.SO4	102 mg/L	100 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 357859)										
CG2106271-004	RG_TRIP_WS_LAEMP_LCO_2021-12_NP	bromide	24959-67-9	E235.Br-L	0.513 mg/L	0.5 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 357860)										
CG2106271-004	RG_TRIP_WS_LAEMP_LCO_2021-12_NP	chloride	16887-00-6	E235.Cl-L	104 mg/L	100 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 357939)										
CG2106269-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0516 mg/L	0.05 mg/L	103	70.0	130	----
Anions and Nutrients (QCLot: 357949)										
CG2106266-006	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0530 mg/L	0.0676 mg/L	78.4	70.0	130	----
Anions and Nutrients (QCLot: 357999)										
CG2106269-004	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.113 mg/L	0.1 mg/L	113	75.0	125	----
Anions and Nutrients (QCLot: 359247)										
CG2106218-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.77 mg/L	2.5 mg/L	111	70.0	130	----
Organic / Inorganic Carbon (QCLot: 358107)										
CG2106266-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	21.8 mg/L	23.9 mg/L	91.2	70.0	130	----
Organic / Inorganic Carbon (QCLot: 358108)										
CG2106266-001	Anonymous	carbon, total organic [TOC]	----	E355-L	23.2 mg/L	23.9 mg/L	97.0	70.0	130	----
Total Metals (QCLot: 359290)										
CG2106271-002	RG_LCUT_WS_LAEMP_LCO_2021-12_NP	aluminum, total	7429-90-5	E420	0.190 mg/L	0.2 mg/L	95.0	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 359290) - continued										
CG2106271-002	RG_LCUT_WS_LAEMP_LCO_2021-12_NP	antimony, total	7440-36-0	E420	0.0188 mg/L	0.02 mg/L	94.2	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0373 mg/L	0.04 mg/L	93.2	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00920 mg/L	0.01 mg/L	92.0	70.0	130	----
		boron, total	7440-42-8	E420	0.092 mg/L	0.1 mg/L	91.9	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00417 mg/L	0.004 mg/L	104	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0189 mg/L	0.02 mg/L	94.5	70.0	130	----
		copper, total	7440-50-8	E420	0.0184 mg/L	0.02 mg/L	92.3	70.0	130	----
		iron, total	7439-89-6	E420	1.91 mg/L	2 mg/L	95.7	70.0	130	----
		lead, total	7439-92-1	E420	0.0180 mg/L	0.02 mg/L	89.8	70.0	130	----
		lithium, total	7439-93-2	E420	0.0874 mg/L	0.1 mg/L	87.4	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0187 mg/L	0.02 mg/L	93.7	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0193 mg/L	0.02 mg/L	96.5	70.0	130	----
		nickel, total	7440-02-0	E420	0.0372 mg/L	0.04 mg/L	92.9	70.0	130	----
		potassium, total	7440-09-7	E420	3.91 mg/L	4 mg/L	97.7	70.0	130	----
		selenium, total	7782-49-2	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		silicon, total	7440-21-3	E420	8.71 mg/L	10 mg/L	87.1	70.0	130	----
		silver, total	7440-22-4	E420	0.00388 mg/L	0.004 mg/L	97.1	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00357 mg/L	0.004 mg/L	89.2	70.0	130	----
		tin, total	7440-31-5	E420	0.0186 mg/L	0.02 mg/L	93.0	70.0	130	----
		titanium, total	7440-32-6	E420	0.0382 mg/L	0.04 mg/L	95.5	70.0	130	----
		uranium, total	7440-61-1	E420	0.00427 mg/L	0.004 mg/L	107	70.0	130	----
		vanadium, total	7440-62-2	E420	0.101 mg/L	0.1 mg/L	101	70.0	130	----
		zinc, total	7440-66-6	E420	0.377 mg/L	0.4 mg/L	94.4	70.0	130	----
Total Metals (QCLot: 359291)										
CG2106271-002	RG_LCUT_WS_LAEMP_LCO_2021-12_NP	chromium, total	7440-47-3	E420.Cr-L	0.0391 mg/L	0.04 mg/L	97.8	70.0	130	----
Total Metals (QCLot: 359884)										
CG2106222-002	Anonymous	mercury, total	7439-97-6	E508-L	4.13 ng/L	5 ng/L	82.5	70.0	130	----
Total Metals (QCLot: 360264)										

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 360264) - continued										
YL2101733-001	Anonymous	aluminum, total	7429-90-5	E420	0.208 mg/L	0.2 mg/L	104	70.0	130	----
		antimony, total	7440-36-0	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0218 mg/L	0.02 mg/L	109	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0400 mg/L	0.04 mg/L	100.0	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00998 mg/L	0.01 mg/L	99.8	70.0	130	----
		boron, total	7440-42-8	E420	ND mg/L	0.1 mg/L	ND	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00399 mg/L	0.004 mg/L	99.8	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0196 mg/L	0.02 mg/L	97.8	70.0	130	----
		copper, total	7440-50-8	E420	0.0188 mg/L	0.02 mg/L	94.0	70.0	130	----
		iron, total	7439-89-6	E420	1.96 mg/L	2 mg/L	98.1	70.0	130	----
		lead, total	7439-92-1	E420	0.0199 mg/L	0.02 mg/L	99.7	70.0	130	----
		lithium, total	7439-93-2	E420	0.0876 mg/L	0.1 mg/L	87.6	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0205 mg/L	0.02 mg/L	102	70.0	130	----
		nickel, total	7440-02-0	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		potassium, total	7440-09-7	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		selenium, total	7782-49-2	E420	0.0436 mg/L	0.04 mg/L	109	70.0	130	----
		silicon, total	7440-21-3	E420	9.02 mg/L	10 mg/L	90.2	70.0	130	----
		silver, total	7440-22-4	E420	0.00412 mg/L	0.004 mg/L	103	70.0	130	----
		sodium, total	17341-25-2	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00387 mg/L	0.004 mg/L	96.7	70.0	130	----
		tin, total	7440-31-5	E420	0.0190 mg/L	0.02 mg/L	94.9	70.0	130	----
		titanium, total	7440-32-6	E420	0.0418 mg/L	0.04 mg/L	105	70.0	130	----
		uranium, total	7440-61-1	E420	0.00428 mg/L	0.004 mg/L	107	70.0	130	----
		vanadium, total	7440-62-2	E420	0.108 mg/L	0.1 mg/L	108	70.0	130	----
		zinc, total	7440-66-6	E420	0.402 mg/L	0.4 mg/L	101	70.0	130	----
Total Metals (QCLot: 360265)										
YL2101733-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0412 mg/L	0.04 mg/L	103	70.0	130	----
Dissolved Metals (QCLot: 359315)										
YL2101733-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.203 mg/L	0.2 mg/L	102	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0204 mg/L	0.02 mg/L	102	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 359315) - continued										
YL2101733-001	Anonymous	arsenic, dissolved	7440-38-2	E421	0.0211 mg/L	0.02 mg/L	105	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00795 mg/L	0.01 mg/L	79.5	70.0	130	----
		boron, dissolved	7440-42-8	E421	ND mg/L	0.1 mg/L	ND	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00391 mg/L	0.004 mg/L	97.9	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0193 mg/L	0.02 mg/L	96.4	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0183 mg/L	0.02 mg/L	91.6	70.0	130	----
		iron, dissolved	7439-89-6	E421	2.00 mg/L	2 mg/L	99.8	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0186 mg/L	0.02 mg/L	93.0	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0976 mg/L	0.1 mg/L	97.6	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0199 mg/L	0.02 mg/L	99.7	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0387 mg/L	0.04 mg/L	96.7	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0838 mg/L	0.08 mg/L	105	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.27 mg/L	10 mg/L	92.7	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00384 mg/L	0.004 mg/L	95.9	70.0	130	----
		sodium, dissolved	17341-25-2	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00372 mg/L	0.004 mg/L	93.1	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0190 mg/L	0.02 mg/L	95.2	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0396 mg/L	0.04 mg/L	99.1	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00420 mg/L	0.004 mg/L	105	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.105 mg/L	0.1 mg/L	105	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.371 mg/L	0.4 mg/L	92.8	70.0	130	----
Dissolved Metals (QCLot: 359316)										
YL2101733-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 361013)										
CG2106216-006	Anonymous	aluminum, dissolved	7429-90-5	E421	1.78 mg/L	2 mg/L	89.0	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.191 mg/L	0.2 mg/L	95.7	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.179 mg/L	0.2 mg/L	89.3	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.176 mg/L	0.2 mg/L	88.1	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 361013) - continued										
CG2106216-006	Anonymous	beryllium, dissolved	7440-41-7	E421	0.370 mg/L	0.4 mg/L	92.6	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.0883 mg/L	0.1 mg/L	88.3	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.961 mg/L	1 mg/L	96.1	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.0362 mg/L	0.04 mg/L	90.5	70.0	130	----
		calcium, dissolved	7440-70-2	E421	36.2 mg/L	40 mg/L	90.4	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.182 mg/L	0.2 mg/L	91.0	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.180 mg/L	0.2 mg/L	89.8	70.0	130	----
		iron, dissolved	7439-89-6	E421	17.8 mg/L	20 mg/L	88.8	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.184 mg/L	0.2 mg/L	92.3	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.922 mg/L	1 mg/L	92.2	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	8.71 mg/L	10 mg/L	87.1	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.181 mg/L	0.2 mg/L	90.6	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.191 mg/L	0.2 mg/L	95.7	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.363 mg/L	0.4 mg/L	90.8	70.0	130	----
		potassium, dissolved	7440-09-7	E421	36.6 mg/L	40 mg/L	91.6	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.382 mg/L	0.4 mg/L	95.6	70.0	130	----
		silicon, dissolved	7440-21-3	E421	87.2 mg/L	100 mg/L	87.2	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.0372 mg/L	0.04 mg/L	93.1	70.0	130	----
		sodium, dissolved	17341-25-2	E421	18.0 mg/L	20 mg/L	89.9	70.0	130	----
		strontium, dissolved	7440-24-6	E421	0.187 mg/L	0.2 mg/L	93.4	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	188 mg/L	200 mg/L	94.2	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.0368 mg/L	0.04 mg/L	92.0	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.182 mg/L	0.2 mg/L	90.9	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.312 mg/L	0.4 mg/L	77.9	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.0372 mg/L	0.04 mg/L	93.0	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.911 mg/L	1 mg/L	91.1	70.0	130	----
		zinc, dissolved	7440-66-6	E421	3.68 mg/L	4 mg/L	92.0	70.0	130	----
Dissolved Metals (QCLot: 363135)										
CG2106266-005	Anonymous	mercury, dissolved	7439-97-6	E509	0.000104 mg/L	0.0001 mg/L	104	70.0	130	----

Teck

Page 1 of 1

COC ID: **Regional Effects Program**

TURNAROUND TIME: Regular

PROJECT/CLIENT INFO

Facility Name	Regional Effects Program		
Project Manager	Cait Good		
Email	cait.good@teck.com		
Address	421 Pine Avenue		
City	Sparwood	Province	BC
	V0B 2G0	Country	Canada

Environmental Division Calgary — 25-8202

LABORATORY

Lab Name	ALS Calgary		
Lab Contact	Lyuda Shvets		
Email	Lyudmyla.Shvets@ALSGlobal.com		
Address	2559 29 Street NE		
City	Calgary	Province	AB
Postal Code	T1Y 7B5	Country	Canada
Phone Number	403-407-1800		

OTHER INFO

Report Format / Distribution		Excel	PDF	EDD
Email 1:	cait.good@teck.com	X		X
Email 2:	Jessica.ritz@teck.com	X	X	X
Email 3:	teckcoal@equisonline.com			X
Email 4:	tyler.mehler@minnow.ca	X	X	X
Email 5:	Cybele.Heddle@teck.com	X	X	X

PO number: VPO748510

Work Order Reference
CG2106271

Telephone : +1 403 407 1800

SAMPLE DETAILS

ANALYSIS REQUESTED

Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	HG-T-U-CVAF-VA	ALS_Package-DOC	ALS_Package-TKN/TOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA
								FILTERED						
								N	Y	N	Y	Y	N	N
								PRESERVED						
								NONE	H2SO4	H2SO4	HCl	HNO3	HNO3	NONE
RG_FO23_WS_LAEMP_LCO_2021-R_MP	RG_FO23	WS	NO	2021/12/01	08:45	G	7	X	X	X	X	X	X	X
RG_LCUT_WS_LAEMP_LCO_2021-R_MP	RG_LCUT	WS	NO	2021/12/01	11:00	G	7	X	X	X	X	X	X	X
RG_LILC3_WS_LAEMP_LCO_2021-R_MP	RG_LILC3	WS	NO	2021/12/01	12:45	G	7	X	X	X	X	X	X	X
RG_TRIP_WS_LAEMP_LCO_2021-R_MP	RG_TRIP	WS	NO	2021/12/01	15:00	G	7	X	X	X	X	X	X	X

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
VPO748510	Rick Smit / Lotic environmental	2021-12-01 16:00		12/2 9:00

SERVICE REQUEST (rush - subject to availability)

Regular (default)	X
Priority (2-3 business days) - 50% surcharge	
Emergency (1 Business Day) - 100% surcharge	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	

Sampler's Name	Rick Smit	Mobile #	403-586-3241
Sampler's Signature		Date/Time	2021-12-01 / 16:00

WATER CHEMISTRY

ALS Laboratory Report CG2106342

(Finalized December 15, 2021)

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **CG2106342**	Page	: 1 of 6
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 03-Dec-2021 10:30
PO	: VPO00748510	Date Analysis Commenced	: 03-Dec-2021
C-O-C number	: Regional Effects Program	Issue Date	: 15-Dec-2021 08:45
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Dee Lee	Analyst	Metals, Burnaby, British Columbia
Elke Tabora		Inorganics, Calgary, Alberta
Erin Sanchez		Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta

General Comments

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

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

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

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

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

Unit	*Description*
-	No Unit
%	percent
µg/L	micrograms per litre
µS/cm	Microsiemens per centimetre
meq/L	milliequivalents per litre
mg/L	milligrams per litre
mV	millivolts
NTU	nephelometric turbidity units
pH units	pH units

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
TKNI	*TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	Client sample ID: RG_LI8_WS_LAEMP_LCO_2021-12_NP	Client sample ID: ----	Client sample ID: ----	Client sample ID: ----
					Client sampling date / time: 02-Dec-2021 08:45	Client sampling date / time: 02-Dec-2021 10:00	----	----	----
					CG2106342-001	CG2106342-002	--------	--------	--------
					Result	Result	----	----	----
Physical Tests									
acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	221	211	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	221	211	----	----	----
conductivity	----	E100	2.0	µS/cm	736	700	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	376	358	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV	261	237	----	----	----
pH	----	E108	0.10	pH units	8.09	8.16	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	469	459	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L	<1.0	1.4	----	----	----
turbidity	----	E121	0.10	NTU	0.22	0.44	----	----	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	269	258	----	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	<1.0	<1.0	----	----	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	<1.0	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L	10.5	9.51	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	0.251	0.279	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.300 TKNI	0.354 TKNI	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	6.22	5.69	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	----	----	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0044	0.0038	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0039	0.0038	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	190	177	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.31	1.20	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.26	1.14	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	RG_LI8_WS_LAEMP_LCO_2021-12_NP	----	----	----
					Client sampling date / time	02-Dec-2021 08:45	02-Dec-2021 10:00	----	----	----
						CG2106342-001	CG2106342-002	--------	--------	--------
						Result	Result	----	----	----
Ion Balance										
anion sum	----	EC101	0.10	meq/L		9.12	8.59	----	----	----
cation sum	----	EC101	0.10	meq/L		7.84	7.46	----	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%		86.0	86.8	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%		7.55	7.04	----	----	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0075	0.0114	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L		0.00018	0.00017	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00013	0.00011	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.0590	0.0588	----	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L		<0.020	<0.020	----	----	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, total	7440-42-8	E420	0.010	mg/L		0.014	0.014	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L		0.108	0.0971	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L		89.3	86.8	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L		0.00014	0.00016	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L		<0.10	<0.10	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L		0.015	0.015	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L		0.0359	0.0345	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L		39.8	37.9	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.00331	0.00225	----	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L		<0.00050	<0.00050	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00203	0.00201	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L		0.00348	0.00305	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L		1.25	1.15	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L		27.5	26.0	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L		2.33	2.36	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, total	7440-23-5	E420	0.050	mg/L		7.08	6.61	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	RG_LI8_WS_LAEMP_LCO_2021-12_NP	----	----	----
					Client sampling date / time	02-Dec-2021 08:45	02-Dec-2021 10:00	----	----	----
						CG2106342-001	**CG2106342-002**	--------	--------	--------
						Result	Result	----	----	----
Total Metals										
strontium, total	7440-24-6	E420	0.00020	mg/L		0.195	0.205	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L		66.7	63.7	----	----	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L		<0.00030	<0.00030	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.00289	0.00279	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	<0.00050	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L		0.0045	0.0045	----	----	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0025	0.0029	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00016	0.00014	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		<0.00010	0.00011	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.0626	0.0601	----	----	----
beryllium, dissolved	7440-41-7	E421	0.020	µg/L		<0.020	<0.020	----	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		0.014	0.013	----	----	----
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L		0.0886	0.0551	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		85.4	81.6	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L		0.00012	0.00010	----	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L		<0.10	<0.10	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	<0.00020	----	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		<0.010	<0.010	----	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	----	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		0.0343	0.0318	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L		39.6	37.6	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.00178	0.00089	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.00207	0.00198	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		0.00340	0.00304	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L		1.18	1.09	----	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	RG_LI8_WS_LAEMP_LCO_2021-12_NP	----	----	----
					Client sampling date / time	02-Dec-2021 08:45	02-Dec-2021 10:00	----	----	----
						CG2106342-001	**CG2106342-002**	--------	--------	--------
						Result	Result	----	----	----
Dissolved Metals										
selenium, dissolved	7782-49-2	E421	0.050	µg/L		28.8	26.8	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		2.40	2.34	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		6.68	6.11	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.190	0.192	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		65.9	62.3	----	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	----	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	----	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	----	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.00268	0.00253	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		0.0035	0.0033	----	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	----	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	----	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2106342**	Page	: 1 of 16
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Cybele Heddle	Account Manager	: Lyudmyla Shvets
Address	: 421 Pine Avenue Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 03-Dec-2021 10:30
PO	: VPO00748510	Issue Date	: 15-Dec-2021 08:45
C-O-C number	: Regional Effects Program		
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

Key

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

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- Matrix Spike outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Matrix Spike (MS) Recoveries								
Anions and Nutrients	Anonymous	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	52.4 % MSTN	70.0-130%	Recovery less than lower data quality objective

Result Qualifiers

Qualifier	Description
MSTN	*TKN Matrix Spike recovery was low due to interference from high nitrate, which causes negative bias on TKN.*

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_LI8_WS_LAEMP_LCO_2021-12_NP	E298	02-Dec-2021	05-Dec-2021	----	----		05-Dec-2021	28 days	3 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E298	02-Dec-2021	05-Dec-2021	----	----		05-Dec-2021	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
RG_LI8_WS_LAEMP_LCO_2021-12_NP	E235.Br-L	02-Dec-2021	----	----	----		04-Dec-2021	28 days	2 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E235.Br-L	02-Dec-2021	----	----	----		04-Dec-2021	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
RG_LI8_WS_LAEMP_LCO_2021-12_NP	E235.Cl-L	02-Dec-2021	----	----	----		04-Dec-2021	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE										
RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E235.Cl-L	02-Dec-2021	----	----	----		04-Dec-2021	28 days	2 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE										
RG_LI8_WS_LAEMP_LCO_2021-12_NP	E378-U	02-Dec-2021	----	----	----		04-Dec-2021	3 days	2 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E378-U	02-Dec-2021	----	----	----		04-Dec-2021	3 days	2 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_LI8_WS_LAEMP_LCO_2021-12_NP	E235.F	02-Dec-2021	----	----	----		04-Dec-2021	28 days	2 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E235.F	02-Dec-2021	----	----	----		04-Dec-2021	28 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_LI8_WS_LAEMP_LCO_2021-12_NP	E235.NO3-L	02-Dec-2021	----	----	----		04-Dec-2021	3 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E235.NO3-L	02-Dec-2021	----	----	----		04-Dec-2021	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_LI8_WS_LAEMP_LCO_2021-12_NP	E235.NO2-L	02-Dec-2021	----	----	----		04-Dec-2021	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E235.NO2-L	02-Dec-2021	----	----	----		04-Dec-2021	3 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_LI8_WS_LAEMP_LCO_2021-12_NP	E235.SO4	02-Dec-2021	----	----	----		04-Dec-2021	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E235.SO4	02-Dec-2021	----	----	----		04-Dec-2021	28 days	2 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) RG_LI8_WS_LAEMP_LCO_2021-12_NP	E318	02-Dec-2021	09-Dec-2021	----	----		10-Dec-2021	28 days	8 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E318	02-Dec-2021	09-Dec-2021	----	----		10-Dec-2021	28 days	8 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_LI8_WS_LAEMP_LCO_2021-12_NP	E372-U	02-Dec-2021	09-Dec-2021	----	----		09-Dec-2021	28 days	7 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E372-U	02-Dec-2021	09-Dec-2021	----	----		09-Dec-2021	28 days	7 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_LI8_WS_LAEMP_LCO_2021-12_NP	E421.Cr-L	02-Dec-2021	08-Dec-2021	----	----		08-Dec-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E421.Cr-L	02-Dec-2021	08-Dec-2021	----	----		08-Dec-2021	180 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_LI8_WS_LAEMP_LCO_2021-12_NP	E509	02-Dec-2021	10-Dec-2021	----	----		10-Dec-2021	28 days	8 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E509	02-Dec-2021	10-Dec-2021	----	----		10-Dec-2021	28 days	8 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_LI8_WS_LAEMP_LCO_2021-12_NP	E421	02-Dec-2021	08-Dec-2021	----	----		08-Dec-2021	180 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E421	02-Dec-2021	08-Dec-2021	----	----		08-Dec-2021	180 days	7 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E358-L	02-Dec-2021	03-Dec-2021	----	----		06-Dec-2021	28 days	4 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) RG_LI8_WS_LAEMP_LCO_2021-12_NP	E358-L	02-Dec-2021	03-Dec-2021	----	----		07-Dec-2021	28 days	5 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_LI8_WS_LAEMP_LCO_2021-12_NP	E355-L	02-Dec-2021	03-Dec-2021	----	----		06-Dec-2021	28 days	4 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E355-L	02-Dec-2021	03-Dec-2021	----	----		06-Dec-2021	28 days	4 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_LI8_WS_LAEMP_LCO_2021-12_NP	E283	02-Dec-2021	----	----	----		06-Dec-2021	14 days	4 days	✓
Physical Tests : Acidity by Titration										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E283	02-Dec-2021	----	----	----		06-Dec-2021	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_LI8_WS_LAEMP_LCO_2021-12_NP	E290	02-Dec-2021	----	----	----		07-Dec-2021	14 days	5 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E290	02-Dec-2021	----	----	----		07-Dec-2021	14 days	5 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE RG_LI8_WS_LAEMP_LCO_2021-12_NP	E100	02-Dec-2021	----	----	----		07-Dec-2021	28 days	5 days	✓
Physical Tests : Conductivity in Water										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E100	02-Dec-2021	----	----	----		07-Dec-2021	28 days	5 days	✓
Physical Tests : ORP by Electrode										
HDPE RG_LI8_WS_LAEMP_LCO_2021-12_NP	E125	02-Dec-2021	----	----	----		09-Dec-2021	0.25 hrs	174 hrs	× EHTR-FM
Physical Tests : ORP by Electrode										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E125	02-Dec-2021	----	----	----		09-Dec-2021	0.25 hrs	175 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_LI8_WS_LAEMP_LCO_2021-12_NP	E108	02-Dec-2021	----	----	----		07-Dec-2021	0.25 hrs	121 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E108	02-Dec-2021	----	----	----		07-Dec-2021	0.25 hrs	122 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE RG_LI8_WS_LAEMP_LCO_2021-12_NP	E162	02-Dec-2021	----	----	----		08-Dec-2021	7 days	6 days	✓
Physical Tests : TDS by Gravimetry										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E162	02-Dec-2021	----	----	----		08-Dec-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] RG_LI8_WS_LAEMP_LCO_2021-12_NP	E160-L	02-Dec-2021	----	----	----		07-Dec-2021	7 days	5 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E160-L	02-Dec-2021	----	----	----		07-Dec-2021	7 days	5 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_LI8_WS_LAEMP_LCO_2021-12_NP	E121	02-Dec-2021	----	----	----		04-Dec-2021	3 days	2 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E121	02-Dec-2021	----	----	----		04-Dec-2021	3 days	2 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_LI8_WS_LAEMP_LCO_2021-12_NP	E420.Cr-L	02-Dec-2021	----	----	----		09-Dec-2021	180 days	7 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E420.Cr-L	02-Dec-2021	----	----	----		09-Dec-2021	180 days	7 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_LI8_WS_LAEMP_LCO_2021-12_NP	E508-L	02-Dec-2021	----	----	----		09-Dec-2021	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E508-L	02-Dec-2021	----	----	----		09-Dec-2021	28 days	7 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_LI8_WS_LAEMP_LCO_2021-12_NP	E420	02-Dec-2021	----	----	----		09-Dec-2021	180 days	7 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	E420	02-Dec-2021	----	----	----		09-Dec-2021	180 days	7 days	✓

Legend & Qualifier Definitions

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

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

Quality Control Parameter Frequency Compliance

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

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Acidity by Titration	E283	360392	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	361249	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	359841	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	359406	1	14	7.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	359407	1	14	7.1	5.0	✓
Conductivity in Water	E100	361247	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	362028	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	364151	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	362029	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	359140	1	15	6.6	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	359694	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	359404	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	359408	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	359409	1	14	7.1	5.0	✓
ORP by Electrode	E125	362554	1	10	10.0	5.0	✓
pH by Meter	E108	361248	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	359405	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	360675	1	8	12.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	362064	1	11	9.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	363938	1	18	5.5	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	363393	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	362065	1	18	5.5	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	359141	1	15	6.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	359827	2	24	8.3	5.0	✓
Turbidity by Nephelometry	E121	359720	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	360392	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	361249	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	359841	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	359406	1	14	7.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	359407	1	14	7.1	5.0	✓
Conductivity in Water	E100	361247	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	362028	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	364151	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	362029	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	359140	1	15	6.6	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	359694	1	20	5.0	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	359404	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	359408	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	359409	1	14	7.1	5.0	✓
ORP by Electrode	E125	362554	1	10	10.0	5.0	✓
pH by Meter	E108	361248	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	359405	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	360675	1	8	12.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	362064	1	11	9.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	363938	1	18	5.5	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	363393	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	362065	1	18	5.5	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	359141	1	15	6.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	359827	2	24	8.3	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	360672	1	17	5.8	5.0	✓
Turbidity by Nephelometry	E121	359720	1	20	5.0	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	360392	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	361249	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	359841	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	359406	1	14	7.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	359407	1	14	7.1	5.0	✓
Conductivity in Water	E100	361247	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	362028	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	364151	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	362029	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	359140	1	15	6.6	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	359694	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	359404	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	359408	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	359409	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	359405	1	14	7.1	5.0	✓
TDS by Gravimetry	E162	360675	1	8	12.5	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	362064	1	11	9.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	363938	1	18	5.5	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	363393	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	362065	1	18	5.5	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	359141	1	15	6.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	359827	2	24	8.3	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	360672	1	17	5.8	5.0	✓
Turbidity by Nephelometry	E121	359720	1	20	5.0	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	359841	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	359406	1	14	7.1	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	359407	1	14	7.1	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	362028	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	364151	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	362029	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	359140	1	15	6.6	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	359694	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	359404	1	14	7.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	359408	1	14	7.1	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	359409	1	14	7.1	5.0	✓
Sulfate in Water by IC	E235.SO4	359405	1	14	7.1	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	362064	1	11	9.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	363938	1	18	5.5	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	363393	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	362065	1	18	5.5	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	359141	1	15	6.6	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	359827	2	24	8.3	5.0	✓

Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Calgary - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Calgary - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Calgary - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
ORP by Electrode	E125 Calgary - Environmental	Water	ASTM D1498 (mod)	Oxidation redution potential is reported as the oxidation-reduction potential of the platinum metal-reference electrode employed, measured in mV. For high accuracy test results, it is recommended that this analysis be conducted in the field.
TSS by Gravimetry (Low Level)	E160-L Calgary - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Calgary - Environmental	Water	APHA 2540 C (mod)	Total Dissolved Solids (TDS) are determined by filtering a sample through a glass fibre filter, with evaporation of the filtrate at 180 ± 2°C for 16 hours or to constant weight, with gravimetric measurement of the residue.
Bromide in Water by IC (Low Level)	E235.Br-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC (Low Level)	E235.Cl-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Fluoride in Water by IC	E235.F Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrite in Water by IC (Low Level)	E235.NO2-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Calgary - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Calgary - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH 8.3

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Alkalinity Species by Titration	E290 Calgary - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Calgary - Environmental	Water	J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in water is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Total Kjeldahl Nitrogen is determined using block digestion followed by flow-injection analysis with fluorescence detection.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U Calgary - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U Calgary - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically on a flow analyzer on a sample that has been lab or field filtered through a 0.45 micron membrane filter. Field filtration is recommended to ensure test results represent conditions at time of sampling.
Total Metals in Water by CRC ICPMS	E420 Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L Vancouver - Environmental	Water	EPA 200.2/6020B (mod)	Water samples are digested with nitric and hydrochloric acids, and analyzed by Collision/Reaction Cell ICPMS.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L Vancouver - Environmental	Water	APHA 3030 B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAFS.
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), dissolved" is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Ion Balance using Dissolved Metals	EC101 Calgary - Environmental	Water	APHA 1030E	Cation Sum, Anion Sum, and Ion Balance are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Dissolved species are used where available. Minor ions are included where data is present. Ion Balance cannot be calculated accurately for waters with very low electrical conductivity (EC).

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Calgary - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested using block digestion with Copper Sulfate Digestion Reagent.
Preparation for Total Organic Carbon by Combustion	EP355 Calgary - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Calgary - Environmental	Water	APHA 5310 B (mod)	Preparation for Dissolved Organic Carbon
Digestion for Total Phosphorus in water	EP372 Calgary - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: **CG2106342**	Page	: 1 of 18
Client	: Teck Coal Limited	Laboratory	: Calgary - Environmental
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Project	: REGIONAL EFFECTS PROGRAM	Date Samples Received	: 03-Dec-2021 10:30
PO	: VPO00748510	Date Analysis Commenced	: 03-Dec-2021
C-O-C number	: Regional Effects Program	Issue Date	: 15-Dec-2021 08:45
Sampler	: Rick Smit		
Site	: ----		
Quote number	: Teck Coal Master Quote		
No. of samples received	: 2		
No. of samples analysed	: 2		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits
- Reference Material (RM) Report; Recovery and Acceptance Limits
- Method Blank (MB) Report; Recovery and Acceptance Limits
- Laboratory Control Sample (LCS) Report; Recovery and Acceptance Limits

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
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General Comments

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

Key :

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 359720)											
CG2106255-001	Anonymous	turbidity	----	E121	0.10	NTU	<0.10	<0.10	0	Diff <2x LOR	----
Physical Tests (QC Lot: 360392)											
CG2106330-006	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	2.3	2.2	0.1	Diff <2x LOR	----
Physical Tests (QC Lot: 360675)											
CG2106330-006	Anonymous	solids, total dissolved [TDS]	----	E162	10	mg/L	<10	<10	0	Diff <2x LOR	----
Physical Tests (QC Lot: 361247)											
CG2106335-006	Anonymous	conductivity	----	E100	2.0	µS/cm	1410	1400	0.568%	10%	----
Physical Tests (QC Lot: 361248)											
CG2106335-006	Anonymous	pH	----	E108	0.10	pH units	8.01	8.06	0.622%	4%	----
Physical Tests (QC Lot: 361249)											
CG2106335-006	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	281	285	1.13%	20%	----
		alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	<1.0	0	Diff <2x LOR	----
		alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	281	285	1.13%	20%	----
Physical Tests (QC Lot: 362554)											
CG2106335-004	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	430	424	1.31%	15%	----
Anions and Nutrients (QC Lot: 359404)											
CG2106330-001	Anonymous	fluoride	16984-48-8	E235.F	0.100	mg/L	0.217	0.210	0.007	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 359405)											
CG2106330-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	762	761	0.138%	20%	----
Anions and Nutrients (QC Lot: 359406)											
CG2106330-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.250	mg/L	<0.250	<0.250	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 359407)											
CG2106330-001	Anonymous	chloride	16887-00-6	E235.Cl-L	0.50	mg/L	1.24	1.09	0.15	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 359408)											
CG2106330-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	6.48	6.49	0.0509%	20%	----
Anions and Nutrients (QC Lot: 359409)											
CG2106330-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 359694)											
CG2106337-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0039	0.0042	0.0003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 359827)											

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Anions and Nutrients (QC Lot: 359827) - continued											
CG2106330-005	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0113	0.0123	0.0010	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 359828)											
CG2106342-002	RG_LI8_WS_LAEMP_LCO_2021-12_NP	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0038	0.0032	0.0006	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 359841)											
CG2106335-006	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0500	mg/L	0.911	0.912	0.121%	20%	----
Anions and Nutrients (QC Lot: 363938)											
CG2106331-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 359140)											
CG2106322-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.91	0.90	0.009	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 359141)											
CG2106322-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.89	0.82	0.07	Diff <2x LOR	----
Total Metals (QC Lot: 362064)											
CG2106333-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00011	0.00011	0.000004	Diff <2x LOR	----
Total Metals (QC Lot: 362065)											
CG2106333-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0081	0.0061	0.0020	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00039	0.00040	0.00001	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00012	0.00012	0.000007	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0591	0.0602	1.90%	20%	----
		beryllium, total	7440-41-7	E420	0.020	mg/L	<0.020 µg/L	<0.000020	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.010	mg/L	0.021	0.022	0.001	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	0.332 µg/L	0.000320	3.70%	20%	----
		calcium, total	7440-70-2	E420	0.050	mg/L	114	115	1.23%	20%	----
		cobalt, total	7440-48-4	E420	0.10	mg/L	<0.10 µg/L	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0701	0.0720	2.57%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	54.5	55.2	1.25%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00027	0.00026	0.000004	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00196	0.00199	1.36%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.0101	0.0102	1.41%	20%	----
		potassium, total	7440-09-7	E420	0.050	mg/L	1.99	2.02	1.09%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	48.7 µg/L	0.0495	1.74%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	2.31	2.32	0.137%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 362065) - continued											
CG2106333-001	Anonymous	silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	10.7	10.9	2.09%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.241	0.245	1.75%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	92.9	93.6	0.723%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	0.000016	0.000016	0.00000002	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00389	0.00405	3.97%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0133	0.0140	0.0006	Diff <2x LOR	----
Total Metals (QC Lot: 363393)											
CG2106342-001	RG_LIDCOM_WS_LAEMP _LCO_2021-12_NP	mercury, total	7439-97-6	E508-L	0.00050	ng/L	<0.00050 µg/L	0.51	0.01	Diff <2x LOR	----
Dissolved Metals (QC Lot: 362028)											
CG2106331-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 362029)											
CG2106331-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0020	mg/L	0.0040	0.0027	0.0012	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00020	mg/L	0.00078	0.00077	0.00001	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00020	mg/L	0.0314	0.0322	2.43%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.040	mg/L	<0.040 µg/L	<0.000040	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.020	mg/L	0.030	0.031	0.001	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0100	mg/L	0.661 µg/L	0.000668	0.994%	20%	----
		calcium, dissolved	7440-70-2	E421	0.100	mg/L	298	291	2.24%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.20	mg/L	0.20 µg/L	<0.00020	0.000002	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00040	mg/L	<0.00040	<0.00040	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0020	mg/L	0.401	0.409	1.86%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0100	mg/L	163	159	2.14%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00020	mg/L	0.00220	0.00215	2.30%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000100	mg/L	0.00354	0.00369	4.16%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00100	mg/L	0.0618	0.0613	0.911%	20%	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	7.16	7.11	0.613%	20%	----
		selenium, dissolved	7782-49-2	E421	0.100	mg/L	172 µg/L	0.173	0.392%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 362029) - continued											
CG2106331-001	Anonymous	silicon, dissolved	7440-21-3	E421	0.100	mg/L	1.83	1.83	0.0892%	20%	----
		silver, dissolved	7440-22-4	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.100	mg/L	11.3	11.4	1.01%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00040	mg/L	0.504	0.508	0.748%	20%	----
		sulfur, dissolved	7704-34-9	E421	1.00	mg/L	295	297	0.595%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000020	mg/L	0.000047	0.000045	0.000002	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000020	mg/L	0.0151	0.0152	0.765%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0020	mg/L	0.0338	0.0337	0.339%	20%	----
Dissolved Metals (QC Lot: 364151)											
CG2106315-008	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 359720)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 360392)						
acidity (as CaCO3)	----	E283	2	mg/L	2.2	----
Physical Tests (QCLot: 360672)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 360675)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 361247)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 361249)						
alkalinity, bicarbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, carbonate (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, hydroxide (as CaCO3)	----	E290	1	mg/L	<1.0	----
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Anions and Nutrients (QCLot: 359404)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 359405)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 359406)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 359407)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 359408)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 359409)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 359694)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 359827)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 359828)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 359841)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 359841) - continued						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 363938)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Organic / Inorganic Carbon (QCLot: 359140)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 359141)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 362064)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 362065)						
aluminum, total	7429-90-5	E420	0.003	mg/L	<0.0030	----
antimony, total	7440-36-0	E420	0.0001	mg/L	<0.00010	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	<0.00010	----
barium, total	7440-39-3	E420	0.0001	mg/L	<0.00010	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	<0.000020	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	<0.000050	----
boron, total	7440-42-8	E420	0.01	mg/L	<0.010	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	<0.0000050	----
calcium, total	7440-70-2	E420	0.05	mg/L	<0.050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 362065) - continued						
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 363393)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 362028)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 362029)						
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	<0.0010	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	<0.00010	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	<0.00010	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	<0.000050	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	<0.050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 362029) - continued						
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 364151)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Laboratory Control Sample (LCS) Report

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

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Physical Tests (QCLot: 359720)									
turbidity	----	E121	0.1	NTU	200 NTU	105	85.0	115	----
Physical Tests (QCLot: 360392)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	110	85.0	115	----
Physical Tests (QCLot: 360672)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	103	85.0	115	----
Physical Tests (QCLot: 360675)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	100	85.0	115	----
Physical Tests (QCLot: 361247)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	102	90.0	110	----
Physical Tests (QCLot: 361248)									
pH	----	E108	----	pH units	7 pH units	99.6	98.6	101	----
Physical Tests (QCLot: 361249)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	100	85.0	115	----
Physical Tests (QCLot: 362554)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	102	95.4	104	----
Anions and Nutrients (QCLot: 359404)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 359405)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 359406)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	97.4	85.0	115	----
Anions and Nutrients (QCLot: 359407)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 359408)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	99.6	90.0	110	----
Anions and Nutrients (QCLot: 359409)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	99.1	90.0	110	----
Anions and Nutrients (QCLot: 359694)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.02 mg/L	95.1	80.0	120	----
Anions and Nutrients (QCLot: 359827)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.02 mg/L	98.5	80.0	120	----
Anions and Nutrients (QCLot: 359828)									

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 359828) - continued									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.02 mg/L	94.6	80.0	120	----
Anions and Nutrients (QCLot: 359841)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	88.6	85.0	115	----
Anions and Nutrients (QCLot: 363938)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	95.6	75.0	125	----
Organic / Inorganic Carbon (QCLot: 359140)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	105	80.0	120	----
Organic / Inorganic Carbon (QCLot: 359141)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	110	80.0	120	----
Total Metals (QCLot: 362064)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
Total Metals (QCLot: 362065)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	99.4	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	104	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	102	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	98.5	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	101	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	98.1	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	98.7	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	101	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	102	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	99.8	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	97.7	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	102	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	99.3	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	99.6	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	99.8	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	97.9	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	108	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	98.1	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	100	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	95.7	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	106	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 362065) - continued									
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	110	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	95.0	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	101	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	101	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	99.2	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	102	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	104	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	99.1	80.0	120	----
Total Metals (QCLot: 363393)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	94.2	80.0	120	----
Dissolved Metals (QCLot: 362028)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
Dissolved Metals (QCLot: 362029)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	102	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	102	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	104	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	99.8	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	95.7	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	92.1	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	98.6	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	99.1	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	99.4	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	98.2	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	96.6	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	98.4	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	102	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	101	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	101	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	105	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	100	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	109	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	92.9	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	102	80.0	120	----

Sub-Matrix: **Water**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 362029) - continued									
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	99.8	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	91.9	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	98.5	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	98.3	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	100.0	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	97.7	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	102	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	99.4	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	96.8	80.0	120	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 359404)										
CG2106330-006	Anonymous	fluoride	16984-48-8	E235.F	0.870 mg/L	1 mg/L	87.0	75.0	125	----
Anions and Nutrients (QCLot: 359405)										
CG2106330-006	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	82.4 mg/L	100 mg/L	82.4	75.0	125	----
Anions and Nutrients (QCLot: 359406)										
CG2106330-006	Anonymous	bromide	24959-67-9	E235.Br-L	0.402 mg/L	0.5 mg/L	80.4	75.0	125	----
Anions and Nutrients (QCLot: 359407)										
CG2106330-006	Anonymous	chloride	16887-00-6	E235.Cl-L	82.5 mg/L	100 mg/L	82.5	75.0	125	----
Anions and Nutrients (QCLot: 359408)										
CG2106330-006	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.07 mg/L	2.5 mg/L	82.9	75.0	125	----
Anions and Nutrients (QCLot: 359409)										
CG2106330-006	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.409 mg/L	0.5 mg/L	81.9	75.0	125	----
Anions and Nutrients (QCLot: 359694)										
CG2106342-001	RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0486 mg/L	0.05 mg/L	97.2	70.0	130	----
Anions and Nutrients (QCLot: 359827)										
CG2106330-006	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0478 mg/L	0.0676 mg/L	70.7	70.0	130	----
Anions and Nutrients (QCLot: 359828)										
CG2106357-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0496 mg/L	0.0676 mg/L	73.4	70.0	130	----
Anions and Nutrients (QCLot: 359841)										
CG2106353-014	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.109 mg/L	0.1 mg/L	109	75.0	125	----
Anions and Nutrients (QCLot: 363938)										
CG2106331-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	1.31 mg/L	2.5 mg/L	52.4	70.0	130	MSTN
Organic / Inorganic Carbon (QCLot: 359140)										
CG2106322-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	28.0 mg/L	23.9 mg/L	117	70.0	130	----
Organic / Inorganic Carbon (QCLot: 359141)										
CG2106322-001	Anonymous	carbon, total organic [TOC]	----	E355-L	29.8 mg/L	23.9 mg/L	125	70.0	130	----
Total Metals (QCLot: 362064)										
CG2106335-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0394 mg/L	0.04 mg/L	98.6	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Total Metals (QCLot: 362065)										
CG2106335-001	Anonymous	aluminum, total	7429-90-5	E420	0.203 mg/L	0.2 mg/L	102	70.0	130	----
		antimony, total	7440-36-0	E420	0.0203 mg/L	0.02 mg/L	101	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		barium, total	7440-39-3	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0382 mg/L	0.04 mg/L	95.5	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00896 mg/L	0.01 mg/L	89.6	70.0	130	----
		boron, total	7440-42-8	E420	0.097 mg/L	0.1 mg/L	97.4	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00393 mg/L	0.004 mg/L	98.2	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0190 mg/L	0.02 mg/L	95.1	70.0	130	----
		copper, total	7440-50-8	E420	0.0182 mg/L	0.02 mg/L	91.2	70.0	130	----
		iron, total	7439-89-6	E420	1.86 mg/L	2 mg/L	93.2	70.0	130	----
		lead, total	7439-92-1	E420	0.0180 mg/L	0.02 mg/L	90.3	70.0	130	----
		lithium, total	7439-93-2	E420	0.0954 mg/L	0.1 mg/L	95.4	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0189 mg/L	0.02 mg/L	94.4	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0203 mg/L	0.02 mg/L	102	70.0	130	----
		nickel, total	7440-02-0	E420	0.0359 mg/L	0.04 mg/L	89.8	70.0	130	----
		potassium, total	7440-09-7	E420	4.11 mg/L	4 mg/L	103	70.0	130	----
		selenium, total	7782-49-2	E420	ND mg/L	0.04 mg/L	ND	70.0	130	----
		silicon, total	7440-21-3	E420	9.26 mg/L	10 mg/L	92.6	70.0	130	----
		silver, total	7440-22-4	E420	0.00393 mg/L	0.004 mg/L	98.2	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00369 mg/L	0.004 mg/L	92.3	70.0	130	----
		tin, total	7440-31-5	E420	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		titanium, total	7440-32-6	E420	0.0396 mg/L	0.04 mg/L	99.0	70.0	130	----
		uranium, total	7440-61-1	E420	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, total	7440-62-2	E420	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		zinc, total	7440-66-6	E420	0.366 mg/L	0.4 mg/L	91.6	70.0	130	----
Total Metals (QCLot: 363393)										
CG2106342-002	RG_LI8_WS_LAEMP_LCO_2021-12_NP	mercury, total	7439-97-6	E508-L	4.27 ng/L	5 ng/L	85.4	70.0	130	----
Dissolved Metals (QCLot: 362028)										
CG2106331-002	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0806 mg/L	0.08 mg/L	101	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 362029)										
CG2106331-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.400 mg/L	0.4 mg/L	100.0	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0411 mg/L	0.04 mg/L	103	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0409 mg/L	0.04 mg/L	102	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0388 mg/L	0.04 mg/L	97.1	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0759 mg/L	0.08 mg/L	94.9	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.0167 mg/L	0.02 mg/L	83.5	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.172 mg/L	0.2 mg/L	86.2	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00805 mg/L	0.008 mg/L	101	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0378 mg/L	0.04 mg/L	94.5	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0370 mg/L	0.04 mg/L	92.4	70.0	130	----
		iron, dissolved	7439-89-6	E421	3.92 mg/L	4 mg/L	98.0	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0370 mg/L	0.04 mg/L	92.6	70.0	130	----
		lithium, dissolved	7439-93-2	E421	ND mg/L	0.1 mg/L	ND	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0399 mg/L	0.04 mg/L	99.8	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0424 mg/L	0.04 mg/L	106	70.0	130	----
		nickel, dissolved	7440-02-0	E421	ND mg/L	0.04 mg/L	ND	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E421	ND mg/L	0.04 mg/L	ND	70.0	130	----
		silicon, dissolved	7440-21-3	E421	18.8 mg/L	20 mg/L	93.9	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00775 mg/L	0.008 mg/L	96.9	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00714 mg/L	0.008 mg/L	89.2	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0416 mg/L	0.04 mg/L	104	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0830 mg/L	0.08 mg/L	104	70.0	130	----
		uranium, dissolved	7440-61-1	E421	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.208 mg/L	0.2 mg/L	104	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.776 mg/L	0.8 mg/L	96.9	70.0	130	----
Dissolved Metals (QCLot: 364151)										
CG2106315-009	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000980 mg/L	0.0001 mg/L	98.0	70.0	130	----

Qualifiers

Qualifier	Description
MSTN	TKN Matrix Spike recovery was low due to interference from high nitrate, which causes negative bias on TKN.

Teck

COC ID: **Regional Effects Program** | TURNAROUND TIME: Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name	Regional Effects Program			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	~~Cait Good~~ Cybele Heddle			Lab Contact	Lyuda Shvets			Email 1:	~~cait.good@teck.com~~	X	X	X
Email	~~caitgood@teck.com~~ Cybele.Heddle@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	Jessica.ritz@teck.com	X	X	X
Address	421 Pine Avenue			Address	2559 29 Street NE			Email 3:	teckcoal@equisonline.com			X
								Email 4:	tyler.mehler@minnow.ca	X	X	X
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 5:	cybele.heddle@teck.com	X	X	X
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada					
Phone Number	250-425-8202			Phone Number	403-407-1800			PO number	VPO748510			

Environmental Division Calgary
Work Order Reference
CG2106342

Telephone : +1 403 407 1800

SAMPLE DETAILS / ANALYSIS REQUESTED (Filtered: F: Field, L: Lab, FL: Field & Lab, N: None)

Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	HG-T-U-CVAF-VA	ALS_Package-DOC	ALS_Package-TKN/TOC	HG-D-CVAF-VA	TECKCOAL-MET-D-VA	TECKCOAL-MET-T-VA	TECKCOAL-ROUTINE-VA
								N	Y	N	Y	Y	N	N
								NONE	H2SO4	H2SO4	HCl	HNO3	HNO3	NONE
RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	RG_LIDCOM-M	WS	NO	2021/12/02	08:45	G	7	X	X	X	X	X	X	X
RG_LI8_WS_LAEMP_LCO_2021-12_NP	RG_LI8	WS	NO	2021/12/02	10:00	G	7	X	X	X	X	X	X	X

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
VPO748510	Rick Smit/Lotic environmental	2021/12/02/13:00		12/03/21 LC

SERVICE REQUEST (rush - subject to availability)

Regular (default)	X
Priority (2-3 business days) - 50% surcharge	
Emergency (1 Business Day) - 100% surcharge	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	

Sampler's Name	Rick Smit	Mobile #	403-586-3241
Sampler's Signature		Date/Time	2021 12 02 / 13:00

SELENIUM SPECIATION

BAL Final Report 2105072

(Finalized May 17, 2021)

BROOKS APPLIED LABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

May 17, 2021

Teck Resources Limited - Vancouver
Cait Good
421 Pine Avenue
Sparwood, B.C. CANADA V0B2G0
Cait.Good@teck.com

Re: Regional Effects Program

Dear Cait Good,

On May 6, 2021, Brooks Applied Labs (BAL) received twenty (20) aqueous samples.

The samples were logged-in for total recoverable selenium [*Se*], dissolved Se [*Se*], and Se speciation analyses, according to the chain-of-custody (COC) form. The sample fractions logged in for Se speciation and dissolved Se had been field-filtered prior to receipt at BAL; sample fractions for total recoverable and dissolved Se had also been preserved by the client prior to receipt. All samples were stored according to BAL SOPs.

Total Recoverable and Dissolved Se
Each aqueous sample fraction for total recoverable or dissolved Se was digested in a closed vessel (bomb) with nitric and hydrochloric acids. The resulting digests were analyzed for Se content via inductively coupled plasma triple quadrupole mass spectrometry (ICP-QQQ-MS). The ICP-QQQ-MS instrumentation uses advanced interference removal techniques to ensure accuracy of the sample results. For more information, please visit the *Interference Reduction Technology* section on our website, brooksapplied.com.

Se Speciation
Each aqueous sample was analyzed for Se speciation using ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Selenium species are chromatographically separated on an ion exchange column and then quantified using inductively coupled plasma collision reaction cell mass spectrometry (ICP-CRC-MS); for more information on this determinative technique, please visit the *Interference Reduction Technology* section on our website. The chromatographic method applied for the analyses provides greater retention of methylseleninic acid and selenomethionine, allowing for more definitive quantitation of these species.

In accordance with the quotation issued for this project, Se speciation was defined as dissolved selenite [*Se(IV)*], selenate [*Se(VI)*], selenocyanate [*SeCN*], methylseleninic acid [*MeSe(IV)*], methaneselenonic acid [*MeSe(VI)*], selenomethionine [*SeMet*], selenosulfate [$SeSO_3$], and dimethylselenoxide [*DMSeO*]. Unknown Se species was defined as the total concentration of all unknown Se species observed during the analysis. This item is identified on the report as [*Unk Se Sp*].

DMSeO elutes early in the chromatographic run due to the nature of the molecule and the applied chromatographic separation method. Since this species elutes near the dead volume, additional

Se species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting Se species.

MeSe(VI) was observed at concentrations above the MDL in samples 2105072-21 and 2105072-30. 2105072-21 and 2105072-30 were subsequently analyzed with MeSe(VI) spikes on top of the samples and the presence of MeSe(VI) was confirmed in each case. With the confirmations that the MeSe(VI) peaks were appropriately assigned, the selenium speciation results are reported from the initial injections in batch B211230.

The results were not method blank corrected, as described in the calculations section of the relevant BAL SOPs and were evaluated using reporting limits adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific method detection limits (MDLs), MRLs, and other details.

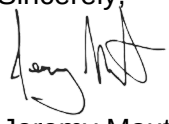
In instances when a matrix spike/matrix spike duplicate (MS/MSD) set was spiked at a level less than the native sample concentration, the recoveries, and the relative percent difference (RPD) are not considered valid indicators of data quality. In such instances, the recoveries of the laboratory fortified blanks (BS) and/or standard reference materials (SRM) demonstrate the accuracy of the applied methods. When the spiking level was less than 25% of the native sample concentration, the spike recovery was not reported (**NR**) and the RPD of the MS/MSD set was not calculated (**N/C**).

Aside from concentration qualifiers, all data were reported without qualification. All associated quality control sample results met the acceptance criteria.

BAL, an accredited laboratory, certifies that the reported results of all analyses for which BAL is NELAP accredited met all NELAP requirements. For more information, please see the Report Information page.

Please feel free to contact us if you have any questions regarding this report.

Sincerely,



Jeremy Maute
Senior Project Manager
Brooks Applied Labs
Jeremy@brooksapplied.com

Report Information

Laboratory Accreditation

BAL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BAL is also certified by many other states to perform environmental analyses. For a current list of our accreditations/certifications, please visit our website at <http://www.brooksapplied.com/resources/certificates-permits/> or review Tables 1 and 2 in our Accreditation Information. Results reported relate only to the samples listed in the report.

Field Quality Control Samples

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

Common Abbreviations

AR	as received
BAL	Brooks Applied Labs
BLK	method blank
BS	blank spike
CAL	calibration standard
CCB	continuing calibration blank
CCV	continuing calibration verification
COC	chain of custody record
D	dissolved fraction
DUP	duplicate
IBL	instrument blank
ICV	initial calibration verification
MDL	method detection limit
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
ND	non-detect
NR	non-reportable
N/C	not calculated
PS	post preparation spike
REC	percent recovery
RPD	relative percent difference
SCV	secondary calibration verification
SOP	standard operating procedure
SRM	reference material
T	total fraction
TR	total recoverable fraction

Definition of Data Qualifiers

(Effective 3/23/2020)

E	An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
H	Holding time and/or preservation requirements not met. Please see narrative for explanation.
J	Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
J-1	Estimated value. A full explanation is presented in the narrative.
M	Duplicate precision (RPD) was not within acceptance criteria. Please see narrative for explanation.
N	Spike recovery was not within acceptance criteria. Please see narrative for explanation.
R	Rejected, unusable value. A full explanation is presented in the narrative.
U	Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
X	Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.
Z	Holding time and/or preservation requirements not established for this method; however, BAL recommendations for holding time were not followed. Please see narrative for explanation.

These qualifiers are based on those previously utilized by Brooks Applied Labs, those found in the EPA SOW ILM03.0, Exhibit B, Section III, pg. B-18, and the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review; USEPA; January 2010. These supersede all previous qualifiers ever employed by BAL.

Accreditation Information

Table 1. Accredited method/matrix/analytes for TNI

Issued by: State of Florida Dept. of Health (The NELAC Institute 2016 Standard)
Issued on: July 27, 2020; Valid to: June 30, 2021
Certificate Number: E87982-35

Method	Matrix	TNI Accredited Analyte(s)
EPA 1638	Non-Potable Waters	Ag, Cd, Cu, Ni, Pb, Sb, Se, Tl, Zn
EPA 200.8	Non-Potable Waters	Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
EPA 6020	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
	Solids/Chemicals & Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
BAL-5000	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn, Hardness
	Solids/Chemicals	Ag, As, B, Be, Cd, Co, Cr, Cu, Pb, Mo, Ni, Sb, Se, Sn, Sr, Tl, V, Zn
	Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Tl, V, Zn
EPA 1640	Non-Potable Waters	Ag, As, Cd, Cu, Pb, Ni, Zn
EPA 1631E	Non-Potable Waters, Solids/Chemicals & Biological	Total Mercury
EPA 1630	Non-Potable Waters	Methyl Mercury
BAL-3200	Solids/Chemicals & Biological	Methyl Mercury
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs
BAL-4200	Non-Potable Waters	Se(IV), Se(VI)
BAL-4201	Non-Potable Waters	Se(IV), Se(VI)
BAL-4300	Non-Potable Waters Solid/Chemicals	Cr(VI)
SM2340B	Non-Potable Waters	Hardness

Accreditation Information

Table 2. Accredited method/matrix/analytes for ISO (1), Non-Governmental TNI (2), and DoD/DOE (3)

Issued by: ANAB

Issued on: November 20, 2020; Valid to: March 20, 2022

Method	Matrix	ISO and Non-Gov. TNI Accredited Analyte(s)	DoD/DOE Accredited Analytes
EPA 1638 Mod EPA 200.8 Mod EPA 6020 Mod	Non-Potable Waters	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn	Ag, Al, As, Ba, Ca, Cd, Cr, Cu, Fe, Pb, Mg, Mn, Ni, Sb, Se, V, Zn
BAL-5000	Solids/Chemicals & Biological	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, V, Zn Hg (Biological Only)	Not Accredited
EPA 1640 Mod	Non-Potable Waters	Ag, As, Cd, Cu, Pb, Ni, Zn Cr, Co, Se, Tl, V (ISO Only)	Not Accredited
EPA 1631E Mod BAL-3100 (waters)	Non-Potable Waters, Solids/Chemicals & Biological/Food	Total Mercury	Total Mercury
EPA 1630 Mod BAL-3200	Non-Potable Waters, Solids/Chemicals Biological	Methyl Mercury	Methyl Mercury (excluding Solids/Chemicals)
EPA 1632A Mod BAL-3300	Non-Potable Waters	Inorganic Arsenic, As(III) (ISO Only)	Not Accredited
	Biological/Food Solids/Chemicals	Inorganic Arsenic (ISO Only)	Not Accredited
AOAC 2015.01 Mod BAL-5000 by BAL-5040	Food	As, Cd, Hg, Pb	Not Accredited
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs	Not Accredited
	Biological by BAL-4115	Inorganic Arsenic, DMAs, MMAs (ISO Only)	Not Accredited
BAL-4101	Food by BAL-4116	Inorganic Arsenic, DMAs, MMAs (ISO Only)	Not Accredited
BAL-4201	Non-Potable Waters	Se(IV), Se(VI), SeCN, SeMet	Not Accredited
BAL-4300	Non-Potable Waters, Solid/Chemicals	Cr(VI)	Cr(VI)
SM 3500-Fe BAL-4500	Non-Potable Waters	Fe, Fe(II) (ISO Only)	Not Accredited
SM2340B	Non-Potable Waters	Hardness	Hardness
SM 2540G EPA 160.3 BAL-0501	Solids/Chemicals & Biological	% Dry Weight	% Dry Weight

(1) ISO/IEC 17025:2017 – Certificate Number ADE-1447.2

(2) Non-Governmental NELAC Institute 2016 Standard – Certificate Number ADE-1447.1

(3) Department of Defense/Energy Consolidated Quality Systems Manual v. 5.3 – Certificate Numbers ADE-1447 for DoD, ADE-1447.3 for DOE.

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
RG_LI24_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-01	WS	Sample	04/26/2021	05/06/2021
RG_LI24_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-02	WS	Sample	04/26/2021	05/06/2021
RG_LI24_WS_LAEMP_LCO_2021-04_NP	2105072-03	WS	Sample	04/26/2021	05/06/2021
RG_SLINE_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-04	WS	Sample	04/26/2021	05/06/2021
RG_SLINE_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-05	WS	Sample	04/26/2021	05/06/2021
RG_SLINE_WS_LAEMP_LCO_2021-04_NP	2105072-06	WS	Sample	04/26/2021	05/06/2021
RG_LISP24_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-07	WS	Sample	04/27/2021	05/06/2021
RG_LISP24_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-08	WS	Sample	04/27/2021	05/06/2021
RG_LISP24_WS_LAEMP_LCO_2021-04_NP	2105072-09	WS	Sample	04/27/2021	05/06/2021
RG_LILC3_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-10	WS	Sample	04/27/2021	05/06/2021
RG_LILC3_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-11	WS	Sample	04/27/2021	05/06/2021
RG_LILC3_WS_LAEMP_LCO_2021-04_NP	2105072-12	WS	Sample	04/27/2021	05/06/2021
RG_LCUT_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-13	WS	Sample	04/27/2021	05/06/2021
RG_LCUT_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-14	WS	Sample	04/27/2021	05/06/2021
RG_LCUT_WS_LAEMP_LCO_2021-04_NP	2105072-15	WS	Sample	04/27/2021	05/06/2021
RG_RIVER_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-16	WS	Sample	04/27/2021	05/06/2021
RG_RIVER_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-17	WS	Sample	04/27/2021	05/06/2021
RG_RIVER_WS_LAEMP_LCO_2021-04_NP	2105072-18	WS	Sample	04/27/2021	05/06/2021
RG_LI8_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-19	WS	Sample	04/28/2021	05/06/2021
RG_LI8_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-20	WS	Sample	04/28/2021	05/06/2021
RG_LI8_WS_LAEMP_LCO_2021-04_NP	2105072-21	WS	Sample	04/28/2021	05/06/2021

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
RG_FO23_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-22	WS	Sample	04/28/2021	05/06/2021
RG_FO23_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-23	WS	Sample	04/28/2021	05/06/2021
RG_FO23_WS_LAEMP_LCO_2021-04_NP	2105072-24	WS	Sample	04/28/2021	05/06/2021
RG_FRUL_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-25	WS	Sample	04/28/2021	05/06/2021
RG_FRUL_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-26	WS	Sample	04/28/2021	05/06/2021
RG_FRUL_WS_LAEMP_LCO_2021-04_NP	2105072-27	WS	Sample	04/28/2021	05/06/2021
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-28	WS	Sample	04/29/2021	05/06/2021
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP_NAL	2105072-29	WS	Sample	04/29/2021	05/06/2021
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	2105072-30	WS	Sample	04/29/2021	05/06/2021

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	05/10/2021	05/11/2021	B211230	S210538
MeSe(IV)	Water	SOP BAL-4201	05/10/2021	05/11/2021	B211230	S210538
MeSe(VI)	Water	SOP BAL-4201	05/10/2021	05/11/2021	B211230	S210538
Se	Water	EPA 1638 Mod	05/10/2021	05/11/2021	B211251	S210547
Se(IV)	Water	SOP BAL-4201	05/10/2021	05/11/2021	B211230	S210538
Se(VI)	Water	SOP BAL-4201	05/10/2021	05/11/2021	B211230	S210538
SeCN	Water	SOP BAL-4201	05/10/2021	05/11/2021	B211230	S210538
SeMet	Water	SOP BAL-4201	05/10/2021	05/11/2021	B211230	S210538
SeSO3	Water	SOP BAL-4201	05/10/2021	05/11/2021	B211230	S210538
Unk Se Sp	Water	SOP BAL-4201	05/10/2021	05/11/2021	B211230	S210538

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LI24_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-01	Se	WS	TR	1.68		0.198	0.528	µg/L	B211251	S210547
RG_LI24_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-02	Se	WS	D	1.85		0.198	0.528	µg/L	B211251	S210547
RG_LI24_WS_LAEMP_LCO_2021-04_NP										
2105072-03	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-03	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-03	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-03	Se(IV)	WS	D	0.029	J	0.010	0.075	µg/L	B211230	S210538
2105072-03	Se(VI)	WS	D	1.81		0.010	0.055	µg/L	B211230	S210538
2105072-03	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211230	S210538
2105072-03	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-03	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B211230	S210538
2105072-03	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211230	S210538
RG_SLINE_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-04	Se	WS	TR	1.06		0.198	0.528	µg/L	B211251	S210547
RG_SLINE_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-05	Se	WS	D	1.12		0.198	0.528	µg/L	B211251	S210547
RG_SLINE_WS_LAEMP_LCO_2021-04_NP										
2105072-06	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-06	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-06	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-06	Se(IV)	WS	D	0.026	J	0.010	0.075	µg/L	B211230	S210538
2105072-06	Se(VI)	WS	D	1.19		0.010	0.055	µg/L	B211230	S210538
2105072-06	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211230	S210538
2105072-06	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-06	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B211230	S210538
2105072-06	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211230	S210538
RG_LISP24_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-07	Se	WS	TR	34.9		0.198	0.528	µg/L	B211251	S210547
RG_LISP24_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-08	Se	WS	D	34.8		0.198	0.528	µg/L	B211251	S210547

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LISP24_WS_LAEMP_LCO_2021-04_NP										
2105072-09	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-09	MeSe(IV)	WS	D	0.015	J	0.010	0.025	µg/L	B211230	S210538
2105072-09	MeSe(VI)	WS	D	0.028		0.010	0.025	µg/L	B211230	S210538
2105072-09	Se(IV)	WS	D	0.214		0.010	0.075	µg/L	B211230	S210538
2105072-09	Se(VI)	WS	D	33.1		0.010	0.055	µg/L	B211230	S210538
2105072-09	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211230	S210538
2105072-09	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-09	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B211230	S210538
2105072-09	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211230	S210538
RG_LILC3_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-10	Se	WS	TR	42.3		0.198	0.528	µg/L	B211251	S210547
RG_LILC3_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-11	Se	WS	D	41.5		0.198	0.528	µg/L	B211251	S210547
RG_LILC3_WS_LAEMP_LCO_2021-04_NP										
2105072-12	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-12	MeSe(IV)	WS	D	0.014	J	0.010	0.025	µg/L	B211230	S210538
2105072-12	MeSe(VI)	WS	D	0.053		0.010	0.025	µg/L	B211230	S210538
2105072-12	Se(IV)	WS	D	0.254		0.010	0.075	µg/L	B211230	S210538
2105072-12	Se(VI)	WS	D	45.0		0.010	0.055	µg/L	B211230	S210538
2105072-12	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211230	S210538
2105072-12	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-12	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B211230	S210538
2105072-12	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211230	S210538
RG_LCUT_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-13	Se	WS	TR	46.9		0.198	0.528	µg/L	B211251	S210547
RG_LCUT_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-14	Se	WS	D	48.6		0.198	0.528	µg/L	B211251	S210547

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LCUT_WS_LAEMP_LCO_2021-04_NP										
2105072-15	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-15	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-15	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-15	Se(IV)	WS	D	0.067	J	0.010	0.075	µg/L	B211230	S210538
2105072-15	Se(VI)	WS	D	44.0		0.010	0.055	µg/L	B211230	S210538
2105072-15	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211230	S210538
2105072-15	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-15	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B211230	S210538
2105072-15	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211230	S210538
RG_RIVER_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-16	Se	WS	TR	46.0		0.198	0.528	µg/L	B211251	S210547
RG_RIVER_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-17	Se	WS	D	45.6		0.198	0.528	µg/L	B211251	S210547
RG_RIVER_WS_LAEMP_LCO_2021-04_NP										
2105072-18	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-18	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-18	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-18	Se(IV)	WS	D	0.072	J	0.010	0.075	µg/L	B211230	S210538
2105072-18	Se(VI)	WS	D	50.0		0.010	0.055	µg/L	B211230	S210538
2105072-18	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211230	S210538
2105072-18	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-18	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B211230	S210538
2105072-18	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211230	S210538
RG_LI8_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-19	Se	WS	TR	28.0		0.198	0.528	µg/L	B211251	S210547
RG_LI8_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-20	Se	WS	D	28.1		0.198	0.528	µg/L	B211251	S210547

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LI8_WS_LAEMP_LCO_2021-04_NP										
2105072-21	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-21	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-21	MeSe(VI)	WS	D	0.014	J	0.010	0.025	µg/L	B211230	S210538
2105072-21	Se(IV)	WS	D	0.173		0.010	0.075	µg/L	B211230	S210538
2105072-21	Se(VI)	WS	D	29.7		0.010	0.055	µg/L	B211230	S210538
2105072-21	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211230	S210538
2105072-21	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-21	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B211230	S210538
2105072-21	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211230	S210538
RG_FO23_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-22	Se	WS	TR	44.1		0.198	0.528	µg/L	B211251	S210547
RG_FO23_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-23	Se	WS	D	43.5		0.198	0.528	µg/L	B211251	S210547
RG_FO23_WS_LAEMP_LCO_2021-04_NP										
2105072-24	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-24	MeSe(IV)	WS	D	0.016	J	0.010	0.025	µg/L	B211230	S210538
2105072-24	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-24	Se(IV)	WS	D	0.211		0.010	0.075	µg/L	B211230	S210538
2105072-24	Se(VI)	WS	D	48.0		0.010	0.055	µg/L	B211230	S210538
2105072-24	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211230	S210538
2105072-24	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-24	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B211230	S210538
2105072-24	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211230	S210538
RG_FRUL_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-25	Se	WS	TR	49.4		0.198	0.528	µg/L	B211251	S210547
RG_FRUL_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-26	Se	WS	D	50.5		0.198	0.528	µg/L	B211251	S210547

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_FRUL_WS_LAEMP_LCO_2021-04_NP										
2105072-27	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-27	MeSe(IV)	WS	D	0.015	J	0.010	0.025	µg/L	B211230	S210538
2105072-27	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-27	Se(IV)	WS	D	0.226		0.010	0.075	µg/L	B211230	S210538
2105072-27	Se(VI)	WS	D	53.3		0.010	0.055	µg/L	B211230	S210538
2105072-27	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211230	S210538
2105072-27	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-27	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B211230	S210538
2105072-27	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211230	S210538
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-28	Se	WS	TR	28.9		0.198	0.528	µg/L	B211251	S210547
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP_NAL										
2105072-29	Se	WS	D	29.5		0.198	0.528	µg/L	B211251	S210547
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP										
2105072-30	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-30	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-30	MeSe(VI)	WS	D	0.016	J	0.010	0.025	µg/L	B211230	S210538
2105072-30	Se(IV)	WS	D	0.176		0.010	0.075	µg/L	B211230	S210538
2105072-30	Se(VI)	WS	D	31.0		0.010	0.055	µg/L	B211230	S210538
2105072-30	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211230	S210538
2105072-30	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211230	S210538
2105072-30	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B211230	S210538
2105072-30	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211230	S210538

Accuracy & Precision Summary

Batch: B211230
Lab Matrix: Water
Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B211230-BS1	**Blank Spike, (1923027)**						
	MeSe(IV)		5.095	5.877	µg/L	115% 75-125	
	Se(IV)		5.000	5.670	µg/L	113% 75-125	
	Se(VI)		5.000	5.373	µg/L	107% 75-125	
	SeCN		5.015	5.076	µg/L	101% 75-125	
	SeMet		4.932	5.386	µg/L	109% 75-125	
B211230-DUP2	**Duplicate, (2105072-30)**						
	DMSeO	ND		ND	µg/L		N/C 25
	MeSe(IV)	ND		0.011	µg/L		N/C 25
	MeSe(VI)	0.016		0.014	µg/L		10% 25
	Se(IV)	0.176		0.169	µg/L		4% 25
	Se(VI)	30.97		31.51	µg/L		2% 25
	SeCN	ND		ND	µg/L		N/C 25
	SeMet	ND		ND	µg/L		N/C 25
	SeSO3	ND		ND	µg/L		N/C 25
	Unk Se Sp	ND		ND	µg/L		N/C 25
B211230-MS2	**Matrix Spike, (2105072-30)**						
	Se(IV)	0.176	4.900	5.151	µg/L	102% 75-125	
	Se(VI)	30.97	5.100	36.01	µg/L	NR 75-125	
	SeCN	ND	1.962	1.828	µg/L	93% 75-125	
	SeMet	ND	1.977	1.904	µg/L	96% 75-125	
B211230-MSD2	**Matrix Spike Duplicate, (2105072-30)**						
	Se(IV)	0.176	4.900	5.252	µg/L	104% 75-125	2% 25
	Se(VI)	30.97	5.100	36.46	µg/L	NR 75-125	N/C 25
	SeCN	ND	1.962	1.802	µg/L	92% 75-125	1% 25
	SeMet	ND	1.977	2.011	µg/L	102% 75-125	5% 25

Accuracy & Precision Summary

Batch: B211251
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B211251-BS1	**Blank Spike, (2035013)**						
	Se		200.0	188.0	µg/L	94% 75-125	
B211251-BS2	**Blank Spike, (2035013)**						
	Se		200.0	179.4	µg/L	90% 75-125	
B211251-BS3	**Blank Spike, (2035013)**						
	Se		200.0	181.9	µg/L	91% 75-125	
B211251-BS4	**Blank Spike, (2035013)**						
	Se		200.0	185.1	µg/L	93% 75-125	
B211251-BS5	**Blank Spike, (2035013)**						
	Se		200.0	179.2	µg/L	90% 75-125	
B211251-SRM1	**Reference Material (2110004, TMDA 51.5 Reference Standard - Bottle 4 - SRM)**						
	Se		14.30	12.99	µg/L	91% 75-125	
B211251-SRM2	**Reference Material (2110004, TMDA 51.5 Reference Standard - Bottle 4 - SRM)**						
	Se		14.30	12.43	µg/L	87% 75-125	
B211251-SRM3	**Reference Material (2110004, TMDA 51.5 Reference Standard - Bottle 4 - SRM)**						
	Se		14.30	12.56	µg/L	88% 75-125	
B211251-SRM4	**Reference Material (2110004, TMDA 51.5 Reference Standard - Bottle 4 - SRM)**						
	Se		14.30	12.73	µg/L	89% 75-125	
B211251-SRM5	**Reference Material (2110004, TMDA 51.5 Reference Standard - Bottle 4 - SRM)**						
	Se		14.30	12.72	µg/L	89% 75-125	
B211251-DUP4	**Duplicate, (2105072-01)**						
	Se	1.679		1.729	µg/L		3% 20

