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Technical Report Overview

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

Overview: This report presents the 2021 results of the local aquatic effects monitoring program developed for Teck's Line Creek Operations at Dry Creek. The report presents data and evaluates the magnitude and extent of influence of mine operations on water quality, calcite, and benthic invertebrate communities downstream of Dry Creek at Line Creek Operations.

This report was prepared for Teck by Minnow Environmental Inc.

For More Information
If you have questions regarding this report, please:
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Future studies will be made available at **teck.com/elkvalley.**

2021 Line Creek Operations Local Aquatic Effects Monitoring Program (LAEMP) Report for Dry Creek

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April 2022

2021 Line Creek Operations Local Aquatic Effects Monitoring Program (LAEMP) Report for Dry Creek

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EXECUTIVE SUMMARY

The Line Creek Operation (LCO) Dry Creek Local Aquatic Effects Monitoring Program (LAEMP) was designed to assess potential effects of Phase II Project of Line Creek Operations (LCOII) on Dry Creek, Grace Creek, and Unnamed Creek (ENV 2013) and was initiated in 2014. To comply with discharge requirements outlined in permit 107517[1] for total suspended solids, Teck constructed the Line Creek Operation (LCO) Dry Creek Water Management System (DCWMS), which began operation in 2015. In 2019, a pathway was theorized that described enhanced primary production in the DCWMS sedimentation ponds that promoted the generation of organic selenium compounds (specifically DMSeO and MeSe[IV]), leading to increased benthic invertebrate tissue selenium concentrations downstream of the DCWMS (Minnow 2020). As a result, a seasonal bypass of the DCWMS was initiated in 2020 to mitigate selenium bioaccumulation in biota, only filling the sedimentation ponds during freshet (i.e., higher-flow periods). Bypass of the DCMWS was operational throughout most of 2021, except from May to July. Further mitigation strategies implemented in 2021 included the use (i.e., filling) of only one of the two available DCWMS sedimentation ponds.

On February 11, 2021, a failure occurred on the Burnt Ridge North (BRN) spoil in the LCO Dry Creek watershed ("BRN spoil failure"). Spoils from LCOII Project were unexpectedly deposited over a 435m stretch of Dry Creek approximately 1.5km upstream of area LC_DC3. Increased monitoring frequency was implemented immediately following the BRN spoil failure and continued through 2021, including: benthic invertebrate tissue and community, periphyton community, water chemistry, aqueous selenium speciation, turbidity, and acute toxicity monitoring. Results of this additional water quality and aquatic health monitoring have been incorporated into the present report.

In 2021, the objectives for the Dry Creek LAEMP continued to be structured into 5 study questions:

1. Are aqueous concentrations of mine-related constituents elevated in relation to British Columbia Water Quality Guidelines (BCWQG) and Elk Valley Water Quality Plan (EVWQP) benchmarks, and are concentrations changing over time?
2. Is acute or chronic toxicity occurring from water collected at the outlet of the DCWMS (LC_SPDC) or within Dry Creek (LC_DCDS), and is toxicity changing over time?

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[1] Phase II Project of Line Creek Operations (LCOII) was previously under Permit 106970, and was transferred to Permit 107517 in 2021.

3. Are benthic invertebrate community endpoints within normal ranges based on samples collected at regional and local reference areas within the Elk River as part of the Regional Aquatic Effects Monitoring Program (RAEMP), and are the endpoints changing over time?
4. How do selenium concentrations in benthic invertebrate tissue compare to normal ranges and BCWQG or EVWQP benchmarks, and are they changing over time?
5. Are changes in fish and fish habitat (including instream flow and calcite index) occurring within Dry Creek as a result of mine operations?

This report evaluates Dry Creek monitoring data up to the end of the 2021 calendar year to evaluate the five study questions. Data collected under the LAEMP and during supplemental monitoring in 2021 were also used to assess potential aquatic health impacts of the BRN spoil failure (i.e., effects to benthic invertebrate tissue and community, and periphyton community).

To answer Study Question #1, monitoring of all constituents[2] listed under permit 107517 and selenium species was carried out in 2021. Concentrations of mine-related constituents including total selenium, nitrate, sulphate, and total cadmium, have increased over time on Dry Creek. Nitrate concentrations in 2021 exceeded the Elk Valley Water Quality Plan (EVWQP) level 2 benchmarks in 100% of samples from areas located furthest upstream (LC_DC3, LC_SPDC, and LC_DCDS), and in >85% of samples from areas located further downstream (LC_DC2, LC_DC4 and LC_DC1). Selenium concentrations exceeded the EVWQP level 1 benchmark (70 µg/L) in samples from all mine-exposed areas except those from furthest downstream in Dry Creek (LC_DC4 and LC_DC1) and from Grace Creek. The site-specific performance objective (SPO) for total selenium (10 µg/L) was exceeded in all samples from one (LC_DCDS) of the three applicable areas (LC_DCDS, LC_GRCK, and LC_UC). Constituent concentrations were more frequently elevated at areas LC_DC3 (the Dry Creek area immediately downstream of LCOII spoiling and upstream of DCWMS effects), LC_SPDC, LC_DCDS, and LC_DC2 (the areas immediately downstream of the DCWMS) than at areas LC_DC4 and LC_DC1, likely due to increasing distance from LCOII operations and input of groundwater from reference area LC_DCEF between LC_DC2 and LC_DC4. Aqueous organoselenium (specifically dimethyl selenoxide (DMSeO) and methylseleninic acid (MeSe[IV])) concentrations were elevated at areas LC_SPDC and LC_DCDS during DCWMS sedimentation pond dewatering in August 2021; however, operation of the DCWMS throughout

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[2] Major ions: bromide, fluoride, calcium, chloride, magnesium, potassium, sodium, sulphate. Nutrients: ammonia, nitrate, nitrite, total Kjeldahl nitrogen (TKN), orthophosphate, and 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, and zinc.

most of the year (except May to July) and reducing the ponds from two to one lowered concentrations to levels below those observed over the same periods in 2020.

To answer Study Question #2, results of acute and chronic toxicity testing in 2021 were evaluated relative to prior years. Acute toxicity testing of water from the outlet of the DCWMS (LC_SPDC) showed no test failures in 2021 for the two test organisms, *Daphnia magna* and rainbow trout. These results included greatly increased testing following the BRN spoil failure (almost daily from February 12 to March 17). Chronic toxicity is monitored at LC_DCDS, directly downstream of LC_SPDC, under the regional chronic toxicity program. In 2021, nickel and nitrate were identified as potentially causing the observed effects on *C. dubia* reproduction, *H. azteca* dry weight, while the cause of effects to *P. subcapitata* algal cell yield were unidentified. All remaining chronic toxicity results in 2021 were categorized as no effect (including rainbow trout and fathead minnow tests). Overall, chronic toxicity results have shown a low proportion of adverse responses over time at LC_DCDS, with a frequency and magnitude of responses that is temporally stable (i.e., no apparent consistent pattern of responses over time) and mostly limited to invertebrate endpoints. Given that the overall proportion of results were similar to those seen in 2020 (16% and 18%, respectively) and no adverse responses are seen in Q2 (immediately following the BRN spoil failure event) it is unlikely that the BRN spoil failure had an effect on chronic toxicity results in 2021.

To answer Study Question #3, benthic invertebrate community condition in 2021 was evaluated relative to regional normal ranges, spatially, and relative to prior years. Total abundance and taxonomic richness were generally within regional and site-specific normal ranges at all areas on Dry Creek in 2021. The community in Dry Creek upstream of the DCWMS headpond (LC_DC3) was most likely to have endpoints outside of normal ranges (particularly %EPT, % Ephemeroptera [%E], and % Chironomidae) and the BRN spoil failure may have had some limited (but not lasting) effects on the total abundance at LC_DC3. Areas located closest to the DCWMS discharge (LC_DCDS and LC_DC2) also tended to have lower %E than other areas and compared to regional and site-specific normal ranges. In contrast, benthic invertebrate communities located upstream and downstream of the mouth of Dry Creek in the Fording River were similar to each other, and community endpoints were within regional normal ranges, suggesting no influence of Dry Creek on benthic invertebrate community structure in the downstream receiving environment.

To answer Study Question #4, benthic invertebrate tissue selenium concentrations in 2021 were evaluated relative to regional normal ranges, spatially, and relative to prior years. In most areas of Dry Creek downstream of the DCWMS, selenium concentrations were lower in 2021 relative to prior years, although remained often higher than regional normal ranges and reference concentrations. Results observed upstream of the DCWMS (i.e., LC_DC3) in 2021 generally remained unchanged, indicating there was likely no effect of the BRN spoil failure on invertebrate tissue selenium concentrations. Downstream of the DCWMS (particularly from LC_DCDS through LC_DC4), the decreases in benthic invertebrate tissue selenium concentrations measured in 2021 relative to earlier years were primarily attributable to changes in management of the DCWMS (i.e., bypass the sedimentation ponds throughout most of the year and limiting use of the DCWMS to one rather than two sedimentation ponds). At the furthest downstream area on Dry Creek (LC_DC1), there was little change in tissue selenium concentrations over time. Higher selenium concentrations at LC_DC1 were observed relative to the upstream area, LC_DC4, in March, May, and September, consistent with occasionally elevated aqueous organoselenium concentrations at LC_DC1 compared to upstream (LC_DCDS) but cannot be attributed to a specific cause. Within the Fording River and Grace Creek, benthic invertebrate tissue selenium concentrations generally remained unchanged in 2021 relative to earlier years, indicating that Dry Creek has had limited or no influence on benthic invertebrate tissue selenium concentrations in these areas.

To answer Study Question #5, relevant fish and fish habitat monitoring data collected in Dry Creek and the East Tributary in 2021 was integrated into this report, including redd surveys, water temperature monitoring, and dissolved oxygen measurements. The upper Fording River (UFR) westslope cutthroat trout (WCT) Monitoring Program suggests that Dry Creek is one of the tributaries within the range used by a relatively large and diverse population of WCT. After a substantial decline in (sub)adult abundance of UFR WCT between 2017 and 2019, the population appears to be rebounding (Thorley et al. 2022). The number of WCT redds detected in Dry Creek 2021 (10) was the second fewest since monitoring began in 2016 (range = 9 to 39). This may be related to the low temperatures in Dry Creek, growing degree days on Dry Creek in 2021 were the lowest reported throughout all years of sampling at all monitoring stations except the East Tributary reference area which increased in 2021. However, mean daily and instantaneous water temperatures in Dry Creek were within limits for WCT rearing and survival throughout 2021. Dissolved oxygen (DO) concentrations were above the long-term chronic and instantaneous acute BCWQGs for most fish life stages for all samples in Dry Creek and the East Tributary reference area in 2021. DO concentrations at all monitoring locations were below the BCWQG for the protection of buried embryos and alevins from May to September in 2021; however, similar conditions observed at the reference area (LC_DCEF) suggest that the decreased DO concentrations are not mine-related. Similar conditions in mean flow from 2013 to 2021 indicate that flow-related ecological conditions through most of 2021 were broadly similar to historical conditions with no notable anomalies. There were no observed changes in the amount of calcite concretion within Dry Creek LAEMP areas in 2021 and levels were below those associated with a biological effect; however, calcite presence continues to increase annually throughout Dry Creek as spoiling has increased. Three fish were captured during population monitoring electrofishing in reach 3 in Dry Creek in 2021; however, no fish tissue samples were collected due minimum muscle plug sampling requirements and so an evaluation of dietary exposure of WCT in Dry Creek to selenium was not possible in 2021.

The results from the Dry Creek LAEMP provide information that supports Teck's Adaptive Management Plan (AMP). The monitoring and management of the DCWMS are adaptive management responses that have been and continue to be actively adjusted to develop our understanding of the watershed and how changes to water management (particularly with respect to the DCWMS) can improve conditions in Dry Creek. The results from this study also support the evaluation of biological triggers, which are intended to identify unexpected monitoring results that may lead to responses under the AMP response framework.

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ACRONYMS AND ABBREVIATIONS

%Ephemeroptera (%E) – relative proportion of Ephemeroptera

%EPT – relative proportion of Ephemeroptera, Plecoptera, and Trichoptera

AMP – Adaptive Management Plan

ANOVA – Analysis of Variance

BC – British Columbia

BCWQG – British Columbia Water Quality Guidelines

BRN – Burnt Ridge North

CABIN – Canadian Aquatic Biomonitoring Network

CI – Calcite Index

CMm – Coal Mountain Mine

COSEWIC – Committee on the Status of Endangered Wildlife in Canada

DCFFHMP – Dry Creek Fish and Fish Habitat Monitoring Program

DCWMS – Dry Creek Water Management System

DFO – Fisheries and Oceans Canada

DMSeO – Dimethyl Selenoxide

DO – Dissolved Oxygen

DQR – Data Quality Review

Ecofish – Ecofish Research Limited

EMC – Environmental Monitoring Committee

EMPR – British Columbia Ministry of Energy, Mines, and Petroleum Resources

ENV – British Columbia Ministry of Environment and Climate Change Strategy (formerly MOE)

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

EVO – Elkview Operation

EVFFHC – Elk Valley Fish and Fish Habitat Committee

EVWQP – Elk Valley Water Quality Plan

DCWMP – Dry Creek Water Management Plan

dw – Dry Weight

FHAP – Fish Habitat Assessment Procedure

FLNRORD – Ministry of Forests, Lands, Natural Resource Operations, and Rural Development

FRO – Fording River Operation

GHO – Greenhills Operation

HSD – Honestly Significant Difference

ICP-MS – Inductively Coupled Plasma Mass Spectrometry

IFRs – Instream Flow Requirements

K-M – Kaplan-Meier

KNC – Ktunaxa Nation Council

LAEMP – Local Aquatic Effects Monitoring Program

LCO – Line Creek Operations

LCOII – Line Creek Operations Phase II

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

LRL – Laboratory Reporting Limit

MBCM – Million Bank Cubic Meters

MCT – Measure of Central Tendency

MeSe(IV) – Methylseleninic Acid

MOD – Magnitude of Difference

MOE – Mistry of the Environment

MWMP – Mine Water Management Plan

MWMxT – Mean weekly maximum water temperature

NCD – non-Chironomidae Diptera

Nupqu – Nupqu Resource Limited Partnership

PC – Principal Components

PCA – Principal Components Analysis

Qx – referring to calendar quarters

QA/QC – Quality Assurance / Quality Control

RAEMP – Regional Aquatic Effects Monitoring Program

SDM – Structured Decision Making

SPO – Site Performance Objective

Teck – Teck Coal Limited

TSS – Total Suspended Solids

WCT – Westslope Cutthroat Trout

1 INTRODUCTION

1.1 Background

Teck Coal Limited (Teck) currently operates four steelmaking coal mines in the Elk River watershed in southeastern British Columbia (BC) which are the Line Creek Operation (LCO), Fording River Operation (FRO), Greenhills Operation (GHO), 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. Teck received a conditional Environmental Assessment Certificate in September 2013 for the LCO Phase II Project (LCOII) and development began in February 2014. The initial placement of waste rock in the Dry Creek watershed occurred in 2015, although minimal spoiling occurred in 2015 (<1 million bank cubic meters [MBCM]) by year compared with subsequent years (2016: <10 MBCM; 2017: <26 MBCM; 2018: <28 MBCM; 2019: <11 MBCM; 2020: <12 MBCM; 2021: <24 MBCM). The LCOII is expected to continue to 2035 and result in a disturbance of approximately 1,940 ha, with placement of waste rock over approximately 5 km of upper LCO[3] Dry Creek, a second order mountainous tributary to the Fording River at the north end of LCO property (Figure 1.2). Since 2015, surface and shallow groundwater from mine-influenced areas of the upper Dry Creek watershed have been managed through the Dry Creek Water Management System (DCWMS; Figure 1.2) which is designed to help meet the total suspended solids discharge limits, as outlined in Permit 107517[4] . Briefly, the DCWMS collects and re-directs mine-influenced surface flow from upper Dry Creek through the sedimentation ponds prior to returning to Dry Creek downstream of the ponds (see Section 1.3 for details).

Section 8.3.1 of Permit 107517 version December 1, 2021; ENV 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[5] and submitted to the Director for approval by May 1 each year.".*

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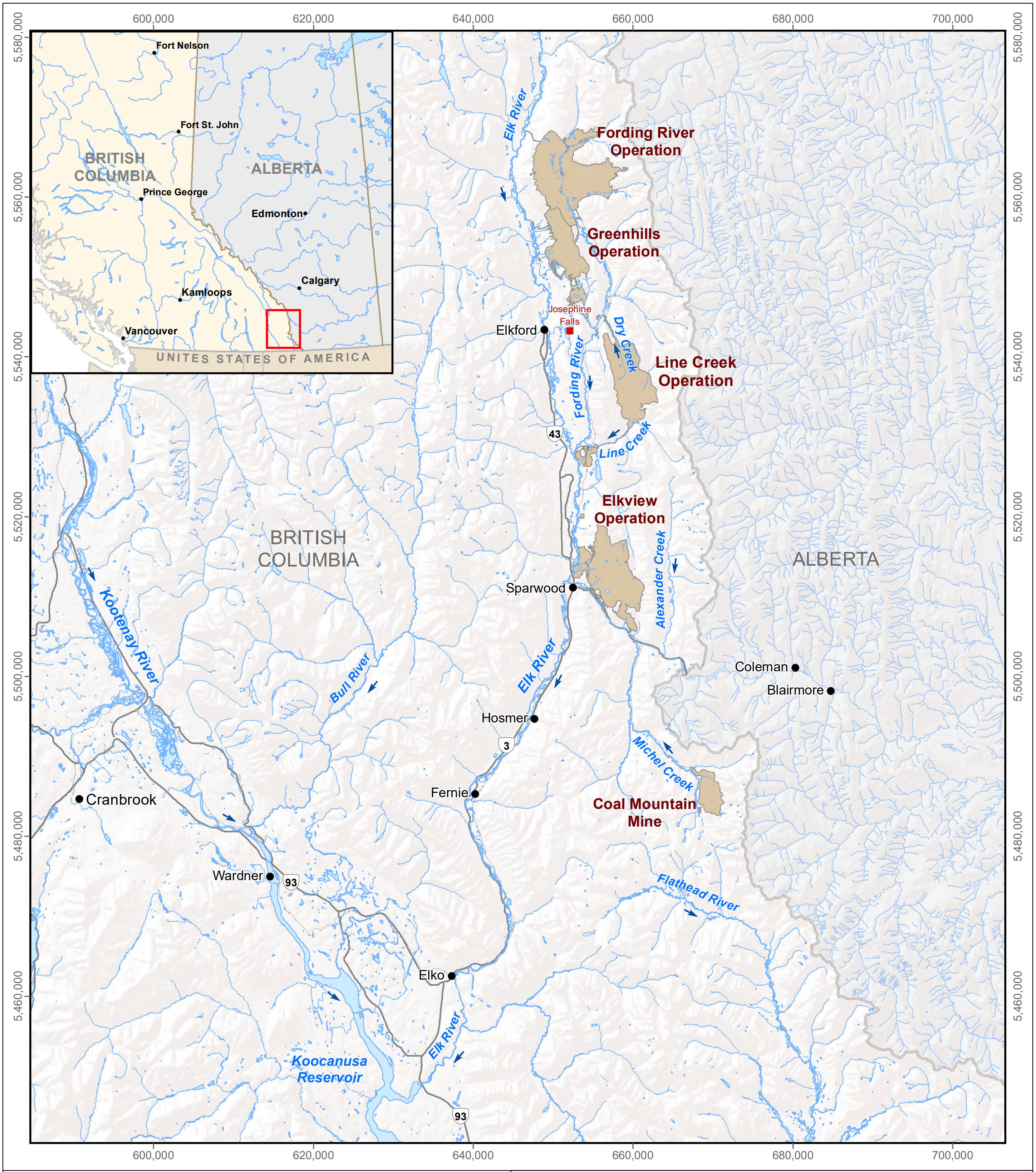
[3] The creek is referred to as LCO Dry Creek to distinguish it from another Dry Creek associated with Teck's Elkview Operation (i.e., Elkview Operations Dry Creek).

[4] Phase II Project of Line Creek Operations (LCOII) was previously under Permit 106970, and was transferred to Permit 107517 in 2021.

[5] 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

N E S W

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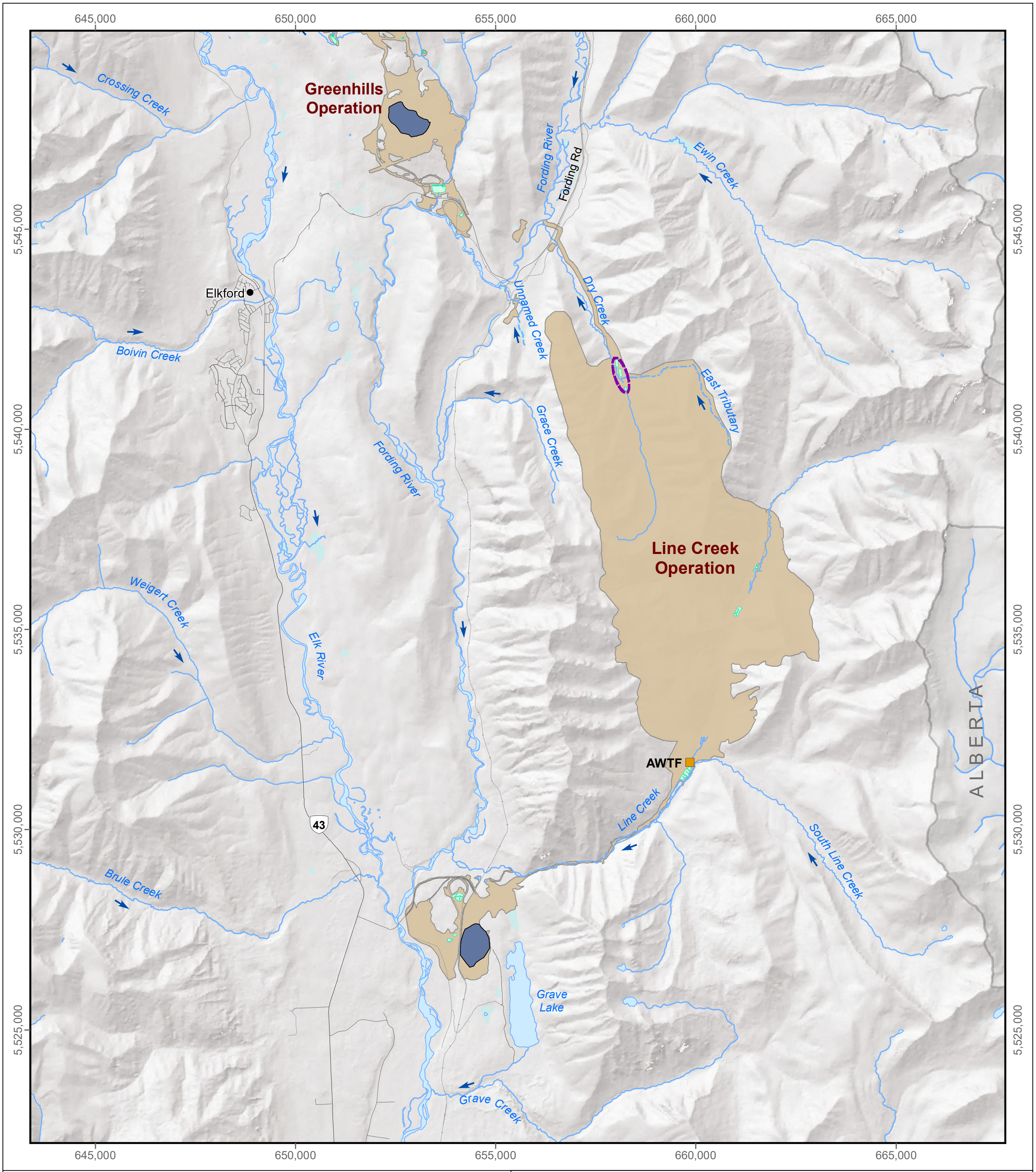
Figure 1.1

Document Path: C:\Users\MLaPalme\Trinity Consultants, Inc\Teck - 217202.0035 - 2021 Dry Creek LAEMP\4 - GIS\Dry Creek LAEMP\21-35 Figure 1.1 Teck Coal Limited Operation.mxd



LEGEND

- ⬭ Dry Creek Water Management System
- 🟧 Active Water Treatment Facility (AWTF)
- ▭ Settling Pond
- ▬ Tailings Pond
- ▭ Teck Coal Mine Operation

Overview of Line Creek Operation

0 2.5 5 10 km

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Figure 1.2

Document Path: C:\Users\MLaPalme\Trinity Consultants, Inc\Teck - 217202.0035 - 2021 Dry Creek LAEMP\4 - GIS\Dry Creek LAEMP\21-35 Figure 1.2 Overview LCO.mxd

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.*

Concurrent with the LAEMP, recommendations for site performance objectives (SPOs), instream flow requirements (IFRs), and environmental flow needs (EFNs) for Dry have been proposed through a Structured Decision Making (SDM) process (Teck 2021b). The SDM process involved a multi-party working group composed of the Ktunaxa Nation Council (KNC), British Columbia Ministry of Environment and Climate Change Strategy (formerly MOE, ENV), the Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD), the Ministry of Energy Mines and Petroleum Resources (EMPR), Fisheries and Oceans Canada (DFO), and Teck. The working group worked to seek consensus on a set of recommendations for water quality SPOs, IFRs, and EFNs for Dry Creek, and an updated LCO Dry Creek Mine Water Management Plan (DCWMP) which was submitted to ENV May 2021 (as per the permit requirements) that outlines the water management objectives, strategies, and mitigation options to achieve the agreed-upon SPOs and IFRs (Teck 2021b). The updated DCWMP includes proposed site performance objectives for selenium, nitrate, sulphate, and cadmium and proposed in-stream flow requirements, which include flushing flows and ramping flows (Teck 2021a).

The 2021 LAEMP period of study includes all biological and water quality sampling conducted in Dry Creek from January 2021 through December 2021. The sections below describe the setting in more detail and provide further context for the LCO Dry Creek LAEMP report.