Accuracy & Precision Summary

Batch: B211251
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B211251-MS4	**Matrix Spike, (2105072-01)**						
	Se	1.679	220.0	204.1	µg/L	92% 75-125	
B211251-MSD4	**Matrix Spike Duplicate, (2105072-01)**						
	Se	1.679	220.0	203.6	µg/L	92% 75-125	0.2% 20
B211251-DUP5	**Duplicate, (2105072-10)**						
	Se	42.34		42.32	µg/L		0.04% 20
B211251-MS5	**Matrix Spike, (2105072-10)**						
	Se	42.34	220.0	241.9	µg/L	91% 75-125	
B211251-MSD5	**Matrix Spike Duplicate, (2105072-10)**						
	Se	42.34	220.0	245.7	µg/L	92% 75-125	2% 20

Method Blanks & Reporting Limits

Batch: B211230
Matrix: Water
Method: SOP BAL-4201
Analyte: DMSeO

Sample	Result	Units
B211230-BLK1	0.00	µg/L
B211230-BLK2	0.00	µg/L
B211230-BLK3	0.00	µg/L
B211230-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005
MDL: 0.002
MRL: 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B211230-BLK1	0.00	µg/L
B211230-BLK2	0.00	µg/L
B211230-BLK3	0.00	µg/L
B211230-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005
MDL: 0.002
MRL: 0.005

Analyte: MeSe(VI)

Sample	Result	Units
B211230-BLK1	0.00	µg/L
B211230-BLK2	0.00	µg/L
B211230-BLK3	0.00	µg/L
B211230-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005
MDL: 0.002
MRL: 0.005

Method Blanks & Reporting Limits

Analyte: Se(IV)

Sample	Result	Units
B211230-BLK1	0.00	µg/L
B211230-BLK2	0.00	µg/L
B211230-BLK3	0.00	µg/L
B211230-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Analyte: Se(VI)

Sample	Result	Units
B211230-BLK1	0.00	µg/L
B211230-BLK2	0.00	µg/L
B211230-BLK3	0.00	µg/L
B211230-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: SeCN

Sample	Result	Units
B211230-BLK1	0.00	µg/L
B211230-BLK2	0.00	µg/L
B211230-BLK3	0.00	µg/L
B211230-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.010

MDL: 0.002
MRL: 0.010

Analyte: SeMet

Sample	Result	Units
B211230-BLK1	0.00	µg/L
B211230-BLK2	0.00	µg/L
B211230-BLK3	0.00	µg/L
B211230-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Method Blanks & Reporting Limits

Analyte: SeSO3

Sample	Result	Units
B211230-BLK1	0.00	µg/L
B211230-BLK2	0.00	µg/L
B211230-BLK3	0.00	µg/L
B211230-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: Unk Se Sp

Sample	Result	Units
B211230-BLK1	0.00	µg/L
B211230-BLK2	0.00	µg/L
B211230-BLK3	0.00	µg/L
B211230-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Method Blanks & Reporting Limits

Batch: B211251
Matrix: Water
Method: EPA 1638 Mod
Analyte: Se

Sample	Result	Units
B211251-BLK1	-0.073	µg/L
B211251-BLK2	-0.067	µg/L
B211251-BLK3	-0.068	µg/L
B211251-BLK4	-0.096	µg/L
B211251-BLK5	-0.136	µg/L

Average: -0.088
Limit: 0.480

MDL: 0.180
MRL: 0.480

Sample Containers

Lab ID: 2105072-01
Sample: RG_LI24_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/26/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-02
Sample: RG_LI24_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/26/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-03
Sample: RG_LI24_WS_LAEMP_LCO_2021-04_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/26/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-04
Sample: RG_SLINE_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/26/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Sample Containers

Lab ID: 2105072-05
Sample: RG_SLINE_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/26/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-06
Sample: RG_SLINE_WS_LAEMP_LCO_2021-04_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/26/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-07
Sample: RG_LISP24_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/27/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-08
Sample: RG_LISP24_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/27/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Sample Containers

Lab ID: 2105072-09
Sample: RG_LISP24_WS_LAEMP_LCO_2021-04_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/27/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-10
Sample: RG_LILC3_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/27/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-11
Sample: RG_LILC3_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/27/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-12
Sample: RG_LILC3_WS_LAEMP_LCO_2021-04_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/27/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072

Sample Containers

Lab ID: 2105072-13
Sample: RG_LCUT_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/27/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-14
Sample: RG_LCUT_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/27/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-15
Sample: RG_LCUT_WS_LAEMP_LCO_2021-04_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/27/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-16
Sample: RG_RIVER_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/27/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Sample Containers

Lab ID: 2105072-17
Sample: RG_RIVER_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/27/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-18
Sample: RG_RIVER_WS_LAEMP_LCO_2021-04_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/27/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-19
Sample: RG_LI8_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/28/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-20
Sample: RG_LI8_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/28/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Sample Containers

Lab ID: 2105072-21 **Report Matrix:** WS **Collected:** 04/28/2021
Sample: RG_LI8_WS_LAEMP_LCO_2021-04_NP **Sample Type:** Sample + Sum **Received:** 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-22 **Report Matrix:** WS **Collected:** 04/28/2021
Sample: RG_FO23_WS_LAEMP_LCO_2021-04_NP_NAL **Sample Type:** Sample + Sum **Received:** 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-23 **Report Matrix:** WS **Collected:** 04/28/2021
Sample: RG_FO23_WS_LAEMP_LCO_2021-04_NP_NAL **Sample Type:** Sample + Sum **Received:** 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-24 **Report Matrix:** WS **Collected:** 04/28/2021
Sample: RG_FO23_WS_LAEMP_LCO_2021-04_NP **Sample Type:** Sample + Sum **Received:** 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072

Sample Containers

Lab ID: 2105072-25
Sample: RG_FRUL_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/28/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-26
Sample: RG_FRUL_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/28/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-27
Sample: RG_FRUL_WS_LAEMP_LCO_2021-04_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/28/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-28
Sample: RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/29/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Sample Containers

Lab ID: 2105072-29
Sample: RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/29/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105072

Lab ID: 2105072-30
Sample: RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 04/29/2021
Received: 05/06/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2105072

Shipping Containers

Styrofoam Cooler #1 - 2105072

Received: May 6, 2021 7:00
Tracking No: PAPS#RWHV84877 via Courier
Coolant Type: Blue Ice
Temperature: 0.6 °C

Description: Styrofoam Cooler #1
Damaged in transit? No
Returned to client? No
Comments: IR# 30

Custody seals present? No
Custody seals intact? No
COC present? Yes

COC ID: Regional Effects Program | **TURNAROUND TIME:** Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Regional Effects Program			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Cait Good			Lab Contact	Lyuda Shvets			Email 1:	cait.good@teck.com	x		x
Email	cait.good@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	carlie.meyer@teck.com	x		x
Address	421 Pine Avenue			Address	2559 29 Street NE			Email 3:	teckcoal@equisonline.com			x
								Email 4:	kbatchelar@minnow.ca			x
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 5:	Carla.FroymanParker@teck.com	x	x	x
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada		Tyler.mehler@minnow.ca			
Phone Number	250-425-8202			Phone Number	403-407-1800			PO number	VPO[redacted] 74851O			

SAMPLE DETAILS								ANALYSIS REQUESTED (Filtered - F: Field, L: Lab, FL: Field & Lab, N: None)											
								FIL	N	Y	N	Y	Y	N	N				
								PRESERV.	NONE	H2SO4	H2SO4	HCl	HNO3	HNO3	NONE				
Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	Total Selenium	Dissolved Selenium	Selenium Speciation								
RG_LI24_WS_LAEMP_LCO_2021-04_NP_NAL	RG_LI24	WS	NO	2021/04/26	11:05	G	2		x	x									
RG_LI24_WS_LAEMP_LCO_2021-04_NP	RG_LI24	WS	NO	2021/04/26	11:05	G	1				x								
RG_SLINE_WS_LAEMP_LCO_2021-04_NP_NAL	RG_SLINE	WS	NO	2021/04/26	14:15	G	2		x	x									
RG_SLINE_WS_LAEMP_LCO_2021-04_NP	RG_SLINE	WS	NO	2021/04/26	14:15	G	1				x								
RG_LISP24_WS_LAEMP_LCO_2021-04_NP_NAL	RG_LISP24	WS	NO	2021/04/27	14:40	G	2		x	x									
RG_LISP24_WS_LAEMP_LCO_2021-04_NP	RG_LISP24	WS	NO	2021/04/27	14:40	G	1				x								
RG_LILC3_WS_LAEMP_LCO_2021-04_NP_NAL	RG_LILC3	WS	NO	2021/04/27	12:46	G	2		x	x									
RG_LILC3_WS_LAEMP_LCO_2021-04_NP	RG_LILC3	WS	NO	2021/04/27	12:46	G	1				x								
RG_LCUT_WS_LAEMP_LCO_2021-04_NP	RG_LCUT	WS	NO	2021/04/27	11:00	G	1				x								
RG_LCUT_WS_LAEMP_LCO_2021-04_NP_NAL	RG_LCUT	WS	NO	2021/04/27	11:00	G	2		x	x									

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Line Creek LAMEP - VPO[redacted]. 74851O Samples for total selenium have been preserved in the field. Dissolved selenium have been filtered and preserved. Speciation samples have been filtered and frozen.	Rick Smit/Lotic environmental	2021/04/29/0930	Julia Jonsson	
	Julia Jonsson	05/04/2021	[signature]	5/6/21 7:00

SERVICE REQUEST (rush - subject to availability)					
Regular (default) X	Sampler's Name	Rick Smit	Mobile #	403-586-3241	
Priority (2-3 business days) - 50% surcharge					
Emergency (1 Business Day) - 100% surcharge	Sampler's Signature	[signature]	Date/Time	2021/04/29 / 0930	
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

Teck

COC ID: Regional Effects Program | **TURNAROUND TIME:** Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Regional Effects Program			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Cait Good			Lab Contact	Lyuda Shvets			Email 1:	cait.good@teck.com	x	x	x
Email	cait.good@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	carlie.meyer@teck.com	x	x	x
Address	421 Pine Avenue			Address	2559 29 Street NE			Email 3:	teckcoal@equisonline.com			x
								Email 4:	kbatchelar@minnow.ca	x	x	x
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 5:	Carla.FroymanParker@teck.com	x	x	x
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada		Tyler, mahler@minnow.ca	x	x	x
Phone Number	250-425-8202			Phone Number	403-407-1800			PO number	VPO [redacted] 74 8510			

SAMPLE DETAILS / **ANALYSIS REQUESTED** (Filtered - F: Field, L: Lab, FL: Field & Lab, N: None)

Sample ID	Sample Location (sys loc code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS: Total Selenium	Dissolved Selenium	Selenium Speciation							
								FIL	N	Y	N	Y	Y	N	N		
								PRESERV.	NONE	H2SO4	H2SO4	HCl	HNO3	HNO3	NONE		
RG_RIVER_LS_LAEMP_LCO_2021-04_NP_NAL	RG_RIVER	WS	NO	2021/04/27	10:00	G	2	x	x								
RG_RIVER_WS_LAEMP-LCO_2021-04_NP	RG_RIVER	WS	NO	2021/04/27	10:00	G	1			x							
RG_LI 8_WS_LAEMP_LCO_2021-04_NP_NAL	RG_LI 8	WS	NO	2021/04/28	14:20	G	2	x	x								
RG_LI 8_WS_LAEMP_LCO_2021-04_NP	RG_LI 8	WS	NO	2021/04/28	14:20	G	1			x							
RG_F023_WS_LAEMP_LCO_2021-04_NP_NAL	RG_F023	WS	NO	2021/04/28	11:50	G	2	x	x								
RG_F023_WS_LAEMP_LCO_2021-04_NP	RG_F023	WS	NO	2021/04/28	11:50	G	1			x							
RG_FRUL_WS_LAEMP_LCO_2021-04_NP_NAL	RG_FRUL	WS	NO	2021/04/28	9:50	G	2	x	x								
RG_FRUL_WS_LAEMP_LCO_2021-04_NP	RG_FRUL	WS	NO	2021/04/28	9:50	G	1			x							
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP	RG_LIDCOM	WS	NO	2021/04/29	08:40	G	1			x							
RG_LIDCOM_WS_LAEMP_LCO_2021-04_NP_NAL	RG_LIDCOM	WS	NO	2021/04/29	08:40	G	2	x	x								

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Line Creek LAMEP - VPO[redacted]74 8510 Samples for total selenium have been preserved in the field. Dissolved selenium have been filtered and preserved. Speciation samples have been filtered and frozen.	Ricky Smit / Lotic environmental	2021/04/29 / 09:30	Julia Johnson	
	Julia Johnson	05/04/2021	[signature]	5/6/21 7:00

SERVICE REQUEST (rush - subject to availability)

Regular (default)	X
Priority (2-3 business days) - 50% surcharge	
Emergency (1 Business Day) - 100% surcharge	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	

Sampler's Name	Ricky Smit	Mobile #	403-586-3241
Sampler's Signature	[signature]	Date/Time	2021 04 29 / 09:30

STRAIGHT BILL OF LADING
NOT NEGOTIABLE

RW HOT SHOT SERVICE INC.
250-425-7447
24 Hour Hot Shot Service

No. 84877

Sparwood, BC
Terrace, BC
Red Deer, AB

Vancouver, BC
Calgary, AB
Montreal, QC

Prince George, BC
Edmonton, AB
Spokane, WA

Elkford, BC
Ft. McMurray, AB
Shelby, MT

Tumbler Ridge, BC
Hinton, AB
Gillette, WY

DATE May 5/21

INVOICE TO

PURCHASE ORDER NUMBER

BILL OF LADING #

CONSIGNEE (TO) ALS Labs Applied Labs

SHIPPER (FROM) Coal Ltd

STREET West Line Creek Treatment

STREET 8081 N Creek Parkway

CITY/PROVINCE Tumbler Ridge BC

POSTAL CODE

CITY/PROVINCE Bothell WA

POSTAL CODE

SPECIAL INSTRUCTIONS

PACKAGES	DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)
2	Coolers - Water Samples	80 LBS

PAPS# RWHV84877

UNIT #

DECLARED VALUATION: Maximum liability of carrier is $2.00 per lb. ($4.41 per kilogram) unless declared valuation states otherwise. $

DRIVER'S SIGNATURE - PICK UP BY | PICK UP TIME | DRIVER'S SIGNATURE - DELIVERY BY | FINISH TIME

FREIGHT CHARGES
SHIPPER TO CHECK
☐PREPAID ☐COLLECT
If not indicated, shipping will automatically move collect

FEE
WAITING
XPU
CHARGES
FSC
US
SUB TOTAL
GST
TOTAL $
IF AT OWNER'S RISK, WRITE ORD HERE

NOTICE OF CLAIM: (a) No carrier is liable for loss, damage or delay of any goods under the Bill of Lading unless notice, therefor setting out particulars of the origin, destination and date of shipment and the estimated amount claimed in respect of such loss, damage or delay is given in writing to the originating carrier or the delivering carrier within sixty (60) days after the delivery of the goods or failure to make delivery. (b) The final statement of the claim must be filed within nine (9) months from the date of shipment together with all documents in support thereof. RECEIVED at the point of origin on the date specified from the consignor mentioned herein, the property herein described, in apparent good order, except as noted (contents and condition of contents of packages unknown) marked, consigned and destined as indicated below, which the carrier agrees to carry and to deliver to the consignee at the said destination, subject to the rates and classifications in effect on the date of shipment. It is mutually agreed, as to each carrier of all or any of the goods over all or any portion of the route to destination, and as to each party of any time interested in any of the goods that every service to be performed hereunder shall be subject to all the conditions standard Bill of Lading, in power at the date of issuing, which are hereby agreed by the consignor and accepted for himself and his assigns. The Contract for the carriage of the goods listed in the Bill of Lading is governed by regulation in force in the jurisdiction at the time and place of shipment and is subject to the conditions set out in such conditions

SHIPPER PRINT	CONSIGNEE PRINT	DATE
SHIPPER SIGN	CONSIGNEE SIGN	TIME

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROAD: Shipper

GST # 864540398RT0001

NUMBER OF PIECES RECEIVED

ALGOS PRINTING

Cooler ID: Styrofoam Cooler #1 **COC (Y/N)** Y **Temperature:** 0.6 **IR:** 30

Coolant Type: Ice Blue Ice Ambient

Notes:

Sampling Locations:	GH		BG		LC						
Sample Types:	T/D	SP	T/D	SP	T/D	SP	T/D	SP	T/D	SP	
Container Types:	120mL	120mL	120mL		120mL						

Opened By: CVL **Date:** 5/6/21

Effective 7/29/20

COPY

Revision 004

SELENIUM SPECIATION

BAL Final Report 2107238

(Finalized August 5, 2021)

BROOKS APPLIED LABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

August 5, 2021

Teck Resources Limited - Vancouver
Cait Good
421 Pine Avenue
Sparwood, B.C. CANADA V0B2G0
Cait.Good@teck.com

Re: Regional Effects Program

Dear Cait Good,

On July 22, 2021, Brooks Applied Labs (BAL) received twenty-two (22) aqueous samples.

The samples were logged-in for total recoverable selenium [*Se*], dissolved Se [*Se*], and Se speciation analyses, according to the chain-of-custody (COC) forms. The sample fractions logged in for Se speciation and dissolved Se had been field-filtered prior to receipt at BAL; sample fractions for total recoverable and dissolved Se had also been preserved by the client prior to receipt. All samples were stored according to BAL SOPs.

Total Recoverable and Dissolved Se
Each aqueous sample fraction for total recoverable or dissolved Se was digested in a closed vessel (bomb) with nitric and hydrochloric acids. The resulting digests were analyzed for Se content via inductively coupled plasma triple quadrupole mass spectrometry (ICP-QQQ-MS). The ICP-QQQ-MS instrumentation uses advanced interference removal techniques to ensure accuracy of the sample results. For more information, please visit the *Interference Reduction Technology* section on our website, brooksapplied.com.

Se Speciation
Each aqueous sample was analyzed for Se speciation using ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Selenium species are chromatographically separated on an ion exchange column and then quantified using inductively coupled plasma collision reaction cell mass spectrometry (ICP-CRC-MS); for more information on this determinative technique, please visit the *Interference Reduction Technology* section on our website. The chromatographic method applied for the analyses provides greater retention of methylseleninic acid and selenomethionine, allowing for more definitive quantitation of these species.

In accordance with the quotation issued for this project, Se speciation was defined as dissolved selenite [*Se(IV)*], selenate [*Se(VI)*], selenocyanate [*SeCN*], methylseleninic acid [*MeSe(IV)*], methaneselenonic acid [*MeSe(VI)*], selenomethionine [*SeMet*], selenosulfate [$SeSO_3$], and dimethylselenoxide [*DMSeO*]. Unknown Se species was defined as the total concentration of all unknown Se species observed during the analysis. This item is identified on the report as [*Unk Se Sp*].

DMSeO elutes early in the chromatographic run due to the nature of the molecule and the applied chromatographic separation method. Since this species elutes near the dead volume, additional

Se species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting Se species.

Chromatographic interference, as indicated by an elevated baseline, or co-eluting peak, was observed for selenosulfate in several client samples. Due to potential bias in the obtained results, the affected data have been qualified as estimates (**J-1**). Upon client request, Brooks Applied Labs can apply a higher dilution to these samples to potentially mitigate the chromatographic interferences, but a higher dilution would elevate the detection limit for SeMet above the client's requested limit of 0.010µg/L.

The results were not method blank corrected, as described in the calculations section of the relevant BAL SOPs and were evaluated using reporting limits adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific method detection limits (MDLs), MRLs, and other details.

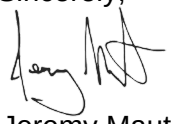
In instances when a matrix spike/matrix spike duplicate (MS/MSD) set was spiked at a level less than the native sample concentration, the recoveries, and the relative percent difference (RPD) are not considered valid indicators of data quality. In such instances, the recoveries of the laboratory fortified blanks (BS) and/or standard reference materials (SRM) demonstrate the accuracy of the applied methods. When the spiking level was less than 25% of the native sample concentration, the spike recovery was not reported (**NR**) and the RPD of the MS/MSD set was not calculated (**N/C**).

Except for items note above and concentration qualifiers, all data were reported without qualification. All associated quality control sample results met the acceptance criteria.

BAL, an accredited laboratory, certifies that the reported results of all analyses for which BAL is NELAP accredited met all NELAP requirements. For more information, please see the Report Information page.

Please feel free to contact us if you have any questions regarding this report.

Sincerely,



Jeremy Maute
Senior Project Manager
Brooks Applied Labs
Jeremy@brooksapplied.com

Report Information

Laboratory Accreditation

BAL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BAL is also certified by many other states to perform environmental analyses. For a current list of our accreditations/certifications, please visit our website at <http://www.brooksapplied.com/resources/certificates-permits/> or review Tables 1 and 2 in our Accreditation Information. Results reported relate only to the samples listed in the report.

Field Quality Control Samples

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

Common Abbreviations

AR	as received
BAL	Brooks Applied Labs
BLK	method blank
BS	blank spike
CAL	calibration standard
CCB	continuing calibration blank
CCV	continuing calibration verification
COC	chain of custody record
D	dissolved fraction
DUP	duplicate
IBL	instrument blank
ICV	initial calibration verification
MDL	method detection limit
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
ND	non-detect
NR	non-reportable
N/C	not calculated
PS	post preparation spike
REC	percent recovery
RPD	relative percent difference
SCV	secondary calibration verification
SOP	standard operating procedure
SRM	reference material
T	total fraction
TR	total recoverable fraction

Definition of Data Qualifiers

(Effective 3/23/2020)

E	An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
H	Holding time and/or preservation requirements not met. Please see narrative for explanation.
J	Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
J-1	Estimated value. A full explanation is presented in the narrative.
M	Duplicate precision (RPD) was not within acceptance criteria. Please see narrative for explanation.
N	Spike recovery was not within acceptance criteria. Please see narrative for explanation.
R	Rejected, unusable value. A full explanation is presented in the narrative.
U	Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
X	Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.
Z	Holding time and/or preservation requirements not established for this method; however, BAL recommendations for holding time were not followed. Please see narrative for explanation.

These qualifiers are based on those previously utilized by Brooks Applied Labs, those found in the EPA SOW ILM03.0, Exhibit B, Section III, pg. B-18, and the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review; USEPA; January 2010. These supersede all previous qualifiers ever employed by BAL.

Accreditation Information

Table 1. Accredited method/matrix/analytes for TNI

Issued by: State of Florida Dept. of Health (The NELAC Institute 2016 Standard)
Issued on: July 27, 2020; Valid to: June 30, 2021
Certificate Number: E87982-35

Method	Matrix	TNI Accredited Analyte(s)
EPA 1638	Non-Potable Waters	Ag, Cd, Cu, Ni, Pb, Sb, Se, Tl, Zn
EPA 200.8	Non-Potable Waters	Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
EPA 6020	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
	Solids/Chemicals & Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
BAL-5000	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn, Hardness
	Solids/Chemicals	Ag, As, B, Be, Cd, Co, Cr, Cu, Pb, Mo, Ni, Sb, Se, Sn, Sr, Tl, V, Zn
	Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Tl, V, Zn
EPA 1640	Non-Potable Waters	Ag, As, Cd, Cu, Pb, Ni, Zn
EPA 1631E	Non-Potable Waters, Solids/Chemicals & Biological	Total Mercury
EPA 1630	Non-Potable Waters	Methyl Mercury
BAL-3200	Solids/Chemicals & Biological	Methyl Mercury
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs
BAL-4200	Non-Potable Waters	Se(IV), Se(VI)
BAL-4201	Non-Potable Waters	Se(IV), Se(VI)
BAL-4300	Non-Potable Waters Solid/Chemicals	Cr(VI)
SM2340B	Non-Potable Waters	Hardness

Accreditation Information

Table 2. Accredited method/matrix/analytes for ISO (1), Non-Governmental TNI (2), and DoD/DOE (3)

Issued by: ANAB

Issued on: November 20, 2020; Valid to: March 20, 2022

Method	Matrix	ISO and Non-Gov. TNI Accredited Analyte(s)	DoD/DOE Accredited Analytes
EPA 1638 Mod EPA 200.8 Mod EPA 6020 Mod	Non-Potable Waters	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn	Ag, Al, As, Ba, Ca, Cd, Cr, Cu, Fe, Pb, Mg, Mn, Ni, Sb, Se, V, Zn
BAL-5000	Solids/Chemicals & Biological	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, V, Zn Hg (Biological Only)	Not Accredited
EPA 1640 Mod	Non-Potable Waters	Ag, As, Cd, Cu, Pb, Ni, Zn Cr, Co, Se, Tl, V (ISO Only)	Not Accredited
EPA 1631E Mod BAL-3100 (waters)	Non-Potable Waters, Solids/Chemicals & Biological/Food	Total Mercury	Total Mercury
EPA 1630 Mod BAL-3200	Non-Potable Waters, Solids/Chemicals Biological	Methyl Mercury	Methyl Mercury (excluding Solids/Chemicals)
EPA 1632A Mod BAL-3300	Non-Potable Waters	Inorganic Arsenic, As(III) (ISO Only)	Not Accredited
	Biological/Food Solids/Chemicals	Inorganic Arsenic (ISO Only)	Not Accredited
AOAC 2015.01 Mod BAL-5000 by BAL-5040	Food	As, Cd, Hg, Pb	Not Accredited
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs	Not Accredited
	Biological by BAL-4115	Inorganic Arsenic, DMAs, MMAs (ISO Only)	Not Accredited
BAL-4101	Food by BAL-4116	Inorganic Arsenic, DMAs, MMAs (ISO Only)	Not Accredited
BAL-4201	Non-Potable Waters	Se(IV), Se(VI), SeCN, SeMet	Not Accredited
BAL-4300	Non-Potable Waters, Solid/Chemicals	Cr(VI)	Cr(VI)
SM 3500-Fe BAL-4500	Non-Potable Waters	Fe, Fe(II) (ISO Only)	Not Accredited
SM2340B	Non-Potable Waters	Hardness	Hardness
SM 2540G EPA 160.3 BAL-0501	Solids/Chemicals & Biological	% Dry Weight	% Dry Weight

(1) ISO/IEC 17025:2017 – Certificate Number ADE-1447.2

(2) Non-Governmental NELAC Institute 2016 Standard – Certificate Number ADE-1447.1

(3) Department of Defense/Energy Consolidated Quality Systems Manual v. 5.3 – Certificate Numbers ADE-1447 for DoD, ADE-1447.3 for DOE.

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
RG_LI24_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-01	WS	Sample	07/13/2021	07/22/2021
RG_LI24_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-02	WS	Sample	07/13/2021	07/22/2021
RG_LI24_WS_LAEMP_LCO_2021-07_NP	2107238-03	WS	Sample	07/13/2021	07/22/2021
RG_SLINE_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-04	WS	Sample	07/13/2021	07/22/2021
RG_SLINE_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-05	WS	Sample	07/13/2021	07/22/2021
RG_SLINE_WS_LAEMP_LCO_2021-07_NP	2107238-06	WS	Sample	07/13/2021	07/22/2021
RG_LISP24_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-07	WS	Sample	07/12/2021	07/22/2021
RG_LISP24_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-08	WS	Sample	07/12/2021	07/22/2021
RG_LISP24_WS_LAEMP_LCO_2021-07_NP	2107238-09	WS	Sample	07/12/2021	07/22/2021
RG_LILC3_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-10	WS	Sample	07/12/2021	07/22/2021
RG_LILC3_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-11	WS	Sample	07/12/2021	07/22/2021
RG_LILC3_WS_LAEMP_LCO_2021-07_NP	2107238-12	WS	Sample	07/12/2021	07/22/2021
RG_LCUT_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-13	WS	Sample	07/12/2021	07/22/2021
RG_LCUT_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-14	WS	Sample	07/12/2021	07/22/2021
RG_LCUT_WS_LAEMP_LCO_2021-07_NP	2107238-15	WS	Sample	07/12/2021	07/22/2021
RG_RIVER_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-16	WS	Sample	07/12/2021	07/22/2021
RG_RIVER_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-17	WS	Sample	07/12/2021	07/22/2021
RG_RIVER_WS_LAEMP_LCO_2021-07_NP	2107238-18	WS	Sample	07/12/2021	07/22/2021
RG_LI8_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-19	WS	Sample	07/15/2021	07/22/2021
RG_LI8_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-20	WS	Sample	07/15/2021	07/22/2021
RG_LI8_WS_LAEMP_LCO_2021-07_NP	2107238-21	WS	Sample	07/15/2021	07/22/2021

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
RG_FO23_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-22	WS	Sample	07/14/2021	07/22/2021
RG_FO23_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-23	WS	Sample	07/14/2021	07/22/2021
RG_FO23_WS_LAEMP_LCO_2021-07_NP	2107238-24	WS	Sample	07/14/2021	07/22/2021
RG_FRUL_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-25	WS	Sample	07/14/2021	07/22/2021
RG_FRUL_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-26	WS	Sample	07/14/2021	07/22/2021
RG_FRUL_WS_LAEMP_LCO_2021-07_NP	2107238-27	WS	Sample	07/14/2021	07/22/2021
RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-28	WS	Sample	07/12/2021	07/22/2021
RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-29	WS	Sample	07/12/2021	07/22/2021
RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP	2107238-30	WS	Sample	07/12/2021	07/22/2021
RG_LIDSL_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-31	WS	Sample	07/14/2021	07/22/2021
RG_LIDSL_WS_LAEMP_LCO_2021-07_NP_NAL	2107238-32	WS	Sample	07/14/2021	07/22/2021
RG_LIDSL_WS_LAEMP_LCO_2021-07_NP	2107238-33	WS	Sample	07/14/2021	07/22/2021

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	07/21/2021	07/22/2021	B212015	S210835
MeSe(IV)	Water	SOP BAL-4201	07/21/2021	07/22/2021	B212015	S210835
MeSe(VI)	Water	SOP BAL-4201	07/21/2021	07/22/2021	B212015	S210835
Se	Water	EPA 1638 Mod	07/22/2021	07/24/2021	B212021	S210842
Se	Water	EPA 1638 Mod	07/27/2021	07/29/2021	B212074	S210853
Se(IV)	Water	SOP BAL-4201	07/21/2021	07/22/2021	B212015	S210835
Se(VI)	Water	SOP BAL-4201	07/21/2021	07/22/2021	B212015	S210835
SeCN	Water	SOP BAL-4201	07/21/2021	07/22/2021	B212015	S210835
SeMet	Water	SOP BAL-4201	07/21/2021	07/22/2021	B212015	S210835
SeSO3	Water	SOP BAL-4201	07/21/2021	07/22/2021	B212015	S210835
Unk Se Sp	Water	SOP BAL-4201	07/21/2021	07/22/2021	B212015	S210835

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LI24_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-01	Se	WS	TR	2.22		0.165	0.528	µg/L	B212021	S210842
RG_LI24_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-02	Se	WS	D	2.29		0.165	0.528	µg/L	B212021	S210842
RG_LI24_WS_LAEMP_LCO_2021-07_NP										
2107238-03	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-03	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-03	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-03	Se(IV)	WS	D	0.015	J	0.010	0.075	µg/L	B212015	S210835
2107238-03	Se(VI)	WS	D	2.04		0.010	0.055	µg/L	B212015	S210835
2107238-03	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212015	S210835
2107238-03	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-03	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212015	S210835
2107238-03	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212015	S210835
RG_SLINE_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-04	Se	WS	TR	0.976		0.165	0.528	µg/L	B212021	S210842
RG_SLINE_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-05	Se	WS	D	0.899		0.165	0.528	µg/L	B212021	S210842
RG_SLINE_WS_LAEMP_LCO_2021-07_NP										
2107238-06	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-06	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-06	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-06	Se(IV)	WS	D	0.014	J	0.010	0.075	µg/L	B212015	S210835
2107238-06	Se(VI)	WS	D	0.887		0.010	0.055	µg/L	B212015	S210835
2107238-06	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212015	S210835
2107238-06	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-06	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212015	S210835
2107238-06	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212015	S210835
RG_LISP24_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-07	Se	WS	TR	24.6		0.165	0.528	µg/L	B212021	S210842
RG_LISP24_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-08	Se	WS	D	26.8		0.165	0.528	µg/L	B212021	S210842

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LISP24_WS_LAEMP_LCO_2021-07_NP										
2107238-09	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-09	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-09	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-09	Se(IV)	WS	D	0.080		0.010	0.075	µg/L	B212015	S210835
2107238-09	Se(VI)	WS	D	23.5		0.010	0.055	µg/L	B212015	S210835
2107238-09	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212015	S210835
2107238-09	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-09	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	µg/L	B212015	S210835
2107238-09	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212015	S210835
RG_LILC3_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-10	Se	WS	TR	35.0		0.165	0.528	µg/L	B212021	S210842
RG_LILC3_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-11	Se	WS	D	33.8		0.165	0.528	µg/L	B212021	S210842
RG_LILC3_WS_LAEMP_LCO_2021-07_NP										
2107238-12	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-12	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-12	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-12	Se(IV)	WS	D	0.094		0.010	0.075	µg/L	B212015	S210835
2107238-12	Se(VI)	WS	D	35.2		0.010	0.055	µg/L	B212015	S210835
2107238-12	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212015	S210835
2107238-12	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-12	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	µg/L	B212015	S210835
2107238-12	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212015	S210835
RG_LCUT_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-13	Se	WS	TR	49.4		0.165	0.528	µg/L	B212021	S210842
RG_LCUT_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-14	Se	WS	D	48.3		0.165	0.528	µg/L	B212021	S210842

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LCUT_WS_LAEMP_LCO_2021-07_NP										
2107238-15	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-15	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-15	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-15	Se(IV)	WS	D	0.080		0.010	0.075	µg/L	B212015	S210835
2107238-15	Se(VI)	WS	D	46.7		0.010	0.055	µg/L	B212015	S210835
2107238-15	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212015	S210835
2107238-15	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-15	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	µg/L	B212015	S210835
2107238-15	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212015	S210835
RG_RIVER_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-16	Se	WS	TR	34.5		0.165	0.528	µg/L	B212021	S210842
RG_RIVER_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-17	Se	WS	D	35.9		0.165	0.528	µg/L	B212021	S210842
RG_RIVER_WS_LAEMP_LCO_2021-07_NP										
2107238-18	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-18	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-18	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-18	Se(IV)	WS	D	0.099		0.010	0.075	µg/L	B212015	S210835
2107238-18	Se(VI)	WS	D	34.1		0.010	0.055	µg/L	B212015	S210835
2107238-18	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212015	S210835
2107238-18	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-18	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	µg/L	B212015	S210835
2107238-18	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212015	S210835
RG_LI8_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-19	Se	WS	TR	22.8		0.165	0.528	µg/L	B212021	S210842
RG_LI8_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-20	Se	WS	D	21.8		0.165	0.528	µg/L	B212021	S210842

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LI8_WS_LAEMP_LCO_2021-07_NP										
2107238-21	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-21	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-21	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-21	Se(IV)	WS	D	0.041	J	0.010	0.075	µg/L	B212015	S210835
2107238-21	Se(VI)	WS	D	21.1		0.010	0.055	µg/L	B212015	S210835
2107238-21	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212015	S210835
2107238-21	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-21	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	µg/L	B212015	S210835
2107238-21	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212015	S210835
RG_FO23_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-22	Se	WS	TR	30.6		0.165	0.528	µg/L	B212021	S210842
RG_FO23_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-23	Se	WS	D	32.1		0.165	0.528	µg/L	B212021	S210842
RG_FO23_WS_LAEMP_LCO_2021-07_NP										
2107238-24	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-24	MeSe(IV)	WS	D	0.016	J	0.010	0.025	µg/L	B212015	S210835
2107238-24	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-24	Se(IV)	WS	D	0.194		0.010	0.075	µg/L	B212015	S210835
2107238-24	Se(VI)	WS	D	30.8		0.010	0.055	µg/L	B212015	S210835
2107238-24	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212015	S210835
2107238-24	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-24	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	µg/L	B212015	S210835
2107238-24	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212015	S210835
RG_FRUL_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-25	Se	WS	TR	37.6		0.165	0.528	µg/L	B212021	S210842
RG_FRUL_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-26	Se	WS	D	35.9		0.165	0.528	µg/L	B212021	S210842

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_FRUL_WS_LAEMP_LCO_2021-07_NP										
2107238-27	DMSeO	WS	D	0.013	J	0.010	0.025	µg/L	B212015	S210835
2107238-27	MeSe(IV)	WS	D	0.018	J	0.010	0.025	µg/L	B212015	S210835
2107238-27	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-27	Se(IV)	WS	D	0.251		0.010	0.075	µg/L	B212015	S210835
2107238-27	Se(VI)	WS	D	35.8		0.010	0.055	µg/L	B212015	S210835
2107238-27	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212015	S210835
2107238-27	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-27	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	µg/L	B212015	S210835
2107238-27	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212015	S210835
RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-28	Se	WS	TR	22.8		0.165	0.528	µg/L	B212021	S210842
RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-29	Se	WS	D	23.3		0.165	0.528	µg/L	B212021	S210842
RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP										
2107238-30	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-30	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-30	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-30	Se(IV)	WS	D	0.082		0.010	0.075	µg/L	B212015	S210835
2107238-30	Se(VI)	WS	D	22.3		0.010	0.055	µg/L	B212015	S210835
2107238-30	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212015	S210835
2107238-30	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-30	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	µg/L	B212015	S210835
2107238-30	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212015	S210835
RG_LIDSL_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-31	Se	WS	TR	24.3		0.165	0.528	µg/L	B212021	S210842
RG_LIDSL_WS_LAEMP_LCO_2021-07_NP_NAL										
2107238-32	Se	WS	D	25.8		0.165	0.528	µg/L	B212074	S210853

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LIDSL_WS_LAEMP_LCO_2021-07_NP										
2107238-33	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-33	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-33	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-33	Se(IV)	WS	D	0.078		0.010	0.075	µg/L	B212015	S210835
2107238-33	Se(VI)	WS	D	24.8		0.010	0.055	µg/L	B212015	S210835
2107238-33	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212015	S210835
2107238-33	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212015	S210835
2107238-33	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	µg/L	B212015	S210835
2107238-33	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212015	S210835

Accuracy & Precision Summary

Batch: B212015
Lab Matrix: Water
Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B212015-BS1	**Blank Spike, (2124033)**						
	MeSe(IV)		5.095	5.838	µg/L	115% 75-125	
	Se(IV)		5.000	5.072	µg/L	101% 75-125	
	Se(VI)		5.000	4.706	µg/L	94% 75-125	
	SeCN		5.015	4.917	µg/L	98% 75-125	
	SeMet		4.932	5.072	µg/L	103% 75-125	
B212015-DUP2	**Duplicate, (2107238-09)**						
	DMSeO	ND		ND	µg/L		N/C 25
	MeSe(IV)	ND		ND	µg/L		N/C 25
	MeSe(VI)	ND		ND	µg/L		N/C 25
	Se(IV)	0.080		0.080	µg/L		0.3% 25
	Se(VI)	23.52		23.45	µg/L		0.3% 25
	SeCN	ND		ND	µg/L		N/C 25
	SeMet	ND		ND	µg/L		N/C 25
	SeSO3	ND		ND	µg/L		N/C 25
	Unk Se Sp	ND		ND	µg/L		N/C 25
B212015-MS2	**Matrix Spike, (2107238-09)**						
	Se(IV)	0.080	4.900	4.953	µg/L	99% 75-125	
	Se(VI)	23.52	5.100	28.43	µg/L	NR 75-125	
	SeCN	ND	1.962	1.802	µg/L	92% 75-125	
	SeMet	ND	1.977	1.900	µg/L	96% 75-125	
B212015-MSD2	**Matrix Spike Duplicate, (2107238-09)**						
	Se(IV)	0.080	4.900	5.037	µg/L	101% 75-125	2% 25
	Se(VI)	23.52	5.100	28.74	µg/L	NR 75-125	N/C 25
	SeCN	ND	1.962	1.781	µg/L	91% 75-125	1% 25
	SeMet	ND	1.977	1.967	µg/L	100% 75-125	4% 25

Accuracy & Precision Summary

Batch: B212021
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B212021-BS1	**Blank Spike, (2104075)**						
	Se		200.0	172.2	µg/L	86% 75-125	
B212021-BS2	**Blank Spike, (2104075)**						
	Se		200.0	188.3	µg/L	94% 75-125	
B212021-SRM1	**Reference Material (2110005, TMDA 51.5 Reference Standard - Bottle 5 - SRM)**						
	Se		14.30	12.85	µg/L	90% 75-125	
B212021-SRM2	**Reference Material (2110005, TMDA 51.5 Reference Standard - Bottle 5 - SRM)**						
	Se		14.30	13.07	µg/L	91% 75-125	
B212021-DUP3	**Duplicate, (2107238-10)**						
	Se	35.00		36.73	µg/L		5% 20
B212021-MS3	**Matrix Spike, (2107238-10)**						
	Se	35.00	220.0	247.7	µg/L	97% 75-125	
B212021-MSD3	**Matrix Spike Duplicate, (2107238-10)**						
	Se	35.00	220.0	234.3	µg/L	91% 75-125	6% 20
B212021-DUP4	**Duplicate, (2107238-28)**						
	Se	22.82		25.74	µg/L		12% 20
B212021-MS4	**Matrix Spike, (2107238-28)**						
	Se	22.82	220.0	233.9	µg/L	96% 75-125	
B212021-MSD4	**Matrix Spike Duplicate, (2107238-28)**						
	Se	22.82	220.0	231.0	µg/L	95% 75-125	1% 20

Accuracy & Precision Summary

Batch: B212074
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B212074-BS1	**Blank Spike, (2104075)**						
	Se		200.0	187.2	µg/L	94% 75-125	
B212074-BS2	**Blank Spike, (2104075)**						
	Se		200.0	184.4	µg/L	92% 75-125	
B212074-BS3	**Blank Spike, (2104075)**						
	Se		200.0	193.5	µg/L	97% 75-125	
B212074-SRM1	**Reference Material (2110003, TMDA 51.5 Reference Standard - Bottle 3 - SRM)**						
	Se		14.30	13.43	µg/L	94% 75-125	
B212074-SRM2	**Reference Material (2110003, TMDA 51.5 Reference Standard - Bottle 3 - SRM)**						
	Se		14.30	13.37	µg/L	94% 75-125	
B212074-SRM3	**Reference Material (2110003, TMDA 51.5 Reference Standard - Bottle 3 - SRM)**						
	Se		14.30	15.28	µg/L	107% 75-125	
B212074-DUP1	**Duplicate, (2107239-01)**						
	Se	1.127		1.214	µg/L		7% 20
B212074-MS1	**Matrix Spike, (2107239-01)**						
	Se	1.127	220.0	221.8	µg/L	100% 75-125	
B212074-MSD1	**Matrix Spike Duplicate, (2107239-01)**						
	Se	1.127	220.0	213.5	µg/L	97% 75-125	4% 20

Method Blanks & Reporting Limits

Batch: B212015
Matrix: Water
Method: SOP BAL-4201
Analyte: DMSeO

Sample	Result	Units
B212015-BLK1	0.00	µg/L
B212015-BLK2	0.00	µg/L
B212015-BLK3	0.00	µg/L
B212015-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B212015-BLK1	0.00	µg/L
B212015-BLK2	0.00	µg/L
B212015-BLK3	0.00	µg/L
B212015-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(VI)

Sample	Result	Units
B212015-BLK1	0.00	µg/L
B212015-BLK2	0.00	µg/L
B212015-BLK3	0.00	µg/L
B212015-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Method Blanks & Reporting Limits

Analyte: Se(IV)

Sample	Result	Units
B212015-BLK1	0.00	µg/L
B212015-BLK2	0.00	µg/L
B212015-BLK3	0.00	µg/L
B212015-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Analyte: Se(VI)

Sample	Result	Units
B212015-BLK1	0.00	µg/L
B212015-BLK2	0.00	µg/L
B212015-BLK3	0.00	µg/L
B212015-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: SeCN

Sample	Result	Units
B212015-BLK1	0.00	µg/L
B212015-BLK2	0.00	µg/L
B212015-BLK3	0.00	µg/L
B212015-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.010

MDL: 0.002
MRL: 0.010

Analyte: SeMet

Sample	Result	Units
B212015-BLK1	0.00	µg/L
B212015-BLK2	0.00	µg/L
B212015-BLK3	0.00	µg/L
B212015-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Method Blanks & Reporting Limits

Analyte: SeSO3

Sample	Result	Units
B212015-BLK1	0.00	µg/L
B212015-BLK2	0.00	µg/L
B212015-BLK3	0.00	µg/L
B212015-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: Unk Se Sp

Sample	Result	Units
B212015-BLK1	0.00	µg/L
B212015-BLK2	0.00	µg/L
B212015-BLK3	0.00	µg/L
B212015-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Method Blanks & Reporting Limits

Batch: B212021
Matrix: Water
Method: EPA 1638 Mod
Analyte: Se

Sample	Result	Units
B212021-BLK1	0.038	µg/L
B212021-BLK2	0.042	µg/L
B212021-BLK3	0.058	µg/L
B212021-BLK4	0.040	µg/L

Average: 0.045
Limit: 0.480

MDL: 0.150
MRL: 0.480

Method Blanks & Reporting Limits

Batch: B212074
Matrix: Water
Method: EPA 1638 Mod
Analyte: Se

Sample	Result	Units
B212074-BLK1	0.145	µg/L
B212074-BLK2	0.131	µg/L
B212074-BLK3	0.124	µg/L
B212074-BLK4	0.104	µg/L

Average: 0.126
Limit: 0.480

MDL: 0.150
MRL: 0.480

Sample Containers

Lab ID: 2107238-01
Sample: RG_LI24_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/13/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-02
Sample: RG_LI24_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/13/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-03
Sample: RG_LI24_WS_LAEMP_LCO_2021-07_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/13/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-04
Sample: RG_SLINE_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/13/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Sample Containers

Lab ID: 2107238-05
Sample: RG_SLINE_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/13/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-06
Sample: RG_SLINE_WS_LAEMP_LCO_2021-07_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/13/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-07
Sample: RG_LISP24_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-08
Sample: RG_LISP24_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Sample Containers

Lab ID: 2107238-09
Sample: RG_LISP24_WS_LAEMP_LCO_2021-07_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-10
Sample: RG_LILC3_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-11
Sample: RG_LILC3_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-12
Sample: RG_LILC3_WS_LAEMP_LCO_2021-07_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238

Sample Containers

Lab ID: 2107238-13
Sample: RG_LCUT_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-14
Sample: RG_LCUT_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-15
Sample: RG_LCUT_WS_LAEMP_LCO_2021-07_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-16
Sample: RG_RIVER_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Sample Containers

Lab ID: 2107238-17
Sample: RG_RIVER_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-18
Sample: RG_RIVER_WS_LAEMP_LCO_2021-07_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-19
Sample: RG_LI8_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/15/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-20
Sample: RG_LI8_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/15/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Sample Containers

Lab ID: 2107238-21 **Report Matrix:** WS **Collected:** 07/15/2021
Sample: RG_LI8_WS_LAEMP_LCO_2021-07_NP **Sample Type:** Sample + Sum **Received:** 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-22 **Report Matrix:** WS **Collected:** 07/14/2021
Sample: RG_FO23_WS_LAEMP_LCO_2021-07_NP_NAL **Sample Type:** Sample + Sum **Received:** 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-23 **Report Matrix:** WS **Collected:** 07/14/2021
Sample: RG_FO23_WS_LAEMP_LCO_2021-07_NP_NAL **Sample Type:** Sample + Sum **Received:** 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-24 **Report Matrix:** WS **Collected:** 07/14/2021
Sample: RG_FO23_WS_LAEMP_LCO_2021-07_NP **Sample Type:** Sample + Sum **Received:** 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238

Sample Containers

Lab ID: 2107238-25
Sample: RG_FRUL_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/14/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-26
Sample: RG_FRUL_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/14/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-27
Sample: RG_FRUL_WS_LAEMP_LCO_2021-07_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/14/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-28
Sample: RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Sample Containers

Lab ID: 2107238-29
Sample: RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-30
Sample: RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/12/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-31
Sample: RG_LIDSL_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/14/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Lab ID: 2107238-32
Sample: RG_LIDSL_WS_LAEMP_LCO_2021-07_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/14/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2117016	<2	Styrofoam Cooler #3 - 2107238

Sample Containers

Lab ID: 2107238-33
Sample: RG_LIDSL_WS_LAEMP_LCO_2021-07_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 07/14/2021
Received: 07/22/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #3 - 2107238

Shipping Containers

Styrofoam Cooler #3 - 2107238

Received: July 22, 2021 7:00
Tracking No: PAPS#RWHV86596 via Courier
Coolant Type: Ice
Temperature: 2.1 °C

Description: Styrofoam Cooler
Damaged in transit? No
Returned to client? No
Comments: IR#31

Custody seals present? No
Custody seals intact? No
COC present? Yes

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BAL Final Report 2107238

COC ID: Regional Effects Program

TURNAROUND TIME: Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Regional Effects Program			Lab Name	ALS Calgary			Report Format / Distribution	Excel	PDF	EDD
Project Manager	Cait Good			Lab Contact	Lyuda Shvets			Email 1: cait.good@teck.com	X	X	X
Email	cait.good@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2: carlie.meyer@teck.com	X	X	X
Address	421 Pine Avenue			Address	2559 29 Street NE			Email 3: teckcoal@equisonline.com			X
								Email 4: tyler.mehler@minnow.ca	X	X	X
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 5: Carla.FroymanParker@teck.com	X	X	X
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada	Danika.Gerlo@teck.com	X	X	X
Phone Number	250-425-8202			Phone Number	403-407-1800			PO number	VPO[redacted] 748510		

SAMPLE DETAILS / **ANALYSIS REQUESTED** (Filtered - F: Field, L: Lab, FL: Field & Lab, N: None)

Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	FIL	PRESERV.	Total Selenium	Dissolved Selenium	Selenium Speciation						
										N	Y	Y	Y	Y	N	N		
										HNO3	HNO3	H2SO4	HCl	HNO3	HNO3	NONE		
										Total Selenium	Dissolved Selenium	Selenium Speciation						
RG_SLINE_WS_LAEMP_LCO_2021-07_NP_NAL	RG_SLINE	WS	NO	2021/07/13	08:35	G	2			X	X							
RG_SLINE_WS_LAEMP_LCO_2021-07_NP	RG_SLINE	WS	NO	2021/07/13	08:35	G	1					X						
RG_LI24_WS_LAEMP_LCO_2021-07_NP_NAL	RG_LI24	WS	NO	2021/07/13	12:55	G	2			X	X							
RG_LI24_WS_LAEMP_LCO_2021-07_NP	RG_LI24	WS	NO	2021/07/13	12:55	G	1					X						
RG_LCUT_WS_LAEMP_LCO_2021-07_NP_NAL	RG_LCUT	WS	NO	2021/07/12	09:15	G	2			X	X							
RG_LCUT_WS_LAEMP_LCO_2021-07_NP	RG_LCUT	WS	NO	2021/07/12	09:15	G	1					X						
RG_LILC3_WS_LAEMP_LCO_2021-07_NP_NAL	RG_LILC3	WS	NO	2021/07/12	11:15	G	2			X	X							
RG_LILC3_WS_LAEMP_LCO_2021-07_NP	RG_LILC3	WS	NO	2021/07/12	11:15	G	1					X						
RG_LISP24_WS_LAEMP_LCO_2021-07_NP_NAL	RG_LISP24	WS	NO	2021/07/12	13:30	G	2			X	X							
RG_LISP24_WS_LAEMP_LCO_2021-07_NP	RG_LISP24	WS	NO	2021/07/12	13:30	G	1					X						

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Line Creek LAMEP - VPO[redacted] 748510 **Samples for total selenium have been preserved in the field. Dissolved selenium have been filtered and preserved. Speciation samples have been filtered and frozen.**	Rick Smit / Lotic environmental	2021/07/15 / 10:00	July 15/21 S. Z (BAL) 7/22/21 7:50 AM	Brett Nelson

SERVICE REQUEST (rush - subject to availability)

Regular (default)	X
Priority (2-3 business days) - 50% surcharge	
Emergency (1 Business Day) - 100% surcharge	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	

Sampler's Name	Rick Smit	**Mobile #**	403-586-3241
Sampler's Signature	[signature]	**Date/Time**	2021 07 15 / 10:00

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COC ID: Regional Effects Program | **TURNAROUND TIME:** Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Regional Effects Program			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Cait Good			Lab Contact	Lyuda Shvets			Email 1:	cait.good@teck.com	X	X	X
Email	cait.good@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	[redacted]	X	X	X
Address	421 Pine Avenue			Address	2559 29 Street NE			Email 3:	teckcoal@equisonline.com			X
								Email 4:	tyler.mehler@minnow.ca	X	X	X
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 5:	Carla.FroymanParker@teck.com	X	X	X
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada		Danika.Gergely@teck.com	X	X	X
Phone Number	250-425-8202			Phone Number	403-407-1800			PO number	VPO[redacted] 74 8510			

SAMPLE DETAILS / **ANALYSIS REQUESTED**

Filtered - F: Field, L: Lab, FL: Field & Lab, N: None

Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	FIL.	N	Y	Y	Y	Y	N	N
								PRESERV.	HNO3	HNO3	H2SO4	HCl	HNO3	HNO3	NONE
								ANALYSIS	Total Selenium	Dissolved Selenium	Selenium Speciation				
RG_LI8_WS_LAEMP_LCO_2021-07_NP_NA	RG_LI8	WS	NO	2021/07/15	08:15	G	2		X	X					
RG_LI8_WS_LAEMP_LCO_2021-07_NP	RG_LI8	WS	NO	2021/07/15	08:15	G	1				X				
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									
		WS	NO			G									

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Line Creek LAMEP - VPO[redacted]. 74 8510 Samples for total selenium have been preserved in the field. Dissolved selenium have been filtered and preserved. Speciation samples have been filtered and frozen.	Rick Smit / Lotic environmental	2021/07/15 / 10:00	Brett Mason S.Z. (BAL)	July 15/21 7/22/21

SERVICE REQUEST (rush - subject to availability)

Regular (default)	X
Priority (2-3 business days) - 50% surcharge	
Emergency (1 Business Day) - 100% surcharge	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	

Sampler's Name	Rick Smit	Mobile #	403-586-3841
Sampler's Signature		Date/Time	2021/07/15 / 10:00

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BAL Final Report 2107238

COC ID: Regional Effects Program

TURNAROUND TIME: Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	Regional Effects Program			Lab Name	ALS Calgary			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Cait Good			Lab Contact	Lyuda Shvets			Email 1:	cait.good@teck.com	X	X	X
Email	cait.good@teck.com			Email	Lyudmyla.Shvets@ALSGlobal.com			Email 2:	[redacted]	X	X	X
Address	421 Pine Avenue			Address	2559 29 Street NE			Email 3:	tsckcoal@equisonline.com			X
								Email 4:	tyler.mehler@mlnnow.ca	X	X	X
City	Sparwood	Province	BC	City	Calgary	Province	AB	Email 5:	Carla.FroymanParker@teck.com	X	X	X
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada	Danika.Gerych@teckcom		X	X	X
Phone Number	250-425-8202			Phone Number	403-407-1800			PO number	VPO[redacted] 74 8510			

SAMPLE DETAILS								ANALYSIS REQUESTED												Filtered - F: Field, L: Lab, FL: Field & Lab, N: None
								FIL.	N	Y	Y	Y	Y	N	N					
								PRESERV.	HNO3	HNO3	H2SO4	HCl	HNO3	HNO3	NONE					
								ANALYSIS	Total Selenium	Dissolved Selenium	Selenium Speciation									
Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.													
RG_LIDSL_WS_LAEMP_LCO_2021-07_NP_NAL	RG_LIDSL	WS	NO	2021/07/14	14:00	G	2		X	X										
RG_LIDSL_WS_LAEMP_LCO_2021-07_NP	RG_LIDSL	WS	NO	2021/07/14	14:00	G	1				X									
RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP_NAL	RG_LIDCOM	WS	NO	2021/07/12	15:00	G	2		X	X										
RG_LIDCOM_WS_LAEMP_LCO_2021-07_NP	RG_LIDCOM	WS	NO	2021/07/12	15:00	G	1				X									
RG_RIVER_WS_LAEMP_LCO_2021-07_NP_NAL	RG_RIVER	WS	NO	2021/07/12	10:00	G	2		X	X										
RG_RIVER_WS_LAEMP_LCO_2021-07_NP	RG_RIVER	WS	NO	2021/07/12	10:00	G	1				X									
RG_FRUL_WS_LAEMP_LCO_2021-07_NP_NAL	RG_FRUL	WS	NO	2021/07/14	09:00	G	2		X	X										
RG_FRUL_WS_LAEMP_LCO_2021-07_NP	RG_FRUL	WS	NO	2021/07/14	09:00	G	1				X									
RG_FO23_WS_LAEMP_LCO_2021-07_NP_NAL	RG_FO23	WS	NO	2021/07/14	11:15	G	2		X	X										
RG_FO23_WS_LAEMP_LCO_2021-07_NP	RG_FO23	WS	NO	2021/07/14	11:15	G	1				X									

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Line Creek LAMEP - VPO[redacted] 74 8510 **Samples for total selenium have been preserved in the field. Dissolved selenium have been filtered and preserved. Speciation samples have been filtered and frozen.**	Rick Smit / Lotic environmental	2021 07 15 / 10:00	Bret Mercer S-Z (BAL)	July 15/21 7/22/21 7:00AM

SERVICE REQUEST (rush - subject to availability)

Regular (default)	X
Priority (2-3 business days) - 50% surcharge	
Emergency (1 Business Day) - 100% surcharge	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	

Sampler's Name	Rick Smit	**Mobile #**	403-586-3241
Sampler's Signature		**Date/Time**	2021 07 15 / 10:00

STRAIGHT BILL OF LADING
NOT NEGOTIABLE

RW HOT SHOT SERVICE INC.
250-425-7447
24 Hour Hot Shot Service

No. 86597

Sparwood, BC · Terrace, BC · Red Deer, AB · Vancouver, BC · Calgary, AB · Montreal, QC · Prince George, BC · Edmonton, AB · Spokane, WA · Elkford, BC · Ft. McMurray, AB · Shelby, MT · Tumbler Ridge, BC · Hinton, AB · Gillette, WY

INVOICE TO | DATE

BILL OF LADING # | PURCHASE ORDER NUMBER

SHIPPER (FROM) | CONSIGNEE (TO)

STREET | STREET

CITY/PROVINCE | POSTAL CODE | CITY/PROVINCE | POSTAL CODE

SPECIAL INSTRUCTIONS

PACKAGES	DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)
	PAPS# RWHV86596	

UNIT #

DECLARED VALUATION: Maximum liability of carrier is $2.00 per lb. ($4.41 per kilogram) unless declared valuation states otherwise. $

DRIVER'S SIGNATURE - PICK UP BY | PICK UP TIME | DRIVER'S SIGNATURE - DELIVERY BY | FINISH TIME

FREIGHT CHARGES
SHIPPER TO CHECK
☐PREPAID ☐COLLECT
If not indicated, shipping will automatically move collec

FEE
WAITING
XPU
CHARGES
FSC
US
SUB TOTAL
GST
TOTAL $
IF AT OWNER'S RISK, WRITE ORD HERE

NOTICE OF CLAIM: (a) No carrier is liable for loss, damage or delay of any goods under the Bill of Lading unless notice, therefor setting forth particulars of the origin, destination and date of shipment of the goods and the estimated amount claimed respect of such loss, damage or delay is given in writing to the originating carrier or the delivering carrier within sixty (60) days after the delivery of the goods, on the case of failure to make delivery within nine (9) months from the date of shipment. (b)The final statement of the claim must be filed within nine (9) months from the date of shipment together with a copy of the paid freight bill. RECEIVED at the point of origin on the date specified from the consignor mentioned herein, the property herein described, in apparent good order, except as noted (contents and condition of contents of package unknown) marked, consigned and destined as indicated below, which the carrier agrees to carry and to deliver to the consignee at the said destination, subject to the rates and classification in effect on the date of shipment. It is mutually agreed, as to each carrier of all or any of the goods over all or any portion of the route to destination, and as to each party of any time interested in all or any of the goods, that every service to be performed hereunder shall be subject to all the conditions standard Bill of Lading, in power at the date of issuing, which are hereto agreed by the consignor and accepted for himself and his assigns. Printed or written, including conditions set aside by the standard Bill of Lading, in power at the date of issuing, which are hereby agreed by the consignor and accepted for himself and his assigns. The Contract for the carriage of the goods listed in the Bill of Lading is governed by regulation in force in the jurisdiction at the time and place of shipment and is subject to the conditions set out in such conditions.

SHIPPER PRINT	CONSIGNEE PRINT	DATE 7-22-21
SHIPPER SIGN	CONSIGNEE SIGN	TIME 6:00

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROAD: Shipper GST # 864540398RT0001 NUMBER OF PIECES RECEIVED

ASCOS PRINTING

Cooler ID: Styrofoam Cooler # 3 COC (Y/N) **Temperature:** 3.1 (Corrected 2.1) **IR:** 31

Coolant Type: (Ice) Blue Ice Ambient

Notes: (1) EE

Sampling Locations:	RG, ~~WL, LC~~		LG		WL					
Sample Types:	(T/D)	SP	T/D	(SP)	(T/D)	(SP)	T/D	SP	T/D	SP
Container Types:	125mL	HDPE	125mL	HDPE	50mL Vial	125mL HDPE				

Opened By: S.Z 7/22/21 **Date:** 7/22/21

Effective 7/29/20 COPY

2107238

ision 004

SELENIUM SPECIATION

BAL Final Report 2109310

(Finalized October 22, 2021)

BROOKS APPLIED LABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

October 22, 2021

Teck Resources Limited – Vancouver
Cybele Heddle
421 Pine Avenue
Sparwood, B.C. CANADA V0B2G0
cybele.heddle@teck.com

Re: REP

Dear Cybele Heddle,

On September 23, 2021, Brooks Applied Labs (BAL) received four (4) aqueous samples. The samples were logged-in for total recoverable selenium [*Se*], dissolved Se, and Se speciation analyses, according to the chain-of-custody (COC) form.

The **Sampling Time** value listed on the chain-of-custody (COC) form did not exactly match the corresponding **Sampling Time** values listed on container labels for samples 2109310-02 and 2109310-03. The discrepancies are described in the table below.

Laboratory ID	**Sample ID** ***(From COC form)***	**Sample Time** ***(From COC)***	**Sample Time** ***(From Container Labels)***	**Analytical Parameter**
2109310-02	RG_SLINE_WS_2021-09-15_N_NAL	8:15	8:17	Total Recoverable Se
2109310-03	RG_SLINE_WS_2021-09-15_N_NAL	8:15	8:17	Dissolved Se

The samples described the table above were logged in and reported according to the **Sampling Time** value listed on the COC form.

The sample fractions logged in for Se speciation and dissolved Se had been field-filtered prior to receipt at BAL. All samples were stored according to BAL SOPs.

Total Recoverable and Dissolved Se
Each aqueous sample fraction for total recoverable or dissolved Se was digested in a closed vessel (bomb) with nitric and hydrochloric acids. The resulting digests were analyzed for Se content via inductively coupled plasma triple quadrupole mass spectrometry (ICP-QQQ-MS). The ICP-QQQ-MS instrumentation uses advanced interference removal techniques to ensure accuracy of the sample results. For more information, please visit the *Interference Reduction Technology* section on our website, brooksapplied.com.

Se Speciation

Each aqueous sample was analyzed for Se speciation using ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Selenium species are chromatographically separated on an ion exchange column and then quantified using inductively coupled plasma collision reaction cell mass spectrometry (ICP-CRC-MS); for more information on this determinative technique, please visit the *Interference Reduction Technology* section on our website. The chromatographic method applied for the analyses provides greater retention of methylseleninic acid and selenomethionine, allowing for more definitive quantitation of these species.

In accordance with the quotation issued for this project, selenium speciation was defined as dissolved selenite [Se(IV)], selenate [Se(VI)], selenocyanate [SeCN], methylseleninic acid [MeSe(IV)], methaneselenonic acid [MeSe(VI)], selenomethionine [SeMet], selenosulfate [SeSO3], and dimethylselenoxide [DMSeO]. Unknown Se species was defined as the total concentration of all unknown Se species observed during the analysis. This item is identified on the report as [Unk Se Sp].

DMSeO elutes early in the chromatographic run due to the nature of the molecule and the applied chromatographic separation method. Since this species elutes near the dead volume, additional Se species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting Se species.

The results were not method blank corrected, as described in the calculations section of the relevant BAL SOPs and were evaluated using reporting limits adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific MDLs, MRLs, and other details.

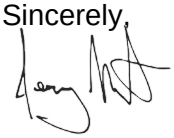
In instances when a matrix spike/matrix spike duplicate (MS/MSD) set was spiked at a level less than the native sample concentration, the recoveries and the relative percent difference (RPD) are not considered valid indicators of data quality. In such instances, the recoveries of the laboratory fortified blanks (BS) and/or standard reference materials (SRM) demonstrate the accuracy of the applied methods. When the spiking level was less than 25% of the native sample concentration, the spike recovery was not reported (NR) and the RPD of the MS/MSD set was not calculated (N/C).

Except for concentration qualifiers, all data were reported without qualification. All associated quality control sample results met the acceptance criteria.

BAL, an accredited laboratory, certifies that the reported results of all analyses for which BAL is NELAP accredited met all NELAP requirements. For more information, please see the *Report Information* page.

Please feel free to contact us if you have any questions regarding this report.

Sincerely,



Jeremy Maute
Senior Project Manager
Brooks Applied Labs
Jeremy@brooksapplied.com

Report Information

Laboratory Accreditation

BAL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BAL is also certified by many other states to perform environmental analyses. For a current list of our accreditations/certifications, please visit our website at <http://www.brooksapplied.com/resources/certificates-permits/> or review Tables 1 and 2 in our Accreditation Information. Results reported relate only to the samples listed in the report.

Field Quality Control Samples

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

Common Abbreviations

AR	as received
BAL	Brooks Applied Labs
BLK	method blank
BS	blank spike
CAL	calibration standard
CCB	continuing calibration blank
CCV	continuing calibration verification
COC	chain of custody record
D	dissolved fraction
DUP	duplicate
IBL	instrument blank
ICV	initial calibration verification
MDL	method detection limit
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
ND	non-detect
NR	non-reportable
N/C	not calculated
PS	post preparation spike
REC	percent recovery
RPD	relative percent difference
SCV	secondary calibration verification
SOP	standard operating procedure
SRM	reference material
T	total fraction
TR	total recoverable fraction

Definition of Data Qualifiers

(Effective 3/23/2020)

E	An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
H	Holding time and/or preservation requirements not met. Please see narrative for explanation.
J	Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
J-1	Estimated value. A full explanation is presented in the narrative.
M	Duplicate precision (RPD) was not within acceptance criteria. Please see narrative for explanation.
N	Spike recovery was not within acceptance criteria. Please see narrative for explanation.
R	Rejected, unusable value. A full explanation is presented in the narrative.
U	Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
X	Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.
Z	Holding time and/or preservation requirements not established for this method; however, BAL recommendations for holding time were not followed. Please see narrative for explanation.

These qualifiers are based on those previously utilized by Brooks Applied Labs, those found in the EPA SOW ILM03.0, Exhibit B, Section III, pg. B-18, and the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review; USEPA; January 2010. These supersede all previous qualifiers ever employed by BAL.

Accreditation Information

Table 1. Accredited method/matrix/analytes for TNI

Issued by: State of Florida Dept. of Health (The NELAC Institute 2016 Standard)
Issued on: July 1, 2021; Valid to: June 30, 2022
Certificate Number: E87982-37

Method	Matrix	TNI Accredited Analyte(s)
EPA 1638	Non-Potable Waters	Ag, Cd, Cu, Ni, Pb, Sb, Se, Tl, Zn
EPA 200.8	Non-Potable Waters	Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
EPA 6020	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
	Solids/Chemicals & Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
BAL-5000	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn, Hardness
	Solids/Chemicals	Ag, As, B, Be, Cd, Co, Cr, Cu, Pb, Mo, Ni, Sb, Se, Sn, Sr, Tl, V, Zn
	Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Tl, V, Zn
EPA 1640	Non-Potable Waters	Cd, Cu, Pb, Ni, Zn
EPA 1631E	Non-Potable Waters, Solids/Chemicals & Biological	Total Mercury
EPA 1630	Non-Potable Waters	Methyl Mercury
BAL-3200	Solids/Chemicals & Biological	Methyl Mercury
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs
BAL-4201	Non-Potable Waters	Se(IV), Se(VI)
BAL-4300	Non-Potable Waters Solid/Chemicals	Cr(VI)
SM2340B	Non-Potable Waters	Hardness

Accreditation Information

Table 2. Accredited method/matrix/analytes for ISO (1), Non-Governmental TNI (2), and DoD/DOE (3)

Issued by: ANAB

Issued on: September 21, 2021; Valid to: March 30, 2024

Method	Matrix	ISO and Non-Gov. TNI Accredited Analyte(s)	DoD/DOE Accredited Analytes
EPA 1638 Mod EPA 200.8 Mod EPA 6020 Mod	Non-Potable Waters	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn	Ag, Al, As, Ba, Ca, Cd, Cr, Cu, Fe, Pb, Mg, Mn, Ni, Sb, Se, V, Zn
BAL-5000	Solids/Chemicals & Biological	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, V, Zn Hg (Biological Only)	Not Accredited
EPA 1640 Mod	Non-Potable Waters	Cd, Cu, Pb, Ni, Zn Ag, As, Cr, Co, Se, Tl, V (ISO Only)	Not Accredited
EPA 1631E Mod BAL-3100	Non-Potable Waters, Solids/Chemicals & Biological/Food	Total Mercury	Total Mercury
EPA 1630 Mod BAL-3200	Non-Potable Waters, Solids/Chemicals Biological	Methyl Mercury	Methyl Mercury (excluding Solids/Chemicals)
EPA 1632A Mod BAL-3300	Non-Potable Waters	Inorganic Arsenic (ISO Only)	Not Accredited
	Biological/Food Solids/Chemicals	Inorganic Arsenic (ISO Only)	Not Accredited
AOAC 2015.01 Mod BAL-5000	Food	As, Cd, Hg, Pb	Not Accredited
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs	Not Accredited
	Biological by BAL-4117	Inorganic Arsenic, DMAs, MMAs (ISO Only)	Not Accredited
BAL-4101	Food by BAL-4117	Inorganic Arsenic, DMAs, MMAs (ISO Only)	Not Accredited
BAL-4201	Non-Potable Waters	Se(IV), Se(VI), SeCN, SeMet	Not Accredited
BAL-4300	Non-Potable Waters, Solid/Chemicals	Cr(VI)	Cr(VI)
SM 3500-Fe BAL-4500	Non-Potable Waters	Fe, Fe(II) (ISO Only)	Not Accredited
SM2340B	Non-Potable Waters	Hardness	Hardness
SM 2540G BAL-0501	Solids/Chemicals & Biological	% Dry Weight	% Dry Weight

(1) ISO/IEC 17025:2017 – Certificate Number ADE-1447.02

(2) Non-Governmental NELAC Institute 2016 Standard – Certificate Number ADE-1447.01

(3) Department of Defense/Energy Consolidated Quality Systems Manual v. 5.3 – Certificate Numbers ADE-1447 for DoD, ADE-1447.03 for DOE.

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
RG_SLINE_WS_2021-09-15_N	2109310-01	WS	Sample	09/15/2021	09/23/2021
RG_SLINE_WS_2021-09-15_N_NAL	2109310-02	WS	Sample	09/15/2021	09/23/2021
RG_SLINE_WS_2021-09-15_N_NAL	2109310-03	WS	Sample	09/15/2021	09/23/2021
RG_LI24_WS_LAEMP_LCO_2021-09-16_N	2109310-04	WS	Sample	09/16/2021	09/23/2021
RG_LI24_WS_LAEMP_LCO_2021-09-16_N_NAL	2109310-05	WS	Sample	09/16/2021	09/23/2021
RG_LI24_WS_LAEMP_LCO_2021-09-16_N_NAL	2109310-06	WS	Sample	09/16/2021	09/23/2021

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	09/22/2021	09/24/2021	B212622	S211081
MeSe(IV)	Water	SOP BAL-4201	09/22/2021	09/24/2021	B212622	S211081
MeSe(VI)	Water	SOP BAL-4201	09/22/2021	09/24/2021	B212622	S211081
Se	Water	EPA 1638 Mod	09/28/2021	09/30/2021	B212656	S211116
Se(IV)	Water	SOP BAL-4201	09/22/2021	09/24/2021	B212622	S211081
Se(VI)	Water	SOP BAL-4201	09/22/2021	09/24/2021	B212622	S211081
SeCN	Water	SOP BAL-4201	09/22/2021	09/24/2021	B212622	S211081
SeMet	Water	SOP BAL-4201	09/22/2021	09/24/2021	B212622	S211081
SeSO3	Water	SOP BAL-4201	09/22/2021	09/24/2021	B212622	S211081
Unk Se Sp	Water	SOP BAL-4201	09/22/2021	09/24/2021	B212622	S211081

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_SLINE_WS_2021-09-15_N										
2109310-01	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212622	S211081
2109310-01	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212622	S211081
2109310-01	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212622	S211081
2109310-01	Se(IV)	WS	D	0.019	J	0.010	0.075	µg/L	B212622	S211081
2109310-01	Se(VI)	WS	D	1.41		0.010	0.055	µg/L	B212622	S211081
2109310-01	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212622	S211081
2109310-01	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212622	S211081
2109310-01	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212622	S211081
2109310-01	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212622	S211081
RG_SLINE_WS_2021-09-15_N_NAL										
2109310-02	Se	WS	TR	1.44		0.165	0.528	µg/L	B212656	S211116
RG_SLINE_WS_2021-09-15_N_NAL										
2109310-03	Se	WS	D	1.58		0.165	0.528	µg/L	B212656	S211116
RG_LI24_WS_LAEMP_LCO_2021-09-16_N										
2109310-04	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212622	S211081
2109310-04	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212622	S211081
2109310-04	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212622	S211081
2109310-04	Se(IV)	WS	D	0.020	J	0.010	0.075	µg/L	B212622	S211081
2109310-04	Se(VI)	WS	D	3.06		0.010	0.055	µg/L	B212622	S211081
2109310-04	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212622	S211081
2109310-04	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212622	S211081
2109310-04	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212622	S211081
2109310-04	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212622	S211081
RG_LI24_WS_LAEMP_LCO_2021-09-16_N_NAL										
2109310-05	Se	WS	TR	3.16		0.165	0.528	µg/L	B212656	S211116
RG_LI24_WS_LAEMP_LCO_2021-09-16_N_NAL										
2109310-06	Se	WS	D	3.08		0.165	0.528	µg/L	B212656	S211116

Accuracy & Precision Summary

Batch: B212622
Lab Matrix: Water
Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B212622-BS1	**Blank Spike, (2124033)**						
	MeSe(IV)		5.095	5.615	µg/L	110% 75-125	
	Se(IV)		5.000	4.997	µg/L	100% 75-125	
	Se(VI)		5.000	5.149	µg/L	103% 75-125	
	SeCN		5.015	5.067	µg/L	101% 75-125	
	SeMet		4.932	5.109	µg/L	104% 75-125	
B212622-DUP6	**Duplicate, (2109306-42)**						
	DMSeO	ND		ND	µg/L		N/C 25
	MeSe(IV)	ND		ND	µg/L		N/C 25
	MeSe(VI)	ND		ND	µg/L		N/C 25
	Se(IV)	0.375		0.375	µg/L		0.1% 25
	Se(VI)	40.70		40.58	µg/L		0.3% 25
	SeCN	ND		ND	µg/L		N/C 25
	SeMet	ND		ND	µg/L		N/C 25
	SeSO3	ND		ND	µg/L		N/C 25
	Unk Se Sp	ND		ND	µg/L		N/C 25
B212622-MS6	**Matrix Spike, (2109306-42)**						
	Se(IV)	0.375	4.900	5.126	µg/L	97% 75-125	
	Se(VI)	40.70	5.100	47.06	µg/L	NR 75-125	
	SeCN	ND	1.962	1.902	µg/L	97% 75-125	
	SeMet	ND	1.977	1.909	µg/L	97% 75-125	
B212622-MSD6	**Matrix Spike Duplicate, (2109306-42)**						
	Se(IV)	0.375	4.900	5.143	µg/L	97% 75-125	0.3% 25
	Se(VI)	40.70	5.100	46.88	µg/L	NR 75-125	N/C 25
	SeCN	ND	1.962	1.870	µg/L	95% 75-125	2% 25
	SeMet	ND	1.977	1.920	µg/L	97% 75-125	0.6% 25

Accuracy & Precision Summary

Batch: B212656
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B212656-BS1	**Blank Spike, (2104075)**						
	Se		200.0	200.6	µg/L	100% 75-125	
B212656-BS2	**Blank Spike, (2104075)**						
	Se		200.0	196.2	µg/L	98% 75-125	
B212656-BS3	**Blank Spike, (2104075)**						
	Se		200.0	201.0	µg/L	100% 75-125	
B212656-BS4	**Blank Spike, (2104075)**						
	Se		200.0	197.1	µg/L	99% 75-125	
B212656-SRM2	**Reference Material (2110008, TMDA 51.5 Reference Standard - Bottle 8 - SRM)**						
	Se		14.30	13.20	µg/L	92% 75-125	
B212656-SRM3	**Reference Material (2110008, TMDA 51.5 Reference Standard - Bottle 8 - SRM)**						
	Se		14.30	13.91	µg/L	97% 75-125	
B212656-SRM4	**Reference Material (2110008, TMDA 51.5 Reference Standard - Bottle 8 - SRM)**						
	Se		14.30	13.70	µg/L	96% 75-125	
B212656-DUP4	**Duplicate, (2109307-02)**						
	Se	5.947		6.345	µg/L		6% 20
B212656-MS4	**Matrix Spike, (2109307-02)**						
	Se	5.947	220.0	229.8	µg/L	102% 75-125	
B212656-MSD4	**Matrix Spike Duplicate, (2109307-02)**						
	Se	5.947	220.0	226.8	µg/L	100% 75-125	1% 20

Method Blanks & Reporting Limits

Batch: B212622
Matrix: Water
Method: SOP BAL-4201
Analyte: DMSeO

Sample	Result	Units
B212622-BLK1	0.00	µg/L
B212622-BLK2	0.00	µg/L
B212622-BLK3	0.00	µg/L
B212622-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B212622-BLK1	0.00	µg/L
B212622-BLK2	0.00	µg/L
B212622-BLK3	0.00	µg/L
B212622-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(VI)

Sample	Result	Units
B212622-BLK1	0.00	µg/L
B212622-BLK2	0.00	µg/L
B212622-BLK3	0.00	µg/L
B212622-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Method Blanks & Reporting Limits

Analyte: Se(IV)

Sample	Result	Units
B212622-BLK1	0.00	µg/L
B212622-BLK2	0.00	µg/L
B212622-BLK3	0.00	µg/L
B212622-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Analyte: Se(VI)

Sample	Result	Units
B212622-BLK1	0.00	µg/L
B212622-BLK2	0.00	µg/L
B212622-BLK3	0.00	µg/L
B212622-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: SeCN

Sample	Result	Units
B212622-BLK1	0.00	µg/L
B212622-BLK2	0.00	µg/L
B212622-BLK3	0.00	µg/L
B212622-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.010

MDL: 0.002
MRL: 0.010

Analyte: SeMet

Sample	Result	Units
B212622-BLK1	0.00	µg/L
B212622-BLK2	0.00	µg/L
B212622-BLK3	0.00	µg/L
B212622-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Method Blanks & Reporting Limits

Analyte: SeSO3

Sample	Result	Units
B212622-BLK1	0.00	µg/L
B212622-BLK2	0.00	µg/L
B212622-BLK3	0.00	µg/L
B212622-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: Unk Se Sp

Sample	Result	Units
B212622-BLK1	0.00	µg/L
B212622-BLK2	0.00	µg/L
B212622-BLK3	0.00	µg/L
B212622-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Method Blanks & Reporting Limits

Batch: B212656
Matrix: Water
Method: EPA 1638 Mod
Analyte: Se

Sample	Result	Units
B212656-BLK1	0.077	µg/L
B212656-BLK2	0.095	µg/L
B212656-BLK3	0.154	µg/L
B212656-BLK4	0.153	µg/L

Average: 0.120
Limit: 0.480

MDL: 0.150
MRL: 0.480

Sample Containers

Lab ID: 2109310-01
Sample: RG_SLINE_WS_2021-09-15_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/15/2021
Received: 09/23/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #4 - 2109310
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #4 - 2109310
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #4 - 2109310

Lab ID: 2109310-02
Sample: RG_SLINE_WS_2021-09-15_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/15/2021
Received: 09/23/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #3 - 2109310

Lab ID: 2109310-03
Sample: RG_SLINE_WS_2021-09-15_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/15/2021
Received: 09/23/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #3 - 2109310

Lab ID: 2109310-04
Sample: RG_LI24_WS_LAEMP_LCO_2021-09-16_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/16/2021
Received: 09/23/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #4 - 2109310
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #4 - 2109310
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #4 - 2109310

Sample Containers

Lab ID: 2109310-05
Sample: RG_LI24_WS_LAEMP_LCO_2021-09-16_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/16/2021
Received: 09/23/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #3 - 2109310

Lab ID: 2109310-06
Sample: RG_LI24_WS_LAEMP_LCO_2021-09-16_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/16/2021
Received: 09/23/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #3 - 2109310

Shipping Containers

Styrofoam Cooler #3 - 2109310

Received: September 23, 2021 7:15
Tracking No: PAPS#RWHV87409 via Courier
Coolant Type: Blue Ice
Temperature: 6.6 °C

Description: Styrofoam Cooler
Damaged in transit? No
Returned to client? No
Comments: IR#30

Custody seals present? No
Custody seals intact? No
COC present? Yes

Styrofoam Cooler #4 - 2109310

Received: September 23, 2021 7:15
Tracking No: PAPS#RWHV87409 via Courier
Coolant Type: Blue Ice
Temperature: 0.5 °C

Description: Styrofoam Cooler
Damaged in transit? No
Returned to client? No
Comments: IR#31

Custody seals present? No
Custody seals intact? No
COC present? Yes

Page 1 of 1

COC ID: September LCO LAEMP | **TURNAROUND TIME:** Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO			
Facility Name / Job#	REP			Lab Name	Brooks Applied Labs			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Cybele Heddle			Lab Contact	Ben Wozniak			Email 1:	cybele.heddle@teck.com	X	X	X
Email	cybele.heddle@teck.com			Email	ben@brooksapplied.com			Email 2:	teckcoal@equisonline.com			X
Address	421 Pine Avenue			Address	18804 North Creek Parkway			Email 3:	claytoo.spytz@teck.com	X	X	X
								Email 4:	lbowron@minnow.ca	X	X	X
City	Sparwood	Province	BC	City	Bothell	Province	WA	Email 5:	tyler.mehler@minnow.ca	X	X	X
Postal Code	V0B 2G0	Country	Canada	Postal Code	98011	Country	USA	Email 5:				
Phone Number	250-910-8755			Phone Number	206-632-6206			PO number	VPO00748540			

SAMPLE DETAILS								ANALYSIS REQUESTED												
								PRESERV.		F	F									
Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	ANALYSIS	Total Selenium	Dissolved Selenium	Selenium Speciation									
RG_SLINE_WS_2021-09-15_N	RG_SLINE	WS	No	September 15, 2021	0815	G	1				1									
RG_SLINE_WS_2021-09-15_N_NAL	RG_SLINE	WS	No	September 15, 2021	0815	G	2		1	1										
RG_LI24_WS_LAEMP_LCO_2021-09-16_N	RG_LI24	WS	No	September 16, 2021	0931	G	1				1									
RG_LI24_WS_LAEMP_LCO_2021-09-16_N_NAL	RG_LI24	WS	No	September 16, 2021	0931	G	2		1	1										

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Total and dissolved selenium samples have NOT been preserved. Dissolved selenium have been filtered. Speciation samples have been filtered and frozen.	Jennifer Ings/Minnow	September 21, 2021	S. T. (BAL)	9/23/21 0715

SERVICE REQUEST (rush - subject to availability)					
Regular (default)	X	Sampler's Name	Jennifer Ings	Mobile #	519-500-3444
Priority (2-3 business days) - 50% surcharge					
Emergency (1 Business Day) - 100% surcharge		Sampler's Signature		Date/Time	September 21, 2021
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

RW HOT SHOT SERVICE INC.
250-425-7447
24 Hour Hot Shot Service

STRAIGHT BILL OF LADING NOT NEGOTIABLE

No. 87409

Sparwood, BC / Terrace, BC / Red Deer, AB — Vancouver, BC / Calgary, AB / Montreal, QC — Prince George, BC / Edmonton, AB / Spokane, WA — Elkford, BC / Ft. McMurray, AB / Shelby, MT — Tumbler Ridge, BC / Hinton, AB / Gillette, WY

DATE: Sept 22 -21

INVOICE TO:

BILL OF LADING #:

PURCHASE ORDER NUMBER:

SHIPPER (FROM): Teck Coal Ltd

STREET: West Line Creek Treatment

CITY/PROVINCE: Sparwood BC

POSTAL CODE:

CONSIGNEE (TO): Brooks Applied Labs

STREET: 18804 N. Creek Parkway

CITY/PROVINCE: Bothell WA

POSTAL CODE: 98011

SPECIAL INSTRUCTIONS:

PIECES	DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)
4	Coolers - Water Samples	97 LBS

PAPS# RWHV87409

FREIGHT CHARGES — SHIPPER TO CHECK: PREPAID / COLLECT

FEE / WAITING / XPU / CHARGES / FSC / SUB TOTAL / GST / TOTAL $

DECLARED VALUATION: Maximum liability of carrier is $2.00 per lb. ($4.41 per kilogram) unless declared valuation states otherwise. $

DRIVER'S SIGNATURE - PICK UP BY | PICK UP TIME | DRIVER'S SIGNATURE - DELIVERY BY | FINISH TIME

CONSIGNEE PRINT: SEAN 7:16AM

CONSIGNEE SIGN:

DATE: 09/23/21

TIME: 7:15

NUMBER OF PIECES RECEIVED: 4

SHIPPER: Rob Bennett

GST # 864540396RT0001

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROD: Shipper

Cooler ID: Styrofoam Cooler # 3 **COC** (Y) N **Temperature:** 6.6 **IR:** 30

Coolant Type: Ice (Blue Ice) Ambient

Notes:

Sampling Locations:	RG		EV		GH					
Sample Types:	(T/D)	SP	(T/D)	(SP)	(T/D)	SP	T/D	SP	T/D	SP
Container Types:	40mL Glass		40mL Glass	40mL Glass	40mL Glass					

Opened By: S. Z. 9/23/21 **Date:** 9/23/21

Effective 7/29/20

COPY

2109310

n 004

RW HOT SHOT SERVICE INC.

250-425-7447

24 Hour Hot Shot Service

STRAIGHT BILL OF LADING NOT NEGOTIABLE

No. 87409

Sparwood, BC
Terrace, BC
Red Deer, AB

Vancouver, BC
Calgary, AB
Montreal, QC

Prince George, BC
Edmonton, AB
Spokane, WA

Elkford, BC
Ft. McMurray, AB
Shelby, MT

Tumbler Ridge, BC
Hinton, AB
Gillette, WY

DATE: Sept 22 - 21

INVOICE TO:

BILL OF LADING #:

PURCHASE ORDER NUMBER:

SHIPPER (FROM): Teck Coal Ltd.

STREET: West Line Creek Treatment

CITY/PROVINCE: Sparwood, BC

POSTAL CODE:

CONSIGNEE (TO): Brooks Applied Labs

STREET: 18804 N. Creek Parkway

CITY/PROVINCE: Bothell, WA

POSTAL CODE: 98011

SPECIAL INSTRUCTIONS:

PIECES	DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)
4	Coolers - Water Samples	97 LBS

PAPS# RWHV87409

DECLARED VALUATION: Maximum liability of carrier is $2.00 per lb. ($4.41 per kilogram) unless declared valuation states otherwise. $

DRIVER'S SIGNATURE - PICK UP BY | PICK UP TIME | DRIVER'S SIGNATURE - DELIVERY BY | FINISH TIME

FREIGHT CHARGES
SHIPPER TO CHECK
☐ PREPAID ☐ COLLECT

FEE
WAITING
XPU
CHARGES
FSC
SUB TOTAL
GST
TOTAL $

CONSIGNEE PRINT: SEAN ZIGAM

CONSIGNEE SIGN:

DATE: 09/23/21
TIME: 7:15

GST # 864548396RT0001

WHITE: Office   YELLOW: Carrier   PINK: Consignee   GOLDENROD: Shipper

Cooler ID: Styrofoam Cooler # 4   **COC (Y/N):**   **Temperature:** 0.5   **IR:** 31

Coolant Type: Ice   Blue Ice (circled)   Ambient

Notes:

	RG		GH		EV					
Sampling Locations:	RG		GH		EV					
Sample Types:	T/D	SP	T/D	SP	T/D	SP	T/D	SP	T/D	SP
Container Types:		60mL		60mL		60mL				

Opened By: CVL   **Date:** 9/23/21

COPY

Effective 7/29/20   Revision 004

SELENIUM SPECIATION

BAL Final Report 2109236

(Finalized October 14, 2021)

BROOKS APPLIED LABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

October 14, 2021

Teck Resources Limited – Vancouver
Cybele Heddle
421 Pine Avenue
Sparwood, B.C. CANADA V0B2G0
cybele.heddle@teck.com

Re: REP

Dear Cybele Heddle,

On September 16, 2021, Brooks Applied Labs (BAL) received eighteen (18) aqueous samples. The samples were logged-in for total recoverable selenium [*Se*], dissolved Se, and Se speciation analyses, according to the chain-of-custody (COC) forms.

The sample fractions logged in for Se speciation and dissolved Se had been field-filtered prior to receipt at BAL. All samples were stored according to BAL SOPs.

Total Recoverable and Dissolved Se
Each aqueous sample fraction for total recoverable or dissolved Se was digested in a closed vessel (bomb) with nitric and hydrochloric acids. The resulting digests were analyzed for Se content via inductively coupled plasma triple quadrupole mass spectrometry (ICP-QQQ-MS). The ICP-QQQ-MS instrumentation uses advanced interference removal techniques to ensure accuracy of the sample results. For more information, please visit the *Interference Reduction Technology* section on our website, brooksapplied.com.

Se Speciation
Each aqueous sample was analyzed for Se speciation using ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Selenium species are chromatographically separated on an ion exchange column and then quantified using inductively coupled plasma collision reaction cell mass spectrometry (ICP-CRC-MS); for more information on this determinative technique, please visit the *Interference Reduction Technology* section on our website. The chromatographic method applied for the analyses provides greater retention of methylseleninic acid and selenomethionine, allowing for more definitive quantitation of these species.

In accordance with the quotation issued for this project, selenium speciation was defined as dissolved selenite [Se(IV)], selenate [Se(VI)], selenocyanate [SeCN], methylseleninic acid [MeSe(IV)], methaneselenonic acid [MeSe(VI)], selenomethionine [SeMet], selenosulfate [SeSO3], and dimethylselenoxide [DMSeO]. Unknown Se species was defined as the total concentration of all unknown Se species observed during the analysis. This item is identified on the report as [Unk Se Sp].

DMSeO elutes early in the chromatographic run due to the nature of the molecule and the applied chromatographic separation method. Since this species elutes near the dead volume, additional Se species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting Se species.

MeSe(VI) was observed at concentrations above the MDL in samples 2109236-04 and 2109236-22. A small peak for MeSe(VI) was observed in the chromatogram of 2109236-01, but the result was less than the MDL (i.e., not detected). 2109236-01, 2109236-04, and 2109236-22 were subsequently analyzed with MeSe(VI) spikes and the small MeSe(VI) peaks were confirmed in each case. With the confirmations that the MeSe(VI) peak were appropriately assigned, the selenium speciation results are reported from initial injections in batch B212603.

The results were not method blank corrected, as described in the calculations section of the relevant BAL SOPs and were evaluated using reporting limits adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific MDLs, MRLs, and other details.

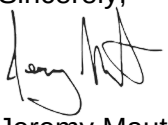
In instances when a matrix spike/matrix spike duplicate (MS/MSD) set was spiked at a level less than the native sample concentration, the recoveries and the relative percent difference (RPD) are not considered valid indicators of data quality. In such instances, the recoveries of the laboratory fortified blanks (BS) and/or standard reference materials (SRM) demonstrate the accuracy of the applied methods. When the spiking level was less than 25% of the native sample concentration, the spike recovery was not reported (NR) and the RPD of the MS/MSD set was not calculated (N/C).

Except for concentration qualifiers, all data were reported without qualification. All associated quality control sample results met the acceptance criteria.

BAL, an accredited laboratory, certifies that the reported results of all analyses for which BAL is NELAP accredited met all NELAP requirements. For more information, please see the *Report Information* page.

Please feel free to contact us if you have any questions regarding this report.

Sincerely,



Jeremy Maute
Senior Project Manager
Brooks Applied Labs
Jeremy@brooksapplied.com

Report Information

Laboratory Accreditation

BAL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BAL is also certified by many other states to perform environmental analyses. For a current list of our accreditations/certifications, please visit our website at <http://www.brooksapplied.com/resources/certificates-permits/> or review Tables 1 and 2 in our Accreditation Information. Results reported relate only to the samples listed in the report.

Field Quality Control Samples

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

Common Abbreviations

AR	as received
BAL	Brooks Applied Labs
BLK	method blank
BS	blank spike
CAL	calibration standard
CCB	continuing calibration blank
CCV	continuing calibration verification
COC	chain of custody record
D	dissolved fraction
DUP	duplicate
IBL	instrument blank
ICV	initial calibration verification
MDL	method detection limit
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
ND	non-detect
NR	non-reportable
N/C	not calculated
PS	post preparation spike
REC	percent recovery
RPD	relative percent difference
SCV	secondary calibration verification
SOP	standard operating procedure
SRM	reference material
T	total fraction
TR	total recoverable fraction

Definition of Data Qualifiers

(Effective 3/23/2020)

E	An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
H	Holding time and/or preservation requirements not met. Please see narrative for explanation.
J	Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
J-1	Estimated value. A full explanation is presented in the narrative.
M	Duplicate precision (RPD) was not within acceptance criteria. Please see narrative for explanation.
N	Spike recovery was not within acceptance criteria. Please see narrative for explanation.
R	Rejected, unusable value. A full explanation is presented in the narrative.
U	Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
X	Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.
Z	Holding time and/or preservation requirements not established for this method; however, BAL recommendations for holding time were not followed. Please see narrative for explanation.

These qualifiers are based on those previously utilized by Brooks Applied Labs, those found in the EPA SOW ILM03.0, Exhibit B, Section III, pg. B-18, and the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review; USEPA; January 2010. These supersede all previous qualifiers ever employed by BAL.

Accreditation Information

Table 1. Accredited method/matrix/analytes for TNI

Issued by: State of Florida Dept. of Health (The NELAC Institute 2016 Standard)
Issued on: July 1, 2021; Valid to: June 30, 2022
Certificate Number: E87982-37

Method	Matrix	TNI Accredited Analyte(s)
EPA 1638	Non-Potable Waters	Ag, Cd, Cu, Ni, Pb, Sb, Se, Tl, Zn
EPA 200.8	Non-Potable Waters	Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
EPA 6020	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
	Solids/Chemicals & Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
BAL-5000	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn, Hardness
	Solids/Chemicals	Ag, As, B, Be, Cd, Co, Cr, Cu, Pb, Mo, Ni, Sb, Se, Sn, Sr, Tl, V, Zn
	Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Tl, V, Zn
EPA 1640	Non-Potable Waters	Cd, Cu, Pb, Ni, Zn
EPA 1631E	Non-Potable Waters, Solids/Chemicals & Biological	Total Mercury
EPA 1630	Non-Potable Waters	Methyl Mercury
BAL-3200	Solids/Chemicals & Biological	Methyl Mercury
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs
BAL-4201	Non-Potable Waters	Se(IV), Se(VI)
BAL-4300	Non-Potable Waters Solid/Chemicals	Cr(VI)
SM2340B	Non-Potable Waters	Hardness

Accreditation Information

Table 2. Accredited method/matrix/analytes for ISO (1), Non-Governmental TNI (2), and DoD/DOE (3)

Issued by: ANAB

Issued on: September 21, 2021; Valid to: March 30, 2024

Method	Matrix	ISO and Non-Gov. TNI Accredited Analyte(s)	DoD/DOE Accredited Analytes
EPA 1638 Mod EPA 200.8 Mod EPA 6020 Mod	Non-Potable Waters	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn	Ag, Al, As, Ba, Ca, Cd, Cr, Cu, Fe, Pb, Mg, Mn, Ni, Sb, Se, V, Zn
BAL-5000	Solids/Chemicals & Biological	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, V, Zn Hg (Biological Only)	Not Accredited
EPA 1640 Mod	Non-Potable Waters	Cd, Cu, Pb, Ni, Zn Ag, As, Cr, Co, Se, Tl, V (ISO Only)	Not Accredited
EPA 1631E Mod BAL-3100	Non-Potable Waters, Solids/Chemicals & Biological/Food	Total Mercury	Total Mercury
EPA 1630 Mod BAL-3200	Non-Potable Waters, Solids/Chemicals Biological	Methyl Mercury	Methyl Mercury (excluding Solids/Chemicals)
EPA 1632A Mod BAL-3300	Non-Potable Waters	Inorganic Arsenic (ISO Only)	Not Accredited
	Biological/Food Solids/Chemicals	Inorganic Arsenic (ISO Only)	Not Accredited
AOAC 2015.01 Mod BAL-5000	Food	As, Cd, Hg, Pb	Not Accredited
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs	Not Accredited
	Biological by BAL-4117	Inorganic Arsenic, DMAs, MMAs (ISO Only)	Not Accredited
BAL-4101	Food by BAL-4117	Inorganic Arsenic, DMAs, MMAs (ISO Only)	Not Accredited
BAL-4201	Non-Potable Waters	Se(IV), Se(VI), SeCN, SeMet	Not Accredited
BAL-4300	Non-Potable Waters, Solid/Chemicals	Cr(VI)	Cr(VI)
SM 3500-Fe BAL-4500	Non-Potable Waters	Fe, Fe(II) (ISO Only)	Not Accredited
SM2340B	Non-Potable Waters	Hardness	Hardness
SM 2540G BAL-0501	Solids/Chemicals & Biological	% Dry Weight	% Dry Weight

(1) ISO/IEC 17025:2017 – Certificate Number ADE-1447.02

(2) Non-Governmental NELAC Institute 2016 Standard – Certificate Number ADE-1447.01

(3) Department of Defense/Energy Consolidated Quality Systems Manual v. 5.3 – Certificate Numbers ADE-1447 for DoD, ADE-1447.03 for DOE.

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
RG_RIVER_WS_2021-09-09_N	2109236-01	WS	Sample	09/09/2021	09/16/2021
RG_RIVER_WS_2021-09-09_N_NAL	2109236-02	WS	Sample	09/09/2021	09/16/2021
RG_RIVER_WS_2021-09-09_N_NAL	2109236-03	WS	Sample	09/09/2021	09/16/2021
RG_LILC3_WS_LAEMP_LCO_2021-09-09_N	2109236-04	WS	Sample	09/09/2021	09/16/2021
RG_LILC3_WS_LAEMP_LCO_2021-09-09_N_NAL	2109236-05	WS	Sample	09/09/2021	09/16/2021
RG_LILC3_WS_LAEMP_LCO_2021-09-09_N_NAL	2109236-06	WS	Sample	09/09/2021	09/16/2021
RG_FBLANK_WS_2021-09-09_N	2109236-07	WS	Sample	09/09/2021	09/16/2021
RG_FBLANK_WS_2021-09-09_N_NAL	2109236-08	WS	Sample	09/09/2021	09/16/2021
RG_FBLANK_WS_2021-09-09_N_NAL	2109236-09	WS	Sample	09/09/2021	09/16/2021
RG_LI8_WS_LAEMP_LCO_2021-09-11_N	2109236-10	WS	Sample	09/10/2021	09/16/2021
RG_LI8_WS_LAEMP_LCO_2021-09-11_N_NAL	2109236-11	WS	Sample	09/10/2021	09/16/2021
RG_LI8_WS_LAEMP_LCO_2021-09-11_N_NAL	2109236-12	WS	Sample	09/10/2021	09/16/2021
RG_FRUL_WS_LAEMP_LCO_2021-09-12_N	2109236-13	WS	Sample	09/12/2021	09/16/2021
RG_FRUL_WS_LAEMP_LCO_2021-09-12_N_NAL	2109236-14	WS	Sample	09/12/2021	09/16/2021
RG_FRUL_WS_LAEMP_LCO_2021-09-12_N_NAL	2109236-15	WS	Sample	09/12/2021	09/16/2021
RG_FO23_WS_LAEMP_LCO_2021-09-12_N	2109236-16	WS	Sample	09/12/2021	09/16/2021
RG_FO23_WS_LAEMP_LCO_2021-09-12_N_NAL	2109236-17	WS	Sample	09/12/2021	09/16/2021
RG_FO23_WS_LAEMP_LCO_2021-09-12_N_NAL	2109236-18	WS	Sample	09/12/2021	09/16/2021
RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_N	2109236-19	WS	Sample	09/13/2021	09/16/2021
RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_N_NAL	2109236-20	WS	Sample	09/13/2021	09/16/2021
RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_N_NAL	2109236-21	WS	Sample	09/13/2021	09/16/2021
RG_LISP24_WS_LAEMP_LCO_2021-09-13_N	2109236-22	WS	Sample	09/13/2021	09/16/2021
RG_LISP24_WS_LAEMP_LCO_2021-09-13_N_NAL	2109236-23	WS	Sample	09/13/2021	09/16/2021

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
RG_LISP24_WS_LAEMP_LCO_2021-09-13_N_NAL	2109236-24	WS	Sample	09/13/2021	09/16/2021
RG_LCUT_WS_LAEMP_LCO_2021-09-12_N	2109236-25	WS	Sample	09/10/2021	09/16/2021
RG_LCUT_WS_LAEMP_LCO_2021-09-12_N_NAL	2109236-26	WS	Sample	09/10/2021	09/16/2021
RG_LCUT_WS_LAEMP_LCO_2021-09-12_N_NAL	2109236-27	WS	Sample	09/10/2021	09/16/2021

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	09/16/2021	09/18/2021	B212603	S211070
MeSe(IV)	Water	SOP BAL-4201	09/16/2021	09/18/2021	B212603	S211070
MeSe(VI)	Water	SOP BAL-4201	09/16/2021	09/18/2021	B212603	S211070
Se	Water	EPA 1638 Mod	09/21/2021	09/22/2021	B212615	S211084
Se(IV)	Water	SOP BAL-4201	09/16/2021	09/18/2021	B212603	S211070
Se(VI)	Water	SOP BAL-4201	09/16/2021	09/18/2021	B212603	S211070
SeCN	Water	SOP BAL-4201	09/16/2021	09/18/2021	B212603	S211070
SeMet	Water	SOP BAL-4201	09/16/2021	09/18/2021	B212603	S211070
SeSO3	Water	SOP BAL-4201	09/16/2021	09/18/2021	B212603	S211070
Unk Se Sp	Water	SOP BAL-4201	09/16/2021	09/18/2021	B212603	S211070

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_RIVER_WS_2021-09-09_N										
2109236-01	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-01	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-01	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-01	Se(IV)	WS	D	0.156		0.010	0.075	µg/L	B212603	S211070
2109236-01	Se(VI)	WS	D	30.4		0.010	0.055	µg/L	B212603	S211070
2109236-01	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212603	S211070
2109236-01	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-01	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212603	S211070
2109236-01	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212603	S211070
RG_RIVER_WS_2021-09-09_N_NAL										
2109236-02	Se	WS	TR	34.7		0.165	0.528	µg/L	B212615	S211084
RG_RIVER_WS_2021-09-09_N_NAL										
2109236-03	Se	WS	D	34.0		0.165	0.528	µg/L	B212615	S211084
RG_LILC3_WS_LAEMP_LCO_2021-09-09_N										
2109236-04	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-04	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-04	MeSe(VI)	WS	D	0.017	J	0.010	0.025	µg/L	B212603	S211070
2109236-04	Se(IV)	WS	D	0.179		0.010	0.075	µg/L	B212603	S211070
2109236-04	Se(VI)	WS	D	37.1		0.010	0.055	µg/L	B212603	S211070
2109236-04	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212603	S211070
2109236-04	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-04	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212603	S211070
2109236-04	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212603	S211070
RG_LILC3_WS_LAEMP_LCO_2021-09-09_N_NAL										
2109236-05	Se	WS	TR	35.0		0.165	0.528	µg/L	B212615	S211084
RG_LILC3_WS_LAEMP_LCO_2021-09-09_N_NAL										
2109236-06	Se	WS	D	34.8		0.165	0.528	µg/L	B212615	S211084

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_FBLANK_WS_2021-09-09_N										
2109236-07	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-07	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-07	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-07	Se(IV)	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212603	S211070
2109236-07	Se(VI)	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212603	S211070
2109236-07	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212603	S211070
2109236-07	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-07	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212603	S211070
2109236-07	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212603	S211070
RG_FBLANK_WS_2021-09-09_N_NAL										
2109236-08	Se	WS	TR	0.177	J	0.165	0.528	µg/L	B212615	S211084
RG_FBLANK_WS_2021-09-09_N_NAL										
2109236-09	Se	WS	D	0.209	J	0.165	0.528	µg/L	B212615	S211084
RG_LI8_WS_LAEMP_LCO_2021-09-11_N										
2109236-10	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-10	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-10	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-10	Se(IV)	WS	D	0.055	J	0.010	0.075	µg/L	B212603	S211070
2109236-10	Se(VI)	WS	D	24.6		0.010	0.055	µg/L	B212603	S211070
2109236-10	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212603	S211070
2109236-10	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-10	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212603	S211070
2109236-10	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212603	S211070
RG_LI8_WS_LAEMP_LCO_2021-09-11_N_NAL										
2109236-11	Se	WS	TR	23.0		0.165	0.528	µg/L	B212615	S211084
RG_LI8_WS_LAEMP_LCO_2021-09-11_N_NAL										
2109236-12	Se	WS	D	22.9		0.165	0.528	µg/L	B212615	S211084

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_FRUL_WS_LAEMP_LCO_2021-09-12_N										
2109236-13	DMSeO	WS	D	0.013	J	0.010	0.025	µg/L	B212603	S211070
2109236-13	MeSe(IV)	WS	D	0.021	J	0.010	0.025	µg/L	B212603	S211070
2109236-13	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-13	Se(IV)	WS	D	0.399		0.010	0.075	µg/L	B212603	S211070
2109236-13	Se(VI)	WS	D	48.1		0.010	0.055	µg/L	B212603	S211070
2109236-13	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212603	S211070
2109236-13	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-13	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212603	S211070
2109236-13	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212603	S211070
RG_FRUL_WS_LAEMP_LCO_2021-09-12_N_NAL										
2109236-14	Se	WS	TR	45.2		0.165	0.528	µg/L	B212615	S211084
RG_FRUL_WS_LAEMP_LCO_2021-09-12_N_NAL										
2109236-15	Se	WS	D	45.1		0.165	0.528	µg/L	B212615	S211084
RG_FO23_WS_LAEMP_LCO_2021-09-12_N										
2109236-16	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-16	MeSe(IV)	WS	D	0.015	J	0.010	0.025	µg/L	B212603	S211070
2109236-16	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-16	Se(IV)	WS	D	0.322		0.010	0.075	µg/L	B212603	S211070
2109236-16	Se(VI)	WS	D	40.8		0.010	0.055	µg/L	B212603	S211070
2109236-16	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212603	S211070
2109236-16	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-16	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212603	S211070
2109236-16	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212603	S211070
RG_FO23_WS_LAEMP_LCO_2021-09-12_N_NAL										
2109236-17	Se	WS	TR	37.1		0.165	0.528	µg/L	B212615	S211084
RG_FO23_WS_LAEMP_LCO_2021-09-12_N_NAL										
2109236-18	Se	WS	D	38.1		0.165	0.528	µg/L	B212615	S211084

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_N										
2109236-19	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-19	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-19	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-19	Se(IV)	WS	D	0.120		0.010	0.075	µg/L	B212603	S211070
2109236-19	Se(VI)	WS	D	27.8		0.010	0.055	µg/L	B212603	S211070
2109236-19	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212603	S211070
2109236-19	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-19	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212603	S211070
2109236-19	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212603	S211070
RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_N_NAL										
2109236-20	Se	WS	TR	24.4		0.165	0.528	µg/L	B212615	S211084
RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_N_NAL										
2109236-21	Se	WS	D	23.7		0.165	0.528	µg/L	B212615	S211084
RG_LISP24_WS_LAEMP_LCO_2021-09-13_N										
2109236-22	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-22	MeSe(IV)	WS	D	0.014	J	0.010	0.025	µg/L	B212603	S211070
2109236-22	MeSe(VI)	WS	D	0.015	J	0.010	0.025	µg/L	B212603	S211070
2109236-22	Se(IV)	WS	D	0.157		0.010	0.075	µg/L	B212603	S211070
2109236-22	Se(VI)	WS	D	29.5		0.010	0.055	µg/L	B212603	S211070
2109236-22	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212603	S211070
2109236-22	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-22	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212603	S211070
2109236-22	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212603	S211070
RG_LISP24_WS_LAEMP_LCO_2021-09-13_N_NAL										
2109236-23	Se	WS	TR	24.9		0.165	0.528	µg/L	B212615	S211084
RG_LISP24_WS_LAEMP_LCO_2021-09-13_N_NAL										
2109236-24	Se	WS	D	24.9		0.165	0.528	µg/L	B212615	S211084

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LCUT_WS_LAEMP_LCO_2021-09-12_N										
2109236-25	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-25	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-25	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-25	Se(IV)	WS	D	0.087		0.010	0.075	µg/L	B212603	S211070
2109236-25	Se(VI)	WS	D	51.3		0.010	0.055	µg/L	B212603	S211070
2109236-25	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212603	S211070
2109236-25	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212603	S211070
2109236-25	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212603	S211070
2109236-25	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212603	S211070
RG_LCUT_WS_LAEMP_LCO_2021-09-12_N_NAL										
2109236-26	Se	WS	TR	42.7		0.165	0.528	µg/L	B212615	S211084
RG_LCUT_WS_LAEMP_LCO_2021-09-12_N_NAL										
2109236-27	Se	WS	D	43.3		0.165	0.528	µg/L	B212615	S211084

Accuracy & Precision Summary

Batch: B212603
Lab Matrix: Water
Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B212603-BS1	**Blank Spike, (2124033)**						
	MeSe(IV)		5.095	5.395	µg/L	106% 75-125	
	Se(IV)		5.000	4.902	µg/L	98% 75-125	
	Se(VI)		5.000	4.701	µg/L	94% 75-125	
	SeCN		5.015	4.811	µg/L	96% 75-125	
	SeMet		4.932	4.724	µg/L	96% 75-125	
B212603-DUP5	**Duplicate, (2109237-04)**						
	DMSeO	ND		0.011	µg/L		N/C 25
	MeSe(IV)	0.017		0.021	µg/L		21% 25
	MeSe(VI)	ND		ND	µg/L		N/C 25
	Se(IV)	1.103		1.093	µg/L		0.9% 25
	Se(VI)	188.6		193.0	µg/L		2% 25
	SeCN	ND		ND	µg/L		N/C 25
	SeMet	ND		ND	µg/L		N/C 25
	SeSO3	ND		ND	µg/L		N/C 25
	Unk Se Sp	ND		ND	µg/L		N/C 25
B212603-MS5	**Matrix Spike, (2109237-04)**						
	Se(IV)	1.103	4.900	5.744	µg/L	95% 75-125	
	Se(VI)	188.6	5.100	198.4	µg/L	NR 75-125	
	SeCN	ND	1.962	1.960	µg/L	100% 75-125	
	SeMet	ND	1.977	2.046	µg/L	103% 75-125	
B212603-MSD5	**Matrix Spike Duplicate, (2109237-04)**						
	Se(IV)	1.103	4.900	5.688	µg/L	94% 75-125	1% 25
	Se(VI)	188.6	5.100	198.8	µg/L	NR 75-125	N/C 25
	SeCN	ND	1.962	2.015	µg/L	103% 75-125	3% 25
	SeMet	ND	1.977	2.140	µg/L	108% 75-125	4% 25

Accuracy & Precision Summary

Batch: B212615
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B212615-BS1	**Blank Spike, (2104075)**						
	Se		200.0	190.9	µg/L	95% 75-125	
B212615-BS2	**Blank Spike, (2104075)**						
	Se		200.0	193.3	µg/L	97% 75-125	
B212615-BS3	**Blank Spike, (2104075)**						
	Se		200.0	188.6	µg/L	94% 75-125	
B212615-BS4	**Blank Spike, (2104075)**						
	Se		200.0	191.9	µg/L	96% 75-125	
B212615-BS5	**Blank Spike, (2104075)**						
	Se		200.0	188.0	µg/L	94% 75-125	
B212615-BS6	**Blank Spike, (2104075)**						
	Se		200.0	186.7	µg/L	93% 75-125	
B212615-BS7	**Blank Spike, (2104075)**						
	Se		200.0	188.4	µg/L	94% 75-125	
B212615-SRM1	**Reference Material (2110006, TMDA 51.5 Reference Standard - Bottle 6 - SRM)**						
	Se		14.30	15.15	µg/L	106% 75-125	
B212615-SRM2	**Reference Material (2110006, TMDA 51.5 Reference Standard - Bottle 6 - SRM)**						
	Se		14.30	14.39	µg/L	101% 75-125	
B212615-SRM3	**Reference Material (2110006, TMDA 51.5 Reference Standard - Bottle 6 - SRM)**						
	Se		14.30	14.63	µg/L	102% 75-125	
B212615-SRM4	**Reference Material (2110006, TMDA 51.5 Reference Standard - Bottle 6 - SRM)**						
	Se		14.30	13.99	µg/L	98% 75-125	

Accuracy & Precision Summary

Batch: B212615
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B212615-SRM5	**Reference Material (2110006, TMDA 51.5 Reference Standard - Bottle 6 - SRM)**						
	Se		14.30	14.00	µg/L	98% 75-125	
B212615-SRM6	**Reference Material (2110006, TMDA 51.5 Reference Standard - Bottle 6 - SRM)**						
	Se		14.30	14.15	µg/L	99% 75-125	
B212615-SRM7	**Reference Material (2110006, TMDA 51.5 Reference Standard - Bottle 6 - SRM)**						
	Se		14.30	13.77	µg/L	96% 75-125	
B212615-DUP6	**Duplicate, (2109236-02)**						
	Se	34.71		35.10	µg/L		1% 20
B212615-MS6	**Matrix Spike, (2109236-02)**						
	Se	34.71	220.0	244.2	µg/L	95% 75-125	
B212615-MSD6	**Matrix Spike Duplicate, (2109236-02)**						
	Se	34.71	220.0	239.1	µg/L	93% 75-125	2% 20
B212615-DUP7	**Duplicate, (2109236-20)**						
	Se	24.44		22.49	µg/L		8% 20
B212615-MS7	**Matrix Spike, (2109236-20)**						
	Se	24.44	220.0	221.2	µg/L	89% 75-125	
B212615-MSD7	**Matrix Spike Duplicate, (2109236-20)**						
	Se	24.44	220.0	211.3	µg/L	85% 75-125	5% 20

Method Blanks & Reporting Limits

Batch: B212603
Matrix: Water
Method: SOP BAL-4201
Analyte: DMSeO

Sample	Result	Units
B212603-BLK1	0.00	µg/L
B212603-BLK2	0.00	µg/L
B212603-BLK3	0.00	µg/L
B212603-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005
MDL: 0.002
MRL: 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B212603-BLK1	0.00	µg/L
B212603-BLK2	0.00	µg/L
B212603-BLK3	0.00	µg/L
B212603-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005
MDL: 0.002
MRL: 0.005

Analyte: MeSe(VI)

Sample	Result	Units
B212603-BLK1	0.00	µg/L
B212603-BLK2	0.00	µg/L
B212603-BLK3	0.00	µg/L
B212603-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005
MDL: 0.002
MRL: 0.005

Method Blanks & Reporting Limits

Analyte: Se(IV)

Sample	Result	Units
B212603-BLK1	0.00	µg/L
B212603-BLK2	0.00	µg/L
B212603-BLK3	0.00	µg/L
B212603-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Analyte: Se(VI)

Sample	Result	Units
B212603-BLK1	0.00	µg/L
B212603-BLK2	0.00	µg/L
B212603-BLK3	0.00	µg/L
B212603-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: SeCN

Sample	Result	Units
B212603-BLK1	0.00	µg/L
B212603-BLK2	0.00	µg/L
B212603-BLK3	0.00	µg/L
B212603-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.010

MDL: 0.002
MRL: 0.010

Analyte: SeMet

Sample	Result	Units
B212603-BLK1	0.00	µg/L
B212603-BLK2	0.00	µg/L
B212603-BLK3	0.00	µg/L
B212603-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Method Blanks & Reporting Limits

Analyte: SeSO3

Sample	Result	Units
B212603-BLK1	0.00	µg/L
B212603-BLK2	0.00	µg/L
B212603-BLK3	0.00	µg/L
B212603-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: Unk Se Sp

Sample	Result	Units
B212603-BLK1	0.00	µg/L
B212603-BLK2	0.00	µg/L
B212603-BLK3	0.00	µg/L
B212603-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Method Blanks & Reporting Limits

Batch: B212615
Matrix: Water
Method: EPA 1638 Mod
Analyte: Se

Sample	Result	Units
B212615-BLK1	0.130	µg/L
B212615-BLK2	0.191	µg/L
B212615-BLK3	0.098	µg/L
B212615-BLK4	0.107	µg/L
B212615-BLK5	0.157	µg/L
B212615-BLK6	0.136	µg/L
B212615-BLK7	0.192	µg/L

Average: 0.144
Limit: 0.480

MDL: 0.150
MRL: 0.480

Sample Containers

Lab ID: 2109236-01
Sample: RG_RIVER_WS_2021-09-09_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/09/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-02
Sample: RG_RIVER_WS_2021-09-09_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/09/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-03
Sample: RG_RIVER_WS_2021-09-09_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/09/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-04
Sample: RG_LILC3_WS_LAEMP_LCO_2021-09-09_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/09/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236

Sample Containers

Lab ID: 2109236-05
Sample: RG_LILC3_WS_LAEMP_LCO_2021-09-09_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/09/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-06
Sample: RG_LILC3_WS_LAEMP_LCO_2021-09-09_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/09/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-07
Sample: RG_FBLANK_WS_2021-09-09_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/09/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-08
Sample: RG_FBLANK_WS_2021-09-09_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/09/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-09
Sample: RG_FBLANK_WS_2021-09-09_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/09/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Sample Containers

Lab ID: 2109236-10 **Report Matrix:** WS **Collected:** 09/10/2021
Sample: RG_LI8_WS_LAEMP_LCO_2021-09-11_N **Sample Type:** Sample + Sum **Received:** 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-11 **Report Matrix:** WS **Collected:** 09/10/2021
Sample: RG_LI8_WS_LAEMP_LCO_2021-09-11_N_NAL **Sample Type:** Sample + Sum **Received:** 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-12 **Report Matrix:** WS **Collected:** 09/10/2021
Sample: RG_LI8_WS_LAEMP_LCO_2021-09-11_N_NAL **Sample Type:** Sample + Sum **Received:** 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-13 **Report Matrix:** WS **Collected:** 09/12/2021
Sample: RG_FRUL_WS_LAEMP_LCO_2021-09-12_N **Sample Type:** Sample + Sum **Received:** 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236

Sample Containers

Lab ID: 2109236-14
Sample: RG_FRUL_WS_LAEMP_LCO_2021-09-12_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/12/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-15
Sample: RG_FRUL_WS_LAEMP_LCO_2021-09-12_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/12/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-16
Sample: RG_FO23_WS_LAEMP_LCO_2021-09-12_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/12/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-17
Sample: RG_FO23_WS_LAEMP_LCO_2021-09-12_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/12/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Sample Containers

Lab ID: 2109236-18
Sample: RG_FO23_WS_LAEMP_LCO_2021-09-12_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/12/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-19
Sample: RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/13/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-20
Sample: RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/13/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-21
Sample: RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/13/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Sample Containers

Lab ID: 2109236-22
Sample: RG_LISP24_WS_LAEMP_LCO_2021-09-13_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/13/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-23
Sample: RG_LISP24_WS_LAEMP_LCO_2021-09-13_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/13/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-24
Sample: RG_LISP24_WS_LAEMP_LCO_2021-09-13_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/13/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-25
Sample: RG_LCUT_WS_LAEMP_LCO_2021-09-12_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/10/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2109236

Sample Containers

Lab ID: 2109236-26
Sample: RG_LCUT_WS_LAEMP_LCO_2021-09-12_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/10/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Lab ID: 2109236-27
Sample: RG_LCUT_WS_LAEMP_LCO_2021-09-12_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 09/10/2021
Received: 09/16/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2127026	<2	Styrofoam Cooler #1 - 2109236

Shipping Containers

Styrofoam Cooler #1 - 2109236

Received: September 16, 2021 6:41
Tracking No: PAPS#RWHV87364 via Courier
Coolant Type: Ice
Temperature: 0.8 °C

Description: Styrofoam Cooler
Damaged in transit? No
Returned to client? No
Comments: IR#30

Custody seals present? No
Custody seals intact? No
COC present? No

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COC ID:	September LCO LAEMP	TURNAROUND TIME:	Regular

PROJECT/CLIENT INFO

Facility Name / Job#	REP
Project Manager	Cybele Heddle
Email	cybele.heddle@teck.com
Address	421 Pine Avenue
City	Sparwood
Province	BC
Postal Code	V0B 2G0
Country	Canada
Phone Number	250-910-8755

LABORATORY

Lab Name	Brooks Applied Labs
Lab Contact	Ben Wozniak
Email	ben@brooksapplied.com
Address	18804 North Creek Parkway
City	Bothell
Province	WA
Postal Code	98011
Country	USA
Phone Number	206-632-6206

OTHER INFO

Report Format / Distribution		Excel	PDF	EDD
Email 1:	cybele.heddle@teck.com	X	X	X
Email 2:	teckcoal@equisonline.com			X
Email 3:	clayton.spytz@teck.com	X	X	X
Email 4:	lbowron@minnow.ca	X	X	X
Email 5:	tyler.mehler@minnow.ca	X	X	X
Email 5:				
PO number	VPO00748540			

SAMPLE DETAILS / **ANALYSIS REQUESTED** (Filtered - F: Field, L: Lab, FL: Field & Lab, N: None)

Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Total Selenium	Dissolved Selenium (F)	Selenium Speciation (F)
RG_RIVER_WS_2021-09-09_N	RG_RIVER	WS	No	09/09/2021	1036	G	1			1
RG_RIVER_WS_2021-09-09_N_NAL	RG_RIVER	WS	No	09/09/2021	1036	G	2	1	1	
RG_LILC3_WS_LAEMP_LCO_2021-09-09_N	RG_LILC3	WS	No	09/09/2021	1036	G	1			1
RG_LILC3_WS_LAEMP_LCO_2021-09-09_N_NAL	RG_LILC3	WS	No	09/09/2021	1036	G	2	1	1	
RG_FBLANK_WS_2021-09-09_N	RG_FBLANK	WS	No	09/09/2021	1036	G	1			1
RG_FBLANK_WS_2021-09-09_N_NAL	RG_FBLANK	WS	No	09/09/2021	1036	G	2	1	1	
RG_LI8_WS_LAEMP_LCO_2021-09-11_N	RG_LI8	WS	No	09/10/2021	1210	G	1			1
RG_LI8_WS_LAEMP_LCO_2021-09-11_N_NAL	RG_LI8	WS	No	09/10/2021	1210	G	2	1	1	

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

Total and dissolved selenium samples have NOT been preserved. Dissolved selenium have been filtered. Speciation samples have been filtered and frozen.

RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Jennifer Ings/Minnow	September 14, 2021	Shale Rosatle	9/16/21 6:41

SERVICE REQUEST (rush - subject to availability)

Regular (default)	X
Priority (2-3 business days) - 50% surcharge	
Emergency (1 Business Day) - 100% surcharge	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	

Sampler's Name	Jennifer Ings	Mobile #	519-500-3444
Sampler's Signature	Jennifer Ings	Date/Time	September 14, 2021

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COC ID:	September LCO LAEMP	TURNAROUND TIME:	Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	REP			Lab Name	Brooks Applied Labs			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Cybele Heddle			Lab Contact	Ben Wozniak			Email 1:	cybele.heddle@teck.com	X	X	X
Email	cybele.heddle@teck.com			Email	ben@brooksapplied.com			Email 2:	teckcoal@equisonline.com			X
Address	421 Pine Avenue			Address	18804 North Creek Parkway			Email 3:	clayton.spytz@teck.com	X	X	X
								Email 4:	tbowron@minnow.ca	X	X	X
City	Sparwood	Province	BC	City	Bothell	Province	WA	Email 5:	tyler.mehler@minnow.ca	X	X	X
Postal Code	V0B 2G0	Country	Canada	Postal Code	98011	Country	USA	Email 5:				
Phone Number	250-910-8755			Phone Number	206-632-6206			PO number	VPO00748540			

SAMPLE DETAILS / ANALYSIS REQUESTED (Filtered - F: Field, L: Lab, FL: Field & Lab, N: None)

Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	Total Selenium	Dissolved Selenium (F)	Selenium Speciation (F)
RG_FRUL_WS_LAEMP_LCO_2021-09-12_N	RG_FRUL	WS	No	09/12/2021	0823	G	1			1
RG_FRUL_WS_LAEMP_LCO_2021-09-12_N_NAL	RG_FRUL	WS	No	09/12/2021	0823	G	2	1	1	
RG_FO23_WS_LAEMP_LCO_2021-09-12_N	RG_FO23	WS	No	09/12/2021	0740	G	1			1
RG_FO23_WS_LAEMP_LCO_2021-09-12_N_NAL	RG_FO23	WS	No	09/12/2021	0740	G	2	1	1	
RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_N	RG_LIDCOM	WS	No	09/13/2021	0919	G	1			1
RG_LIDCOM_WS_LAEMP_LCO_2021-09-13_N_NAL	RG_LIDCOM	WS	No	09/13/2021	0919	G	2	1	1	
RG_LISP24_WS_LAEMP_LCO_2021-09-13_N	RG_LISP24	WS	No	09/13/2021	1300	G	1			1
RG_LISP24_WS_LAEMP_LCO_2021-09-13_N_NAL	RG_LISP24	WS	No	09/13/2021	1300	G	2	1	1	

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

Total and dissolved selenium samples have NOT been preserved. Dissolved selenium have been filtered. Speciation samples have been filtered and frozen.

RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Jennifer Ings/Minnow	September 14, 2021	Sarah Rossetti	9/16/21 6:41

SERVICE REQUEST (rush - subject to availability)

Regular (default)	X
Priority (2-3 business days) - 50% surcharge	
Emergency (1 Business Day) - 100% surcharge	
For Emergency <1 Day, ASAP or Weekend - Contact ALS	

Sampler's Name	Jennifer Ings	Mobile #	519-500-3444
Sampler's Signature	Jennifer Ings	Date/Time	September 14, 2021

26 13

Teck

COC ID:	September LCO LAEMP	TURNAROUND TIME:	Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name / Job#	REP			Lab Name	Brooks Applied Labs			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Cybele Heddle			Lab Contact	Ben Wozniak			Email 1:	cybele.heddle@teck.com	X	X	X
Email	cybele.heddle@teck.com			Email	ben@brooksapplied.com			Email 2:	teckcoal@equisonline.com			X
Address	421 Pine Avenue			Address	18804 North Creek Parkway			Email 3:	clayton.spytz@teck.com	X	X	X
								Email 4:	tbowron@minnow.ca	X	X	X
City	Sparwood	Province	BC	City	Bothell	Province	WA	Email 5:	tyler.mehler@minnow.ca	X	X	X
Postal Code	V0B 2G0	Country	Canada	Postal Code	98011	Country	USA	Email 5:				
Phone Number	250-910-8755			Phone Number	206-632-6206			PO number	VPO00748540			

SAMPLE DETAILS								ANALYSIS REQUESTED														
								FIL		F	F											
								PRESERV.														
								ANALYSIS	Total Selenium	Dissolved Selenium	Selenium Speciation											
Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.															
RG_LCUT_WS_LAEMP_LCO_2021-09-12_N	RG_LCUT	WS	No	09/10/2021	1254	G	1				1											
RG_LCUT_WS_LAEMP_LCO_2021-09-12_N_NAL	RG_LCUT	WS	No	09/10/2021	1254	G	2		1	1												

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Total and dissolved selenium samples have NOT been preserved. Dissolved selenium have been filtered. Speciation samples have been filtered and frozen.	Jennifer Ings/Minnow	September 14, 2021	Shula Russell	9/16/21 6:41

SERVICE REQUEST (rush - subject to availability)					
Regular (default)	X	Sampler's Name	Jennifer Ings	Mobile #	519-500-3444
Priority (2-3 business days) - 50% surcharge		Sampler's Signature		Date/Time	September 14, 2021
Emergency (1 Business Day) - 100% surcharge					
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

RW HOT SHOT SERVICE INC.
250-425-7447
24 Hour Hot Shot Service

STRAIGHT BILL OF LEADING
NOT NEGOTIABLE

No. 87364

Sparwood, BC / Terrace, BC / Red Deer, AB
Vancouver, BC / Calgary, AB / Montreal, QC
Prince George, BC / Edmonton, AB / Spokane, WA
Elkford, BC / Ft. McMurray, AB / Shelby, MT
Tumbler Ridge, BC / Hinton, AB / Gillette, WY

DATE: Sept 15-21

INVOICE TO:

PURCHASE ORDER NUMBER:

BILL OF LADING #:

CONSIGNEE (TO): Brooks Applied Labs
STREET: 18804 N. Creek Parkway
CITY/PROVINCE: Bothell, WA
POSTAL CODE: 98011

SHIPPER (FROM): Teck Coal Ltd
STREET: West Line Creek Treatment
CITY/PROVINCE: Sparwood, BC
POSTAL CODE:

SPECIAL INSTRUCTIONS:

PACKAGES	DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)
5	Coolers - Water Samples	100 LBS
	PAPS#RWHV87364	

FREIGHT CHARGES
SHIPPER TO CHECK
☐ PREPAID ☐ COLLECT
If not indicated, shipping will automatically move collect.

FEE
WAITING
XPU
CHARGES
FSC
US
SUB TOTAL
GST
TOTAL $

IF AT OWNER'S RISK, WRITE ORD HERE
DATE
TIME
NUMBER OF PIECES RECEIVED

UNIT #

DECLARED VALUATION: Maximum liability of carrier is $2.00 per lb. ($4.41 per kilogram) unless declared valuation states otherwise. $

DRIVER'S SIGNATURE - PICK UP BY | PICK UP TIME | DRIVER'S SIGNATURE - DELIVERY BY | FINISH TIME

NOTICE OF CLAIM: (a) No carrier is liable for loss, damage or delay of any goods under the Bill of Lading unless notice, therefor setting out particulars of the origin, destination and date of shipment of the goods and the estimated amount claimed in respect of such loss, damage or delay is given in writing to the originating carrier or the delivering carrier within sixty (60) days after the delivery of the goods, or in the case of failure to make delivery within nine (9) months from the date of shipment. (b) The final statement of the claim must be filed within nine (9) months from the date of shipment together with a copy of the paid freight bill. RECEIVED at the point of origin on the date specified from the consignor mentioned herein, the property herein described, in apparent good order, except as noted (contents and condition of contents of package unknown) marked, consigned and destined as indicated below, which the carrier agrees to carry and to deliver to the consignee at the said destination, subject to the rates and classification in effect on the date of shipment. It is mutually agreed, as to each carrier of all or any of the goods over all or any portion of the route to destination, and as to each party of any time interested in all or any of the goods, that every service to be performed hereunder shall be subject to all the conditions standard Bill of Lading, in power at the date of issuing, which are hereto agreed by the consignor and accepted for himself and his assigns. Printed or written, including conditions set aside by the standard Bill of Lading, in power at the date of issuing, which are hereby agreed by the consignor and accepted for himself and his assigns. The Contract for the carriage of the goods listed in the Bill of Lading is governed by regulation in force in the jurisdiction at the time and place of shipment and is subject to the conditions set out in such conditions.

SHIPPER PRINT: Jason Zhorath
SHIPPER SIGN: [signature]
CONSIGNEE PRINT: Sean Zeck (BAL)
CONSIGNEE SIGN: [signature]
9/16/21
GST # 864540398RT0001

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROAD: Shipper

Cooler ID: Styrofoam Cooler #1 **COC (Y/N)** **Temperature:** 0.8 **IR:** 30

Coolant Type: (Ice) Blue Ice Ambient

Notes:

2109236

Sampling Locations:	BG		EV		GH				
Sample Types:	T/D	SP	T/D	SP	T/D	SP			
Container Types:	40mL	60mL		60mL	40mL	60mL			

Opened By: CVL **Date:** 9/16/21

COPY

STRAIGHT BILL OF LADING
NOT NEGOTIABLE

RW HOT SHOT SERVICE INC.
250-425-7447
24 Hour Hot Shot Service

No. 87364

Sparwood, BC
Terrace, BC
Red Deer, AB

Vancouver, BC
Calgary, AB
Montreal, QC

Prince George, BC
Edmonton, AB
Spokane, WA

Elkford, BC
Ft. McMurray, AB
Shelby, MT

Tumbler Ridge, BC
Hinton, AB
Gillette, WY

DATE Sept 15-21

INVOICE TO

PURCHASE ORDER NUMBER

BILL OF LADING #

SHIPPER (FROM) Tech Coal Ltd

CONSIGNEE (TO) BROOKS Applied Labs

STREET West Line Creek Treatment

STREET 1604 N. Creek Parkway

CITY/PROVINCE Sparwood, BC

POSTAL CODE

CITY/PROVINCE Bothell WA

POSTAL CODE 98011

SPECIAL INSTRUCTIONS

PACKAGES	DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)
5	Coolers - Water Samples	100 LBS

PAPS# RWHV87364

UNIT #

DECLARED VALUATION: Maximum liability of carrier is $2.00 per lb. ($4.41 per kilogram) unless declared valuation states otherwise. $

DRIVER'S SIGNATURE - PICK UP BY

PICK UP TIME

DRIVER'S SIGNATURE - DELIVERY BY

FINISH TIME

NOTICE OF CLAIM: (a) No carrier is liable for loss, damage or delay of any goods under the Bill of Lading unless notice, therefor setting out particulars of the origin, destination and date of shipment of the goods and the estimated amount claimed in respect of such loss, damage or delay is given in writing to the originating carrier or the delivering carrier within sixty (60) days after the delivery of the goods, (in the case of failure to make delivery within nine (9) months from the date of shipment. (b) The final statement of the claim must be filed within nine (9) months from the date of shipment together with a copy of the paid freight bill. RECEIVED at the point of origin on the date specified from the consignor mentioned herein, the property herein described, in apparent good order, except as noted (contents and condition of contents of package unknown) marked, consigned and destined as indicated below, which the carrier agrees to carry and to deliver to the consigned at the said destination, subject to the rates and classification in effect on the date of shipment. It is mutually agreed, as to each carrier of all or any of the goods over all or any portion of the route to destination, and as to each party at any time interested in all or any of the goods, that every service to be performed hereunder shall be subject to all the conditions standard Bill of Lading, in power at the date of issuing, which are hereby agreed by the consignor and accepted for himself and his assigns. Printed or written, including conditions set aside by the standard Bill of Lading, in power at the date of issuing, which are hereby agreed by the consignor and accepted for himself and his assigns. The Contract for the carriage of the goods listed in the Bill of Lading is governed by regulation in force in the jurisdiction at the time and place of shipment and is subject to the conditions set out in such conditions.

SHIPPER PRINT: Jason Turnbull

CONSIGNEE PRINT

SHIPPER SIGN

CONSIGNEE SIGN

GST # 864540398RT0001

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROAD: Shipper

AMICOS PRINTING

FREIGHT CHARGES

SHIPPER TO CHECK

☐ PREPAID ☐ COLLECT

If not indicated, shipping will automatically move to...

FEE

WAITING

XPU

CHARGES

FSC

US

SUB TOTAL

GST

TOTAL $

IF AT OWNER'S RISK, WRITE ORD HERE

DATE 9/16/21

TIME 7:47

NUMBER OF PIECES RECEIVED 5

Cooler ID: Styrofoam Cooler #2 **COC (Y/N)** **Temperature:** T/D: 5.6 °C Sp: 1.1 °C **IR:** 30

Coolant Type: Ice Blue Ice Ambient

Notes:

Sampling Locations:	LC		RG						
	T/D	SP	T/D	SP	T/D	SP	T/D	SP	T/D	SP
Sample Types:										
Container Types:	40mL		40mL	60mL						

Opened By: SP **Date:** 9/16/21

COPY

STRAIGHT BILL OF LADING
NOT NEGOTIABLE

RW HOT SHOT SERVICE INC.

250-425-7447

24 Hour Hot Shot Service

No. 87364

Sparwood, BC
Terrace, BC
Red Deer, AB

Vancouver, BC
Calgary, AB
Montreal, QC

Prince George, BC
Edmonton, AB
Spokane, WA

Elkford, BC
Ft. McMurray, AB
Shelby, MT

Tumbler Ridge, BC
Hinton, AB
Gillette, WY

DATE Sept 15-21

INVOICE TO

PURCHASE ORDER NUMBER

BILL OF LADING #

SHIPPER (FROM) Teck Coal Ltd

CONSIGNEE (TO) Brooks Applied Labs

STREET West Line Creek Treatment

STREET 18804 N. Creek Parkway

CITY/PROVINCE Sparwood, BC

POSTAL CODE

CITY/PROVINCE Bothell, WA

POSTAL CODE 98011

SPECIAL INSTRUCTIONS

PACKAGES	DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)
5	Coolers - Water Samples	100 LBS

PAPS# RWHV87364

UNIT #

DECLARED VALUATION: Maximum liability of carrier is $2.00 per lb. ($4.41 per kilogram) unless declared valuation states otherwise. $

DRIVER'S SIGNATURE - PICK UP BY

PICK UP TIME

DRIVER'S SIGNATURE - DELIVERY BY

FINISH TIME

FREIGHT CHARGES
SHIPPER TO CHECK
☐PREPAID ☐COLLECT
If not indicated, shipping will automatically move collect.

FEE
WAITING
XPU
CHARGES
FSC
US
SUB TOTAL
GST
TOTAL $
IF AT OWNER'S RISK, WRITE ORDER HERE
DATE
TIME
NUMBER OF PIECES RECEIVED

NOTICE OF CLAIM: (a) No carrier is liable for loss, damage or delay of any goods under the Bill of Lading unless notice, therefor setting out particulars of the origin, destination and date of shipment of the goods and the estimated amount claimed in respect of such loss, damage or delay is given in writing to the originating carrier or the delivering carrier within sixty (60) days after the delivery of the goods; on the case of failure to make delivery within nine (9) months from the date of shipment, together with a copy of the paid freight bill. (b) The final statement of the claim must be filed within nine (9) months from the date specified from the consignor mentioned herein, the property herein described, in apparent good order, except as noted (contents and condition of contents of package unknown) marked, consigned and RECEIVED at the point of origin on the date specified from the consignor mentioned herein, the property herein described, in apparent good order, except as noted (contents and condition of contents of package unknown) marked, consigned and destined as indicated below, which the carrier agrees to carry and to deliver to the consigned at the said destination, subject to the rates and classification in effect on the date of shipment. It is mutually agreed, as to each carrier of all or any of the goods over all or any portion of the route to destination, agrees to each party of any time interested in all or any of the goods, that every service to be performed hereunder shall be subject to all the conditions standard Bill of Lading, in power at the date of issuing, which are hereto agreed by the consignor and accepted for himself and his assigns. Printed or written, including conditions set aside by the standard Bill of Lading, in power at the date of issuing, which are hereby agreed by the consignor and accepted for himself and his assigns. The Contract for the carriage of the goods listed in the Bill of Lading is governed by regulation in force in the jurisdiction at the time and place of shipment and is subject to the conditions set out in such conditions.

SHIPPER PRINT Jason Thurrott

CONSIGNEE PRINT Teck Coal (BAL)

SHIPPER SIGN

CONSIGNEE SIGN

9/16/21

GST # 864540398RT0001

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROAD: Shipper

ASSIGNS PRINTING

Cooler ID: Styrofoam Cooler #3 COC (Y/N) Temperature: T/D: 6.0°C Sp: 0.4°C IR: 30

Coolant Type: (Ice) (Blue Ice) Ambient

Notes:

Sampling Locations:	RG		EV		LC					
Sample Types:	T/D	SP	T/D	SP	T/D	SP	T/D	SP	T/D	SP
Container Types:	40mL	60mL	40mL			60mL				

Opened By: SP Date: 9/16/21

COPY

SELENIUM SPECIATION

BAL Final Report 2112095

(Finalized January 4, 2022)

BROOKS APPLIED LABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

January 4, 2022

Teck Resources Limited – Vancouver
Cybele Heddle
421 Pine Avenue
Sparwood, B.C. CANADA V0B2G0
cybele.heddle@teck.com

Re: REP

Dear Cybele Heddle,

On December 9, 2021, Brooks Applied Labs (BAL) received twenty-two (22) aqueous samples. The samples were logged-in for total recoverable selenium [*Se*], dissolved Se, and Se speciation analyses, according to the chain-of-custody (COC) form.

Sample ID values listed on the chain-of-custody (COC) form did not exactly match the corresponding **Sample ID** values listed on container labels for samples 2112095-04 and 2112095-05. The discrepancies are described in the table below.

Laboratory ID	**Sample ID** ***(From COC form)***	**Sample ID** ***(From Container Label)***	**Analytical Parameter**
2112095-04	RG_SLINE_WS_LAEMP_LCO_2021-12_NP_NAL	RG_SLINE_WS_LAEMP_LCO_2021-11_NP_NAL	Total Recoverable Se
2112095-05	RG_SLINE_WS_LAEMP_LCO_2021-12_NP_NAL	RG_SLINE_WS_LAEMP_LCO_2021-11_NP_NAL	Dissolved Se

Per client request, 2112095-04 and 2112095-05 were logged in and reported according to the **Sample ID** values listed on the COC form.

The sample fractions logged in for Se speciation and dissolved Se had been field-filtered prior to receipt at BAL. All samples were stored according to BAL SOPs.

Total Recoverable and Dissolved Se
Each aqueous sample fraction for total recoverable or dissolved Se was digested in a closed vessel (bomb) with nitric and hydrochloric acids. The resulting digests were analyzed for Se content via inductively coupled plasma triple quadrupole mass spectrometry (ICP-QQQ-MS). The ICP-QQQ-MS instrumentation uses advanced interference removal techniques to ensure accuracy of the sample results. For more information, please visit the *Interference Reduction Technology* section on our website, brooksapplied.com.

Se Speciation

Each aqueous sample was analyzed for Se speciation using ion chromatography inductively coupled plasma collision reaction cell mass spectrometry (IC-ICP-CRC-MS). Selenium species are chromatographically separated on an ion exchange column and then quantified using inductively coupled plasma collision reaction cell mass spectrometry (ICP-CRC-MS); for more information on this determinative technique, please visit the *Interference Reduction Technology* section on our website. The chromatographic method applied for the analyses provides greater retention of methylseleninic acid and selenomethionine, allowing for more definitive quantitation of these species.

In accordance with the quotation issued for this project, selenium speciation was defined as dissolved selenite [Se(IV)], selenate [Se(VI)], selenocyanate [SeCN], methylseleninic acid [MeSe(IV)], methaneselenonic acid [MeSe(VI)], selenomethionine [SeMet], selenosulfate [SeSO3], and dimethylselenoxide [DMSeO]. Unknown Se species was defined as the total concentration of all unknown Se species observed during the analysis. This item is identified on the report as [Unk Se Sp].

DMSeO elutes early in the chromatographic run due to the nature of the molecule and the applied chromatographic separation method. Since this species elutes near the dead volume, additional Se species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting Se species.

The results were not method blank corrected, as described in the calculations section of the relevant BAL SOPs and were evaluated using reporting limits adjusted to account for sample aliquot size. Please refer to the *Sample Results* page for sample-specific MDLs, MRLs, and other details.

In instances when a matrix spike/matrix spike duplicate (MS/MSD) set was spiked at a level less than the native sample concentration, the recoveries and the relative percent difference (RPD) are not considered valid indicators of data quality. In such instances, the recoveries of the laboratory fortified blanks (BS) and/or standard reference materials (SRM) demonstrate the accuracy of the applied methods. When the spiking level was less than 25% of the native sample concentration, the spike recovery was not reported (NR) and the RPD of the MS/MSD set was not calculated (N/C).

Except for concentration qualifiers, all data were reported without qualification. All associated quality control sample results met the acceptance criteria.

BAL, an accredited laboratory, certifies that the reported results of all analyses for which BAL is NELAP accredited met all NELAP requirements. For more information, please see the *Report Information* page.

Please feel free to contact us if you have any questions regarding this report.