1.2 Study Questions

In consideration of Permit 107517 requirements, the conceptual site model outlining potential effects to aquatic receptors (see Minnow 2020b for details), previous LCO Dry Creek LAEMP reports (Minnow 2015, 2016, 2017, 2018b, 2019, 2020a, 2021a), and input from the Environmental Monitoring Committee (EMC), the following overarching study question has been developed:

- Has there been a change in condition since previous monitoring years with respect to mine-related constituents in water quality, benthic invertebrate community endpoints and tissue selenium concentrations, calcite, fish, fish habitat, and/or flow?

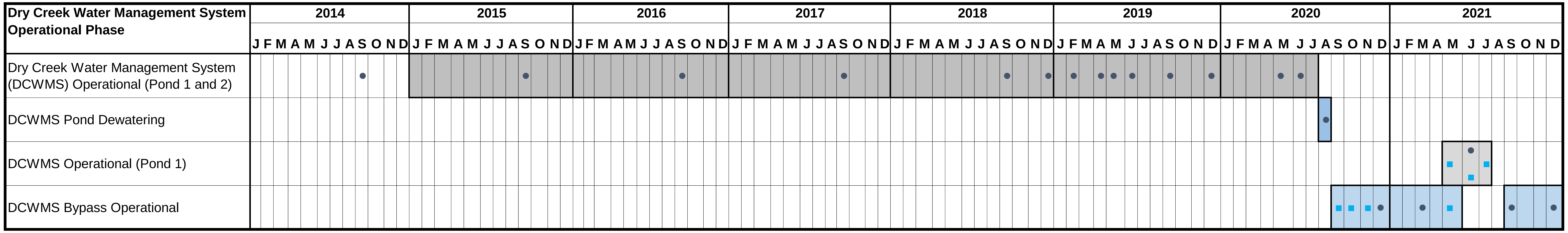
Five specific questions were further developed to help answer the above question and guide data evaluation:

1. Are aqueous concentrations of mine-related constituents elevated in relation to British Columbia Water Quality Guidelines (BCWQG) and Elk Valley Water Quality Plan (EVWQP) benchmarks, and are concentrations changing over time?
2. Is acute or chronic toxicity occurring from water collected at the outlet of the DCWMS (LC_SPDC) or within Dry Creek (LC_DCDS), and is toxicity changing over time?
3. Are benthic invertebrate community endpoints within normal ranges derived based on samples collected at regional and local reference areas within the Elk River as part of the Regional Aquatic Effects Monitoring Program (RAEMP), and are the endpoints changing over time?
4. How do selenium concentrations in benthic invertebrate tissue compare to normal ranges and BCWQG or EVWQP benchmarks, and are they changing over time?
5. Are changes in fish and fish habitat (including instream flow and calcite index) occurring within Dry Creek as a result of mine operations?

1.3 Dry Creek Water Management System (DCWMS) Operations

As outlined in Section 1.1, surface and shallow groundwater from mine-influenced areas of the upper Dry Creek watershed (at and above area LC_DC3) have been managed through the DCWMS since 2015 (Figures 1.3 and 1.4). The DCWMS is currently designed to treat total suspended solids (TSS) to meet discharge limits, as outlined in Permit 5353 in section 1.10. The DCWMS collects and re-directs mine-influenced surface flow from upper Dry Creek through the sedimentation ponds prior to returning to Dry Creek at area LC_SPDC, directly upstream of area LC_DCDS. The upstream end of the DCWMS collects flow from upper Dry Creek into the headpond where it is then piped over the East Tributary to a splitter box (Figure 1.4). At the splitter box (or in 2021, upstream of the headpond) flocculant is added, as required, to enhance sediment removal and reduce the amount of total suspended solids (TSS) in the effluent (Teck 2018a, 2019a). The splitter box manages flow to the two sedimentation ponds (i.e., parallel ponds) that are referred to as Sedimentation Pond 1 and Sedimentation Pond 2 (Figure 1.4).

Sampling for the LCO Dry Creek LAEMP began in September 2014, prior to initial commissioning of the DCWMS and supporting infrastructure in 2015 (Figure 1.3). Annual monitoring for the Dry Creek LAEMP in 2014 to 2017 focused on two areas downstream of the DCWMS (LC_DCDS and LC_DC1; Minnow 2015, 2016, 2017, 2018b). In 2018, aqueous concentrations of mine-related constituents in Dry Creek (e.g., nitrate and total selenium), were greater than previously observed (Minnow 2019) and the rate of change was greater than predicted in the LCOII project application (Teck 2011) or in Regional Water Quality Model updates. These results led to additional Dry

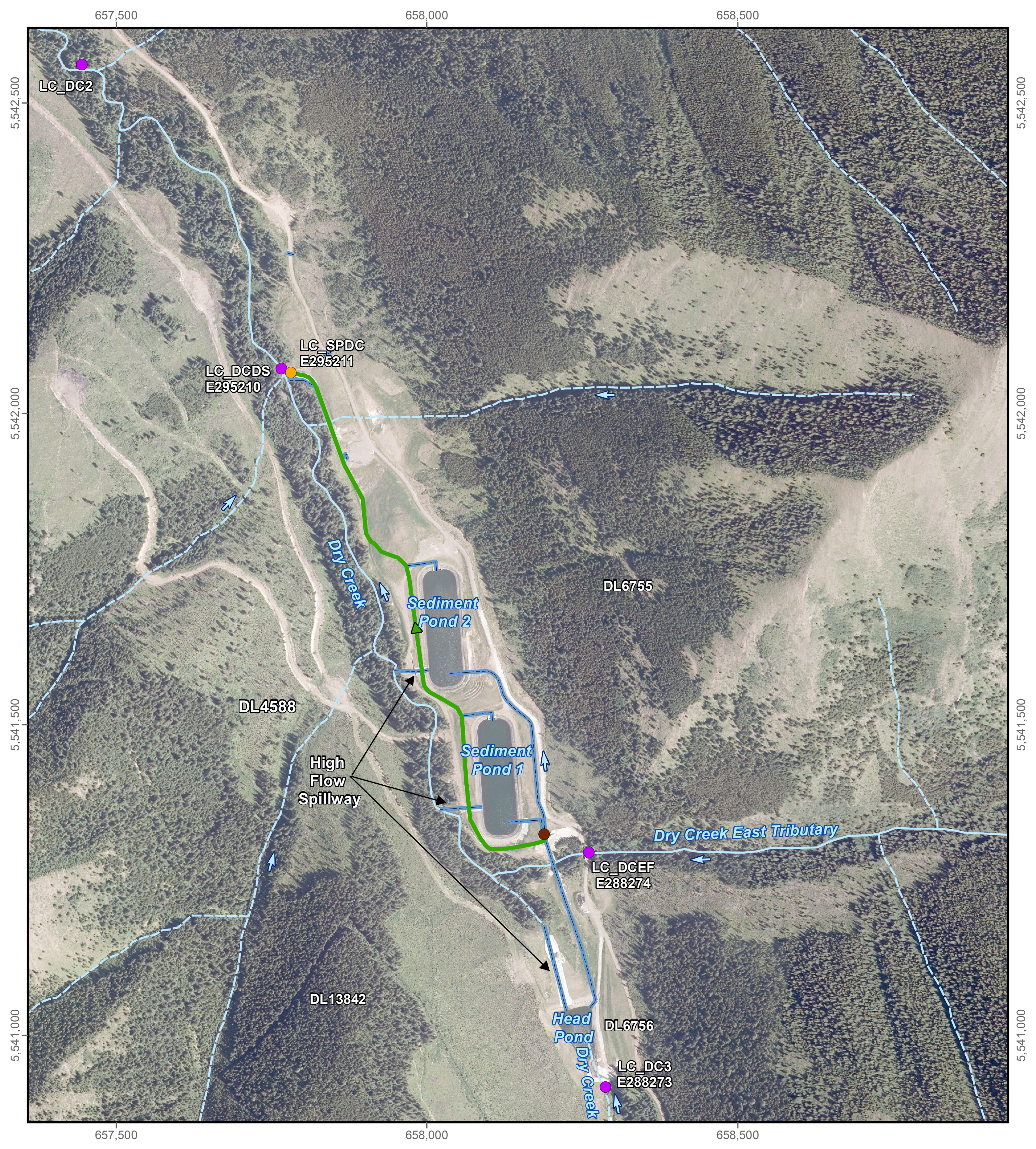


● = Sampling associated with the Dry Creek LAEMP. Collection of Benthic Invertebrate Community and Tissue Samples as well as water quality samples.

▪ = Supplemental Collection of Benthic Invertebrate Tissue and Periphyton Community.

Figure 1.3: **Overview of LAEMP and Supplemental Sampling Events in Relation to Operational Phases of the Dry Creek Water Management System Operation, 2014 to 2021**

Note: Shading represents changes in DCWMS operational phases



LEGEND

- 🟠 Dry Creek LAEMP Water Quality Sampling Area
- 🟣 Dry Creek LAEMP Biological and Water Quality Sampling Area
- ● Splitter Box
- DCWMS Bypass
- Water Management Structure Piping
- Watercourse
- Intermittent Watercourse

LCO Dry Creek Water Management System

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Figure 1.4

Document Path: C:\Users\MLaPalme\Trinity Consultants, Inc\Teck - 217202.0035 - 2021 Dry Creek LAEMP\4 - GIS\Dry Creek LAEMP\21-35 Figure 1.4 LCO Dry Creek Water Management System.mxd

Creek LAEMP biological and water quality sampling (including concurrent sampling for aqueous selenium speciation during biological sampling) and the addition of new biological sampling locations in Dry Creek upstream (LC_DC3) and downstream (LC_SPDC, LC_DC2, and LC_DC4) of the DCWMS[6] (Minnow 2019).

Elevated selenium concentrations in benthic invertebrate tissue samples downstream of the DCWMS (i.e., LC_SPDC and LC_DCDS; Figure 1.4) were observed in 2018 and early 2019 (Minnow 2019, 2020a). In response to these results, a detailed investigation was undertaken in 2019 (particularly during growing season) to better understand the processes and location of organic selenium species generation in Dry Creek and the resulting selenium bioaccumulation in benthic invertebrates (Lorax 2020). The investigation concluded that the higher-than-expected concentrations of aqueous and tissue selenium downstream of the DCWMS were occurring due to algal bioaccumulation and reduction of selenium in the sedimentation ponds (Lorax 2020, Minnow 2020). Utilizing the structured decision making (SDM) process, a decision was made to bypass the sedimentation ponds seasonally, only filling them during higher-flow periods (e.g., freshet; Figures 1.3 and 1.4; Teck 2020c). The DCWMS bypass diverts water from the DCWMS headpond directly to LC_SPDC, therefore is active only when the sedimentation ponds are not operational. The ponds are dewatered into Dry Creek at area LC_SPDC (Figure 1.4).

In 2020 pond dewatering and bypass operation began in July, with pond dewatering completed in September and bypass active through December (Figure 1.3). In August 2020 elevated aqueous concentrations of organoselenium species dimethyl selenoxide (DMSeO) and methylseleninic acid (MeSe[IV]) were detected at areas LC_SPDC and LC_DCDS, likely the result of discharge from pond dewatering. These results led to a temporary halt on pond dewatering in the late fall of 2020, followed by the initiation of additional weekly sampling on Dry Creek (Figure 1.3; Minnow 2021a). Weekly sampling was designed to evaluate the effects of elevated concentrations of aqueous organoselenium species downstream of the DCWMS as well as the potential for selenium bioaccumulation/reduction in primary producers (periphyton) and benthic invertebrates. Periphyton community sampling continued into 2021; however, samples were only collected once in each March, May (early and late), June (only LC_DC3), September, and December. In 2021 DCWMS operation was similar to 2020, however bypass was operational through most of the year (except May to July) and only pond 1 was used rather than both ponds 1 and 2 (which were both used in 2020; Table 1.1).

Prior to October 2020, effluent discharge (i.e., combined mine-impacted water from the two sedimentation ponds) was released into a man-made sedimentation pond discharge channel with

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[6] Areas LC_DC3, LC_DCEF, LC_DC2, and LC_DC4 were not sampled for the LCO Dry Creek LAEMP prior to December 2018. Biological sampling was not conducted at area LC_SPDC prior to December 2018.

Table 1.1: Dry Creek Water Management System Operational Phases, 2020 to 2021

Operational Phase	**Start Date**	**End Date**
DCWMS Pond 1 & 2 Operational	15-Jul-15	15-Jul-20
Bypass Operational	16-Jul-20	3-Aug-20
Dewatering Pond 1 & 2/Bypass Operational	4-Aug-20	4-Sep-20
Bypass Operational	5-Sep-20	4-May-21
Bypass Operational/Pond 1 Refilling	5-May-21	18-May-21
DCWMS Pond 1 Operational	18-May-21	12-Jul-21
Bypass Operational	13-Jul-21	26-Jul-21
Dewatering Pond 1/Bypass Operational	27-Jul-21	13-Aug-21
Bypass Operational	14-Aug-21	31-Dec-21

artificial boulder substrate area prior to entering lower Dry Creek (i.e., LC_SPDC; Figure 1.4). This area was permanently modified in October of 2020 with removal of the pool immediately upstream LC_SPDC as well as the discharge channel itself, and replacement with a culvert pipe conveying water from the sedimentation ponds into Dry Creek upstream of LC_DCDS (Minnow 2021a). The spillway downstream of the DCWMS (LC_SPDC) was removed and replaced with a pipe to mitigate potential dietary uptake of benthic invertebrates by WCT (Teck 2021c).

1.4 BRN Spoil Failure

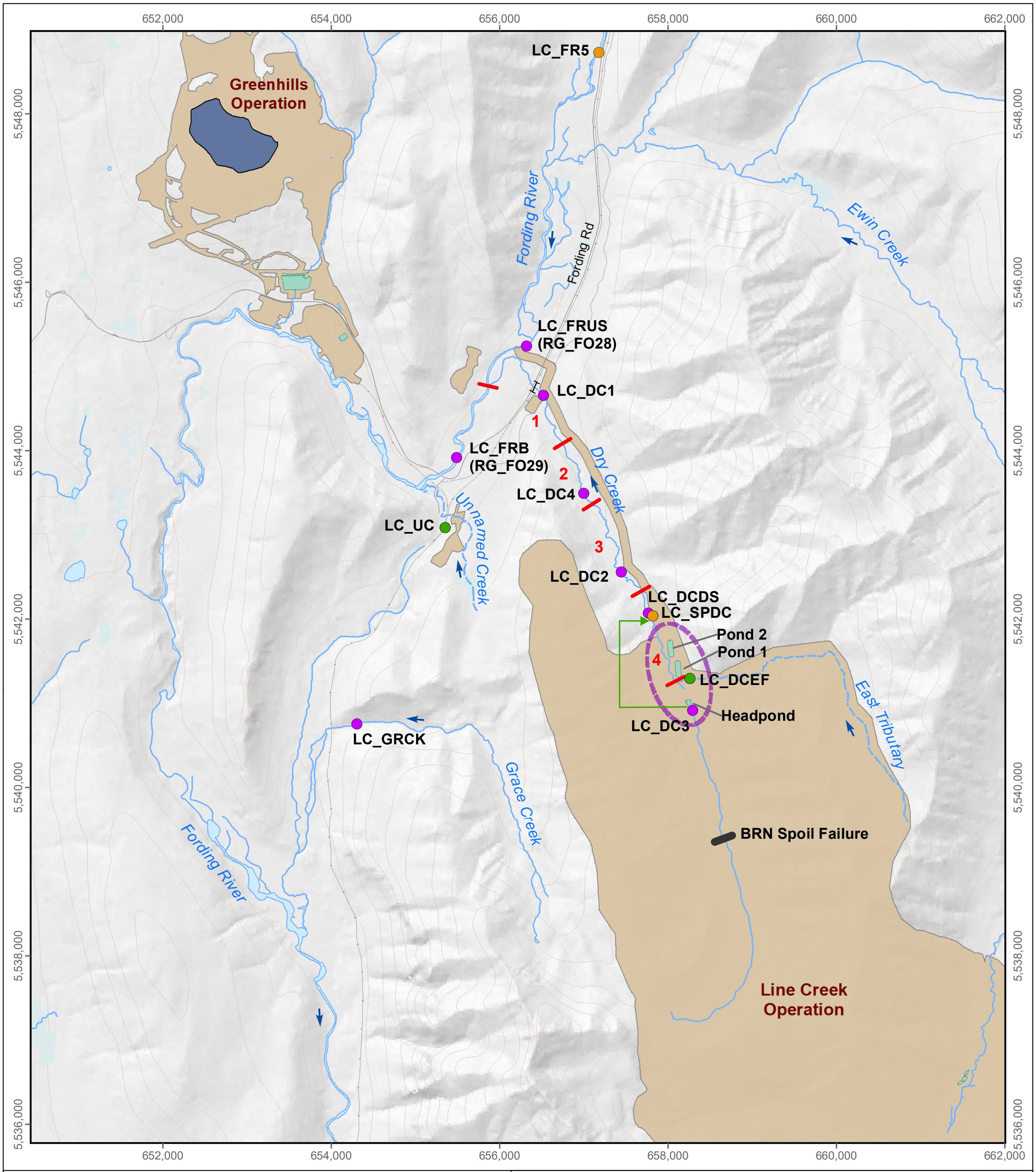
On February 11, 2021, a failure occurred on the Burnt Ridge North (BRN) spoil in the LCO Dry Creek watershed ("BRN spoil failure"). Spoils from LCO Phase 2 Project were unexpectedly deposited over a 435m stretch of Dry Creek approximately 1.5km upstream of area LC_DC3 (Figure 1.5). Investigations were undertaken to better understand the nature of material deposited into Dry Creek and to ensure safe work conditions at LC_DC3 and areas downstream.

Increased water quality monitoring frequency was implemented by operations immediately following the BRN spoil failure and continued through the remainder of 2021, including water chemistry, aqueous selenium speciation, turbidity, and acute toxicity monitoring. Aquatic health effects monitoring in Dry Creek was conducted by Minnow throughout 2021 to detect and assess any immediate and/or potential long-term changes to water chemistry and biological endpoints (periphyton and benthic invertebrates) associated with this operational event. Supplementary monitoring included additional sampling campaigns in March, May, and June that were beyond the scope of the 2021 LCO Dry Creek LAEMP study design (Minnow 2021b; see Section 2.1 for details).

Results of this additional water quality and aquatic health monitoring have been incorporated into the present report and monitoring frequencies for these components (including acute toxicity, water quality, and biological endpoints).

1.5 Linkage to the Adaptive Management Plan

As required in Permit 107517 Section 10, Teck has developed an Adaptive Management Plan (AMP). The purpose of the AMP is to support implementation of the EVWQP to achieve water quality and calcite targets, to be protective of human health and the environment, and where necessary, restorative, and to facilitate continuous improvement of water quality in the Elk Valley (Teck 2018b). 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 2018c) and the various LAEMPs (including the LCO Dry Creek LAEMP) will feed into the adaptive management



LEGEND

- ● Reference Biological and Water Quality Sampling Area
- ● Dry Creek LAEMP Water Quality Sampling Area
- ● Dry Creek LAEMP Biological and Water Quality Sampling Area
- ▬ Reach Break
- → Sedimentation Ponds Bypass
- ◯ Dry Creek Water Management System
- 🟩 Sedimentation Pond
- ▨ Tailings Pond

LCO Dry Creek LAEMP Sampling Locations, 2021

0 1 2 4 km

N E S W

Projection: North American Datum 1983 UTM Zone 11N
Data Source: Reproduced under licence from Her Majesty the Queen in Right of Canada, Natural Resources Canada, BCGov and GeoBC. All rights reserved.

Date: April 2022
Project 217202.0035

minnow environmental inc.

Figure 1.5

Document Path: C:\Users\MLaPalme\Trinity Consultants, Inc\Teck - 217202.0035 - 2021 Dry Creek LAEMP\4 - GIS\Dry Creek LAEMP\21-35 Figure 2.1 LCO Dry Creek LAEMP Sampling Locations.mxd process to address these Management Questions that collectively address the environmental management objectives of the AMP (Teck 2018b) 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.

Monitoring data from the LAEMP will contribute to the broader data set assessed every three years within the RAEMP, in addition to addressing questions specific to the LCO Dry Creek LAEMP on an annual basis. The RAEMP is designed to evaluate multiple management related questions, 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 been also developed to identify data gaps and direct future work (as described in annual AMP Reports). Information acquired from the LCO Dry Creek LAEMP will be used in conjunction with studies in the Elk Valley area (including other LAEMPs) to reduce these uncertainties and provide additional context to the ecological conditions of the Elk Valley region.

The evaluation of biological triggers for potential management action is a requirement of Permit 107517 and is incorporated as part of Management Question #5 of the AMP (Teck 2021c). Generally, triggers are intended as a simple way to flag potential unexpected monitoring results that may require action. In the 2021 LCO Dry Creek LAEMP, percent EPT (Ephemeroptera [mayflies], Plecoptera [stoneflies], and Trichoptera [caddisflies]; %EPT) and composite-taxa benthic invertebrate tissue selenium concentration were assessed against their respective biological triggers (additional information and methods pertaining to this analysis can be found in Appendix H). A third draft biological trigger, WCT muscle tissue selenium, could not be analyzed as part of the Dry Creek LAEMP as no WCT were sampled in 2021 in Dry Creek.

The Dry Creek LAEMP was designed following an adaptive approach to monitor conditions associated with the LCOII Project and the DCWMS as well as to answer site-specific questions on an annual basis (Section 1.2). The adaptive management framework may be implemented at any time during the course of each annual LAEMP cycle (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. Results of monitoring completed in 2014 to 2017 triggered minor study design adjustments. Results from 2017 were evaluated as part of the SDM process, which included re-evaluation of the regional water quality model and a detailed flow accretion study to evaluate shallow ground water and surface water interactions (Golder 2019a, Golder 2019b).

In September 2018, Dry Creek benthic invertebrate tissue selenium concentrations were elevated and not consistent with what would be expected based on current water quality concentrations and application of the selenium bioaccumulation model (Teck 2020a). These results led to additional monitoring, as a potential need for a response was identified via the AMP response framework under Management Question #5 of Teck's Adaptive Management Plan (i.e., "Does monitoring indicate that mine-related changes in aquatic ecosystem conditions are consistent with expectations?"). Actions associated with the AMP response to elevated benthic invertebrate tissue selenium concentrations in 2019 focused on investigations of temporal duration, spatial extent, and magnitude, all of which are outlined in the detail in the 2019 Annual AMP report (Teck 2020a). The investigation of cause identified waste rock as the source of selenium in Dry Creek, and conditions in the DCWMS sedimentation ponds as a contributing factor to enhanced selenium bioaccumulation downstream of the DCWMS. Adjustments implemented as part of the AMP response framework included the addition of more monitoring areas and sampling events as part of the LAEMP to increase the understanding of spatial resolution and seasonality of conditions, introduction of a temporary barrier excluding fish from area LC_SPDC in October 2019, replacement of area LC_SPDC and the pool upstream of LC_SPDC with a discharge pipe (Minnow 2021a), and implementation of the DCWMS bypass in 2020.

In late 2018, concentrations of mine-related constituents (primarily selenium, nitrate, and sulphate) in LCO Dry Creek were higher than projections modelled for LCOII development in the project proposal (Teck 2011) and were increasing more quickly than expected. As a result, ongoing monitoring and management efforts have been re-evaluated through the SDM process (Teck 2021b) and AMP response framework (Teck 2021c). Elevated aqueous nitrate concentrations were the focus of further investigations in 2019 and adjustments (including changes to the Dry Creek LAEMP study design and operational changes at LCO) were made in response to those results as outlined in detail in the 2019 Annual AMP report (Teck 2020a). The investigation of cause identified blasting residue on waste rock as the source of selenium, nitrate, and sulphate in Dry Creek. Several adjustments have been implemented as part of the AMP response framework, including moving waste placement to LCO Phase I, an updated water quality model for Dry Creek, and utilization of drill hole liners for blasting (Teck 2020a). Additionally, the LCO nitrate compliance action plan is under development alongside an updated LCO DCWMP, and the DCWMP outlines a proposed Site Performance Objectives (SPO) for Nitrate (Teck 2021b).

During DCMWS dewatering in August 2020, elevated aqueous organoselenium (specifically, DMSeO and MeSe(IV)) concentrations were detected downstream of the DCWMS at areas LC_SPDC and LC_DCDS (Minnow 2021a). Adjustments implemented as part of the

AMP response upon receipt of the selenium speciation data included an immediate halt to dewatering as well as implementation of additional weekly biological and water quality monitoring at Dry Creek areas downstream of the DCWMS starting September 23rd and continuing until November 14th, 2020.

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 2021c) and the 2021 Annual AMP report (Teck 2022c).

2 METHODS

2.1 Overview

The general approach for the LCO Dry Creek LAEMP includes analysis and interpretation of data in relation to the each of the study questions. This report includes data collected up to the end of 2021 calendar year for all study parameters. Historical data are also presented where appropriate.

Water quality and/or biological samples were collected from established monitoring areas in Dry Creek, the Dry Creek East Tributary, Grace Creek, Unnamed Creek, and the Fording River[7] (Table 2.1, Figure 1.5). Monitoring areas sampled in 2021 included mine-exposed areas upstream and downstream of the DCWMS in Dry Creek, upstream and downstream of Dry Creek in the upper Fording River, Grace Creek, and reference areas (Dry Creek East Tributary, Unnamed Creek). It should be noted that water from the east tributary to Dry Creek (LC_DCEF) enters Dry Creek channel either upstream of LC_DCDS as surface water input (20% of LC_DCEF flow) or enters Dry Creek further downstream as groundwater input (upstream of LC_DC4; 80% of LC_DCEF flow; Golder 2019b). Results from the flow accretion study are used to help interpret water quality and aquatic health results in the Dry Creek LAEMP.

Biological monitoring at area LC_SPDC was not completed in 2021 as this area was permanently modified to extend the discharge pipe from the sedimentation ponds by 40 m to Dry Creek in October 2020. Collection of water for routine analysis, selenium speciation, and acute toxicity testing continued at discharge location LC_SPDC (end of pipe) in 2021. Collection of benthic invertebrate tissue and community samples continued at LC_GRCK in 2021, as the aqueous selenium concentration threshold required for biological monitoring at that area (50% of samples in a given year >2 µg/L) was met in 2020 (64%; Minnow 2021b). The same threshold applies to LC_UC; however, it was not met in 2020 (Minnow 2021b) so biological sampling was not conducted at LC_UC in 2021.

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

- Benthic invertebrate abundance, community, and tissue selenium concentrations (composite-taxa samples);

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[7] Areas DC1, DCDS, FRB and FRUS have been sampled since 2014. Areas LC_DC3, LC_DCEF, LC_DC2, and LC_DC4 were not sampled for the LCO Dry Creek LAEMP prior to December 2018. Biological sampling was not conducted at area LC_SPDC prior to December 2018.

Table 2.1: Monitoring Areas Associated with LCO Dry Creek LAEMP, 2021

Area	Area Type	Sampling Location					
		Teck Location Code	Biological Sampling Area (Alternative Names)	Environmental Monitoring Station Number (EMS #)	Location Description	UTM (NAD83, Zone 11U)	
						Easting	Northing
Dry Creek	Mine-exposed	LC_DC3	-	E288273	Dry Creek upstream of Headpond	658294	5540918
	Reference	LC_DCEF	-	E288274	East Tributary near confluence with Dry Creek	658260	5541295
	Mine-exposed	LC_SPDC[a]	-	E295211	Dry Creek sediment ponds outlet; effluent to Dry Creek	657821	5542042
	Mine-exposed	LC_DCDS	-	E295210	Dry Creek downstream of sediment ponds outlet	657766	5542073
	Mine-exposed	LC_DC2	-	-	Dry Creek approximately 0.6 km downstream from sediment ponds outlet	657445	5542561
	Mine-exposed	LC_DC4	-	-	Dry Creek 1.6 km downstream from the sediment ponds outlet	657172	5543327
	Mine-exposed	LC_DC1	LC_DC1 (DRCK)	E288270	Dry Creek upstream of Fording Mine Road	656519	5544658
Fording River	Mine-exposed	FR_FR5[b]	-	-	Fording River upstream of Dry Creek and Ewin Creek, and downstream of Chauncey Creek	657173	5548723
	Mine-exposed	-[b]	LC_FRUS (FO28)	E295232		656307	5545255
	Mine-exposed	LC_FRB	LC_FRB (FO29)	-	Fording River downstream of Dry Creek	655275	5543711
Unnamed Creek	Reference	LC_UC[c]	-	E295213	Unnamed Creek	655351	5543087
Grace Creek	Mine-exposed	LC_GRCK	-	E288275	Grace Creek upstream of the CP rail tracks	654303	5540755

▨ Historical Sampling Areas for LCO Dry Creek LAEMP (Minnow 2019).

Note: "-" indicates no data available.

[a] LC_SPDC was discontinued as a biological sampling location when the DCWMS pipe was extended in 2020. 2021 samples were collected for antiscalant addition system monitoring.

[b] The requirement to sample water at LC_FRUS was removed from Permit 106970 in late summer of 2015. FR_FR5 has been included as an alternative station. FR_FR5 is not a permitted water monitoring station, therefore, sampling location and frequency may change.

[c] Unnamed Creek is currently not included as a biological sampling area as it did not trigger the mine effect level necessitating additional monitoring in 2020 (Minnow 2021b).

- Concentrations of total selenium, nitrate, sulphate, total and dissolved cadmium, nutrients, selenium species, and other constituents (i.e., those listed in Section 2.2.1) in water, based on routine water quality monitoring;
- *In situ* water quality (including temperature and dissolved oxygen) at routine water quality monitoring locations and concurrently with benthic invertebrate sampling;
- Acute (at LC_SPDC) and chronic (LC_DCDS) toxicity of water samples;
- Calcite index; and
- Temperature, flow, dissolved oxygen, and redd surveys as part of the Fish and Fish habitat section (Section 7).

Water quality monitoring presented in this report includes requirements specified under Permit 107517 and acute and chronic water toxicity testing results represent the requirements of Permit 107517 (ENV 2013 and 2021, respectively; Table 2.2). Biological sampling in 2021 was completed in accordance with the 2021 LCO Dry Creek LAEMP study design (Minnow 2021b).

In response to the BRN spoil failure additional sampling was added to the 2021 LAEMP sampling program. Supplemental BRN spoil failure sampling evaluated the following components at all areas on Dry Creek.

- Benthic invertebrate abundance, community and tissue selenium concentrations (composite-taxa samples);
- Concentrations of total selenium, nitrate, sulphate, total and dissolved cadmium, nutrients, selenium species, and other constituents (i.e., those listed in Section 2.2.1) in water, based on routine water quality monitoring;
- *In situ* water quality (including temperature and dissolved oxygen) at routine water quality monitoring locations; and
- Periphyton community composition[8].

The timing of sampling, as well as the methods associated with sample collection, laboratory analysis, and data analyses are described in the following sections.

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[8] Periphyton community monitoring was completed to better understand primary productivity and periphyton community composition in relation to algal bioaccumulation of selenium and the reduction of selenium in Dry Creek. Details of this monitoring (including background, methods, and results) are presented in Appendix I. Details are not included in the main body of the present report because periphyton community monitoring does not directly relate to the LCO Dry Creek LAEMP study questions (see Section 1.2).

Table 2.2: **Summary of Water Quality Monitoring for Permit 107517**

Area	Area Type	Teck Water Station Code (associated Biological Station Code in brackets)	EMS Number	Location Description	UTM (NAD83, Zone 11U)		Water Quality Samples				
					Easting	Northing	Field Parameters[a]	All Other Parameters Required Under Mine Permits[b]	Selenium Speciation Sampling[c]	Toxicity[d]	
										Acute	Chronic
Dry Creek	Mine-exposed	LC_DC3	E288273	Dry Creek upstream of Headpond	658294	5540918	BP-W/M	BP-W/M	BP-W/M	-	-
	Reference	LC_DCEF	E288274	Dry Creek East Tributary near confluence with Dry Creek	658260	5541295	M	M	-	-	-
	Mine-exposed	LC_SPDC[e]	E295211	Dry Creek sediment ponds outlet; effluent to Dry Creek	657821	5542042	M	M	-	Q	-
	Mine-exposed	LC_DCDS	E295210	Dry Creek downstream of sediment ponds outlet	657766	5542073	BP-W/M	BP-W/M	BP-W/M	-	Q/SA[f]
	Mine-exposed	LC_DC2	-	Dry Creek approximately 0.6 km downstream from sediment ponds outlet	657445	5542561	-	-	Q	-	-
	Mine-exposed	LC_DC4	-	Dry Creek 1.6 km downstream from the sediment ponds outlet	657172	5543327	-	-	Q	-	-
	Mine-exposed	LC_DC1 (DRCK)	E288270	Dry Creek upstream of Fording Mine Road	656519	5544658	W/M	W/M	-	-	-
Fording River	Mine-exposed	LC_FRUS[g]	E295232	Fording River upstream of Dry Creek and Ewin Creek, and downstream of Chauncey Creek	656307	5545255	M	M	-	-	-
	Mine-exposed	LC_FRB (FO29)	-	Fording River downstream of Dry Creek	655275	5543711	M	M	-	-	-
Unnamed Creek	Reference	LC_UC[h]	E295213	Unnamed Creek	655351	5543087	M	M	-	-	-
Grace Creek	Mine-exposed	LC_GRCK	E288275	Grace Creek upstream of the CP rail tracks	654303	5540755	M	M	-	-	-

Notes: "-" indicates no data available; BP-W/M = Weekly frequency March 15 to at least August 31 during bypass of the LCO Dry Creek Water Management System, monthly during the rest of the year; W/M = weekly from March 15 to July 15, monthly for the remainder of the year; M = monthly; SA = semi-annually; Q = quarterly.

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

[b] Parameters consistent with Permit 107517 (see Table 2.3 for details).

[c] Samples for selenium speciation analysis collected in April, June, September, and December within a week of biological sampling.

[d] Acute toxicity testing as per permit 107517 requirement. Chronic toxicity testing as per permit 107517 requirement.

[e] LC_SPDC was discontinued as a biological sampling location when the DCWMS pipe was extended in 2020. Sampled as part of antiscalant addition system monitoring.

[f] Quarterly chronic toxicity tests: *Ceriodaphnia dubia* and algae. Semi-annual tests: fathead minnow (Q1 & Q3), rainbow trout (Q2 & Q4), and *Hyalella azteca* (Q2 & Q4).

[g] The requirement to sample water at LC_FRUS was removed from Permit 106970 in late summer of 2015. FR_FR5 has been included as an alternative station. FR_FR5 is not a permitted water monitoring station, therefore, sampling location and frequency may change.

[h] Unnamed Creek is currently not included as a biological sampling area as it has not triggered the mine effect level necessitating additional monitoring (Minnow 2020b).

2.2 Study Question 1: Water Quality

2.2.1 Routine Water Quality

Water quality data assessed as part of the LCO Dry Creek LAEMP included data collected for routine monitoring managed by Teck in accordance with monitoring requirements under Permit 107517, as well as data collected concurrently with benthic invertebrate sampling at unpermitted biological monitoring areas (Tables 2.2 and 2.3).

Receiving water quality is monitored by LCO staff at permitted areas in Dry Creek (LC_SPDC, LC_DCDS, and LC_DC1), the Fording River (LC_FRB), low[9] mine-exposure area Grace Creek (LC_GRCK) and reference areas Dry Creek East Tributary and Unnamed Creek (LC_DCEF and LC_UC; Table 2.1 and Figure 1.5). At area LC_SPDC, extension of the pipe bypassing the discharge channel was completed in October 2020, and water samples for routine monitoring and selenium speciation have been collected from the decant of this pipe since that time (LC_SPDC).

Collection of selenium speciation samples from Dry Creek LAEMP areas began in late 2018. Selenium speciation sampling frequency was variable[10] in Dry Creek in 2019 and 2020, but sampling was conducted weekly at most areas in 2021[11]. Selenium speciation samples were only collected concurrently with biological sampling (i.e., not routinely) at areas LC_GRCK, LC_FRB, and LC_FRUS. Selenium speciation samples were not collected at areas FR_FR5 or LC_UC.

Detailed water quality reports are submitted by Teck to ENV quarterly and interpreted annually in accordance with Permit 107517 (Teck 2022). Data from 2012 to the end of December 2021 were downloaded from Teck's EQuIS™ database for each of the above monitoring locations (Table 2.2), including:

- Order Constituents (dissolved cadmium, nitrate, total selenium, and sulphate; Teck 2014)[12];
- Nutrient concentrations (i.e., nitrate [noted above], nitrite, ammonia, total phosphorus, and orthophosphate);

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[9] Grace Creek is downgradient of the LCOII development footprint however it is far enough from mine property that mine-influence is low relative to Dry Creek.

[10] Selenium speciation sampling occurred more frequently than was prescribed in the study design (quarterly) at Dry Creek areas LC_DC3, LC_DCDS, LC_DC4, and LC_DC1, with samples generally taken weekly from April through December, but with some variability throughout the year.

[11] Weekly at LD_DC3, LC_SPDC, LC_DCDS, LC_DC2,LC_DC4, and LC_DC2. Monthly at LC_DCEF. Only concurrently with biological sampling at LC_FRUS, LC_FRB and LC_GRCK.

[12] Collectively referred to as "Order constituents" because they are specifically named in Provincial Order M113 issued in April 2013.

Table 2.3: Water Quality Parameters Required Under Permit 107517[a]

Category	Parameters
Field Parameters	water temperature, specific conductance, dissolved oxygen (DO), pH
Conventional Parameters	specific conductance, total dissolved solids, total suspended solids, hardness, alkalinity, dissolved organic carbon, total organic carbon, and turbidity
Major Ions	bromide, fluoride, calcium, chloride, magnesium, potassium, sodium, and sulphate
Nutrients	ammonia, nitrate, nitrite, total Kjeldahl nitrogen (TKN), orthophosphate, and 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 27, Appendix 3 of Permit 107517.

- Selenium concentrations (i.e., total and dissolved selenium concentrations, and selenium speciation results[13] including concentrations of selenate, selenite, dimethylselenoxide, methylseleninic acid, selenocyanate, selenomethionine, methaneselenonic acid selenosulphate, and unknown selenium species);
- Concentrations with existing SPOs for Dry Creek (total selenium [noted above] and total cadmium) and/or have previously been identified via SDM and/or AMP response frameworks on Dry Creek (total selenium, nitrate, sulphate, and non-selenate selenium species [all noted above]);
- Concentrations of constituents with early warning triggers under the AMP (i.e., total dissolved solids, sulphate [note above], total concentrations of antimony, barium, boron, lithium, manganese, molybdenum, nickel, selenium [noted above], uranium, and zinc, and dissolved concentrations of cadmium [noted above] and cobalt);
- Concentrations of constituents with BCWQG (BCMOECCS 2019, 2021), SPOs for LCO Dry Creek (total selenium and total cadmium; ENV 2013), and/or water quality benchmarks (Teck 2014), see Appendix Table C.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) measures associated with routine water quality monitoring were discussed in the annual water quality report for Permit 107517 (Teck 2021a). Quality control results associated with water samples collected concurrently with biological samples are discussed in greater detail in the Data Quality Review (DQR) in Appendix B (see Appendix K for applicable laboratory reports).

2.2.2 Laboratory Analysis

Water samples were analyzed by ALS Environmental, Calgary, Alberta, for constituents consistent with Permit 107517 (i.e., conventional parameters, major ions, nutrients, and total and dissolved metals) using standard methods (Table 2.3).

Water samples were analyzed by Brooks Applied Labs, Seattle, Washington for selenium speciation analysis (including concentrations of selenate, selenite, DMSeO, MeSe(IV), methaneselenonic acid, selenocyanate, selenomethionine, selenosulphate, and unknown selenium species).

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[13] Selenium speciation samples were first collected from Dry Creek in November 2018.

2.2.3 Data Analysis

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. Analyses of water quality data were completed using the following approaches (see Appendix A for detailed methodology):

- Tabular and graphical comparison to applicable benchmarks, interim screening values, SPOs, and BCWQGs;
- Principal Component Analysis (PCA) to condense water quality results for use in benthic invertebrate community correlation analysis;
- Evaluation of temporal trends in monthly mean water quality concentrations using two tests:
    - Non-parametric seasonal Kendall test;
    - Two-way censored regression Analysis of Variance (2-way ANOVA);
- Evaluation of changes in selenium species concentrations before and after the BRN spoil failure using a two-way censored regression ANOVA.

Following the completion of the statistical analyses listed above, the following four criteria were applied to the water quality results to focus data interpretation for the present report. Those water quality constituents that met each of criteria 1 to 3 listed below and those that met criteria 4 (either independently of or in addition to meeting criteria 1 to 3 below) were selected as the focus for data interpretation. The four criteria applied to the water quality results are as follows:

> **Criteria 1:** Constituents had concentrations exceed applicable BCWQGs and/or site-specific effect benchmarks in the majority (> 50%) of samples in a year at the majority (≥ 50%) of the mine-exposed areas on Dry Creek in 2021 (i.e., ≥ 3 areas);
>
> **Criteria 2:** Seasonal Kendall trend analysis indicated significant increases in concentration with a trend slope (average percentage change in concentration per year) > 50% at the majority (≥ 50%) of the mine-exposed areas on Dry Creek in 2021 (i.e., ≥ 3 areas);
>
> **Criteria 3:** 2-way ANOVA analysis indicated concentrations increased >100% between the first year of sampling and 2021 and were significantly higher in 2021 than 2020 at the majority (≥ 50%) of the mine-exposed areas on Dry Creek in 2021 (i.e., ≥ 3 areas);

Criteria 4: Constituents that have existing SPOs for Dry Creek (total selenium and total cadmium) and/or have previously been identified by SDM and/or AMP response frameworks on Dry Creek (total selenium, nitrate, sulphate, and non-selenate selenium species).

2.3 Study Question 2: Acute and Chronic Toxicity

Permit 107517 requires that water samples be collected quarterly at LC_SPDC by LCO operations for acute toxicity testing, however, following the BRN spoil failure, the frequency of acute toxicity testing was increased to almost daily (February 12 to March 17; n = 32), weekly (mid-March to early-July), and monthly for the remainder of the year (n = 62; Table 2.2). The following acute toxicity tests were conducted at LC_SPDC:

- Acute toxicity test using rainbow trout (*Oncorhynchus mykiss*); Report EPS 1/RM/9 July 1990 (with May 1996 and May 2007 amendments; Environment Canada 2007a); and
- Acute toxicity test using *Daphnia* spp.; Report EPS 1/RM/11 July 1990 (with May 1996 amendments; Environment Canada 1996).

Chronic toxicity tests were also completed on water samples collected quarterly and semi-annually in 2021 at area LC_DCDS (Table 2.2; Figures 1.4 and 1.5) as per the Permit 107517 Chronic Toxicity Program integration amendment (March 4, 2019). 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)[14].

Semi-annual tests – Q2[15] and Q4:

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

---

[14] A single bioassay was used for each test area, with the test allowed to continue to 8 days (per request of the EMC). The lab collected and compiled data for both 7- and 8-d test length, and the results of the two test durations for *C. dubia* are compared in the interpretive report (Golder 2021a).

[15] In 2019, Q2 *H. azteca* test was invalid and therefore repeated in Q3 (Golder 2020). In 2021, additional testing with *H. azteca* was conducted in Q3 since 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 2021 for all stations.

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

Semi-annual tests - Q1 and Q3:

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

Mean test site responses were compared to responses for tests of samples from local reference areas. 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'.[16] Toxicity tests and associated QA/QC measures were completed and reported by the Nautilus Environmental Company Inc. contracted by Teck to complete tests in accordance with the above listed methods. The results were summarized in reports completed in accordance with Permit 107517 (Teck 2021a, Golder 2021a).

2.4 Study Questions 3 and 4: Benthic Invertebrates

2.4.1 Overview

In 2021, biological sampling (i.e., benthic invertebrate community and tissue chemistry) and calcite assessment for the Dry Creek LAEMP met the requirements outlined in the 2021 LCO Dry Creek LAEMP study design (Minnow 2020b), with additional sampling added in response to the BRN spoil failure.

Sampling dates in 2021 were consistent with LAEMP sampling in 2020 (Minnow 2020a). LAEMP sampling events completed on Dry Creek in 2021 took place in May, June, September, and December (Tables 2.4 and 2.5).

In response to the BRN Spoil failure additional biological sampling events were completed on March 8 to 16 and May 31 to June 2. All biological monitoring areas were sampled during these events, with the exceptions of LC_GRCK (March and June) and LC_DC2 (March only) due to the area being too frozen to sample properly (Table 2.4). Results from the additional sampling in response to the BRN spoil failure have been incorporated into the LAEMP data set and used in

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[16] 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 2.4: Benthic Invertebrate Community Sampling for Dry Creek LAEMP and Burnt Ridge Spoil Failure, 2021

Area		March	May	June	September	December
Mine-exposed	LC_DC3	n=3 (√)	n=3 (√)	n=3 (√)	n=3 (√)	-
Reference	LC_DCEF	n=3 (√)	n=3 (√)	n=3 (√)	n=3 (√)	-
Mine-exposed	LC_DCDS	n=3 (√)	n=3 (√)	n=3 (√)	n=3 (√)	n=3 (√)
	LC_DC2	-	n=3 (√)	n=3 (√)	n=3 (√)	-
	LC_DC4	n=3 (√)	n=3 (√)	n=3 (√)	n=3 (√)	-
	LC_DC1	n=3 (√)	n=3 (√)	n=3 (√)	n=3 (√)	n=3 (√)
	LC_FRUS	n=3 (√)	n=3 (√)	n=3 (n=2)	n=3 (√)	-
	LC_FRB	n=3 (√)	n=3 (√)	n=3 (n=1)	n=3 (√)	-
	LC_GRCK	-	n=3 (√)	-	n=3 (√)	-

▨ Sampling events associated solely with BRN spoil failure .

Notes: "-" = area was not sampled; "√" = target sample size was met; (n=X) indicates actual number of samples collected if target size was not met. Target sample sizes where not met at LC_FRUS and LC_FRB in June due to flow conditions.

Table 2.5: Benthic Invertebrate Composite-Taxa Tissue Selenium Sampling for Dry Creek LAEMP and Burnt Ridge Spoil Failure, 2021

Area		March	May	June (early)	June (mid)	June (late)	September	December
Mine-exposed	LC_DC3	n=3 (√)	n=5 (√)	n=5(√)	n=3 (√)	n=7(√)	n=5 (√)	n=7 (√)
Reference	LC_DCEF	n=3 (√)	n=5 (√)	n=3 (√)	-	n=5 (√)	n=5 (√)	n=5 (√)
Mine-exposed	LC_DCDS	n=3 (√)	n=5 (√)	n=3 (√)	n=3 (√)	n=5 (√)	n=5 (√)	n=5 (√)
	LC_DC2	n=3 (-)	n=5 (√)	n=3 (√)	-	n=5 (√)	n=5 (√)	n=5 (√)
	LC_DC4	n=3 (√)	n=5 (√)	n=3 (√)	-	n=5 (√)	n=5 (√)	n=5 (√)
	LC_DC1	n=3 (√)	n=5 (√)	n=3 (√)	-	n=5 (√)	n=5 (√)	n=5 (√)
	LC_FRUS	n=3 (√)	n=5 (√)	n=3 (√)	-	n=5 (√)	n=5 (√)	-
	LC_FRB	n=3 (√)	n=5 (√)	n=3 (√)	-	n=5 (√)	n=5 (√)	-
	LC_GRCK	-	n=5 (√)	-	-	-	n=5 (√)	-

▨ Sampling events associated solely with BRN spoil failure.

Notes: "-" = area was not sampled; "√" = target sample size was met. Samples where not collected from LC_DC2 in March due to ice conditions.

all statistical analysis; interpretation of results will focus on the study questions posed in the study design and timing of the spoil failure will be used to help contextualize results.

2.4.2 Study Question 3: Benthic Invertebrate Community

Triplicate benthic invertebrate community samples were collected during each sampling event (Table 2.4) apart from LC_FRUS (n=2) and LC_FRB (n=1) in June as high flows precluded sampling at all stations at these sampling areas. Effort was made to target similar habitats for collection of both tissue and community samples within each sampling area. Replicates were collected from three stations within each sampling area either in separate riffles or in riffle sections a minimum of 50 m apart, where habitat allowed, and sampling could be completed safely.

Benthic invertebrate community samples were collected according to the Canadian Aquatic Biomonitoring Network (CABIN) protocol (Environment Canada 2012), which involves a three-minute- travelling kick collection using a net with a triangular aperture measuring 36 cm per side and a mesh (400 µm). During sampling, the technician moved across the stream channel (from bank to bank, depending on stream depth and width) in an upstream direction. The net was held immediately downstream of the technician's feet, so the detritus and invertebrates disturbed from the substrate were passively collected into 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 debris and invertebrates into the collection cup at the bottom of the net. The collection cup was then removed, the contents poured into a labelled plastic jar and preserved to a final concentration of 10% buffered formalin in water.

Consistent with the requirements of the CABIN sampling protocol, supporting habitat information (e.g., water velocity and depth, *in situ* water quality [temperature, dissolved oxygen, conductivity, and pH], periphyton coverage scores, and substrate characteristics [100 pebble count], etc.) was collected concurrent with benthic invertebrate community samples (Environment Canada 2012). As stipulated by the CABIN sampling method, the intermediate axis (i.e., the axis perpendicular to the longest axis) was measured for each of 100 pebbles, which were collected randomly at each benthic invertebrate sampling area. The pebbles were collected over an area that included the benthic invertebrate sampling path while avoiding characterization of previously-disturbed substrate. Moving through the sampling area, the technician stopped at every second step to reach down and evaluate the substrate nearest to the big toe of their right foot, taking care not to bias results by avoiding larger boulders. The intermediate axis of the pebble was measured in centimetres to one significant digit. If the pebble could not be picked up, it was measured in the water (e.g., large boulders and embedded cobbles). For every 10th pebble encountered during sampling, an estimate of the degree of embeddedness in surrounding materials was recorded (to the nearest quarter percent).

In addition to the CABIN requirements, measurements of calcite presence and concretion were made on a total of 100 particles (concurrent, and on the same particles used in the 100-pebble count) using methods described by Teck (2016). Consistent with the Teck methodology for monitoring calcite, an adaptation of the Wolman pebble count was used to characterize calcite deposition by also recording the presence (score = 1) or absence (score = 0) of calcite on each particle. In 2021, an additional method for assessing calcite presence in lotic environments was included (Cp′, Lotic 2021, Zathey et al. 2021a) 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.)[17]. The degree of concretion 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 were then be expressed as a Calcite Index (CI) based on the following equation (Teck 2016):

$CI = C_p + C_c$ or $CI = C_p' + C_c$

Where:

$$CI\ or\ CI' = Calcite\ Index^{18}$$

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

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

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

2.4.2.1 Laboratory Analysis

Benthic invertebrate community samples were sent to Cordillera Consulting (lead taxonomist Scott Finlayson), in Summerland, BC, for sorting and taxonomic identification. Organisms were identified to the lowest practicable 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

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[17] 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)

[18] CI refers to the binary assessment of Cp and CI′ refers to the proportional assessment of Cp′.

and enumeration. In such cases, the CABIN method requires that a minimum of 5% of each sample (i.e., five cells in a Marchant sorting box) and 300 organisms be analyzed. Sorting efficiency and sub-sampling accuracy and precision were quantified using methods outlined by Environment Canada (2012). Total organism abundance was reported for every distinct taxon identified in each sample (see Appendix K for raw data).