Sincerely,

Jeremy Maute
Senior Project Manager
Brooks Applied Labs
Jeremy@brooksapplied.com

Report Information

Laboratory Accreditation

BAL is accredited by the *National Environmental Laboratory Accreditation Program* (NELAP) through the State of Florida Department of Health, Bureau of Laboratories (E87982) and is certified to perform many environmental analyses. BAL is also certified by many other states to perform environmental analyses. For a current list of our accreditations/certifications, please visit our website at <http://www.brooksapplied.com/resources/certificates-permits/> or review Tables 1 and 2 in our Accreditation Information. Results reported relate only to the samples listed in the report.

Field Quality Control Samples

Please be notified that certain EPA methods require the collection of field quality control samples of an appropriate type and frequency; failure to do so is considered a deviation from some methods and for compliance purposes should only be done with the approval of regulatory authorities. Please see the specific EPA methods for details regarding required field quality control samples.

Common Abbreviations

AR	as received
BAL	Brooks Applied Labs
BLK	method blank
BS	blank spike
CAL	calibration standard
CCB	continuing calibration blank
CCV	continuing calibration verification
COC	chain of custody record
D	dissolved fraction
DUP	duplicate
IBL	instrument blank
ICV	initial calibration verification
MDL	method detection limit
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
ND	non-detect
NR	non-reportable
N/C	not calculated
PS	post preparation spike
REC	percent recovery
RPD	relative percent difference
SCV	secondary calibration verification
SOP	standard operating procedure
SRM	reference material
T	total fraction
TR	total recoverable fraction

Definition of Data Qualifiers

(Effective 3/23/2020)

E	An estimated value due to the presence of interferences. A full explanation is presented in the narrative.
H	Holding time and/or preservation requirements not met. Please see narrative for explanation.
J	Detected by the instrument, the result is > the MDL but ≤ the MRL. Result is reported and considered an estimate.
J-1	Estimated value. A full explanation is presented in the narrative.
M	Duplicate precision (RPD) was not within acceptance criteria. Please see narrative for explanation.
N	Spike recovery was not within acceptance criteria. Please see narrative for explanation.
R	Rejected, unusable value. A full explanation is presented in the narrative.
U	Result is ≤ the MDL or client requested reporting limit (CRRL). Result reported as the MDL or CRRL.
X	Result is not BLK-corrected and is within 10x the absolute value of the highest detectable BLK in the batch. Result is estimated.
Z	Holding time and/or preservation requirements not established for this method; however, BAL recommendations for holding time were not followed. Please see narrative for explanation.

These qualifiers are based on those previously utilized by Brooks Applied Labs, those found in the EPA SOW ILM03.0, Exhibit B, Section III, pg. B-18, and the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review; USEPA; January 2010. These supersede all previous qualifiers ever employed by BAL.

Accreditation Information

Table 1. Accredited method/matrix/analytes for TNI

Issued by: State of Florida Dept. of Health (The NELAC Institute 2016 Standard)
Issued on: July 1, 2021; Valid to: June 30, 2022
Certificate Number: E87982-37

Method	Matrix	TNI Accredited Analyte(s)
EPA 1638	Non-Potable Waters	Ag, Cd, Cu, Ni, Pb, Sb, Se, Tl, Zn
EPA 200.8	Non-Potable Waters	Ag, Al, As, Ba, Be, Cd, Co, Cr, Cu, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
EPA 6020	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, U, V, Zn
	Solids/Chemicals & Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Tl, V, Zn
BAL-5000	Non-Potable Waters	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn, Hardness
	Solids/Chemicals	Ag, As, B, Be, Cd, Co, Cr, Cu, Pb, Mo, Ni, Sb, Se, Sn, Sr, Tl, V, Zn
	Biological	Ag, Al, As, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Tl, V, Zn
EPA 1640	Non-Potable Waters	Cd, Cu, Pb, Ni, Zn
EPA 1631E	Non-Potable Waters, Solids/Chemicals & Biological	Total Mercury
EPA 1630	Non-Potable Waters	Methyl Mercury
BAL-3200	Solids/Chemicals & Biological	Methyl Mercury
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs
BAL-4201	Non-Potable Waters	Se(IV), Se(VI)
BAL-4300	Non-Potable Waters Solid/Chemicals	Cr(VI)
SM2340B	Non-Potable Waters	Hardness

Accreditation Information

Table 2. Accredited method/matrix/analytes for ISO (1), Non-Governmental TNI (2), and DoD/DOE (3)

Issued by: ANAB

Issued on: September 21, 2021; Valid to: March 30, 2024

Method	Matrix	ISO and Non-Gov. TNI Accredited Analyte(s)	DoD/DOE Accredited Analytes
EPA 1638 Mod EPA 200.8 Mod EPA 6020 Mod	Non-Potable Waters	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, U, V, Zn	Ag, Al, As, Ba, Ca, Cd, Cr, Cu, Fe, Pb, Mg, Mn, Ni, Sb, Se, V, Zn
BAL-5000	Solids/Chemicals & Biological	Ag, Al, As, B, Ba, Be, Ca, Cd, Co, Cr, Cu, Fe, Mg, Mn, Mo, Ni, Pb, Sb, Se, Sn, Sr, Tl, V, Zn Hg (Biological Only)	Not Accredited
EPA 1640 Mod	Non-Potable Waters	Cd, Cu, Pb, Ni, Zn Ag, As, Cr, Co, Se, Tl, V (ISO Only)	Not Accredited
EPA 1631E Mod BAL-3100	Non-Potable Waters, Solids/Chemicals & Biological/Food	Total Mercury	Total Mercury
EPA 1630 Mod BAL-3200	Non-Potable Waters, Solids/Chemicals Biological	Methyl Mercury	Methyl Mercury (excluding Solids/Chemicals)
EPA 1632A Mod BAL-3300	Non-Potable Waters	Inorganic Arsenic (ISO Only)	Not Accredited
	Biological/Food Solids/Chemicals	Inorganic Arsenic (ISO Only)	Not Accredited
AOAC 2015.01 Mod BAL-5000	Food	As, Cd, Hg, Pb	Not Accredited
BAL-4100	Non-Potable Waters	As(III), As(V), DMAs, MMAs	Not Accredited
	Biological by BAL-4117	Inorganic Arsenic, DMAs, MMAs (ISO Only)	Not Accredited
BAL-4101	Food by BAL-4117	Inorganic Arsenic, DMAs, MMAs (ISO Only)	Not Accredited
BAL-4201	Non-Potable Waters	Se(IV), Se(VI), SeCN, SeMet	Not Accredited
BAL-4300	Non-Potable Waters, Solid/Chemicals	Cr(VI)	Cr(VI)
SM 3500-Fe BAL-4500	Non-Potable Waters	Fe, Fe(II) (ISO Only)	Not Accredited
SM2340B	Non-Potable Waters	Hardness	Hardness
SM 2540G BAL-0501	Solids/Chemicals & Biological	% Dry Weight	% Dry Weight

(1) ISO/IEC 17025:2017 – Certificate Number ADE-1447.02

(2) Non-Governmental NELAC Institute 2016 Standard – Certificate Number ADE-1447.01

(3) Department of Defense/Energy Consolidated Quality Systems Manual v. 5.3 – Certificate Numbers ADE-1447 for DoD, ADE-1447.03 for DOE.

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
RG_LI24_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-01	WS	Sample	11/30/2021	12/09/2021
RG_LI24_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-02	WS	Sample	11/30/2021	12/09/2021
RG_LI24_WS_LAEMP_LCO_2021-12_NP	2112095-03	WS	Sample	11/30/2021	12/09/2021
RG_SLINE_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-04	WS	Sample	11/29/2021	12/09/2021
RG_SLINE_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-05	WS	Sample	11/29/2021	12/09/2021
RG_SLINE_WS_LAEMP_LCO_2021-12_NP	2112095-06	WS	Sample	11/29/2021	12/09/2021
RG_LISP24_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-07	WS	Sample	11/30/2021	12/09/2021
RG_LISP24_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-08	WS	Sample	11/30/2021	12/09/2021
RG_LISP24_WS_LAEMP_LCO_2021-12_NP	2112095-09	WS	Sample	11/21/2021	12/09/2021
RG_LILC3_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-10	WS	Sample	12/01/2021	12/09/2021
RG_LILC3_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-11	WS	Sample	12/01/2021	12/09/2021
RG_LILC3_WS_LAEMP_LCO_2021-12_NP	2112095-12	WS	Sample	12/01/2021	12/09/2021
RG_LCUT_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-13	WS	Sample	12/01/2021	12/09/2021
RG_LCUT_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-14	WS	Sample	12/01/2021	12/09/2021
RG_LCUT_WS_LAEMP_LCO_2021-12_NP	2112095-15	WS	Sample	12/01/2021	12/09/2021
RG_RIVER_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-16	WS	Sample	11/30/2021	12/09/2021
RG_RIVER_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-17	WS	Sample	11/30/2021	12/09/2021
RG_RIVER_WS_LAEMP_LCO_2021-12_NP	2112095-18	WS	Sample	11/30/2021	12/09/2021
RG_LI8_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-19	WS	Sample	12/02/2021	12/09/2021
RG_LI8_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-20	WS	Sample	12/02/2021	12/09/2021
RG_LI8_WS_LAEMP_LCO_2021-12_NP	2112095-21	WS	Sample	12/02/2021	12/09/2021

Sample Information

Sample	Lab ID	Report Matrix	Type	Sampled	Received
RG_FO23_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-22	WS	Sample	12/01/2021	12/09/2021
RG_FO23_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-23	WS	Sample	12/01/2021	12/09/2021
RG_FO23_WS_LAEMP_LCO_2021-12_NP	2112095-24	WS	Sample	12/01/2021	12/09/2021
RG_FRUL_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-25	WS	Sample	11/29/2021	12/09/2021
RG_FRUL_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-26	WS	Sample	11/29/2021	12/09/2021
RG_FRUL_WS_LAEMP_LCO_2021-12_NP	2112095-27	WS	Sample	11/29/2021	12/09/2021
RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-28	WS	Sample	12/02/2021	12/09/2021
RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-29	WS	Sample	12/02/2021	12/09/2021
RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	2112095-30	WS	Sample	12/02/2021	12/09/2021
RG_FBLANK_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-31	WS	Sample	11/30/2021	12/09/2021
RG_FBLANK_WS_LAEMP_LCO_2021-12_NP_NAL	2112095-32	WS	Sample	11/30/2021	12/09/2021
RG_FBLANK_WS_LAEMP_LCO_2021-12_NP	2112095-33	WS	Sample	11/30/2021	12/09/2021

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	12/09/2021	12/11/2021	B213406	S211390
DMSeO	Water	SOP BAL-4201	12/09/2021	12/22/2021	B213406	S211443
MeSe(IV)	Water	SOP BAL-4201	12/09/2021	12/11/2021	B213406	S211390
MeSe(IV)	Water	SOP BAL-4201	12/09/2021	12/22/2021	B213406	S211443
MeSe(VI)	Water	SOP BAL-4201	12/09/2021	12/11/2021	B213406	S211390
MeSe(VI)	Water	SOP BAL-4201	12/09/2021	12/22/2021	B213406	S211443
Se	Water	EPA 1638 Mod	12/10/2021	12/15/2021	B213468	S211433
Se(IV)	Water	SOP BAL-4201	12/09/2021	12/11/2021	B213406	S211390
Se(IV)	Water	SOP BAL-4201	12/09/2021	12/22/2021	B213406	S211443
Se(VI)	Water	SOP BAL-4201	12/09/2021	12/11/2021	B213406	S211390
Se(VI)	Water	SOP BAL-4201	12/09/2021	12/22/2021	B213406	S211443
SeCN	Water	SOP BAL-4201	12/09/2021	12/11/2021	B213406	S211390
SeCN	Water	SOP BAL-4201	12/09/2021	12/22/2021	B213406	S211443
SeMet	Water	SOP BAL-4201	12/09/2021	12/11/2021	B213406	S211390
SeMet	Water	SOP BAL-4201	12/09/2021	12/22/2021	B213406	S211443
SeSO3	Water	SOP BAL-4201	12/09/2021	12/11/2021	B213406	S211390
SeSO3	Water	SOP BAL-4201	12/09/2021	12/22/2021	B213406	S211443
Unk Se Sp	Water	SOP BAL-4201	12/09/2021	12/11/2021	B213406	S211390
Unk Se Sp	Water	SOP BAL-4201	12/09/2021	12/22/2021	B213406	S211443

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LI24_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-01	Se	WS	TR	2.41		0.165	0.528	µg/L	B213468	S211433
RG_LI24_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-02	Se	WS	D	2.71		0.165	0.528	µg/L	B213468	S211433
RG_LI24_WS_LAEMP_LCO_2021-12_NP										
2112095-03	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-03	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-03	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-03	Se(IV)	WS	D	0.022	J	0.010	0.075	µg/L	B213406	S211390
2112095-03	Se(VI)	WS	D	2.58		0.010	0.055	µg/L	B213406	S211390
2112095-03	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B213406	S211390
2112095-03	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-03	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B213406	S211390
2112095-03	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B213406	S211390
RG_SLINE_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-04	Se	WS	TR	1.15		0.165	0.528	µg/L	B213468	S211433
RG_SLINE_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-05	Se	WS	D	1.04		0.165	0.528	µg/L	B213468	S211433
RG_SLINE_WS_LAEMP_LCO_2021-12_NP										
2112095-06	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-06	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-06	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-06	Se(IV)	WS	D	0.018	J	0.010	0.075	µg/L	B213406	S211390
2112095-06	Se(VI)	WS	D	1.16		0.010	0.055	µg/L	B213406	S211390
2112095-06	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B213406	S211390
2112095-06	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-06	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B213406	S211390
2112095-06	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B213406	S211390
RG_LISP24_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-07	Se	WS	TR	30.9		0.165	0.528	µg/L	B213468	S211433
RG_LISP24_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-08	Se	WS	D	31.3		0.165	0.528	µg/L	B213468	S211433

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LISP24_WS_LAEMP_LCO_2021-12_NP										
2112095-09	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-09	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-09	MeSe(VI)	WS	D	0.014	J	0.010	0.025	µg/L	B213406	S211390
2112095-09	Se(IV)	WS	D	0.178		0.010	0.075	µg/L	B213406	S211390
2112095-09	Se(VI)	WS	D	31.7		0.010	0.055	µg/L	B213406	S211390
2112095-09	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B213406	S211390
2112095-09	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-09	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B213406	S211390
2112095-09	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B213406	S211390
RG_LILC3_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-10	Se	WS	TR	46.1		0.165	0.528	µg/L	B213468	S211433
RG_LILC3_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-11	Se	WS	D	45.3		0.165	0.528	µg/L	B213468	S211433
RG_LILC3_WS_LAEMP_LCO_2021-12_NP										
2112095-12	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-12	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-12	MeSe(VI)	WS	D	0.018	J	0.010	0.025	µg/L	B213406	S211390
2112095-12	Se(IV)	WS	D	0.219		0.010	0.075	µg/L	B213406	S211390
2112095-12	Se(VI)	WS	D	43.8		0.010	0.055	µg/L	B213406	S211390
2112095-12	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B213406	S211390
2112095-12	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-12	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B213406	S211390
2112095-12	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B213406	S211390
RG_LCUT_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-13	Se	WS	TR	55.3		0.165	0.528	µg/L	B213468	S211433
RG_LCUT_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-14	Se	WS	D	56.3		0.165	0.528	µg/L	B213468	S211433

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LCUT_WS_LAEMP_LCO_2021-12_NP										
2112095-15	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211443
2112095-15	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211443
2112095-15	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211443
2112095-15	Se(IV)	WS	D	0.097		0.010	0.075	µg/L	B213406	S211443
2112095-15	Se(VI)	WS	D	49.4		0.010	0.055	µg/L	B213406	S211443
2112095-15	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B213406	S211443
2112095-15	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211443
2112095-15	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B213406	S211443
2112095-15	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B213406	S211443
RG_RIVER_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-16	Se	WS	TR	31.7		0.165	0.528	µg/L	B213468	S211433
RG_RIVER_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-17	Se	WS	D	31.2		0.165	0.528	µg/L	B213468	S211433
RG_RIVER_WS_LAEMP_LCO_2021-12_NP										
2112095-18	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211443
2112095-18	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211443
2112095-18	MeSe(VI)	WS	D	0.011	J	0.010	0.025	µg/L	B213406	S211443
2112095-18	Se(IV)	WS	D	0.161		0.010	0.075	µg/L	B213406	S211443
2112095-18	Se(VI)	WS	D	31.2		0.010	0.055	µg/L	B213406	S211443
2112095-18	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B213406	S211443
2112095-18	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211443
2112095-18	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B213406	S211443
2112095-18	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B213406	S211443
RG_LI8_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-19	Se	WS	TR	23.4		0.165	0.528	µg/L	B213468	S211433
RG_LI8_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-20	Se	WS	D	23.7		0.165	0.528	µg/L	B213468	S211433

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_LI8_WS_LAEMP_LCO_2021-12_NP										
2112095-21	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-21	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-21	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-21	Se(IV)	WS	D	0.074	J	0.010	0.075	µg/L	B213406	S211390
2112095-21	Se(VI)	WS	D	19.3		0.010	0.055	µg/L	B213406	S211390
2112095-21	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B213406	S211390
2112095-21	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-21	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B213406	S211390
2112095-21	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B213406	S211390
RG_FO23_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-22	Se	WS	TR	42.8		0.165	0.528	µg/L	B213468	S211433
RG_FO23_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-23	Se	WS	D	42.2		0.165	0.528	µg/L	B213468	S211433
RG_FO23_WS_LAEMP_LCO_2021-12_NP										
2112095-24	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-24	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-24	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-24	Se(IV)	WS	D	0.238		0.010	0.075	µg/L	B213406	S211390
2112095-24	Se(VI)	WS	D	44.1		0.010	0.055	µg/L	B213406	S211390
2112095-24	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B213406	S211390
2112095-24	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-24	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B213406	S211390
2112095-24	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B213406	S211390
RG_FRUL_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-25	Se	WS	TR	53.3		0.165	0.528	µg/L	B213468	S211433
RG_FRUL_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-26	Se	WS	D	54.3		0.165	0.528	µg/L	B213468	S211433

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_FRUL_WS_LAEMP_LCO_2021-12_NP										
2112095-27	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-27	MeSe(IV)	WS	D	0.013	J	0.010	0.025	µg/L	B213406	S211390
2112095-27	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-27	Se(IV)	WS	D	0.345		0.010	0.075	µg/L	B213406	S211390
2112095-27	Se(VI)	WS	D	59.5		0.010	0.055	µg/L	B213406	S211390
2112095-27	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B213406	S211390
2112095-27	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-27	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B213406	S211390
2112095-27	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B213406	S211390
RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-28	Se	WS	TR	26.7		0.165	0.528	µg/L	B213468	S211433
RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-29	Se	WS	D	25.4		0.165	0.528	µg/L	B213468	S211433
RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP										
2112095-30	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-30	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-30	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-30	Se(IV)	WS	D	0.138		0.010	0.075	µg/L	B213406	S211390
2112095-30	Se(VI)	WS	D	27.3		0.010	0.055	µg/L	B213406	S211390
2112095-30	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B213406	S211390
2112095-30	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-30	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B213406	S211390
2112095-30	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B213406	S211390
RG_FBLANK_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-31	Se	WS	TR	≤ 0.165	U	0.165	0.528	µg/L	B213468	S211433
RG_FBLANK_WS_LAEMP_LCO_2021-12_NP_NAL										
2112095-32	Se	WS	D	≤ 0.165	U	0.165	0.528	µg/L	B213468	S211433

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
RG_FBLANK_WS_LAEMP_LCO_2021-12_NP										
2112095-33	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-33	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-33	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-33	Se(IV)	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B213406	S211390
2112095-33	Se(VI)	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B213406	S211390
2112095-33	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B213406	S211390
2112095-33	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112095-33	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B213406	S211390
2112095-33	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B213406	S211390

Accuracy & Precision Summary

Batch: B213406
Lab Matrix: Water
Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B213406-BS1	**Blank Spike, (2124033)**						
	MeSe(IV)		5.095	5.569	µg/L	109% 75-125	
	Se(IV)		5.000	4.785	µg/L	96% 75-125	
	Se(VI)		5.000	4.538	µg/L	91% 75-125	
	SeCN		5.015	4.686	µg/L	93% 75-125	
	SeMet		4.932	5.054	µg/L	102% 75-125	
B213406-DUP5	**Duplicate, (2112093-19)**						
	DMSeO	ND		ND	µg/L		N/C 25
	MeSe(IV)	ND		ND	µg/L		N/C 25
	MeSe(VI)	ND		ND	µg/L		N/C 25
	Se(IV)	0.446		0.455	µg/L		2% 25
	Se(VI)	4.820		4.844	µg/L		0.5% 25
	SeCN	ND		ND	µg/L		N/C 25
	SeMet	ND		ND	µg/L		N/C 25
	SeSO3	ND		ND	µg/L		N/C 25
	Unk Se Sp	ND		ND	µg/L		N/C 25
B213406-MS5	**Matrix Spike, (2112093-19)**						
	Se(IV)	0.446	4.900	6.348	µg/L	120% 75-125	
	Se(VI)	4.820	5.100	10.77	µg/L	117% 75-125	
	SeCN	ND	1.962	1.914	µg/L	98% 75-125	
	SeMet	ND	1.977	1.971	µg/L	100% 75-125	
B213406-MSD5	**Matrix Spike Duplicate, (2112093-19)**						
	Se(IV)	0.446	4.900	6.453	µg/L	123% 75-125	2% 25
	Se(VI)	4.820	5.100	11.03	µg/L	122% 75-125	2% 25
	SeCN	ND	1.962	1.969	µg/L	100% 75-125	3% 25
	SeMet	ND	1.977	1.964	µg/L	99% 75-125	0.4% 25

Accuracy & Precision Summary

Batch: B213406
Lab Matrix: Water
Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B213406-DUP6	**Duplicate, (2112095-06)**						
	DMSeO	ND		ND	µg/L		N/C 25
	MeSe(IV)	ND		ND	µg/L		N/C 25
	MeSe(VI)	ND		ND	µg/L		N/C 25
	Se(IV)	0.018		0.019	µg/L		7% 25
	Se(VI)	1.159		1.140	µg/L		2% 25
	SeCN	ND		ND	µg/L		N/C 25
	SeMet	ND		ND	µg/L		N/C 25
	SeSO3	ND		ND	µg/L		N/C 25
	Unk Se Sp	ND		ND	µg/L		N/C 25
B213406-MS6	**Matrix Spike, (2112095-06)**						
	Se(IV)	0.018	4.900	5.449	µg/L	111% 75-125	
	Se(VI)	1.159	5.100	6.647	µg/L	108% 75-125	
	SeCN	ND	1.962	1.857	µg/L	95% 75-125	
	SeMet	ND	1.977	2.053	µg/L	104% 75-125	
B213406-MSD6	**Matrix Spike Duplicate, (2112095-06)**						
	Se(IV)	0.018	4.900	5.024	µg/L	102% 75-125	8% 25
	Se(VI)	1.159	5.100	6.293	µg/L	101% 75-125	5% 25
	SeCN	ND	1.962	1.797	µg/L	92% 75-125	3% 25
	SeMet	ND	1.977	1.988	µg/L	101% 75-125	3% 25

Accuracy & Precision Summary

Batch: B213468
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B213468-BS1	**Blank Spike, (2128021)**						
	Se		200.0	203.8	µg/L	102% 75-125	
B213468-BS2	**Blank Spike, (2128021)**						
	Se		200.0	202.4	µg/L	101% 75-125	
B213468-BS3	**Blank Spike, (2128021)**						
	Se		200.0	200.6	µg/L	100% 75-125	
B213468-BS4	**Blank Spike, (2128021)**						
	Se		200.0	201.7	µg/L	101% 75-125	
B213468-SRM1	**Reference Material (2145002, TMDA 51.5 Reference Standard - Bottle 1 - SRM)**						
	Se		14.30	14.14	µg/L	99% 75-125	
B213468-SRM2	**Reference Material (2145002, TMDA 51.5 Reference Standard - Bottle 1 - SRM)**						
	Se		14.30	14.48	µg/L	101% 75-125	
B213468-SRM3	**Reference Material (2145002, TMDA 51.5 Reference Standard - Bottle 1 - SRM)**						
	Se		14.30	14.16	µg/L	99% 75-125	
B213468-SRM4	**Reference Material (2145002, TMDA 51.5 Reference Standard - Bottle 1 - SRM)**						
	Se		14.30	14.50	µg/L	101% 75-125	
B213468-DUP2	**Duplicate, (2112094-02)**						
	Se	1.182		1.218	µg/L		3% 20
B213468-MS2	**Matrix Spike, (2112094-02)**						
	Se	1.182	220.0	218.8	µg/L	99% 75-125	
B213468-MSD2	**Matrix Spike Duplicate, (2112094-02)**						
	Se	1.182	220.0	220.7	µg/L	100% 75-125	0.9% 20

Accuracy & Precision Summary

Batch: B213468
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B213468-DUP3	**Duplicate, (2112095-10)**						
	Se	46.07		44.45	µg/L		4% 20
B213468-MS3	**Matrix Spike, (2112095-10)**						
	Se	46.07	220.0	261.0	µg/L	98% 75-125	
B213468-MSD3	**Matrix Spike Duplicate, (2112095-10)**						
	Se	46.07	220.0	260.1	µg/L	97% 75-125	0.3% 20
B213468-DUP4	**Duplicate, (2112096-01)**						
	Se	74.94		75.33	µg/L		0.5% 20
B213468-MS4	**Matrix Spike, (2112096-01)**						
	Se	74.94	220.0	295.9	µg/L	100% 75-125	
B213468-MSD4	**Matrix Spike Duplicate, (2112096-01)**						
	Se	74.94	220.0	296.2	µg/L	101% 75-125	0.08% 20

Method Blanks & Reporting Limits

Batch: B213406
Matrix: Water
Method: SOP BAL-4201
Analyte: DMSeO

Sample	Result	Units
B213406-BLK1	0.00	µg/L
B213406-BLK2	0.00	µg/L
B213406-BLK3	0.00	µg/L
B213406-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005
MDL: 0.002
MRL: 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B213406-BLK1	0.00	µg/L
B213406-BLK2	0.00	µg/L
B213406-BLK3	0.00	µg/L
B213406-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005
MDL: 0.002
MRL: 0.005

Analyte: MeSe(VI)

Sample	Result	Units
B213406-BLK1	0.00	µg/L
B213406-BLK2	0.00	µg/L
B213406-BLK3	0.00	µg/L
B213406-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005
MDL: 0.002
MRL: 0.005

Method Blanks & Reporting Limits

Analyte: Se(IV)

Sample	Result	Units
B213406-BLK1	0.00	µg/L
B213406-BLK2	0.00	µg/L
B213406-BLK3	0.00	µg/L
B213406-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Analyte: Se(VI)

Sample	Result	Units
B213406-BLK1	0.00	µg/L
B213406-BLK2	0.00	µg/L
B213406-BLK3	0.00	µg/L
B213406-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: SeCN

Sample	Result	Units
B213406-BLK1	0.00	µg/L
B213406-BLK2	0.00	µg/L
B213406-BLK3	0.00	µg/L
B213406-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.010

MDL: 0.002
MRL: 0.010

Analyte: SeMet

Sample	Result	Units
B213406-BLK1	0.00	µg/L
B213406-BLK2	0.00	µg/L
B213406-BLK3	0.00	µg/L
B213406-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Method Blanks & Reporting Limits

Analyte: SeSO3

Sample	Result	Units
B213406-BLK1	0.00	µg/L
B213406-BLK2	0.00	µg/L
B213406-BLK3	0.00	µg/L
B213406-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: Unk Se Sp

Sample	Result	Units
B213406-BLK1	0.00	µg/L
B213406-BLK2	0.00	µg/L
B213406-BLK3	0.00	µg/L
B213406-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Method Blanks & Reporting Limits

Batch: B213468
Matrix: Water
Method: EPA 1638 Mod
Analyte: Se

Sample	Result	Units
B213468-BLK1	-0.0009	µg/L
B213468-BLK2	-0.016	µg/L
B213468-BLK3	-0.012	µg/L
B213468-BLK4	-0.007	µg/L

Average: -0.009
Limit: 0.480

MDL: 0.150
MRL: 0.480

Sample Containers

Lab ID: 2112095-01
Sample: RG_LI24_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/30/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-02
Sample: RG_LI24_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/30/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-03
Sample: RG_LI24_WS_LAEMP_LCO_2021-12_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/30/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler #2 - 2112095
B	XTRA_VOL	15 mL	na	none	na	na	Cooler #2 - 2112095
C	XTRA_VOL	125ml	na	none	na	na	Cooler #2 - 2112095

Lab ID: 2112095-04
Sample: RG_SLINE_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/29/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-05
Sample: RG_SLINE_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/29/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Sample Containers

Lab ID: 2112095-06
Sample: RG_SLINE_WS_LAEMP_LCO_2021-12_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/29/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler #2 - 2112095
B	XTRA_VOL	15 mL	na	none	na	na	Cooler #2 - 2112095
C	XTRA_VOL	125ml	na	none	na	na	Cooler #2 - 2112095

Lab ID: 2112095-07
Sample: RG_LISP24_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/30/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-08
Sample: RG_LISP24_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/30/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-09
Sample: RG_LISP24_WS_LAEMP_LCO_2021-12_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/21/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler #2 - 2112095
B	XTRA_VOL	15 mL	na	none	na	na	Cooler #2 - 2112095
C	XTRA_VOL	125ml	na	none	na	na	Cooler #2 - 2112095

Sample Containers

Lab ID: 2112095-10
Sample: RG_LILC3_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/01/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-11
Sample: RG_LILC3_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/01/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-12
Sample: RG_LILC3_WS_LAEMP_LCO_2021-12_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/01/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler #2 - 2112095
B	XTRA_VOL	15 mL	na	none	na	na	Cooler #2 - 2112095
C	XTRA_VOL	125ml	na	none	na	na	Cooler #2 - 2112095

Lab ID: 2112095-13
Sample: RG_LCUT_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/01/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-14
Sample: RG_LCUT_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/01/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Sample Containers

Lab ID: 2112095-15
Sample: RG_LCUT_WS_LAEMP_LCO_2021-12_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/01/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler #2 - 2112095
B	XTRA_VOL	15 mL	na	none	na	na	Cooler #2 - 2112095
C	XTRA_VOL	125ml	na	none	na	na	Cooler #2 - 2112095

Lab ID: 2112095-16
Sample: RG_RIVER_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/30/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-17
Sample: RG_RIVER_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/30/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-18
Sample: RG_RIVER_WS_LAEMP_LCO_2021-12_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/30/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler #2 - 2112095
B	XTRA_VOL	15 mL	na	none	na	na	Cooler #2 - 2112095
C	XTRA_VOL	125ml	na	none	na	na	Cooler #2 - 2112095

Sample Containers

Lab ID: 2112095-19
Sample: RG_LI8_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/02/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-20
Sample: RG_LI8_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/02/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-21
Sample: RG_LI8_WS_LAEMP_LCO_2021-12_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/02/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler #2 - 2112095
B	XTRA_VOL	15 mL	na	none	na	na	Cooler #2 - 2112095
C	XTRA_VOL	125ml	na	none	na	na	Cooler #2 - 2112095

Lab ID: 2112095-22
Sample: RG_FO23_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/01/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-23
Sample: RG_FO23_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/01/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Sample Containers

Lab ID: 2112095-24
Sample: RG_FO23_WS_LAEMP_LCO_2021-12_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/01/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler #2 - 2112095
B	XTRA_VOL	15 mL	na	none	na	na	Cooler #2 - 2112095
C	XTRA_VOL	125ml	na	none	na	na	Cooler #2 - 2112095

Lab ID: 2112095-25
Sample: RG_FRUL_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/29/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-26
Sample: RG_FRUL_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/29/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-27
Sample: RG_FRUL_WS_LAEMP_LCO_2021-12_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/29/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler #2 - 2112095
B	XTRA_VOL	15 mL	na	none	na	na	Cooler #2 - 2112095
C	XTRA_VOL	125ml	na	none	na	na	Cooler #2 - 2112095

Sample Containers

Lab ID: 2112095-28
Sample: RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/02/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-29
Sample: RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/02/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-30
Sample: RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 12/02/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler #2 - 2112095
B	XTRA_VOL	15 mL	na	none	na	na	Cooler #2 - 2112095
C	XTRA_VOL	125ml	na	none	na	na	Cooler #2 - 2112095

Lab ID: 2112095-31
Sample: RG_FBLANK_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/30/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Lab ID: 2112095-32
Sample: RG_FBLANK_WS_LAEMP_LCO_2021-12_NP_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/30/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112095

Sample Containers

Lab ID: 2112095-33
Sample: RG_FBLANK_WS_LAEMP_LCO_2021-12_NP
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 11/30/2021
Received: 12/09/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Cooler #2 - 2112095
B	XTRA_VOL	15 mL	na	none	na	na	Cooler #2 - 2112095
C	XTRA_VOL	125ml	na	none	na	na	Cooler #2 - 2112095

Shipping Containers

Cooler #2 - 2112095

Received: December 9, 2021 8:38
Tracking No: PAPS#RWHV88666 via Courier
Coolant Type: Ice
Temperature: 0.6 °C

Description: Large Cooler
Damaged in transit? No
Returned to client? No
Comments: IR# 31

Custody seals present? No
Custody seals intact? No
COC present? Yes

Confidential

BAL Final Report 2112095

COC ID: LCO LAEMP Dec 2021 **TURNAROUND TIME:**

PROJECT/CLIENT INFO				LABORATORY					Excel	PDF	EDD
Facility Name	REP			Lab Name	Brooks Applied Labs			Email 1:	Cybele.Heddle@teck.com	x	x	x
Project Manager	~~Cait Good~~ Cybele Heddle			Lab Contact	Ben Wozniak			Email 2:	teckcoal@equisonline.com			x
Email	~~cait.good@teck.com~~ Cybele.Heddle@teck.com			Email	ben@brooksapplied.com			Email 3:	Jessica.Ritz@teck.com	x	x	x
Address	421 Pine Avenue			Address	18804 North Creek Parkway			Email 4:	tyler.mehler@minnow.ca	x	x	x
City	Sparwood	Province	BC	City	Bothell	Province	WA	Email 5:				
Postal Code	V0B 2G0	Country	Canada	Postal Code	98011	Country	USA					
Phone Number	250-425-8202			Phone Number	206-632-6206				VPO 0748540			

SAMPLE DETAILS / **ANALYSIS REQUESTED** (Filtered - F: Field, L: Lab, FL: Field & Lab, N: None)

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	FIL.	HNO3	HNO3										
PRESERV.									P	F/P	F									
ANALYSIS									Total Selenium	Dissolved Selenium	Selenium Speciation									
RG_LI24_WS_LAEMP_LCO_2021-12_NP_NAL	RG_LI24	WS	No	2021/11/30	11:15	G	2		X	X										
RG_LI24_WS_LAEMP_LCO_2021-12_NP	RG_LI24	WS	No	2021/11/30	11:15	G	1				X									
RG_SLINE_WS_LAEMP_LCO_2021-12_NP_NAL	RG_SLINE	WS	No	2021/11/29	11:00	G	2		X	X										
RG_SLINE_WS_LAEMP_LCO_2021-12_NP	RG_SLINE	WS	No	2021/11/29	11:00	G	1				X									
RG_LISP24_WS_LAEMP_LCO_2021-12_NP_NAL	RG_LISP24	WS	No	2021/11/30	14:30	G	2		X	X										
RG_LISP24_WS_LAEMP_LCO_2021-12_NP	RG_LISP24	WS	No	2021/11/30	14:30	G	1				X									
RG_LILC3_WS_LAEMP_LCO_2021-12_NP_NAL	RG_LILC3	WS	No	2021/12/01	12:45	G	2		X	X										
RG_LILC3_WS_LAEMP_LCO_2021-12_NP	RG_LILC3	WS	No	2021/12/01	12:45	G	1				X									
RG_LCUT_WS_LAEMP_LCO_2021-12_NP_NAL	RG_LCUT	WS	No	2021/12/01	11:00	G	2		X	X										
RG_LCUT_WS_LAEMP_LCO_2021-12_NP	RG_LCUT	WS	No	2021/12/01	11:00	G	1				X									
RG_RIVER_WS_LAEMP_LCO_2021-12_NP_NAL	RG_RIVER	WS	No	2021/11/30	14:00	G	2		X	X										
RG_RIVER_WS_LAEMP_LCO_2021-12_NP	RG_RIVER	WS	No	2021/11/30	14:00	G	1				X									
RG_LI8_WS_LAEMP_LCO_2021-12_NP_NAL	RG_LI8	WS	No	2021/12/02	10:[illegible]	G	2		X	X										
RG_LI8_WS_LAEMP_LCO_2021-12_NP	RG_LI8	WS	No	2021/12/02	10:[illegible]	G	1				X									
RG_FO23_WS_LAEMP_LCO_2021-12_NP_NAL	RG_FO23	WS	No	2021/12/01	08:45	G	2		X	X										
RG_FO23_WS_LAEMP_LCO_2021-07_NP	RG_FO23	WS	No	2021/12/01	08:45	G	1				X									
RG_FRUL_WS_LAEMP_LCO_2021-12_NP_NAL	RG_FRUL	WS	No	2021/11/29	15:30	G	2		X	X										
RG_FRUL_WS_LAEMP_LCO_2021-12_NP	RG_FRUL	WS	No	2021/11/29	15:30	G	1				X									
RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP_NAL	RG_LIDCOM	WS	No	2021/12/02	08:45	G	2		X	X										
RG_LIDCOM_WS_LAEMP_LCO_2021-12_NP	RG_LIDCOM	WS	No	2021/12/02	08:45	G	1				X									
RG_[illegible]_WS_LAEMP_LCO_2021-12_NP_NAL FBLANK	RG_LIDSL FBLANK	WS	No	2021/11/30	13:00	G	2		X	X										
RG_[illegible]_WS_LAEMP_LCO_2021-12_NP FBLANK	RG_LIDSL FBLANK	WS	No	2021/11/30	13:00	G	1				X									

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

Line Creek LAMEP - VPO748540.

Samples for total selenium have been preserved in the field. Dissolved selenium have been filtered and preserved. Speciation samples have been filtered and frozen.

RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	
Rick Smit/Lotic Environmental	2021/12/02/12:00	[signature]	12/9/21 8:58

NB OF BOTTLES RETURNED/DESCRIPTION

Regular (default) x

Priority (2-3 business days) - 50% surcharge

Sampler's Name	Rick Smit	Mobile #	403-586-3241

2021 12 02 / 12:00

STRAIGHT BILL OF LADING
NOT NEGOTIABLE

RW HOT SHOT SERVICE INC.

250-425-7447

24 Hour Hot Shot Service

No. 88606

Sparwood, BC · Terrace, BC · Red Deer, AB · Vancouver, BC · Calgary, AB · Montreal, QC · Prince George, BC · Edmonton, AB · Spokane, WA · Elkford, BC · Ft. McMurray, AB · Shelby, MT · Tumbler Ridge, BC · Hinton, AB · Gillette, WY

INVOICE TO	DATE Dec. 8/21
BILL OF LADING #	PURCHASE ORDER NUMBER
SHIPPER (FROM) Teck Coal West Line Creek	CONSIGNEE (TO) Brooks Applied Labs
STREET c/o Water Treatment Facility	STREET 18804 N. Creek Parkway
CITY/PROVINCE Sparwood BC	POSTAL CODE
CITY/PROVINCE Bothell, WA	POSTAL CODE 98011

SPECIAL INSTRUCTIONS

PACKAGES	DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)
3	Coolers Water Samples	55 lbs

COPY

FREIGHT CHARGES
SHIPPER TO CHECK
X PREPAID ☐ COLLECT
If not indicated, shipping will automatically mo...

FEE
WAITING
XPU
CHARGES
FSC
US
SUB TOTAL
GST
TOTAL $
IF AT OWNER'S RISK, WRITE ORD HERE

UNIT #

DECLARED VALUATION: Maximum liability of carrier is $2.00 per lb. ($4.41 per kilogram) unless declared valuation states otherwise. $

DRIVER'S SIGNATURE - PICK UP BY	PICK UP TIME	DRIVER'S SIGNATURE - DELIVERY BY	FINISH TIME

NOTICE OF CLAIM: (a) No carrier is liable for loss, damage or delay of any goods under the Bill of Lading unless notice, therefor setting out particulars of the origin, destination and date of shipment of the goods and the estimated amount claimed in respect of such loss, damage or delay is given in writing to the originating carrier or the delivering carrier within sixty (60) days after the delivery of the goods, or in the case of failure to make delivery within nine (9) months from the date of shipment. (b) The final statement of the claim must be filed within nine (9) months from the date of shipment together with a copy of the paid freight bill. RECEIVED at the point of origin on the date specified from the consignor mentioned herein, the property herein described, in apparent good order, except as noted (contents and condition of contents of package unknown) marked, consigned and destined as indicated below, which the carrier agrees to carry and to deliver to the consigned at the said destination, subject to the rates and classification in effect on the date of shipment. It is mutually agreed, as to each carrier of all or any of the goods over all or any portion of the route to destination, and as to each party of any time interested in all or any of the goods, that every service to be performed hereunder shall be subject to all the conditions standard Bill of Lading, in power at the date of issuing, which are hereto agreed by the consignor and accepted for himself and his assigns. Printed or written, including conditions set aside by the standard Bill of Lading, in power at the date of issuing, which are hereby agreed by the consignor and accepted for himself and his assigns.
The Contract for the carriage of the goods listed in the Bill of Lading is governed by regulation in force in the jurisdiction at the time and place of shipment and is subject to the conditions set out in such conditions.

SHIPPER PRINT	CONSIGNEE PRINT	DATE 12-9-21
SHIPPER SIGN	CONSIGNEE SIGN	TIME

WHITE: Office · YELLOW: Carrier · PINK: Consignee · GOLDENROAD: Shipper

GST #864540398RT0001

NUMBER OF PIECES RECEIVED 3

AMIGOS PRINTING

Cooler ID: Cooler #2 **COC** (Y)/N **Temperature:** 0.6 **IR:** 31

Coolant Type: (Ice) Blue Ice Ambient

Notes:

Sampling Locations:	SESMP		BG		LC					
Sample Types:	T/D	SP	T/D	SP	T/D	SP	T/D	SP	T/D	SP
Container Types:	40mL	40mL 60mL	40mL 120mL	120mL	60mL	60mL				

Opened By: CVL **Date:** 12/9/21

2112095

Effective 7/29/20

vision 004

BENTHIC COMMUNITY

Cordillera Methods and QC Report 21-36

Methods and QC Report 2021

Project ID: LCO LAEMP (21-36)

Client: Minnow Environmental

Prepared by:
Cordillera Consulting Inc.
Summerland, BC

Unit 1, 13216 Henry Ave B1202
Summerland, BC, V0H 1Z0
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P: 250.494.7553
F: 250.494.7562

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Sample Reception

On September 29, 2021, Cordillera Consulting received 34 benthic samples from Minnow Environmental. When samples arrived to Cordillera Consulting, exterior packaging was initially inspected for damage or wet spots that would have indicated damage to the interior containers.

Samples were logged into a proprietary software database (INSTAR1) where the clients assigned sample name was recorded along with a Cordillera Consulting (CC) number for cross-reference. Each sample was checked to ensure that all sites and replicates recorded on field sheets or packing lists were delivered intact and with adequate preservative. Any missing, mislabelled or extra samples were reported to the client immediately to confirm the total numbers and correct names on the sample jars. The client representative was notified of the arrival of the shipment and provided a sample inventory once intake was completed.
See table below for sample inventory:

Table 1: Summary of sample information including Cordillera Consulting (CC) number

Sample	CC#	Date	Size	# of Jars
RG_LILC3_BIC_1_2021-09-09	CC221341	9/9/2021	400µM	1
RG_LILC3_BIC_2_2021-09-09	CC221342	9/9/2021	400µM	1
RG_LILC3_BIC_3_2021-09-09	CC221343	9/9/2021	400µM	2
RG_FRUL_BIC_1_2021-09-12	CC221344	9/12/2021	400µM	1
RG_FRUL_BIC_2_2021-09-12	CC221345	9/12/2021	400µM	1
RG_FRUL_BIC_3_2021-09-12	CC221346	9/12/2021	400µM	1
RG_LIDSL_BIC_1_2021-09-14	CC221347	9/14/2021	400µM	1
RG_LIDSL_BIC_2_2021-09-14	CC221348	9/14/2021	400µM	1
RG_LIDSL_BIC_3_2021-09-14	CC221349	9/14/2021	400µM	1
RG_LIDSL_BIC_4_2021-09-14	CC221350	9/14/2021	400µM	1
RG_LIDSL_BIC_5_2021-09-14	CC221351	9/14/2021	400µM	1
RG_LCUT_BIC_1_2021-09-10	CC221352	9/10/2021	400µM	1
RG_LCUT_BIC_2_2021-09-10	CC221353	9/10/2021	400µM	1
RG_LCUT_BIC_3_2021-09-10	CC221354	9/10/2021	400µM	1
RG_SLINE_BIC_1_2021-09-15	CC221355	9/15/2021	400µM	1
RG_SLINE_BIC_2_2021-09-15	CC221356	9/15/2021	400µM	1
RG_SLINE_BIC_3_2021-09-15	CC221357	9/15/2021	400µM	1
RG_LIDCOM_BIC_1_2021-09-13	CC221358	9/13/2021	400µM	2
RG_LISP24_BIC_1_2021-09-13	CC221359	9/13/2021	400µM	1
RG_FO23_BIC_1_2021-09-12	CC221360	9/12/2021	400µM	1
RG_FO23_BIC_2_2021-09-12	CC221361	9/12/2021	400µM	1
RG_FO23_BIC_3_2021-09-12	CC221362	9/12/2021	400µM	1
RG_FO23_BIC_4_2021-09-12	CC221363	9/12/2021	400µM	1
RG_FO23_BIC_5_2021-09-12	CC221364	9/12/2021	400µM	1
RG_LI8_BIC_1_2021-09-11	CC221365	9/11/2021	400µM	1
RG_LI8_BIC_2_2021-09-11	CC221366	9/11/2021	400µM	1
RG_LI8_BIC_3_2021-09-11	CC221367	9/11/2021	400µM	1

RG_LILC3_BIC_4_2021-09-10	CC221368	9/10/2021	400µM	2
RG_LILC3_BIC_5_2021-09-10	CC221369	9/10/2021	400µM	2
RG_LI24_BIC_1_2021-09-16	CC221370	9/16/2021	400µM	1
RG_LI24_BIC_2_2021-09-16	CC221371	9/16/2021	400µM	1
RG_LI24_BIC_3_2021-09-16	CC221372	9/16/2021	400µM	2
RG_LI24_BIC_4_2021-09-16	CC221373	9/16/2021	400µM	1
RG_LI24_BIC_5_2021-09-16	CC221374	9/16/2021	400µM	1

Sample Sorting

- Using a gridded Petri dish, fine forceps and a low power stereo-microscope (Olympus, Nikon, Leica) the sorting technicians removed the invertebrates and sorted them into family/orders.
- The sorting technician kept a running tally of total numbers excluding organisms from Porifera, Nemata, Platyhelminthes, Ostracoda, Copepoda, Cladocera and terrestrial drop-ins such as aphids. These organisms were marked for their presence (given a value of 1) only and left in the sample. They were not included towards the 300-organism subsample count.
- Where specimens are broken or damaged, only heads were counted.
- Subsampling was conducted with the use of a Marchant Box.
- When using the Marchant box, cells were extracted at the same time in the order indicated by a random number table. If the 300th organism was found part way into sorting a cell then the balance of that cell was sorted. If the organism count had not reached 300 by the 50th cell then the entire sample was sorted.
- The total number of cells sorted and the number of organisms removed were recorded manually on a bench sheet and then recorded into INSTAR1
- Organisms were stored in vials containing 80% ethanol and an interior label indicating the site names, date of sampling, site code numbers and portion subsampled. This information was also recorded on the laboratory bench sheet and on INSTAR1.
- The sorted portion of the debris was preserved and labeled separately from the unsorted portion and was tested for sorting efficiency (Sorting Quality Control – Sorting Efficiency). The unsorted portion was also labeled and preserved in separate jars.

Percent sub-sampled and total countable invertebrates pulled from the samples were summarized in the table below.

Table 2: Percent sub-sample and invertebrate count for each sample

Sample	**Date**	**CC#**	**400 micron fraction**	
			% Sampled	**# Invertebrates**
RG_LILC3_BIC_1_2021-09-09	09-Sep-21	CC221341	5%	625

RG_LILC3_BIC_2_2021-09-09	09-Sep-21	CC221342	5%	411
RG_LILC3_BIC_3_2021-09-09	09-Sep-21	CC221343	5%	936
RG_FRUL_BIC_1_2021-09-12	12-Sep-21	CC221344	5%	411
RG_FRUL_BIC_2_2021-09-12	12-Sep-21	CC221345	5%	307
RG_FRUL_BIC_3_2021-09-12	12-Sep-21	CC221346	10%	492
RG_LIDSL_BIC_1_2021-09-14	14-Sep-21	CC221347	5%	588
RG_LIDSL_BIC_2_2021-09-14	14-Sep-21	CC221348	5%	728
RG_LIDSL_BIC_3_2021-09-14	14-Sep-21	CC221349	5%	515
RG_LIDSL_BIC_4_2021-09-14	14-Sep-21	CC221350	5%	374
RG_LIDSL_BIC_5_2021-09-14	14-Sep-21	CC221351	5%	564
RG_LCUT_BIC_1_2021-09-10	10-Sep-21	CC221352	5%	495
RG_LCUT_BIC_2_2021-09-10	10-Sep-21	CC221353	5%	466
RG_LCUT_BIC_3_2021-09-10	10-Sep-21	CC221354	5%	521
RG_SLINE_BIC_1_2021-09-15	15-Sep-21	CC221355	10%	314
RG_SLINE_BIC_2_2021-09-15	15-Sep-21	CC221356	5%	356
RG_SLINE_BIC_3_2021-09-15	15-Sep-21	CC221357	7%	326
RG_LIDCOM_BIC_1_2021-09-13	13-Sep-21	CC221358	5%	1165
RG_LISP24_BIC_1_2021-09-13	13-Sep-21	CC221359	5%	497
RG_FO23_BIC_1_2021-09-12	12-Sep-21	CC221360	12%	350
RG_FO23_BIC_2_2021-09-12	12-Sep-21	CC221361	5%	409
RG_FO23_BIC_3_2021-09-12	12-Sep-21	CC221362	5%	472
RG_FO23_BIC_4_2021-09-12	12-Sep-21	CC221363	5%	333
RG_FO23_BIC_5_2021-09-12	12-Sep-21	CC221364	5%	402
RG_LI8_BIC_1_2021-09-11	11-Sep-21	CC221365	5%	730
RG_LI8_BIC_2_2021-09-11	11-Sep-21	CC221366	50%	546
RG_LI8_BIC_3_2021-09-11	11-Sep-21	CC221367	5%	489
RG_LILC3_BIC_4_2021-09-10	10-Sep-21	CC221368	5%	1219
RG_LILC3_BIC_5_2021-09-10	10-Sep-21	CC221369	5%	923
RG_LI24_BIC_1_2021-09-16	16-Sep-21	CC221370	5%	444
RG_LI24_BIC_2_2021-09-16	16-Sep-21	CC221371	5%	459
RG_LI24_BIC_3_2021-09-16	16-Sep-21	CC221372	5%	484
RG_LI24_BIC_4_2021-09-16	16-Sep-21	CC221373	6%	332
RG_LI24_BIC_5_2021-09-16	16-Sep-21	CC221374	5%	663

Sorting Quality Control - Sorting Efficiency

As a part of Cordillera's laboratory policy, all projects undergo sorting efficiency checks.

- As sorting progresses, 10% of samples were randomly chosen by senior members of the sorting team for resorting.
- All sorters working on a project had at least 1 sample resorted by another sorter.
- An efficiency of 90 % was expected (95% for CABIN samples).
- If 90/95% efficiency was not met, samples from that sorter were resorted.
- To calculated sorting efficiency the following formula was used:

$$\frac{\#OrganismsMissed}{TotalOrganismsFound} * 100 = \%OM$$

Table 3 Summary of sorting efficiency

			Total from Sample	Percent Efficiency
Site - QC, Sample - QC 1, CC# - CC221343, Percent sampled = 5%, Sieve size = 400				
Baetidae		9		
Plecoptera		7		
Trichoptera		7		
Oligochaeta		1		
	Total:	**24**	**936**	**97%**
Site - QC, Sample - QC 2, CC# - CC221360, Percent sampled = 12%, Sieve size = 400				
Plecoptera		5		
	Total:	**5**	**350**	**99%**
Site - QC, Sample - QC 3, CC# - CC221367, Percent sampled = 5%, Sieve size = 400				
Plecoptera		3		
	Total:	**3**	**489**	**99%**

Sorting Quality Control - Sub-Sampling QC

Certain Provincial and Mining projects require additional sorting checks in the form of sub-sampling QC, (Environmental Effects Monitoring (EEM) protocol). This ensured that any fraction of the total sample that was examined was actually an accurate representation of the number of total organisms. Organisms from the additional sub-samples were not identified; rather total organism count only was compared.

Sub-Sampling efficiency was measured on 10% of the number of sub-sampled samples in the project. Ex. In a project where 50 of 100 total samples were processed through subsampling using a Marchant box, then 10% of 50; or 5 samples were used for sub sampling efficiency.

Sub-Sampling efficiency was performed by fractioning the entire sample into sub-sample percentages. On each sub-sampled portion, a total organism count was recorded and compared to the rest of the sub-samples. In order to pass, all fractions were required to be within 20% of total organism count.

Example: If 300 organisms are found in 10% of the sample, the sorter will continue to sample in 10% fractions until the entire sample is separated. They will then count the total number of organisms in each of the 10 fractions of 10% and compare the organism count.

When divergence is >20% the sorting manager examines for the source of the problem and takes steps to correct it. With the Marchant box, the problem typically rested with how the box is flipped back to the upright position. For this reason, subsampling was performed by experienced employees only. Another common source of error would be the type of debris in the sample. Samples with algae or heavy with periphyton have a higher incident of failure due to clumping than clear samples.

Table 4 Summary of Sub Sample efficiency

Station ID		Organisms in Subsample																			Sorter		Actual Total	Precision		Accuracy	
CC#	Sample Name	1	2	3	4	5	6	7	8	9	10										By	Time		Percent Range		Min	Max
221355	RG_SLINE_BIC-1	270	267	280	282	313	253	279	304	252	269										HY	265	2769	0.36	19.49	0.76	13.04
221344	RG_FRUL_BIC-1	352	347	337	351	346															MP	230	1733	0.28	4.26	0.12	2.77
221346	RG_FRUL_BIC-3	488	472	444	495	478															MP	270	2377	1.26	10.30	0.55	6.60

Taxonomic Effort

The next procedure was the identification to genus-species level where possible of all the organisms in the sample.

- Identifications were made at the genus/species level for all insect organisms found including Chironomidae (Based on CABIN protocol).
- Non-insect organisms (except those not included in CABIN count) were identified to genus/species where possible and to a minimum of family level with intact and mature specimens.
- The Standard Taxonomic Effort lists compiled by the CABIN manual[1], SAFIT[2] , and PNAMP[3] were used as a guide line for what level of identification to achieve where the condition and maturity of the organism enabled.
- Organisms from the same families/order were kept in separate vials with 80% ethanol and an interior label of printed laser paper.
- Chironomidae was identified to genus/species level where possible and was aided by slide mounts. CMC-10 was used to clear and mount the slide.
- Oligochaetes was identified to family/genus level with the aid of slide mounts. CMC-10 was used to clear and mount the slide.
- Other Annelida (leeches, polychaetes) were identified to the family/genus/species level with undamaged, mature specimens.
- Mollusca was identified to family and genus/species where possible
- Decapoda, Amphipoda and Isopoda were identified at family/genus/species level where possible.
- Bryozoans and Nemata remained at the phylum level
- Hydrachnidae and Cnidaria were identified at the family/genus level where possible.
- When requested, reference collections were made containing at least one individual from each taxa listed. Organisms represented will have been identified to the lowest practical level.
- Reference collection specimens were stored in 55 mm glass vials with screw-cap lids with polyseal inserts (museum quality). They were labeled with taxa name, site code, date identified and taxonomist name. The same information was applied to labels on the slide mounts.

Taxonomists

The taxonomists for this project were certified by the Society of Freshwater Science (SFS) Taxonomic Certification Program at level 2 which is the required certification for CABIN projects:

Scott Finlayson: Group 1 General Arthropods (East/West); Group 2 EPT (East/West); Group 3 Chironomidae (East/West); Group 4 Oligochaeta

Adam Bliss: Group 1 General Arthropods (East/West); Group 2 EPT (East/West); Group 3 Chironomidae
Rita Avery: Group 1 General Arthropods (East/West); Group 2 EPT (East/West)

Taxonomic QC

Taxonomic QC was performed in house by someone other than the original taxonomist.

- Quality control protocol involved complete, blind re-identification and re-enumeration of at least 10% of samples by a second SFS-certified taxonomist.
- Samples for taxonomic quality control were randomly selected and quality control procedures were conducted as the project progresses through the laboratories.

- The second (QC) taxonomist will calculate and record four types of errors:
    1. Misidentification error
    2. Enumeration error
    3. Questionable taxonomic resolution error
    4. Insufficient taxonomic resolution error

The QC coordinator then calculates the following estimates of taxonomic precision.

1. The percent total identification error rate is calculated as:

$$\frac{Sum\ of\ incorrect\ identifications}{total\ organisms\ counted\ in\ audit} * (100)$$

The average total identification error rate of audited samples did not exceed 5%. All samples that exceed a 5% error rate were re-evaluated to determine whether repeated errors or patterns in error contributed.

2. The percent difference in enumeration (PDE) to quantify the consistency of specimen counts.

$$PDE = \frac{|n_1 - n_2|}{n_1 + n_2} x100$$

3. The percent taxonomic disagreement (PTD) to quantify the shared precision between two sets of identifications.

$$PTD = \left(1 - \left[\frac{a}{N}\right]\right) x100$$

4. Bray Curtis dissimilarity Index to quantify the differences in identifications.

$$BC_{ij} = 1 - \frac{2C_{ij}}{S_j + S_i}$$

Error Summary

All samples report errors within the acceptable limits for CABIN Laboratory methods (less than 5% error).

Table 5 Summary of taxonomic error following QC

Site	Taxa Identified	% Error	PDE	PTD	Bray - Curtis Dissimilarity index
Site - 2021, Sample - RG_LILC3_BIC_2_2021-09-09, CC# - CC221342, Percent sampled = 5%, Sieve size = 400	410	0.00	0.12180268	0.72992701	0.00609013
Site - 2021, Sample - RG_LIDSL_BIC_3_2021-09-14, CC# - CC221349, Percent sampled = 5%, Sieve size = 400	517	0.00	0.19379845	0.96711799	0.00775194
Site - 2021, Sample - RG_SLINE_BIC_3_2021-09-15, CC# - CC221357, Percent sampled = 7%, Sieve size = 400	327	0.31	0.15313936	0.6116208	0.00459418

There will always be disagreements between taxonomists regarding the degree of taxonomic resolution in immature specimens and when laboratories make use of different keys for certain groups (Mollusks is an especially disputed group). It is always possible that some taxa found by the original taxonomist were overlooked in QC.

All of the Taxonomic QC samples that were observed passed testing according to the CABIN misidentification protocols. See the tables below for results from taxonomic QC audit.

Error Rationale

Site - 2021, Sample - RG_LILC3_BIC_2_2021-09-09, CC# - CC221342, Percent sampled = 5%, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficient Taxonomic Resolution	Comments
Aturus	1	1						
Baetidae	3	4	No			X		
Baetis	3	2	No			X		
Baetis rhodani group	14	14						
Chironomidae	52	52						

Diamesa	7	7						
Diplocladius cultriger	1	1						
Empididae	1	1						
Ephemerellidae	1	1						
Eukiefferiella	29	29						
Feltria	7	7						
Glossosomatidae	1	1						
Heptageniidae	20	19	No			X		
Hydrobaenus	8	8						
Hydropsychidae	6	6						
Kogotus	4	4						
Lebertia	11	11						
Micropsectra	8	8						
Orthocladius complex	138	138						
Pagastia	22	22						
Pericoma/Telmatoscopus	1	1						
Rheocricotopus	27	27						
Rhyacophila	1	1						
Simulium	1	1						
Sperchon	22	21	No			X		
Sweltsa	1	1						
Taeniopterygidae	1	1						
Trichoptera	1	1						
Tvetenia	13	14	No			X		
Zapada	1	1						
Zapada cinctipes	1	1						
Zapada columbiana	2	2						
Zapada oregonensis group	2	2						
Total:	**411**	**410**						
					0	5	0	
% Total Misidentification Rate =	misidentifications / total number	x100 =	0.00	**Pass**				

Site - 2021, Sample - RG_LIDSL_BIC_3_2021-09-14, CC# - CC221349, Percent sampled = 5%, Sieve size = 400	Laboratory Count	QC Audit Count	Agreement	Misidentification	Questionable Taxonomic Resolution	Enumeration	Insufficient Taxonomic Resolution	Comments
Ameletus	4	4						

Baetis	21	24	No			X		
Baetis rhodani group	28	25	No			X		
Brachycentridae	1	1						
Chironomidae	18	18						
Chloroperlidae	4	4						
Dicranota	1	1						
Drunella doddsii	4	4						
Epeorus	3	3						
Ephemerella excrucians complex	1	1						
Ephemerellidae	5	5						
Eukiefferiella	4	4						
Glossosomatidae	1	1						
Heptageniidae	218	219	No			X		
Hydropsychidae	21	21						
Kogotus	2	2						
Lebertia	1	1						
Megarcys	6	6						
Orthocladius complex	26	26						
Pagastia	12	12						
Parapsyche	3	3						
Pericoma/Telmatoscopus	7	7						
Rheocricotopus	4	4						
Rhyacophila	2	2						
Rhyacophila betteni group	3	3						
Rhyacophila brunnea/vemna group	2	2						
Rhyacophila hyalinata group	5	5						
Rhyacophila vofixa group	1	1						
Simuliidae	4	4						
Simulium	1	1						
Suwallia	1	1						
Sweltsa	7	7						
Taeniopterygidae	54	55	No			X		
Trichoptera	2	2						
Zapada	18	18						
Zapada columbiana	9	9						
Zapada oregonensis group	11	11						
Total:	**515**	**517**						

					0	4	0	
% Total Misidentification Rate =	misidentifications / total number	x100 =	0.00	**Pass**				
Site - 2021, Sample - RG_SLINE_BIC_3_2021-09-15, CC# - CC221357, Percent sampled = 7%, Sieve size = 400	**Laboratory Count**	**QC Audit Count**	**Agreement**	**Misidentification**	**Questionable Taxonomic Resolution**	**Enumeration**	**Insufficient Taxonomic Resolution**	**Comments**
Ameletus	3	3						
Atractides	1	1						
Baetis bicaudatus	1	1						
Baetis rhodani group	2	2						
Chironomidae	1	1						
Chloroperlidae	5	5						
Diamesa	1	1						
Drunella doddsii	7	7						
Empididae	1	1						
Epeorus	9	9						
Ephemerellidae	41	40	No			X		
Ephemeroptera	1	1						
Eukiefferiella	1	1						
Glossosomatidae	1	1						
Heptageniidae	123	124	No	1		X		
Hydropsychidae	9	9						
Lumbriculidae	1	1						
Megarcys	2	2						
Nemouridae	2	2						
Neothremma	1	1						
Oreogeton	1	1						
Orthocladius complex	3	3						
Parorthocladius	1	1						
Pericoma/Telmatoscopus	1	1						
Perlodidae	5	5						
Plumiperla	1	1						
Rheocricotopus	6	6						
Rhithrogena	11	11						
Rhyacophila	6	6						
Rhyacophila brunnea/vemna group	5	5						

Rhyacophila hyalinata group	3	3						
Rhyacophila vofixa group	3	3						
Suwallia	1	1						
Sweltsa	8	8						
Taeniopterygidae	17	18	No			X		
Trichoptera	1	1						
Tvetenia	5	5						
Yoraperla	1	1						
Zapada columbiana	32	32						
Zapada oregonensis group	2	2						
Total:	**326**	**327**						
					0	**3**	**0**	
% Total Misidentification Rate =	misidentifications / total number	x100 =	0.31	**Pass**				

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[2] Southwest Association of Freshwater Invertebrate Taxonomists. (2015). www.safit.org

[3] Pacific Northwest Aquatic Monitoring Partnership (Accessed 2015). www.pnamp.org

Taxonomic Keys

Below is a reference list of taxonomic keys utilized by taxonomists at Cordillera Consulting. Cordillera taxonomists routinely seek out new literature to ensure the most accurate identification keys are being utilized. This is not reflective of the exhaustive list of resources that we use for identification. A more complete list of taxonomic resources can be found at Southwest Association of Freshwater Invertebrate Taxonomists. (2015).
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Raw Benthic Invertebrate Density Results (# organisms/sample), LCO LAEMP 2021

Project: LCO LAEMP (21-36)
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LILC3_BIC_1_2021-09-09	RG_LILC3_BIC_2_2021-09-09	RG_LILC3_BIC_3_2021-09-09	RG_FRUL_BIC_1_2021-09-12	RG_FRUL_BIC_2_2021-09-12	RG_FRUL_BIC_3_2021-09-12	RG_LIDSL_BIC_1_2021-09-14	RG_LIDSL_BIC_2_2021-09-14	RG_LIDSL_BIC_3_2021-09-14
Sample Collection Date:	09-Sep-21	09-Sep-21	09-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	14-Sep-21	14-Sep-21	14-Sep-21
CC#:	CC221341	CC221342	CC221343	CC221344	CC221345	CC221346	CC221347	CC221348	CC221349
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0
Ameletus	0	0	0	0	20	0	140	80	80
| Family: Baetidae	0	60	100	40	0	10	60	100	0
Acentrella	0	0	0	0	0	0	0	0	0
Baetis	220	60	420	320	560	500	200	620	420
Baetis rhodani group	460	280	1,440	420	620	470	580	600	560
Baetis bicaudatus	0	0	0	0	0	0	0	0	0
Diphetor hageni	0	0	0	0	0	0	0	0	0
| Family: Ephemerellidae	20	20	60	0	20	10	300	360	100
Drunella	0	0	0	0	0	0	20	0	0
Drunella doddsii	60	0	0	140	20	60	100	80	80
Ephemerella excrucians complex	0	0	0	0	0	0	0	20	20
| Family: Heptageniidae	380	400	360	1,460	1,500	630	3,240	4,900	4,360
Cinygmula	0	0	0	0	0	0	0	0	0
Epeorus	0	0	0	0	120	0	60	100	60
Rhithrogena	0	0	0	180	80	120	0	0	0
| Order: Plecoptera	0	0	40	60	0	10	0	20	0
| Family: Capniidae	0	0	0	80	20	30	60	0	0
Mesocapnia	0	0	0	0	0	0	0	0	0
| Family: Chloroperlidae	0	0	0	380	120	40	20	60	80
Haploperla	0	0	0	0	0	0	0	0	0
Plumiperla	0	0	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0	0	20
Sweltsa	0	20	100	1,800	80	90	80	80	140
| Family: Leuctridae	0	0	0	100	0	0	0	0	0
Paraleuctra	0	0	0	20	0	0	0	0	0
| Family: Nemouridae	0	0	0	0	0	10	0	0	0
Malenka	0	0	20	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0	0	0

Note: A value of zero reported at a less specific level of taxonomy does not indicate an absence of organisms at a more specific level of taxonomy.

Raw Benthic Invertebrate Density Results (# organisms/sample), LCO LAEMP 2021

Project: LCO LAEMP (21-36)
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LILC3_BIC_1_2021-09-09	RG_LILC3_BIC_2_2021-09-09	RG_LILC3_BIC_3_2021-09-09	RG_FRUL_BIC_1_2021-09-12	RG_FRUL_BIC_2_2021-09-12	RG_FRUL_BIC_3_2021-09-12	RG_LIDSL_BIC_1_2021-09-14	RG_LIDSL_BIC_2_2021-09-14	RG_LIDSL_BIC_3_2021-09-14
Sample Collection Date:	09-Sep-21	09-Sep-21	09-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	14-Sep-21	14-Sep-21	14-Sep-21
CC#:	CC221341	CC221342	CC221343	CC221344	CC221345	CC221346	CC221347	CC221348	CC221349
Zapada	140	20	300	340	20	30	440	520	360
Zapada oregonensis group	160	40	580	0	0	0	240	220	220
Zapada cinctipes	0	20	40	560	600	620	100	120	0
Zapada columbiana	100	40	60	0	20	0	140	180	180
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0	0	0
| Family: Perlidae	0	0	0	0	0	10	0	0	0
Hesperoperla	0	0	0	200	180	30	0	0	0
| Family: Perlodidae	60	0	160	20	20	40	80	0	0
Isoperla	0	0	0	0	0	0	0	0	0
Kogotus	140	80	200	0	20	0	0	40	40
Megarcys	40	0	40	20	0	0	160	40	120
Setvena	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	40	20	60	1,180	660	570	1,380	2,920	1,080
| Order: Trichoptera	0	20	100	0	0	10	440	40	40
| Family: Apataniidae	0	0	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	40	100	20	0	20	20
Brachycentrus	0	0	0	0	0	0	0	0	0
Brachycentrus americanus	0	0	0	0	0	0	0	0	0
Micrasema	0	0	0	0	20	0	0	0	0
| Family: Glossosomatidae	0	20	0	0	0	10	20	0	20
Glossosoma	0	0	0	0	0	0	0	0	0
| Family: Hydropsychidae	360	120	560	0	0	10	760	580	420
Parapsyche	0	0	0	0	0	0	0	0	60
Parapsyche elsis	80	0	520	0	0	0	0	60	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	20	0	0	0	0	0	0	0	0
Ecclisomyia	0	0	0	0	0	0	0	0	0
Homophylax	0	0	0	0	0	0	0	0	0

Note: A value of zero reported at a less specific level of taxonomy does not indicate an absence of organisms at a more specific level of taxonomy.