2.4.2.2 Data Analysis

Benthic invertebrate community condition was evaluated based on total abundance, taxonomic richness (to the lowest practicable level of taxonomy), and the abundances and proportional abundances (%) of major taxonomic groups. Analyses of benthic invertebrate community data were completed using the following approaches (see Appendix A for detailed methodology):

- Graphical comparison of data relative to regional[19] and site-specific normal ranges[20];
- Evaluation of temporal changes in endpoints from mine-exposed areas relative to reference, and in the Fording River downstream relative to upstream of Dry Creek, using a two-way ANOVA;
- Evaluation of temporal changes in endpoints using a one-way ANOVA for sampling events where reference data do not exist (i.e., June events);
- Assessment of relationship between benthic invertebrate community structure and physical and chemical parameters using non-parametric (Spearman Rank) correlations.

Benthic invertebrate community data collected in September were the focus of data analyses and interpretation. Data from other seasons (namely May and June) were used in the temporal evaluation of the potential effects of the BRN spoil failure on the benthic invertebrate community. See Appendix A for additional rationale.

2.4.3 Study Question 4: Benthic Invertebrate Tissue Selenium

Benthic invertebrate tissue chemistry sampling was completed in accordance with the 2021 LCO Dry Creek LAEMP study design (Minnow 2020b), with the addition of supplemental sampling outlined in Section 2.4.1. Seven sampling events (March, May, early-June, mid-June, late-June, September, and December) were conducted in 2021 (Table 2.5). Five replicate composite-taxa

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[19] The reference normal range as presented in the RAEMP represents the 2.5th and 75th percentiles of the distribution of reference area data (pooled 2012 to 2019 data) reported in the 2017 to 2019 RAEMP report (Minnow 2020c).

[20] Site-specific normal ranges represent the 2.5th and 97.5 percentile for a given area as determined by habitat predictors for a given site 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 2020c).

benthic invertebrate tissue samples were collected from each sampling area in May, late-June, September, and December sampling events, except for June and December at LC_DC3 where seven replicate samples were collected (Table 2.5). Three replicate composite-taxa benthic invertebrate tissue samples were collected from each sampling area during supplemental sampling events, except for LC_DC3 where five replicates were collected (Table 2.5).

Samples were collected using the kick and sweep method described in Section 2.4.2, except collections were not timed, and kicking continued only until sufficient organisms were collected. 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 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, organisms in the sample were carefully removed from sample debris using tweezers until a minimum of approximately 0.5 g of wet tissue was obtained. Invertebrate tissue samples were then photographed to document taxa composition, placed into labelled, sterile, 20 mL scintillation vials and stored in a cooler with ice packs until transfer to a freezer later in the day.

2.4.3.1 Laboratory Analysis

Frozen samples were shipped by courier in coolers with ice packs to TrichAnalytics Inc. in Saanichton, BC. Samples were dehydrated upon receipt and were analyzed using Laser Ablation Inductively Coupled Plasma Mass Spectrometry (ICP-MS). 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 K for laboratory reports).

2.4.3.2 Data Analysis

Analyses of composite-taxa benthic invertebrate tissue selenium data were completed using the following approaches (see Appendix A for detailed methodology):

- Graphical comparison of tissue selenium concentrations relative to applicable benchmarks and the regional normal range;
- Evaluation of the potential effects of DCWMS operational phases and the BRN spoil failure on tissue selenium concentrations from mine-exposed areas relative to reference, and in the Fording River downstream relative to upstream of Dry Creek, using a two-way ANOVA;
- Comparison of observed tissue selenium concentrations to those predicted using a selenium bioaccumulation tool;

- Evaluation of changes in tissue selenium concentrations among sampling events in 2021 at mine-exposed areas relative to reference, and in the Fording River downstream relative to upstream of Dry Creek, using a two-way ANOVA;
- Evaluation of spatial differences among areas in tissue selenium concentrations for each sampling event in 2021, using a one-way ANOVA.

2.5 Study Question 5: Fish and Fish Habitat

Fish collection in Dry Creek began in 2009 as part of the baseline environmental assessment (EA; Teck 2011). Further baseline sampling occurred in 2010. Fish community surveys did not occur between 2011 and 2015. In 2016, Lotic Environmental Ltd. (Lotic) and Ecofish were retained by Teck to complete fish and fish habitat monitoring on Dry Creek. These annual fish community surveys in Dry Creek were conducted as part of the Dry Creek Fish and Fish Habitat Monitoring Program to support the permit conditions for the Dry Creek Water Management Plan from 2016 until 2019. Water temperatures and WCT relative abundance, biomass, density, and spawning information was collected (Ecofish 2019; Ecofish 2020a). In 2020, the fish and fish habitat monitoring was completed by Nupqu and AJM (Nupqu and AJM 2021). These data are used to assess whether changes in fish and fish habitat (including instream flows and calcite index) are occurring within Dry Creek as a result of mine operations. WCT is the only fish species present in Dry Creek.

In 2021, fish and fish habitat monitoring was conducted by Lotic and Ecofish and relevant monitoring data were integrated into this report. Previously completed components of fish and fish habitat monitoring included an instream flow study (Healey et al. 2016) and a fish habitat assessment procedure (FHAP) of Reaches 1 to 4 (Buchanan et al. 2017).

To limit stress on WCT populations related to sampling activities, fish collections were not completed in 2020 and minimal sampling occurred in 2021. The decision to limit fish handling was based on feedback from the Elk Valley Fish and Fish Habitat Committee (EVFFHC) and was implemented as a proactive response to an observed decline in the WCT population of the Upper Fording River in 2019 (Cope 2020).

These analyses, along with the 2021 study provide data to support the following study questions:

1. What is the status of fish and fish habitat in LCO Dry Creek?
2. Is there a temporal trend in the status of fish and fish habitat?

2.5.1 Fish Abundance and Fish Health

Ecofish monitored fish abundance in Dry Creek from 2016 to 2019 using a closed-area electrofishing survey at six sites in Dry Creek (Ecofish 2019, 2020a). Minnow traps were employed to capture WCT from 2016 to 2019 but was found to be an inefficient form of capture and was removed from planned study designs after 2019 (Ecofish 2020a). These data allowed for analyses of WCT relative abundance and biomass in Dry Creek from 2016 to 2019. Due to reduced sampling effort in 2020 relative abundance and biomass estimates were not included in the 2020 report (Minnow 2021a).

Lotic performed a fish survey in Dry Creek in 2021 as part of the UFR WCT Monitoring Program (Thorley et al., 2022) a randomly selected, single pass, open electrofishing site was completed on September 16, 2021, to determine tributary density downstream of the sediment pond outlet in Reach 3 (657626E, 5542350N). The survey area was 300 m in length with an average channel width of 2.3 m. Search effort at the site was approximately 16 minutes (944 shocking seconds) and completed using a Smith-Root backpack electrofisher LR-24 (250 V at 50 Hz). As described in Buchanan et al. 2017 and Thorley et al. 2022, LCO Dry Creek culverts are partial barriers depending on flow levels.

Overall, fish monitoring data from the upper Fording River (UFR) WCT monitoring program suggest that there is a relatively large, diverse, population of genetically pure WCT with a range that currently includes about 52 km of the mainstem UFR and 36 km of connected tributaries (including LCO Dry Creek). After a substantial decline in (sub)adult abundance of WCT between 2017 and 2019, due to colder than average winter conditions in tandem with mining related changes in discharge and channel morphology, the population appears to be rebounding (Thorley et al. 2022). There is some evidence that habitat offsetting measures to improve degraded habitat from mining operations may have locally increased (sub)adult densities (Thorley et al. 2022).

Measures of fish population and community health were assessed from 2016 to 2019 (Ecofish 2019, 2020a). Measures of fish health previously reported include population age, geographic distribution of age classes among Dry Creek reaches, and relative fish condition. Due to reduced sampling in 2020 and 2021 results from similar analyses could not be provided. However, the fork length (mm) and estimated age of fish captured in 2021 are summarized in Section 7.2.

2.5.2 Fish Tissue Analysis

No fish were retained in 2021 and so an evaluation of dietary exposure of WCT in Dry Creek to selenium is not repeatable. Observed concentrations of selenium in muscle and ovary tissued observed in 2020 are discussed in Section 7 to provide context. Muscle selenium concentrations were compared to upper and lower Fording River data from 2018 and the site-specific benchmark for WCT muscle tissue selenium toxicity developed for the Elk Valley (15.5 mg/kg dry weight [dw]; Elk Valley Water Quality Plan; Appendix Table F.1; Golder 2014b). Collection and analysis methods for fish collected in 2020 can be found in Minnow (2021). An evaluation of fish tissue selenium concentration is beyond the scope of the 2021 LCO Dry Creek study design (Minnow 2020b) and study questions (Section 1.2) but is discussed to better understand the dietary exposure of WCT in Dry Creek to selenium.

2.5.3 Redd Surveys

Redd surveys were conducted in Dry Creek each year from 2016 to 2021, to assess the abundance and distribution of redds. The surveys have been conducted by different crews over time but followed similar methods. The surveys were conducted as bank walk counts during which two surveyors walked slowly along opposite banks in an upstream direction to avoid reducing water visibility or flushing fish prior to observation. During each survey, the presence and location of redds, and data for water temperature and visibility were recorded. Redds were identified as recent, clean excavations in gravel substrates, and marked with flagging or UTM coordinates to avoid double counting on subsequent surveys. The surveys were generally completed in June and July of each year, though timing of surveys varied each year depending on flow and water visibility (Table 2.6). The area of the surveys extended from the Dry Creek confluence with the Fording River upstream to the outlet of the sedimentation ponds in Reach 4 (Figure 1.5). Depending on availability of time in the field, some surveys continued as far as the East Tributary confluence, roughly 850 m upstream of the sedimentation pond outlet.

2.5.4 Physical Habitat, Temperature, Dissolved Oxygen, Flow, and Calcite

Physical habitat data including stream gradient, habitat type, cover, and substrate characteristics were collected at each of the closed-area electrofishing sites from 2016 to 2019 following methods described by Bech (1994) but were not measured in 2020 (Nupqu and AJM 2021) or in 2021. Some features of the physical habitat were measured during benthic invertebrate community monitoring completed as part of the LAEMP sampling (See Section 5).

Monitoring of water temperature has been ongoing since 2016 at six locations in the Dry Creek watershed, including one location in the East Tributary of Dry Creek, and one location in the Fording River near Dry Creek (Table 2.7). An additional three locations in the Fording River near Dry Creek were monitored for part of 2021. The final download of Dry Creek water temperature data in 2021 was 23 October. Detailed descriptions of water temperature data and analyses are provided in Appendix A to Hatfield et al. 2022. A summary of water temperature metrics used in interpretation and description of their calculation methods are provided in Table 2.8.

Prior to 2020, the sedimentation pond outlet channel was an engineered discharge channel lined with riprap that conveyed water from the sedimentation ponds back into the Dry Creek mainstem channel. In October 2020, the outlet channel was filled in and replaced with a

Table 2.6. Redd Surveys Completed in Dry Creek, 2016 to 2021

Waterbody	Year	Survey Round	Dates	Company	Partial or Complete Survey [1]
Dry Creek	2016	Round 1	June 6-7 and 12	Ecofish	Complete
		Round 2	July 4	Ecofish	Complete
	2017	Round 1	June 16-17	Ecofish	Complete
		Round 2	July 12	Ecofish	Complete
	2018	Round 1	June 29-30	Ecofish	Complete
		Round 2	July 19-21	Ecofish	Complete
	2019	Round 1	July 6	Ecofish	Complete
		Round 2	July 17	Ecofish	Complete
	2020	Round 1	June 30	Nupqu	Complete
		Round 2	July 6	Ecofish	Complete
		Round 2	July 7	Nupqu	Complete
	2021	Round 1	June 16	Lotic Environmental	Complete
		Round 2	June 23	Lotic Environmental	Partial [2]
		Round 3	June 30	Lotic Environmental	Complete
		Round 4	July 7	Lotic Environmental	Complete

[1] A survey was complete if the area surveyed spanned from the Fording River confluence to the Dry Creek sedimentation pond outlet, though prior to 2020 most surveys ended at East Tributary confluence, ~900 m upstream.

[2] The June 23, 2021 survey was not completed due to lightning nearby; Dry Creek was surveyed from the Fording River confluence to midway through Reach 3.

Table 2.7: Summary of Water Temperature Monitoring Stations in Dry Creek, 2016 to 2021

Waterbody	Site Name	Site Description[1]	UTM Coordinates (Zone 11 U, NAD83)		Elevation (masl)[1]	Start of Record	End of Record	Number of Sensors	Sensor Make and Accuracy	Logging Interval (min)	Number of Days with Valid Data	Gaps in Record (%)
			Easting	Northing								
Dry Creek East Tributary	DRY-WQ03	~20 m upstream of East tributary bridge	658,269	5,541,290	1,701	06-Jun-2016	23-Oct-2021	2	Tidbit (±0.2°C)	15	1,964	0
Dry Creek	DRY-WQ04	~50m upstream from the East tributary confluence	658,132	5,541,240	1,690	06-Jun-2016	23-Oct-2021	2	Tidbit (±0.2°C)	15	1,964	0
	DRY-WQ02	~80m downstream of East tributary	658,069	5,541,281	1,686	06-Jun-2016	23-Oct-2021	2	Tidbit (±0.2°C)	15	1,942	1
	DRY-WQ06	Settling pond outlet channel	657,808	5,542,061	1,642	07-Sep-2016	07-Oct-2020	2	Tidbit (±0.2°C)	15	1,489	0
	DRY-WQ07	Settling pond outlet channel	657,808	5,542,061	1,642	25-Jun-2021	23-Oct-2021	2	Tidbit (±0.2°C)	15	120	0
	DRY-WQ05	Downstream of settling pond	657,749	5,542,082	1,642	07-Sep-2016	23-Oct-2021	2	Tidbit (±0.2°C)	15	1,872	0
	DRY-WQ01	~100m upstream of Dry/Fording River confluence	655,972	5,544,842	1,515	06-Jun-2016	23-Oct-2021	2	Tidbit (±0.2°C)	15	1,965	0

[1] Meters above sea level, as measured with Google Earth.

Table 2.8: Summary Descriptions of Water Temperature Metrics and Calculation Methods

Parameter	Description	Method of Calculation
Monthly water temperature statistics	Average, minimum, and maximum temperatures on a monthly basis	Calculated from temperatures observed at or interpolated to 15-min intervals.
Number of days with extreme daily-mean temperature	>18°C , >20°C , and <1°C	Total number of days with daily-mean water temperature >18°C , >20°C , and <1°C
Growing Season Degree Days (GSDD)	The cumulative sum of daily mean water temperatures over the course of the growing season.	The beginning of the growing season is defined as the beginning of the first week that mean stream temperatures exceed and remain above 5°C; the end of the growing season was defined as the last day of the first week that mean stream temperature dropped below 4°C (as per Coleman and Fausch 2007). Daily mean water temperatures are summed over this period (i.e., from the first day of the first week when weekly mean temperatures reached and remained above 5°C until the last day of the first week when weekly mean temperature dropped below 4°C).
Rate of change in water temperature	Change in water temperature over hourly intervals	Calculated from 15 minute data, presented in graphical form.
MWMxT	Mean Weekly Maximum Temperature	A 1-week moving-average filter is applied to the record of daily-maximum water temperatures inferred from hourly data; e.g., if MWMxT = 15°C on August 1, 2008, this is the average of the daily-maximum water temperatures for the 7 days from July 29 to August 4. MWMxT is calculated for every day of the year.

pipe extension. To accommodate the infrastructure change, the temperature monitoring station DRY-WQ06 was discontinued and a new station DRY-WQ07 was established downstream from the outlet in October 2020.

Guidelines for the protection of aquatic life in the Province of British Colombia (Oliver and Fidler 2001) state that water temperature should not exceed 19°C or fall below 1°C in coldwater tributary streams. The upper threshold of 19°C is considered appropriate for WCT survival because this species has an upper incipient lethal temperature of 19.6°C (95% CI = 19.1 to 19.9°C; Bear et al. 2007). Optimum growth for WCT has been reported at 13.6oC and suitable thermal habitat occurs where maximum daily temperatures are between 13 to 15°C (Bear et al. 2007). However, exposure to prolonged periods of warm water is a useful indicator of potential thermal stress experienced by WCT and is calculated as mean weekly maximum water temperature (MWMxT). Hunter (1973) noted that the preferred MWMxT range of WCT is 9 to 12°C and peak spawning occurs in temperatures from 6 to 17°C. Optimal MWMxT for cutthroat trout rearing is similar, ranging from 7 to 16°C (Oliver and Fidler 2001). Therefore, water temperature was assessed by determining the number of days each year when instantaneous or daily mean water temperatures exceeded 18°C as a potential effects threshold for WCT, assessing minimum, maximum, and average monthly temperatures, and by determining the total number of days when mean daily temperatures were within 1 to 18°C.

The number of growing degree days was also calculated for each reach of Dry Creek. Growing degree days are calculated as the sum of temperatures for each day in a “growing” season; the growing season for WCT is defined as beginning the first week when average water temperature exceeds 5°C and ending the first week that average water temperature drops below 4°C (Coleman and Fausch 2007). For cutthroat trout, recruitment failure may occur when there are less than 800 growing degree days in a growing season, when 800 to 900 growing degree days are observed recruitment may be sustained in some years, whereas recruitment sufficient to sustain the population is expected when growing degree days exceed 900 (Coleman and Fausch 2007).

Dissolved oxygen (DO) is an important parameter of water quality relevant to all aquatic life, and particularly salmonids which are sensitive to low DO conditions (Committee on the Status of Endangered Wildlife in Canada [COSEWIC] 2016). The BCWQG for the protection of aquatic life (BCMOECCS 2021) state that long-term (chronic, 30-day mean) DO concentrations should not fall below 8.0 mg/L and that instantaneous (acute) DO should not fall below 5.0 mg/L. For buried embryos and alevins, the guidelines state that the 30-day mean DO concentrations should not fall below 11 mg/L and instantaneous (acute) DO should not fall below 9 mg/L. The annual minimum and 30day mean DO concentrations at six locations (LC_DCEF, LC_DC1, LC_DC2, LC_DC4, LC_SPDC, and LC_DCDS) in Dry Creek in 2021 were evaluated for key life history activity periods for WCT (e.g., spawning and incubation) to determine if DO minima may negatively impact WCT recruitment or survival.

Streamflow is a "master variable" that influences myriad components of flowing water systems (Poff et al. 1997; Annear et al. 2004). In this report, we focus on timing and magnitude of low flows during the non-freshet period and high flows during freshet. Low flows during the non-freshet period may indicate habitat limitations during an activity period; evidence of anomalous high flows during freshet can be used to infer direct effects to fish (e.g., scour of redds or displacement of free-swimming individuals) or rapid changes to stream morphology. High magnitude flows during freshet also have positive ecological effects and are referred to as channel-maintenance or flushing flows. These high flows maintain gravel quality, sediment dynamics, connectivity with off-channel habitat and riparian communities, and healthy vegetation dynamics in riparian communities. Timing and duration of high and low flows were also examined.

Flow data for Dry Creek were collected in 2021 by Teck and Kerr Wood Leidal at the hydrometric station located at LC_DC1. Mean daily, monthly, and annual discharge for the period of record were tabulated and mean daily discharge rates were plotted relative to timing and duration (periodicity) of life history activity periods for WCT in Dry Creek. The periodicity used here was developed collaboratively and previously reported in Teck (2021). Months with less than 20 days of data were not used in the calculations of mean monthly discharge, which precluded use of data from 2013. There were no data available for LC_DC1 in 2020. Monthly and daily streamflow statistics were also tabulated for the Water Survey of Canada Fording River at the Mouth (WSC 08NK018) gauge, for comparison with flows at LC_DC1. The WSC 08NK018 gauge is located <0.5 km downstream of the confluence with Line Creek.

Summary statistics were reviewed and examined for anomalies within the main WCT activity periods. Pre-existing thresholds for effects are not available, so the evaluation of low flows was done qualitatively. A preliminary flushing flow threshold of 1.0 m3/s for a 2-day duration as measured at LC_DC1 was developed and presented in West et al. (2021). Recent historical flows as measured at LC_DC1 were calculated and tabulated relative to this flushing flow threshold to describe existing conditions in Dry Creek.

The Regional Calcite Monitoring Program was implemented in 2013 to document the occurrence of calcite in streams downstream of its Elk Valley operations. Since 2013, sample locations in the upper Fording watershed have been visited annually in areas downstream of Teck's operations and in non-mine affected reference streams. As part of the Regional Calcite Monitoring Program, there is ongoing calcite monitoring in Dry Creek. Calcite data for Dry Creek were summarized and compared to historical information to provide indications of calcite coverage (extent and intensity) and changes over time.

3 STUDY QUESTION 1: WATER QUALITY

3.1 Overview

The water quality monitoring data were evaluated to address Study Question #1: Are aqueous concentrations of mine-related constituents elevated in relation to BCWQG and EVWQP benchmarks, and are concentrations changing over time? To address this study question, monitoring of constituents listed under permit 107517 (Table 2.3) and selenium species was carried out in 2021 (see Sections 2.2.1 and 2.2.3 for details). Data were evaluated against BCWQG and/or water quality benchmarks or interim screening values where available. Water quality data were also plotted and analyzed statistically to assess changes over time. (Appendix Table C.1).

Water quality data collected concurrent with biological sampling for the present study were of acceptable quality as characterized by good detectability, concentrations below LRLs in almost all method blank samples, good laboratory precision and accuracy, and good field sampling precision. Therefore, the associated data are considered acceptable for this study. QA/QC associated with water samples collected routinely by Teck for Permit 107517 were discussed in the annual water quality report for Permit 107517 (Teck 2022). Temporal changes in concentrations of aqueous constituents evaluated for the Dry Creek LAEMP were statistically evaluated as outlined in Section 2.2.3. Although statistical analyses were completed for: 1) Order Constituents; 2) constituents with early warning triggers under the AMP; and 3) constituents that have previously identified and tracked through SDM and/or AMP response frameworks (listed in Section 2.2.1), detailed data interpretation was focused on those that satisfied the criteria listed in Section 2.2.3. These constituents included nitrate, sulphate, total cadmium, total selenium, organoselenium species[21] in 2021. Unlike in 2020 when nickel met the requirements for detailed interpretation, nickel did the requirements in 2021 (Table 3.1). For graphical plots and the results of statistical analyses for remaining water quality constituents, see Appendix C.

3.2 Nitrate

Aqueous nitrate concentrations were higher than the BCWQG for long-term chronic exposure at all Dry Creek and Fording River areas throughout 2021. The BCWQG for short-term acute

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[21] This interpretation focused on organoselenium species (particularly DMSeO and MeSe(IV) and specifically excluding selenite and other individual selenium species) as elevated concentrations of those constituents are a need for a response was identified through the AMP response framework in 2020.

Table 3.1: Criteria for Detailed Evaluation of Water Quality Endpoints in 2021 LCO Dry Creek LAEMP

Water Quality Endpoint		Criteria for Inclusion			
		All Three Satisfied			Or Only
		2-Way ANOVA[a]	Seasonal Kendall[b]	Guidelines/ Benchmarks[c]	SPO or AMP/SDM[d]
Total Dissolved Solids		-	-	-	-
Nitrate		-	√	√	√
Nitrite		-	-	-	-
Sulphate		√	√	-	√
Total Antimony		√	-	-	-
Total Cadmium		-	-	-	√
Total Lithium		√	-	-[e]	-
Total Mercury		-	-	√	-
Total Molybdenum		√	-	-	-
Total Nickel		-	-	√	-
Total Selenium		-	√	√	√
Total Zinc		-	-	-	-
Organoselenium [f]	Dimethylseleneoxide	-	-	-[e]	√
	Methylseleninic acid	-	-	-[e]	√

🟩 Criteria for detailed evaluation met.

Notes: "√" = criteria met; "-" = criteria not met; ANOVA = Analysis of variance; SPO = site performance objective; AMP = adaptive management plan, SDM = Structured Decision Making.

[a] In 2-way ANOVA results, analyte concentrations increased >100% between first year of sampling and 2021 *and* were significantly higher in 2021 than 2020 at ≥ 50% (i.e., ≥ 3) of the mine exposed areas on Dry Creek (Appendix Table B.3).

[b] In Seasonal Kendall results, analyte concentration trend slope (average percent increase per year) >50% at ≥ 50% (i.e., ≥ 3) of the mine exposed areas on Dry Creek in 2021 (Appendix Table B.2).

[c] Analyte exceeded BCWQG and/or site-specific benchmark(s) in 2021 (Appendix Table B.4).

[d] Analyte has SPO for Dry Creek LAEMP area(s) under permit 107517 (ENV 2021) and/or elevated analyte concentrations have triggered AMP or SDM response frameworks (Appendix Table B.1).

[e] No guidelines or benchmarks exist for lithium or organoselenium.

[f] The 2020 AMP response framework for LCO Dry Creek (Teck 2021) identified dimethyl selenoxide (DMSeO) and methylseleninic acid (MeSe(IV)) as the two organoselenium species primarily generated by biological productivity within the Dry Creek Water Management System (DCWMS). Therefore, interpretation of organoselenium species herein was focused on these two organoselenium species (DMSeO and MeSe(IV)), and excluded consideration of selenite and other individual selenium species.

exposure was also exceeded at LC_DC3 (54% of samples), LC_SPDC (53% of samples), LC_DCDS (58% of samples), and LC_DC2 (43% of samples) in 2021 (Figure 3.1; Appendix Table C.4; Appendix Figure C.25). Nitrate concentrations exceeded the EVWQP 2 benchmarks in all samples from areas LC_DC3, LC_SPDC, and LC_DCDS, and in >85% of samples from area LC_DC2, LC_DC4 and LC_DC1 in 2021 (Figure 3.1). In the Fording River, nitrate concentrations exceeded the EVWQP level 1 and level 2 benchmarks at areas FR_FR5 (100% and 42%, respectively), LC_FRUS (40% and 20%, respectively) LC_FRB (72% and 4%, respectively), but concentrations were below BCWQGs and EVWQP benchmarks at areas LC_DCEF, LC_UC, and LC_GRCK in 2021 (Appendix Table C.4; Appendix Figure C.25).

Nitrate concentrations have increased significantly over time at all Dry Creek areas since mining started in the watershed (2015; based on Seasonal Kendall results; Figure 3.1, Table 3.2; Appendix Table C.2). Results of the 2-way ANOVA indicated that nitrate was significantly higher in 2021 than 2020 and higher in 2021 than the pooled means of all previous years at area LC_DC4 (Table 3.2; Appendix Table C.2). Despite the lack of statistically significant increase between 2020 and 2021, annual mean and maximum aqueous nitrate concentrations were higher in 2021 than 2020 at all Dry Creek areas (Appendix Figure C.25, Appendix Table C.4; Minnow 2021). Nitrate concentrations have not changed significantly at any of the reference areas, LC_GRCK since 2019; however, nitrate increased between 2020 and 2021 at LC_FRB (Table 3.2; Appendix Tables C.2 and C.3).

Annual mean and maximum nitrate concentrations in Dry Creek in 2021 were highest closest to spoiling at area LC_DC3, followed by LC_SPDC, LC_DCDS, and LC_DC2 (Figure 3.1; Appendix Table C.4). At areas LC_DC4 and LC_DC1 mean annual and maximum nitrate concentrations were notably less than those observed at LC_DC2 in 2021 (Appendix Figure C.25; Appendix Table C.4). This indicates that dilution by groundwater input from LC_DCEF (between LC_DC2 and LC_DC4) is likely reducing nitrate concentrations downstream of LC_DC2 in lower Dry Creek (Golder 2019b). Annual mean and maximum nitrate concentrations in 2021 were higher at FR_FR5 (located upstream of Dry Creek; 2021 mean = 18.5) than LC_FRUS (2021 mean = 12.3 mg/L) and LC_FRB (2021 mean = 13.5 mg/L), which are located farther downstream on the Fording River (Figure 1.5). Elevated nitrate concentrations at areas FR_FR5, LC_FRUS and LC_FRB are primarily attributed to upstream mining sources from Fording River Operation.

At LC_DCDS, nitrate was identified as potentially causing observed effects in chronic toxicity tests with water fleas and amphipods between 2018 and 2021 and with rainbow trout in 2019. This corresponded with an observed increase in nitrate in these years compared to concentrations in previous years (Section 4; Golder 2022). Elevated concentrations of nitrate have

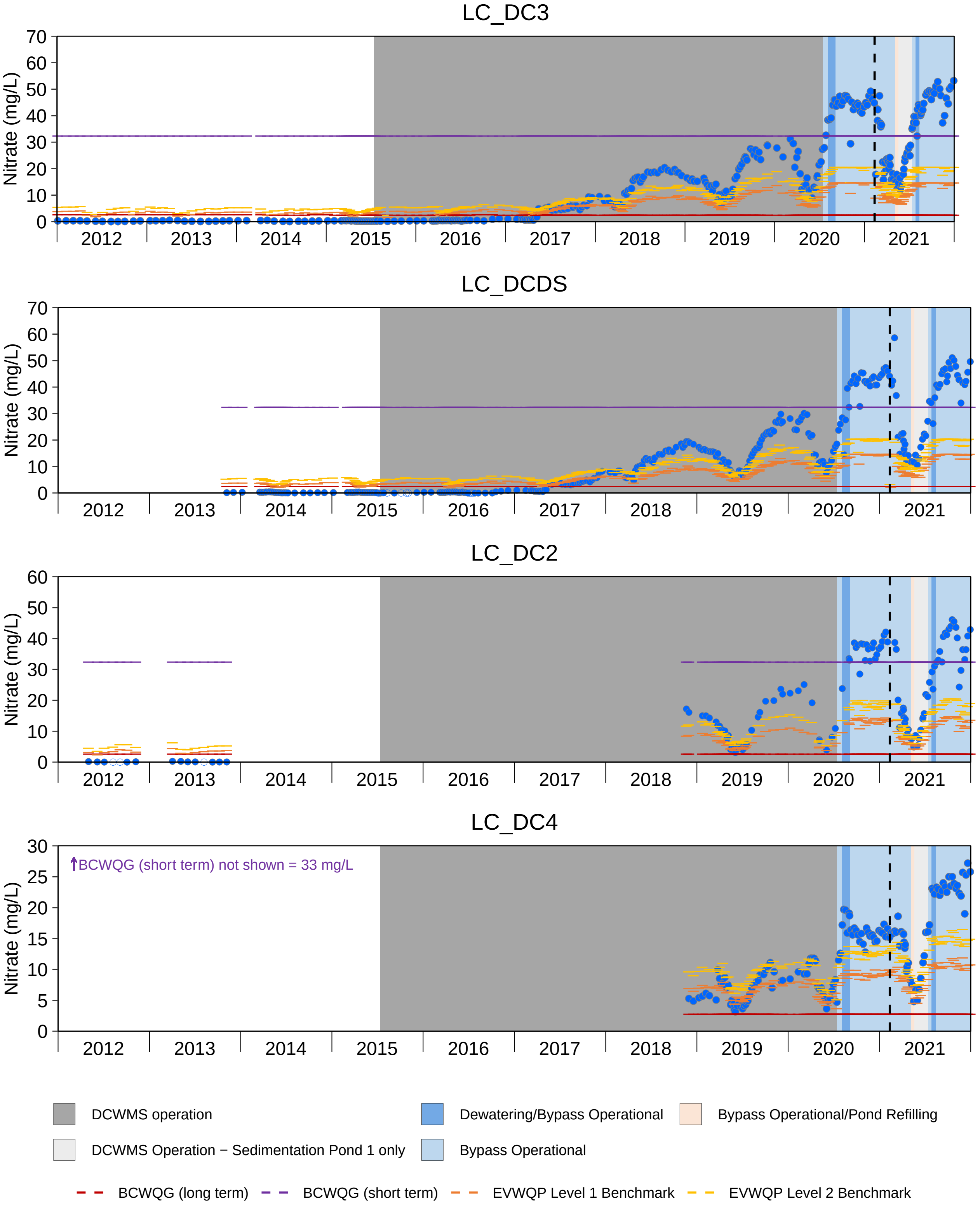

Figure 3.1: Time Series Plots for Nitrate (as N) from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

Table 3.2: Summary of Water Quality Statistical Results and Comparison with Benchmarks and Guidelines, Dry Creek LAEMP, 2021

Endpoint		Watercourse	Seasonal Kendall			2-way ANOVA				Exceedances	
			# of areas with significant change	Change since the base year of sampling[b]	Range[a] of Mean Annual % Change	# of areas with significant change	Areas with significant change between 2020 and 2021	Range[a] of % change between first year[b] of sampling and 2021	Change between 2020 and 2021	BCWQG	EVWQP Benchmark
Total Selenium		Dry Creek	6	LC_DC3, LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, LC_DC1	29 to 198	2	LC_DC4, LC_DC1	155 to 1,877	√	+	+
		Fording River	2	FR_FR5, LC_FRB	3.3 to 3.6	0	-	NS	-	+	+
		Other	3	LC_DCEF, LC_UC, LC_GRCK	1 to 6.6	0	-	NS	-	+	-
Nitrate		Dry Creek	6	LC_DC3, LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, LC_DC1	26 to 365	1	LC_DC4	145	√	+	+
		Fording River	1	LC_FRB	1.4	1	LC_FRB	59	√	+	+
		Other	0	-	NS	0	-	NS	-	-	-
Sulphate		Dry Creek	6	LC_DC3, LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, LC_DC1	24 to 83	3	LC_DC2, LC_DC4, LC_DC1	120 to 1,554	√	-	-
		Fording River	2	FR_FR5, LC_FRB	2.8 to 2.9	0	-	NS	-	-	-
		Other	2	LC_UC, LC_GRCK	1 to 2.2	1	LC_UC	19	√	-	-
Total Cadmium		Dry Creek	6	LC_DC3, LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, LC_DC1	6.3 to 24	2	LC_DC3, LC_DC4	63 to 431	√	-[c]	-
		Fording River	0	-	NS	-	-	NS	-	-[c]	-
		Other	0	-	NS	-	-	NS	-	-[c]	-
Organoselenium [e]	**Methylseleninic Acid**	Dry Creek	0	LC_SPDC, LC_DCDS	-21 to -17	3	LC_SPDC, LC_DCDS,	-38 to -8.3	√	-[c]	-
		Fording River	-	-	NS	-	-	NS	-	-[c]	-
		Other	-[d]	-	-	-[d]	-	-	-	-[c]	-
	Dimethylseleneoxide	Dry Creek	2	LC_DC3, LC_DC1	4.2 to 26	0	-	-	-	-[c]	-
		Fording River	-	-	NS	0	-	NS	-	-[c]	-
		Other	-[d]	-	-	-[d]	-	-	-	-[c]	-

🟦 Significant increase.

🟩 Significant decrease.

Notes: "Other" refers to Grace Creek (LC_GRCK), Dry Creek East Tributary (LC_DCEF), and Unnamed Creek (LC_UC); "NS" = no significant changes; '√' = significant change; "+" = at least one value exceeded guideline or benchmark.

[a] Range of increase for areas with significant results only.

[b] First year of sampling: LC_DC3 - 2012, LC_SPDC - 2014, LC_DCDS - 2013, LC_DC2 - 2012, LC_DC4 - 2018, LC_DC1 - 2012, FR_FR5 - 2012, LC_FRUS - 2013, LC_FRB - 2012

[c] There is no BC water quality guideline for cadmium or organoselenium

[d] Selenium speciation samples not collected at area LC_UC .

[e] The 2020 AMP response framework for LCO Dry Creek (Teck 2021) identified dimethyl selenoxide (DMSeO) and methylseleninic acid (MeSe(IV)) as the two organoselenium species primarily generated by biological productivity within the Dry Creek Water Management System (DCWMS). Therefore, interpretation of organoselenium species herein was focused on these two organoselenium species (DMSeO and MeSe(IV)), and excluded consideration of selenite and other individual selenium species.

been tracked, and future monitoring efforts evaluated, as the need for a response was identified under the AMP response framework in 2018 (Section 1.5 for details; Teck 2019b). Investigations and adjustments as part of that response are currently ongoing. With respect to nitrate, efforts are already underway and include integrated effects assessment modelling to better understand potential effects of nitrate on biota including resident WCT early life stages and thereby guide management planning (Teck 2020b) and implementation of the nitrate compliance action plan. Under the nitrate compliance action plan there has been an increase in explosives bagging (~80% bagged at Dry Creek in 2019) to reduce nitrate releases from waste rock placed in the LCO Dry Creek watershed (Golder 2021b). Modelling results suggest effects on WCT early life stages in Dry Creek and that the magnitude of those effects will be greatest at LC_DCDS. In 2021, no chronic toxicity effects to rainbow trout or fathead minnow were observed at this area (Section 4). Effects of elevated aqueous nitrate concentrations on biota are discussed in more detail in Sections 4 and 5.4.

3.3 Sulphate

Sulphate concentrations have increased significantly at all Dry Creek LAEMP areas, on Dry Creek, Fording River, Grace Creek, and both reference areas since the start of spoiling in the watershed (2015) except for at area LC_FRUS (based on Seasonal Kendall results; Figure 3.2; Table 3.2; Appendix Figures C.39 and C.40). Sulphate concentrations remained below the BCWQG and EVWQP benchmark throughout 2021 at all Dry Creek LAEMP monitoring areas. The average percent annual increases at Dry Creek areas (24 to 83%) were at least an order of magnitude higher than Fording River areas (2.8 to 2.9%) and reference areas (1 to 2.2%; Table 3.2) in 2021. Results of the 2-way ANOVA indicated that sulphate concentrations at LC_DC2, LC_DC4 and LC_DC1 were significantly higher in 2021 than 2020, and significantly higher than the pooled means of monitoring data from 2012 to 2020 (Table 3.2; Appendix Table C.3).

3.4 Total Cadmium

Permit 107517 outlines an SPO for total cadmium at Dry Creek area LC_DCDS as well as Grace Creek (LC_GRCK) and Unnamed Creek (LC_UC) that came into effect January 1, 2020 (ENV 2013). There were no exceedances of the SPO for total cadmium in 2021. There are BCWQGs and EVWQP benchmark values for dissolved cadmium, but no such guidelines (BCWQG) or benchmarks (EVWQP) exist for total cadmium (Appendix Table C.1).

Total cadmium has increased significantly since the start of spoiling in the watershed (2015) at all monitoring areas of Dry Creek (based on Seasonal Kendall results; Figure 3.3; Table 3.2; Appendix Tables C.1 and C.2). Average annual percentage increases ranged from 6.3%

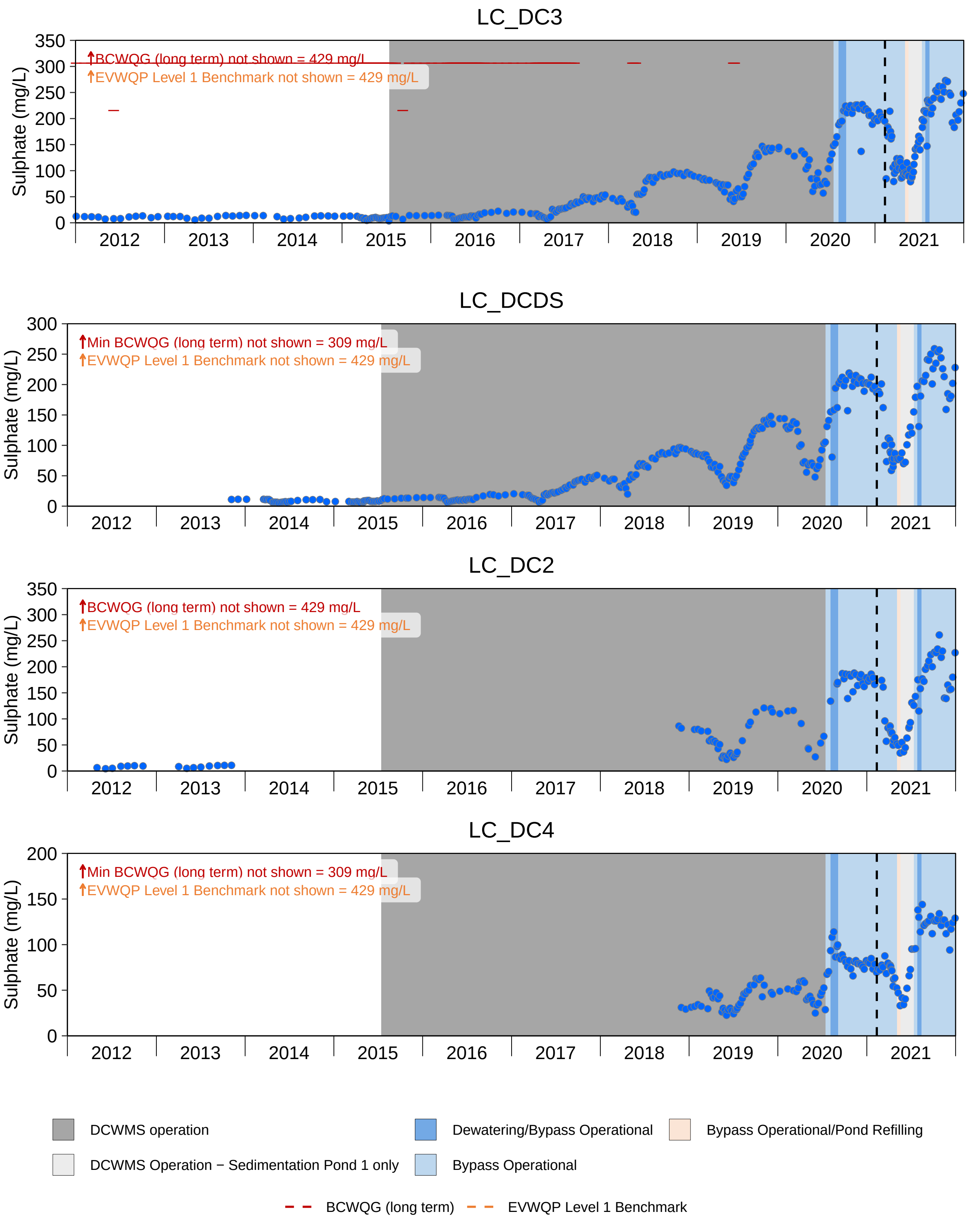

Figure 3.2: Time Series Plots for Sulphate from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1). 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.

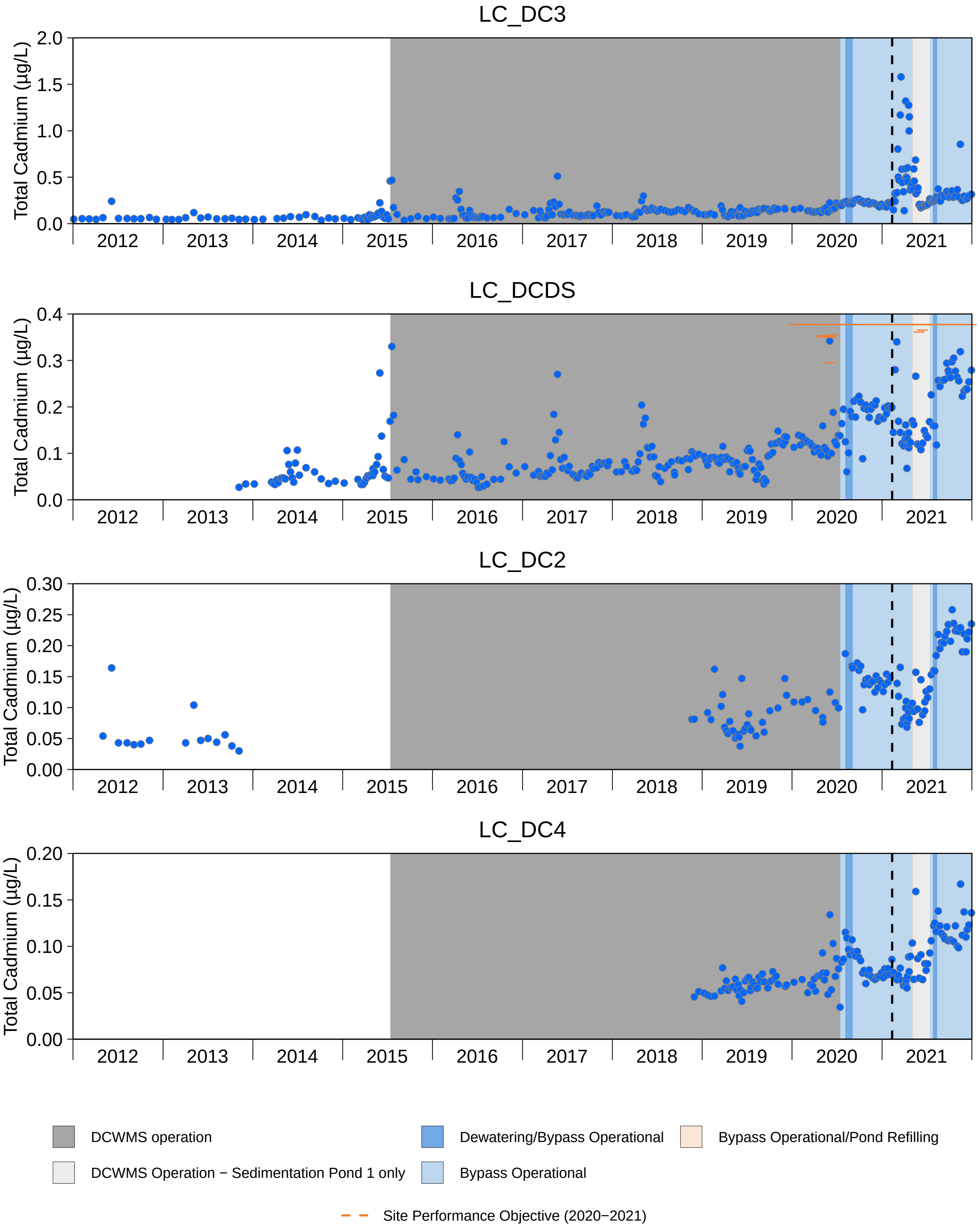

Figure 3.3: Time Series Plots for Total Cadmium from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

(LC_DC1) to 24% (LC_SPDC). Total cadmium concentrations were significantly higher at Dry Creek areas LC_DC3 and LC_DC4 in 2021 compared with 2020 values and pooled means of all previous years sampled (based on 2-way ANOVA results; Table 3.2; Appendix Table C.3).

Annual mean and maximum total cadmium concentrations in 2021 were highest on Dry Creek at areas LC_DC3 and lowest at area LC_DC1 (Appendix Figure C.9; Appendix Table C.4;). Concentrations decreased between LC_DC2 and LC_DC4, likely due to groundwater input from reference area LC_DCEF entering Dry Creek at that point. Annual mean total cadmium concentrations were similar among Fording River areas and lowest at LC_FRB, downstream of the mouth of Dry Creek, indicating Dry Creek did not have a detectable impact on Fording River total cadmium concentrations in 2021.

Total and dissolved cadmium showed an increase shortly after the BRN spoil failure at LC_DC3. Total cadmium, which is correlated with TSS, continued to increase due to erosion and transport of slide material concurrent with snowmelt and runoff (freshet). These processes stabilized and returned to expected conditions by the end of freshet in early June (Figure 3.3). In contrast to total cadmium, dissolved cadmium concentrations decreased following the modest increase to levels well below pre-slide observations. Dissolved cadmium appears to have been attenuated along the flow path. The attenuation process is likely via sorption and occurred as seepage migrated through and reacted with charged particles of the slide material (e.g., clay, organics, etc.). The benefit of these attenuations processes appears to have stabilized and returned to expected conditions by the end of freshet in early June (Appendix Figure C.7).

3.5 Total Selenium

Selenium concentrations exceeded the EVWQP level 1 benchmark (70 µg/L) at Dry Creek areas LC_DC3, LC_SPDC, LC_DCDS, and LC_DC2 as well as Fording River areas FR_FR5, LC_FRB, and FRUS (Figure 3.4; Appendix Figure C.35, Appendix Table C.4). Aqueous total selenium concentrations exceeded the BCWQG (2 µg/L) in all samples from the mine-exposed LAEMP areas in 2021, except at LC_GRCK where 62% of samples exceeded the guideline (Appendix Table C.4).

The SPO for total selenium (10 µg/L) came into effect January 1, 2020 at areas LC_DCDS, LC_GRCK, and LC_UC (ENV 2015). The SPO was exceeded in all 2021 samples at LC_DCDS (Figure 3.4) and non-compliance reports were submitted to the British Columbia Ministry of Environment and Climate Change Strategy (formerly MOE, ENV) in each incidence (Teck 2021a). The SPO was not exceeded at LC_GRCK or LC_UC (Appendix Figure C.35).

Total selenium concentrations have increased significantly since the start of baseline (2012 to 2018 depending on site; Appendix Figure C.35, Appendix Table C.3) and LAEMP monitoring at

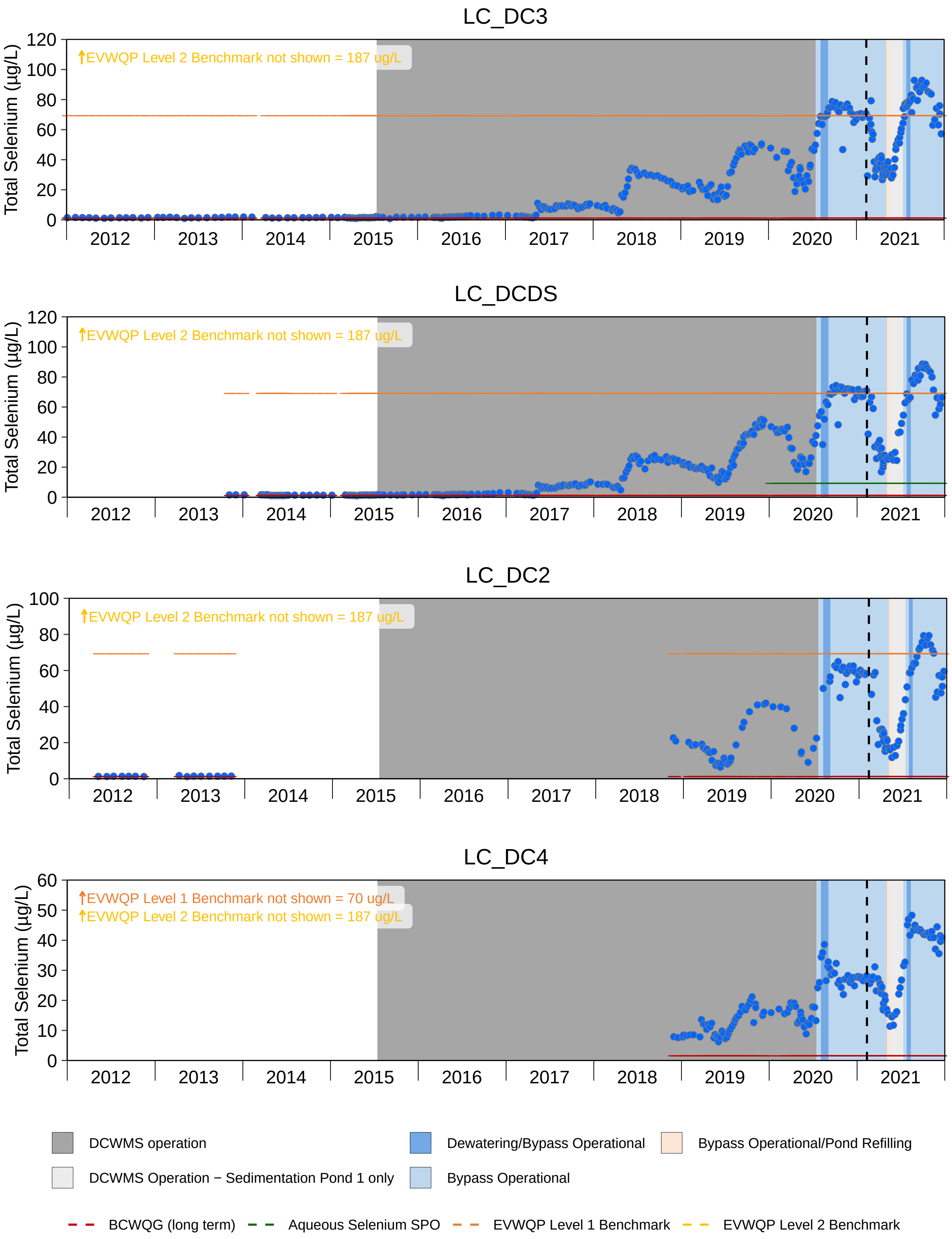

Figure 3.4: Time Series Plots for Total Selenium from LCO Dry Creek LAEMP Areas, 2012 to 2021

Note: 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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

all Dry Creek areas, based on Seasonal Kendall results (Figure 3.4, Table 3.2; Appendix Figures C.35 and C.36; Appendix Tables C.2 and C.3). Mean total selenium concentrations were significantly higher in 2021 than 2020 and higher in 2021 than the pooled means of all previous years sampled for LC_DC4 and LC_DC1 (as determined by the 2-way ANOVA). Significant increases over time also occurred at both reference areas (LC_DCEF and LC_UC) as well as areas FR_FR5, LC_FRB, and LC_GRCK (as determined by Seasonal Kendall analyses), but concentrations at those areas in 2021 were not significantly higher than 2020 or higher than the pooled means for all years sampled. The annual percent increase over time in total selenium concentrations was higher at areas in Dry Creek than at reference (LC_DCEF and LC_UC), the Fording River (FR_FR5, LC_FRB), or Grace Creek (LC_GRCK; 29 to 198 %, 2.4 to 6.6%, 3.3 to 3.6%, or 1.0% respectively; Table 3.2; Appendix Tables C.2 and C.3).