Raw Benthic Invertebrate Density Results (# organisms/sample), LCO LAEMP 2021

Project: LCO LAEMP (21-36)
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LILC3_BIC_1_2021-09-09	RG_LILC3_BIC_2_2021-09-09	RG_LILC3_BIC_3_2021-09-09	RG_FRUL_BIC_1_2021-09-12	RG_FRUL_BIC_2_2021-09-12	RG_FRUL_BIC_3_2021-09-12	RG_LIDSL_BIC_1_2021-09-14	RG_LIDSL_BIC_2_2021-09-14	RG_LIDSL_BIC_3_2021-09-14
Sample Collection Date:	09-Sep-21	09-Sep-21	09-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	14-Sep-21	14-Sep-21	14-Sep-21
CC#:	CC221341	CC221342	CC221343	CC221344	CC221345	CC221346	CC221347	CC221348	CC221349
| **Family: Rhyacophilidae**	0	0	0	0	0	0	0	0	0
Rhyacophila	80	20	0	20	20	20	140	80	40
Rhyacophila angelita group	0	0	0	0	0	0	0	0	0
Rhyacophila betteni group	0	0	0	0	0	20	0	0	60
Rhyacophila brunnea/vemna group	0	0	0	0	0	10	0	0	40
Rhyacophila hyalinata group	0	0	40	0	0	0	20	40	100
Rhyacophila vofixa group	0	0	0	0	0	0	0	0	20
Rhyacophila narvae	0	0	0	0	0	0	0	20	0
Rhyacophila verrula group	0	0	20	0	0	0	0	0	0
| **Family: Thremmatidae**	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0	0	0
| **Family: Uenoidae**	0	0	0	0	0	0	0	0	0
Neothremma	0	0	0	0	0	0	0	20	0
| **Order: Diptera**	0	0	40	0	0	0	0	0	0
| **Family: Athericidae**	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	80	70	0	0	0
| **Family: Blephariceridae**	0	0	0	0	0	0	0	0	0
Philorus	0	0	0	40	0	0	0	0	0
| **Family: Ceratopogonidae**	0	0	0	0	0	0	0	0	0
Mallochohelea	0	0	0	40	0	10	0	0	0
| **Family: Chironomidae**	2,360	1,040	2,160	40	0	60	1,160	340	360
| **Subfamily: Chironominae**	0	0	0	0	0	0	0	0	0
| **Tribe: Tanytarsini**	0	0	0	0	0	0	0	0	0
Constempellina sp. C	0	0	0	0	20	0	0	0	0
Micropsectra	200	160	80	0	0	40	40	0	0
Stempellinella	0	0	0	0	0	0	20	0	0
Tanytarsus	0	0	0	0	0	0	0	0	0
| **Subfamily: Diamesinae**	0	0	0	0	0	0	0	0	0
| **Tribe: Diamesini**	0	0	0	0	0	0	0	0	0
Diamesa	200	140	280	20	0	0	0	0	0
Pagastia	640	440	980	0	0	0	180	200	240
Pseudodiamesa	20	0	0	0	0	10	0	0	0
| **Subfamily: Orthocladiinae**	0	0	0	0	0	0	0	0	0
Brillia	0	0	20	0	0	0	0	0	0
Corynoneura	0	0	20	0	0	0	0	20	0

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Raw Benthic Invertebrate Density Results (# organisms/sample), LCO LAEMP 2021

Project: LCO LAEMP (21-36)
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LILC3_BIC_1_2021-09-09	RG_LILC3_BIC_2_2021-09-09	RG_LILC3_BIC_3_2021-09-09	RG_FRUL_BIC_1_2021-09-12	RG_FRUL_BIC_2_2021-09-12	RG_FRUL_BIC_3_2021-09-12	RG_LIDSL_BIC_1_2021-09-14	RG_LIDSL_BIC_2_2021-09-14	RG_LIDSL_BIC_3_2021-09-14
Sample Collection Date:	09-Sep-21	09-Sep-21	09-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	14-Sep-21	14-Sep-21	14-Sep-21
CC#:	CC221341	CC221342	CC221343	CC221344	CC221345	CC221346	CC221347	CC221348	CC221349
Cricotopus (Nostococladius)	0	0	0	0	0	0	0	0	0
Diplocladius cultriger	0	20	40	0	0	0	0	0	0
Eukiefferiella	960	580	1,040	160	60	50	60	160	80
Hydrobaenus	20	160	180	0	0	0	40	60	0
Orthocladius complex	3,980	2,760	5,440	20	0	0	700	900	520
Orthocladius lignicola	0	0	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0	0	0	0
Parorthocladius	0	0	20	0	0	0	0	0	0
Rheocricotopus	600	540	1,520	140	100	20	240	400	80
Thienemanniella	0	0	0	0	0	0	0	0	0
Tvetenia	320	260	760	140	60	60	40	60	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	20	0	0	0	0	0
| Family: Empididae	20	20	0	0	80	0	20	20	0
Neoplasta	0	0	0	0	0	0	0	0	0
Oreogeton	0	0	0	0	0	0	0	0	0
Roederiodes	0	0	0	0	0	40	0	0	0
Trichoclinocera	0	0	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0	0	0
Limnophora	0	0	20	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	80	20	60	20	400	520	120	120	140
| Family: Simuliidae	20	0	0	0	80	170	40	60	80
Prosimulium	0	0	80	0	0	0	0	0	0
Prosimulium/Helodon	40	0	0	0	0	0	40	40	0
Simulium	60	20	0	180	220	400	20	0	20
| Family: Tipulidae	0	0	0	0	100	0	0	0	0
Antocha	0	0	0	0	0	0	0	0	0
Cryptolabis	0	0	0	0	0	0	0	0	0
Dicranota	0	0	0	0	0	10	80	120	20

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Minnow Environmental (BC)
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250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LILC3_BIC_1_2021-09-09	RG_LILC3_BIC_2_2021-09-09	RG_LILC3_BIC_3_2021-09-09	RG_FRUL_BIC_1_2021-09-12	RG_FRUL_BIC_2_2021-09-12	RG_FRUL_BIC_3_2021-09-12	RG_LIDSL_BIC_1_2021-09-14	RG_LIDSL_BIC_2_2021-09-14	RG_LIDSL_BIC_3_2021-09-14
Sample Collection Date:	09-Sep-21	09-Sep-21	09-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	14-Sep-21	14-Sep-21	14-Sep-21
CC#:	CC221341	CC221342	CC221343	CC221344	CC221345	CC221346	CC221347	CC221348	CC221349
Hexatoma	0	0	0	20	80	10	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0
Aturus	0	20	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0
Feltria	80	140	40	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0
Lebertia	280	220	200	0	0	40	60	20	20
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0
Sperchon	240	440	500	0	0	0	100	120	0
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0
Testudacarus	20	0	0	0	20	20	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	10	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0	0	0	0
Rhynchelmis	0	0	20	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	20	0	0	0	0
Enchytraeus	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0	0	0
Totals:	**12,500**	**8,220**	**18,720**	**8,220**	**6,140**	**4,920**	**11,740**	**14,560**	**10,300**

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250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LILC3_BIC_1_2021-09-09	RG_LILC3_BIC_2_2021-09-09	RG_LILC3_BIC_3_2021-09-09	RG_FRUL_BIC_1_2021-09-12	RG_FRUL_BIC_2_2021-09-12	RG_FRUL_BIC_3_2021-09-12	RG_LIDSL_BIC_1_2021-09-14	RG_LIDSL_BIC_2_2021-09-14	RG_LIDSL_BIC_3_2021-09-14
Sample Collection Date:	09-Sep-21	09-Sep-21	09-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	14-Sep-21	14-Sep-21	14-Sep-21
CC#:	CC221341	CC221342	CC221343	CC221344	CC221345	CC221346	CC221347	CC221348	CC221349
Taxa present but not included:									
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0
| Class: Ostracoda	20	20	0	0	20	10	20	20	20
| Class: Branchiopoda	0	0	0	0	0	0	0	0	0
| Order: Cladocera	0	0	0	0	0	0	20	0	0
Phylum: Nemata	20	20	0	20	20	10	0	20	0
Phylum: Platyhelminthes	0	0	0	0	0	0	0	0	0
| Class: Turbellaria	20	20	0	0	20	10	20	0	20
Totals:	**60**	**60**	0	**20**	**60**	**30**	**60**	**40**	**40**

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Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LIDSL_BIC_4_2021-09-14	RG_LIDSL_BIC_5_2021-09-14	RG_LCUT_BIC_1_2021-09-10	RG_LCUT_BIC_2_2021-09-10	RG_LCUT_BIC_3_2021-09-10	RG_SLINE_BIC_1_2021-09-15	RG_SLINE_BIC_2_2021-09-15	RG_SLINE_BIC_3_2021-09-15	RG_LIDCOM_BIC_1_2021-09-13
Sample Collection Date:	14-Sep-21	14-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	13-Sep-21
CC#:	CC221350	CC221351	CC221352	CC221353	CC221354	CC221355	CC221356	CC221357	CC221358
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	14	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0
Ameletus	80	20	0	0	0	50	180	43	80
| Family: Baetidae	0	0	0	0	0	0	20	0	40
Acentrella	0	0	60	0	0	0	0	0	0
Baetis	320	360	180	240	400	60	0	0	560
Baetis rhodani group	640	460	360	520	520	70	60	29	2,940
Baetis bicaudatus	0	0	0	0	0	0	20	14	0
Diphetor hageni	0	0	20	0	0	0	0	0	0
| Family: Ephemerellidae	120	80	60	60	320	210	860	586	640
Drunella	0	0	0	0	0	0	0	0	0
Drunella doddsii	80	20	0	20	0	130	120	100	660
Ephemerella excrucians complex	0	0	0	0	20	0	0	0	0
| Family: Heptageniidae	2,160	3,000	380	200	200	630	1,440	1,757	3,760
Cinygmula	0	0	0	0	0	0	0	0	0
Epeorus	20	80	0	0	0	190	100	129	100
Rhithrogena	0	0	0	0	0	10	20	157	0
| Order: Plecoptera	0	0	0	0	0	0	0	0	80
| Family: Capniidae	20	0	0	40	20	0	0	0	0
Mesocapnia	0	0	0	0	20	0	0	0	0
| Family: Chloroperlidae	20	20	60	0	0	140	60	71	40
Haploperla	0	0	0	0	0	0	0	0	0
Plumiperla	0	0	0	0	0	80	0	14	0
Suwallia	0	0	0	0	0	60	0	14	0
Sweltsa	20	0	40	60	40	40	80	114	40
| Family: Leuctridae	0	0	0	0	0	0	0	0	0
Paraleuctra	0	0	0	0	0	20	0	0	20
| Family: Nemouridae	0	0	0	0	0	0	20	29	0
Malenka	0	0	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	10	0	0	0

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Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LIDSL_BIC_4_2021-09-14	RG_LIDSL_BIC_5_2021-09-14	RG_LCUT_BIC_1_2021-09-10	RG_LCUT_BIC_2_2021-09-10	RG_LCUT_BIC_3_2021-09-10	RG_SLINE_BIC_1_2021-09-15	RG_SLINE_BIC_2_2021-09-15	RG_SLINE_BIC_3_2021-09-15	RG_LIDCOM_BIC_1_2021-09-13
Sample Collection Date:	14-Sep-21	14-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	13-Sep-21
CC#:	CC221350	CC221351	CC221352	CC221353	CC221354	CC221355	CC221356	CC221357	CC221358
Zapada	540	100	20	20	20	20	0	0	1,500
Zapada oregonensis group	140	300	100	40	40	20	20	29	580
Zapada cinctipes	100	100	60	80	120	0	0	0	620
Zapada columbiana	80	300	20	0	40	220	1,540	457	400
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0	14	0
| Family: Perlidae	0	0	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0	0	0
| Family: Perlodidae	0	0	80	0	60	40	340	71	0
Isoperla	0	0	0	0	0	0	20	0	0
Kogotus	80	40	180	100	120	0	0	0	100
Megarcys	0	20	140	100	140	120	220	29	180
Setvena	0	0	0	0	20	0	20	0	0
| Family: Taeniopterygidae	900	1,300	120	0	0	400	220	243	2,520
| Order: Trichoptera	40	60	20	20	160	40	0	14	1,080
| Family: Apataniidae	0	0	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0	0	80
| Family: Brachycentridae	0	20	0	0	0	0	0	0	20
Brachycentrus	0	0	0	0	0	0	0	0	0
Brachycentrus americanus	0	0	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	20	0	0	0	30	0	14	20
Glossosoma	0	0	0	0	0	0	40	0	0
| Family: Hydropsychidae	80	360	300	60	120	120	60	129	540
Parapsyche	40	0	0	0	0	0	0	0	200
Parapsyche elsis	0	80	40	0	80	0	0	0	220
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0	0	0
| Family: Limnephilidae	20	0	0	40	60	0	0	0	0
Ecclisomyia	0	0	20	180	180	0	0	0	20
Homophylax	0	0	0	0	20	0	0	0	0

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250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LIDSL_BIC_4_2021-09-14	RG_LIDSL_BIC_5_2021-09-14	RG_LCUT_BIC_1_2021-09-10	RG_LCUT_BIC_2_2021-09-10	RG_LCUT_BIC_3_2021-09-10	RG_SLINE_BIC_1_2021-09-15	RG_SLINE_BIC_2_2021-09-15	RG_SLINE_BIC_3_2021-09-15	RG_LIDCOM_BIC_1_2021-09-13
Sample Collection Date:	14-Sep-21	14-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	13-Sep-21
CC#:	CC221350	CC221351	CC221352	CC221353	CC221354	CC221355	CC221356	CC221357	CC221358
| **Family: Rhyacophilidae**	0	0	0	0	0	0	0	0	0
Rhyacophila	120	1,500	100	20	80	70	200	86	220
Rhyacophila angelita group	0	0	0	0	0	0	0	0	0
Rhyacophila betteni group	60	20	40	20	0	0	0	0	140
Rhyacophila brunnea/vemna group	20	20	0	0	0	40	320	71	40
Rhyacophila hyalinata group	20	140	60	40	60	50	160	43	100
Rhyacophila vofixa group	0	0	0	0	0	0	40	43	20
Rhyacophila narvae	20	0	0	0	0	0	0	0	20
Rhyacophila verrula group	0	0	0	0	0	0	0	0	0
| **Family: Thremmatidae**	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0	0	20
| **Family: Uenoidae**	0	0	0	0	0	0	0	0	0
Neothremma	0	0	0	0	0	10	20	14	0
| **Order: Diptera**	0	0	0	0	0	0	0	0	0
| **Family: Athericidae**	0	0	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0	0	0
| **Family: Blephariceridae**	0	0	0	0	0	0	0	0	0
Philorus	0	0	0	0	0	0	0	0	0
| **Family: Ceratopogonidae**	0	0	0	0	0	0	0	0	0
Mallochohelea	0	0	0	0	0	0	0	0	0
| **Family: Chironomidae**	280	400	1,400	1,160	1,260	40	180	14	920
| **Subfamily: Chironominae**	0	0	0	0	0	0	0	0	0
| **Tribe: Tanytarsini**	0	0	0	0	0	0	0	0	0
Constempellina sp. C	0	0	0	0	0	0	0	0	0
Micropsectra	0	0	40	0	40	0	0	0	0
Stempellinella	0	0	0	0	0	0	0	0	0
Tanytarsus	0	0	0	120	0	0	0	0	0
| **Subfamily: Diamesinae**	0	0	0	0	0	0	0	0	0
| **Tribe: Diamesini**	0	0	0	0	0	0	0	0	0
Diamesa	20	100	260	180	340	0	0	14	160
Pagastia	220	60	640	620	720	0	0	0	340
Pseudodiamesa	0	0	0	0	0	0	0	0	0
| **Subfamily: Orthocladiinae**	0	0	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	0	0	0	0
Corynoneura	0	0	0	0	0	0	0	0	0

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Raw Benthic Invertebrate Density Results (# organisms/sample), LCO LAEMP 2021

Project: LCO LAEMP (21-36)
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LIDSL_BIC_4_2021-09-14	RG_LIDSL_BIC_5_2021-09-14	RG_LCUT_BIC_1_2021-09-10	RG_LCUT_BIC_2_2021-09-10	RG_LCUT_BIC_3_2021-09-10	RG_SLINE_BIC_1_2021-09-15	RG_SLINE_BIC_2_2021-09-15	RG_SLINE_BIC_3_2021-09-15	RG_LIDCOM_BIC_1_2021-09-13
Sample Collection Date:	14-Sep-21	14-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	13-Sep-21
CC#:	CC221350	CC221351	CC221352	CC221353	CC221354	CC221355	CC221356	CC221357	CC221358
Cricotopus (Nostococladius)	0	0	0	0	0	0	0	0	40
Diplocladius cultriger	0	0	0	0	0	0	0	0	0
Eukiefferiella	20	280	520	540	520	10	340	14	560
Hydrobaenus	20	0	20	180	60	0	0	0	140
Orthocladius complex	720	1,540	3,020	3,200	3,560	10	120	43	2,200
Orthocladius lignicola	0	0	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0	0	0	0
Parorthocladius	0	0	0	0	0	0	0	14	0
Rheocricotopus	160	140	660	420	100	90	160	86	260
Thienemanniella	0	0	0	20	0	0	0	0	0
Tvetenia	20	0	260	100	80	20	20	71	40
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	0	0	40	0	0	0	14	40
Neoplasta	0	0	0	0	0	0	0	0	20
Oreogeton	0	0	0	0	0	20	20	14	0
Roederiodes	0	0	0	0	0	0	0	0	0
Trichoclinocera	0	0	80	40	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0	0	0
Limnophora	0	0	20	0	40	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	10	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	60	60	0	0	20	10	0	14	280
| Family: Simuliidae	0	20	0	0	20	0	0	0	0
Prosimulium	0	0	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0	0	0
Simulium	20	120	20	0	60	0	0	0	0
| Family: Tipulidae	0	0	0	0	0	0	20	0	20
Antocha	0	0	0	0	0	0	0	0	0
Cryptolabis	0	0	0	0	0	10	0	0	0
Dicranota	0	40	20	0	0	0	20	0	0

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250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LIDSL_BIC_4_2021-09-14	RG_LIDSL_BIC_5_2021-09-14	RG_LCUT_BIC_1_2021-09-10	RG_LCUT_BIC_2_2021-09-10	RG_LCUT_BIC_3_2021-09-10	RG_SLINE_BIC_1_2021-09-15	RG_SLINE_BIC_2_2021-09-15	RG_SLINE_BIC_3_2021-09-15	RG_LIDCOM_BIC_1_2021-09-13
Sample Collection Date:	14-Sep-21	14-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	13-Sep-21
CC#:	CC221350	CC221351	CC221352	CC221353	CC221354	CC221355	CC221356	CC221357	CC221358
Hexatoma	0	0	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0
Feltria	0	0	0	0	60	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	14	0
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0
Lebertia	0	20	140	300	260	0	0	0	100
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0
Sperchon	200	80	320	500	420	10	40	0	520
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	20	0	14	0
Rhynchelmis	0	0	20	40	0	10	0	0	60
| Order: Tubificida	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0
Enchytraeus	0	0	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0	0	0
Totals:	**7,480**	**11,280**	**9,900**	**9,320**	**10,420**	**3,140**	**7,120**	**4,654**	**23,300**

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Raw Benthic Invertebrate Density Results (# organisms/sample), LCO LAEMP 2021

Project: LCO LAEMP (21-36)
Minnow Environmental (BC)
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250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LIDSL_BIC_4_2021-09-14	RG_LIDSL_BIC_5_2021-09-14	RG_LCUT_BIC_1_2021-09-10	RG_LCUT_BIC_2_2021-09-10	RG_LCUT_BIC_3_2021-09-10	RG_SLINE_BIC_1_2021-09-15	RG_SLINE_BIC_2_2021-09-15	RG_SLINE_BIC_3_2021-09-15	RG_LIDCOM_BIC_1_2021-09-13
Sample Collection Date:	14-Sep-21	14-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21	15-Sep-21	15-Sep-21	15-Sep-21	13-Sep-21
CC#:	CC221350	CC221351	CC221352	CC221353	CC221354	CC221355	CC221356	CC221357	CC221358
Taxa present but not included:									
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0
| Class: Ostracoda	20	0	20	20	20	10	20	14	20
| Class: Branchiopoda	0	0	0	0	0	0	0	0	0
| Order: Cladocera	0	0	0	0	0	0	0	0	0
Phylum: Nemata	20	0	20	0	20	0	0	0	0
Phylum: Platyhelminthes	0	0	0	0	0	0	0	0	0
| Class: Turbellaria	20	0	20	20	20	0	0	14	20
Totals:	**60**	**0**	**60**	**40**	**60**	**10**	**20**	**28**	**40**

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scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LISP24_BIC_1_2021-09-13	RG_FO23_BIC_1_2021-09-12	RG_FO23_BIC_2_2021-09-12	RG_FO23_BIC_3_2021-09-12	RG_FO23_BIC_4_2021-09-12	RG_FO23_BIC_5_2021-09-12	RG_LI8_BIC_1_2021-09-11	RG_LI8_BIC_2_2021-09-11	RG_LI8_BIC_3_2021-09-11
Sample Collection Date:	13-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	11-Sep-21	11-Sep-21	11-Sep-21
CC#:	CC221359	CC221360	CC221361	CC221362	CC221363	CC221364	CC221365	CC221366	CC221367
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0
| Order: Collembola	20	0	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0	0	0
Ameletus	140	33	20	40	20	20	80	200	120
| Family: Baetidae	20	0	20	40	20	0	40	0	0
Acentrella	0	17	100	0	20	40	0	0	0
Baetis	720	108	1,500	60	80	100	120	240	180
Baetis rhodani group	440	108	780	920	1,020	680	1,580	1,720	1,180
Baetis bicaudatus	0	0	0	0	0	0	0	0	0
Diphetor hageni	0	0	0	0	0	0	0	0	0
| Family: Ephemerellidae	200	25	0	100	20	280	20	60	180
Drunella	0	8	0	20	0	0	0	0	20
Drunella doddsii	40	17	100	100	100	140	180	260	180
Ephemerella excrucians complex	0	0	0	0	0	0	0	0	0
| Family: Heptageniidae	1,660	308	800	880	1,160	1,580	3,840	2,400	2,580
Cinygmula	0	0	0	0	0	0	0	0	0
Epeorus	20	0	0	0	20	0	160	80	20
Rhithrogena	0	8	0	100	200	100	20	0	0
| Order: Plecoptera	0	0	0	0	0	20	20	0	0
| Family: Capniidae	0	50	160	120	0	60	40	80	20
Mesocapnia	0	0	0	0	0	0	0	0	0
| Family: Chloroperlidae	20	8	0	0	20	0	0	0	0
Haploperla	0	0	0	0	0	0	0	0	0
Plumiperla	0	0	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0	0	0
Sweltsa	0	67	80	140	200	180	20	20	0
| Family: Leuctridae	0	8	0	40	40	60	40	0	20
Paraleuctra	0	0	0	0	0	0	0	0	0
| Family: Nemouridae	0	0	40	200	40	0	100	0	0
Malenka	0	0	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0	0	0

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scottfinlayson@cordilleraconsulting.ca
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Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LISP24_BIC_1_2021-09-13	RG_FO23_BIC_1_2021-09-12	RG_FO23_BIC_2_2021-09-12	RG_FO23_BIC_3_2021-09-12	RG_FO23_BIC_4_2021-09-12	RG_FO23_BIC_5_2021-09-12	RG_LI8_BIC_1_2021-09-11	RG_LI8_BIC_2_2021-09-11	RG_LI8_BIC_3_2021-09-11
Sample Collection Date:	13-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	11-Sep-21	11-Sep-21	11-Sep-21
CC#:	CC221359	CC221360	CC221361	CC221362	CC221363	CC221364	CC221365	CC221366	CC221367
Zapada	220	8	0	0	80	200	500	80	240
Zapada oregonensis group	360	0	0	0	0	0	220	20	160
Zapada cinctipes	20	108	800	1,260	400	460	160	140	160
Zapada columbiana	220	8	0	20	0	20	300	60	140
| Family: Peltoperlidae	0	0	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0	0	0
| Family: Perlidae	0	17	80	100	0	40	0	0	0
Hesperoperla	0	8	60	220	100	60	0	0	0
| Family: Perlodidae	60	67	60	0	0	0	0	0	20
Isoperla	0	0	0	0	0	0	0	0	0
Kogotus	0	0	40	40	0	40	40	60	0
Megarcys	20	0	0	0	20	0	260	60	20
Setvena	0	0	0	0	0	0	0	0	0
| Family: Taeniopterygidae	420	67	1,180	1,280	1,260	920	4,240	2,960	2,320
| Order: Trichoptera	940	50	0	40	0	160	80	480	440
| Family: Apataniidae	0	0	0	0	0	0	0	0	0
Apatania	0	0	0	0	0	0	0	20	0
| Family: Brachycentridae	40	75	20	0	20	100	0	20	0
Brachycentrus	0	0	120	320	100	0	0	0	0
Brachycentrus americanus	0	0	20	0	0	0	0	0	0
Micrasema	0	17	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	8	40	60	0	0	0	0	20
Glossosoma	0	0	0	0	0	0	0	0	0
| Family: Hydropsychidae	160	0	0	20	0	0	260	160	180
Parapsyche	20	0	0	0	0	0	0	20	60
Parapsyche elsis	40	0	0	0	0	0	0	0	20
| Family: Lepidostomatidae	0	0	0	0	0	0	0	0	0
Lepidostoma	0	0	0	20	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0	0	0
Ecclisomyia	0	0	0	0	0	0	0	0	60
Homophylax	0	0	0	0	0	0	0	0	0

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Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LISP24_BIC_1_2021-09-13	RG_FO23_BIC_1_2021-09-12	RG_FO23_BIC_2_2021-09-12	RG_FO23_BIC_3_2021-09-12	RG_FO23_BIC_4_2021-09-12	RG_FO23_BIC_5_2021-09-12	RG_LI8_BIC_1_2021-09-11	RG_LI8_BIC_2_2021-09-11	RG_LI8_BIC_3_2021-09-11
Sample Collection Date:	13-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	11-Sep-21	11-Sep-21	11-Sep-21
CC#:	CC221359	CC221360	CC221361	CC221362	CC221363	CC221364	CC221365	CC221366	CC221367
| **Family: Rhyacophilidae**	0	0	0	0	0	0	0	0	0
Rhyacophila	0	25	20	40	20	60	100	120	0
Rhyacophila angelita group	0	0	0	0	0	40	0	0	0
Rhyacophila betteni group	20	0	0	0	0	0	20	40	0
Rhyacophila brunnea/vemna group	0	0	0	0	0	0	20	40	60
Rhyacophila hyalinata group	40	8	0	0	0	0	80	60	40
Rhyacophila vofixa group	20	0	0	0	0	0	0	0	0
Rhyacophila narvae	0	0	0	0	0	0	0	0	0
Rhyacophila verrula group	0	0	0	0	0	0	0	0	0
| **Family: Thremmatidae**	0	0	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0	0	0
| **Family: Uenoidae**	0	0	0	0	0	0	0	0	0
Neothremma	0	0	0	0	0	0	0	0	0
| **Order: Diptera**	0	0	0	0	0	0	0	0	0
| **Family: Athericidae**	0	0	0	0	0	0	0	0	0
Atherix	0	8	60	60	0	20	0	0	0
| **Family: Blephariceridae**	0	0	0	0	0	0	0	0	0
Philorus	0	0	0	0	0	0	0	0	0
| **Family: Ceratopogonidae**	0	0	0	0	0	20	0	0	0
Mallochohelea	0	0	0	0	0	0	0	0	0
| **Family: Chironomidae**	680	67	120	240	160	200	720	580	440
| **Subfamily: Chironominae**	0	0	0	0	0	0	0	0	0
| **Tribe: Tanytarsini**	0	0	0	0	0	0	0	0	0
Constempellina sp. C	0	17	0	0	0	20	0	0	0
Micropsectra	20	8	80	100	40	40	40	0	0
Stempellinella	0	0	0	0	0	0	0	20	0
Tanytarsus	0	0	0	0	0	0	0	0	0
| **Subfamily: Diamesinae**	0	0	0	0	0	0	0	0	0
| **Tribe: Diamesini**	0	0	0	0	0	0	0	0	0
Diamesa	80	0	0	0	0	0	0	0	0
Pagastia	160	17	20	0	0	0	20	0	0
Pseudodiamesa	0	0	0	0	0	0	0	0	0
| **Subfamily: Orthocladiinae**	0	0	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	0	0	0	0
Corynoneura	0	25	0	0	0	0	0	0	0

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Sample:	RG_LISP24_BIC_1_2021-09-13	RG_FO23_BIC_1_2021-09-12	RG_FO23_BIC_2_2021-09-12	RG_FO23_BIC_3_2021-09-12	RG_FO23_BIC_4_2021-09-12	RG_FO23_BIC_5_2021-09-12	RG_LI8_BIC_1_2021-09-11	RG_LI8_BIC_2_2021-09-11	RG_LI8_BIC_3_2021-09-11
Sample Collection Date:	13-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	11-Sep-21	11-Sep-21	11-Sep-21
CC#:	CC221359	CC221360	CC221361	CC221362	CC221363	CC221364	CC221365	CC221366	CC221367
Cricotopus (Nostococladius)	0	0	0	0	0	0	0	20	0
Diplocladius cultriger	40	0	0	0	0	0	0	0	0
Eukiefferiella	20	17	220	240	40	60	80	20	0
Hydrobaenus	180	0	20	0	0	20	100	60	40
Orthocladius complex	1,980	383	160	160	60	80	40	20	20
Orthocladius lignicola	0	0	20	0	0	0	0	0	0
Parametriocnemus	0	0	0	20	0	0	0	0	0
Parorthocladius	0	0	0	0	0	0	0	0	0
Rheocricotopus	380	17	200	40	60	100	280	240	180
Thienemanniella	0	0	0	0	0	0	0	0	0
Tvetenia	120	17	200	140	80	80	100	0	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0	0	0	0
| Family: Empididae	0	33	80	20	20	40	0	20	0
Neoplasta	0	33	0	60	20	20	20	20	0
Oreogeton	0	0	0	0	0	0	0	0	0
Roederiodes	0	0	0	60	0	60	0	0	0
Trichoclinocera	0	0	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0	0	0
Limnophora	0	0	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	0	450	760	1,480	760	1,340	340	240	420
| Family: Simuliidae	0	8	40	20	180	40	0	60	0
Prosimulium	0	0	0	0	0	0	20	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0	20	0
Simulium	20	0	20	20	20	20	0	40	0
| Family: Tipulidae	0	0	0	0	0	0	0	20	0
Antocha	0	0	0	0	0	20	0	0	0
Cryptolabis	0	0	0	0	0	0	0	0	0
Dicranota	0	0	0	0	0	40	0	0	0

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Raw Benthic Invertebrate Density Results (# organisms/sample), LCO LAEMP 2021

Project: LCO LAEMP (21-36)
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LISP24_BIC_1_2021-09-13	RG_FO23_BIC_1_2021-09-12	RG_FO23_BIC_2_2021-09-12	RG_FO23_BIC_3_2021-09-12	RG_FO23_BIC_4_2021-09-12	RG_FO23_BIC_5_2021-09-12	RG_LI8_BIC_1_2021-09-11	RG_LI8_BIC_2_2021-09-11	RG_LI8_BIC_3_2021-09-11
Sample Collection Date:	13-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	11-Sep-21	11-Sep-21	11-Sep-21
CC#:	CC221359	CC221360	CC221361	CC221362	CC221363	CC221364	CC221365	CC221366	CC221367
Hexatoma	0	8	0	100	40	100	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	20	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0	0	0
Feltria	0	8	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0	0	0
Lebertia	100	333	100	100	40	80	40	0	20
| Family: Sperchontidae	0	0	0	0	0	0	0	0	0
Sperchon	280	42	0	0	0	0	120	60	20
| Family: Torrenticolidae	0	0	0	0	0	0	0	0	0
Testudacarus	0	8	0	0	0	40	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0	0	0
Stygothrombium	0	17	0	20	0	20	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0	0	0
| Family: Lumbriculidae	0	33	20	0	0	0	60	0	80
Rhynchelmis	0	50	0	60	60	60	80	40	120
| Order: Tubificida	0	0	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0	0	0
Enchytraeus	0	0	0	100	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0	0	0
Nais	0	83	20	220	120	140	0	40	0
Totals:	**9,940**	**2,913**	**8,180**	**9,440**	**6,660**	**8,040**	**14,600**	**10,920**	**9,780**

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Project: LCO LAEMP (21-36)
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LISP24_BIC_1_2021-09-13	RG_FO23_BIC_1_2021-09-12	RG_FO23_BIC_2_2021-09-12	RG_FO23_BIC_3_2021-09-12	RG_FO23_BIC_4_2021-09-12	RG_FO23_BIC_5_2021-09-12	RG_LI8_BIC_1_2021-09-11	RG_LI8_BIC_2_2021-09-11	RG_LI8_BIC_3_2021-09-11
Sample Collection Date:	13-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	12-Sep-21	11-Sep-21	11-Sep-21	11-Sep-21
CC#:	CC221359	CC221360	CC221361	CC221362	CC221363	CC221364	CC221365	CC221366	CC221367
Taxa present but not included:									
Phylum: Arthropoda	0	0	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0	0	0
| Class: Ostracoda	20	8	0	20	20	20	20	20	20
| Class: Branchiopoda	0	0	0	0	0	0	0	0	0
| Order: Cladocera	0	0	0	0	0	0	0	0	0
Phylum: Nemata	20	8	0	20	0	0	0	20	0
Phylum: Platyhelminthes	0	0	0	0	0	0	0	0	0
| Class: Turbellaria	20	8	0	20	0	20	20	20	20
Totals:	**60**	**24**	**0**	**60**	**20**	**40**	**40**	**60**	**40**

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Minnow Environmental (BC)
Taxonomist: Scott Finlayson
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250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LILC3_BIC_4_2021-09-10	RG_LILC3_BIC_5_2021-09-10	RG_LI24_BIC_1_2021-09-16	RG_LI24_BIC_2_2021-09-16	RG_LI24_BIC_3_2021-09-16	RG_LI24_BIC_4_2021-09-16	RG_LI24_BIC_5_2021-09-16
Sample Collection Date:	10-Sep-21	10-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21
CC#:	CC221368	CC221369	CC221370	CC221371	CC221372	CC221373	CC221374
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	0	0	120	0	60	67	160
| Family: Baetidae	180	0	0	0	0	0	0
Acentrella	0	0	0	0	0	0	0
Baetis	580	380	0	0	20	0	0
Baetis rhodani group	1,760	1,340	20	20	0	17	0
Baetis bicaudatus	0	0	0	0	0	0	0
Diphetor hageni	0	0	0	0	0	0	0
| Family: Ephemerellidae	0	0	60	180	280	50	180
Drunella	0	0	0	0	0	0	0
Drunella doddsii	20	20	60	20	160	100	240
Ephemerella excrucians complex	0	0	0	0	0	0	0
| Family: Heptageniidae	560	240	5,520	5,020	4,360	2,433	6,820
Cinygmula	0	0	40	20	0	17	60
Epeorus	0	0	0	60	100	100	40
Rhithrogena	0	0	180	240	140	117	220
| Order: Plecoptera	0	0	40	40	0	33	20
| Family: Capniidae	0	0	20	80	160	33	200
Mesocapnia	0	0	0	0	0	0	0
| Family: Chloroperlidae	20	0	20	120	80	83	20
Haploperla	0	0	0	0	0	17	0
Plumiperla	0	0	0	80	0	0	20
Suwallia	0	0	0	0	0	0	0
Sweltsa	20	0	400	220	20	50	180
| Family: Leuctridae	0	0	40	40	0	0	20
Paraleuctra	0	0	40	80	20	83	40
| Family: Nemouridae	0	40	0	60	60	17	0
Malenka	20	0	0	0	0	0	0
Visoka cataractae	0	0	60	60	0	17	20

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Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LILC3_BIC_4_2021-09-10	RG_LILC3_BIC_5_2021-09-10	RG_LI24_BIC_1_2021-09-16	RG_LI24_BIC_2_2021-09-16	RG_LI24_BIC_3_2021-09-16	RG_LI24_BIC_4_2021-09-16	RG_LI24_BIC_5_2021-09-16
Sample Collection Date:	10-Sep-21	10-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21
CC#:	CC221368	CC221369	CC221370	CC221371	CC221372	CC221373	CC221374
Zapada	440	40	80	0	80	17	20
Zapada oregonensis group	280	100	0	0	0	0	0
Zapada cinctipes	40	20	0	0	0	0	0
Zapada columbiana	100	0	920	900	2,420	750	2,180
| **Family: Peltoperlidae**	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0
| **Family: Perlidae**	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0
| **Family: Perlodidae**	100	20	40	0	60	50	40
Isoperla	0	0	0	0	0	0	0
Kogotus	280	160	0	0	0	0	0
Megarcys	40	0	0	20	80	133	40
Setvena	0	0	0	20	0	50	20
| **Family: Taeniopterygidae**	60	20	600	860	520	217	1,720
| **Order: Trichoptera**	80	0	0	20	40	17	40
| **Family: Apataniidae**	0	0	0	0	0	0	0
Apatania	0	20	0	0	0	0	0
| **Family: Brachycentridae**	0	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0	0
Brachycentrus americanus	0	0	0	0	0	0	0
Micrasema	0	20	0	0	0	0	0
| **Family: Glossosomatidae**	0	0	0	0	0	0	0
Glossosoma	0	0	0	0	0	0	0
| **Family: Hydropsychidae**	260	520	0	140	80	67	60
Parapsyche	20	60	0	0	0	0	0
Parapsyche elsis	320	80	0	0	0	0	0
| **Family: Lepidostomatidae**	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| **Family: Limnephilidae**	0	20	0	0	0	0	0
Ecclisomyia	0	40	0	0	100	17	0
Homophylax	0	0	0	0	0	0	0

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Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LILC3_BIC_4_2021-09-10	RG_LILC3_BIC_5_2021-09-10	RG_LI24_BIC_1_2021-09-16	RG_LI24_BIC_2_2021-09-16	RG_LI24_BIC_3_2021-09-16	RG_LI24_BIC_4_2021-09-16	RG_LI24_BIC_5_2021-09-16
Sample Collection Date:	10-Sep-21	10-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21
CC#:	CC221368	CC221369	CC221370	CC221371	CC221372	CC221373	CC221374
| **Family: Rhyacophilidae**	0	0	0	0	0	0	0
Rhyacophila	40	20	0	0	20	17	20
Rhyacophila angelita group	0	0	0	0	0	0	0
Rhyacophila betteni group	20	0	0	0	0	0	0
Rhyacophila brunnea/vemna group	0	20	40	0	20	67	80
Rhyacophila hyalinata group	60	0	0	0	0	17	0
Rhyacophila vofixa group	0	0	0	0	0	0	0
Rhyacophila narvae	20	0	0	0	0	0	0
Rhyacophila verrula group	0	20	0	0	0	0	0
| **Family: Thremmatidae**	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	0	0	0	0
| **Family: Uenoidae**	0	0	0	0	0	0	0
Neothremma	0	0	40	80	0	33	40
| **Order: Diptera**	0	0	0	0	0	0	0
| **Family: Athericidae**	0	0	0	0	0	0	0
Atherix	0	0	0	0	0	0	0
| **Family: Blephariceridae**	0	0	0	0	0	0	0
Philorus	0	0	0	0	0	0	0
| **Family: Ceratopogonidae**	0	0	0	0	0	0	0
Mallochohelea	0	0	0	0	0	0	0
| **Family: Chironomidae**	3,540	2,800	140	220	160	83	180
| **Subfamily: Chironominae**	0	0	0	0	0	0	0
| **Tribe: Tanytarsini**	0	0	0	0	0	0	0
Constempellina sp. C	0	0	0	0	0	0	0
Micropsectra	240	420	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0
Tanytarsus	0	0	0	0	0	0	0
| **Subfamily: Diamesinae**	0	0	0	0	0	0	0
| **Tribe: Diamesini**	0	0	0	0	0	0	0
Diamesa	320	160	0	0	80	450	120
Pagastia	1,460	880	0	0	0	0	0
Pseudodiamesa	20	0	0	0	0	0	0
| **Subfamily: Orthocladiinae**	0	0	0	0	0	0	0
Brillia	0	0	0	0	0	0	0
Corynoneura	20	60	0	0	0	0	0

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Minnow Environmental (BC)
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Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LILC3_BIC_4_2021-09-10	RG_LILC3_BIC_5_2021-09-10	RG_LI24_BIC_1_2021-09-16	RG_LI24_BIC_2_2021-09-16	RG_LI24_BIC_3_2021-09-16	RG_LI24_BIC_4_2021-09-16	RG_LI24_BIC_5_2021-09-16
Sample Collection Date:	10-Sep-21	10-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21
CC#:	CC221368	CC221369	CC221370	CC221371	CC221372	CC221373	CC221374
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Diplocladius cultriger	140	120	0	0	0	0	0
Eukiefferiella	1,300	1,240	0	20	0	67	40
Hydrobaenus	320	560	0	0	0	0	0
Orthocladius complex	7,800	6,600	0	20	60	67	20
Orthocladius lignicola	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0	0
Parorthocladius	0	0	20	0	40	67	0
Rheocricotopus	1,320	520	200	200	180	17	160
Thienemanniella	0	0	0	0	0	0	0
Tvetenia	800	260	100	100	80	17	140
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0	0
| Family: Empididae	80	60	0	0	0	0	0
Neoplasta	20	0	0	0	0	0	0
Oreogeton	0	0	0	0	0	17	0
Roederiodes	0	0	0	0	0	0	0
Trichoclinocera	20	20	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0
Limnophora	0	20	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	140	20	0	0	0	0	0
| Family: Simuliidae	0	0	0	0	0	0	0
Prosimulium	0	20	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0
Simulium	20	60	0	0	0	0	0
| Family: Tipulidae	0	0	0	0	0	0	0
Antocha	0	0	0	0	0	0	0
Cryptolabis	0	0	0	0	0	0	0
Dicranota	0	0	0	40	0	0	0

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250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LILC3_BIC_4_2021-09-10	RG_LILC3_BIC_5_2021-09-10	RG_LI24_BIC_1_2021-09-16	RG_LI24_BIC_2_2021-09-16	RG_LI24_BIC_3_2021-09-16	RG_LI24_BIC_4_2021-09-16	RG_LI24_BIC_5_2021-09-16
Sample Collection Date:	10-Sep-21	10-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21
CC#:	CC221368	CC221369	CC221370	CC221371	CC221372	CC221373	CC221374
Hexatoma	0	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	20	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	140	80	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Atractides	0	0	0	20	40	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	340	360	60	80	20	17	20
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	960	960	20	100	100	50	80
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	20	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0	0
| Family: Lumbriculidae	20	0	0	0	0	0	0
Rhynchelmis	0	0	0	0	20	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	0	40	0	0	20	0	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0
Totals:	**24,380**	**18,460**	**8,880**	**9,180**	**9,680**	**5,538**	**13,260**

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Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	RG_LILC3_BIC_4_2021-09-10	RG_LILC3_BIC_5_2021-09-10	RG_LI24_BIC_1_2021-09-16	RG_LI24_BIC_2_2021-09-16	RG_LI24_BIC_3_2021-09-16	RG_LI24_BIC_4_2021-09-16	RG_LI24_BIC_5_2021-09-16
Sample Collection Date:	10-Sep-21	10-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21	16-Sep-21
CC#:	CC221368	CC221369	CC221370	CC221371	CC221372	CC221373	CC221374
Taxa present but not included:							
Phylum: Arthropoda	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0
| Class: Ostracoda	20	20	20	20	20	17	20
| Class: Branchiopoda	0	0	0	0	0	0	0
| Order: Cladocera	0	0	0	0	0	0	0
Phylum: Nemata	20	20	0	0	0	0	20
Phylum: Platyhelminthes	0	0	0	0	0	0	0
| Class: Turbellaria	20	20	0	0	0	0	0
Totals:	**60**	**60**	**20**	**20**	**20**	**17**	**40**

Note: A value of zero reported at a less specific level of taxonomy does not indicate an absence of organisms at a more specific level of taxonomy.

BENTHIC COMMUNITY DENSITY

ZEAS 21-36 Raw Data

(September 16, 2021)

Table 6: Raw Benthic Invertebrate Family-Level Counts and Biomass for Samples Collected by Hess at Line Creek, September 2021

Area	Date	Sample ID	Taxa	Count	Total Biomass
RG_LI24	09/16/2021	RG_LI24_HESS-1_2021-09-16	Ostracoda	3	0.0026
RG_LI24	09/16/2021	RG_LI24_HESS-1_2021-09-16	Ameletidae	5	0.0016
RG_LI24	09/16/2021	RG_LI24_HESS-1_2021-09-16	Ephemerellidae	5	0.0216
RG_LI24	09/16/2021	RG_LI24_HESS-1_2021-09-16	Heptageniidae	256	0.6564
RG_LI24	09/16/2021	RG_LI24_HESS-1_2021-09-16	Capniidae	10	0.046
RG_LI24	09/16/2021	RG_LI24_HESS-1_2021-09-16	Chloroperlidae	42	0.0198
RG_LI24	09/16/2021	RG_LI24_HESS-1_2021-09-16	Nemouridae	13	0.0484
RG_LI24	09/16/2021	RG_LI24_HESS-1_2021-09-16	Perlodidae	3	0.3528
RG_LI24	09/16/2021	RG_LI24_HESS-1_2021-09-16	Taeniopterygidae	12	0.027
RG_LI24	09/16/2021	RG_LI24_HESS-1_2021-09-16	Rhyacophilidae	3	0.0486
RG_LI24	09/16/2021	RG_LI24_HESS-1_2021-09-16	Chironomidae	23	0.0408
RG_LI24	09/16/2021	RG_LI24_HESS-1_2021-09-16	Empididae	1	0.006
RG_LI24	09/16/2021	RG_LI24_HESS-1_2021-09-16	Psychodidae	1	0.0008
RG_LI24	09/16/2021	RG_LI24_HESS-1_2021-09-16	Tipulidae	1	0.0008
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Lumbriculidae	1	0.001
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Sperchonidae	1	0.0006
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Ostracoda	15	0.0036
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Ameletidae	3	0.0005
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Baetidae	2	0.0164
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Ephemerellidae	9	0.0583
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Heptageniidae	305	0.3814
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Chloroperlidae	35	0.0929
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Leuctridae	15	0.0271
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Nemouridae	27	0.0486
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Perlodidae	4	0.2492
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Taeniopterygidae	16	0.0064
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Hydropsychidae	1	0.0002
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Rhyacophilidae	3	0.074
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Uenoidae	6	0.0029
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Chironomidae	48	0.0178
RG_LI24	09/16/2021	RG_LI24_HESS-2_2021-09-16	Empididae	2	0.0046
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Ostracoda	4	0.0014
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Ameletidae	7	0.018
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Ephemerellidae	3	0.0366
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Heptageniidae	160	0.2304
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Capniidae	3	0.007
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Chloroperlidae	19	0.074
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Leuctridae	6	0.0138
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Nemouridae	22	0.064
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Taeniopterygidae	4	0.0018
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Trichoptera	1	0.0002
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Limnephilidae	2	0.0072
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Rhyacophilidae	1	0.0002
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Uenoidae	6	0.0064
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Chironomidae	10	0.006
RG_LI24	09/16/2021	RG_LI24_HESS-3_2021-09-16	Empididae	2	0.0016
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Lumbriculidae	6	0.0742
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Sperchonidae	1	0.0006
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Ostracoda	19	0.0104
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Ameletidae	10	0.0462
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Ephemerellidae	5	0.0162
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Heptageniidae	245	0.4088
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Capniidae	7	0.0222
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Chloroperlidae	47	0.2386
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Leuctridae	14	0.0334
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Nemouridae	22	0.0584
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Perlodidae	4	0.1716
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Taeniopterygidae	7	0.0048
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Limnephilidae	2	0.002
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Rhyacophilidae	1	0.0006
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Uenoidae	1	0.0018
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Chironomidae	44	0.0242
RG_LI24	09/16/2021	RG_LI24_HESS-4_2021-09-16	Empididae	1	0.0046
RG_LI24	09/16/2021	RG_LI24_HESS-5_2021-09-16	Lebertiidae	1	0.0003
RG_LI24	09/16/2021	RG_LI24_HESS-5_2021-09-16	Ostracoda	16	0.0043
RG_LI24	09/16/2021	RG_LI24_HESS-5_2021-09-16	Ameletidae	10	0.0051
RG_LI24	09/16/2021	RG_LI24_HESS-5_2021-09-16	Ephemerellidae	6	0.0284
RG_LI24	09/16/2021	RG_LI24_HESS-5_2021-09-16	Heptageniidae	311	0.3259
RG_LI24	09/16/2021	RG_LI24_HESS-5_2021-09-16	Capniidae	8	0.014
RG_LI24	09/16/2021	RG_LI24_HESS-5_2021-09-16	Chloroperlidae	38	0.1329
RG_LI24	09/16/2021	RG_LI24_HESS-5_2021-09-16	Leuctridae	20	0.0363
RG_LI24	09/16/2021	RG_LI24_HESS-5_2021-09-16	Nemouridae	26	0.0237
RG_LI24	09/16/2021	RG_LI24_HESS-5_2021-09-16	Taeniopterygidae	1	0.0002
RG_LI24	09/16/2021	RG_LI24_HESS-5_2021-09-16	Uenoidae	3	0.0042
RG_LI24	09/16/2021	RG_LI24_HESS-5_2021-09-16	Chironomidae	12	0.0036
RG_LI24	09/16/2021	RG_LI24_HESS-5_2021-09-16	Empididae	3	0.0075
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Nemata	3	0.0018
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Planariidae	3	0.0036
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Lumbriculidae	1	0.0146
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Lebertiidae	6	0.0012
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Sperchonidae	4	0.0036
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Ostracoda	9	0.0028
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Ameletidae	3	0.001

Area	Date	Sample ID	Taxa	Count	Total Biomass
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Baetidae	7	0.0708
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Ephemerellidae	14	0.0044
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Heptageniidae	130	0.2248
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Chloroperlidae	3	0.011
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Leuctridae	2	0.002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Nemouridae	18	0.1048
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Perlodidae	3	0.0006
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Taeniopterygidae	8	0.0012
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Trichoptera	18	0.0008
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Apataniidae	1	0.0024
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Brachycentridae	3	0.0012
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Glossosomatidae	2	0.0612
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Hydropsychidae	2	0.2896
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Limnephilidae	2	0.0014
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Rhyacophilidae	3	0.0672
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Uenoidae	6	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Ceratopogonidae	1	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Chironomidae	88	0.3438
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Empididae	7	0.0256
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Pelecorhyncidae	2	0.0314
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Psychodidae	52	0.0372
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Tipulidae	1	0.4014
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-1_2021-09-14	Tipulidae	9	0.1234
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Nemata	2	0.0001
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Planariidae	6	0.1586
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Lumbriculidae	6	0.1689
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Lebertiidae	3	0.1518
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Sperchonidae	11	0.1538
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Ostracoda	9	0.1526
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Ameletidae	6	0.1609
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Baetidae	14	0.1939
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Ephemerellidae	52	0.1662
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Heptageniidae	300	0.4208
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Capniidae	5	0.151
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Chloroperlidae	33	0.1688
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Leuctridae	3	0.1512
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Nemouridae	57	0.3872
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Perlodidae	6	0.161
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Taeniopterygidae	44	0.1564
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Trichoptera	148	0.1693
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Glossosomatidae	14	0.1606
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Hydropsychidae	8	0.649
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Rhyacophilidae	38	0.5037
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Uenoidae	4	0.1505
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Ceratopogonidae	23	0.1604
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Chironomidae	52	0.2116
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Empididae	12	0.1643
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Pelecorhyncidae	7	0.1799
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Psychodidae	71	0.1778
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-10_2021-09-14	Tipulidae	2	0.1506
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Nemata	1	0.0001
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Planariidae	7	0.005
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Lumbriculidae	6	0.034
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Lebertiidae	2	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Sperchonidae	8	0.0021
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Ostracoda	1	0.0001
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Baetidae	11	0.054
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Ephemerellidae	20	0.0452
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Heptageniidae	365	0.2797
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Chloroperlidae	16	0.0226
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Leuctridae	2	0.0017
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Nemouridae	49	0.1935
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Perlodidae	6	0.0755
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Taeniopterygidae	60	0.0091
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Trichoptera	8	0.0008
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Apataniidae	1	0.0008
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Glossosomatidae	1	0.0103
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Hydropsychidae	25	1.115
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Limnephilidae	2	0.0001
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Rhyacophilidae	16	0.1954
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Uenoidae	2	0.0001
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Ceratopogonidae	1	0.0004
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Chironomidae	134	0.1889
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Empididae	8	0.0188
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Psychodidae	79	0.0343
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Simuliidae	1	0.0055
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-2_2021-09-14	Tipulidae	5	0.0116
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Planariidae	7	0.0202
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Lumbriculidae	4	0.0386
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Lebertiidae	3	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Sperchonidae	1	0.0022
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Ostracoda	16	0.0068
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Elmidae	1	0.0032
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Ameletidae	4	0.0028
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Baetidae	1	0.001
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Ephemerellidae	18	0.082

Area	Date	Sample ID	Taxa	Count	Total Biomass
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Heptageniidae	256	0.2706
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Capniidae	3	0.0008
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Chloroperlidae	22	0.0948
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Leuctridae	21	0.034
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Nemouridae	17	0.0716
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Perlodidae	3	0.0904
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Taeniopterygidae	58	0.0154
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Trichoptera	2	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Glossosomatidae	1	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Hydropsychidae	12	0.9768
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Rhyacophilidae	10	0.166
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Uenoidae	1	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Ceratopogonidae	5	0.0042
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Chironomidae	63	0.1606
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Empididae	10	0.036
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Pelecorhyncidae	3	0.0174
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Psychodidae	131	0.101
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-3_2021-09-14	Tipulidae	18	0.775
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Nemata	1	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Planariidae	6	0.0109
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Lumbriculidae	8	0.025
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Lebertiidae	2	0.0012
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Sperchonidae	1	0.0006
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Ostracoda	16	0.0042
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Ameletidae	16	0.0276
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Baetidae	16	0.0788
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Ephemerellidae	24	0.0123
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Heptageniidae	257	0.1182
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Chloroperlidae	68	0.0766
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Leuctridae	19	0.0105
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Nemouridae	26	0.098
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Perlodidae	2	0.0182
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Taeniopterygidae	52	0.0102
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Apataniidae	1	0.0026
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Glossosomatidae	10	0.014
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Hydropsychidae	4	0.3647
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Limnephilidae	3	0.0089
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Rhyacophilidae	25	0.1069
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Uenoidae	9	0.0007
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Chironomidae	48	0.0509
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Empididae	24	0.1708
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Psychodidae	84	0.0261
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-4_2021-09-14	Tipulidae	3	0.0099
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Nemata	1	0.0001
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Planariidae	4	0.0063
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Lumbriculidae	7	0.0275
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Lebertiidae	3	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Sperchonidae	15	0.0035
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Ostracoda	4	0.0009
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Baetidae	7	0.0023
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Ephemerellidae	14	0.0147
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Heptageniidae	117	0.0839
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Chloroperlidae	13	0.0397
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Leuctridae	14	0.0108
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Nemouridae	31	0.1138
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Perlodidae	2	0.0246
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Taeniopterygidae	13	0.0008
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Trichoptera	26	0.0006
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Brachycentridae	5	0.0009
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Hydropsychidae	28	0.4127
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Hydroptilidae	1	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Rhyacophilidae	34	0.2247
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Uenoidae	9	0.0004
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Chironomidae	55	0.0359
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Empididae	6	0.0094
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Pelecorhyncidae	7	0.0675
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Psychodidae	51	0.021
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-5_2021-09-14	Simuliidae	2	0.0058
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Nemata	3	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Planariidae	15	0.0612
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Lumbriculidae	12	0.1138
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Lebertiidae	1	0.0008
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Sperchonidae	6	0.0044
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Ostracoda	10	0.007
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Elmidae	1	0.002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Ameletidae	4	0.0004
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Baetidae	18	0.1826
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Ephemerellidae	24	0.13
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Heptageniidae	257	0.2356
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Capniidae	1	0.0004
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Chloroperlidae	18	0.076
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Leuctridae	18	0.0154
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Nemouridae	26	0.1762
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Perlodidae	6	0.083
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Taeniopterygidae	39	0.0154
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Trichoptera	8	0.0008

Area	Date	Sample ID	Taxa	Count	Total Biomass
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Apataniidae	1	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Brachycentridae	2	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Glossosomatidae	3	0.0304
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Hydropsychidae	11	1.0602
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Rhyacophilidae	16	0.1844
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Uenoidae	1	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Ceratopogonidae	1	0.0004
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Chironomidae	132	0.634
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Empididae	11	0.0482
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Psychodidae	26	0.013
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-6_2021-09-14	Tipulidae	11	0.5404
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Nemata	1	0.0007
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Planariidae	14	0.0168
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Lumbriculidae	11	0.0606
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Lebertiidae	4	0.0008
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Sperchonidae	2	0.0016
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Ostracoda	6	0.0013
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Ameletidae	2	0.0018
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Baetidae	11	0.0579
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Ephemerellidae	35	0.064
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Heptageniidae	405	0.2047
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Capniidae	5	0.0034
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Chloroperlidae	43	0.0555
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Leuctridae	6	0.0034
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Nemouridae	45	0.1563
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Perlodidae	21	0.0944
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Taeniopterygidae	61	0.015
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Trichoptera	11	0.0032
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Apataniidae	6	0.0025
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Glossosomatidae	3	0.0063
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Hydropsychidae	5	0.5667
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Rhyacophilidae	45	0.2123
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Uenoidae	3	0.0003
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Ceratopogonidae	4	0.0017
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Chironomidae	45	0.0648
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Empididae	4	0.0048
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Pelecorhyncidae	3	0.0219
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Psychodidae	74	0.0343
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Simuliidae	1	0.0038
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-7_2021-09-14	Tipulidae	8	0.2526
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Nemata	1	0.0001
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Planariidae	22	0.0306
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Lumbriculidae	20	0.0587
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Lebertiidae	2	0.0002
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Sperchonidae	5	0.0016
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Ostracoda	33	0.0068
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Elmidae	2	0.001
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Ameletidae	5	0.0013
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Baetidae	14	0.0528
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Ephemerellidae	10	0.0053
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Heptageniidae	137	0.083
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Chloroperlidae	9	0.0154
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Leuctridae	8	0.0062
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Nemouridae	24	0.0581
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Perlodidae	4	0.0249
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Taeniopterygidae	12	0.0016
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Trichoptera	6	0.0001
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Glossosomatidae	1	0.0003
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Hydropsychidae	12	0.3421
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Rhyacophilidae	55	0.1331
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Chironomidae	43	0.0954
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Empididae	4	0.0047
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Pelecorhyncidae	3	0.004
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Psychodidae	17	0.0046
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-8_2021-09-14	Tipulidae	2	0.0034
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Nemata	1	0.0001
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Planariidae	7	0.0089
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Lumbriculidae	29	0.1137
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Lebertiidae	3	0.0008
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Sperchonidae	3	0.0024
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Ostracoda	9	0.0025
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Baetidae	10	0.0413
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Ephemerellidae	28	0.0708
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Heptageniidae	218	0.1854
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Capniidae	3	0.0014
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Chloroperlidae	31	0.0626
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Leuctridae	14	0.0142
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Nemouridae	37	0.1636
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Perlodidae	4	0.0217
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Taeniopterygidae	34	0.0076
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Trichoptera	8	0.0005
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Glossosomatidae	9	0.0512
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Hydropsychidae	23	0.9071
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Rhyacophilidae	47	0.1085
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Ceratopogonidae	3	0.0016
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Chironomidae	60	0.0762

Area	Date	Sample ID	Taxa	Count	Total Biomass
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Empididae	12	0.0221
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Pelecorhyncidae	2	0.0238
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Psychodidae	43	0.0143
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Simuliidae	2	0.0121
RG_LIDSL	09/14/2021	RG_LIDSL_HESS-9_2021-09-14	Tipulidae	7	0.0136
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Nemata	18	0.024
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Lebertiidae	4	0.0088
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Sperchonidae	22	0.172
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Ostracoda	31	0.0848
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Baetidae	6	0.1408
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Heptageniidae	13	0.0232
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Chloroperlidae	1	0.0208
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Nemouridae	12	0.56
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Perlodidae	4	0.2624
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Hydropsychidae	8	1.0695
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Hydropsychidae	1	0.0032
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Rhyacophilidae	2	0.416
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Chironomidae	290	4.5784
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Empididae	3	0.0384
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Psychodidae	3	0.0152
RG_LILC3	09/10/2021	RG_LILC3_HESS-1_2021-09-10	Simuliidae	1	0.0104
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Nemata	14	0.0208
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Planariidae	4	0.0752
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Lebertiidae	7	0.036
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Sperchonidae	27	0.088
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Ostracoda	167	0.3472
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Baetidae	19	0.3064
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Ephemerellidae	1	0.0144
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Heptageniidae	2	0.0064
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Chloroperlidae	11	0.2928
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Nemouridae	6	0.2288
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Perlodidae	4	0.1048
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Hydropsychidae	2	0.2775
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Limnephilidae	2	0.0032
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Rhyacophilidae	3	0.3199
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Rhyacophilidae	4	2.7128
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Diptera	1	0.004
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Chironomidae	458	4.7376
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Empididae	2	0.0336
RG_LILC3	09/15/2021	RG_LILC3_HESS-10_2021-09-10	Psychodidae	1	0.0032
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Nemata	3	0.0024
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Planariidae	1	0.006
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Lebertiidae	5	0.0096
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Sperchonidae	24	0.0584
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Ostracoda	94	0.1008
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Baetidae	3	0.1888
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Ephemerellidae	2	0.006
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Heptageniidae	6	0.0032
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Chloroperlidae	22	0.2012
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Nemouridae	9	0.3624
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Perlodidae	10	0.1968
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Hydropsychidae	4	0.6266
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Limnephilidae	1	0.002
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Rhyacophilidae	1	0.1113
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Rhyacophilidae	6	0.7468
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Chironomidae	421	3.9416
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Empididae	2	0.0228
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Simuliidae	1	0.002
RG_LILC3	09/10/2021	RG_LILC3_HESS-2_2021-09-10	Stratiomyidae	1	0.0004
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Nemata	10	0.0048
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Planariidae	59	0.3544
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Lumbriculidae	3	0.1068
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Lebertiidae	27	0.0456
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Sperchonidae	13	0.0372
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Ostracoda	189	0.1768
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Baetidae	24	0.1804
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Ephemerellidae	1	0.0004
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Heptageniidae	20	0.0296
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Chloroperlidae	9	0.1056
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Nemouridae	11	0.1708
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Perlodidae	6	0.0604
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Taeniopterygidae	1	0.0004
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Apataniidae	1	0.0004
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Hydropsychidae	8	1.2476
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Hydropsychidae	3	0.004
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Limnephilidae	2	0.0028
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Rhyacophilidae	1	0.0517
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Rhyacophilidae	2	0.0128
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Chironomidae	571	2.2812
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Empididae	12	0.0844
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Psychodidae	8	0.01
RG_LILC3	09/10/2021	RG_LILC3_HESS-3_2021-09-10	Simuliidae	1	0.0032
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Nemata	60	0.028
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Planariidae	1	0.002
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Trombidiformes	1	0.0004
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Lebertiidae	24	0.0364

Area	Date	Sample ID	Taxa	Count	Total Biomass
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Sperchonidae	27	0.0744
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Ostracoda	180	0.1932
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Baetidae	16	0.188
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Ephemerellidae	1	0.0004
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Heptageniidae	5	0.0048
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Chloroperlidae	1	0.0084
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Nemouridae	15	0.2388
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Perlodidae	7	0.0852
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Apataniidae	1	0.0012
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Brachycentridae	1	0.0004
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Hydropsychidae	7	0.754
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Limnephilidae	1	0.0008
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Rhyacophilidae	6	0.4852
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Rhyacophilidae	3	0.4208
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Chironomidae	474	2.3876
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Empididae	3	0.018
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Pelecorhyncidae	2	0.0194
RG_LILC3	09/10/2021	RG_LILC3_HESS-4_2021-09-10	Psychodidae	15	0.0068
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Nemata	14	1.2072
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Planariidae	41	2.1
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Lumbriculidae	8	1.4736
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Trombidiformes	1	0.0008
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Lebertiidae	18	1.2384
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Sperchonidae	25	1.3168
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Ostracoda	133	1.48
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Baetidae	17	1.7648
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Ephemerellidae	1	1.2
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Heptageniidae	18	1.232
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Chloroperlidae	6	1.3224
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Nemouridae	2	0.1685
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Nemouridae	23	1.9224
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Perlodidae	1	0.1863
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Perlodidae	4	1.316
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Brachycentridae	1	1.2064
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Hydropsychidae	18	2.5761
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Hydropsychidae	3	1.2056
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Rhyacophilidae	3	0.3239
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Rhyacophilidae	1	1.46
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Chironomidae	387	5.1384
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Empididae	7	1.3096
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Pelecorhyncidae	1	0.1895
RG_LILC3	09/10/2021	RG_LILC3_HESS-5_2021-09-10	Psychodidae	2	1.2016
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Nemata	113	0.04
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Planariidae	5	0.0368
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Enchytraeidae	4	0.0036
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Lumbriculidae	1	0.0104
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Lebertiidae	12	0.0192
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Sperchonidae	34	0.0552
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Ostracoda	77	0.088
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Baetidae	26	0.2216
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Heptageniidae	10	0.0104
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Chloroperlidae	5	0.0168
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Nemouridae	1	0.0105
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Nemouridae	20	0.546
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Peltoperlidae	1	0.0568
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Perlodidae	1	0.3056
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Perlodidae	11	0.0151
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Taeniopterygidae	2	0.0008
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Brachycentridae	1	0.0008
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Hydropsychidae	14	1.891
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Hydropsychidae	20	0.4096
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Rhyacophilidae	7	0.501
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Rhyacophilidae	5	0.9564
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Chironomidae	496	1.3472
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Empididae	13	0.0976
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Pelecorhyncidae	2	0.0541
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Psychodidae	9	0.0092
RG_LILC3	09/10/2021	RG_LILC3_HESS-6_2021-09-10	Simuliidae	1	0.0076
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Nemata	17	0.0028
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Planariidae	55	0.8704
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Enchytraeidae	1	0.0004
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Lumbriculidae	1	0.0388
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Naididae	1	0.0004
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Trombidiformes	5	0.0024
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Lebertiidae	21	0.0408
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Sperchonidae	33	0.07
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Ostracoda	215	0.2484
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Baetidae	26	0.282
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Ephemerellidae	2	0.0012
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Heptageniidae	14	0.0296
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Chloroperlidae	5	0.0676
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Nemouridae	25	0.424
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Perlodidae	10	0.4208
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Taeniopterygidae	1	0.0004
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Hydropsychidae	5	1.678
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Limnephilidae	3	0.0184

Area	Date	Sample ID	Taxa	Count	Total Biomass
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Rhyacophilidae	1	0.2704
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Chironomidae	599	3.4624
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Empididae	7	0.0572
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Pelecorhyncidae	1	0.0016
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Psychodidae	3	0.0028
RG_LILC3	09/10/2021	RG_LILC3_HESS-7_2021-09-10	Tipulidae	1	0.0004
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Nemata	21	0.0136
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Planariidae	9	0.1092
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Lumbriculidae	1	0.0072
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Lebertiidae	5	0.0096
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Sperchonidae	7	0.0084
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Ostracoda	163	0.16
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Ameletidae	1	0.0004
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Baetidae	8	0.0444
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Heptageniidae	8	0.0128
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Chloroperlidae	12	0.1644
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Nemouridae	2	0.0652
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Perlodidae	4	0.0068
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Hydropsychidae	5	0.7623
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Hydroptilidae	2	0.6928
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Limnephilidae	1	0.0012
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Rhyacophilidae	2	0.163
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Rhyacophilidae	1	0.1612
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Chironomidae	373	1.6904
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Empididae	2	0.0152
RG_LILC3	09/10/2021	RG_LILC3_HESS-8_2021-09-10	Psychodidae	4	0.0044
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Nemata	16	0.0052
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Planariidae	25	0.3584
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Lebertiidae	4	0.0108
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Sperchonidae	20	0.0424
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Ostracoda	204	0.2212
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Ameletidae	1	0.0016
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Baetidae	11	0.1232
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Heptageniidae	11	0.0112
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Chloroperlidae	18	0.2684
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Nemouridae	10	0.2572
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Perlodidae	4	0.3248
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Hydropsychidae	4	0.5727
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Hydropsychidae	1	0.2592
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Limnephilidae	3	0.0056
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Rhyacophilidae	1	0.0563
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Rhyacophilidae	3	0.6604
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Chironomidae	459	2.6308
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Empididae	1	0.0088
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Muscidae	1	0.032
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Psychodidae	2	0.0024
RG_LILC3	09/10/2021	RG_LILC3_HESS-9_2021-09-10	Tipulidae	1	0.2842
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Lumbriculidae	39	0.1532
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Lebertiidae	1	0.0005
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Ostracoda	8	0.0071
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Ameletidae	3	0.0156
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Baetidae	1	0.0096
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Ephemerellidae	10	0.0558
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Heptageniidae	113	0.138
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Capniidae	1	0.0004
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Chloroperlidae	74	0.1382
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Leuctridae	9	0.0045
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Nemouridae	16	0.0219
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Perlodidae	14	0.2883
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Taeniopterygidae	5	0.001
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Glossosomatidae	16	0.1002
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Hydropsychidae	2	0.0008
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Rhyacophilidae	18	0.0487
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Uenoidae	1	0.0001
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Chironomidae	12	0.007
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Empididae	6	0.0259
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Pelecorhyncidae	2	0.0097
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Psychodidae	1	0.0009
RG_SLINE	09/15/2021	RG_SLINE_HESS-1_2021-09-15	Tipulidae	1	0.0005
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Nemata	3	0.001
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Lebertiidae	1	0.0024
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Ostracoda	6	0.0034
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Ameletidae	14	0.0658
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Ephemerellidae	23	0.0138
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Heptageniidae	60	0.048
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Chloroperlidae	6	0.0256
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Nemouridae	35	0.112
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Peltoperlidae	3	0.0272
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Perlodidae	32	0.1082
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Taeniopterygidae	1	0.0004
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Rhyacophilidae	6	0.0824
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Chironomidae	32	0.028
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Empididae	6	0.0226
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Pelecorhyncidae	1	0.0012
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Psychodidae	1	0.001
RG_SLINE	09/15/2021	RG_SLINE_HESS-2_2021-09-15	Tipulidae	2	0.002

Area	Date	Sample ID	Taxa	Count	Total Biomass
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Enchytraeidae	1	0.0001
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Lumbriculidae	9	0.0262
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Lebertiidae	1	0.0003
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Sperchonidae	3	0.0009
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Ostracoda	43	0.0103
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Ameletidae	2	0.0046
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Ephemerellidae	4	0.001
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Heptageniidae	41	0.0299
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Capniidae	1	0.0011
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Chloroperlidae	36	0.0407
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Leuctridae	16	0.009
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Nemouridae	28	0.0185
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Perlodidae	7	0.0081
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Hydropsychidae	1	0.0003
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Rhyacophilidae	10	0.012
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Uenoidae	2	0.0006
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Chironomidae	7	0.0017
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Empididae	23	0.0274
RG_SLINE	09/15/2021	RG_SLINE_HESS-3_2021-09-15	Psychodidae	2	0.0008
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Lumbriculidae	21	0.1215
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Lebertiidae	1	0.0005
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Ostracoda	8	0.012
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Ameletidae	2	0.0011
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Baetidae	2	0.0133
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Ephemerellidae	24	0.0841
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Heptageniidae	247	0.3092
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Capniidae	6	0.0035
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Chloroperlidae	57	0.1056
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Leuctridae	7	0.0046
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Nemouridae	32	0.0418
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Peltoperlidae	4	0.0224
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Perlodidae	21	0.2263
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Taeniopterygidae	5	0.0096
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Glossosomatidae	7	0.0563
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Hydropsychidae	1	0.1056
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Rhyacophilidae	31	0.0525
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Uenoidae	1	0.0018
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Chironomidae	10	0.0053
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Empididae	23	0.0637
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Simuliidae	1	0.008
RG_SLINE	09/15/2021	RG_SLINE_HESS-4_2021-09-15	Tipulidae	4	0.0288
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Planariidae	3	0.0114
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Lumbriculidae	1	0.0134
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Ostracoda	10	0.0023
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Ameletidae	6	0.0453
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Baetidae	1	0.0056
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Ephemerellidae	27	0.1147
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Heptageniidae	241	0.1871
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Capniidae	1	0.0027
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Chloroperlidae	40	0.1075
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Nemouridae	19	0.0251
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Peltoperlidae	2	0.001
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Perlodidae	15	0.2669
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Glossosomatidae	5	0.0567
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Limnephilidae	1	0.0903
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Rhyacophilidae	19	0.1346
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Chironomidae	15	0.0069
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Empididae	14	0.0342
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Pelecorhyncidae	3	0.0013
RG_SLINE	09/15/2021	RG_SLINE_HESS-5_2021-09-15	Psychodidae	4	0.001

BENTHIC TISSUE CHEMISTRY

TrichAnalytics Laboratory Report 2021-216

(Finalized May 28, 2021)

TrichAnalytics Inc.

Tissue Microchemistry Analysis Report

Client: Tyler Mehler
Aquatic Scientist
Minnow Environmental
Phone: (250) 595-1627
Email: tmehler@minnow.ca

Date Received: 11 May 2021
Date of Analysis: 27 May 2021
Final Report Date: 28 May 2021
Project No.: 2021-216
Method No.: MET-002.05

Client Project: Teck Coal/Minnow Environmental 21-36 (Line Creek)

Analytical Request: Benthic Invertebrate Tissue Microchemistry (total metals and moisture) – 50 samples.
See chain of custody form provided for sample identification numbers.

Notes:

Analytical results are expressed in part per million (ppm) dry weight (equivalent to mg/kg).
Samples quantified using DORM-4, NIST-1566b, and NIST-2976 certified reference standards.
Aluminum concentrations above 1,000 ppm are outside linear range of the calibration curve.
Client specific DQO for Selenium accuracy is 90 - 110% of the certified value; (average achieved 104%, range 97 - 110%).
RPD values calculated according to the British Columbia Environmental Laboratory Manual (2020) criteria.

This report provides the analytical results only for tissue samples noted above as received from the Client.