The proportion of water samples in Grace Creek having total selenium concentrations above the BCWQG was above the threshold required for further biological monitoring at that area (50% of samples >2 µg/L total Se) in 2021 (62%, Appendix Table C.4). Biological monitoring will continue at LC_GRCK in 2022. The same threshold applies to LC_UC although it was not met in 2021 so biological sampling will not be conducted at LC_UC in 2022. Screening of 2022 LC_GRCK and LC_UC aqueous total selenium concentrations against this threshold will be included in the 2022 Dry Creek LAEMP report.

Annual maximum and mean total selenium concentrations were highest at area LC_DC3 (the area farthest upstream on Dry Creek and closest to the LCOII expansion) in 2021. Selenium concentrations were similar to LC_DC3 at three areas closest to the downstream end of the DCWMS (LC_SPDC, LC_DCDS, and LC_DC2;) and lowest on Dry Creek at areas LC_DC1 and LC_DC4 in 2020 (Appendix Figure C.35, Appendix Table C.4). LC_DC1 and LC_DC4 are downstream of groundwater input from reference area LC_DCEF (Golder 2019b). The decrease in selenium concentrations at areas LC_DC4 and LC_DC1 is therefore more likely a result of dilution with groundwater flow from LC_DCEF than proximity to LCOII spoils or DCWMS effects. Selenium concentrations were higher on Dry Creek than at both reference areas (LC_DCEF and LC_UC) and area LC_GRCK. Annual mean selenium concentrations at Fording River area FR_FR5 (farthest upstream of the mouth of Dry Creek) were higher in 2021 than areas LC_DC3 and Fording River area LC_FRB (downstream of the mouth of Dry Creek). Furthermore, selenium concentrations were higher at Fording River areas than the Dry Creek areas closest to the mouth of Dry Creek (LC_DC1; Appendix Figure C.35, Appendix Table C.4). Collectively, these results indicate no detectable influence of Dry Creek on total selenium concentrations in the Fording River in 2021.

Elevated concentrations of several mine-related constituents, including selenium, initially led to these results and future monitoring efforts being tracked with a potential need for response per the AMP response framework in 2018 (Section 1.5 for details; Teck 2019b). Results from the chronic toxicity tests completed at LC_DCDS in 2021 showed no adverse responses for fathead minnow or rainbow trout in 2021 and selenium was not identified as a potential cause for the chronic toxicity responses that were observed for other organisms (invertebrates and algae; see Section 4 for detailed chronic toxicity results) . Investigations and adjustments as part of that adaptive management response are currently ongoing.

3.6 Organoselenium

In 2021, DMSeO concentrations increased from base year (2019) at LC_DC3 and LC_DC1; however, results of the 2-way ANOVA indicated that DMSeO was not significantly higher in 2021 than 2020 or higher in 2021 than the pooled means of all previous years at any site (Figure 3.5; Appendix Tables C.2 and C.3). MeSe(IV) concentrations have decreased from base year (2019) to 2021 at LC_DC3, LC_SPDC, LC_DCDS and LC_DC2. Results of the 2-way ANOVA indicated that MeSe(IV) was significantly lower in 2021 than 2020 at LC_DC3, LC_SPDC, and LC_DCDS and lower in 2021 than the pooled means of all previous years at LC_SPDC and LC_DCDS (Table 3.2, Figure 3.5; Appendix Tables C.2 and C.3). The lower organoselenium concentrations observed in 2021 compared to 2020 were most likely related to changes in pond operation in 2021 compared to 2020. Specifically, only pond 1 of the DCWMS was used in 2021 and bypass was operational throughout most 2021 (except May to July; Table 1.1), whereas both ponds 1 and 2 were used in 2020 and DCWMS bypass was initiated in July 2020.

In the surface water of Dry Creek, organoselenium concentrations (DMSeO and MeSe(IV)) were generally highest at LC_DC3 or LC_DCDS and decreased downstream; however, there were some exceptions to this pattern. Concentrations of DMSeO and MeSe(IV) were below detectable levels in most samples from LC_DC1 in 2021; however, five times in 2021, organoselenium concentrations at LC_DC1 were higher than concentrations at LC_DCDS. These comparatively higher values occurred on April 20th (MeSe (IV)), May 17th (MeSe (IV)), June 14th (MeSe (IV)), July 20th, and August 3rd (DMSeO and MeSe (IV)). Although organselenium concentrations were occasionally higher at LC_DC1 than at LC_DCDS, they were lower than the draft screening value (0.025 µg/L expressed as the sum of DMSeO and MeSe(IV); ADEPT 2022) for 94%[22] of samples taken in 2021 (Appendix Table C.5).

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[22] The sum of DMSeO and MeSe(IV) in Dry Creek samples was calculated by substituting zero for organoselenium results that were below detection (i.e., <LRL = 0).

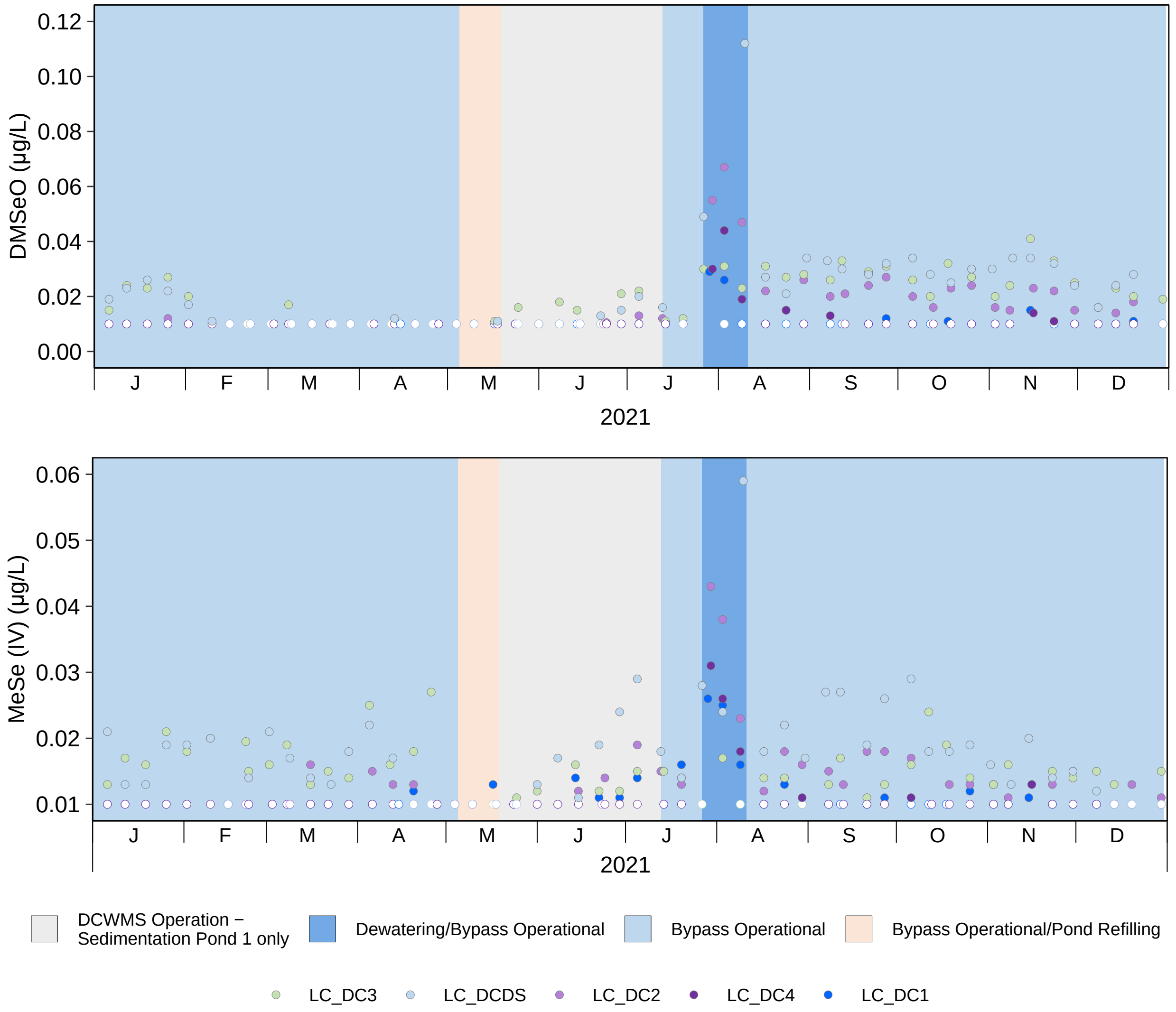

Figure 3.5: **Selenium Species Concentrations from LCO Dry Creek LAEMP Sampling Areas, 2021**

Note: Concentrations reported below the laboratory reporting limit (LRL) are plotted with an open symbol.

Organoselenium concentrations above 0.025 µg/L could indicate conditions that might cause an incremental increase in bioaccumulation relative to the normal range of variation in monitoring data (ADEPT 2022). Based on the currently available information, the occasionally higher organoselenium concentrations at LC_DC1 compared to LC_DCDS cannot be attributed to a specific cause (Figure 3.5).

At LC_DCDS, combined concentrations of DMSeO and MeSe(IV) ranged from <0.011 to 0.041 µg/L in July prior to dewatering and ranged from 0.014 to 0.408 µg/L during dewatering (July 27 to August 13; Table 1.1, Figure 3.5; Appendix Table C.5). This peak was less pronounced in 2021 than in 2020, likely related to the changes in DCWMS operation and dewatering outlined above. During the period of bypass in 2021 there was little seasonal and overall variability in organoselenium concentrations downstream of the DCWMS (Figure 3.5; Appendix Figure C.45). The higher organoselenium concentrations observed downstream of the DCWMS in August 2021 (during pond dewatering), compared to the earlier in the year, were consistent with the flushing of biologically generated organoselenium species from the sedimentation ponds during dewatering. These results support the theorized pathway wherein enhanced primary production and / or heterotrophic microbial activity in the sedimentation ponds promotes the generation of organoselenium compounds, which is the cause of increased tissue selenium concentrations in periphyton and benthic invertebrates downstream of the DCWMS (see also Section 6, Minnow 2020a and Lorax 2020). Overall, the management actions implemented at the DCWMS starting in mid-2020 have been effective in decreasing selenium concentrations in benthic invertebrates downstream (see Section 6.4 for further details).

Concentrations of DMSeO and MeSe(IV) were below detectable levels in most samples from LC_DC4 and LC_DC1 in 2019, 2020 and 2021 likely due to a combination, dilution from LC_DCEF groundwater input downstream of area LC_DC2, uptake by periphyton, and degradation of organoselenium species (via hydrolysis and/or photolysis) into species such as dimethyl selenide and dimethyl diselenide (Appendix Figure C.45, Appendix Table C.5; Golder 2021b). Organoselenium concentrations were below detectable levels in all samples collected in 2021 from reference area LC_DCEF, and LC_GRCK and above detection once (September 12, 2021) at Fording River areas LC_FRB and LC_FRUS (Appendix Figure C.45, Appendix Table C.5). These results indicate that Dry Creek did not have a detectable impact on organoselenium concentrations in the Fording River in 2021, including during DCWMS dewatering.

To assess changes in organoselenium concentrations in relation to the BRN spoil failure, a two-way ANOVA integrating data from March to December 2020 (before the spoil failure) compared to March to December 2021 (after the spoil failure) was completed (Appendix Tables C.6 to C.9). At LC_DC3 (furthest upstream), DMSeO increased significantly in June, August and

November and there were no significant differences between 2020 and 2021 in any other months. In contrast, MeSe(IV) was significantly lower in May, July, and September and with no significant differences between 2020 and 2021 in any other month. Downstream of the DCWMS, detection of potential effects related to the BRN spoil failure (when comparing 2021 to 2020 results) is more challenging due to the confounding factor of differences in DCWMS operation between years. At LC_DCDS (downstream of the DCWMS), organoselenium concentrations were significantly lower (MeSe(IV) in April, August, September and December) or showed no change (DMSeO) in 2021 compared to 2020 across all months (Appendix Tables C.6 to C.9). Further downstream (LC_DC4 and LC_DC1), organoselenium concentrations were not significantly different between 2021 and 2020, and in general were below detection for both years except during pond dewatering. LC_DC2 recorded lower concentrations in September 2021 compared to September 2020 (Appendix Tables C.6 to C.9). These data suggest that there was no effect of the BRN spoil failure on organoselenium concentrations in 2021.

3.7 Nutrient Status

Dry Creek was nitrogen and phosphorus co-limited (versus solely nitrogen or phosphorus limited) prior to LCOII development owing to high natural phosphorus and low natural nitrogen concentrations (Minnow 2020d). Since 2017, total nitrogen to total phosphorus (TN:TP) ratios have increased in Dry Creek concurrent with increasing nitrate concentrations (Figure 3.1). As a result, Dry Creek nutrient limitation has shifted to phosphorus limitation over the same period since total phosphorus concentrations did not increase, and even decreased at area LC_DC1 (Figure 3.6; Appendix Tables C.2 and C.3).

Trophic status of Dry Creek has also changed since the start of LCOII development, with shifts from oligotrophic to either mesotrophic or meso-eutrophic conditions observed at areas LC_DC3, LC_DCDS, and to a lesser extent, LC_DC1 (Minnow 2020d). Changes in nutrient limitation and trophic status were not observed over the same period at reference areas LC_DCEF and LC_UC or Fording River areas LC_FRUS and LC_FRB. It is likely that mine-related nitrogen input has changed nutrient limitation and trophic status in Dry Creek (Minnow 2020d).

Initial nutrient enrichment above background levels can have positive effects on productivity; however, concentrations can reach nuisance and even toxic levels that cause impairment to biological communities (CCME 2016). As Dry Creek is now phosphorus limited and its trophic status is moving in the direction of eutrophication, it is unlikely that further increases in nitrogen concentrations will contribute to productivity stimulation of existing Dry Creek biological communities. Given that nitrate concentrations have exceeded BCWQGs (including the maximum for short-term exposure) and EVWQP benchmarks on Dry Creek, it is likely that nitrate is already acting as a stressor in Dry Creek.

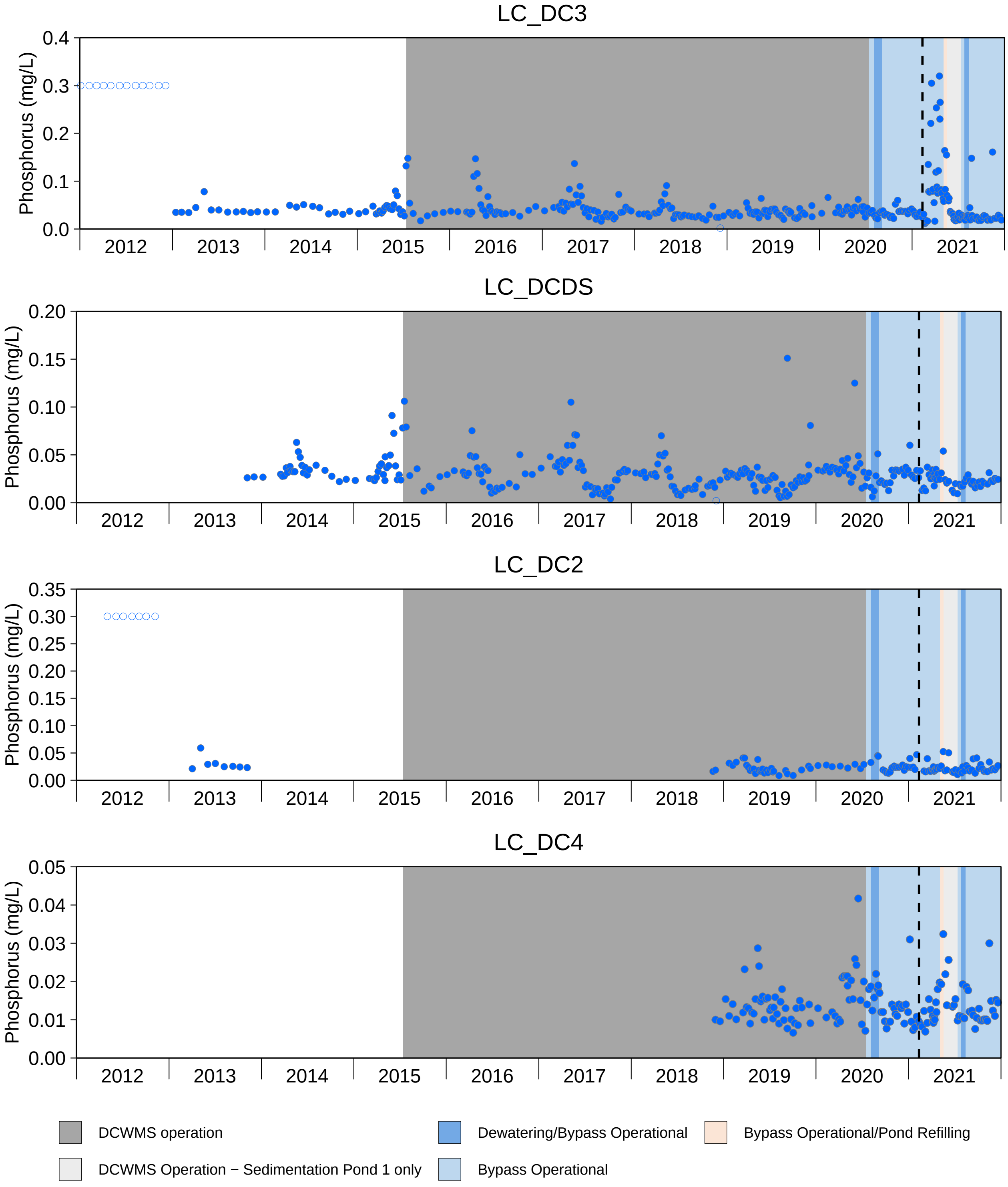

Figure 3.6: Time Series Plots for Phosphorus from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

3.8 Summary

Concentrations of mine-related constituents including nitrate, sulphate, total cadmium, total selenium have increased over time on Dry Creek. Constituents including nitrate and total selenium exceeded guideline and/or benchmark (where applicable) values on Dry Creek in 2021. Constituent concentrations were more frequently elevated at areas LC_DC3 (the Dry Creek area immediately downstream of LCOII spoiling and prior to DCWMS effects) and LC_SPDC, LC_DCDS, and LC_DC2 (the areas immediately downstream of the DCWMS) than at areas LC_DC4 and LC_DC1, likely due to increasing distance from LCOII operations and input of groundwater from reference area LC_DCEF between LC_DC2 and LC_DC4. Aqueous organoselenium species concentrations (specifically DMSeO and MeSe[IV]) were elevated at areas LC_SPDC and LC_DCDS during DCWMS sedimentation pond dewatering in August 2021; however, activation of the DCWMS bypass throughout most of the year (except May to July; Table 1.1), and decreasing the number of ponds from two in 2020 to a single pond in 2021, decreased concentrations to lower than those observed over the same periods in 2020. Similar trends in aqueous constituents were not detected on the Fording River downstream of Dry Creek or on Grace Creek (LC_GRCK).

Operational changes to the DCWMS including development and implementation of the seasonal bypass and modification of discharge channel area LC_SPDC have been completed to minimize organoselenium bioaccumulation and effects to biota. Additional investigation of causes and effects (including integrated effects assessment modelling; Teck 2020b) of increased concentrations of aqueous mine-related constituents are currently underway.

3.8.1 BRN summary

The potential effect of the BRN spoil failure on Upper Dry Creek water quality (LC_DC3) for constituents of interest (nitrate, sulphate, selenium) were explored by comparing modeled concentrations with measured concentration. Throughout 2021, modeled results showed a good match (magnitude and seasonality) with measured concentrations for total selenium, nitrate, and sulphate. Both total and dissolved cadmium showed a modest increase shortly after the slide at LC_DC3. Total cadmium continued to increase due to erosion and transport of slide material concurrent with snowmelt and runoff (freshet), as correlated with elevated TSS. These processes stabilized and returned to expected conditions by the end of freshet in early June. In contrast to total cadmium, dissolved cadmium concentrations decreased over this period following the modest increase and decreased to levels well below pre-slide observations. Dissolved cadmium appears to have been attenuated along the flow path. The attenuation process is likely via sorption and occurred as seepage migrated through and reacted with charged particles of the slide material (e.g., clay, organics, etc.). The benefit of these attenuation processes appears to have stabilized and returned to expected conditions by the end of freshet in early June (Figure 3.3; Appendix Figure C.7). Overall, the quantity of surface water was impacted at time of spoil failure and a short period following but returned to expected conditions by the end of freshet.

4 STUDY QUESTION 2: AQUEOUS TOXICITY

Acute toxicity testing was conducted with water samples collected from LC_SPDC using the water flea *D. magna* and rainbow trout in 2021. Out of 62 samples collected, no samples failed the test criteria for acute toxicity for either organism (i.e., did not cause > 50% mortality to either organism), while mortality ≤ 10% was observed in one instance for rainbow trout and in 13 instances for *D. magna* (Table 4.1; Appendix Table D.1).

Chronic toxicity testing was performed quarterly on water samples collected at LC_DCDS to evaluate potential effects on water flea (*C. dubia*) and green algae (*P. subcapitata*). Semi-annual chronic toxicity tests were conducted to evaluate potential effects on amphipods (*H. azteca*), fathead minnow, and rainbow trout. Results are discussed on species-specific bases below.

Effects on *C. dubia* (survival and reproduction) in Q1 and Q2 of 2021 were either not significantly different compared to the reference or were categorized as 'no adverse response' (i.e., for Q1 reproduction, based on low effect-size relative to reference [< 20%] and results falling within the local range). Survival for *C. dubia* in Q3 and Q4 of 2021 also did not differ from reference (Table 4.2; Golder 2022). Reproduction for *C. dubia* for LC_DCDS showed a 'likely adverse response' in Q3 and Q4 of 2021, with 43 and 42% reduction in reproduction, respectively (Table 4.2; Golder 2022). Similar 'likely adverse responses' for *C. dubia* reproduction were observed in previous years, including in Q1 of 2020 and in Q2 and Q4 of 2016, and a 'possible adverse response' in *C. dubia* reproduction was observed in Q4 of 2018 (Table 4.2). Nitrate was identified as potentially causing the observed effects in both the 2018 and 2020 events, corresponding with elevated aqueous nitrate in those quarters, and the cause of the response was not identified in 2016 (Table 4.2). Nitrate and nickel were identified as a potential contributor to responses in Q3 and Q4 2021 tests (Golder 2022). Overall, chronic toxicity results indicated that effects to *C. dubia* reproduction at LC_DCDS in 2021 were of similar frequency to 2016 (i.e., in two quarters), but of greater frequency than remaining previous years (when ≤ 1 adverse response was observed), and of greater magnitude than previous responses except for Q4 in 2016 (Table 4.2).

Effects on cell yield for *P. subcapita* at LC_DCDS were observed in Q1 and Q3 but were not significantly different when compared to reference in any other quarter in 2021. *P. subcapita* cell yield for LC_DCDS in Q1 and Q3 showed a 'possible adverse response' (Table 4.2). The first 'possible adverse response' for *P. subcapita* at area LC_DCDS was seen in 2020 and occurrences of adverse effects increased at LC_DCDS in 2021 in both frequency (i.e., 'possible adverse responses' in two quarters of 2021 compared to one quarter in 2020)

Table 4.1: Summary of Acute Toxicity Test Results for LCO Dry Creek LAEMP 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**
LC_SPDC	Dry Creek sediment ponds outlet; effluent to Dry Creek	2021	0	62	0	62

Table 4.2: Results of Quarterly and Semi-Annual Chronic Toxicity Tests at LC_DCDS 2015 to 2021[a] (Golder 2016, 2017a, 2018, 2019, 2020a, 2021, 2022)

Area	Quarter		Water Flea (*Ceriodaphnia dubia*)[b]			Amphipod (*Hyalella azteca*)		Green Alga (*Pseudokirchneriella subcapitata*)[c]	Rainbow Trout (*Oncorhynchus mykiss*)[d]				Fathead Minnow (*Pimephales promelas*)[d]				
			Survival (% control-normalized)	Reproduction (% control-normalized; Protocol-specified)	Reproduction (% control-normalized; 8-day)	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_DCDS	2015	Q1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Q2	111	87	-	-	-	132.5	-	-	-	-	-	-	-	-	-
		Q3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Q4	111	103	-	-	-	118.3	-	-	-	-	-	-	-	-	-
	2016	Q1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Q2	90	62$^{\text{UN}}$	-	-	-	118.5	-	-	-	-	-	-	-	-	-
		Q3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Q4	100	39$^{\text{UN}}$	-	-	-	183.5	-	-	-	-	-	-	-	-	-
	2017	Q1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Q2	100	87	-	-	-	140.5	-	-	-	-	-	-	-	-	-
		Q3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Q4	100	87	-	-	-	123	-	-	-	-	-	-	-	-	-
	2018	Q1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Q2	100	77	-	-	-	148.3	-	-	-	-	-	-	-	-	-
		Q3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Q4	100	85$^{\text{NO3}}$	-	-	-	100.8	-	-	-	-	-	-	-	-	-
	2019	Q1	100 ± 0	90 ± 19	90 ± 19	-	-	82.8 ± 5.0	-	-	-	-	100 ± 0	100 ± 4	85 ± 7	*88 ± 3*	96 ± 4
		Q2	90 ± 32	87 ± 30	87 ± 30	-	-	*112.0 ± 7.3*	95 ± 13	98 ± 16	105 ± 2	112 ± 6	-	-	-	-	-
		Q3	90 ± 32	111 ± 16	94 ± 14	94 ± 10	65 ± 25$^{\text{UN}}$	58.5 ± 6.5	-	-	-	-	98 ± 3	76 ± 20	***74 ± 13***	*98 ± 2*	100 ± 0
		Q4	90 ± 32	100 ± 18	100 ± 11	*35 ± 33*$^{\text{NO3}}$	*52 ± 30*$^{\text{NO3}}$	102.0 ± 7.0	*73 ± 9*$^{\text{NO3}}$	*66 ± 13*$^{\text{NO3}}$	101 ± 4	105 ± 3	-	-	-	-	-
	2020	Q1	100 ± 35	68 ± 12$^{\text{NO3}}$	*68 ± 12*	-	-	*93 ± 3.7*	-	-	-	-	100 ± 0	**64 ± 43**$^{\text{UN, HI-RV}}$	**58 ± 39**$^{\text{UN, HI-RV}}$	94 ± 4	100 ± 0
		Q2	100 ± 0	92 ± 22	97 ± 12	87 ± 17	49 ± 13$^{\text{UN}}$	134 ± 5.6	104 ± 20$^{\text{M}}$	97 ± 31$^{\text{M}}$	99 ± 9$^{\text{M}}$	109 ± 22$^{\text{M}}$	-	-	-	-	-
		Q3	100 ± 0	***89 ± 9***	***93 ± 12***	-	-	***85 ± 5.7***$^{\text{UN}}$	-	-	-	-	113 ± 4	99 ± 11	69 ± 9	86 ± 3	100 ± 0
		Q4	100 ± 0	76 ± 17	***77 ± 17***	61 ± 23$^{\text{UN, HI-RV}}$	20 ± 6	112 ± 4.1	*86 ± 9*$^{\text{M}}$	***86 ± 9***$^{\text{M}}$	104 ± 2$^{\text{M}}$	106 ± 5$^{\text{M}}$	-	-	-	-	-
	2021	Q1	90 ± 32	90 ± 36	-	-	-	***78.5 ± 5***$^{\text{UN}}$	-	-	-	-	89 ± 16	100 ± 18	90 ± 7	100 ± 8	98 ± 5
		Q2	100 ± 0	96 ± 27	-	98 ± 9	-[e]	69 ± 9.8	102 ± 4$^{\text{M}}$	109 ± 7$^{\text{M}}$	107 ± 2$^{\text{M}}$	132 ± 16$^{\text{M}}$	-	-	-	-	-
		Q3	80 ± 42	*57 ± 42*$^{\text{Ni, NO3}}$	-	104 ± 0	*67 ± 7*	***68.5 ± 7.4***$^{\text{UN}}$	-	-	-	-	105 ± 0	89 ± 28	94 ± 11	95 ± 4	100 ± 8
		Q4	100 ± 0	***58 ± 16***$^{\text{Ni, NO3}}$	-	**83 ± 36**	*92 ± 19*$^{\text{Ni, NO3}}$	**74.5 ± 4.9**	105 ± 4$^{\text{M}}$	103 ± 7$^{\text{M}}$	105 ± 5$^{\text{M}}$	107 ± 10$^{\text{M}}$	-	-	-	-	-

Bold	result significantly lower than Fording River reference (FR_UFR1).	☐	test categorized as no adverse response.
Underline	result significantly lower than Elk River reference (GH_ER2).	🟨	test categorized as possible adverse response.
Italic	result significantly lower than Michel Creek reference (CM_MC1).	🟧	test categorized as likely adverse response.
▭	result significantly lower than South Line Creek reference (LC_SLC).	$^{\text{M}}$	test had evidence of microbes in one or more replicates.

Notes: Q$_x$ = Calendar year quarters; "-" = no data available. Possible and likely symbols are annotated with constituent identified as potentially contributing to observed response: H_RV = high inter-replicate variability; NO3 = nitrate; Ni = Nickel, UN =unknown, no water quality constituent identified.

[a] Results presented as percent survival or mean ± standard deviation.

[b] *Ceriodaphnia dubia* survival (% control normalized) and reproduction (% control normalized; protocol specified) toxicity tests were conducted for LC_DCDS between 2015 and 2018 but not under Permit 107517. Standard deviations are not available for these results. Two test lengths were used to evaluate potential effects on *C. dubia* reproduction in 2020. 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 2021). These two test lengths were used in 2019 and 2020 to evaluate potential brood effect. Prior to 2019, the protocol-specified test length was used.

[c] *Pseudokirchneriella subcapitata* cell yield toxicity tests were conducted for LC_DCDS between 2015 and 2018 but not under Permit 107517. Standard deviations are not available for these results.

[d] Fathead minnow and rainbow trout chronic toxicity testing at LC_DCDS was initiated in 2019.

[e] *H. azteca* Q2 test organisms were disposed prior to measured dry weight due to a lab technician error (see Section 2.6), and therefore the initial Q2 tests have only survival data. In response to this, tests were repeated in Q3 for all stations.

and in magnitude (i.e., 21.5 to 31.5% and 15% reduction in cell yield in 2021 and 2020, respectively; Table 4.2). In Q1 2021, mean cell yield that was systematically depressed across multiple test sites (including LC_DCDS) despite variability in water chemistries; this resulted in elevated uncertainty and poor correspondence between water chemistry and responses (Golder 2022). For both Q1 and Q3 2021, no water quality constituent was identified as potentially contributing to observed responses in these tests at LC_DCDS (Golder 2022). The water quality constituent causing the observed effects on this species in 2020 were also unknown (Golder 2021a).

Chronic toxicity testing was performed on dry weight and survival of *H. azteca* at LC_DCDS in 2021 in Q2, Q3[23], and Q4 (Table 4.2). *H. azteca* survival at LC_DCDS was categorized as no adverse response in each quarter tested (i.e., Q2, Q3, Q4). A 'possible adverse response' was observed for *H. azteca* dry weight at LC_DCDS in Q4 (Table 4.2). Nitrate and nickel were identified as potential contributors to responses observed in Q4 2021 (Golder 2022). Overall, the frequency of potentially adverse responses to *H. azteca* at LC_DCDS was slightly lower in 2021 than 2020 (one fewer significant response for dry weight in 2021). In 2020 a 'likely adverse response' was recorded for survival in Q4 and a 'possible adverse response' was recorded for dry weight in Q2 (Table 4.2). Nitrate was attributed to the likely response in survival Q4 2020; however, no water quality constituent was identified as potentially contributing to the observed responses observed in Q2 survival of *H. azteca* at LC_DCDS in 2020 (Golder 2021a, Golder 2022). In 2019, there were three 'potential adverse responses' in *H. azteca* at LC_DCDS, with possible and likely adverse effects responses attributed to nitrate toxicity for *H. azteca* dry weight and survival, respectively, in Q4.

No adverse responses were detected for rainbow trout at LC_DCDS in 2021 for any of the four test endpoints (survival, viability, length, and wet weight; Table 4.2; Golder 2022). Despite this result, each rainbow trout test in 2021 had evidence of microbes in one or more replicates, which also occurred in 2020 (Table 4.1). The 2021 results were similar to those in 2020 (i.e., no adverse responses reported for the four test endpoints in either quarter or year). In 2019, 'likely adverse responses' were observed for survival and viability in Q4 (Table 4.2). For rainbow trout, Q2 results are considered the most relevant for evaluating potential effects on early life stages of the congenic WCT, and all Q2 tests were categorized as no adverse response (Golder 2022). Nitrate was identified as the potential cause of those responses in 2019, indicating that it may be related to toxicity to rainbow trout at LC_DCDS. However, no potential adverse responses were

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[23] *H. azteca* Q2 test organisms were disposed of prior to measuring dry weight due to a lab technician error (see Section 2.3), and therefore the initial Q2 tests have only survival data. In response to this, tests were repeated in Q3 for all stations.

observed in 2020 or 2021 despite continued increases in nitrate concentrations between 2019 and 2021 at LC_DCDS (Section 3.2).

No adverse responses were detected for fathead minnow at LC_DCDS in 2021 for any of the five test endpoints (hatch, survival, biomass, length, and normal development) and no evidence of microbial interference was detected (Table 4.2; Golder 2022). The frequency of adverse responses decreased in 2021 compared to 2020 (two fewer significant responses in 2021), when survival and biomass showed a 'likely adverse response' in Q1 (Table 4.2; Golder 2021a). No water quality constituent was identified as potentially contributing to the observed responses in fathead minnow at LC_DCDS in Q1 of 2020 (Golder 2021a). The results in 2021 were similar to 2019, when no adverse responses were also reported for the five test endpoints (Table 4.2).

Overall, acute toxicity testing of Dry Creek DCWMS effluent showed no test failures in 62 samples collected at area LC_SPDC in 2021 (Teck 2022). Testing efforts were greatly increased following the BRN spoil failure, almost daily from February 12 to March 17, with no effect of the BRN spoil failure seen in the acute toxicity tests. For chronic toxicity testing at LC_DCDS, results have shown a low proportion of adverse responses over time, with a frequency and magnitude of responses that is temporally stable (i.e., no apparent consistent pattern of responses over time) and mostly limited to invertebrate endpoints (Golder 2022). Recently, there has been improved understanding of causation of the observed adverse responses (Golder 2022). In 2021, nickel and nitrate were identified as potentially causing the observed effects on *C. dubia* reproduction (Q3 and Q4) and on *H. azteca* dry weight (Q4) at LC_DCDS in 2021 (Golder 2022). Nitrate has been identified as potentially causing observed effects in chronic toxicity tests with *C. dubia* (Q4 2018, Q1 2020, Q3, and Q4 2021), *H. azteca* (Q4 2019, Q4 2020, and Q4 2021) and rainbow trout (Q4 2019; Table 4.2; Golder 2022) which corresponds to the increasing trend in nitrate observed at LC_DCDS since 2018 (Section 3.2; see Sections 5.4 for further discussion of potential effects of nitrate to the receiving environment). Teck has initiated an increase to explosives bagging (~80% bagged at Dry Creek in 2019) under the LCO Nitrate Compliance Action Plan to reduce nitrate releases from waste rock placed in the LCO Dry Creek watershed. In addition to nitrate, nickel was identified as potentially causing observed effects on *C. dubia* reproduction (Q3 and Q4) and *H. azteca* dry weight (Q4) in 2021 but had not been identified as such in previous years (Golder 2022). For the *C. dubia* responses in 2021, these were associated with higher test nickel concentrations compared to previous years (Golder 2022).

Total Nickel concentrations showed a short-lived increase following the BRN spoil failure at area LC_DC3; however, this increase was not seen further downstream at area LC_DCDS and therefore it is unlikely that changes in water quality due to the BRN spoil failure were responsible for the response observed in toxicity testing (Appendix Figure C.23). Given that the overall proportion of results were similar to those seen in 2020 (16% and 18%, respectively) and no adverse responses are seen in Q2 (immediately following the BRN spoil failure event) it is unlikely that the BRN spoil failure had an effect on chronic toxicity results in 2021. No water quality constituents beyond nitrate and nickel were identified as a potential cause of the remaining adverse results observed in all years.

5 STUDY QUESTION 3: BENTHIC INVERTEBRATE COMMUNITY

5.1 Overview

Benthic invertebrate communities were sampled in March (Dry Creek and Fording River; Appendix Table E.1), May (Dry Creek, Fording River, and Grace Creek; Appendix Table E.2), June (Dry Creek and Fording River; Appendix Table E.3), September (Dry Creek, Fording River, and Grace Creek; Appendix Table E.4), and November/December (Dry Creek; Appendix Table E.5) in 2021 to support Study Question #3: "Are benthic invertebrate community endpoints within normal ranges derived based on samples collected at regional and local reference areas within the Elk River as part of the RAEMP, and are the endpoints changing over time?".

Benthic invertebrate community data collected for the present study were considered to be of good quality based on sorting efficiency, subsampling precision and accuracy, and taxonomic identification accuracy. Therefore, the associated data can be used with a high level of confidence for interpretation (Appendix B).

5.2 Dry Creek

Total benthic invertebrate abundance was within regional and site-specific normal ranges at all Dry Creek sampling areas except for LC_DC1 (where one of three replicates was above the regional normal range, but still within the site-specific normal range; Figure 5.1). Taxonomic richness was within the regional normal range at all sampling areas, but two of three replicates exceeded the site-specific normal range at LC_DCDS (Figure 5.1). Except at station LC_DC3, the proportion of EPT was within the regional normal range (and site-specific normal range, where available) for all samples from Dry Creek (Figure 5.1). Absolute abundance of EPT was similarly within regional and site-specific normal ranges in September 2021 for all samples, including those from LC_DC3 (Appendix Figure E.1). The proportion of Ephemeroptera (%E) was below the regional normal range in all replicates from LC_DC3 and LC_DC2, and in two of three replicates from LC_DCDS, but within the regional normal range elsewhere (Figure 5.1). Percent Ephemeroptera was also below the site-specific normal range in all samples from LC_DCDS in September 2021 (Figure 5.1). In contrast, absolute abundance of Ephemeroptera was within regional and site-specific normal ranges at all areas except for LC_DC3 (Appendix Figure E.1). The proportion of Chironomidae (%C) was within the regional normal range at all Dry Creek stations except LC_DC3 where all samples were above the regional normal range (Figure 5.1). In contrast, absolute abundances of Chironomidae were within the regional normal range for all Dry Creek areas (Appendix Figure E.1). Proportions of

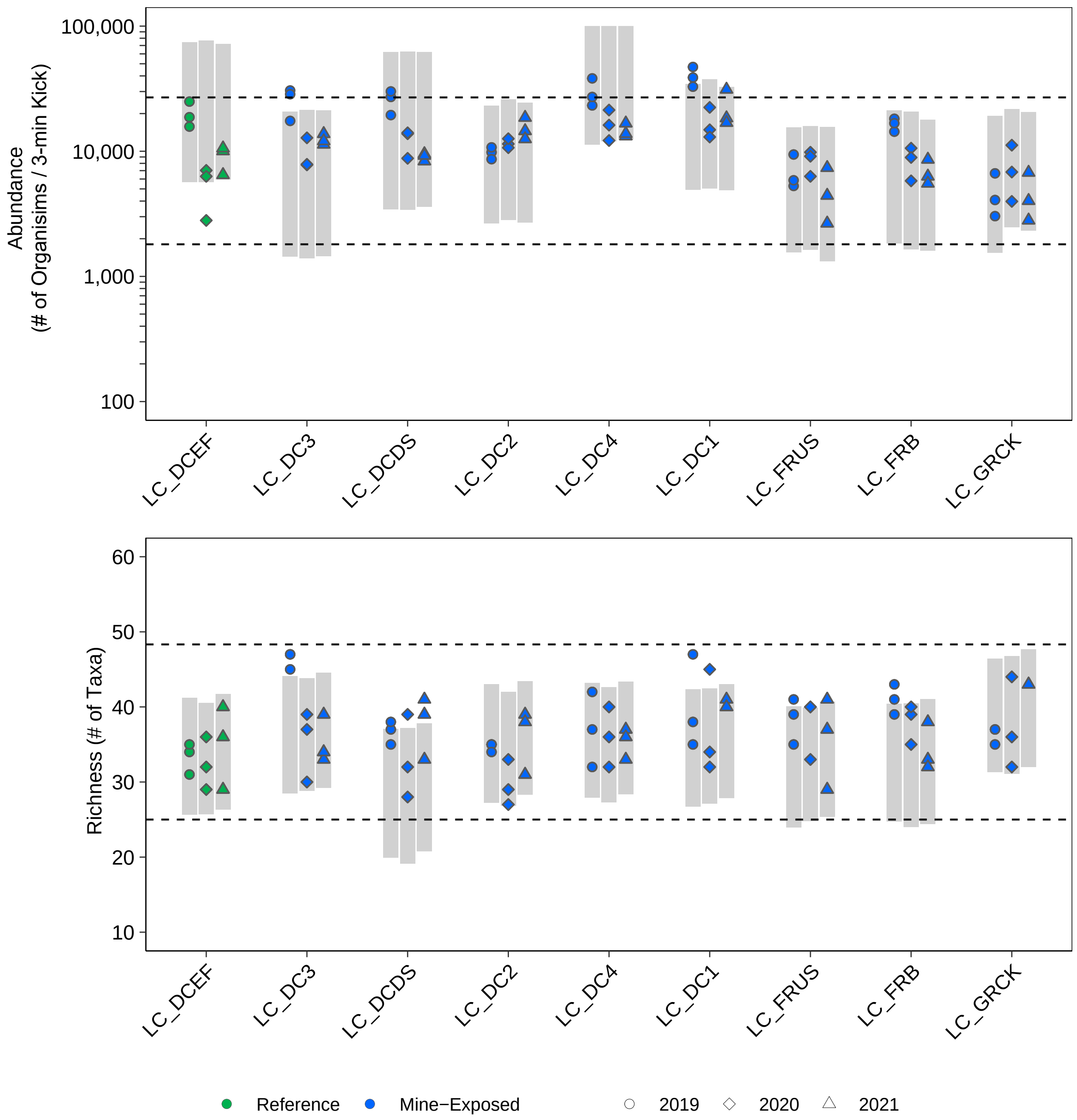

Figure 5.1: Benthic Invertebrate Community Endpoints at Upper and Lower Dry Creek Sampling Areas, and at Upstream and Downstream Fording River Sampling Areas, Dry Creek LAEMP, September 2019 to 2021

Notes: Upper and Lower Dry Creek = LC_DCDS and LC_DC1, respectively, and upstream and downstream in the Fording River = FR_FR5/LC_FRUS and LC_FRB, respectively. Site specific normal ranges using regression models shown with grey shading (when available). Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines.

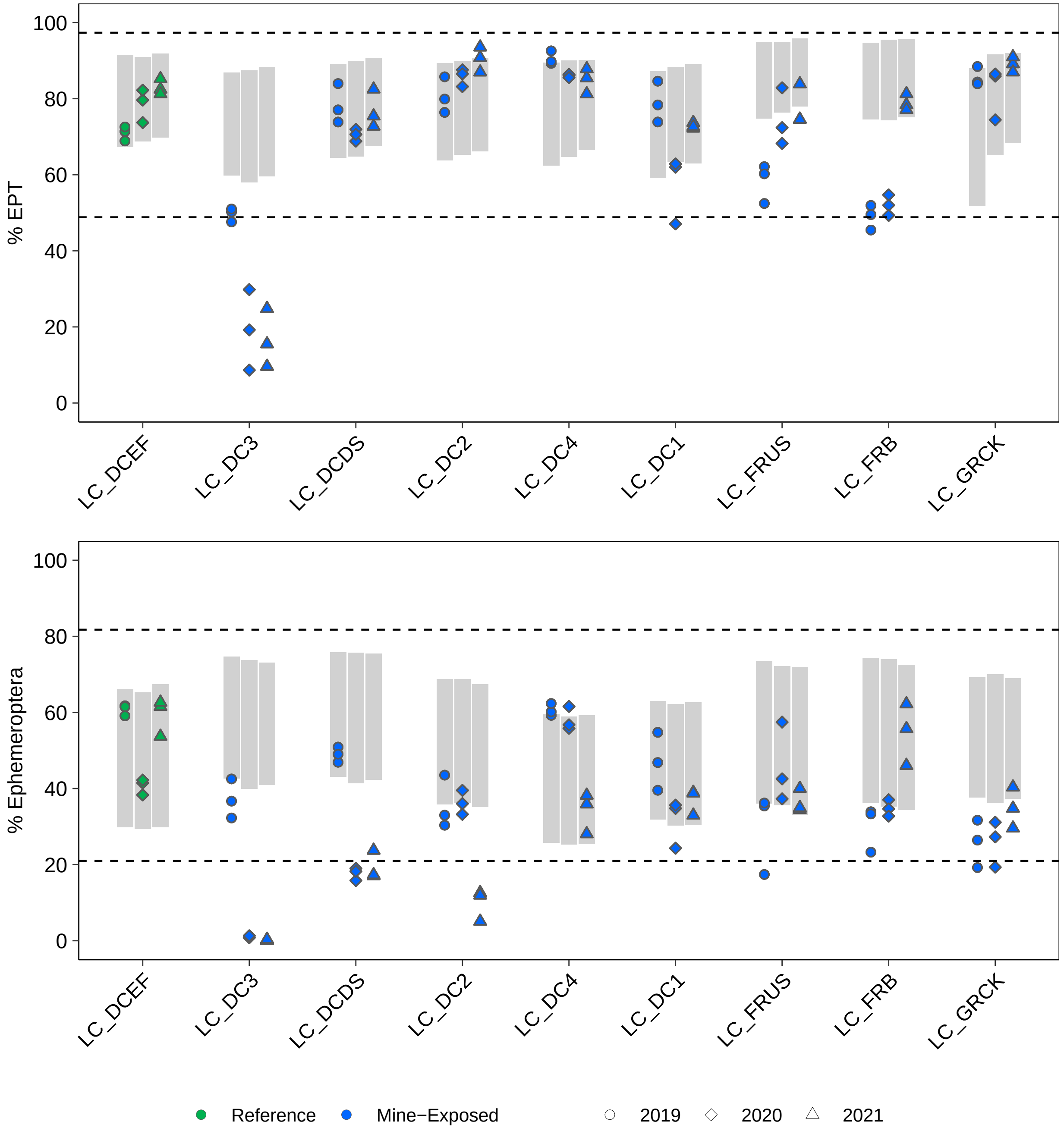

Figure 5.1: **Benthic Invertebrate Community Endpoints at Dry Creek, Fording River, Grace Creek, and Dry Creek East Tributary Sampling Areas, LCO Dry Creek LAEMP, September 2019 to 2021**

Notes: Upper and Lower Dry Creek = LC_DCDS and LC_DC1, respectively, and upstream and downstream in the Fording River = FR_FR5/LC_FRUS and LC_FRB, respectively. Site specific normal ranges using regression models shown with grey shading (when available). Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines.