Reviewed and Approved by Jennie Christensen, PhD, RPBio — 28 May 2021 Date

TrichAnalytics Inc.
207-1753 Sean Heights
Saanichton, BC V8M 0B3
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CALA Testing Accreditation No. A4196

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_FO23_INV-1_2021-04-28	RG_FO23_INV-2_2021-04-28	RG_FO23_INV-3_2021-04-28	RG_FO23_INV-4_2021-04-28	RG_FO23_INV-5_2021-04-28
		Lab ID	500	501	502	503	504
		Wet Weight (g)	1.6845	1.5223	1.6321	1.3804	1.4368
		Dry Weight (g)	0.2979	0.2899	0.3130	0.2564	0.3271
		Moisture (%)	82.3	81.0	80.8	81.4	77.2
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.004	0.013	1.1	0.634	0.698	0.921	0.513
11B	0.078	0.260	4.2	1.7	1.1	1.8	1.4
23Na	1.3	4.3	3,646	3,072	3,712	4,371	2,344
24Mg	0.024	0.080	2,081	1,595	1,241	1,508	1,342
27Al	0.053	0.177	1,564	893	410	752	533
31P	52	173	12,188	10,525	9,223	9,115	9,010
39K	2.9	9.7	11,177	10,696	9,106	8,149	7,823
44Ca	5.8	19	4,154	2,357	1,637	2,570	1,992
49Ti	0.001	0.003	153	63	23	59	42
51V	0.042	0.140	2.7	1.1	0.800	1.2	1.0
52Cr	0.131	0.437	13	6.4	4.7	9.1	5.9
55Mn	0.007	0.023	44	38	28	38	34
57Fe	1.1	3.7	867	545	303	581	387
59Co	0.003	0.010	1.9	2.5	0.923	0.937	1.6
60Ni	0.001	0.003	27	17	10	19	13
63Cu	0.025	0.083	19	18	16	13	14
66Zn	0.537	1.8	468	713	294	303	450
75As	0.444	1.5	0.616	0.534	<0.444	<0.444	0.452
77Se	0.306	1.0	9.0	6.5	6.1	4.5	5.3
88Sr	0.001	0.003	11	4.5	3.6	4.7	2.9
95Mo	0.001	0.003	0.427	0.285	0.207	0.388	0.233
107Ag	0.001	0.003	0.137	0.069	0.099	0.099	0.092
111Cd	0.084	0.280	2.4	4.7	1.3	3.0	2.5
118Sn	0.030	0.100	1.1	0.607	0.383	0.517	0.198
121Sb	0.004	0.013	0.046	0.030	0.020	0.038	0.026
137Ba	0.001	0.003	62	29	25	30	18
202Hg	0.040	0.133	<0.040	0.057	<0.040	0.046	<0.040
205Tl	0.001	0.003	0.045	0.060	0.017	0.031	0.028
208Pb	0.004	0.013	0.307	0.171	0.139	0.160	0.121
238U	0.001	0.003	0.109	0.072	0.034	0.037	0.033

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_FRUL_INV-1_2021-04-28	RG_FRUL_INV-2_2021-04-28	RG_FRUL_INV-3_2021-04-28	RG_FRUL_INV-4_2021-04-28	RG_FRUL_INV-5_2021-04-28
		Lab ID	505	506	507	508	509
		Wet Weight (g)	1.3986	1.1297	1.4131	1.2290	1.4669
		Dry Weight (g)	0.2528	0.1650	0.2621	0.2303	0.2622
		Moisture (%)	81.9	85.4	81.5	81.3	82.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.004	0.013	0.780	1.9	1.3	0.599	1.2
11B	0.078	0.260	1.0	1.2	2.8	0.680	1.8
23Na	1.3	4.3	3,128	5,160	2,815	2,109	5,803
24Mg	0.024	0.080	1,476	1,573	1,722	1,805	1,798
27Al	0.053	0.177	554	636	1,757	431	685
31P	52	173	9,341	11,179	8,507	10,227	10,797
39K	2.9	9.7	7,756	9,234	8,542	7,506	9,632
44Ca	5.8	19	2,028	2,766	2,907	2,627	3,029
49Ti	0.001	0.003	41	44	194	27	53
51V	0.042	0.140	0.990	1.1	3.5	0.953	1.5
52Cr	0.131	0.437	4.7	4.6	5.9	5.5	8.4
55Mn	0.007	0.023	33	53	42	33	40
57Fe	1.1	3.7	303	403	1,004	348	587
59Co	0.003	0.010	0.522	0.777	0.815	0.944	0.949
60Ni	0.001	0.003	7.5	9.1	11	9.6	18
63Cu	0.025	0.083	18	17	16	15	15
66Zn	0.537	1.8	330	266	310	375	271
75As	0.444	1.5	<0.444	<0.444	0.555	<0.444	<0.444
77Se	0.306	1.0	6.4	7.5	7.1	5.5	7.5
88Sr	0.001	0.003	3.5	4.5	5.7	5.0	5.0
95Mo	0.001	0.003	0.233	0.285	0.492	0.233	0.273
107Ag	0.001	0.003	0.221	0.283	0.183	0.176	0.255
111Cd	0.084	0.280	1.0	2.7	1.1	1.6	1.6
118Sn	0.030	0.100	0.466	0.771	0.644	0.462	0.427
121Sb	0.004	0.013	0.027	0.029	0.089	0.017	0.039
137Ba	0.001	0.003	23	31	66	23	35
202Hg	0.040	0.133	0.046	0.057	<0.040	0.046	0.052
205Tl	0.001	0.003	0.020	0.027	0.066	0.023	0.023
208Pb	0.004	0.013	0.143	0.182	0.416	0.108	0.231
238U	0.001	0.003	0.039	0.103	0.103	0.037	0.068

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LCUT_INV-1_2021-04-27	RG_LCUT_INV-2_2021-04-27	RG_LCUT_INV-3_2021-04-27	RG_LCUT_INV-4_2021-04-27	RG_LCUT_INV-5_2021-04-27
		Lab ID	510	511	512	513	514
		Wet Weight (g)	1.3250	1.5497	1.3391	1.8215	1.3491
		Dry Weight (g)	0.2432	0.2672	0.2770	0.3363	0.2637
		Moisture (%)	81.6	82.8	79.3	81.5	80.5
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.004	0.013	0.961	0.885	1.1	1.1	0.880
11B	0.078	0.260	2.7	2.9	2.5	3.6	5.4
23Na	1.3	4.3	3,155	2,874	2,948	3,337	2,540
24Mg	0.024	0.080	1,395	1,514	1,514	1,560	1,706
27Al	0.053	0.177	1,039	790	1,197	981	1,233
31P	52	173	11,137	12,761	9,591	10,918	11,349
39K	2.9	9.7	11,066	13,085	9,740	11,826	10,304
44Ca	5.8	19	1,982	2,141	2,436	3,425	3,006
49Ti	0.001	0.003	75	69	109	87	136
51V	0.042	0.140	2.2	1.7	3.0	1.9	2.7
52Cr	0.131	0.437	7.7	5.3	11	4.0	6.1
55Mn	0.007	0.023	31	35	21	28	30
57Fe	1.1	3.7	516	364	778	400	449
59Co	0.003	0.010	1.1	1.3	1.6	2.0	2.1
60Ni	0.001	0.003	22	20	32	20	20
63Cu	0.025	0.083	21	23	19	30	36
66Zn	0.537	1.8	243	335	194	394	318
75As	0.444	1.5	1.6	1.8	1.4	2.0	2.7
77Se	0.306	1.0	15	6.7	4.9	6.8	5.5
88Sr	0.001	0.003	4.6	4.5	4.9	6.6	6.9
95Mo	0.001	0.003	0.572	0.423	0.497	0.447	0.472
107Ag	0.001	0.003	0.038	0.038	0.028	0.057	0.066
111Cd	0.084	0.280	3.0	3.2	2.3	5.1	4.0
118Sn	0.030	0.100	0.412	0.366	0.394	0.483	0.295
121Sb	0.004	0.013	0.076	0.068	0.084	0.111	0.099
137Ba	0.001	0.003	40	48	42	56	65
202Hg	0.040	0.133	<0.040	0.117	0.059	0.091	0.085
205Tl	0.001	0.003	0.042	0.042	0.041	0.077	0.050
208Pb	0.004	0.013	0.474	0.424	0.397	0.424	0.489
238U	0.001	0.003	0.099	0.132	0.105	0.156	0.118

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LI8_INV-1_2021-04-28	RG_LI8_INV-2_2021-04-28	RG_LI8_INV-3_2021-04-28	RG_LI8_INV-4_2021-04-28	RG_LI8_INV-5_2021-04-28
		Lab ID	515	516	517	518	519
		Wet Weight (g)	1.3822	1.4739	1.4712	1.7977	1.2191
		Dry Weight (g)	0.2746	0.3071	0.2975	0.3797	0.2349
		Moisture (%)	80.1	79.2	79.8	78.9	80.7
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.004	0.013	0.397	0.523	0.593	0.480	0.817
11B	0.078	0.260	0.892	0.962	0.962	0.918	1.5
23Na	1.3	4.3	2,865	2,974	3,384	3,010	3,409
24Mg	0.024	0.080	1,145	1,421	1,361	1,378	1,506
27Al	0.053	0.177	270	321	408	356	662
31P	52	173	8,542	10,252	10,334	10,520	10,731
39K	2.9	9.7	8,766	8,866	9,573	9,772	10,018
44Ca	5.8	19	1,379	2,501	1,916	1,649	2,384
49Ti	0.001	0.003	20	29	37	27	58
51V	0.042	0.140	0.625	0.665	0.805	0.754	1.6
52Cr	0.131	0.437	2.6	2.9	3.1	2.9	5.1
55Mn	0.007	0.023	44	56	61	65	70
57Fe	1.1	3.7	178	241	273	200	487
59Co	0.003	0.010	0.850	1.0	1.0	0.664	1.1
60Ni	0.001	0.003	9.3	15	16	11	18
63Cu	0.025	0.083	14	18	16	16	17
66Zn	0.537	1.8	489	547	408	319	406
75As	0.444	1.5	<0.444	<0.444	0.551	<0.444	0.654
77Se	0.306	1.0	6.2	7.1	7.0	6.8	7.5
88Sr	0.001	0.003	3.1	4.4	3.1	4.0	5.8
95Mo	0.001	0.003	0.273	0.249	0.298	0.319	0.435
107Ag	0.001	0.003	0.019	0.038	0.038	0.027	0.036
111Cd	0.084	0.280	5.4	6.8	6.5	4.2	6.7
118Sn	0.030	0.100	0.286	0.303	0.232	0.302	0.498
121Sb	0.004	0.013	0.033	0.039	0.046	0.044	0.054
137Ba	0.001	0.003	17	20	21	17	42
202Hg	0.040	0.133	0.065	0.078	0.065	0.062	0.062
205Tl	0.001	0.003	0.040	0.038	0.038	0.027	0.061
208Pb	0.004	0.013	0.114	0.140	0.162	0.149	0.305
238U	0.001	0.003	0.061	0.087	0.063	0.062	0.129

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LI24_INV-1_2021-04-26	RG_LI24_INV-2_2021-04-26	RG_LI24_INV-3_2021-04-26	RG_LI24_INV-4_2021-04-26	RG_LI24_INV-5_2021-04-26
		Lab ID	520	521	522	523	524
		Wet Weight (g)	1.1185	1.0017	1.2681	1.2147	0.8467
		Dry Weight (g)	0.1579	0.1754	0.1931	0.1690	0.1498
		Moisture (%)	85.9	82.5	84.8	86.1	82.3
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.004	0.013	0.379	0.245	0.424	0.335	0.496
11B	0.078	0.260	0.753	0.565	1.1	0.953	1.2
23Na	1.3	4.3	2,946	3,495	3,626	2,987	2,851
24Mg	0.024	0.080	1,429	1,090	1,607	1,651	1,451
27Al	0.053	0.177	249	115	256	237	346
31P	52	173	12,318	9,264	12,675	12,523	10,949
39K	2.9	9.7	11,016	8,684	10,727	11,062	8,509
44Ca	5.8	19	2,791	2,176	3,007	3,290	3,187
49Ti	0.001	0.003	15	7.7	17	17	27
51V	0.042	0.140	1.4	1.1	2.4	2.4	2.5
52Cr	0.131	0.437	6.9	3.1	4.4	4.2	10
55Mn	0.007	0.023	15	10	15	15	17
57Fe	1.1	3.7	294	149	248	211	376
59Co	0.003	0.010	0.823	0.563	0.489	0.610	0.725
60Ni	0.001	0.003	14	6.3	12	11	22
63Cu	0.025	0.083	13	13	16	15	18
66Zn	0.537	1.8	547	586	488	499	371
75As	0.444	1.5	1.8	1.3	1.8	2.3	1.6
77Se	0.306	1.0	6.7	6.2	7.3	6.6	5.2
88Sr	0.001	0.003	12	7.4	12	13	12
95Mo	0.001	0.003	0.348	0.232	0.348	0.377	0.348
107Ag	0.001	0.003	0.072	0.054	0.081	0.063	0.090
111Cd	0.084	0.280	2.2	2.1	1.9	1.6	2.0
118Sn	0.030	0.100	1.2	0.553	1.0	1.0	0.528
121Sb	0.004	0.013	0.029	0.022	0.028	0.024	0.030
137Ba	0.001	0.003	25	14	25	24	28
202Hg	0.040	0.133	0.062	0.055	0.062	0.055	0.049
205Tl	0.001	0.003	0.074	0.043	0.063	0.055	0.052
208Pb	0.004	0.013	0.140	0.095	0.153	0.117	0.172
238U	0.001	0.003	0.075	0.082	0.136	0.085	0.198

Notes:

ppm = parts per million

DL = detection limit

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g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LIDCOM_INV-1_2021-04-29	RG_LIDCOM_INV-2_2021-04-29	RG_LIDCOM_INV-3_2021-04-29	RG_LIDCOM_INV-4_2021-04-29	RG_LIDCOM_INV-5_2021-04-29
		Lab ID	525	526	527	528	529
		Wet Weight (g)	1.6895	1.4375	1.6366	2.3325	1.7485
		Dry Weight (g)	0.3514	0.3132	0.3348	0.4386	0.3090
		Moisture (%)	79.2	78.2	79.5	81.2	82.3
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.004	0.013	0.457	1.7	0.600	0.441	0.730
11B	0.078	0.260	1.1	6.2	2.0	1.5	2.8
23Na	1.3	4.3	2,927	3,364	3,188	3,152	2,914
24Mg	0.024	0.080	1,439	1,882	1,685	1,986	1,630
27Al	0.053	0.177	206	3,665	415	362	663
31P	52	173	12,365	9,446	12,222	10,940	9,517
39K	2.9	9.7	11,689	12,170	11,288	10,104	9,100
44Ca	5.8	19	1,914	2,071	2,621	2,994	2,796
49Ti	0.001	0.003	12	313	32	22	37
51V	0.042	0.140	0.443	7.4	1.1	0.855	1.5
52Cr	0.131	0.437	2.3	29	4.9	5.1	4.4
55Mn	0.007	0.023	126	110	128	86	102
57Fe	1.1	3.7	241	1,816	461	387	621
59Co	0.003	0.010	2.1	2.5	2.7	2.2	2.6
60Ni	0.001	0.003	16	53	23	22	23
63Cu	0.025	0.083	19	19	21	20	20
66Zn	0.537	1.8	423	332	487	546	529
75As	0.444	1.5	0.544	0.998	0.777	0.706	0.706
77Se	0.306	1.0	6.6	6.2	6.4	7.1	6.0
88Sr	0.001	0.003	3.9	6.4	4.8	6.6	6.1
95Mo	0.001	0.003	0.377	0.653	0.402	0.368	0.368
107Ag	0.001	0.003	0.045	0.036	0.028	0.038	0.038
111Cd	0.084	0.280	4.9	3.7	5.6	5.3	8.2
118Sn	0.030	0.100	0.360	0.610	0.430	0.537	0.711
121Sb	0.004	0.013	0.048	0.111	0.047	0.039	0.053
137Ba	0.001	0.003	22	56	26	27	32
202Hg	0.040	0.133	0.055	0.042	0.072	0.058	0.043
205Tl	0.001	0.003	0.048	0.086	0.045	0.055	0.054
208Pb	0.004	0.013	0.095	0.804	0.144	0.116	0.212
238U	0.001	0.003	0.070	0.144	0.117	0.086	0.117

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

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g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LIDSL_INV-1_2021-04-27	RG_LIDSL_INV-2_2021-04-27	RG_LIDSL_INV-3_2021-04-27	RG_LIDSL_INV-4_2021-04-27	RG_LIDSL_INV-5_2021-04-27
		Lab ID	530	531	532	533	534
		Wet Weight (g)	1.6397	1.6644	1.7947	2.0443	1.7387
		Dry Weight (g)	0.2741	0.3379	0.4060	0.3885	0.3162
		Moisture (%)	83.3	79.7	77.4	81.0	81.8
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.004	0.013	0.473	0.391	0.328	0.549	0.464
11B	0.078	0.260	1.2	1.1	1.1	2.0	1.9
23Na	1.3	4.3	2,453	2,875	2,359	3,318	2,187
24Mg	0.024	0.080	1,082	1,320	1,177	1,351	1,162
27Al	0.053	0.177	267	163	156	331	265
31P	52	173	9,789	9,540	9,314	11,355	8,936
39K	2.9	9.7	9,304	9,587	8,513	11,067	7,311
44Ca	5.8	19	1,597	1,477	1,923	2,434	2,022
49Ti	0.001	0.003	17	9.0	7.8	28	19
51V	0.042	0.140	0.767	0.816	0.420	1.1	0.789
52Cr	0.131	0.437	5.4	3.5	2.6	6.1	3.6
55Mn	0.007	0.023	152	150	102	206	143
57Fe	1.1	3.7	555	465	307	734	563
59Co	0.003	0.010	1.8	1.6	2.7	3.9	2.2
60Ni	0.001	0.003	18	16	13	27	15
63Cu	0.025	0.083	15	18	20	21	15
66Zn	0.537	1.8	243	480	345	505	289
75As	0.444	1.5	<0.444	0.447	<0.444	0.659	0.471
77Se	0.306	1.0	5.0	5.2	5.4	5.6	4.6
88Sr	0.001	0.003	3.4	4.6	3.3	5.2	4.7
95Mo	0.001	0.003	0.368	0.301	0.335	0.569	0.368
107Ag	0.001	0.003	0.019	0.019	0.028	0.038	0.028
111Cd	0.084	0.280	1.9	2.4	3.9	7.3	2.8
118Sn	0.030	0.100	0.471	0.391	0.439	0.697	0.456
121Sb	0.004	0.013	0.058	0.061	0.046	0.091	0.053
137Ba	0.001	0.003	22	18	13	32	27
202Hg	0.040	0.133	0.043	<0.040	<0.040	0.058	0.043
205Tl	0.001	0.003	0.021	0.025	0.024	0.047	0.022
208Pb	0.004	0.013	0.101	0.096	0.060	0.132	0.116
238U	0.001	0.003	0.053	0.050	0.039	0.091	0.070

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LILC3_INV-1_2021-04-27	RG_LILC3_INV-2_2021-04-27	RG_LILC3_INV-3_2021-04-27	RG_LILC3_INV-4_2021-04-27	RG_LILC3_INV-5_2021-04-27
		Lab ID	535	536	537	538	539
		Wet Weight (g)	1.6178	1.4208	2.0763	1.5594	1.8515
		Dry Weight (g)	0.3224	0.2846	0.4050	0.3014	0.3334
		Moisture (%)	80.1	80.0	80.5	80.7	82.0
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.004	0.013	0.538	0.877	0.730	0.754	0.709
11B	0.078	0.260	1.2	2.8	1.4	1.7	1.8
23Na	1.3	4.3	2,226	2,742	3,491	2,695	3,061
24Mg	0.024	0.080	1,252	1,691	1,554	1,581	1,470
27Al	0.053	0.177	256	699	358	444	273
31P	52	173	9,834	11,504	11,881	10,345	11,429
39K	2.9	9.7	8,510	13,012	13,288	12,797	12,042
44Ca	5.8	19	2,601	3,271	3,329	2,442	2,492
49Ti	0.001	0.003	16	50	27	31	16
51V	0.042	0.140	0.835	2.3	1.4	1.5	1.1
52Cr	0.131	0.437	3.0	5.4	5.6	4.8	3.5
55Mn	0.007	0.023	313	602	549	429	384
57Fe	1.1	3.7	729	2,557	1,405	1,684	1,194
59Co	0.003	0.010	4.8	4.2	4.2	4.5	2.9
60Ni	0.001	0.003	21	31	27	32	19
63Cu	0.025	0.083	16	21	22	18	18
66Zn	0.537	1.8	274	397	371	401	325
75As	0.444	1.5	0.847	1.2	1.1	1.4	0.931
77Se	0.306	1.0	6.2	10	11	12	9.4
88Sr	0.001	0.003	4.9	8.4	6.6	5.6	5.1
95Mo	0.001	0.003	0.669	1.3	0.986	1.4	0.957
107Ag	0.001	0.003	0.009	0.036	0.036	0.036	0.036
111Cd	0.084	0.280	6.0	7.4	6.1	7.3	5.4
118Sn	0.030	0.100	0.485	1.3	0.687	0.907	0.708
121Sb	0.004	0.013	0.111	0.193	0.168	0.164	0.134
137Ba	0.001	0.003	27	69	46	43	36
202Hg	0.040	0.133	<0.040	0.068	0.061	0.068	0.055
205Tl	0.001	0.003	0.041	0.069	0.056	0.053	0.043
208Pb	0.004	0.013	0.096	0.270	0.139	0.171	0.135
238U	0.001	0.003	0.086	0.236	0.169	0.199	0.154

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

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g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LISP24_INV-1_2021-04-27	RG_LISP24_INV-2_2021-04-27	RG_LISP24_INV-3_2021-04-27	RG_LISP24_INV-4_2021-04-27	RG_LISP24_INV-5_2021-04-27
		Lab ID	540	541	542	543	544
		Wet Weight (g)	1.9473	1.0769	2.1307	1.5804	1.5803
		Dry Weight (g)	0.4031	0.1899	0.3525	0.2944	0.2838
		Moisture (%)	79.3	82.4	83.5	81.4	82.0
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.004	0.013	0.430	0.574	0.568	0.451	0.770
11B	0.078	0.260	1.3	1.3	1.3	0.833	1.8
23Na	1.3	4.3	2,846	2,867	3,475	3,128	3,597
24Mg	0.024	0.080	1,246	1,376	1,342	1,163	1,608
27Al	0.053	0.177	201	359	231	196	254
31P	52	173	9,941	10,621	10,045	8,623	9,676
39K	2.9	9.7	10,155	10,202	9,912	8,498	8,990
44Ca	5.8	19	1,622	2,520	2,685	1,944	2,967
49Ti	0.001	0.003	12	24	14	13	21
51V	0.042	0.140	0.705	1.2	0.775	0.672	1.3
52Cr	0.131	0.437	2.6	7.9	3.3	3.1	8.9
55Mn	0.007	0.023	252	234	222	160	316
57Fe	1.1	3.7	642	1,042	682	596	1,607
59Co	0.003	0.010	5.7	3.7	3.4	3.7	5.6
60Ni	0.001	0.003	25	29	20	16	38
63Cu	0.025	0.083	18	23	17	19	23
66Zn	0.537	1.8	457	429	417	532	573
75As	0.444	1.5	0.718	0.628	0.561	0.572	0.826
77Se	0.306	1.0	7.2	7.3	7.6	7.5	7.8
88Sr	0.001	0.003	3.2	5.6	5.6	3.7	7.8
95Mo	0.001	0.003	0.406	0.580	0.493	0.348	0.619
107Ag	0.001	0.003	0.027	0.036	0.027	0.018	0.054
111Cd	0.084	0.280	7.6	7.9	5.6	8.9	9.8
118Sn	0.030	0.100	0.534	0.819	0.570	0.466	0.869
121Sb	0.004	0.013	0.109	0.097	0.088	0.063	0.118
137Ba	0.001	0.003	22	30	27	20	47
202Hg	0.040	0.133	0.095	0.082	0.095	0.082	0.071
205Tl	0.001	0.003	0.043	0.044	0.034	0.065	0.056
208Pb	0.004	0.013	0.081	0.121	0.094	0.076	0.239
238U	0.001	0.003	0.064	0.097	0.092	0.075	0.137

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_SLINE_INV-1_2021-04-26	RG_SLINE_INV-2_2021-04-26	RG_SLINE_INV-3_2021-04-26	RG_SLINE_INV-4_2021-04-26	RG_SLINE_INV-5_2021-04-26
		Lab ID	545	546	547	548	549
		Wet Weight (g)	0.9602	0.7340	0.9799	0.9157	1.1034
		Dry Weight (g)	0.1763	0.0749	0.1462	0.1605	0.1536
		Moisture (%)	81.6	89.8	85.1	82.5	86.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.004	0.013	0.234	0.345	0.297	0.340	0.499
11B	0.078	0.260	0.494	0.680	0.717	1.3	1.8
23Na	1.3	4.3	2,815	2,287	3,222	2,319	3,500
24Mg	0.024	0.080	1,519	1,372	1,616	1,456	1,560
27Al	0.053	0.177	212	335	276	405	604
31P	52	173	10,132	9,113	10,601	9,555	10,924
39K	2.9	9.7	8,443	6,855	8,655	7,058	9,896
44Ca	5.8	19	2,004	3,033	3,283	2,601	3,034
49Ti	0.001	0.003	11	25	20	35	41
51V	0.042	0.140	0.878	1.0	1.0	1.3	1.7
52Cr	0.131	0.437	4.7	8.1	5.5	6.1	8.9
55Mn	0.007	0.023	15	20	15	19	29
57Fe	1.1	3.7	216	372	259	354	491
59Co	0.003	0.010	0.351	0.485	0.499	0.696	1.1
60Ni	0.001	0.003	9.3	16	14	14	20
63Cu	0.025	0.083	13	15	15	14	16
66Zn	0.537	1.8	491	750	646	622	879
75As	0.444	1.5	0.895	1.1	0.986	1.6	1.4
77Se	0.306	1.0	6.8	5.9	5.9	6.3	7.4
88Sr	0.001	0.003	5.8	10	11	11	13
95Mo	0.001	0.003	0.354	0.413	0.369	0.324	0.442
107Ag	0.001	0.003	0.076	0.108	0.119	0.086	0.108
111Cd	0.084	0.280	2.9	3.6	3.1	4.0	4.8
118Sn	0.030	0.100	0.412	1.5	0.375	0.285	0.815
121Sb	0.004	0.013	0.025	0.021	0.023	0.025	0.042
137Ba	0.001	0.003	29	26	23	23	40
202Hg	0.040	0.133	0.086	0.086	0.057	0.071	0.114
205Tl	0.001	0.003	0.080	0.050	0.064	0.063	0.069
208Pb	0.004	0.013	0.089	0.129	0.112	0.150	0.225
238U	0.001	0.003	0.148	0.095	0.160	0.095	0.441

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue QA/QC Relative Percent Difference Results

Client ID		RG_LCUT_INV-2_2021-04-27			RG_LIDCOM_INV-4_2021-04-29			RG_LILC3_INV-3_2021-04-27		
Lab ID		511			528			537		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.004	0.885	0.890	0.6	0.441	0.521	17	0.730	0.672	8.3
11B	0.078	2.9	2.8	3.5	1.5	1.5	0.0	1.4	1.5	6.9
23Na	1.3	2,874	2,750	4.4	3,152	3,308	4.8	3,491	3,587	2.7
24Mg	0.024	1,514	1,499	1.0	1,986	1,848	7.2	1,554	1,466	5.8
27Al	0.053	790	825	4.3	362	362	0.0	358	266	30
31P	52	12,761	11,571	9.8	10,940	11,506	5.0	11,881	11,143	6.4
39K	2.9	13,085	10,660	20	10,104	10,087	0.2	13,288	13,591	2.3
44Ca	5.8	2,141	1,996	7.0	2,994	2,563	16	3,329	2,855	15
49Ti	0.001	69	61	12	22	21	4.7	27	20	30
51V	0.042	1.7	1.7	0.0	0.855	0.850	0.6	1.4	1.1	24
52Cr	0.131	5.3	4.1	26	5.1	4.9	4.0	5.6	4.1	31
55Mn	0.007	35	31	12	86	78	9.8	549	429	25
57Fe	1.1	364	316	14	387	422	8.7	1,405	1,277	9.5
59Co	0.003	1.3	1.1	17	2.2	2.4	8.7	4.2	4.9	15
60Ni	0.001	20	18	11	22	23	4.4	27	29	7.1
63Cu	0.025	23	18	24	20	23	14	22	23	4.4
66Zn	0.537	335	280	18	546	580	6.0	371	317	16
75As	0.444	1.8	1.3	-	0.706	0.894	-	1.1	1.0	-
77Se	0.306	6.7	5.7	16	7.1	6.7	5.8	11	11	0.0
88Sr	0.001	4.5	4.1	9.3	6.6	6.0	9.5	6.6	5.8	13
95Mo	0.001	0.423	0.385	9.4	0.368	0.435	17	0.986	0.943	4.5
107Ag	0.001	0.038	0.028	30	0.038	0.038	0.0	0.036	0.036	0.0
111Cd	0.084	3.2	2.7	17	5.3	5.3	0.0	6.1	5.6	8.5
118Sn	0.030	0.366	0.452	21	0.537	0.369	37	0.687	0.765	11
121Sb	0.004	0.068	0.072	5.7	0.039	0.037	-	0.168	0.193	14
137Ba	0.001	48	42	13	27	22	20	46	34	30
202Hg	0.040	0.117	0.078	-	0.058	0.043	-	0.061	0.068	-
205Tl	0.001	0.042	0.043	2.4	0.055	0.056	1.8	0.056	0.060	6.9
208Pb	0.004	0.424	0.341	22	0.116	0.106	9.0	0.139	0.117	17
238U	0.001	0.132	0.090	38	0.086	0.075	14	0.169	0.168	0.6

Notes:

ppm = parts per million

RPD = relative percent difference

DL = detection limit

< = less than detection limit

% = percent

Data Quality Objectives:

Laboratory Duplicates - RPD ≤40% for all elements, except Ca and Sr, which are ≤60%

Minimum DQOs apply to individual samples at concentrations above 10x DL

Teck Coal Limited

Tissue QA/QC Relative Percent Difference Results

	Client ID	RG_LISP24_INV-3_2021-04-27			RG_SLINE_INV-4_2021-04-26		
	Lab ID	542			548		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.004	0.568	0.531	6.7	0.340	0.361	6.0
11B	0.078	1.3	1.3	0.0	1.3	1.4	7.4
23Na	1.3	3,475	3,305	5.0	2,319	2,678	14
24Mg	0.024	1,342	1,288	4.1	1,456	1,584	8.4
27Al	0.053	231	218	5.8	405	406	0.2
31P	52	10,045	9,569	4.9	9,555	9,708	1.6
39K	2.9	9,912	9,598	3.2	7,058	8,294	16
44Ca	5.8	2,685	2,313	15	2,601	2,759	5.9
49Ti	0.001	14	13	7.4	35	35	0.0
51V	0.042	0.775	0.770	0.6	1.3	1.3	0.0
52Cr	0.131	3.3	2.9	13	6.1	7.5	21
55Mn	0.007	222	240	7.8	19	20	5.1
57Fe	1.1	682	683	0.1	354	383	7.9
59Co	0.003	3.4	3.7	8.5	0.696	0.798	14
60Ni	0.001	20	21	4.9	14	16	13
63Cu	0.025	17	17	0.0	14	14	0.0
66Zn	0.537	417	374	11	622	739	17
75As	0.444	0.561	0.583	-	1.6	1.5	-
77Se	0.306	7.6	7.2	5.4	6.3	6.5	3.1
88Sr	0.001	5.6	4.8	15	11	11	0.0
95Mo	0.001	0.493	0.435	13	0.324	0.295	9.4
107Ag	0.001	0.027	0.027	0.0	0.086	0.097	12
111Cd	0.084	5.6	4.4	24	4.0	4.8	18
118Sn	0.030	0.570	0.602	5.5	0.285	0.240	-
121Sb	0.004	0.088	0.106	19	0.025	0.024	-
137Ba	0.001	27	26	3.8	23	22	4.4
202Hg	0.040	0.095	0.055	-	0.071	0.086	-
205Tl	0.001	0.034	0.031	9.2	0.063	0.073	15
208Pb	0.004	0.094	0.090	4.3	0.150	0.136	9.8
238U	0.001	0.092	0.075	20	0.095	0.102	7.1

Notes:

ppm = parts per million

RPD = relative percent difference

DL = detection limit

< = less than detection limit

% = percent

Data Quality Objectives:

Laboratory Duplicates - RPD ≤40% for all elements, except Ca and Sr, which are ≤60%

Minimum DQOs apply to individual samples at concentrations above 10x DL

Teck Coal Limited

Tissue QA/QC Accuracy and Precision Results

			Sample Group ID	01			02	
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.004	1.21	1.4	118	8.9	1.2	101	5.4
11B	0.078	4.5	5.1	114	1.8	4.8	107	3.1
23Na	1.3	14,000	16,206	116	6.1	14,500	104	3.1
24Mg	0.024	910	1,024	113	2.7	950	104	3.5
27Al	0.053	197.2	218	110	2.4	185	94	6.1
31P	52	8,000	8,856	111	2.2	8,355	104	5.1
39K	2.9	15,500	17,391	112	1.0	16,613	107	3.3
44Ca	5.8	2,360	2,642	112	2.6	2,515	107	3.7
49Ti	0.001	12.24	15	119	14	11	93	7.2
51V	0.042	1.57	1.6	103	8.8	1.8	115	8.4
52Cr	0.131	1.87	2.1	112	3.6	2.0	108	4.5
55Mn	0.007	3.17	3.5	112	4.7	3.5	109	5.1
57Fe	1.1	343	404	118	4.3	369	108	3.7
59Co	0.003	0.25	0.285	114	3.9	0.279	112	5.3
60Ni	0.001	1.34	1.5	114	6.3	1.5	114	3.7
63Cu	0.025	15.7	19	118	5.7	17	108	3.2
66Zn	0.537	51.6	60	116	4.9	55	107	2.5
75As	0.444	6.87	7.8	113	4.0	7.2	106	3.3
77Se	0.306	3.45	3.8	110	5.3	3.7	108	4.2
88Sr	0.001	10.1	11	112	7.8	11	105	1.6
95Mo	0.001	0.29	0.347	120	6.7	0.278	96	4.0
107Ag	0.001	0.0252	0.032	127	20	0.030	120	14
111Cd	0.084	0.299	0.335	112	13	0.329	110	14
118Sn	0.030	0.061	0.073	120	15	0.052	86	17
121Sb	0.004	0.011	0.014	124	11	0.013	116	13
137Ba	0.001	8.6	9.8	114	1.8	9.0	104	1.5
202Hg	0.040	0.412	0.438	106	4.5	0.471	114	5.9
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.004	0.404	0.464	115	20	0.494	122	13
238U	0.001	0.05	0.054	107	10	0.059	117	4.1

Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified values for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

Tl certified concentration from NIST-2976.

Accuracy and precision for Tl are not reported as the certified concentration is too close to the reportable detection limit.

Teck Coal Limited

Tissue QA/QC Accuracy and Precision Results

			Sample Group ID	03			04	
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.004	1.21	1.4	117	11	1.2	101	11
11B	0.078	4.5	4.7	105	1.5	5.1	114	2.8
23Na	1.3	14,000	15,741	112	3.0	14,599	104	4.0
24Mg	0.024	910	1,025	113	4.5	967	106	4.2
27Al	0.053	197.2	187	95	4.9	200	102	1.7
31P	52	8,000	8,897	111	2.2	8,002	100	3.0
39K	2.9	15,500	17,083	110	3.7	16,236	105	1.0
44Ca	5.8	2,360	2,653	112	5.3	2,493	106	5.6
49Ti	0.001	12.24	11	89	9.2	12	96	13
51V	0.042	1.57	1.8	116	13	1.7	108	11
52Cr	0.131	1.87	2.1	114	4.7	1.9	103	3.4
55Mn	0.007	3.17	3.7	117	4.2	3.5	109	4.6
57Fe	1.1	343	402	117	5.7	380	111	4.2
59Co	0.003	0.25	0.288	115	7.2	0.280	112	9.8
60Ni	0.001	1.34	1.6	120	4.9	1.4	107	7.4
63Cu	0.025	15.7	19	120	7.5	18	112	7.8
66Zn	0.537	51.6	62	120	8.3	56	108	5.5
75As	0.444	6.87	7.7	113	4.7	6.9	101	3.0
77Se	0.306	3.45	3.8	109	12	3.4	97	5.4
88Sr	0.001	10.1	11	110	2.4	11	112	4.2
95Mo	0.001	0.29	0.319	110	6.4	0.325	112	8.6
107Ag	0.001	0.0252	0.031	121	16	0.031	121	16
111Cd	0.084	0.299	0.347	116	6.2	0.318	106	18
118Sn	0.030	0.061	0.072	118	17	0.067	110	12
121Sb	0.004	0.011	0.012	109	20	0.014	127	20
137Ba	0.001	8.6	8.4	98	1.3	9.3	108	4.3
202Hg	0.040	0.412	0.508	123	7.4	0.441	107	10
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.004	0.404	0.463	114	14	0.367	91	8.7
238U	0.001	0.05	0.058	116	3.3	0.053	105	8.4

Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified values for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

Tl certified concentration from NIST-2976.

Accuracy and precision for Tl are not reported as the certified concentration is too close to the reportable detection limit.

Teck Coal Limited

Tissue QA/QC Accuracy and Precision Results

			Sample Group ID	05			06	
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.004	1.21	1.1	92	3.4	1.2	100	10
11B	0.078	4.5	5.1	113	2.4	4.5	101	1.8
23Na	1.3	14,000	13,628	97	2.8	14,021	100	2.2
24Mg	0.024	910	906	100	2.4	923	101	3.6
27Al	0.053	197.2	195	99	6.9	195	99	7.4
31P	52	8,000	7,779	97	1.5	7,625	95	2.0
39K	2.9	15,500	15,235	98	4.1	15,207	98	4.3
44Ca	5.8	2,360	2,365	100	4.0	2,295	97	2.4
49Ti	0.001	12.24	11	92	8.7	13	107	9.8
51V	0.042	1.57	1.6	100	9.3	1.5	94	9.5
52Cr	0.131	1.87	1.9	99	3.2	1.9	100	2.8
55Mn	0.007	3.17	3.3	103	2.4	3.3	105	3.2
57Fe	1.1	343	354	103	3.2	357	104	2.3
59Co	0.003	0.25	0.256	102	3.5	0.253	101	4.3
60Ni	0.001	1.34	1.4	107	4.1	1.4	102	4.5
63Cu	0.025	15.7	17	106	4.3	17	106	4.2
66Zn	0.537	51.6	53	102	2.7	52	101	3.4
75As	0.444	6.87	6.6	96	1.2	7.0	102	1.3
77Se	0.306	3.45	3.4	100	5.4	3.5	100	4.1
88Sr	0.001	10.1	10	100	2.1	10	101	2.5
95Mo	0.001	0.29	0.284	98	8.5	0.295	102	7.1
107Ag	0.001	0.0252	0.030	119	17	0.030	120	16
111Cd	0.084	0.299	0.335	112	15	0.306	102	14
118Sn	0.030	0.061	0.051	83	16	0.070	114	**21**
121Sb	0.004	0.011	0.013	116	3.9	0.011	96	6.8
137Ba	0.001	8.6	9.1	106	1.9	8.9	103	3.3
202Hg	0.040	0.412	0.433	105	9.1	0.433	105	5.8
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.004	0.404	0.418	103	3.6	0.409	101	6.5
238U	0.001	0.05	0.050	100	6.2	0.050	100	4.2

Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified values for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

Tl certified concentration from NIST-2976.

Accuracy and precision for Tl are not reported as the certified concentration is too close to the reportable detection limit.

Bold indicates DQO exceedance but result is accepted as it does not impact the reportable results

Teck Coal Limited
Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
01	RG_FO23_INV-1_2021-04-28	500	27 May 2021
	RG_FO23_INV-2_2021-04-28	501	
	RG_FO23_INV-3_2021-04-28	502	
	RG_FO23_INV-4_2021-04-28	503	
	RG_FO23_INV-5_2021-04-28	504	
	RG_FRUL_INV-1_2021-04-28	505	
	RG_FRUL_INV-2_2021-04-28	506	
	RG_FRUL_INV-3_2021-04-28	507	
	RG_FRUL_INV-4_2021-04-28	508	
02	RG_FRUL_INV-5_2021-04-28	509	27 May 2021
	RG_LCUT_INV-1_2021-04-27	510	
	RG_LCUT_INV-2_2021-04-27	511	
	RG_LCUT_INV-3_2021-04-27	512	
	RG_LCUT_INV-4_2021-04-27	513	
	RG_LCUT_INV-5_2021-04-27	514	
	RG_LI8_INV-1_2021-04-28	515	
	RG_LI8_INV-2_2021-04-28	516	
	RG_LI8_INV-3_2021-04-28	517	
03	RG_LI8_INV-4_2021-04-28	518	27 May 2021
	RG_LI8_INV-5_2021-04-28	519	
	RG_LI24_INV-1_2021-04-26	520	
	RG_LI24_INV-2_2021-04-26	521	
	RG_LI24_INV-3_2021-04-26	522	
	RG_LI24_INV-4_2021-04-26	523	
	RG_LI24_INV-5_2021-04-26	524	
	RG_LIDCOM_INV-1_2021-04-29	525	
	RG_LIDCOM_INV-2_2021-04-29	526	
04	RG_LIDCOM_INV-3_2021-04-29	527	27 May 2021
	RG_LIDCOM_INV-4_2021-04-29	528	
	RG_LIDCOM_INV-5_2021-04-29	529	
	RG_LIDSL_INV-1_2021-04-27	530	
	RG_LIDSL_INV-2_2021-04-27	531	
	RG_LIDSL_INV-3_2021-04-27	532	
	RG_LIDSL_INV-4_2021-04-27	533	
	RG_LIDSL_INV-5_2021-04-27	534	
	RG_LILC3_INV-1_2021-04-27	535	
05	RG_LILC3_INV-2_2021-04-27	536	27 May 2021
	RG_LILC3_INV-3_2021-04-27	537	
	RG_LILC3_INV-4_2021-04-27	538	
	RG_LILC3_INV-5_2021-04-27	539	

Teck Coal Limited
Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
05	RG_LISP24_INV-1_2021-04-27	540	27 May 2021
	RG_LISP24_INV-2_2021-04-27	541	
	RG_LISP24_INV-3_2021-04-27	542	
	RG_LISP24_INV-4_2021-04-27	543	
06	RG_LISP24_INV-5_2021-04-27	544	27 May 2021
	RG_SLINE_INV-1_2021-04-26	545	
	RG_SLINE_INV-2_2021-04-26	546	
	RG_SLINE_INV-3_2021-04-26	547	
	RG_SLINE_INV-4_2021-04-26	548	
	RG_SLINE_INV-5_2021-04-26	549	

MINNOW ENVIRONMENTAL INCORPORATED

204-1006 Fort Street
Victoria, British Columbia V8V 3K4
Telephone:(250) 595-1627
Facsmile:(250) 595-1625

CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Carlie.Meyer@teck.com; Kbatchelar@minnow.ca

					Analysis Required						
Sample Number	Minnow Sample ID	Date Sampled	Matrix	Moisture (Freeze Drying)	Full Metals including Hg				Number of Containers	Comments
505	1 RG_FRUL_INV-1_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
506	2 RG_FRUL_INV-2_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
507	3 RG_FRUL_INV-3_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
508	4 RG_FRUL_INV-4_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
509	5 RG_FRUL_INV-5_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
	6									
	7									
	8									
	9									
	10									
	11									
	12									
	13									
	14									
	15									

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature)	Date: 11 May 2021	Time: 7:00pm	Sample Condition upon Receipt: frozen in cooler.

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

MINNOW ENVIRONMENTAL INCORPORATED

204-1006 Fort Street
Victoria, British Columbia V8V 3K4
Telephone:(250) 595-1627
Facsmile:(250) 595-1625

CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Carlie.Meyer@teck.com; Kbatchelar@minnow.ca

					Analysis Required					
Sample Number	Minnow Sample ID	Date Sampled	Matrix	Moisture (Freeze Drying)	Full Metals including Hg				Number of Containers	Comments
S10 1	RG_LCUT_INV-1_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
S11 2	RG_LCUT_INV-2_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
S12 3	RG_LCUT_INV-3_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
S13 4	RG_LCUT_INV-4_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
S14 5	RG_LCUT_INV-5_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
S+ 6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Samples Relinquished to Lab By: (Minnow Employee Signature) | Date: | Time: | Shipment Method: Pacific Coastal cargo in iced cooler

Samples Received in Lab By: (Lab Employee Signature) | Date: 11 May 2021 | Time: 7:00pm | Sample Condition upon Receipt: frozen in cooler

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

MINNOW ENVIRONMENTAL INCORPORATED	CHAIN OF CUSTODY RECORD
204-1006 Fort Street Victoria, British Columbia V8V 3K4 Telephone:(250) 595-1627 Facsmile:(250) 595-1625	

Laboratory: Trich Analytics

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Carlie.Meyer@teck.com; Kbatchelar@minnow.ca

					Analysis Required						
Sample Number	Minnow Sample ID	Date Sampled	Matrix	Moisture (Freeze Drying)	Full Metals including Hg				Number of Containers	Comments
S15 1	RG_LI8_INV-1_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
S16 2	RG_LI8_INV-2_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
S17 3	RG_LI8_INV-3_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
S18 4	RG_LI8_INV-4_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
S19 5	RG_LI8_INV-5_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature)	Date: 11 May 2021	Time: 7:00 pm	Sample Condition upon Receipt: frozen in cooler.

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

MINNOW ENVIRONMENTAL INCORPORATED	CHAIN OF CUSTODY RECORD
204-1006 Fort Street Victoria, British Columbia V8V 3K4 Telephone:(250) 595-1627 Facsmile:(250) 595-1625	

COPY
email copy received 11 May 2021

Laboratory: Trich Analytics

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:

Page 1 of 10

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Carlie.Meyer@teck.com; Kbatchelar@minnow.ca

Trich ID#	Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Full Metals including Hg				Number of Containers	Comments
500	1	RG_FO23_INV-1_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
501	2	RG_FO23_INV-2_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
502	3	RG_FO23_INV-3_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
503	4	RG_FO23_INV-4_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
504	5	RG_FO23_INV-5_2021-04-28 ✓	28-Apr-21	Invertebrate tissue	x	x				1	
	6										
	7										
	8										
	9										Project #2021-216
	10										
	11										
	12										
	13										
	14										
	15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature)	Date: 11 May 2021	Time: 7:00 pm.	Sample Condition upon Receipt: frozen in cooler.

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

MINNOW ENVIRONMENTAL INCORPORATED

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CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Carlie.Meyer@teck.com; Kbatchelar@minnow.ca

					Analysis Required					
Sample Number	Minnow Sample ID	Date Sampled	Matrix	Moisture (Freeze Drying)	Full Metals including Hg				Number of Containers	Comments
S20 1	RG_LI24_INV-1_2021-04-26 ✓	26-Apr-21	Invertebrate tissue	x	x				1	
S21 2	RG_LI24_INV-2_2021-04-26 ✓	26-Apr-21	Invertebrate tissue	x	x				1	
S22 3	RG_LI24_INV-3_2021-04-26 ✓	26-Apr-21	Invertebrate tissue	x	x				1	
S23 4	RG_LI24_INV-4_2021-04-26 ✓	26-Apr-21	Invertebrate tissue	x	x				1	
S24 5	RG_LI24_INV-5_2021-04-26 ✓	26-Apr-21	Invertebrate tissue	x	x				1	
6										
7										
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9										
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12										
13										
14										
15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature)	Date: 11 May 2021	Time: 7:00pm	Sample Condition upon Receipt: Frozen in cooler.

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

MINNOW ENVIRONMENTAL INCORPORATED

204-1006 Fort Street
Victoria, British Columbia V8V 3K4
Telephone:(250) 595-1627
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CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Carlie.Meyer@teck.com; Kbatchelar@minnow.ca

				Analysis Required						
Sample Number	Minnow Sample ID	Date Sampled	Matrix	Moisture (Freeze Drying)	Full Metals including Hg				Number of Containers	Comments
S25 1	RG_LIDCOM_INV-1_2021-04-29 ✓	29-Apr-21	Invertebrate tissue	x	x				1	
S26 2	RG_LIDCOM_INV-2_2021-04-29 ✓	29-Apr-21	Invertebrate tissue	x	x				1	
S27 3	RG_LIDCOM_INV-3_2021-04-29 ✓	29-Apr-21	Invertebrate tissue	x	x				1	
S28 4	RG_LIDCOM_INV-4_2021-04-29 ✓	29-Apr-21	Invertebrate tissue	x	x				1	
S29 5	RG_LIDCOM_INV-5_2021-04-29 ✓	29-Apr-21	Invertebrate tissue	x	x				1	
6										
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14										
15										

Samples Relinquished to Lab By: (Minnow Employee Signature) Date: Time: Shipment Method: Pacific Coastal cargo in iced cooler

Samples Received in Lab By: (Lab Employee Signature) Date: 11 May 2021 Time: 7:00pm Sample Condition upon Receipt: frozen in cooler.

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

MINNOW ENVIRONMENTAL INCORPORATED	CHAIN OF CUSTODY RECORD
204-1006 Fort Street Victoria, British Columbia V8V 3K4 Telephone:(250) 595-1627 Facsmile:(250) 595-1625	

Laboratory: Trich Analytics

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Carlie.Meyer@teck.com; Kbatchelar@minnow.ca

				Analysis Required						
Sample Number	Minnow Sample ID	Date Sampled	Matrix	Moisture (Freeze Drying)	Full Metals including Hg				Number of Containers	Comments
S30 1	RG_LIDSL_INV-1_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
S31 2	RG_LIDSL_INV-2_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
S32 3	RG_LIDSL_INV-3_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
S33 4	RG_LIDSL_INV-4_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
S34 5	RG_LIDSL_INV-5_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
6										
7										
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12										
13										
14										
15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature)	Date: 11 May 2024	Time: 7:00pm	Sample Condition upon Receipt: Frozen in cooler.

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

MINNOW ENVIRONMENTAL INCORPORATED	CHAIN OF CUSTODY RECORD
204-1006 Fort Street Victoria, British Columbia V8V 3K4 Telephone:(250) 595-1627 Facsmile:(250) 595-1625	

Laboratory: Trich Analytics

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Carlie.Meyer@teck.com; Kbatchelar@minnow.ca

				Analysis Required						
Sample Number	Minnow Sample ID	Date Sampled	Matrix	Moisture (Freeze Drying)	Full Metals including Hg				Number of Containers	Comments
535 1	RG_LILC3_INV-1_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
536 2	RG_LILC3_INV-2_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
537 3	RG_LILC3_INV-3_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
538 4	RG_LILC3_INV-4_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
539 5	RG_LILC3_INV-5_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature)	Date: 11 May 2021	Time: 7:00 pm	Sample Condition upon Receipt: Frozen in cooler.

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

MINNOW ENVIRONMENTAL INCORPORATED	CHAIN OF CUSTODY RECORD
204-1006 Fort Street Victoria, British Columbia V8V 3K4 Telephone:(250) 595-1627 Facsmile:(250) 595-1625	

Laboratory: Trich Analytics

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Carlie.Meyer@teck.com; Kbatchelar@minnow.ca

					Analysis Required					
Sample Number	Minnow Sample ID	Date Sampled	Matrix	Moisture (Freeze Drying)	Full Metals including Hg				Number of Containers	Comments
1 (540)	RG_LISP24_INV-1_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
2 (541)	RG_LISP24_INV-2_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
3 (542)	RG_LISP24_INV-3_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
4 (543)	RG_LISP24_INV-4_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
5 (544)	RG_LISP24_INV-5_2021-04-27 ✓	27-Apr-21	Invertebrate tissue	x	x				1	
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature)	Date: 11 May 2021	Time: 7:00pm	Sample Condition upon Receipt: frozen in cooler

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

MINNOW ENVIRONMENTAL INCORPORATED

204-1006 Fort Street
Victoria, British Columbia V8V 3K4
Telephone:(250) 595-1627
Facsmile:(250) 595-1625

CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:
Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Carlie.Meyer@teck.com; Kbatchelar@minnow.ca

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

	Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Analysis Required	Analysis Required	Analysis Required	Number of Containers	Comments
545	1	RG_SLINE_INV-1_2021-04-26 ✓	26-Apr-21	Invertebrate tissue	x	x				1	
546	2	RG_SLINE_INV-2_2021-04-26 ✓	26-Apr-21	Invertebrate tissue	x	x				1	
547	3	RG_SLINE_INV-3_2021-04-26 ✓	26-Apr-21	Invertebrate tissue	x	x				1	
548	4	RG_SLINE_INV-4_2021-04-26 ✓	26-Apr-21	Invertebrate tissue	x	x				1	
549	5	RG_SLINE_INV-5_2021-04-26 ✓	26-Apr-21	Invertebrate tissue	x	x				1	
	6										
	7										
	8										
	9										
	10										
	11										
	12										
	13										
	14										
	15										

Samples Relinquished to Lab By: (Minnow Employee Signature) Date: Time: Shipment Method: Pacific Coastal cargo in iced cooler

Samples Received in Lab By: (Lab Employee Signature) Date: 11 May 2021 Time: 7:00pm Sample Condition upon Receipt: frozen in cooler.

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

BENTHIC TISSUE CHEMISTRY

TrichAnalytics Laboratory Report 2021-240

(Finalized August 05, 2021)

TrichAnalytics Inc.

Tissue Microchemistry Analysis Report

Client: Tyler Mehler
Aquatic Scientist
Minnow Environmental
Phone: (250) 595-4652
Email: tmehler@minnow.ca

Date Received: 27 Jul 2021
Date of Analysis: 30 Jul 2021
03 Aug 2021
Final Report Date: 05 Aug 2021
Project No.: 2021-240
Method No.: MET-002.05

Client Project: Teck Coal Limited/Minnow Environmental Line Creek Operations (LAEMP)

Analytical Request: Benthic Invertebrate Tissue Microchemistry (total metals and moisture) – 50 samples.
See chain of custody form provided for sample identification numbers.

Notes:
Analytical results are expressed in part per million (ppm) dry weight (equivalent to mg/kg).
Samples quantified using DORM-4, NIST-1566b, and NIST-2976 certified reference standards.
Aluminum concentrations above 1,000 ppm are outside linear range of the calibration curve.
Client specific DQO for Selenium accuracy is 90 - 110% of the certified value; (average achieved 105%, range 102 - 108%).
RPD values calculated according to the British Columbia Environmental Laboratory Manual (2020) criteria.

This report provides the analytical results only for tissue samples noted above as received from the Client.

Reviewed and Approved by Jennie Christensen, PhD, RPBio — 05 Aug 2021 Date

TrichAnalytics Inc.
207-1753 Sean Heights
Saanichton, BC V8M 0B3
www.trichanalytics.com

CALA Testing Accreditation No. A4196

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_FO23_INV-1_2021-07-14	RG_FO23_INV-2_2021-07-14	RG_FO23_INV-3_2021-07-14	RG_FO23_INV-4_2021-07-14	RG_FO23_INV-5_2021-07-14
		Lab ID	171	172	173	174	175
		Wet Weight (g)	1.1482	2.0387	1.3230	1.6841	1.3683
		Dry Weight (g)	0.1924	0.3445	0.2434	0.2555	0.2523
		Moisture (%)	83.2	83.1	81.6	84.8	81.6
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.006	0.020	0.776	0.982	0.616	0.781	1.5
11B	0.090	0.300	1.2	1.1	1.3	1.9	1.7
23Na	1.0	3.3	3,475	3,976	3,397	3,518	5,741
24Mg	0.022	0.073	2,091	1,349	1,737	1,862	1,793
27Al	0.053	0.177	777	389	589	652	749
31P	30	100	13,224	9,379	11,927	12,699	12,762
39K	16	53	10,183	8,013	11,378	11,016	11,686
44Ca	60	200	3,694	2,752	3,387	3,382	3,208
49Ti	0.420	1.4	43	22	29	34	56
51V	0.042	0.140	1.1	0.608	1.0	1.0	1.2
52Cr	0.951	3.2	8.5	4.9	4.9	6.3	8.4
55Mn	0.011	0.037	45	31	43	47	44
57Fe	4.2	14	388	258	419	449	483
59Co	0.005	0.017	2.3	1.7	2.7	2.9	2.2
60Ni	0.040	0.133	17	8.6	13	15	15
63Cu	0.011	0.037	21	15	19	22	18
66Zn	0.684	2.3	469	335	375	477	320
75As	0.496	1.7	0.805	0.507	0.826	0.805	0.696
77Se	0.333	1.1	9.4	6.9	8.3	8.8	8.5
88Sr	0.001	0.003	5.2	3.8	5.0	4.8	4.8
95Mo	0.001	0.003	0.273	0.237	0.416	0.388	0.273
107Ag	0.001	0.003	0.142	0.104	0.126	0.151	0.132
111Cd	0.094	0.313	3.5	3.1	4.4	4.7	4.3
118Sn	0.048	0.160	0.731	0.463	0.827	1.6	0.553
121Sb	0.006	0.020	0.032	0.020	0.032	0.021	0.028
137Ba	0.001	0.003	27	17	24	31	27
202Hg	0.030	0.100	0.123	0.086	0.102	0.105	0.099
205Tl	0.001	0.003	0.035	0.026	0.036	0.035	0.042
208Pb	0.002	0.007	0.195	0.132	0.195	0.210	0.256
238U	0.001	0.003	0.045	0.044	0.062	0.084	0.064

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_FRUL_INV-1_2021-07-14	RG_FRUL_INV-2_2021-07-14	RG_FRUL_INV-3_2021-07-14	RG_FRUL_INV-4_2021-07-14	RG_FRUL_INV-5_2021-07-14
		Lab ID	176	177	178	179	180
		Wet Weight (g)	1.2046	1.0862	1.4747	0.9187	1.0307
		Dry Weight (g)	0.1952	0.1587	0.2365	0.1804	0.1956
		Moisture (%)	83.8	85.4	84.0	80.4	81.0
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.006	0.020	1.1	1.4	0.888	1.3	2.1
11B	0.090	0.300	0.994	0.426	0.728	2.2	1.3
23Na	1.0	3.3	5,126	8,582	4,474	3,210	7,029
24Mg	0.022	0.073	1,714	1,553	1,940	1,567	1,226
27Al	0.053	0.177	504	191	367	2,828	838
31P	30	100	12,743	11,267	12,349	9,799	11,798
39K	16	53	12,379	10,938	11,769	8,466	11,719
44Ca	60	200	3,452	2,335	2,948	4,506	2,840
49Ti	0.420	1.4	30	9.4	19	207	57
51V	0.042	0.140	0.780	0.368	0.615	5.0	1.7
52Cr	0.951	3.2	6.8	4.6	7.1	40	26
55Mn	0.011	0.037	60	28	38	73	67
57Fe	4.2	14	356	165	281	2,041	865
59Co	0.005	0.017	1.5	0.634	1.2	2.5	2.7
60Ni	0.040	0.133	13	6.9	12	56	46
63Cu	0.011	0.037	23	20	28	18	18
66Zn	0.684	2.3	196	233	297	185	189
75As	0.496	1.7	0.638	<0.496	0.558	1.0	0.910
77Se	0.333	1.1	11	9.0	9.4	7.6	9.8
88Sr	0.001	0.003	4.7	2.7	4.1	6.0	3.3
95Mo	0.001	0.003	0.459	0.215	0.215	0.445	0.356
107Ag	0.001	0.003	0.243	0.214	0.230	0.208	0.193
111Cd	0.094	0.313	3.3	2.9	1.8	1.9	2.7
118Sn	0.048	0.160	0.739	0.579	0.373	0.638	0.745
121Sb	0.006	0.020	0.032	0.007	0.014	0.067	0.033
137Ba	0.001	0.003	21	14	18	61	25
202Hg	0.030	0.100	0.099	0.099	0.080	0.083	0.085
205Tl	0.001	0.003	0.032	0.018	0.021	0.063	0.030
208Pb	0.002	0.007	0.496	0.060	0.105	0.770	0.222
238U	0.001	0.003	0.067	0.023	0.047	0.083	0.050

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LCUT_INV-1_2021-07-12	RG_LCUT_INV-2_2021-07-12	RG_LCUT_INV-3_2021-07-12	RG_LCUT_INV-4_2021-07-12	RG_LCUT_INV-5_2021-07-12
		Lab ID	181	182	183	184	185
		Wet Weight (g)	2.0510	1.1630	1.7247	1.4230	1.9126
		Dry Weight (g)	0.3695	0.2247	0.3725	0.2560	0.3872
		Moisture (%)	82.0	80.7	78.4	82.0	79.8
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.006	0.020	0.641	0.270	0.627	0.664	0.989
11B	0.090	0.300	1.1	0.766	0.891	1.5	2.7
23Na	1.0	3.3	3,220	1,338	3,535	3,422	3,064
24Mg	0.022	0.073	1,743	747	1,711	1,673	1,838
27Al	0.053	0.177	471	158	435	559	1,797
31P	30	100	13,716	6,556	13,589	12,874	12,210
39K	16	53	11,732	6,690	13,292	14,022	13,275
44Ca	60	200	3,648	1,651	2,613	4,587	3,704
49Ti	0.420	1.4	28	6.4	23	29	109
51V	0.042	0.140	0.623	0.333	0.765	1.1	2.6
52Cr	0.951	3.2	3.2	2.8	5.7	7.4	7.7
55Mn	0.011	0.037	31	15	38	43	64
57Fe	4.2	14	183	86	272	279	484
59Co	0.005	0.017	0.830	0.942	1.5	1.9	1.9
60Ni	0.040	0.133	11	7.9	15	20	25
63Cu	0.011	0.037	33	23	34	51	54
66Zn	0.684	2.3	180	196	184	259	293
75As	0.496	1.7	2.2	1.5	2.0	3.4	3.5
77Se	0.333	1.1	3.6	2.4	4.8	4.2	5.9
88Sr	0.001	0.003	5.3	1.9	4.5	5.9	6.6
95Mo	0.001	0.003	0.373	0.259	0.437	0.486	0.551
107Ag	0.001	0.003	0.021	0.014	0.028	0.037	0.051
111Cd	0.094	0.313	3.4	2.0	4.6	6.4	8.8
118Sn	0.048	0.160	0.500	0.225	0.430	0.971	0.799
121Sb	0.006	0.020	0.026	0.020	0.033	0.045	0.069
137Ba	0.001	0.003	26	11	28	32	52
202Hg	0.030	0.100	0.079	0.092	0.112	0.112	0.128
205Tl	0.001	0.003	0.036	0.017	0.043	0.041	0.091
208Pb	0.002	0.007	0.190	0.075	0.239	0.273	0.666
238U	0.001	0.003	0.058	0.031	0.064	0.107	0.174

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

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g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LI8_INV-1_2021-07-15	RG_LI8_INV-2_2021-07-15	RG_LI8_INV-3_2021-07-15	RG_LI8_INV-4_2021-07-15	RG_LI8_INV-5_2021-07-15
		Lab ID	186	187	188	189	190
		Wet Weight (g)	1.5096	1.4474	1.1932	1.2805	1.3465
		Dry Weight (g)	0.2486	0.2606	0.2189	0.2401	0.2314
		Moisture (%)	83.5	82.0	81.7	81.2	82.8
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.006	0.020	0.522	0.405	0.742	0.423	0.526
11B	0.090	0.300	0.746	0.684	1.1	0.919	0.696
23Na	1.0	3.3	4,120	4,316	4,430	3,693	3,673
24Mg	0.022	0.073	1,986	1,677	1,698	2,193	1,682
27Al	0.053	0.177	246	193	807	287	332
31P	30	100	15,402	12,522	13,299	12,640	13,124
39K	16	53	13,534	12,358	12,622	11,428	11,435
44Ca	60	200	2,669	1,986	3,226	2,782	2,059
49Ti	0.420	1.4	16	10	72	17	20
51V	0.042	0.140	0.483	0.419	2.0	0.468	0.425
52Cr	0.951	3.2	4.4	3.7	16	3.8	4.7
55Mn	0.011	0.037	50	41	71	41	43
57Fe	4.2	14	257	234	528	260	221
59Co	0.005	0.017	3.2	4.1	4.5	3.3	1.7
60Ni	0.040	0.133	22	22	44	22	14
63Cu	0.011	0.037	18	16	16	18	13
66Zn	0.684	2.3	588	565	463	770	412
75As	0.496	1.7	2.0	2.2	2.3	2.9	1.3
77Se	0.333	1.1	7.3	7.3	6.9	8.0	5.5
88Sr	0.001	0.003	4.8	3.3	5.6	5.5	4.2
95Mo	0.001	0.003	0.421	0.324	0.486	0.324	0.290
107Ag	0.001	0.003	0.028	0.021	0.028	0.027	0.018
111Cd	0.094	0.313	11	11	12	12	5.6
118Sn	0.048	0.160	1.1	0.611	1.3	0.657	0.402
121Sb	0.006	0.020	0.020	0.016	0.033	0.018	0.018
137Ba	0.001	0.003	20	16	31	23	21
202Hg	0.030	0.100	0.118	0.092	0.085	0.109	0.089
205Tl	0.001	0.003	0.059	0.060	0.043	0.063	0.036
208Pb	0.002	0.007	0.110	0.100	0.241	0.119	0.104
238U	0.001	0.003	0.066	0.050	0.093	0.053	0.044

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LI24_INV-1_2021-07-13	RG_LI24_INV-2_2021-07-13	RG_LI24_INV-3_2021-07-13	RG_LI24_INV-4_2021-07-13	RG_LI24_INV-5_2021-07-13
		Lab ID	191	192	193	194	195
		Wet Weight (g)	1.4087	1.0999	1.2589	1.6234	1.2337
		Dry Weight (g)	0.2509	0.1830	0.2039	0.2808	0.2081
		Moisture (%)	82.2	83.4	83.8	82.7	83.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.006	0.020	1.1	0.615	0.669	0.359	0.649
11B	0.090	0.300	1.4	0.547	0.671	0.323	0.621
23Na	1.0	3.3	5,017	4,087	4,055	4,215	3,190
24Mg	0.022	0.073	2,370	1,746	2,074	2,483	1,594
27Al	0.053	0.177	921	400	401	216	458
31P	30	100	14,828	11,797	13,903	14,156	9,670
39K	16	53	14,719	11,636	12,200	11,717	9,270
44Ca	60	200	3,316	3,063	3,703	3,331	2,726
49Ti	0.420	1.4	54	21	23	11	22
51V	0.042	0.140	2.6	1.1	1.0	0.706	0.919
52Cr	0.951	3.2	18	7.6	6.2	2.6	6.9
55Mn	0.011	0.037	43	31	29	17	27
57Fe	4.2	14	573	355	276	203	295
59Co	0.005	0.017	2.5	1.7	1.2	1.4	1.1
60Ni	0.040	0.133	34	18	13	8.0	13
63Cu	0.011	0.037	19	14	17	19	17
66Zn	0.684	2.3	924	469	449	844	483
75As	0.496	1.7	3.0	2.1	1.8	1.8	1.7
77Se	0.333	1.1	9.6	6.1	6.6	9.4	6.0
88Sr	0.001	0.003	8.3	7.6	8.2	7.5	6.9
95Mo	0.001	0.003	0.529	0.426	0.358	0.409	0.392
107Ag	0.001	0.003	0.076	0.052	0.079	0.072	0.061
111Cd	0.094	0.313	4.0	2.2	1.3	3.5	2.1
118Sn	0.048	0.160	1.7	0.952	1.3	0.815	0.570
121Sb	0.006	0.020	0.035	0.022	0.018	0.018	0.022
137Ba	0.001	0.003	40	32	33	20	24
202Hg	0.030	0.100	0.109	0.075	0.085	0.126	0.099
205Tl	0.001	0.003	0.174	0.100	0.076	0.130	0.079
208Pb	0.002	0.007	0.422	0.165	0.180	0.086	0.153
238U	0.001	0.003	0.185	0.123	0.116	0.122	0.094

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LIDCOM_INV-1_2021-07-12	RG_LIDCOM_INV-2_2021-07-12	RG_LIDCOM_INV-3_2021-07-12	RG_LIDCOM_INV-4_2021-07-12	RG_LIDCOM_INV-5_2021-07-12
		Lab ID	196	197	198	199	200
		Wet Weight (g)	2.1453	2.3152	2.0416	2.5716	2.5309
		Dry Weight (g)	0.3914	0.3763	0.4799	0.4437	0.4557
		Moisture (%)	81.8	83.7	76.5	82.7	82.0
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.006	0.020	0.445	0.590	0.340	0.548	0.522
11B	0.090	0.300	0.795	1.2	0.466	1.1	0.932
23Na	1.0	3.3	3,055	3,093	3,701	3,355	4,028
24Mg	0.022	0.073	2,001	1,735	2,277	1,728	1,991
27Al	0.053	0.177	534	682	379	749	754
31P	30	100	12,415	10,703	13,184	13,188	12,113
39K	16	53	10,757	9,245	10,151	9,837	10,938
44Ca	60	200	2,588	2,600	3,380	2,572	2,755
49Ti	0.420	1.4	38	52	22	38	53
51V	0.042	0.140	0.962	0.966	0.524	1.1	1.0
52Cr	0.951	3.2	9.6	4.7	4.0	10	7.2
55Mn	0.011	0.037	43	59	47	63	59
57Fe	4.2	14	496	392	354	462	519
59Co	0.005	0.017	5.4	2.6	6.5	3.8	4.9
60Ni	0.040	0.133	25	21	20	24	25
63Cu	0.011	0.037	13	19	22	13	19
66Zn	0.684	2.3	426	448	838	538	586
75As	0.496	1.7	2.3	2.2	2.3	2.0	2.7
77Se	0.333	1.1	5.1	5.8	5.6	5.8	6.0
88Sr	0.001	0.003	4.4	5.0	5.0	4.2	4.7
95Mo	0.001	0.003	0.273	0.341	0.357	0.348	0.440
107Ag	0.001	0.003	0.029	0.029	0.044	0.020	0.032
111Cd	0.094	0.313	9.4	6.5	18	7.8	11
118Sn	0.048	0.160	0.761	0.825	0.279	0.283	0.479
121Sb	0.006	0.020	0.018	0.026	0.028	0.028	0.033
137Ba	0.001	0.003	14	27	20	25	24
202Hg	0.030	0.100	0.062	0.092	0.107	0.085	0.075
205Tl	0.001	0.003	0.095	0.079	0.131	0.101	0.115
208Pb	0.002	0.007	0.153	0.232	0.097	0.169	0.201
238U	0.001	0.003	0.051	0.095	0.040	0.076	0.073

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LIDSL_INV-1_2021-07-14	RG_LIDSL_INV-2_2021-07-14	RG_LIDSL_INV-3_2021-07-14	RG_LIDSL_INV-4_2021-07-14	RG_LIDSL_INV-5_2021-07-14
		Lab ID	201	202	203	204	205
		Wet Weight (g)	4.5532	1.9373	2.3419	4.1704	1.7380
		Dry Weight (g)	0.7089	0.3661	0.4996	0.7064	0.3063
		Moisture (%)	84.4	81.1	78.7	83.1	82.4
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.006	0.020	0.441	0.421	0.355	0.383	0.451
11B	0.090	0.300	0.622	0.699	0.893	0.466	0.505
23Na	1.0	3.3	4,245	2,584	3,544	3,846	4,028
24Mg	0.022	0.073	1,914	1,419	1,748	1,440	1,373
27Al	0.053	0.177	180	355	408	156	159
31P	30	100	14,836	12,299	11,811	10,799	11,120
39K	16	53	11,667	8,082	9,764	10,413	11,010
44Ca	60	200	3,492	3,017	2,630	2,777	2,263
49Ti	0.420	1.4	8.2	19	27	6.7	6.0
51V	0.042	0.140	0.321	0.704	0.737	0.314	0.376
52Cr	0.951	3.2	2.4	5.7	7.1	1.8	5.1
55Mn	0.011	0.037	76	77	84	78	60
57Fe	4.2	14	272	366	445	254	232
59Co	0.005	0.017	8.6	2.4	9.7	6.3	3.2
60Ni	0.040	0.133	19	14	25	15	16
63Cu	0.011	0.037	23	15	22	23	15
66Zn	0.684	2.3	782	233	814	515	253
75As	0.496	1.7	2.0	1.1	2.0	1.8	1.2
77Se	0.333	1.1	7.9	5.8	7.0	6.2	6.5
88Sr	0.001	0.003	6.1	5.5	4.3	4.4	3.8
95Mo	0.001	0.003	0.348	0.293	0.311	0.302	0.366
107Ag	0.001	0.003	0.024	0.020	0.028	0.024	0.016
111Cd	0.094	0.313	13	4.2	18	14	6.4
118Sn	0.048	0.160	0.479	0.566	0.587	0.624	0.627
121Sb	0.006	0.020	0.022	0.022	0.028	0.022	0.017
137Ba	0.001	0.003	13	25	19	15	13
202Hg	0.030	0.100	0.114	0.057	0.114	0.078	0.078
205Tl	0.001	0.003	0.138	0.054	0.169	0.114	0.056
208Pb	0.002	0.007	0.075	0.123	0.193	0.094	0.094
238U	0.001	0.003	0.061	0.053	0.093	0.087	0.038

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

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g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LILC3_INV-1_2021-07-12	RG_LILC3_INV-2_2021-07-12	RG_LILC3_INV-3_2021-07-12	RG_LILC3_INV-4_2021-07-12	RG_LILC3_INV-5_2021-07-12
		Lab ID	206	207	208	209	210
		Wet Weight (g)	1.2804	1.5844	1.7051	2.0537	1.5459
		Dry Weight (g)	0.1880	0.3245	0.2678	0.3477	0.2925
		Moisture (%)	85.3	79.5	84.3	83.1	81.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.006	0.020	0.544	0.577	0.952	0.637	0.927
11B	0.090	0.300	0.669	1.8	2.0	1.2	0.983
23Na	1.0	3.3	2,468	2,719	3,763	2,782	4,568
24Mg	0.022	0.073	1,648	1,887	1,981	1,622	2,011
27Al	0.053	0.177	231	544	548	338	642
31P	30	100	10,130	12,780	12,605	11,164	14,559
39K	16	53	9,533	12,089	12,410	11,230	15,816
44Ca	60	200	4,129	4,784	6,266	3,509	3,536
49Ti	0.420	1.4	9.0	31	24	17	48
51V	0.042	0.140	0.486	1.1	1.0	0.764	1.3
52Cr	0.951	3.2	3.5	5.0	4.9	5.0	4.0
55Mn	0.011	0.037	61	287	195	189	185
57Fe	4.2	14	327	637	532	470	728
59Co	0.005	0.017	1.7	4.2	2.8	3.0	8.8
60Ni	0.040	0.133	8.5	34	19	20	25
63Cu	0.011	0.037	21	24	25	22	29
66Zn	0.684	2.3	191	343	281	212	353
75As	0.496	1.7	0.896	1.2	1.4	1.3	1.6
77Se	0.333	1.1	6.1	6.2	8.8	6.8	7.5
88Sr	0.001	0.003	7.2	9.1	8.9	5.2	5.2
95Mo	0.001	0.003	0.426	0.851	0.560	0.457	0.567
107Ag	0.001	0.003	0.024	0.017	0.021	0.017	0.030
111Cd	0.094	0.313	3.3	7.6	4.4	3.4	7.7
118Sn	0.048	0.160	0.961	0.540	1.1	0.571	0.786
121Sb	0.006	0.020	0.029	0.049	0.057	0.045	0.049
137Ba	0.001	0.003	19	33	30	20	21
202Hg	0.030	0.100	0.126	0.092	0.109	0.092	0.121
205Tl	0.001	0.003	0.014	0.042	0.030	0.024	0.046
208Pb	0.002	0.007	0.105	0.197	0.176	0.163	0.253
238U	0.001	0.003	0.076	0.154	0.126	0.073	0.080

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

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g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LISP24_INV-1_2021-07-12	RG_LISP24_INV-2_2021-07-12	RG_LISP24_INV-3_2021-07-12	RG_LISP24_INV-4_2021-07-12	RG_LISP24_INV-5_2021-07-12
		Lab ID	211	212	213	214	215
		Wet Weight (g)	2.2913	3.7294	2.4059	2.1963	2.7867
		Dry Weight (g)	0.3955	0.6347	0.4943	0.3785	0.4880
		Moisture (%)	82.7	83.0	79.5	82.8	82.5
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.006	0.020	0.575	0.470	0.468	0.412	0.874
11B	0.090	0.300	0.711	0.586	0.502	0.648	1.1
23Na	1.0	3.3	4,597	3,308	4,044	3,138	5,593
24Mg	0.022	0.073	1,800	1,418	1,852	1,588	2,225
27Al	0.053	0.177	213	225	182	366	390
31P	30	100	14,044	10,515	10,917	11,086	14,850
39K	16	53	15,577	10,674	12,060	10,256	14,663
44Ca	60	200	2,262	1,978	2,394	2,396	2,847
49Ti	0.420	1.4	11	13	13	15	28
51V	0.042	0.140	0.499	0.470	0.405	0.511	0.757
52Cr	0.951	3.2	3.3	2.2	2.4	4.3	5.5
55Mn	0.011	0.037	79	60	84	62	110
57Fe	4.2	14	351	355	320	332	500
59Co	0.005	0.017	9.8	11	5.8	5.5	8.4
60Ni	0.040	0.133	23	19	18	22	36
63Cu	0.011	0.037	26	25	20	22	26
66Zn	0.684	2.3	695	720	494	439	688
75As	0.496	1.7	1.7	1.6	1.5	1.3	2.8
77Se	0.333	1.1	7.2	5.1	5.5	5.9	7.7
88Sr	0.001	0.003	3.7	3.0	3.3	3.6	5.3
95Mo	0.001	0.003	0.481	0.315	0.426	0.394	0.538
107Ag	0.001	0.003	0.039	0.032	0.032	0.024	0.030
111Cd	0.094	0.313	15	15	12	11	14
118Sn	0.048	0.160	0.568	0.434	0.607	0.421	0.640
121Sb	0.006	0.020	0.024	0.020	0.022	0.012	0.038
137Ba	0.001	0.003	13	11	12	9.2	25
202Hg	0.030	0.100	0.126	0.115	0.098	0.121	0.105
205Tl	0.001	0.003	0.077	0.072	0.092	0.082	0.095
208Pb	0.002	0.007	0.094	0.086	0.086	0.077	0.142
238U	0.001	0.003	0.083	0.065	0.081	0.059	0.085

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_SLINE_INV-1_2021-07-13	RG_SLINE_INV-2_2021-07-13	RG_SLINE_INV-3_2021-07-13	RG_SLINE_INV-4_2021-07-13	RG_SLINE_INV-5_2021-07-13
		Lab ID	216	217	218	219	220
		Wet Weight (g)	1.6994	1.3514	1.3205	1.5003	1.0851
		Dry Weight (g)	0.2846	0.2769	0.2190	0.3065	0.1875
		Moisture (%)	83.3	79.5	83.4	79.6	82.7
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.006	0.020	0.286	0.211	0.177	0.239	0.177
11B	0.090	0.300	0.652	0.796	0.575	0.575	0.619
23Na	1.0	3.3	3,600	3,410	2,915	3,595	2,733
24Mg	0.022	0.073	1,679	1,754	1,688	1,732	1,480
27Al	0.053	0.177	320	241	179	227	199
31P	30	100	11,597	11,071	10,437	11,378	10,929
39K	16	53	12,570	11,322	10,486	12,017	9,792
44Ca	60	200	2,576	3,825	2,475	2,828	2,134
49Ti	0.420	1.4	17	14	8.5	11	11
51V	0.042	0.140	0.837	1.3	0.569	0.761	0.629
52Cr	0.951	3.2	3.7	4.2	5.0	4.8	4.5
55Mn	0.011	0.037	34	27	42	27	24
57Fe	4.2	14	309	274	236	296	238
59Co	0.005	0.017	1.3	1.2	0.913	1.1	1.1
60Ni	0.040	0.133	9.4	11	9.1	9.7	9.0
63Cu	0.011	0.037	19	23	17	23	20
66Zn	0.684	2.3	587	862	561	693	528
75As	0.496	1.7	2.0	1.9	1.5	1.3	1.6
77Se	0.333	1.1	7.3	8.1	6.1	6.6	6.9
88Sr	0.001	0.003	5.8	7.3	6.2	5.9	4.7
95Mo	0.001	0.003	0.427	0.617	0.633	0.554	0.601
107Ag	0.001	0.003	0.113	0.079	0.087	0.102	0.076
111Cd	0.094	0.313	5.1	6.2	3.8	4.5	4.2
118Sn	0.048	0.160	1.0	0.865	0.929	0.634	1.1
121Sb	0.006	0.020	0.024	0.024	0.017	0.014	0.019
137Ba	0.001	0.003	22	21	41	25	21
202Hg	0.030	0.100	0.080	0.102	0.099	0.096	0.080
205Tl	0.001	0.003	0.076	0.105	0.060	0.067	0.058
208Pb	0.002	0.007	0.104	0.068	0.083	0.084	0.084
238U	0.001	0.003	0.111	0.174	0.090	0.082	0.078

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue QA/QC Relative Percent Difference Results

Client ID		RG_FO23_INV-1_2021-07-14			RG_LCUT_INV-1_2021-07-12			RG_LIDSL_INV-2_2021-07-14		
Lab ID		171			181			202		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.006	0.776	0.696	11	0.641	0.678	5.6	0.421	0.497	17
11B	0.090	1.2	1.0	18	1.1	1.0	9.5	0.699	0.855	-
23Na	1.0	3,475	3,177	9.0	3,220	3,750	15	2,584	3,312	25
24Mg	0.022	2,091	1,655	23	1,743	1,771	1.6	1,419	1,407	0.8
27Al	0.053	777	654	17	471	409	14	355	510	36
31P	30	13,224	11,391	15	13,716	12,565	8.8	12,299	11,895	3.3
39K	16	10,183	9,168	11	11,732	12,973	10	8,082	10,271	24
44Ca	60	3,694	3,218	14	3,648	3,510	3.9	3,017	2,764	8.8
49Ti	0.420	43	35	21	28	20	33	19	27	35
51V	0.042	1.1	0.872	23	0.623	0.633	1.6	0.704	0.824	16
52Cr	0.951	8.5	8.0	-	3.2	3.3	-	5.7	7.5	-
55Mn	0.011	45	37	20	31	28	10	77	60	25
57Fe	4.2	388	367	5.6	183	185	1.1	366	434	17
59Co	0.005	2.3	1.8	24	0.830	0.735	12	2.4	2.8	15
60Ni	0.040	17	15	13	11	11	0.0	14	17	19
63Cu	0.011	21	17	21	33	35	5.9	15	15	0.0
66Zn	0.684	469	363	26	180	188	4.3	233	260	11
75As	0.496	0.805	0.710	-	2.2	2.1	-	1.1	1.1	-
77Se	0.333	9.4	8.0	16	3.6	3.5	2.8	5.8	5.7	1.7
88Sr	0.001	5.2	4.7	10	5.3	5.5	3.7	5.5	5.5	0.0
95Mo	0.001	0.273	0.258	5.6	0.373	0.332	12	0.293	0.330	12
107Ag	0.001	0.142	0.132	7.3	0.021	0.024	13	0.020	0.016	22
111Cd	0.094	3.5	2.5	33	3.4	4.2	21	4.2	4.8	13
118Sn	0.048	0.731	0.661	10	0.500	0.440	-	0.566	0.595	5.0
121Sb	0.006	0.032	0.025	-	0.026	0.026	-	0.022	0.022	-
137Ba	0.001	27	23	16	26	22	17	25	21	17
202Hg	0.030	0.123	0.093	-	0.079	0.085	-	0.057	0.060	-
205Tl	0.001	0.035	0.029	19	0.036	0.032	12	0.054	0.055	1.8
208Pb	0.002	0.195	0.149	27	0.190	0.184	3.2	0.123	0.162	27
238U	0.001	0.045	0.039	14	0.058	0.063	8.3	0.053	0.058	9.0

Notes:

ppm = parts per million

RPD = relative percent difference

DL = detection limit

< = less than detection limit

% = percent

Data Quality Objectives:

Laboratory Duplicates - RPD ≤40% for all elements, except Ca and Sr, which are ≤60%

Minimum DQOs apply to individual samples at concentrations above 10x DL

Teck Coal Limited

Tissue QA/QC Relative Percent Difference Results

	Client ID	RG_LISP24_INV-5_2021-07-12			RG_SLINE_INV-5_2021-07-13		
	Lab ID	215			220		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.006	0.874	0.770	13	0.177	0.166	6.4
11B	0.090	1.1	1.4	24	0.619	0.530	-
23Na	1.0	5,593	4,429	23	2,733	2,603	4.9
24Mg	0.022	2,225	2,150	3.4	1,480	1,514	2.3
27Al	0.053	390	399	2.3	199	206	3.5
31P	30	14,850	13,314	11	10,929	10,200	6.9
39K	16	14,663	13,621	7.4	9,792	8,837	10
44Ca	60	2,847	3,088	8.1	2,134	2,038	4.6
49Ti	0.420	28	20	33	11	10	9.5
51V	0.042	0.757	0.784	3.5	0.629	0.591	6.2
52Cr	0.951	5.5	5.9	-	4.5	4.5	-
55Mn	0.011	110	105	4.7	24	22	8.7
57Fe	4.2	500	512	2.4	238	211	12
59Co	0.005	8.4	10	17	1.1	0.858	25
60Ni	0.040	36	37	2.7	9.0	7.9	13
63Cu	0.011	26	29	11	20	18	11
66Zn	0.684	688	887	25	528	522	1.1
75As	0.496	2.8	2.5	-	1.6	1.5	-
77Se	0.333	7.7	6.6	15	6.9	6.5	6.0
88Sr	0.001	5.3	5.3	0.0	4.7	4.9	4.2
95Mo	0.001	0.538	0.427	23	0.601	0.506	17
107Ag	0.001	0.030	0.030	0.0	0.076	0.072	5.4
111Cd	0.094	14	16	13	4.2	3.6	15
118Sn	0.048	0.640	0.829	26	1.1	0.762	36
121Sb	0.006	0.038	0.033	-	0.019	0.014	-
137Ba	0.001	25	21	17	21	22	4.7
202Hg	0.030	0.105	0.124	-	0.080	0.080	-
205Tl	0.001	0.095	0.088	7.7	0.058	0.059	1.7
208Pb	0.002	0.142	0.131	8.1	0.084	0.078	7.4
238U	0.001	0.085	0.100	16	0.078	0.070	11

Notes:

ppm = parts per million

RPD = relative percent difference

DL = detection limit

< = less than detection limit

% = percent

Data Quality Objectives:

Laboratory Duplicates - RPD ≤40% for all elements, except Ca and Sr, which are ≤60%

Minimum DQOs apply to individual samples at concentrations above 10x DL

Teck Coal Limited

Tissue QA/QC Accuracy and Precision Results

			Sample Group ID	01			02	
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.006	1.21	1.3	110	12	1.2	103	9.9
11B	0.090	4.5	5.0	111	1.7	5.2	117	1.7
23Na	1.0	14,000	15,315	109	6.1	14,873	106	2.4
24Mg	0.022	910	1,001	110	7.7	1,004	110	3.6
27Al	0.053	197.2	225	114	6.6	230	116	5.3
31P	30	8,000	8,357	104	4.3	8,672	108	3.7
39K	16	15,500	17,415	112	4.8	16,741	108	4.2
44Ca	60	2,360	2,594	110	7.8	2,590	110	1.4
49Ti	0.420	12.24	12	99	8.8	14	118	7.0
51V	0.042	1.57	1.7	106	7.7	1.7	108	6.7
52Cr	0.951	1.87	2.2	118	6.4	1.9	100	1.8
55Mn	0.011	3.17	3.3	105	5.9	3.4	108	2.4
57Fe	4.2	343	378	110	8.3	369	108	2.9
59Co	0.005	0.25	0.290	116	6.1	0.283	113	4.2
60Ni	0.040	1.34	1.5	110	5.6	1.5	110	4.5
63Cu	0.011	15.7	19	119	8.2	17	110	4.0
66Zn	0.684	51.6	58	112	5.1	57	111	1.0
75As	0.496	6.87	7.3	107	4.9	7.2	104	1.7
77Se	0.333	3.45	3.7	107	10	3.5	102	5.0
88Sr	0.001	10.1	11	107	6.5	11	108	1.3
95Mo	0.001	0.29	0.317	109	8.2	0.327	113	6.5
107Ag	0.001	0.0252	0.027	108	6.4	0.028	111	12
111Cd	0.094	0.299	0.331	111	3.4	0.343	115	6.2
118Sn	0.048	0.061	0.057	94	7.5	0.063	103	11
121Sb	0.006	0.011	0.013	114	14	0.013	115	18
137Ba	0.001	8.6	9.5	110	4.5	9.8	114	3.2
202Hg	0.030	0.412	0.442	107	7.6	0.438	106	4.3
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.002	0.404	0.395	98	13	0.403	100	14
238U	0.001	0.05	0.047	95	6.1	0.053	106	8.7

Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified value for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

Tl certified concentration from NIST-2976.

Accuracy and precision for Tl are not reported as the certified concentration is too close to the reportable detection limit.

Teck Coal Limited

Tissue QA/QC Accuracy and Precision Results

			Sample Group ID	03			04	
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.006	1.21	1.3	107	5.6	1.2	103	7.8
11B	0.090	4.5	5.4	120	3.1	4.7	105	2.9
23Na	1.0	14,000	15,972	114	2.8	14,773	106	3.0
24Mg	0.022	910	970	107	1.5	1,010	111	8.8
27Al	0.053	197.2	210	107	5.9	209	106	10
31P	30	8,000	8,528	107	2.3	8,633	108	6.5
39K	16	15,500	16,596	107	0.9	16,622	107	3.1
44Ca	60	2,360	2,510	106	4.4	2,534	107	3.2
49Ti	0.420	12.24	14	114	9.5	13	105	10
51V	0.042	1.57	1.6	104	4.3	1.8	112	3.9
52Cr	0.951	1.87	2.2	116	6.4	2.0	108	5.2
55Mn	0.011	3.17	3.4	109	3.4	3.4	109	5.0
57Fe	4.2	343	374	109	2.1	380	111	5.9
59Co	0.005	0.25	0.283	113	3.0	0.276	110	1.6
60Ni	0.040	1.34	1.5	110	4.6	1.4	108	2.8
63Cu	0.011	15.7	17	111	4.2	17	110	4.1
66Zn	0.684	51.6	58	112	2.6	54	105	1.0
75As	0.496	6.87	7.4	108	2.4	7.3	106	0.9
77Se	0.333	3.45	3.7	108	1.1	3.6	104	2.4
88Sr	0.001	10.1	11	112	4.9	11	107	3.3
95Mo	0.001	0.29	0.305	105	5.0	0.311	107	8.3
107Ag	0.001	0.0252	0.026	103	10	0.028	110	0.0
111Cd	0.094	0.299	0.329	110	9.7	0.305	102	8.8
118Sn	0.048	0.061	0.069	113	17	0.061	101	20
121Sb	0.006	0.011	0.012	108	17	0.012	110	20
137Ba	0.001	8.6	10	116	1.7	9.3	108	2.9
202Hg	0.030	0.412	0.429	104	7.1	0.430	104	6.8
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.002	0.404	0.465	115	4.0	0.448	111	4.8
238U	0.001	0.05	0.054	107	9.7	0.051	103	5.1

Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified value for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

Tl certified concentration from NIST-2976.

Accuracy and precision for Tl are not reported as the certified concentration is too close to the reportable detection limit.

Teck Coal Limited

Tissue QA/QC Accuracy and Precision Results

			Sample Group ID	05			06	
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.006	1.21	1.3	108	5.1	1.4	117	4.0
11B	0.090	4.5	5.3	117	2.7	4.8	106	2.9
23Na	1.0	14,000	15,723	112	7.4	14,670	105	5.3
24Mg	0.022	910	987	108	6.8	1,007	111	4.4
27Al	0.053	197.2	227	115	3.0	202	102	4.7
31P	30	8,000	8,638	108	5.6	8,392	105	3.5
39K	16	15,500	17,730	114	6.9	16,665	108	5.5
44Ca	60	2,360	2,554	108	5.3	2,499	106	3.2
49Ti	0.420	12.24	14	111	4.2	13	108	9.9
51V	0.042	1.57	1.7	107	11	1.6	104	7.8
52Cr	0.951	1.87	2.1	113	8.0	2.0	108	4.6
55Mn	0.011	3.17	3.5	110	6.7	3.5	111	4.9
57Fe	4.2	343	381	111	7.5	382	111	2.7
59Co	0.005	0.25	0.310	124	7.7	0.279	112	3.8
60Ni	0.040	1.34	1.5	115	7.7	1.5	111	3.2
63Cu	0.011	15.7	18	117	5.0	17	108	5.3
66Zn	0.684	51.6	58	112	3.3	56	108	4.0
75As	0.496	6.87	7.4	107	6.4	7.2	106	3.1
77Se	0.333	3.45	3.7	107	6.1	3.6	103	4.3
88Sr	0.001	10.1	11	112	7.5	11	108	4.3
95Mo	0.001	0.29	0.323	111	4.2	0.291	100	6.2
107Ag	0.001	0.0252	0.029	117	6.5	0.027	108	12
111Cd	0.094	0.299	0.335	112	7.8	0.357	119	10
118Sn	0.048	0.061	0.085	139	13	0.064	104	**27**
121Sb	0.006	0.011	0.012	107	7.7	0.013	116	**36**
137Ba	0.001	8.6	9.8	114	3.5	9.4	110	3.7
202Hg	0.030	0.412	0.437	106	8.4	0.447	109	4.4
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.002	0.404	0.465	115	16	0.450	112	8.9
238U	0.001	0.05	0.052	105	8.9	0.056	111	6.5

Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified value for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

Tl certified concentration from NIST-2976.

Accuracy and precision for Tl are not reported as the certified concentration is too close to the reportable detection limit.

Bold indicates DQO exceedance but result is accepted as it does not impact the reportable results

Teck Coal Limited
Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
01	RG_FO23_INV-1_2021-07-14	171	30 Jul 2021
	RG_FO23_INV-2_2021-07-14	172	
	RG_FO23_INV-3_2021-07-14	173	
	RG_FO23_INV-4_2021-07-14	174	
	RG_FO23_INV-5_2021-07-14	175	
	RG_FRUL_INV-1_2021-07-14	176	
	RG_FRUL_INV-2_2021-07-14	177	
	RG_FRUL_INV-3_2021-07-14	178	
	RG_FRUL_INV-4_2021-07-14	179	
02	RG_FRUL_INV-5_2021-07-14	180	30 Jul 2021
	RG_LCUT_INV-1_2021-07-12	181	
	RG_LCUT_INV-2_2021-07-12	182	
	RG_LCUT_INV-3_2021-07-12	183	
	RG_LCUT_INV-4_2021-07-12	184	
	RG_LCUT_INV-5_2021-07-12	185	
	RG_LI8_INV-1_2021-07-15	186	
	RG_LI8_INV-2_2021-07-15	187	
	RG_LI8_INV-3_2021-07-15	188	
03	RG_LI8_INV-4_2021-07-15	189	30 Jul 2021
	RG_LI8_INV-5_2021-07-15	190	
	RG_LI24_INV-1_2021-07-13	191	
	RG_LI24_INV-2_2021-07-13	192	
	RG_LI24_INV-3_2021-07-13	193	
	RG_LI24_INV-4_2021-07-13	194	
	RG_LI24_INV-5_2021-07-13	195	
	RG_LIDCOM_INV-1_2021-07-12	196	
	RG_LIDCOM_INV-2_2021-07-12	197	
04	RG_LIDCOM_INV-3_2021-07-12	198	30 Jul 2021
	RG_LIDCOM_INV-4_2021-07-12	199	
	RG_LIDCOM_INV-5_2021-07-12	200	
	RG_LIDSL_INV-1_2021-07-14	201	
	RG_LIDSL_INV-2_2021-07-14	202	
	RG_LIDSL_INV-3_2021-07-14	203	
	RG_LIDSL_INV-4_2021-07-14	204	
	RG_LIDSL_INV-5_2021-07-14	205	
05	RG_LILC3_INV-1_2021-07-12	206	03 Aug 2021
	RG_LILC3_INV-2_2021-07-12	207	
	RG_LILC3_INV-3_2021-07-12	208	
	RG_LILC3_INV-4_2021-07-12	209	
	RG_LILC3_INV-5_2021-07-12	210	

Teck Coal Limited
Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
05	RG_LISP24_INV-1_2021-07-12	211	03 Aug 2021
	RG_LISP24_INV-2_2021-07-12	212	
	RG_LISP24_INV-3_2021-07-12	213	
	RG_LISP24_INV-4_2021-07-12	214	
06	RG_LISP24_INV-5_2021-07-12	215	03 Aug 2021
	RG_SLINE_INV-1_2021-07-13	216	
	RG_SLINE_INV-2_2021-07-13	217	
	RG_SLINE_INV-3_2021-07-13	218	
	RG_SLINE_INV-4_2021-07-13	219	
	RG_SLINE_INV-5_2021-07-13	220	

MINNOW ENVIRONMENTAL INCORPORATED

204-1006 Fort Street
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Telephone:(250) 595-1627
Facsmile:(250) 595-1625

CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Kbatchelar@minnow.ca, Danika.Gerylo@teck.com

Trich ID	Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Number of Containers	Comments
171	1	RG_FO23_INV-1_2021-07-14	14-Jul-21	Invertebrate tissue	x	x	1	
172	2	RG_FO23_INV-2_2021-07-14	14-Jul-21	Invertebrate tissue	x	x	1	
173	3	RG_FO23_INV-3_2021-07-14	14-Jul-21	Invertebrate tissue	x	x	1	
174	4	RG_FO23_INV-4_2021-07-14	14-Jul-21	Invertebrate tissue	x	x	1	
175	5	RG_FO23_INV-5_2021-07-14	14-Jul-21	Invertebrate tissue	x	x	1	
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: Alex Wade (Lab Employee Signature) (Proj # 2021-240)	Date: 27 JUL 2021	Time: 15:30	Sample Condition upon Receipt: In cooler, cold / frozen

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

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TRICH ID	Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Full Metals including Hg				Number of Containers	Comments
176	1	RG_FRUL_INV-1_2021-07-14	14-Jul-21	Invertebrate tissue	x	x				1	
177	2	RG_FRUL_INV-2_2021-07-14	14-Jul-21	Invertebrate tissue	x	x				1	
178	3	RG_FRUL_INV-3_2021-07-14	14-Jul-21	Invertebrate tissue	x	x				1	
179	4	RG_FRUL_INV-4_2021-07-14	14-Jul-21	Invertebrate tissue	x	x				1	
180	5	RG_FRUL_INV-5_2021-07-14	14-Jul-21	Invertebrate tissue	x	x				1	
	6										
	7										
	8										
	9										
	10										
	11										
	12										
	13										
	14										
	15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: Alex Wade (Proj # 2021-240) (Lab Employee Signature)	Date: 27JUL2021	Time: 15:30	Sample Condition upon Receipt: In cooler, cold / frozen

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TRICH ID	Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Full Metals including Hg				Number of Containers	Comments
181	1	RG_LCUT_INV-1_2021-07-12 ✓	12-Jul-21	Invertebrate tissue	x	x				1	
182	2	RG_LCUT_INV-2_2021-07-12 ✓	12-Jul-21	Invertebrate tissue	x	x				1	
183	3	RG_LCUT_INV-3_2021-07-12 ✓	12-Jul-21	Invertebrate tissue	x	x				1	
184	4	RG_LCUT_INV-4_2021-07-12 ✓	12-Jul-21	Invertebrate tissue	x	x				1	
185	5	RG_LCUT_INV-5_2021-07-12 ✓	12-Jul-21	Invertebrate tissue	x	x				1	
	6										
	7										
	8										
	9										
	10										
	11										
	12										
	13										
	14										
	15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: Alex Wade (Lab Employee Signature) (Proj# 2021-240)	Date: 27JUL2021	Time: 15:30	Sample Condition upon Receipt: In cooler, cold / frozen

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TRICH ID	Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Analysis Required	Analysis Required	Analysis Required	Number of Containers	Comments
186	1	RG_LI8_INV-1_2021-07-15 ✓	15-Jul-21	Invertebrate tissue	x	x				1	
187	2	RG_LI8_INV-2_2021-07-15 ✓	15-Jul-21	Invertebrate tissue	x	x				1	
188	3	RG_LI8_INV-3_2021-07-15 ✓	15-Jul-21	Invertebrate tissue	x	x				1	
189	4	RG_LI8_INV-4_2021-07-15 ✓	15-Jul-21	Invertebrate tissue	x	x				1	
190	5	RG_LI8_INV-5_2021-07-15 ✓	15-Jul-21	Invertebrate tissue	x	x				1	
	6										
	7										
	8										
	9										
	10										
	11										
	12										
	13										
	14										
	15										

Samples Relinquished to Lab By: (Minnow Employee Signature) | Date: | Time: | Shipment Method: Pacific Coastal cargo in iced cooler

Samples Received in Lab By: Alex Wade (Lab Employee Signature) (Proj # 2021-240) | Date: 14 Jul 2021 | Time: 15:30 | Sample Condition upon Receipt: In cooler, cold / frozen

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

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Date Results Required By:

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Phone: 587-597-1612 Fax:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Kbatchelar@minnow.ca, Danika.Gerylo@teck.com

					Analysis Required					
TRICH ID Sample Number	Minnow Sample ID	Date Sampled	Matrix	Moisture (Freeze Drying)	Full Metals including Hg				Number of Containers	Comments
191 1	RG_LI24_INV-1_2021-07-13 ✓	13-Jul-21	Invertebrate tissue	x	x				1	
192 2	RG_LI24_INV-2_2021-07-13 *	13-Jul-21	Invertebrate tissue	x	x				1	
193 3	RG_LI24_INV-3_2021-07-13 ✓	13-Jul-21	Invertebrate tissue	x	x				1	
194 4	RG_LI24_INV-4_2021-07-13 ✓	13-Jul-21	Invertebrate tissue	x	x				1	
195 5	RG_LI24_INV-5_2021-07-13 ✓	13-Jul-21	Invertebrate tissue	x	x				1	
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: Alex Wade (Lab Employee Signature) (Proj # 2021-240)	Date: 27JUL2021	Time: 15:30	Sample Condition upon Receipt: In cooler, cold / frozen

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

* Sample container lid label: RG-LI24-INV2-2021-07-12
(side label matches COC though)
→ COC correct

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Minnow Project #: 217202.0036
Date Results Required By:

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Kbatchelar@minnow.ca, Danika.Gerylo@teck.com

Trich SD

Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Analysis Required	Analysis Required	Analysis Required	Number of Containers	Comments
196 1 ✓	RG_LIDCOM_INV-1_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	
197 2 ✓	RG_LIDCOM_INV-2_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	
198 3 ✓	RG_LIDCOM_INV-3_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	
199 4 ✓	RG_LIDCOM_INV-4_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	
200 5 ✓	RG_LIDCOM_INV-5_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	Proj # 2021-240
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Samples Relinquished to Lab By: (Minnow Employee Signature) Date: Time: Shipment Method: Pacific Coastal cargo in iced cooler

Samples Received in Lab By: (Lab Employee Signature) Date: 27 Jul 2021 Time: 15:30 Sample Condition upon Receipt: in cooler, cold / Frozen

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

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Laboratory: Trich Analytics

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Kbatchelar@minnow.ca, Danika.Gerylo@teck.com

				Analysis Required						
Sample Number	Minnow Sample ID	Date Sampled	Matrix	Moisture (Freeze Drying)	Full Metals including Hg				Number of Containers	Comments
Trich ID										
201 1 ✓	RG_LIDSL_INV-1_2021-07-14	14-Jul-21	Invertebrate tissue	x	x				1	
202 2 ✓	RG_LIDSL_INV-2_2021-07-14	14-Jul-21	Invertebrate tissue	x	x				1	
203 3 ✓	RG_LIDSL_INV-3_2021-07-14	14-Jul-21	Invertebrate tissue	x	x				1	
204 4 ✓	RG_LIDSL_INV-4_2021-07-14	14-Jul-21	Invertebrate tissue	x	x				1	
205 5 ✓	RG_LIDSL_INV-5_2021-07-14	14-Jul-21	Invertebrate tissue	x	x				1	Proj # 2021-240
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature)	Date: 27 Jul 2021	Time: 15:30	Sample Condition upon Receipt: In cooler, frozen

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

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Trich ID	Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Analysis Required	Analysis Required	Analysis Required	Number of Containers	Comments
206	1 ✓	RG_LILC3_INV-1_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	
207	2 ✓	RG_LILC3_INV-2_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	
208	3 ✓	RG_LILC3_INV-3_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	
209	4 ✓	RG_LILC3_INV-4_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	
210	5 ✓	RG_LILC3_INV-5_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	Proj # 2021-240
	6										
	7										
	8										
	9										
	10										
	11										
	12										
	13										
	14										
	15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature)	Date: 27 Jul 2021	Time: 15:30	Sample Condition upon Receipt: In cooler, frozen

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

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Minnow Project #: 217202.0036
Date Results Required By:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Kbatchelar@minnow.ca, Danika.Gerylo@teck.com

Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Analysis Required	Analysis Required	Analysis Required	Number of Containers	Comments
Trich ID										
Z11 1 ✓	RG_LISP24_INV-1_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	
Z12 2 ✓	RG_LISP24_INV-2_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	
Z13 3 ✓	RG_LISP24_INV-3_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	
Z14 4 ✓	RG_LISP24_INV-4_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	
Z15 5 ✓	RG_LISP24_INV-5_2021-07-12	12-Jul-21	Invertebrate tissue	x	x				1	Proj # 2021-240
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature)	Date: 27 Jul 2021	Time: 15:30	Sample Condition upon Receipt: In cooler, frozen

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Date Results Required By:

Report mailing list: tyler.mehler@minnow.ca; Cait.Good@teck.com; Kbatchelar@minnow.ca, Danika.Gerylo@teck.com

Trich ID	Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Analysis Required	Analysis Required	Analysis Required	Number of Containers	Comments
216	1 ✓	RG_SLINE_INV-1_2021-07-13	13-Jul-21	Invertebrate tissue	x	x				1	Proj # 2021-240
217	2 ✓	RG_SLINE_INV-2_2021-07-13	13-Jul-21	Invertebrate tissue	x	x				1	
218	3 ✓	RG_SLINE_INV-3_2021-07-13	13-Jul-21	Invertebrate tissue	x	x				1	
219	4 ✓	RG_SLINE_INV-4_2021-07-13	13-Jul-21	Invertebrate tissue	x	x				1	
220	5 ✓	RG_SLINE_INV-5_2021-07-13	13-Jul-21	Invertebrate tissue	x	x				1	
	6										
	7										
	8										
	9										
	10										
	11										
	12										
	13										
	14										
	15										

Samples Relinquished to Lab By: (Minnow Employee Signature) Date: Time: Shipment Method: Pacific Coastal cargo in iced cooler

Samples Received in Lab By: (Lab Employee Signature) Date: 27 Jul 2021 Time: 15:30 Sample Condition upon Receipt: In cooler, frozen

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

BENTHIC TISSUE CHEMISTRY

TrichAnalytics Laboratory Report 2021-264

(Finalized October 19, 2021)

TrichAnalytics Inc.

Tissue Microchemistry Analysis Report

Client: Tyler Mehler
Aquatic Scientist
Minnow Environmental
Phone: (205) 595-1627
Email: tyler.mehler@minnow.ca

Date Received:	28 Sep 2021
Date of Analysis:	15 Oct 2021
Final Report Date:	19 Oct 2021
Project No.:	2021-264
Method No.:	MET-002.05

Client Project: LINE CREEK LAEMP (21-36) (PO 748530)

Analytical Request: Composite-Taxa Benthic Invertebrate Tissue (total metals and moisture) - 54 samples.
See chain of custody form provided for sample identification numbers.

Notes:

Analytical results are expressed in parts per million (ppm) dry weight (equivalent to mg/kg).
Samples quantified using DORM-4, NIST-1566b, and NIST-2976 certified reference standards.
Aluminum concentrations above 1,000 ppm are outside linear range of the calibration curve.
RPD values calculated according to the British Columbia Environmental Laboratory Manual (2020) criteria.
Client specific DQO for Selenium accuracy is 90% to 110% of the certified value (result achieved 108%; range 105-109%).

This report provides the analytical results only for tissue samples noted above as received from the Client.

Reviewed and Approved by Jennie Christensen, PhD, RPBio — 19 Oct 2021 (Date)

TrichAnalytics Inc.
207-1753 Sean Heights
Saanichton, BC V8M 0B3
www.trichanalytics.com

CALA Testing Accreditation No. A4196

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LI24_INV-1_2021-09-16	RG_LI24_INV-2_2021-09-16	RG_LI24_INV-3_2021-09-16	RG_LI24_INV-4_2021-09-16	RG_LI24_INV-5_2021-09-16
		Lab ID	511	512	513	514	515
		Wet Weight (g)	0.3479	0.3986	0.6504	0.4277	0.4662
		Dry Weight (g)	0.0738	0.1086	0.1370	0.0985	0.1183
		Moisture (%)	78.8	72.8	78.9	77.0	74.6
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.008	0.027	0.462	0.362	0.168	0.220	0.245
11B	0.096	0.320	0.681	0.775	0.493	0.376	0.423
23Na	1.5	5.0	4,893	4,020	3,920	5,024	4,167
24Mg	0.018	0.060	1,650	1,927	1,628	1,965	1,531
27Al	0.036	0.120	273	327	76	106	101
31P	37	123	14,592	13,454	12,457	15,146	12,838
39K	3.2	11	14,519	13,470	12,720	13,115	14,130
44Ca	9.7	32	3,413	5,428	2,976	3,786	2,290
49Ti	0.262	0.873	17	17	4.5	5.4	5.7
51V	0.062	0.207	1.2	1.1	0.839	0.584	0.486
52Cr	0.186	0.620	9.6	10	3.4	6.6	4.0
55Mn	0.010	0.033	14	17	11	16	12
57Fe	1.1	3.7	304	366	116	209	152
59Co	0.008	0.027	0.639	0.436	0.286	0.544	0.313
60Ni	0.048	0.160	18	22	9.0	15	7.1
63Cu	0.018	0.060	17	16	13	14	17
66Zn	0.340	1.1	353	353	320	380	368
75As	0.454	1.5	1.3	1.5	1.4	1.6	1.1
77Se	0.386	1.3	7.2	6.1	3.8	4.3	8.5
88Sr	0.001	0.003	7.4	10	6.5	8.7	5.3
95Mo	0.001	0.003	0.395	0.452	0.320	0.320	0.301
107Ag	0.001	0.003	0.091	0.087	0.063	0.061	0.081
111Cd	0.065	0.217	1.2	0.987	0.680	0.893	0.773
118Sn	0.011	0.037	0.499	0.266	0.226	0.367	0.227
121Sb	0.004	0.013	0.032	0.047	0.018	0.015	0.016
137Ba	0.001	0.003	17	20	11	13	11
202Hg	0.024	0.080	0.068	0.068	0.061	0.061	0.053
205Tl	0.001	0.003	0.055	0.068	0.036	0.046	0.037
208Pb	0.001	0.003	0.122	0.261	0.069	0.054	0.054
238U	0.001	0.003	0.124	0.158	0.084	0.059	0.063

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LIDSL_INV-1_2021-09-14	RG_LIDSL_INV-2_2021-09-14	RG_LIDSL_INV-3_2021-09-14	RG_LIDSL_INV-4_2021-09-14	RG_LIDSL_INV-5_2021-09-14
		Lab ID	516	517	518	519	520
		Wet Weight (g)	0.4843	0.5554	0.6162	0.9215	0.8941
		Dry Weight (g)	0.1202	0.1269	0.1561	0.2369	0.1956
		Moisture (%)	75.2	77.2	74.7	74.3	78.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.008	0.027	0.838	0.507	0.519	0.582	0.529
11B	0.096	0.320	1.2	0.822	0.846	0.799	0.939
23Na	1.5	5.0	4,924	4,307	3,717	4,061	4,316
24Mg	0.018	0.060	1,497	1,301	1,468	1,321	1,502
27Al	0.036	0.120	489	234	201	199	235
31P	37	123	15,140	12,459	11,350	12,992	12,577
39K	3.2	11	16,365	13,016	11,604	13,060	13,098
44Ca	9.7	32	2,325	2,258	2,525	1,567	1,738
49Ti	0.262	0.873	27	15	12	9.5	10
51V	0.062	0.207	1.0	0.509	0.457	0.433	0.473
52Cr	0.186	0.620	5.8	5.4	4.8	4.2	3.6
55Mn	0.010	0.033	137	127	147	176	159
57Fe	1.1	3.7	507	323	301	308	396
59Co	0.008	0.027	2.8	2.4	2.3	2.0	2.5
60Ni	0.048	0.160	24	22	20	16	24
63Cu	0.018	0.060	15	16	17	14	21
66Zn	0.340	1.1	305	342	280	252	333
75As	0.454	1.5	0.634	0.611	0.705	0.658	0.705
77Se	0.386	1.3	7.1	6.2	7.7	6.7	7.5
88Sr	0.001	0.003	4.1	4.4	4.7	2.6	3.3
95Mo	0.001	0.003	0.414	0.339	0.414	0.433	0.504
107Ag	0.001	0.003	0.032	0.024	0.035	0.020	0.020
111Cd	0.065	0.217	4.7	4.6	5.2	3.0	5.4
118Sn	0.011	0.037	0.319	0.179	0.174	0.290	0.220
121Sb	0.004	0.013	0.050	0.042	0.036	0.029	0.036
137Ba	0.001	0.003	26	18	23	17	17
202Hg	0.024	0.080	0.084	0.084	0.084	0.068	0.081
205Tl	0.001	0.003	0.047	0.037	0.029	0.034	0.033
208Pb	0.001	0.003	0.216	0.125	0.152	0.109	0.097
238U	0.001	0.003	0.079	0.073	0.086	0.063	0.083

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_SLINE_INV-1_2021-09-15	RG_SLINE_INV-2_2021-09-15	RG_SLINE_INV-3_2021-09-15	RG_SLINE_INV-4_2021-09-15	RG_SLINE_INV-5_2021-09-15
		Lab ID	521	522	523	524	525
		Wet Weight (g)	0.4578	0.2773	0.6174	0.4629	0.7902
		Dry Weight (g)	0.0903	0.0620	0.1245	0.1196	0.1747
		Moisture (%)	80.3	77.6	79.8	74.2	77.9
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.008	0.027	0.461	0.234	0.325	0.217	0.252
11B	0.096	0.320	1.4	0.635	1.1	1.2	2.3
23Na	1.5	5.0	3,469	3,519	3,317	3,519	3,396
24Mg	0.018	0.060	1,986	1,660	1,829	1,549	2,044
27Al	0.036	0.120	576	198	552	132	327
31P	37	123	14,097	12,969	12,797	13,136	13,056
39K	3.2	11	13,238	12,853	12,772	14,201	14,919
44Ca	9.7	32	4,116	2,743	2,797	2,816	3,040
49Ti	0.262	0.873	29	9.2	30	5.1	15
51V	0.062	0.207	1.1	0.847	1.1	0.599	0.878
52Cr	0.186	0.620	11	11	7.1	3.0	6.2
55Mn	0.010	0.033	44	23	44	40	84
57Fe	1.1	3.7	442	321	418	210	288
59Co	0.008	0.027	0.827	0.626	0.617	0.411	0.773
60Ni	0.048	0.160	21	19	13	8.6	12
63Cu	0.018	0.060	15	14	16	15	14
66Zn	0.340	1.1	434	353	523	408	629
75As	0.454	1.5	1.1	1.1	1.3	1.3	1.0
77Se	0.386	1.3	7.3	7.2	9.0	5.4	7.3
88Sr	0.001	0.003	11	6.1	7.2	6.0	8.3
95Mo	0.001	0.003	0.441	0.504	0.546	0.504	0.546
107Ag	0.001	0.003	0.076	0.066	0.066	0.040	0.060
111Cd	0.065	0.217	2.3	2.5	3.1	3.2	2.9
118Sn	0.011	0.037	0.707	0.696	0.337	0.435	0.206
121Sb	0.004	0.013	0.039	0.025	0.030	0.029	0.042
137Ba	0.001	0.003	45	21	56	61	109
202Hg	0.024	0.080	0.073	0.065	0.073	0.077	0.130
205Tl	0.001	0.003	0.066	0.082	0.090	0.074	0.097
208Pb	0.001	0.003	0.180	0.076	0.189	0.113	0.231
238U	0.001	0.003	0.201	0.134	0.162	0.313	0.471

Notes:

ppm = parts per million

DL = detection limit

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g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LI8_INV-1_2021-09-11	RG_LI8_INV-2_2021-09-11	RG_LI8_INV-3_2021-09-11	RG_LI8_INV-4_2021-09-11	RG_LI8_INV-5_2021-09-11
		Lab ID	526	527	528	529	530
		Wet Weight (g)	1.7965	0.8584	1.3887	1.4729	1.4373
		Dry Weight (g)	0.3795	0.1793	0.3402	0.3317	0.3456
		Moisture (%)	78.9	79.1	75.5	77.5	76.0
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.008	0.027	0.620	0.446	0.443	0.541	0.448
11B	0.096	0.320	2.0	0.829	0.525	0.565	0.792
23Na	1.5	5.0	4,601	3,526	3,048	4,194	3,541
24Mg	0.018	0.060	1,994	1,502	957	1,432	1,207
27Al	0.036	0.120	337	225	215	386	241
31P	37	123	12,532	10,734	10,934	14,524	10,519
39K	3.2	11	14,064	12,668	10,030	12,719	10,789
44Ca	9.7	32	3,452	2,868	1,365	1,415	2,412
49Ti	0.262	0.873	22	11	9.6	18	15
51V	0.062	0.207	1.3	0.500	0.378	0.537	0.395
52Cr	0.186	0.620	3.4	7.2	4.7	2.8	3.1
55Mn	0.010	0.033	65	38	42	40	50
57Fe	1.1	3.7	263	290	177	173	178
59Co	0.008	0.027	1.3	1.0	0.494	0.739	0.893
60Ni	0.048	0.160	23	20	14	12	17
63Cu	0.018	0.060	21	18	10	12	11
66Zn	0.340	1.1	510	419	298	305	331
75As	0.454	1.5	0.666	0.474	<0.454	0.651	0.542
77Se	0.386	1.3	9.3	7.4	7.2	8.8	7.2
88Sr	0.001	0.003	6.5	5.2	2.8	3.4	3.9
95Mo	0.001	0.003	0.525	0.326	0.315	0.245	0.245
107Ag	0.001	0.003	0.030	0.023	0.015	0.016	0.016
111Cd	0.065	0.217	3.8	3.1	2.7	4.1	4.7
118Sn	0.011	0.037	0.570	0.473	0.175	0.111	0.178
121Sb	0.004	0.013	0.070	0.044	0.028	0.027	0.035
137Ba	0.001	0.003	30	21	15	18	13
202Hg	0.024	0.080	0.102	0.057	0.065	0.091	0.073
205Tl	0.001	0.003	0.040	0.024	0.014	0.025	0.029
208Pb	0.001	0.003	0.238	0.119	0.094	0.090	0.107
238U	0.001	0.003	0.173	0.083	0.044	0.068	0.050

Notes:

ppm = parts per million

DL = detection limit

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g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LI8_INVLUM-1_2021-09-11	RG_LI8_INVLUM-2_2021-09-11	RG_LI8_INVLUM-3_2021-09-11	RG_FRUL_INV-1_2021-09-12	RG_FRUL_INV-2_2021-09-12
		Lab ID	531	532	533	534	535
		Wet Weight (g)	0.0314	0.0183	0.0454	1.1371	1.3464
		Dry Weight (g)	0.0098	0.0102	0.0128	0.4663	0.2636
		Moisture (%)	68.8	44.3	71.8	59.0	80.4
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.008	0.027	6.2	3.3	2.6	0.737	2.4
11B	0.096	0.320	9.0	11	6.7	0.678	0.749
23Na	1.5	5.0	2,715	1,671	2,755	3,712	7,205
24Mg	0.018	0.060	3,149	2,159	2,380	1,903	1,454
27Al	0.036	0.120	7,240	7,745	5,321	129	152
31P	37	123	12,079	8,921	11,025	11,814	10,787
39K	3.2	11	13,435	8,846	13,824	12,044	11,154
44Ca	9.7	32	70,745	27,861	27,408	3,136	2,845
49Ti	0.262	0.873	644	948	585	8.4	9.5
51V	0.062	0.207	13	11	12	0.373	0.330
52Cr	0.186	0.620	301	72	134	10	5.3
55Mn	0.010	0.033	140	87	94	20	26
57Fe	1.1	3.7	7,066	3,218	3,251	271	187
59Co	0.008	0.027	13	4.3	3.9	0.728	0.649
60Ni	0.048	0.160	459	121	217	15	9.1
63Cu	0.018	0.060	14	9.9	15	22	22
66Zn	0.340	1.1	607	577	634	327	235
75As	0.454	1.5	5.0	3.4	5.0	<0.454	<0.454
77Se	0.386	1.3	7.9	5.5	7.7	10	10
88Sr	0.001	0.003	119	59	43	3.7	3.2
95Mo	0.001	0.003	0.817	0.735	1.6	0.204	0.245
107Ag	0.001	0.003	0.053	0.026	0.042	0.234	0.278
111Cd	0.065	0.217	12	9.3	13	0.798	2.1
118Sn	0.011	0.037	1.0	0.935	1.9	0.170	0.208
121Sb	0.004	0.013	0.311	0.208	0.302	0.019	0.013
137Ba	0.001	0.003	676	519	421	17	18
202Hg	0.024	0.080	0.163	0.163	0.173	0.073	0.091
205Tl	0.001	0.003	0.286	0.220	0.241	0.015	0.018
208Pb	0.001	0.003	2.1	1.2	1.1	0.050	0.065
238U	0.001	0.003	1.3	0.492	0.411	0.029	0.025

Notes:

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% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_FRUL_INV-3_2021-09-12	RG_FRUL_INV-4_2021-09-12	RG_FRUL_INV-5_2021-09-12	RG_FO23_INV-1_2021-09-12	RG_FO23_INV-2_2021-09-12
		Lab ID	536	537	538	539	540
		Wet Weight (g)	0.6835	0.8354	1.6901	0.5807	0.3671
		Dry Weight (g)	0.1938	0.1357	0.3423	0.1422	0.0913
		Moisture (%)	71.6	83.8	79.7	75.5	75.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.008	0.027	0.510	1.5	1.1	1.1	0.634
11B	0.096	0.320	0.311	0.961	0.835	0.880	1.2
23Na	1.5	5.0	2,464	10,971	4,471	5,428	4,092
24Mg	0.018	0.060	851	1,675	1,829	2,148	1,762
27Al	0.036	0.120	67	266	134	266	171
31P	37	123	7,358	12,315	11,159	12,505	11,427
39K	3.2	11	8,550	11,567	8,815	10,133	9,721
44Ca	9.7	32	1,366	3,843	4,119	4,554	3,254
49Ti	0.262	0.873	3.2	13	10	19	12
51V	0.062	0.207	0.175	0.548	0.325	0.490	0.404
52Cr	0.186	0.620	3.5	7.2	3.1	7.4	9.8
55Mn	0.010	0.033	12	39	28	25	23
57Fe	1.1	3.7	84	240	167	240	273
59Co	0.008	0.027	0.343	0.971	0.598	1.1	1.1
60Ni	0.048	0.160	4.8	12	5.7	12	19
63Cu	0.018	0.060	18	18	21	19	22
66Zn	0.340	1.1	174	206	327	475	421
75As	0.454	1.5	<0.454	<0.454	<0.454	0.534	<0.454
77Se	0.386	1.3	7.2	9.9	11	8.1	7.2
88Sr	0.001	0.003	1.2	3.7	5.4	5.9	4.7
95Mo	0.001	0.003	0.163	0.306	0.275	0.217	0.183
107Ag	0.001	0.003	0.242	0.213	0.253	0.151	0.122
111Cd	0.065	0.217	0.438	3.0	1.7	1.3	0.861
118Sn	0.011	0.037	0.135	0.298	0.184	0.139	0.113
121Sb	0.004	0.013	0.011	0.027	0.030	0.027	0.029
137Ba	0.001	0.003	5.4	22	25	19	15
202Hg	0.024	0.080	0.054	0.073	0.083	0.074	0.065
205Tl	0.001	0.003	0.012	0.030	0.019	0.019	0.016
208Pb	0.001	0.003	0.024	0.131	0.078	0.061	0.073
238U	0.001	0.003	0.015	0.037	0.044	0.028	0.022

Notes:

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g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_FO23_INV-3_2021-09-12	RG_FO23_INV-4_2021-09-12	RG_FO23_INV-5_2021-09-12	RG_LISP24_INV-1_2021-09-13	RG_LISP24_INV-2_2021-09-13
		Lab ID	541	542	543	544	545
		Wet Weight (g)	0.4210	0.1214	0.6760	0.6779	0.6524
		Dry Weight (g)	0.0809	0.0279	0.1502	0.1474	0.1369
		Moisture (%)	80.8	77.0	77.8	78.3	79.0
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.008	0.027	0.542	0.879	0.377	0.331	0.411
11B	0.096	0.320	0.731	3.5	0.537	0.581	0.567
23Na	1.5	5.0	2,668	2,790	3,606	3,098	2,987
24Mg	0.018	0.060	1,236	1,390	1,937	1,315	1,343
27Al	0.036	0.120	214	1,707	133	160	139
31P	37	123	8,616	9,394	9,597	10,940	10,291
39K	3.2	11	7,421	9,490	8,378	8,429	8,042
44Ca	9.7	32	2,750	5,070	2,391	1,999	1,727
49Ti	0.262	0.873	12	118	7.5	10	7.2
51V	0.062	0.207	0.394	3.5	0.202	0.387	0.341
52Cr	0.186	0.620	6.5	72	2.8	2.4	3.8
55Mn	0.010	0.033	21	38	15	127	105
57Fe	1.1	3.7	234	2,060	121	342	375
59Co	0.008	0.027	0.815	5.9	0.646	1.6	2.3
60Ni	0.048	0.160	13	107	6.2	13	11
63Cu	0.018	0.060	12	15	19	18	13
66Zn	0.340	1.1	280	448	292	211	190
75As	0.454	1.5	<0.454	0.815	<0.454	<0.454	0.478
77Se	0.386	1.3	5.8	7.0	7.1	6.0	6.5
88Sr	0.001	0.003	4.4	6.4	4.1	3.4	2.7
95Mo	0.001	0.003	0.286	0.618	0.206	0.309	0.343
107Ag	0.001	0.003	0.105	0.058	0.087	0.017	0.017
111Cd	0.065	0.217	1.2	3.4	0.734	3.4	2.6
118Sn	0.011	0.037	0.251	0.847	0.121	0.198	0.138
121Sb	0.004	0.013	0.035	0.051	0.026	0.024	0.029
137Ba	0.001	0.003	15	48	11	14	11
202Hg	0.024	0.080	0.046	0.046	0.065	0.065	0.056
205Tl	0.001	0.003	0.019	0.049	0.016	0.021	0.049
208Pb	0.001	0.003	0.071	0.357	0.041	0.073	0.071
238U	0.001	0.003	0.035	0.084	0.015	0.050	0.040

Notes:

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DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LISP24_INV-3_2021-09-13	RG_LISP24_INV-4_2021-09-13	RG_LISP24_INV-5_2021-09-13	RG_LIDCOM_INV-1_2021-09-13	RG_LIDCOM_INV-2_2021-09-13
		Lab ID	546	547	548	549	550
		Wet Weight (g)	0.6631	0.5590	0.8217	0.6396	0.5370
		Dry Weight (g)	0.1614	0.1092	0.1867	0.1352	0.1057
		Moisture (%)	75.7	80.5	77.3	78.9	80.3
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.008	0.027	0.528	0.873	0.720	0.460	0.663
11B	0.096	0.320	0.760	1.6	1.3	0.667	0.881
23Na	1.5	5.0	3,870	5,155	5,050	3,985	4,560
24Mg	0.018	0.060	1,228	1,801	1,662	1,285	1,697
27Al	0.036	0.120	230	629	372	264	382
31P	37	123	12,817	15,010	14,947	10,993	13,391
39K	3.2	11	9,933	16,328	13,332	12,098	13,999
44Ca	9.7	32	1,806	3,168	2,201	2,324	3,076
49Ti	0.262	0.873	17	44	24	14	23
51V	0.062	0.207	0.541	1.4	0.977	0.599	0.686
52Cr	0.186	0.620	3.2	9.9	6.1	6.4	7.5
55Mn	0.010	0.033	169	204	118	63	82
57Fe	1.1	3.7	436	867	525	246	339
59Co	0.008	0.027	3.7	4.7	2.3	0.940	1.7
60Ni	0.048	0.160	19	36	16	20	27
63Cu	0.018	0.060	19	27	21	14	18
66Zn	0.340	1.1	325	377	217	207	320
75As	0.454	1.5	0.619	0.874	0.674	0.587	0.674
77Se	0.386	1.3	8.5	8.3	8.2	6.7	7.4
88Sr	0.001	0.003	3.4	5.3	3.8	4.4	6.4
95Mo	0.001	0.003	0.435	0.618	0.533	0.320	0.469
107Ag	0.001	0.003	0.017	0.033	0.027	0.027	0.036
111Cd	0.065	0.217	4.6	7.3	3.0	2.4	4.3
118Sn	0.011	0.037	0.137	0.592	0.274	0.166	0.274
121Sb	0.004	0.013	0.034	0.059	0.044	0.024	0.032
137Ba	0.001	0.003	14	27	15	19	22
202Hg	0.024	0.080	0.065	0.070	0.094	0.055	0.070
205Tl	0.001	0.003	0.032	0.045	0.048	0.025	0.031
208Pb	0.001	0.003	0.102	0.231	0.140	0.072	0.102
238U	0.001	0.003	0.063	0.104	0.068	0.060	0.069

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LIDCOM_INV-3_2021-09-13	RG_LIDCOM_INV-4_2021-09-13	RG_LIDCOM_INV-5_2021-09-13	RG_LILC3_INV-1_2021-09-09	RG_LILC3_INV-2_2021-09-09
		Lab ID	551	552	553	554	555
		Wet Weight (g)	0.6393	0.6011	0.4718	1.8004	1.8931
		Dry Weight (g)	0.1485	0.1356	0.1050	0.3697	0.4247
		Moisture (%)	76.8	77.4	77.7	79.5	77.6
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.008	0.027	0.552	0.363	0.615	0.789	1.2
11B	0.096	0.320	0.587	0.734	1.2	1.3	1.4
23Na	1.5	5.0	3,886	2,700	3,644	3,963	6,011
24Mg	0.018	0.060	1,442	1,308	1,557	1,538	1,632
27Al	0.036	0.120	225	248	650	561	858
31P	37	123	12,679	10,907	11,575	11,860	16,643
39K	3.2	11	12,510	9,658	11,853	11,803	19,375
44Ca	9.7	32	1,600	2,087	3,390	3,058	1,540
49Ti	0.262	0.873	14	12	36	39	61
51V	0.062	0.207	0.467	0.553	1.0	1.2	1.1
52Cr	0.186	0.620	3.8	3.9	11	4.3	4.4
55Mn	0.010	0.033	78	55	66	151	133
57Fe	1.1	3.7	212	218	472	833	736
59Co	0.008	0.027	0.996	0.950	1.3	2.8	1.8
60Ni	0.048	0.160	17	13	29	20	16
63Cu	0.018	0.060	19	15	18	25	13
66Zn	0.340	1.1	310	217	241	220	174
75As	0.454	1.5	0.749	0.549	0.524	0.686	0.796
77Se	0.386	1.3	8.5	5.4	6.3	9.9	8.6
88Sr	0.001	0.003	3.0	4.0	5.8	5.6	3.5
95Mo	0.001	0.003	0.405	0.320	0.501	0.618	0.423
107Ag	0.001	0.003	0.038	0.033	0.038	0.027	0.016
111Cd	0.065	0.217	2.8	2.6	4.5	4.5	1.5
118Sn	0.011	0.037	0.213	0.196	0.385	0.471	0.234
121Sb	0.004	0.013	0.023	0.040	0.565	0.058	0.057
137Ba	0.001	0.003	19	18	25	21	22
202Hg	0.024	0.080	0.105	0.070	0.070	0.094	0.111
205Tl	0.001	0.003	0.027	0.028	0.032	0.031	0.063
208Pb	0.001	0.003	0.077	0.094	0.172	0.201	0.198
238U	0.001	0.003	0.062	0.074	0.070	0.086	0.048

Notes:

ppm = parts per million

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g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LILC3_INV-3_2021-09-09	RG_LCUT_INV-1_2021-09-10	RG_LCUT_INV-2_2021-09-10	RG_LCUT_INV-3_2021-09-10	RG_LCUT_INV-4_2021-09-10
		Lab ID	556	557	558	559	560
		Wet Weight (g)	1.7814	1.6766	0.9264	1.4155	0.7652
		Dry Weight (g)	0.4404	0.4256	0.2078	0.3047	0.1843
		Moisture (%)	75.3	74.6	77.6	78.5	75.9
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.008	0.027	0.804	0.680	0.860	0.618	0.748
11B	0.096	0.320	0.939	1.5	1.8	1.5	2.0
23Na	1.5	5.0	5,950	3,541	5,242	3,783	4,356
24Mg	0.018	0.060	1,550	1,289	1,767	1,321	1,581
27Al	0.036	0.120	342	706	733	537	670
31P	37	123	15,761	12,349	15,678	10,618	13,668
39K	3.2	11	16,894	12,371	16,337	10,456	13,746
44Ca	9.7	32	1,792	1,578	3,920	2,954	3,468
49Ti	0.262	0.873	22	44	61	25	47
51V	0.062	0.207	0.800	1.1	1.2	0.802	1.2
52Cr	0.186	0.620	2.8	4.6	3.9	3.6	6.7
55Mn	0.010	0.033	201	30	21	27	29
57Fe	1.1	3.7	872	271	271	206	344
59Co	0.008	0.027	2.8	0.864	1.1	0.766	0.864
60Ni	0.048	0.160	27	14	12	9.6	16
63Cu	0.018	0.060	20	21	32	30	35
66Zn	0.340	1.1	196	178	202	173	199
75As	0.454	1.5	0.955	0.875	0.862	0.955	1.2
77Se	0.386	1.3	11	5.7	6.2	5.8	7.4
88Sr	0.001	0.003	3.5	3.1	6.4	4.0	5.7
95Mo	0.001	0.003	0.470	0.294	0.423	0.306	0.353
107Ag	0.001	0.003	0.027	0.022	0.032	0.016	0.038
111Cd	0.065	0.217	2.3	1.7	4.5	3.8	4.9
118Sn	0.011	0.037	0.194	0.109	0.350	0.087	0.140
121Sb	0.004	0.013	0.069	0.044	0.043	0.031	0.038
137Ba	0.001	0.003	33	26	26	22	30
202Hg	0.024	0.080	0.115	0.115	0.133	0.106	0.142
205Tl	0.001	0.003	0.062	0.057	0.063	0.049	0.059
208Pb	0.001	0.003	0.203	0.298	0.298	0.230	0.348
238U	0.001	0.003	0.089	0.109	0.156	0.088	0.127

Notes:

ppm = parts per million

DL = detection limit

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< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue Analysis Results

		Client ID	RG_LCUT_INV-5_2021-09-10	RG_LILC3_INV-4_2021-09-10	RG_LILC3_INV-5_2021-09-10	RG_LILC3_INVLUM-3_2021-09-10
		Lab ID	561	562	563	564
		Wet Weight (g)	1.3735	1.4728	1.3954	0.0059
		Dry Weight (g)	0.3603	0.3435	0.3126	0.0031
		Moisture (%)	73.8	76.7	77.6	47.5
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.008	0.027	1.3	0.343	0.520	1.2
11B	0.096	0.320	4.8	0.587	0.631	2.7
23Na	1.5	5.0	2,902	2,808	3,617	3,291
24Mg	0.018	0.060	1,513	1,024	1,245	2,096
27Al	0.036	0.120	3,850	109	208	1,266
31P	37	123	10,260	9,729	11,967	12,262
39K	3.2	11	11,504	9,925	10,088	16,487
44Ca	9.7	32	2,502	978	1,872	6,897
49Ti	0.262	0.873	350	5.0	18	80
51V	0.062	0.207	9.8	0.276	0.553	3.0
52Cr	0.186	0.620	27	1.9	3.0	2.2
55Mn	0.010	0.033	31	59	163	481
57Fe	1.1	3.7	947	268	552	1,406
59Co	0.008	0.027	0.982	1.8	3.5	9.5
60Ni	0.048	0.160	52	7.5	24	73
63Cu	0.018	0.060	29	14	23	24
66Zn	0.340	1.1	191	184	246	462
75As	0.454	1.5	1.1	<0.454	0.689	7.5
77Se	0.386	1.3	6.4	7.2	9.9	15
88Sr	0.001	0.003	9.0	2.0	3.4	25
95Mo	0.001	0.003	0.894	0.259	0.517	0.752
107Ag	0.001	0.003	0.049	0.005	0.016	0.289
111Cd	0.065	0.217	3.1	2.4	7.0	12
118Sn	0.011	0.037	0.399	0.146	0.233	3.2
121Sb	0.004	0.013	0.183	0.025	0.040	0.125
137Ba	0.001	0.003	98	8.5	18	124
202Hg	0.024	0.080	0.160	0.062	0.115	0.213
205Tl	0.001	0.003	0.153	0.030	0.041	0.161
208Pb	0.001	0.003	1.1	0.055	0.120	0.391
238U	0.001	0.003	0.276	0.021	0.070	0.186

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Coal Limited

Tissue QA/QC Relative Percent Difference Results

	Client ID	RG_LI24_INV-1_2021-09-16			RG_LI8_INV-4_2021-09-11			RG_FRUL_INV-5_2021-09-12		
	Lab ID	511			529			538		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.008	0.462	0.471	1.9	0.541	0.588	8.3	1.1	1.1	0.0
11B	0.096	0.681	0.764	-	0.565	0.989	-	0.835	0.745	-
23Na	1.5	4,893	5,117	4.5	4,194	4,181	0.3	4,471	4,703	5.1
24Mg	0.018	1,650	2,020	20	1,432	1,325	7.8	1,829	1,569	15
27Al	0.036	273	347	24	386	345	11	134	111	19
31P	37	14,592	15,725	7.5	14,524	11,912	20	11,159	11,338	1.6
39K	3.2	14,519	15,141	4.2	12,719	14,377	12	8,815	9,017	2.3
44Ca	9.7	3,413	3,685	7.7	1,415	2,248	46	4,119	3,003	31
49Ti	0.262	17	20	16	18	18	0.0	10	6.8	38
51V	0.062	1.2	1.5	22	0.537	0.631	-	0.325	0.226	-
52Cr	0.186	9.6	11	14	2.8	3.4	19	3.1	2.9	6.7
55Mn	0.010	14	18	25	40	58	37	28	21	29
57Fe	1.1	304	373	20	173	241	33	167	128	26
59Co	0.008	0.639	0.758	17	0.739	1.1	39	0.598	0.449	29
60Ni	0.048	18	21	15	12	17	35	5.7	4.0	35
63Cu	0.018	17	18	5.7	12	14	15	21	20	4.9
66Zn	0.340	353	374	5.8	305	366	18	327	269	20
75As	0.454	1.3	1.4	-	0.651	0.678	-	<0.454	<0.454	-
77Se	0.386	7.2	8.1	12	8.8	8.2	7.1	11	12	8.7
88Sr	0.001	7.4	8.6	15	3.4	5.5	47	5.4	3.8	35
95Mo	0.001	0.395	0.471	18	0.245	0.327	29	0.275	0.206	29
107Ag	0.001	0.091	0.091	0.0	0.016	0.016	0.0	0.253	0.244	3.6
111Cd	0.065	1.2	1.1	8.7	4.1	4.5	9.3	1.7	1.3	27
118Sn	0.011	0.499	0.563	12	0.111	0.125	12	0.184	0.145	24
121Sb	0.004	0.032	0.038	-	0.027	0.034	-	0.030	0.019	-
137Ba	0.001	17	19	11	18	26	36	25	20	22
202Hg	0.024	0.068	0.068	-	0.091	0.100	-	0.083	0.102	-
205Tl	0.001	0.055	0.066	18	0.025	0.032	25	0.019	0.015	24
208Pb	0.001	0.122	0.156	25	0.090	0.124	32	0.078	0.054	36
238U	0.001	0.124	0.146	16	0.068	0.070	2.9	0.044	0.031	35

Notes:

ppm = parts per million

RPD = relative percent difference

DL = detection limit

< = less than detection limit

% = percent

Data Quality Objectives:

Laboratory Duplicates - RPD ≤40% for all elements, except Ca and Sr, which are ≤60%

Minimum DQOs apply to individual samples at concentrations above 10x DL

Teck Coal Limited

Tissue QA/QC Relative Percent Difference Results

	Client ID	RG_LISP24_INV-4_2021-09-13			RG_LCUT_INV-2_2021-09-10			RG_LILC3_INV-5_2021-09-10		
	Lab ID	547			558			563		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.008	0.873	0.984	12	0.860	0.832	3.3	0.520	0.568	8.8
11B	0.096	1.6	1.8	12	1.8	1.8	1.0	0.631	0.792	-
23Na	1.5	5,155	5,502	6.5	5,242	4,309	20	3,617	3,774	4.2
24Mg	0.018	1,801	1,980	9.5	1,767	1,467	19	1,245	1,249	0.3
27Al	0.036	629	854	30	733	1,089	39	208	308	39
31P	37	15,010	15,305	1.9	15,678	13,236	17	11,967	10,858	9.7
39K	3.2	16,328	17,757	8.4	16,337	13,139	22	10,088	10,187	1.0
44Ca	9.7	3,168	3,273	3.3	3,920	3,242	19	1,872	2,119	12
49Ti	0.262	44	51	15	61	69	12	18	20	11
51V	0.062	1.4	1.7	19	1.193	1.4	16	0.553	0.870	-
52Cr	0.186	9.9	9.1	8.4	3.9	4.9	23	3.0	3.5	15
55Mn	0.010	204	223	8.9	21	25	20	163	176	7.7
57Fe	1.1	867	1,082	22	271	341	23	552	643	15
59Co	0.008	4.7	5.4	14	1.088	1.2	9.7	3.5	5.0	35
60Ni	0.048	36	40	11	11.9	14	17	24	31	26
63Cu	0.018	27	29	7.1	32	29	11	23	27	16
66Zn	0.340	377	365	3.2	202	177	13	246	306	22
75As	0.454	0.874	0.936	-	0.862	0.875	1.5	0.689	0.742	-
77Se	0.386	8.3	9.0	8.1	6.2	6.2	0.0	9.9	9.5	4.1
88Sr	0.001	5.3	6.1	14	6.4	5.3	18	3.4	4.4	26
95Mo	0.001	0.618	0.704	13	0.423	0.470	10	0.517	0.635	21
107Ag	0.001	0.033	0.044	29	0.032	0.027	18	0.016	0.022	32
111Cd	0.065	7.3	7.5	2.7	4.5	4.2	6.3	7.0	9.6	31
118Sn	0.011	0.592	0.679	14	0.350	0.332	5.3	0.233	0.309	28
121Sb	0.004	0.059	0.084	35	0.043	0.050	14	0.040	0.044	-
137Ba	0.001	27	33	20	26	30	14	18	19	5.4
202Hg	0.024	0.070	0.101	-	0.133	0.129	3.1	0.115	0.111	-
205Tl	0.001	0.045	0.047	4.3	0.063	0.061	3.5	0.041	0.052	24
208Pb	0.001	0.231	0.300	26	0.298	0.425	35	0.120	0.156	26
238U	0.001	0.104	0.150	36	0.156	0.177	12	0.070	0.083	17

Notes:

ppm = parts per million

RPD = relative percent difference

DL = detection limit

< = less than detection limit

% = percent

Data Quality Objectives:

Laboratory Duplicates - RPD ≤40% for all elements, except Ca and Sr, which are ≤60%

Minimum DQOs apply to individual samples at concentrations above 10x DL

Teck Coal Limited

Tissue QA/QC Accuracy and Precision Results

			Sample Group ID	01			02	
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.008	1.21	1.3	106	4.0	1.3	111	5.8
11B	0.096	4.5	5.1	114	3.0	5.3	118	4.3
23Na	1.5	14,000	15,099	108	3.6	15,178	108	4.7
24Mg	0.018	910	1,010	111	4.8	1,005	110	3.5
27Al	0.036	197.2	223	113	10	213	108	4.3
31P	37	8,000	8,659	108	3.4	8,720	109	2.0
39K	3.2	15,500	16,722	108	4.7	17,508	113	3.6
44Ca	9.7	2,360	2,517	107	2.5	2,578	109	3.7
49Ti	0.262	12.24	15	119	16	12	100	11
51V	0.062	1.57	1.5	99	8.9	1.9	119	5.0
52Cr	0.186	1.87	2.0	108	3.8	2.1	114	3.6
55Mn	0.010	3.17	3.6	113	4.4	3.5	110	2.4
57Fe	1.1	343	380	111	4.4	387	113	2.1
59Co	0.008	0.25	0.275	110	6.3	0.298	119	3.5
60Ni	0.048	1.34	1.6	119	4.2	1.5	114	3.1
63Cu	0.018	15.7	19	120	5.2	18	113	2.7
66Zn	0.340	51.6	56	109	3.6	58	113	4.0
75As	0.454	6.87	7.2	105	2.4	7.3	106	3.0
77Se	0.386	3.45	3.6	105	6.3	3.7	107	1.4
88Sr	0.001	10.1	11	105	3.0	12	114	3.2
95Mo	0.001	0.29	0.328	113	7.7	0.324	112	5.8
107Ag	0.001	0.0252	0.029	116	7.4	0.032	128	8.6
111Cd	0.065	0.299	0.332	111	5.9	0.347	116	12
118Sn	0.011	0.061	0.062	101	19	0.085	140	12
121Sb	0.004	0.011	0.013	114	19	0.015	134	8.5
137Ba	0.001	8.6	9.4	109	5.2	9.7	113	4.3
202Hg	0.024	0.412	0.440	107	5.3	0.440	107	2.9
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.382	94	16	0.470	116	11
238U	0.001	0.05	0.047	95	8.0	0.059	117	4.9

Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified values for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

Tl certified concentration from NIST-2976.

Accuracy and precision for Tl are not reported as the certified concentration is too close to the reportable detection limit.

Teck Coal Limited

Tissue QA/QC Accuracy and Precision Results

			Sample Group ID	03			04	
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.008	1.21	1.2	102	6.3	1.3	111	5.6
11B	0.096	4.5	4.6	102	5.6	4.7	106	2.1
23Na	1.5	14,000	14,859	106	7.9	15,640	112	1.3
24Mg	0.018	910	936	103	5.2	1,037	114	4.1
27Al	0.036	197.2	204	103	6.7	195	99	4.6
31P	37	8,000	8,257	103	5.4	8,764	110	2.4
39K	3.2	15,500	16,210	105	6.1	16,316	105	4.1
44Ca	9.7	2,360	2,442	104	5.0	2,583	110	1.0
49Ti	0.262	12.24	14	113	7.6	12	100	12
51V	0.062	1.57	1.6	99	4.5	1.7	107	4.2
52Cr	0.186	1.87	2.0	106	4.5	2.0	106	2.2
55Mn	0.010	3.17	3.2	101	4.1	3.6	112	4.4
57Fe	1.1	343	347	101	3.1	380	111	2.4
59Co	0.008	0.25	0.262	105	4.0	0.270	108	2.0
60Ni	0.048	1.34	1.4	106	3.5	1.5	112	2.2
63Cu	0.018	15.7	17	110	5.0	17	109	3.4
66Zn	0.340	51.6	54	105	4.7	58	112	2.7
75As	0.454	6.87	7.5	109	4.8	7.2	105	1.8
77Se	0.386	3.45	3.8	109	7.7	3.7	107	4.6
88Sr	0.001	10.1	10	101	7.7	12	114	2.3
95Mo	0.001	0.29	0.282	97	9.4	0.325	112	3.1
107Ag	0.001	0.0252	0.024	93	12	0.028	111	9.3
111Cd	0.065	0.299	0.316	106	4.8	0.343	115	9.5
118Sn	0.011	0.061	0.057	93	11	0.067	110	10
121Sb	0.004	0.011	0.011	103	19	0.011	98	19
137Ba	0.001	8.6	8.7	101	1.5	8.7	101	1.7
202Hg	0.024	0.412	0.461	112	1.6	0.420	102	8.8
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.446	110	14	0.449	111	6.9
238U	0.001	0.05	0.048	95	7.9	0.055	110	1.6

Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified values for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

Tl certified concentration from NIST-2976.

Accuracy and precision for Tl are not reported as the certified concentration is too close to the reportable detection limit.

Teck Coal Limited

Tissue QA/QC Accuracy and Precision Results

		Sample Group ID	05			06		
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.008	1.21	1.3	105	2.3	1.3	107	4.0
11B	0.096	4.5	4.8	106	2.6	4.9	110	4.1
23Na	1.5	14,000	14,728	105	1.5	14,035	100	1.0
24Mg	0.018	910	995	109	3.1	926	102	3.2
27Al	0.036	197.2	199	101	4.6	216	110	5.1
31P	37	8,000	8,360	104	2.5	8,029	100	4.2
39K	3.2	15,500	16,523	107	3.9	15,957	103	3.2
44Ca	9.7	2,360	2,468	105	3.0	2,426	103	4.3
49Ti	0.262	12.24	13	108	13	14	116	18
51V	0.062	1.57	1.9	119	9.0	1.5	97	8.7
52Cr	0.186	1.87	2.0	107	2.5	1.9	103	4.8
55Mn	0.010	3.17	3.5	111	4.3	3.4	106	3.0
57Fe	1.1	343	367	107	3.5	368	107	2.6
59Co	0.008	0.25	0.280	112	4.4	0.273	109	2.6
60Ni	0.048	1.34	1.5	113	5.6	1.4	107	4.5
63Cu	0.018	15.7	18	113	5.5	17	108	3.6
66Zn	0.340	51.6	53	103	2.6	56	109	0.9
75As	0.454	6.87	7.2	105	5.8	7.3	106	2.0
77Se	0.386	3.45	3.7	109	4.8	3.7	108	2.6
88Sr	0.001	10.1	11	106	4.3	11	107	2.0
95Mo	0.001	0.29	0.292	101	8.8	0.320	110	8.4
107Ag	0.001	0.0252	0.028	113	8.6	0.025	99	12
111Cd	0.065	0.299	0.346	116	5.6	0.328	110	10
118Sn	0.011	0.061	0.070	114	17	0.065	107	19
121Sb	0.004	0.011	0.011	99	15	0.010	100	16
137Ba	0.001	8.6	8.8	102	1.7	9.3	109	5.7
202Hg	0.024	0.412	0.432	105	8.0	0.471	114	3.2
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.460	114	9.9	0.432	107	10
238U	0.001	0.05	0.059	118	13	0.053	106	12

Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified values for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

Tl certified concentration from NIST-2976.

Accuracy and precision for Tl are not reported as the certified concentration is too close to the reportable detection limit.

Teck Coal Limited
Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
01	RG_LI24_INV-1_2021-09-16	511	15 Oct 2021
	RG_LI24_INV-2_2021-09-16	512	
	RG_LI24_INV-3_2021-09-16	513	
	RG_LI24_INV-4_2021-09-16	514	
	RG_LI24_INV-5_2021-09-16	515	
	RG_LIDSL_INV-1_2021-09-14	516	
	RG_LIDSL_INV-2_2021-09-14	517	
	RG_LIDSL_INV-3_2021-09-14	518	
	RG_LIDSL_INV-4_2021-09-14	519	
02	RG_LIDSL_INV-5_2021-09-14	520	15 Oct 2021
	RG_SLINE_INV-1_2021-09-15	521	
	RG_SLINE_INV-2_2021-09-15	522	
	RG_SLINE_INV-3_2021-09-15	523	
	RG_SLINE_INV-4_2021-09-15	524	
	RG_SLINE_INV-5_2021-09-15	525	
	RG_LI8_INV-1_2021-09-11	526	
	RG_LI8_INV-2_2021-09-11	527	
	RG_LI8_INV-3_2021-09-11	528	
03	RG_LI8_INV-4_2021-09-11	529	15 Oct 2021
	RG_LI8_INV-5_2021-09-11	530	
	RG_LI8_INVLUM-1_2021-09-11	531	
	RG_LI8_INVLUM-2_2021-09-11	532	
	RG_LI8_INVLUM-3_2021-09-11	533	
	RG_FRUL_INV-1_2021-09-12	534	
	RG_FRUL_INV-2_2021-09-12	535	
	RG_FRUL_INV-3_2021-09-12	536	
	RG_FRUL_INV-4_2021-09-12	537	
04	RG_FRUL_INV-5_2021-09-12	538	15 Oct 2021
	RG_FO23_INV-1_2021-09-12	539	
	RG_FO23_INV-2_2021-09-12	540	
	RG_FO23_INV-3_2021-09-12	541	
	RG_FO23_INV-4_2021-09-12	542	
	RG_FO23_INV-5_2021-09-12	543	
	RG_LISP24_INV-1_2021-09-13	544	
	RG_LISP24_INV-2_2021-09-13	545	
	RG_LISP24_INV-3_2021-09-13	546	
05	RG_LISP24_INV-4_2021-09-13	547	15 Oct 2021
	RG_LISP24_INV-5_2021-09-13	548	
	RG_LIDCOM_INV-1_2021-09-13	549	
	RG_LIDCOM_INV-2_2021-09-13	550	

Teck Coal Limited
Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
05	RG_LIDCOM_INV-3_2021-09-13	551	15 Oct 2021
	RG_LIDCOM_INV-4_2021-09-13	552	
	RG_LIDCOM_INV-5_2021-09-13	553	
	RG_LILC3_INV-1_2021-09-09	554	
06	RG_LILC3_INV-2_2021-09-09	555	15 Oct 2021
	RG_LILC3_INV-3_2021-09-09	556	
	RG_LCUT_INV-1_2021-09-10	557	
	RG_LCUT_INV-2_2021-09-10	558	
	RG_LCUT_INV-3_2021-09-10	559	
	RG_LCUT_INV-4_2021-09-10	560	
	RG_LCUT_INV-5_2021-09-10	561	
	RG_LILC3_INV-4_2021-09-10	562	
	RG_LILC3_INV-5_2021-09-10	563	
	RG_LILC3_INVLUM-3_2021-09-10	564	

TrichAnalytics Inc. 207-1753 Sean Heights, Saanichton, BC, V8M 0B3 Ph: (250) 532-1084	Chain of Custody (COC) for LA-ICP-MS Analysis

Invoicing		Reporting (if different from Invoicing)	
Project Number: LINE CREEK LAEMP (21-36) (PO 748530)			
Company Name:	Teck Coal Limited	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Tyler Mehler
Address:	421 Pine Avenue	Address:	2 Lamb Street
City, Province:	Sparwood, BC	City, Province:	Georgetown, ON
Postal Code:	V0B 2G0	Postal Code:	L7G 2G7
Phone:	250-425-8202	Phone:	
Email:	cait.good@teck.com	Email:	

Sample Analysis Requested

TRICH ID		Sample Identification:	Sample Type: Species	Sample Type: Sample type
511	1	RG_LI24_INV-1_2021-09-16	Composite	Composite-taxa benthic invertebrate tissue samples
512	2	RG_LI24_INV-2_2021-09-16	Composite	Composite-taxa benthic invertebrate tissue samples
513	3	RG_LI24_INV-3_2021-09-16	Composite	Composite-taxa benthic invertebrate tissue samples
514	4	RG_LI24_INV-4_2021-09-16	Composite	Composite-taxa benthic invertebrate tissue samples
515	5	RG_LI24_INV-5_2021-09-16	Composite	Composite-taxa benthic invertebrate tissue samples
516	6	RG_LIDSL_INV-1_2021-09-14	Composite	Composite-taxa benthic invertebrate tissue samples
517	7	RG_LIDSL_INV-2_2021-09-14	Composite	Composite-taxa benthic invertebrate tissue samples
518	8	RG_LIDSL_INV-3_2021-09-14	Composite	Composite-taxa benthic invertebrate tissue samples
519	9	RG_LIDSL_INV-4_2021-09-14	Composite	Composite-taxa benthic invertebrate tissue samples
520	10	RG_LIDSL_INV-5_2021-09-14	Composite	Composite-taxa benthic invertebrate tissue samples
521	11	RG_SLINE_INV-1_2021-09-15	Composite	Composite-taxa benthic invertebrate tissue samples
522	12	RG_SLINE_INV-2_2021-09-15	Composite	Composite-taxa benthic invertebrate tissue samples
523	13	RG_SLINE_INV-3_2021-09-15	Composite	Composite-taxa benthic invertebrate tissue samples
524	14	RG_SLINE_INV-4_2021-09-15	Composite	Composite-taxa benthic invertebrate tissue samples
525	15	RG_SLINE_INV-5_2021-09-15	Composite	Composite-taxa benthic invertebrate tissue samples
	16	RG_LCUT_INV-6_2021-09-11 *	Composite	Composite-taxa benthic invertebrate tissue samples
526	17	RG_LI8_INV-1_2021-09-11	Composite	Composite-taxa benthic invertebrate tissue samples
527	18	RG_LI8_INV-2_2021-09-11	Composite	Composite-taxa benthic invertebrate tissue samples
528	19	RG_LI8_INV-3_2021-09-11	Composite	Composite-taxa benthic invertebrate tissue samples
529	20	RG_LI8_INV-4_2021-09-11	Composite	Composite-taxa benthic invertebrate tissue samples

Sample(s) Released By:		Sample(s) Received By:	Alex Wade
Signature:		Signature:	
Date Sent:		Date Received: (lab)	28 Sep 2021 (Proj # 2021-264) aw 05 Oct 2021
Sample(s) Returned to Client By:		Shipping Conditions:	
		Shipping Container:	
Signature:		Date Sent:	

* missing sample → client confirmed mistake (no sample) aw 05 Oct 2021

COM-011.01

TrichAnalytics Inc. 207-1753 Sean Heights, Saanichton, BC, V8M 0B3 Ph: (250) 532-1084	Chain of Custody (COC) for LA-ICP-MS Analysis

Invoicing		Reporting (if different from Invoicing)	
Project Number: LINE CREEK LAEMP (21-36) (PO 748530)			
Company Name:	Teck Coal Limited	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Tyler Mehler
Address:	421 Pine Avenue	Address:	2 Lamb Street
City, Province:	Sparwood, BC	City, Province:	Georgetown, ON
Postal Code:	V0B 2G0	Postal Code:	L7G 2G7
Phone:	250-425-8202	Phone:	250-595-1627
Email:	cait.good@teck.com	Email:	pschnurr@minnow.ca

Sample Analysis Requested

TRICH ID		Sample Identification:	Sample Type: Species	Sample Type: Sample type
530	21	RG_LI8_INV-5_2021-09-11	Composite	Composite-taxa benthic invertebrate tissue samples
531	22	RG_LI8_INVLUM-1_2021-09-11	Composite	Composite-taxa benthic invertebrate tissue samples
532	23	RG_LI8_INVLUM-2_2021-09-11	Composite	Composite-taxa benthic invertebrate tissue samples
533	24	RG_LI8_INVLUM-3_2021-09-11	Composite	Composite-taxa benthic invertebrate tissue samples
534	25	RG_FRUL_INV-1_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
535	26	RG_FRUL_INV-2_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
536	27	RG_FRUL_INV-3_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
537	28	RG_FRUL_INV-4_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
538	29	RG_FRUL_INV-5_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
539	30	RG_FO23_INV-1_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
540	31	RG_FO23_INV-2_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
541	32	RG_FO23_INV-3_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
542	33	RG_FO23_INV-4_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
543	34	RG_FO23_INV-5_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
544	35	RG_LISP24_INV-1_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
545	36	RG_LISP24_INV-2_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
546	37	RG_LISP24_INV-3_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
547	38	RG_LISP24_INV-4_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
548	39	RG_LISP24_INV-5_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
549	40	RG_LIDCOM_INV-1_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples

aw 05 oct 2021

Sample(s) Released By:	Sample(s) Received By: Alex Wade
Signature:	Signature:
Date Sent:	Date Received: 28 Sep 2021 (lab) (Proj # 2021-264) aw 05 oct 2021
Sample(s) Returned to Client By:	Shipping Conditions:
	Shipping Container:
Signature:	Date Sent:

TrichAnalytics Inc. 207-1753 Sean Heights, Saanichton, BC, V8M 0B3 Ph: (250) 532-1084	Chain of Custody (COC) for LA-ICP-MS Analysis

Invoicing		Reporting (if different from Invoicing)	
Project Number: LINE CREEK LAEMP (21-36) (PO 748530)			
Company Name:	Teck Coal Limited	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Tyler Mehler
Address:	421 Pine Avenue	Address:	2 Lamb Street
City, Province:	Sparwood, BC	City, Province:	Georgetown, ON
Postal Code:	V0B 2G0	Postal Code:	L7G 2G7
Phone:	250-425-8202	Phone:	
Email:	cait.good@teck.com	Email:	

Sample Analysis Requested

TRICH ID		Sample Identification:	Sample Type: Species	Sample Type: Sample type
556	41	RG_LIDCOM_INV-2_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
551	42	RG_LIDCOM_INV-3_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
552	43	RG_LIDCOM_INV-4_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
553	44	RG_LIDCOM_INV-5_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
554	45	RG_LILC3_INV-1_2021-09-09	Composite	Composite-taxa benthic invertebrate tissue samples
555	46	RG_LILC3_INV-2_2021-09-09	Composite	Composite-taxa benthic invertebrate tissue samples
556	47	RG_LILC3_INV-3_2021-09-09	Composite	Composite-taxa benthic invertebrate tissue samples
557	48	RG_LCUT_INV-1_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
558	49	RG_LCUT_INV-2_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
559	50	RG_LCUT_INV-3_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
560	51	RG_LCUT_INV-4_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
561	52	RG_LCUT_INV-5_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
562	53	RG_LILC3_INV-4_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
563	54	RG_LILC3_INV-5_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
564	55	RG_LILC3_INVLUM-3_2021-09-10	Composite	Lumbriculidae tissue sample
	56	RG_L18_INVLUM-1_2021-09-11 *	Composite	Composite-taxa benthic invertebrate tissue samples
	57	RG_L18_INVLUM-2_2021-09-11 *	Composite	Lumbriculidae tissue sample
	58	RG_L18_INVLUM-3_2021-09-11 *	Composite	Composite-taxa benthic invertebrate tissue samples
	59		Composite	Composite-taxa benthic invertebrate tissue samples
	60		Composite	Composite-taxa benthic invertebrate tissue samples

Sample(s) Released By:	Sample(s) Received By: Alex Wade
Signature:	Signature:
Date Sent:	Date Received: 28 Sep 2021 (Proj # 2021-264) AW 05 Oct 2021
Sample(s) Returned to Client By:	Shipping Conditions:
	Shipping Container:
Signature:	Date Sent:

AW 05 Oct 2021 * missing samples → client confirmed mistake (no samples) AW 05 Oct 2021

BENTHIC TISSUE CHEMISTRY

TrichAnalytics Laboratory Report 2021-282

(Finalized December 17, 2021)

TrichAnalytics Inc.

Tissue Microchemistry Analysis Report

Client: Tyler Mehler
Aquatic Scientist
Minnow Environmental
Phone: (587) 597-1612
Email: tyler.mehler@minnow.ca; cybele.heddle@teck.com; kbatchelar@minnow.ca; jessica.ritz@teck.com

Date Received:	10 Dec 2021
Date of Analysis:	14 Dec 2021
Final Report Date:	17 Dec 2021
Project No.:	2021-282
Method No.:	MET-002.05

Client Project: LCO LAEMP (PO 748530)

Analytical Request: Benthic Invertebrate Tissue Microchemistry (total metals and moisture) - 50 samples.
See chain of custody form provided for sample identification numbers.

Notes:

Analytical results are expressed in parts per million (ppm) dry weight (equivalent to mg/kg).
Samples quantified using DORM-4, NIST-1566b, and NIST-2976 certified reference standards.
Aluminum concentrations above 1,000 ppm are outside linear range of the calibration curve.
RPD values calculated according to the British Columbia Environmental Laboratory Manual (2020) criteria.
Client specific DQO for Selenium accuracy is 90-110% of the certified value; result achieved 100% (ranging from 94-108%).

This report provides the analytical results only for tissue samples noted above as received from the Client.

Reviewed and Approved by Jennie Christensen, PhD, RPBio — 17 Dec 2021 (Date)

TrichAnalytics Inc.
207-1753 Sean Heights
Saanichton, BC V8M 0B3
www.trichanalytics.com

CALA Testing Accreditation No. A4196

Minnow Environmental

Tissue Analysis Results

		Client ID	RG_FO23_INV-1_2021-12-01	RG_FO23_INV-2_2021-12-01	RG_FO23_INV-3_2021-12-01	RG_FO23_INV-4_2021-12-01	RG_FO23_INV-5_2021-12-01
		Lab ID	078	079	080	081	082
		Wet Weight (g)	1.0326	0.8180	1.5476	1.3539	1.4215
		Dry Weight (g)	0.1879	0.1594	0.2512	0.2648	0.2737
		Moisture (%)	81.8	80.5	83.8	80.4	80.7
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.013	0.043	1.3	1.1	0.652	1.2	0.675
11B	0.101	0.337	3.1	3.4	1.1	3.5	2.3
23Na	1.5	5.0	3,667	3,019	2,892	3,857	2,388
24Mg	0.031	0.103	2,025	1,648	1,611	1,860	1,325
27Al	0.046	0.153	1,646	1,917	533	2,242	819
31P	41	137	13,230	11,390	10,906	12,502	10,577
39K	8.4	28	12,951	12,911	8,469	14,251	8,965
44Ca	27	90	7,191	6,527	2,741	5,609	4,150
49Ti	0.001	0.003	79	144	32	179	42
51V	0.055	0.183	2.3	2.8	1.0	3.6	1.6
52Cr	0.396	1.3	13	18	7.9	12	5.9
55Mn	0.013	0.043	41	39	20	37	21
57Fe	2.5	8.3	955	1,056	325	997	406
59Co	0.011	0.037	2.2	3.3	0.791	3.2	0.800
60Ni	0.044	0.147	23	30	12	22	11
63Cu	0.007	0.023	20	21	18	22	15
66Zn	0.489	1.6	495	576	302	628	300
75As	0.436	1.5	0.751	0.829	<0.436	1.1	0.544
77Se	0.335	1.1	7.7	7.7	6.2	8.6	5.5
88Sr	0.001	0.003	8.6	8.8	3.7	8.0	4.9
95Mo	0.001	0.003	0.475	0.475	0.211	0.580	0.237
107Ag	0.001	0.003	0.135	0.089	0.126	0.086	0.086
111Cd	0.058	0.193	2.1	3.1	0.848	4.7	1.1
118Sn	0.027	0.090	0.578	0.644	0.688	1.3	0.408
121Sb	0.006	0.020	0.063	0.051	0.028	0.060	0.033
137Ba	0.001	0.003	21	57	15	60	21
202Hg	0.029	0.097	0.106	0.089	0.065	0.106	0.073
205Tl	0.001	0.003	0.047	0.041	0.021	0.048	0.022
208Pb	0.002	0.007	0.321	0.336	0.103	0.369	0.167
238U	0.001	0.003	0.138	0.117	0.036	0.103	0.058

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Minnow Environmental

Tissue Analysis Results

		Client ID	RG_FRUL_INV-1_2021-11-29	RG_FRUL_INV-2_2021-11-29	RG_FRUL_INV-3_2021-11-29	RG_FRUL_INV-4_2021-11-29	RG_FRUL_INV-5_2021-11-29
		Lab ID	083	084	085	086	087
		Wet Weight (g)	0.6049	2.4925	1.0288	1.1565	1.2925
		Dry Weight (g)	0.1201	0.4443	0.1815	0.1835	0.2232
		Moisture (%)	80.1	82.2	82.4	84.1	82.7
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.013	0.043	0.699	0.554	0.944	0.826	0.512
11B	0.101	0.337	1.8	0.770	0.781	0.712	0.661
23Na	1.5	5.0	2,975	3,954	4,075	5,559	2,680
24Mg	0.031	0.103	1,308	1,183	985	1,149	1,676
27Al	0.046	0.153	612	325	285	244	306
31P	41	137	9,228	10,488	8,060	9,781	7,713
39K	8.4	28	10,456	8,906	8,514	10,372	5,615
44Ca	27	90	5,597	2,770	2,196	2,333	3,133
49Ti	0.001	0.003	27	19	21	14	18
51V	0.055	0.183	1.8	0.670	0.731	0.515	0.618
52Cr	0.396	1.3	11	3.0	4.5	4.4	4.0
55Mn	0.013	0.043	34	16	15	20	20
57Fe	2.5	8.3	664	198	246	203	168
59Co	0.011	0.037	0.959	0.301	0.458	0.314	0.337
60Ni	0.044	0.147	17	3.9	6.0	6.5	6.9
63Cu	0.007	0.023	15	18	12	28	14
66Zn	0.489	1.6	288	269	156	240	199
75As	0.436	1.5	0.466	<0.436	<0.436	<0.436	<0.436
77Se	0.335	1.1	7.8	8.2	7.4	9.8	6.2
88Sr	0.001	0.003	5.9	3.7	2.3	2.8	3.5
95Mo	0.001	0.003	0.224	0.158	0.185	0.237	0.154
107Ag	0.001	0.003	0.186	0.241	0.160	0.275	0.241
111Cd	0.058	0.193	1.3	0.804	0.982	0.714	0.592
118Sn	0.027	0.090	0.498	0.170	0.351	0.393	0.237
121Sb	0.006	0.020	0.043	0.022	0.019	0.023	0.018
137Ba	0.001	0.003	43	17	11	16	18
202Hg	0.029	0.097	0.073	0.081	0.065	0.081	0.074
205Tl	0.001	0.003	0.023	0.010	0.013	0.012	0.013
208Pb	0.002	0.007	0.216	0.098	0.088	0.073	0.068
238U	0.001	0.003	0.079	0.039	0.028	0.033	0.024

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

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g = grams

% = percent

Minnow Environmental

Tissue Analysis Results

		Client ID	RG_LCUT_INV-1_2021-12-01	RG_LCUT_INV-2_2021-12-01	RG_LCUT_INV-3_2021-12-01	RG_LCUT_INV-4_2021-12-01	RG_LCUT_INV-5_2021-12-01
		Lab ID	088	089	090	091	092
		Wet Weight (g)	1.7130	1.5190	1.8169	1.9727	1.6076
		Dry Weight (g)	0.3590	0.3237	0.4321	0.3461	0.3284
		Moisture (%)	79.0	78.7	76.2	82.5	79.6
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.013	0.043	1.0	0.891	0.641	0.771	0.678
11B	0.101	0.337	1.6	2.1	1.5	1.7	1.4
23Na	1.5	5.0	3,492	2,553	2,265	2,339	2,250
24Mg	0.031	0.103	1,134	1,217	999	1,228	768
27Al	0.046	0.153	426	1,025	777	620	705
31P	41	137	11,109	9,228	8,556	7,971	6,041
39K	8.4	28	11,237	9,558	7,706	8,620	6,812
44Ca	27	90	2,145	3,122	2,332	3,771	2,274
49Ti	0.001	0.003	30	78	55	53	40
51V	0.055	0.183	0.785	2.1	1.3	1.3	1.4
52Cr	0.396	1.3	3.8	11	2.8	7.4	7.6
55Mn	0.013	0.043	22	19	12	10	9.8
57Fe	2.5	8.3	223	334	266	274	309
59Co	0.011	0.037	0.862	1.2	0.900	0.914	0.926
60Ni	0.044	0.147	11	24	12	15	18
63Cu	0.007	0.023	19	33	28	25	34
66Zn	0.489	1.6	148	174	123	124	161
75As	0.436	1.5	1.3	1.2	0.755	0.901	1.1
77Se	0.335	1.1	4.5	3.7	3.7	3.9	2.7
88Sr	0.001	0.003	3.8	4.9	3.4	6.2	3.3
95Mo	0.001	0.003	0.307	0.358	0.333	0.256	0.307
107Ag	0.001	0.003	0.021	0.041	0.021	0.027	0.041
111Cd	0.058	0.193	2.3	2.6	1.5	1.9	2.7
118Sn	0.027	0.090	0.277	0.407	0.143	0.451	0.333
121Sb	0.006	0.020	0.054	0.064	0.057	0.047	0.045
137Ba	0.001	0.003	49	32	23	23	15
202Hg	0.029	0.097	0.127	0.098	0.094	0.123	0.090
205Tl	0.001	0.003	0.037	0.046	0.042	0.031	0.035
208Pb	0.002	0.007	0.319	0.287	0.204	0.220	0.204
238U	0.001	0.003	0.103	0.098	0.077	0.077	0.059

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

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Tissue Analysis Results

		Client ID	RG_LI8_INV-1_2021-12-02	RG_LI8_INV-2_2021-12-02	RG_LI8_INV-3_2021-12-02	RG_LI8_INV-4_2021-12-02	RG_LI8_INV-5_2021-12-02
		Lab ID	093	094	095	096	097
		Wet Weight (g)	2.0363	1.9079	1.0015	1.5234	1.8380
		Dry Weight (g)	0.4155	0.4555	0.2518	0.3362	0.4112
		Moisture (%)	79.6	76.1	74.9	77.9	77.6
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.013	0.043	0.333	0.580	0.311	0.580	0.742
11B	0.101	0.337	0.698	1.0	0.474	1.3	2.1
23Na	1.5	5.0	1,925	3,349	1,653	3,142	3,209
24Mg	0.031	0.103	893	1,382	918	1,648	1,596
27Al	0.046	0.153	347	552	237	718	996
31P	41	137	5,757	10,812	6,868	10,552	10,535
39K	8.4	28	5,395	9,884	4,824	8,897	9,977
44Ca	27	90	1,406	1,876	1,163	2,305	2,935
49Ti	0.001	0.003	19	39	12	49	74
51V	0.055	0.183	0.657	0.970	0.561	1.2	1.6
52Cr	0.396	1.3	3.5	3.5	2.2	4.4	6.1
55Mn	0.013	0.043	26	53	30	49	54
57Fe	2.5	8.3	162	272	153	317	424
59Co	0.011	0.037	0.548	0.532	0.447	1.1	1.1
60Ni	0.044	0.147	9.2	14	6.8	14	22
63Cu	0.007	0.023	12	14	10	14	19
66Zn	0.489	1.6	267	170	183	450	334
75As	0.436	1.5	<0.436	0.490	<0.436	0.718	0.603
77Se	0.335	1.1	4.2	6.3	4.5	8.0	7.2
88Sr	0.001	0.003	2.4	3.7	2.8	5.0	5.7
95Mo	0.001	0.003	0.230	0.281	0.230	0.377	0.290
107Ag	0.001	0.003	0.021	0.014	0.007	0.028	0.028
111Cd	0.058	0.193	2.1	1.7	2.0	5.7	6.1
118Sn	0.027	0.090	0.220	0.230	0.153	0.406	0.601
121Sb	0.006	0.020	0.021	0.038	0.018	0.038	0.061
137Ba	0.001	0.003	11	17	9.0	21	24
202Hg	0.029	0.097	0.066	0.066	0.066	0.100	0.109
205Tl	0.001	0.003	0.015	0.022	0.014	0.053	0.058
208Pb	0.002	0.007	0.073	0.111	0.049	0.185	0.263
238U	0.001	0.003	0.034	0.080	0.030	0.101	0.103

Notes:

ppm = parts per million

DL = detection limit

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g = grams

% = percent

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Tissue Analysis Results

		Client ID	RG_LI24_INV-1_2021-11-30	RG_LI24_INV-2_2021-11-30	RG_LI24_INV-3_2021-11-30	RG_LI24_INV-4_2021-11-30	RG_LI24_INV-5_2021-11-30
		Lab ID	098	099	100	101	102
		Wet Weight (g)	0.9765	0.8753	1.1588	0.9740	1.1191
		Dry Weight (g)	0.2135	0.1549	0.2291	0.1883	0.2226
		Moisture (%)	78.1	82.3	80.2	80.7	80.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.013	0.043	0.262	0.318	0.511	0.377	0.498
11B	0.101	0.337	0.650	0.739	1.1	0.946	0.709
23Na	1.5	5.0	4,060	2,962	5,116	3,458	3,647
24Mg	0.031	0.103	1,509	1,202	1,564	1,495	1,515
27Al	0.046	0.153	229	244	366	331	323
31P	41	137	13,007	9,668	14,381	12,295	12,110
39K	8.4	28	12,050	8,549	12,958	12,046	10,996
44Ca	27	90	3,050	2,858	3,313	3,397	3,273
49Ti	0.001	0.003	12	11	15	16	12
51V	0.055	0.183	1.8	1.2	1.9	1.6	1.2
52Cr	0.396	1.3	3.4	4.3	4.1	3.5	5.0
55Mn	0.013	0.043	13	15	16	19	19
57Fe	2.5	8.3	159	168	214	191	234
59Co	0.011	0.037	0.527	0.587	0.721	0.977	0.906
60Ni	0.044	0.147	8.7	8.1	9.1	7.4	10
63Cu	0.007	0.023	12	14	13	14	12
66Zn	0.489	1.6	401	344	466	402	367
75As	0.436	1.5	1.5	1.3	1.9	2.0	1.4
77Se	0.335	1.1	6.8	6.0	8.3	9.0	6.7
88Sr	0.001	0.003	8.0	7.1	8.3	8.6	8.4
95Mo	0.001	0.003	0.348	0.348	0.377	0.377	0.319
107Ag	0.001	0.003	0.042	0.070	0.077	0.070	0.063
111Cd	0.058	0.193	1.6	1.7	1.8	2.6	2.0
118Sn	0.027	0.090	0.880	1.2	1.1	1.2	1.1
121Sb	0.006	0.020	0.023	0.019	0.029	0.028	0.031
137Ba	0.001	0.003	15	15	17	19	19
202Hg	0.029	0.097	0.064	0.064	0.091	0.100	0.064
205Tl	0.001	0.003	0.099	0.075	0.089	0.098	0.093
208Pb	0.002	0.007	0.125	0.100	0.128	0.128	0.132
238U	0.001	0.003	0.082	0.069	0.093	0.096	0.094

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

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g = grams

% = percent

Minnow Environmental

Tissue Analysis Results

		Client ID	RG_LIDCOM_INV-1_2021-12-02	RG_LIDCOM_INV-2_2021-12-02	RG_LIDCOM_INV-3_2021-12-02	RG_LIDCOM_INV-4_2021-12-02	RG_LIDCOM_INV-5_2021-12-02
		Lab ID	103	104	105	106	107
		Wet Weight (g)	1.6818	1.7639	2.0175	2.7554	1.6759
		Dry Weight (g)	0.3427	0.4245	0.3738	0.5722	0.3705
		Moisture (%)	79.6	75.9	81.5	79.2	77.9
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.013	0.043	0.545	0.560	0.678	0.491	0.567
11B	0.101	0.337	0.857	1.6	0.958	0.988	0.869
23Na	1.5	5.0	3,559	2,664	4,304	2,483	3,021
24Mg	0.031	0.103	1,165	1,040	1,462	1,048	1,314
27Al	0.046	0.153	414	671	651	576	556
31P	41	137	9,667	7,956	12,469	7,751	9,068
39K	8.4	28	8,847	6,951	12,143	7,040	8,104
44Ca	27	90	1,629	2,008	2,613	1,918	1,887
49Ti	0.001	0.003	16	46	37	36	32
51V	0.055	0.183	0.680	1.1	0.883	0.871	0.970
52Cr	0.396	1.3	4.0	3.9	3.5	3.1	5.5
55Mn	0.013	0.043	77	106	102	72	58
57Fe	2.5	8.3	287	497	390	352	355
59Co	0.011	0.037	0.888	1.0	1.4	0.689	0.969
60Ni	0.044	0.147	15	19	19	13	14
63Cu	0.007	0.023	13	15	20	14	17
66Zn	0.489	1.6	167	153	295	174	226
75As	0.436	1.5	0.474	0.532	0.532	0.473	<0.436
77Se	0.335	1.1	5.0	4.8	6.0	4.7	5.4
88Sr	0.001	0.003	3.4	3.5	4.4	3.8	4.1
95Mo	0.001	0.003	0.290	0.451	0.528	0.404	0.311
107Ag	0.001	0.003	0.021	0.015	0.030	0.038	0.030
111Cd	0.058	0.193	1.3	1.3	4.4	1.4	1.9
118Sn	0.027	0.090	0.466	0.491	0.745	0.262	0.464
121Sb	0.006	0.020	0.029	0.041	0.033	0.037	0.033
137Ba	0.001	0.003	14	20	23	23	18
202Hg	0.029	0.097	0.073	0.090	0.100	0.090	0.070
205Tl	0.001	0.003	0.035	0.028	0.049	0.028	0.027
208Pb	0.002	0.007	0.093	0.212	0.147	0.147	0.123
238U	0.001	0.003	0.038	0.089	0.083	0.066	0.058

Notes:

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g = grams

% = percent

Minnow Environmental

Tissue Analysis Results

		Client ID	RG_LIDSL_INV-1_2021-11-29	RG_LIDSL_INV-2_2021-11-29	RG_LIDSL_INV-3_2021-11-29	RG_LIDSL_INV-4_2021-11-29	RG_LIDSL_INV-5_2021-11-29
		Lab ID	108	109	110	111	112
		Wet Weight (g)	3.3397	1.2291	1.0253	0.7426	2.2817
		Dry Weight (g)	0.7826	0.2470	0.2588	0.1663	0.4661
		Moisture (%)	76.6	79.9	74.8	77.6	79.6
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.013	0.043	0.339	0.446	0.408	0.775	0.429
11B	0.101	0.337	1.0	0.764	0.809	1.4	0.764
23Na	1.5	5.0	2,308	2,461	2,363	2,555	2,681
24Mg	0.031	0.103	1,008	1,013	1,024	1,178	1,188
27Al	0.046	0.153	279	270	207	429	148
31P	41	137	8,670	7,969	8,627	9,125	9,654
39K	8.4	28	7,475	7,879	8,460	8,628	8,256
44Ca	27	90	1,414	1,938	1,776	2,811	1,654
49Ti	0.001	0.003	20	16	12	46	7.7
51V	0.055	0.183	0.602	0.660	0.497	1.5	0.354
52Cr	0.396	1.3	2.5	3.4	2.8	11	2.2
55Mn	0.013	0.043	182	198	109	213	162
57Fe	2.5	8.3	411	502	364	1,155	266
59Co	0.011	0.037	1.7	2.3	2.0	3.1	2.1
60Ni	0.044	0.147	19	20	14	33	17
63Cu	0.007	0.023	17	19	17	20	13
66Zn	0.489	1.6	166	219	227	279	171
75As	0.436	1.5	0.709	0.532	0.591	0.828	0.828
77Se	0.335	1.1	5.0	6.4	5.4	4.9	6.3
88Sr	0.001	0.003	2.8	3.3	3.0	4.6	3.0
95Mo	0.001	0.003	0.342	0.342	0.373	0.435	0.373
107Ag	0.001	0.003	0.023	0.038	0.023	0.030	0.023
111Cd	0.058	0.193	1.7	3.7	3.7	4.8	3.1
118Sn	0.027	0.090	0.311	0.584	0.378	0.926	0.388
121Sb	0.006	0.020	0.049	0.036	0.033	0.050	0.038
137Ba	0.001	0.003	19	19	13	27	15
202Hg	0.029	0.097	0.060	0.100	0.090	0.070	0.080
205Tl	0.001	0.003	0.018	0.024	0.029	0.051	0.026
208Pb	0.002	0.007	0.118	0.090	0.096	0.273	0.068
238U	0.001	0.003	0.047	0.066	0.077	0.107	0.074

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

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g = grams

% = percent

Minnow Environmental

Tissue Analysis Results

		Client ID	RG_LILC3_INV-1_2021-12-01	RG_LILC3_INV-2_2021-12-01	RG_LILC3_INV-3_2021-12-01	RG_LILC3_INV-4_2021-12-01	RG_LILC3_INV-5_2021-12-01
		Lab ID	113	114	115	116	117
		Wet Weight (g)	1.9442	1.4002	1.9321	2.1718	1.6900
		Dry Weight (g)	0.3839	0.2401	0.3858	0.3772	0.3418
		Moisture (%)	80.3	82.9	80.0	82.6	79.8
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.013	0.043	1.1	0.553	0.546	0.815	0.785
11B	0.101	0.337	2.6	0.748	1.0	0.803	1.8
23Na	1.5	5.0	4,230	2,649	2,950	4,385	3,034
24Mg	0.031	0.103	1,653	976	1,099	1,882	1,440
27Al	0.046	0.153	905	178	293	290	805
31P	41	137	12,502	8,176	8,753	12,349	10,031
39K	8.4	28	11,018	7,598	8,254	12,198	9,187
44Ca	27	90	5,370	2,411	2,527	2,635	3,632
49Ti	0.001	0.003	63	7.7	13	15	60
51V	0.055	0.183	2.8	0.538	0.908	0.678	2.5
52Cr	0.396	1.3	6.9	1.9	3.1	2.6	9.9
55Mn	0.013	0.043	534	133	256	238	376
57Fe	2.5	8.3	2,651	548	1,100	897	1,754
59Co	0.011	0.037	6.1	1.9	3.6	2.8	6.3
60Ni	0.044	0.147	44	13	21	17	40
63Cu	0.007	0.023	25	13	19	23	23
66Zn	0.489	1.6	219	133	161	215	223
75As	0.436	1.5	1.4	0.565	0.788	0.840	1.3
77Se	0.335	1.1	9.5	4.0	6.8	8.2	8.0
88Sr	0.001	0.003	9.4	3.1	4.0	3.9	6.5
95Mo	0.001	0.003	0.743	0.283	0.566	0.654	1.1
107Ag	0.001	0.003	0.034	0.017	0.021	0.034	0.025
111Cd	0.058	0.193	3.3	1.5	2.3	1.8	3.1
118Sn	0.027	0.090	1.1	0.328	0.527	0.708	1.0
121Sb	0.006	0.020	0.276	0.132	0.125	0.160	0.290
137Ba	0.001	0.003	64	15	25	22	38
202Hg	0.029	0.097	0.118	0.075	0.064	0.107	0.107
205Tl	0.001	0.003	0.082	0.032	0.039	0.049	0.102
208Pb	0.002	0.007	0.369	0.065	0.119	0.129	0.308
238U	0.001	0.003	0.178	0.068	0.101	0.083	0.152

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Minnow Environmental

Tissue Analysis Results

		Client ID	RG_LISP24_INV-1_2021-11-30	RG_LISP24_INV-2_2021-11-30	RG_LISP24_INV-3_2021-11-30	RG_LISP24_INV-4_2021-11-30	RG_LISP24_INV-5_2021-11-30
		Lab ID	118	119	120	121	122
		Wet Weight (g)	2.2012	1.7079	1.4358	1.0488	1.7355
		Dry Weight (g)	0.5596	0.3918	0.2999	0.2402	0.3582
		Moisture (%)	74.6	77.1	79.1	77.1	79.4
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.013	0.043	0.411	0.673	0.456	0.639	0.570
11B	0.101	0.337	0.876	1.4	0.895	1.4	1.1
23Na	1.5	5.0	2,484	3,573	2,684	3,982	2,941
24Mg	0.031	0.103	1,086	1,294	1,242	1,698	1,300
27Al	0.046	0.153	280	389	149	440	400
31P	41	137	10,965	10,928	9,034	13,838	9,599
39K	8.4	28	7,717	10,214	8,085	12,768	8,550
44Ca	27	90	2,075	2,543	3,394	3,511	2,638
49Ti	0.001	0.003	22	20	8.8	27	27
51V	0.055	0.183	0.566	0.603	0.507	1.1	0.859
52Cr	0.396	1.3	3.4	4.5	2.4	4.7	4.9
55Mn	0.013	0.043	270	410	162	345	166
57Fe	2.5	8.3	449	393	382	916	664
59Co	0.011	0.037	3.0	3.2	3.3	5.1	2.4
60Ni	0.044	0.147	27	27	16	28	21
63Cu	0.007	0.023	14	25	24	25	23
66Zn	0.489	1.6	181	232	379	397	254
75As	0.436	1.5	0.651	0.720	0.788	0.773	0.691
77Se	0.335	1.1	5.0	6.3	4.6	7.2	5.6
88Sr	0.001	0.003	3.3	5.5	5.6	6.4	4.4
95Mo	0.001	0.003	0.389	0.424	0.495	0.502	0.569
107Ag	0.001	0.003	0.017	0.042	0.025	0.030	0.030
111Cd	0.058	0.193	1.8	3.3	7.8	13	4.4
118Sn	0.027	0.090	0.329	0.476	0.777	0.877	0.792
121Sb	0.006	0.020	0.098	0.125	0.052	0.055	0.049
137Ba	0.001	0.003	26	37	13	38	20
202Hg	0.029	0.097	0.075	0.091	0.064	0.100	0.078
205Tl	0.001	0.003	0.026	0.046	0.041	0.077	0.040
208Pb	0.002	0.007	0.100	0.200	0.056	0.156	0.128
238U	0.001	0.003	0.047	0.104	0.069	0.111	0.086

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

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Tissue Analysis Results

		Client ID	RG_SLINE_INV-1_2021-11-29	RG_SLINE_INV-2_2021-11-29	RG_SLINE_INV-3_2021-11-29	RG_SLINE_INV-4_2021-11-29	RG_SLINE_INV-5_2021-11-29
		Lab ID	123	124	125	126	127
		Wet Weight (g)	1.3886	1.0100	1.1667	0.6980	1.2796
		Dry Weight (g)	0.3342	0.1859	0.2325	0.1426	0.2134
		Moisture (%)	75.9	81.6	80.1	79.6	83.3
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.013	0.043	0.660	0.339	0.424	0.381	0.339
11B	0.101	0.337	1.8	0.780	1.0	1.2	0.780
23Na	1.5	5.0	2,584	3,416	2,965	4,277	3,140
24Mg	0.031	0.103	1,384	1,600	1,193	1,794	1,423
27Al	0.046	0.153	565	265	441	386	366
31P	41	137	10,800	11,592	9,020	13,155	10,562
39K	8.4	28	9,287	11,636	8,493	13,425	8,994
44Ca	27	90	2,616	2,931	2,528	3,852	2,571
49Ti	0.001	0.003	43	14	34	21	19
51V	0.055	0.183	1.1	0.950	0.983	1.6	0.940
52Cr	0.396	1.3	5.0	2.2	3.3	3.9	3.3
55Mn	0.013	0.043	24	13	16	21	18
57Fe	2.5	8.3	329	157	242	234	197
59Co	0.011	0.037	0.420	0.345	0.379	0.679	0.442
60Ni	0.044	0.147	8.5	8.6	6.9	9.3	6.0
63Cu	0.007	0.023	14	19	11	18	19
66Zn	0.489	1.6	306	457	308	684	481
75As	0.436	1.5	1.1	1.2	1.1	1.5	0.921
77Se	0.335	1.1	7.1	8.0	5.6	11	7.5
88Sr	0.001	0.003	5.2	5.7	5.8	8.9	6.1
95Mo	0.001	0.003	0.602	0.301	0.234	0.468	0.368
107Ag	0.001	0.003	0.076	0.083	0.045	0.113	0.121
111Cd	0.058	0.193	2.4	3.5	2.3	6.3	3.3
118Sn	0.027	0.090	0.338	0.620	0.479	1.3	1.1
121Sb	0.006	0.020	0.037	0.016	0.019	0.019	0.017
137Ba	0.001	0.003	36	15	16	25	20
202Hg	0.029	0.097	0.100	0.128	0.100	0.145	0.139
205Tl	0.001	0.003	0.095	0.095	0.067	0.113	0.070
208Pb	0.002	0.007	0.110	0.119	0.119	0.111	0.082
238U	0.001	0.003	0.114	0.131	0.091	0.200	0.113

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

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Tissue QA/QC Relative Percent Difference Results

Client ID		RG_LI8_INV-4_2021-12-02			RG_LI24_INV-3_2021-11-30			RG_LILC3_INV-1_2021-12-01		
Lab ID		096			100			113		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.013	0.580	0.636	9.2	0.511	0.371	32	1.1	0.957	14
11B	0.101	1.3	1.7	27	1.1	1.0	-	2.6	2.2	17
23Na	1.5	3,142	3,149	0.2	5,116	4,455	14	4,230	4,301	1.7
24Mg	0.031	1,648	1,747	5.8	1,564	1,680	7.2	1,653	1,609	2.7
27Al	0.046	718	722	0.6	366	250	38	905	818	10
31P	41	10,552	10,565	0.1	14,381	13,085	9.4	12,502	12,837	2.6
39K	8.4	8,897	10,074	12	12,958	12,217	5.9	11,018	12,685	14
44Ca	27	2,305	2,944	24	3,313	3,402	2.7	5,370	4,254	23
49Ti	0.001	49	41	18	15	13	14	63	66	4.7
51V	0.055	1.2	1.1	8.7	1.9	1.7	11	2.8	2.4	15
52Cr	0.396	4.4	5.3	19	4.1	3.6	-	6.9	6.7	2.9
55Mn	0.013	49	53	7.8	16	17	6.1	534	499	6.8
57Fe	2.5	317	309	2.6	214	167	25	2,651	2,312	14
59Co	0.011	1.1	0.918	18	0.721	0.727	0.8	6.1	5.5	10
60Ni	0.044	14	14	0.0	9.1	8.3	9.2	44	37	17
63Cu	0.007	14	19	30	13	12	8.0	25	25	0.0
66Zn	0.489	450	434	3.6	466	380	20	219	226	3.1
75As	0.436	0.718	0.574	-	1.9	1.9	-	1.4	1.1	-
77Se	0.335	8.0	7.1	12	8.3	8.4	1.2	9.5	9.5	0.0
88Sr	0.001	5.0	5.8	15	8.3	7.8	6.2	9.4	7.9	17
95Mo	0.001	0.377	0.334	12	0.377	0.348	8.0	0.743	0.778	4.6
107Ag	0.001	0.028	0.028	0.0	0.077	0.070	9.5	0.034	0.025	31
111Cd	0.058	5.7	5.6	1.8	1.8	1.7	5.7	3.3	2.9	13
118Sn	0.027	0.406	0.499	21	1.1	1.0	9.5	1.1	1.0	9.5
121Sb	0.006	0.038	0.046	-	0.029	0.023	-	0.276	0.234	17
137Ba	0.001	21	20	4.9	17	16	6.1	64	56	13
202Hg	0.029	0.100	0.109	-	0.091	0.100	-	0.118	0.107	-
205Tl	0.001	0.053	0.062	16	0.089	0.089	0.0	0.082	0.075	8.9
208Pb	0.002	0.185	0.161	14	0.128	0.116	9.8	0.369	0.339	8.5
238U	0.001	0.101	0.073	32	0.093	0.089	4.4	0.178	0.181	1.7

Notes:

ppm = parts per million

RPD = relative percent difference

DL = detection limit

< = less than detection limit

% = percent

Data Quality Objectives:

Laboratory Duplicates - RPD ≤40% for all elements, except Ca and Sr, which are ≤60%

Minimum DQOs apply to individual samples at concentrations above 10x DL

Minnow Environmental

Tissue QA/QC Relative Percent Difference Results

	Client ID	RG_LILC3_INV-5_2021-12-01			RG_SLINE_INV-4_2021-11-29		
	Lab ID	117			126		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.013	0.785	0.905	14	0.381	0.300	24
11B	0.101	1.8	1.9	5.4	1.2	0.958	-
23Na	1.5	3,034	3,622	18	4,277	3,585	18
24Mg	0.031	1,440	1,557	7.8	1,794	1,669	7.2
27Al	0.046	805	877	8.6	386	342	12
31P	41	10,031	11,107	10	13,155	12,492	5.2
39K	8.4	9,187	10,809	16	13,425	10,191	27
44Ca	27	3,632	3,711	2.2	3,852	2,882	29
49Ti	0.001	60	81	30	21	17	21
51V	0.055	2.5	2.4	4.1	1.6	1.5	6.5
52Cr	0.396	9.9	11	11	3.9	3.4	-
55Mn	0.013	376	434	14	21	18	15
57Fe	2.5	1,754	2,066	16	234	219	6.6
59Co	0.011	6.3	5.9	6.6	0.679	0.630	7.5
60Ni	0.044	40	53	28	9.3	7.3	24
63Cu	0.007	23	27	16	18	15	18
66Zn	0.489	223	227	1.8	684	670	2.1
75As	0.436	1.3	1.2	-	1.5	1.3	-
77Se	0.335	8.0	6.5	21	11	10	9.5
88Sr	0.001	6.5	6.8	4.5	8.9	6.6	30
95Mo	0.001	1.1	0.884	22	0.468	0.435	7.3
107Ag	0.001	0.025	0.034	31	0.113	0.098	14
111Cd	0.058	3.1	4.1	28	6.3	5.8	8.3
118Sn	0.027	1.0	1.2	18	1.3	1.1	17
121Sb	0.006	0.290	0.220	28	0.019	0.023	-
137Ba	0.001	38	49	25	25	18	33
202Hg	0.029	0.107	0.102	-	0.145	0.111	-
205Tl	0.001	0.102	0.085	18	0.113	0.105	7.3
208Pb	0.002	0.308	0.331	7.2	0.111	0.111	0.0
238U	0.001	0.152	0.145	4.7	0.200	0.184	8.3

Notes:

ppm = parts per million

RPD = relative percent difference

DL = detection limit

< = less than detection limit

% = percent

Data Quality Objectives:

Laboratory Duplicates - RPD ≤40% for all elements, except Ca and Sr, which are ≤60%

Minimum DQOs apply to individual samples at concentrations above 10x DL

Minnow Environmental

Tissue QA/QC Accuracy and Precision Results

		Sample Group ID	01			02		
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.013	1.21	1.3	112	11	1.3	107	7.2
11B	0.101	4.5	5.0	111	3.8	4.9	108	3.2
23Na	1.5	14,000	16,084	115	7.6	14,655	105	4.8
24Mg	0.031	910	1,074	118	9.8	946	104	5.7
27Al	0.046	197.2	203	103	4.6	201	102	5.4
31P	41	8,000	8,781	110	6.6	7,847	98	6.8
39K	8.4	15,500	18,466	119	7.7	15,073	97	8.1
44Ca	27	2,360	2,699	114	7.9	2,494	106	8.6
49Ti	0.001	12.24	14	117	13	13	109	2.5
51V	0.055	1.57	2.0	125	9.4	1.5	95	15
52Cr	0.396	1.87	2.1	114	6.1	2.0	107	4.8
55Mn	0.013	3.17	3.8	121	8.5	3.2	101	7.8
57Fe	2.5	343	406	118	7.0	354	103	5.1
59Co	0.011	0.25	0.306	122	8.3	0.259	104	3.3
60Ni	0.044	1.34	1.6	121	5.2	1.4	105	7.6
63Cu	0.007	15.7	18	116	6.9	17	107	4.9
66Zn	0.489	51.6	58	113	3.2	54	104	3.6
75As	0.436	6.87	7.5	110	7.5	7.0	101	3.8
77Se	0.335	3.45	3.4	100	14	3.4	99	3.3
88Sr	0.001	10.1	11	109	6.2	11	110	9.5
95Mo	0.001	0.29	0.348	120	6.3	0.281	97	6.4
107Ag	0.001	0.0252	0.033	132	7.7	0.030	120	12
111Cd	0.058	0.299	0.347	116	8.2	0.324	108	12
118Sn	0.027	0.061	0.078	127	16	0.073	120	7.2
121Sb	0.006	0.011	0.013	127	19	0.012	106	9.1
137Ba	0.001	8.6	9.0	105	1.6	9.2	107	0.8
202Hg	0.029	0.412	0.418	101	7.2	0.417	101	3.3
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.002	0.404	0.519	128	4.3	0.393	97	12
238U	0.001	0.05	0.057	115	7.1	0.049	97	12

Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified values for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

Tl certified concentration from NIST-2976.

Accuracy and precision for Tl are not reported as the certified concentration is too close to the reportable detection limit.

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Tissue QA/QC Accuracy and Precision Results

			Sample Group ID	03			04	
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.013	1.21	1.2	99	8.3	1.3	111	9.8
11B	0.101	4.5	4.7	104	2.3	4.6	101	4.6
23Na	1.5	14,000	14,157	101	2.9	15,382	110	7.2
24Mg	0.031	910	898	99	4.7	1,013	111	4.5
27Al	0.046	197.2	198	100	7.6	205	104	6.9
31P	41	8,000	7,747	97	2.0	8,268	103	4.9
39K	8.4	15,500	15,632	101	7.8	17,136	111	8.8
44Ca	27	2,360	2,365	100	3.9	2,620	111	5.7
49Ti	0.001	12.24	12	97	9.5	14	115	9.1
51V	0.055	1.57	1.7	110	3.9	1.5	98	14
52Cr	0.396	1.87	2.0	105	2.8	2.0	109	9.8
55Mn	0.013	3.17	3.4	108	7.1	3.5	110	4.9
57Fe	2.5	343	375	109	5.9	374	109	8.0
59Co	0.011	0.25	0.268	107	10	0.275	110	5.6
60Ni	0.044	1.34	1.5	113	4.2	1.5	112	7.3
63Cu	0.007	15.7	17	105	8.6	18	113	4.7
66Zn	0.489	51.6	53	102	5.9	56	108	5.4
75As	0.436	6.87	6.9	101	4.8	7.3	107	6.0
77Se	0.335	3.45	3.3	94	8.2	3.5	101	4.0
88Sr	0.001	10.1	11	107	8.4	11	109	6.2
95Mo	0.001	0.29	0.313	108	12	0.311	107	16
107Ag	0.001	0.0252	0.027	108	5.7	0.027	108	15
111Cd	0.058	0.299	0.320	107	9.1	0.309	103	10
118Sn	0.027	0.061	0.070	115	11	0.046	75	14
121Sb	0.006	0.011	0.011	101	8.3	0.010	93	20
137Ba	0.001	8.6	8.3	97	2.4	9.1	105	2.3
202Hg	0.029	0.412	0.451	110	8.4	0.458	111	5.3
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.002	0.404	0.445	110	2.6	0.483	120	19
238U	0.001	0.05	0.052	104	3.7	0.054	108	14

Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified values for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

Tl certified concentration from NIST-2976.

Accuracy and precision for Tl are not reported as the certified concentration is too close to the reportable detection limit.

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Tissue QA/QC Accuracy and Precision Results

		Sample Group ID	05			06		
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.013	1.21	1.3	109	6.4	1.2	103	6.1
11B	0.101	4.5	5.0	112	4.6	4.4	97	2.8
23Na	1.5	14,000	15,731	112	7.9	13,818	99	3.7
24Mg	0.031	910	1,024	112	5.8	900	99	2.8
27Al	0.046	197.2	209	106	7.6	185	94	5.2
31P	41	8,000	8,695	109	4.3	7,613	95	2.9
39K	8.4	15,500	16,740	108	6.0	15,353	99	3.4
44Ca	27	2,360	2,703	114	4.5	2,286	97	4.5
49Ti	0.001	12.24	13	109	8.6	11	94	4.9
51V	0.055	1.57	1.8	115	5.4	1.5	96	6.3
52Cr	0.396	1.87	2.1	115	7.3	1.8	98	1.6
55Mn	0.013	3.17	3.6	114	6.3	3.1	99	4.9
57Fe	2.5	343	407	119	8.0	341	99	4.6
59Co	0.011	0.25	0.314	126	8.6	0.244	98	7.6
60Ni	0.044	1.34	1.5	110	7.2	1.3	99	4.4
63Cu	0.007	15.7	17	110	9.2	16	103	4.6
66Zn	0.489	51.6	59	114	6.7	51	99	3.5
75As	0.436	6.87	7.5	109	6.4	6.7	97	1.9
77Se	0.335	3.45	3.7	108	8.2	3.4	99	5.2
88Sr	0.001	10.1	12	118	5.5	10	99	2.7
95Mo	0.001	0.29	0.329	113	7.2	0.274	95	5.5
107Ag	0.001	0.0252	0.030	120	15	0.023	90	0.0
111Cd	0.058	0.299	0.355	119	8.1	0.339	114	10
118Sn	0.027	0.061	0.061	100	15	0.052	85	7.9
121Sb	0.006	0.011	0.013	118	20	0.007	62	20
137Ba	0.001	8.6	9.4	109	6.1	8.4	98	3.5
202Hg	0.029	0.412	0.475	115	5.3	0.429	104	2.9
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.002	0.404	0.458	113	13	0.408	101	12
238U	0.001	0.05	0.059	117	4.8	0.051	102	9.0

Notes:

ppm = parts per million; % = percent; DL = detection limit; RSD = relative standard deviation

Data Quality Objectives:

Accuracy: DQO of 60 - 140% of the certified values for B, Ti, Ag, Sn, Sb, and Ba.

Accuracy: DQO of 90 - 110% of the certified values for Se.

Accuracy: DQO of 70 - 130% of the certified values for all other elements provided.

Precision: DQO of ≤20% for all elements.

DORM-4 used for all parameters except B, Ti, Sb, Ba, and Al where NIST-1566b was used.

Tl certified concentration from NIST-2976.

Accuracy and precision for Tl are not reported as the certified concentration is too close to the reportable detection limit.

Minnow Environmental
Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
01	RG_FO23_INV-1_2021-12-01	078	14 Dec 2021
	RG_FO23_INV-2_2021-12-01	079	
	RG_FO23_INV-3_2021-12-01	080	
	RG_FO23_INV-4_2021-12-01	081	
	RG_FO23_INV-5_2021-12-01	082	
	RG_FRUL_INV-1_2021-11-29	083	
	RG_FRUL_INV-2_2021-11-29	084	
	RG_FRUL_INV-3_2021-11-29	085	
	RG_FRUL_INV-4_2021-11-29	086	
02	RG_FRUL_INV-5_2021-11-29	087	14 Dec 2021
	RG_LCUT_INV-1_2021-12-01	088	
	RG_LCUT_INV-2_2021-12-01	089	
	RG_LCUT_INV-3_2021-12-01	090	
	RG_LCUT_INV-4_2021-12-01	091	
	RG_LCUT_INV-5_2021-12-01	092	
	RG_LI8_INV-1_2021-12-02	093	
	RG_LI8_INV-2_2021-12-02	094	
	RG_LI8_INV-3_2021-12-02	095	
03	RG_LI8_INV-4_2021-12-02	096	14 Dec 2021
	RG_LI8_INV-5_2021-12-02	097	
	RG_LI24_INV-1_2021-11-30	098	
	RG_LI24_INV-2_2021-11-30	099	
	RG_LI24_INV-3_2021-11-30	100	
	RG_LI24_INV-4_2021-11-30	101	
	RG_LI24_INV-5_2021-11-30	102	
	RG_LIDCOM_INV-1_2021-12-02	103	
04	RG_LIDCOM_INV-2_2021-12-02	104	14 Dec 2021
	RG_LIDCOM_INV-3_2021-12-02	105	
	RG_LIDCOM_INV-4_2021-12-02	106	
	RG_LIDCOM_INV-5_2021-12-02	107	
	RG_LIDSL_INV-1_2021-11-29	108	
	RG_LIDSL_INV-2_2021-11-29	109	
	RG_LIDSL_INV-3_2021-11-29	110	
	RG_LIDSL_INV-4_2021-11-29	111	
	RG_LIDSL_INV-5_2021-11-29	112	
05	RG_LILC3_INV-1_2021-12-01	113	14 Dec 2021
	RG_LILC3_INV-2_2021-12-01	114	
	RG_LILC3_INV-3_2021-12-01	115	
	RG_LILC3_INV-4_2021-12-01	116	
	RG_LILC3_INV-5_2021-12-01	117	

Minnow Environmental
Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
05	RG_LISP24_INV-1_2021-11-30	118	14 Dec 2021
	RG_LISP24_INV-2_2021-11-30	119	
	RG_LISP24_INV-3_2021-11-30	120	
06	RG_LISP24_INV-4_2021-11-30	121	14 Dec 2021
	RG_LISP24_INV-5_2021-11-30	122	
	RG_SLINE_INV-1_2021-11-29	123	
	RG_SLINE_INV-2_2021-11-29	124	
	RG_SLINE_INV-3_2021-11-29	125	
	RG_SLINE_INV-4_2021-11-29	126	
	RG_SLINE_INV-5_2021-11-29	127	

MINNOW ENVIRONMENTAL INCORPORATED

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CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:
Report mailing list: tyler.mehler@minnow.ca; Cybele.Heddle@teck.com; Kbatchelar@minnow.ca, Jessica.Ritz@teck.com

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

TRICH ID	Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Analysis Required	Analysis Required	Analysis Required	Number of Containers	Comments
078	1	RG_FO23_INV-1_2021-12-01 *	01-Dec-21	Invertebrate tissue	x	x				1	
079	2	RG_FO23_INV-2_2021-12-01 ✓	01-Dec-21	Invertebrate tissue	x	x				1	
080	3	RG_FO23_INV-3_2021-12-01 ✓	01-Dec-21	Invertebrate tissue	x	x				1	
081	4	RG_FO23_INV-4_2021-12-01 ✓	01-Dec-21	Invertebrate tissue	x	x				1	
082	5	RG_FO23_INV-5_2021-12-01 ✓	01-Dec-21	Invertebrate tissue	x	x				1	
	6										
	7										
	8										
	9										
	10										
	11										
	12										
	13										
	14										
	15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature) (Proj # 2021-282)	Date: 10 Dec 2021	Time: 07:20	Sample Condition upon Receipt: Frozen in cooler

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

* Lid label reads INV2, side label reads INV1

MINNOW ENVIRONMENTAL INCORPORATED

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CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:
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Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Number of Containers	Comments
TRICH ID							
083 1	RG_FRUL_INV-1_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x	1	
084 2	RG_FRUL_INV-2_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x	1	
085 3	RG_FRUL_INV-3_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x	1	
086 4	RG_FRUL_INV-4_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x	1	
087 5	RG_FRUL_INV-5_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x	1	
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

Samples Relinquished to Lab By: (Minnow Employee Signature) Date: Time: Shipment Method: Pacific Coastal cargo in iced cooler

Samples Received in Lab By: (Lab Employee Signature) (Proj. # 2021-282) Date: 10 Dec 2021 Time: 07:25 Sample Condition upon Receipt: Frozen in cooler

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

MINNOW ENVIRONMENTAL INCORPORATED

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CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Contact: Tyler Mehler
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Report mailing list: tyler.mehler@minnow.ca; Cybele.Heddle@teck.com; Kbatchelar@minnow.ca, Jessica.Ritz@teck.com

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Analysis Required	Analysis Required	Analysis Required	Number of Containers	Comments
TRICH ID										
088 1	RG_LCUT_INV-1_2021-12-01 ✓	01-Dec-21	Invertebrate tissue	x	x				1	
089 2	RG_LCUT_INV-2_2021-12-01 ✓	01-Dec-21	Invertebrate tissue	x	x				1	
090 3	RG_LCUT_INV-3_2021-12-01 ✓	01-Dec-21	Invertebrate tissue	x	x				1	
091 4	RG_LCUT_INV-4_2021-12-01 ✓	01-Dec-21	Invertebrate tissue	x	x				1	
092 5	RG_LCUT_INV-5_2021-12-01 ✓	01-Dec-21	Invertebrate tissue	x	x				1	
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Samples Relinquished to Lab By: (Minnow Employee Signature) Date: Time: Shipment Method: Pacific Coastal cargo in iced cooler

Samples Received in Lab By: (Lab Employee Signature) (Proj. # 2021-282) Date: 10 Dec 2021 Time: 07:30 Sample Condition upon Receipt: Frozen in cooler

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

MINNOW ENVIRONMENTAL INCORPORATED

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CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Contact: Tyler Mehler
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Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Report mailing list: tyler.mehler@minnow.ca; Cybele.Heddle@teck.com; Kbatchelar@minnow.ca, Jessica.Ritz@teck.com

TRICH ID	Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Analysis Required	Analysis Required	Analysis Required	Number of Containers	Comments
093	1	RG_LI8_INV-1_2021-12-02 ✓	02-Dec-21	Invertebrate tissue	x	x				1	
094	2	RG_LI8_INV-2_2021-12-02 ✓	02-Dec-21	Invertebrate tissue	x	x				1	
095	3	RG_LI8_INV-3_2021-12-02 ✓	02-Dec-21	Invertebrate tissue	x	x				1	
096	4	RG_LI8_INV-4_2021-12-02 *	02-Dec-21	Invertebrate tissue	x	x				1	
097	5	RG_LI8_INV-5_2021-12-02 ✓	02-Dec-21	Invertebrate tissue	x	x				1	
	6										
	7										
	8										
	9										
	10										
	11										
	12										
	13										
	14										
	15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature) (Proj. # 2021 - 282)	Date: 10 Dec 2021	Time: 07:35	Sample Condition upon Receipt: Frozen in cooler

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

* Lid label reads "Dec 2/21", side label reads "2021 12 01"

MINNOW ENVIRONMENTAL INCORPORATED

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CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:
Report mailing list: tyler.mehler@minnow.ca; Cybele.Heddle@teck.com; Kbatchelar@minnow.ca, Jessica.Ritz@teck.com

TRICH ID	Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg				Number of Containers	Comments
098	1	RG_LI24_INV-1_2021-11-30 ✓	30-Nov-21	Invertebrate tissue	x	x				1	
099	2	RG_LI24_INV-2_2021-11-30 ✓	30-Nov-21	Invertebrate tissue	x	x				1	
100	3	RG_LI24_INV-3_2021-11-30 ✓	30-Nov-21	Invertebrate tissue	x	x				1	
101	4	RG_LI24_INV-4_2021-11-30 ✓	30-Nov-21	Invertebrate tissue	x	x				1	
102	5	RG_LI24_INV-5_2021-11-30 ✓	30-Nov-21	Invertebrate tissue	x	x				1	
	6										
	7										
	8										
	9										
	10										
	11										
	12										
	13										
	14										
	15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature) (Project # 2021-282)	Date: 10 Dec 2021	Time: 07:40	Sample Condition upon Receipt: Frozen in cooler

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

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CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Contact: Tyler Mehler
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Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

TRICH ID	Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Analysis Required	Analysis Required	Analysis Required	Number of Containers	Comments
103	1	RG_LIDCOM_INV-1_2021-12-02 ✓	02-Dec-21	Invertebrate tissue	x	x				1	
104	2	RG_LIDCOM_INV-2_2021-12-02 ✓	02-Dec-21	Invertebrate tissue	x	x				1	
105	3	RG_LIDCOM_INV-3_2021-12-02 ✓	02-Dec-21	Invertebrate tissue	x	x				1	
106	4	RG_LIDCOM_INV-4_2021-12-02 ✓	02-Dec-21	Invertebrate tissue	x	x				1	
107	5	RG_LIDCOM_INV-5_2021-12-02 ✓	02-Dec-21	Invertebrate tissue	x	x				1	
	6										
	7										
	8										
	9										
	10										
	11										
	12										
	13										
	14										
	15										

Samples Relinquished to Lab By: (Minnow Employee Signature) Date: Time: Shipment Method: Pacific Coastal cargo in iced cooler

Samples Received in Lab By: (Lab Employee Signature) (Proj # 2021-282) Date: 10 Dec 2021 Time: 07:45 Sample Condition upon Receipt: Frozen in cooler

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

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CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:
Report mailing list: tyler.mehler@minnow.ca; Cybele.Heddle@teck.com; Kbatchelar@minnow.ca, Jessica.Ritz@teck.com

Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Analysis Required	Analysis Required	Analysis Required	Number of Containers	Comments
TRICH ID										
108 1	RG_LIDSL_INV-1_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x				1	
109 2	RG_LIDSL_INV-2_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x				1	
110 3	RG_LIDSL_INV-3_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x				1	
111 4	RG_LIDSL_INV-4_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x				1	
112 5	RG_LIDSL_INV-5_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x				1	
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature) (Proj. # 2021-282)	Date: 10 Dec 2021	Time: 07:50	Sample Condition upon Receipt: Frozen in cooler

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

MINNOW ENVIRONMENTAL INCORPORATED

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CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:
Report mailing list: tyler.mehler@minnow.ca; Cybele.Heddle@teck.com; Kbatchelar@minnow.ca, Jessica.Ritz@teck.com

					Analysis Required					
Sample Number	Minnow Sample ID	Date Sampled	Matrix	Moisture (Freeze Drying)	Full Metals including Hg				Number of Containers	Comments
TRICH ID										
113 1	RG_LILC3_INV-1_2021-12-01 ✓	01-Dec-21	Invertebrate tissue	x	x				1	
114 2	RG_LILC3_INV-2_2021-12-01 ✓	01-Dec-21	Invertebrate tissue	x	x				1	
115 3	RG_LILC3_INV-3_2021-12-01 ✓	01-Dec-21	Invertebrate tissue	x	x				1	
116 4	RG_LILC3_INV-4_2021-12-01 ✓	01-Dec-21	Invertebrate tissue	x	x				1	
117 5	RG_LILC3_INV-5_2021-12-01 ✓	01-Dec-21	Invertebrate tissue	x	x				1	
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature) (Proj. # 2021-282)	Date: 10 Dec 2021	Time: 07:55	Sample Condition upon Receipt: Frozen in cooler

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

MINNOW ENVIRONMENTAL INCORPORATED

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CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

Contact: Tyler Mehler
Phone: 587-597-1612 Fax:

Minnow Contact: Tyler Mehler
Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Report mailing list: tyler.mehler@minnow.ca; Cybele.Heddle@teck.com; Kbatchelar@minnow.ca, Jessica.Ritz@teck.com

TRICH ID	Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Analysis Required	Analysis Required	Analysis Required	Number of Containers	Comments
118	1	RG_LISP24_INV-1_2021-11-30 ✓	30-Nov-21	Invertebrate tissue	x	x				1	
119	2	RG_LISP24_INV-2_2021-11-30 ✓	30-Nov-21	Invertebrate tissue	x	x				1	
120	3	RG_LISP24_INV-3_2021-11-30 ✓	30-Nov-21	Invertebrate tissue	x	x				1	
121	4	RG_LISP24_INV-4_2021-11-30 ✓	30-Nov-21	Invertebrate tissue	x	x				1	
122	5	RG_LISP24_INV-5_2021-11-30 ✓	30-Nov-21	Invertebrate tissue	x	x				1	
	6										
	7										
	8										
	9										
	10										
	11										
	12										
	13										
	14										
	15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature) (Proj # 2021-282)	Date: 10 Dec 2021	Time: 08:00	Sample Condition upon Receipt: Frozen in cooler

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW

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CHAIN OF CUSTODY RECORD

Laboratory: Trich Analytics

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Contact Email: tyler.mehler@minnow.ca
Minnow Project #: 217202.0036
Date Results Required By:

Report mailing list: tyler.mehler@minnow.ca; Cybele.Heddle@teck.com; Kbatchelar@minnow.ca, Jessica.Ritz@teck.com

Trich ID	Sample Number	Minnow Sample ID	Date Sampled	Matrix	Analysis Required: Moisture (Freeze Drying)	Analysis Required: Full Metals including Hg	Analysis Required	Analysis Required	Analysis Required	Number of Containers	Comments
123	1	RG_SLINE_INV-1_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x				1	
124	2	RG_SLINE_INV-2_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x				1	
125	3	RG_SLINE_INV-3_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x				1	
126	4	RG_SLINE_INV-4_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x				1	
127	5	RG_SLINE_INV-5_2021-11-29 ✓	29-Nov-21	Invertebrate tissue	x	x				1	
	6										
	7										
	8										
	9										
	10										
	11										
	12										
	13										
	14										
	15										

Samples Relinquished to Lab By: (Minnow Employee Signature)	Date:	Time:	Shipment Method: Pacific Coastal cargo in iced cooler
Samples Received in Lab By: (Lab Employee Signature) (Proj # 2021-282)	Date: 10 Dec 2021	Time: 08:05	Sample Condition upon Receipt: Frozen in cooler

SUBMIT ORIGINAL TO LAB WITH SAMPLES AND RETAIN TWO PHOTOCOPIES AT MINNOW