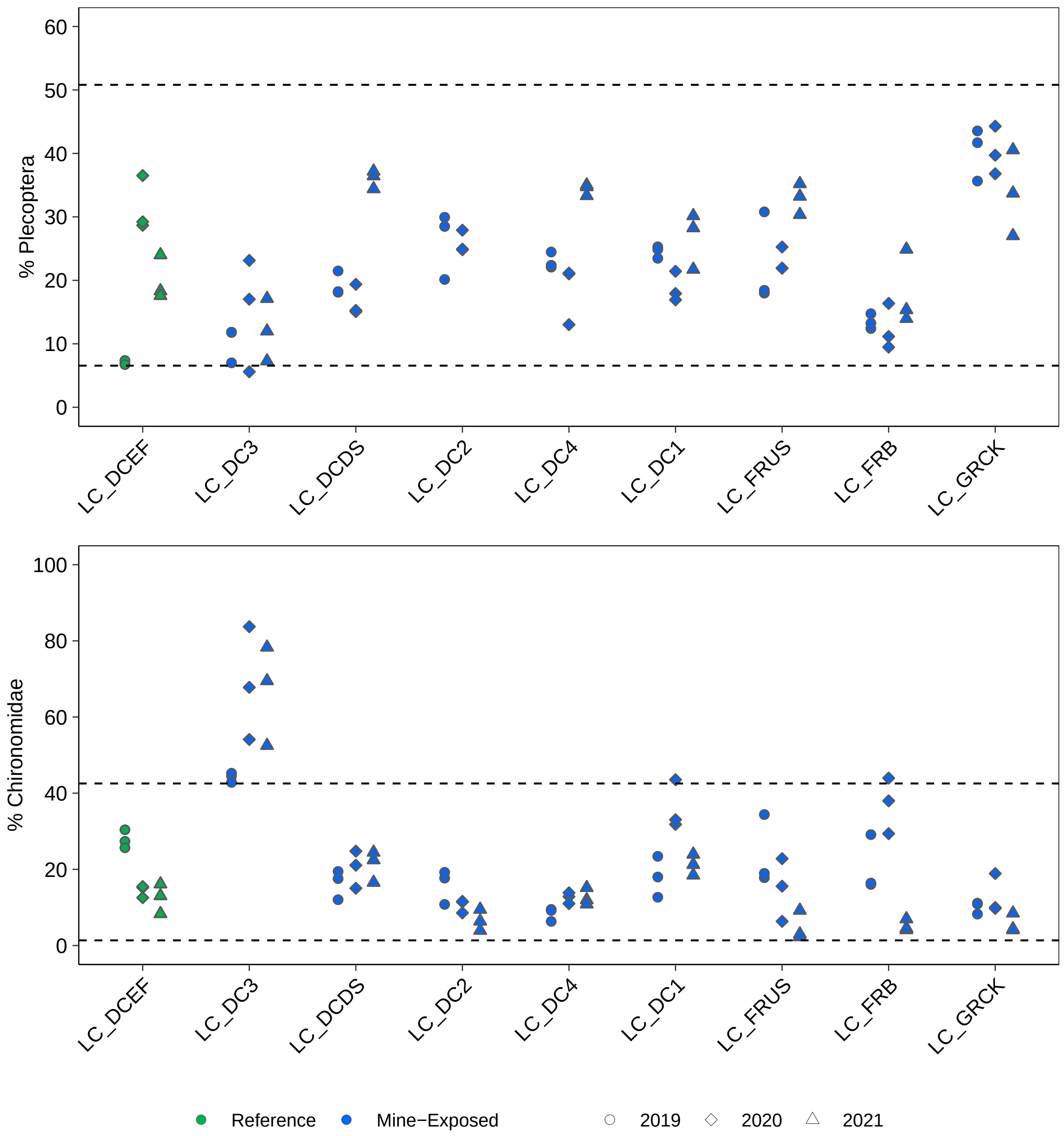

Figure 5.1: Benthic Invertebrate Community Endpoints at Dry Creek, Fording River, Grace Creek, and Dry Creek East Tributary Sampling Areas, LCO Dry Creek LAEMP, September 2019 to 2021

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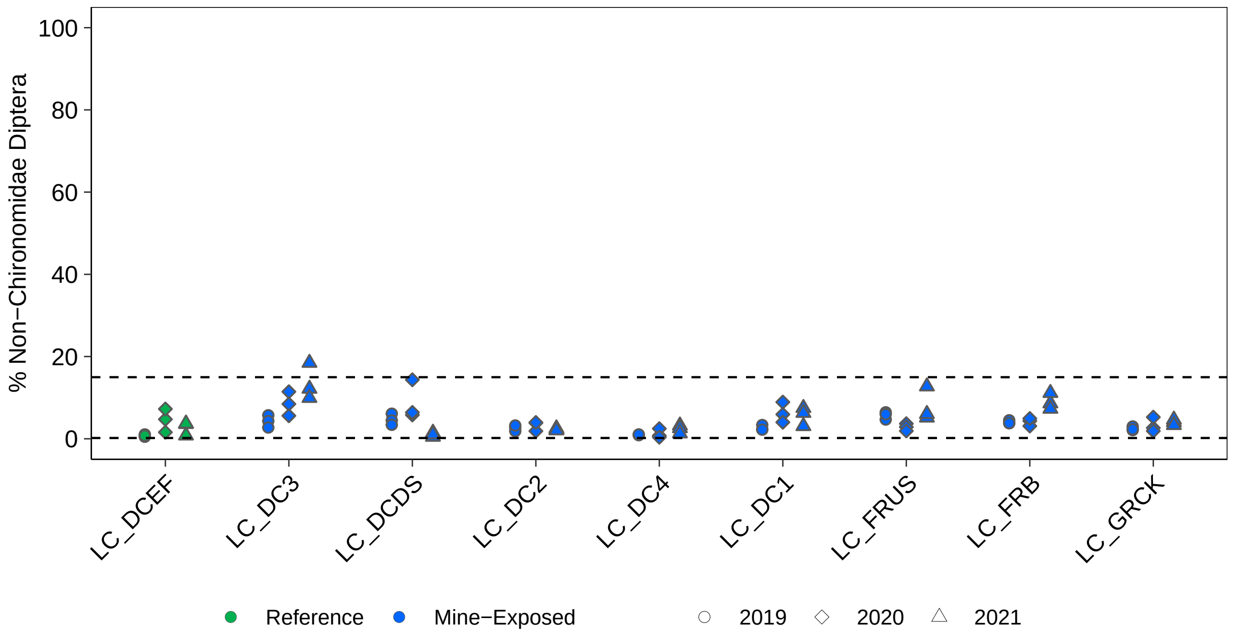

Figure 5.1: Benthic Invertebrate Community Endpoints at Dry Creek, Fording River, Grace Creek, and Dry Creek East Tributary Sampling Areas, LCO Dry Creek LAEMP, September 2019 to 2021

Notes: Upper and Lower Dry Creek = LC_DCDS and LC_DC1, respectively, and upstream and downstream in the Fording River = FR_FR5/LC_FRUS and LC_FRB, respectively. Site specific normal ranges using regression models shown with grey shading (when available). Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines.

non-Chironomidae Diptera (%NCD; e.g. Simuliidae and Psychodidae) were also within the regional normal range in all Dry Creek samples except for one replicate from LC_DC3 (Figure 5.1).

In general, benthic invertebrate communities in Dry Creek upstream of the DCWMS (LC_DC3) were most likely to have endpoints outside of normal ranges. Areas located closest to the discharge (LC_DCDS and LC_DC2) also tended to have lower %E than other areas and compared to regional and site-specific normal ranges.

5.2.1 Fording River and Grace Creek

All benthic invertebrate community endpoints associated with samples collected from the Fording River and Grace Creek in September 2021 were within the respective regional normal ranges (Figure 5.1; Appendix Figure E.1). Except for two of three replicates from LC_FRUS and LC_GRCK, where %EPT and %E were below their site-specific normal ranges, respectively, all other samples had community endpoints within site-specific normal ranges (where applicable; Figure 5.1; Appendix Figure E.1).

Overall, benthic invertebrate communities located upstream and downstream of the mouth of Dry Creek in the Fording River were similar to each other, and community endpoints were within regional normal ranges, suggesting minimal influence of Dry Creek on benthic invertebrate community structure in the immediate downstream receiving environment. The benthic invertebrate community within Grace Creek also had endpoints within regional normal ranges, as expected, based on current lack of mine influence.

5.3 Spatiotemporal Changes and Biological Trigger Assessment

Analysis of potential changes in benthic invertebrate community endpoints over time and among mine-exposed areas in Dry Creek and the Fording River relative to changes at upstream reference areas (i.e., LC_DCEF for Dry Creek areas and LC_FRUS[24] for LC_FRB) were explored using data collected from Dry Creek areas over the 2019 to 2021 period and data collected from Fording River areas over the 2018 to 2021 period (Figures 5.2 to 5.8; Appendix Figures E.2 to E.10, Appendix Tables E.6 to E.10; see Section 2.4.2.2 for ANOVA methods). Analyses were completed separately for datasets collected in May, June, and September of each year, with the focus of the discussion below on data collected in September (discussion of the May and June data is provided in Section 5.5 relative to the potential effects of the BRN runout).

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[24] LC_FRUS is not in reference condition; however, due to its position upstream of the mouth of Dry Creek, it is being used as an upstream reference area for LC_FRB (located downstream of the mouth of Dry Creek) to assess potential effects of Dry Creek inputs on Fording River benthic invertebrate communities.

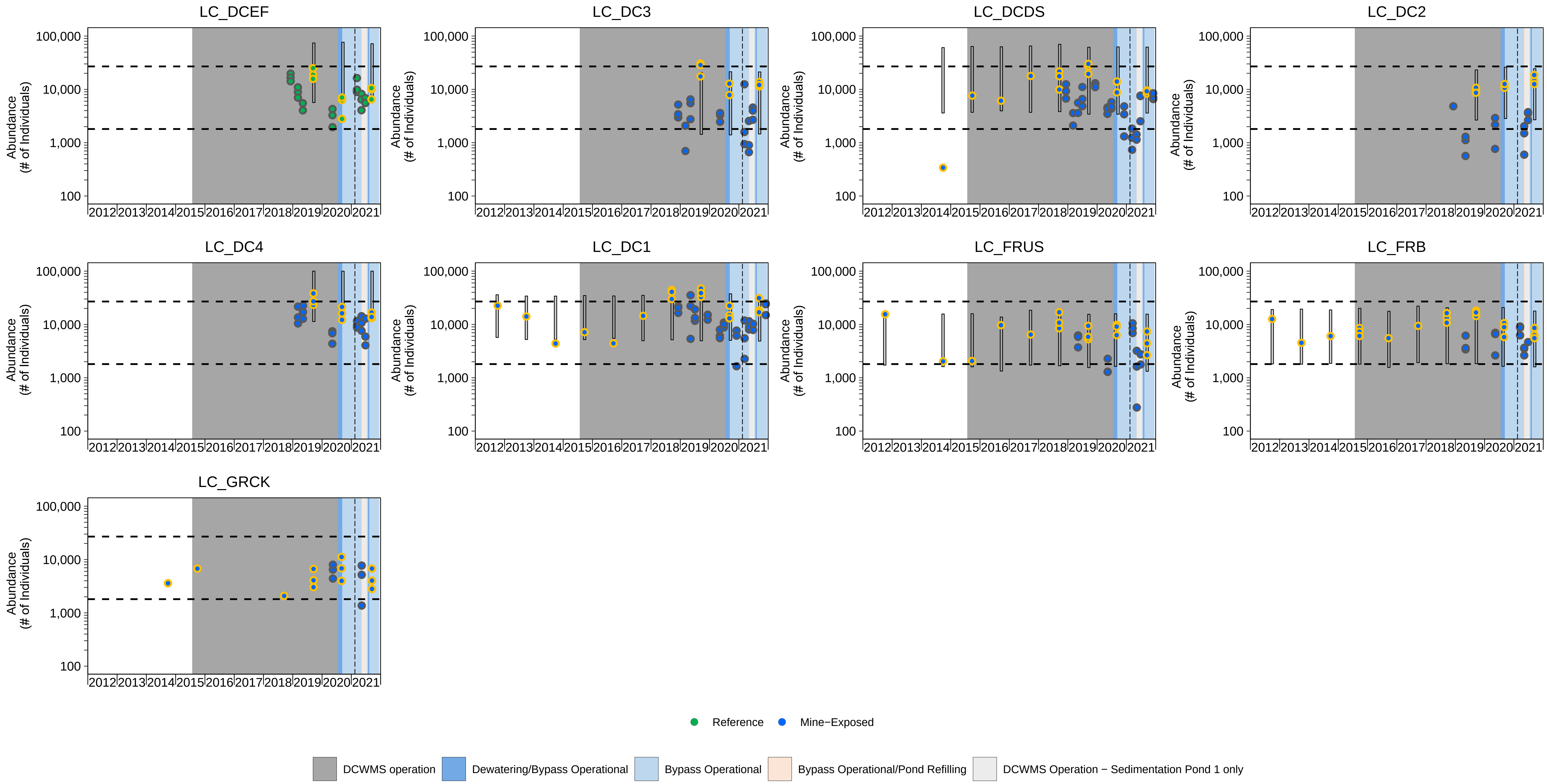

Figure 5.2: **Benthic Invertebrate Community Total Abundance from Dry Creek LAEMP Sampling Areas, 2012 to 2021**

Notes: Site specific normal ranges using regression models shown with grey shading and black rectangles (when available). Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

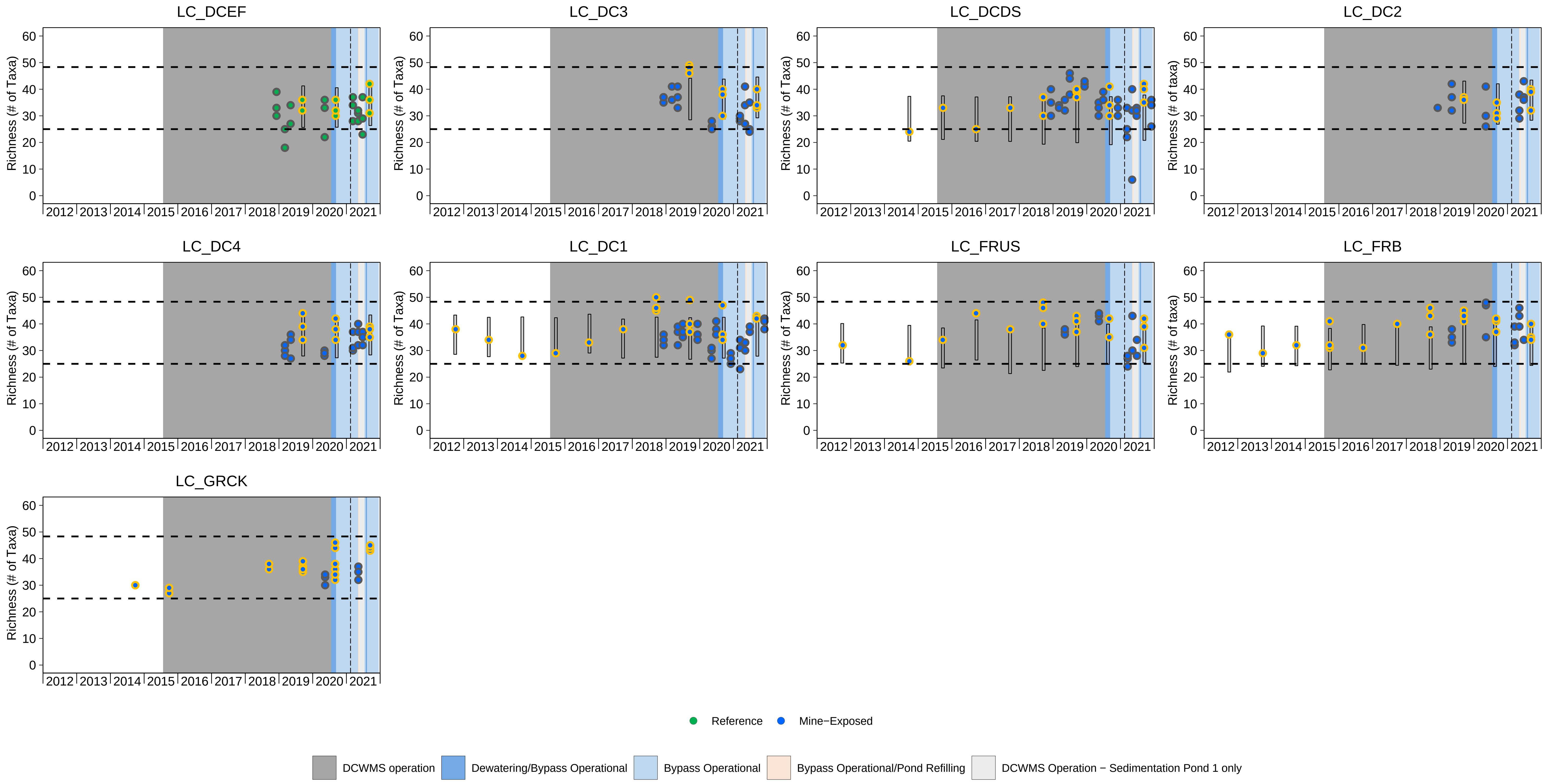

Figure 5.3: **Benthic Invertebrate Community Richness from Dry Creek LAEMP Sampling Areas, 2012 to 2021**

Notes: Site specific normal ranges using regression models shown with grey shading and black rectangles (when available). Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

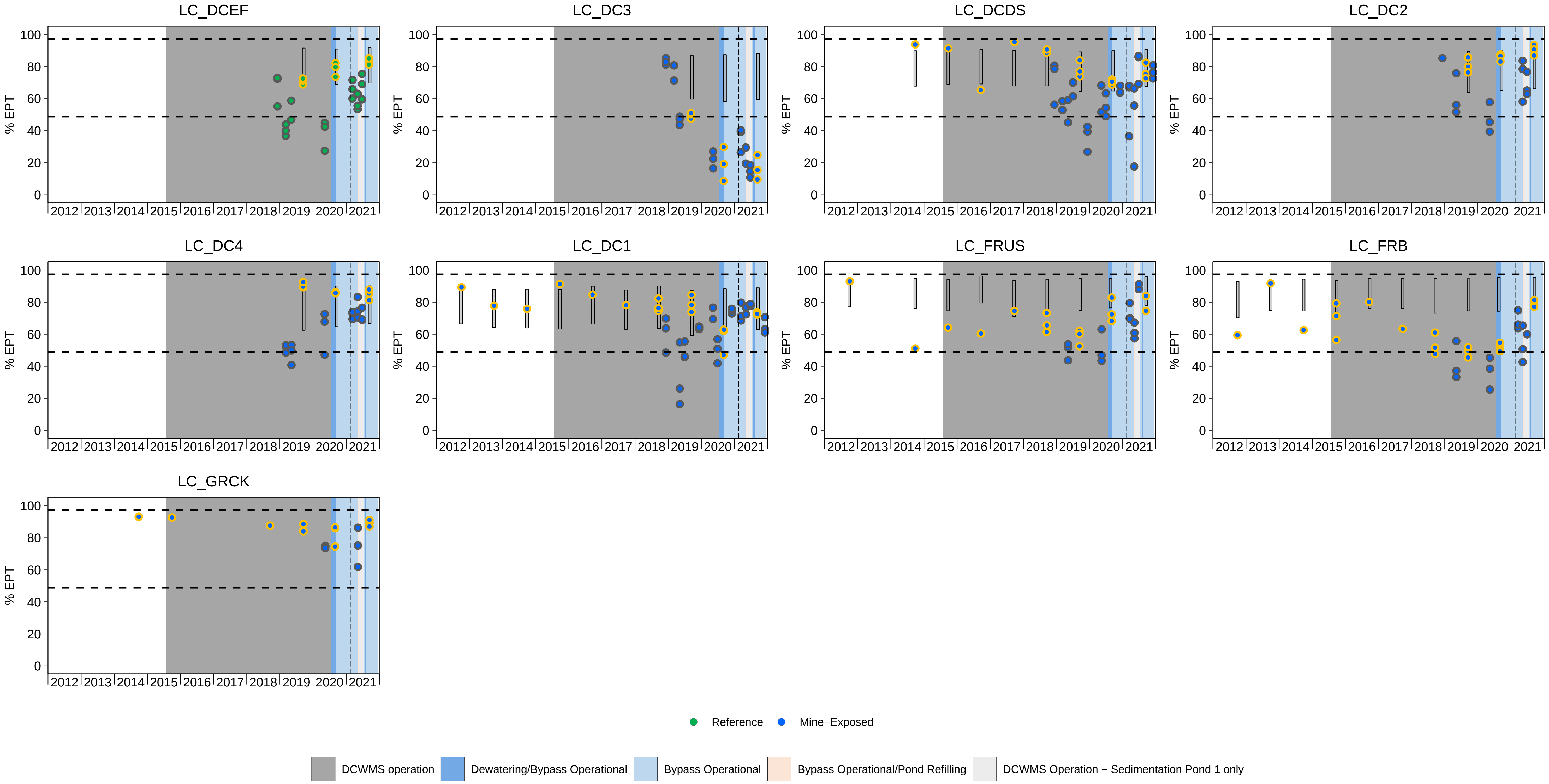

Figure 5.4: **Benthic Invertebrate Community % EPT from Dry Creek LAEMP Sampling Areas, 2012 to 2021**

Notes: Site specific normal ranges using regression models shown with grey shading and black rectangles (when available). Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

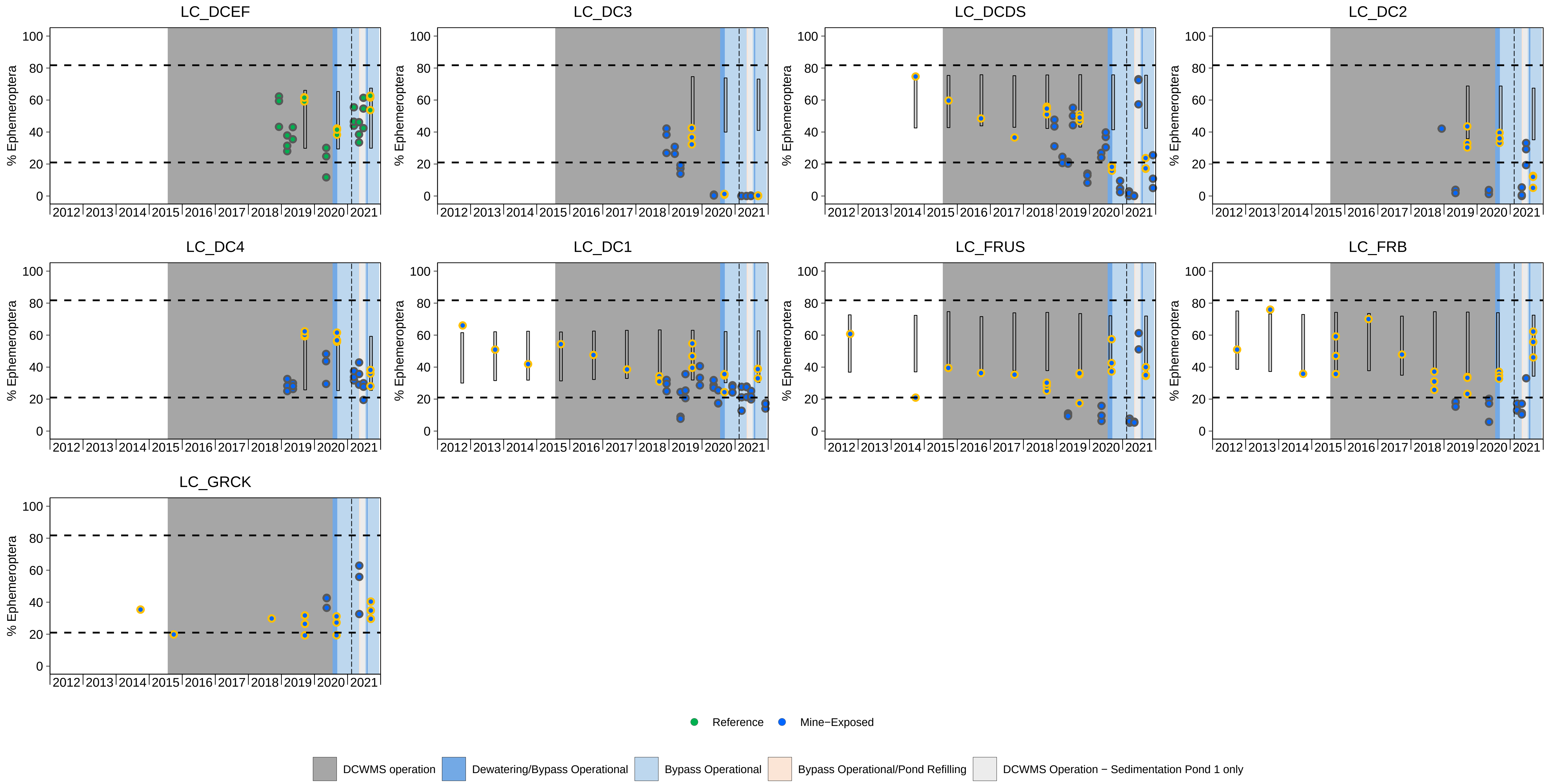

Figure 5.5: **Benthic Invertebrate Community % Ephemeroptera from Dry Creek LAEMP Sampling Areas, 2012 to 2021**

Notes: Site specific normal ranges using regression models shown with grey shading and black rectangles (when available). Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

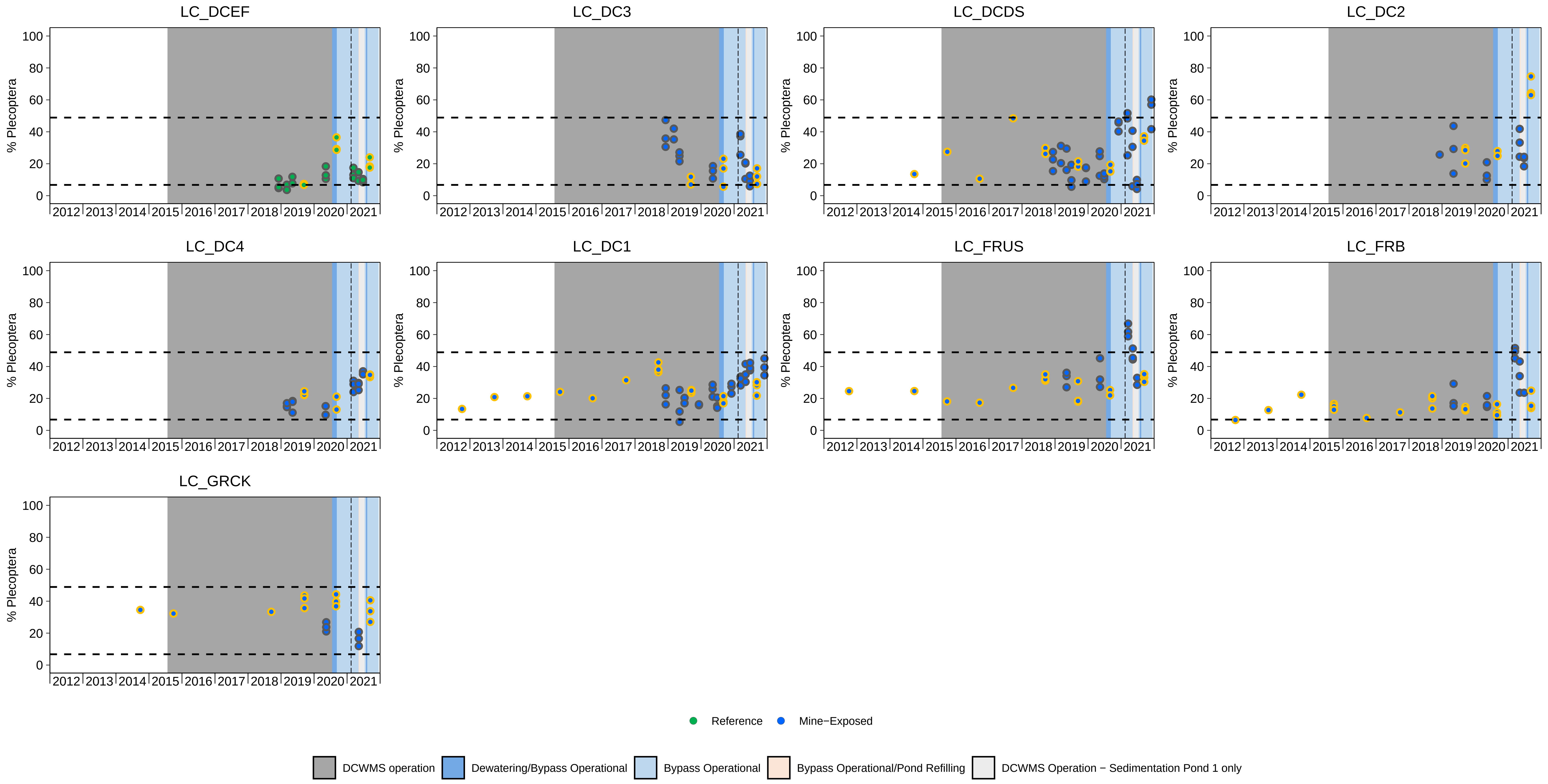

Figure 5.6: **Benthic Invertebrate Community % Plecoptera from Dry Creek LAEMP Sampling Areas, 2012 to 2021**

Notes: Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

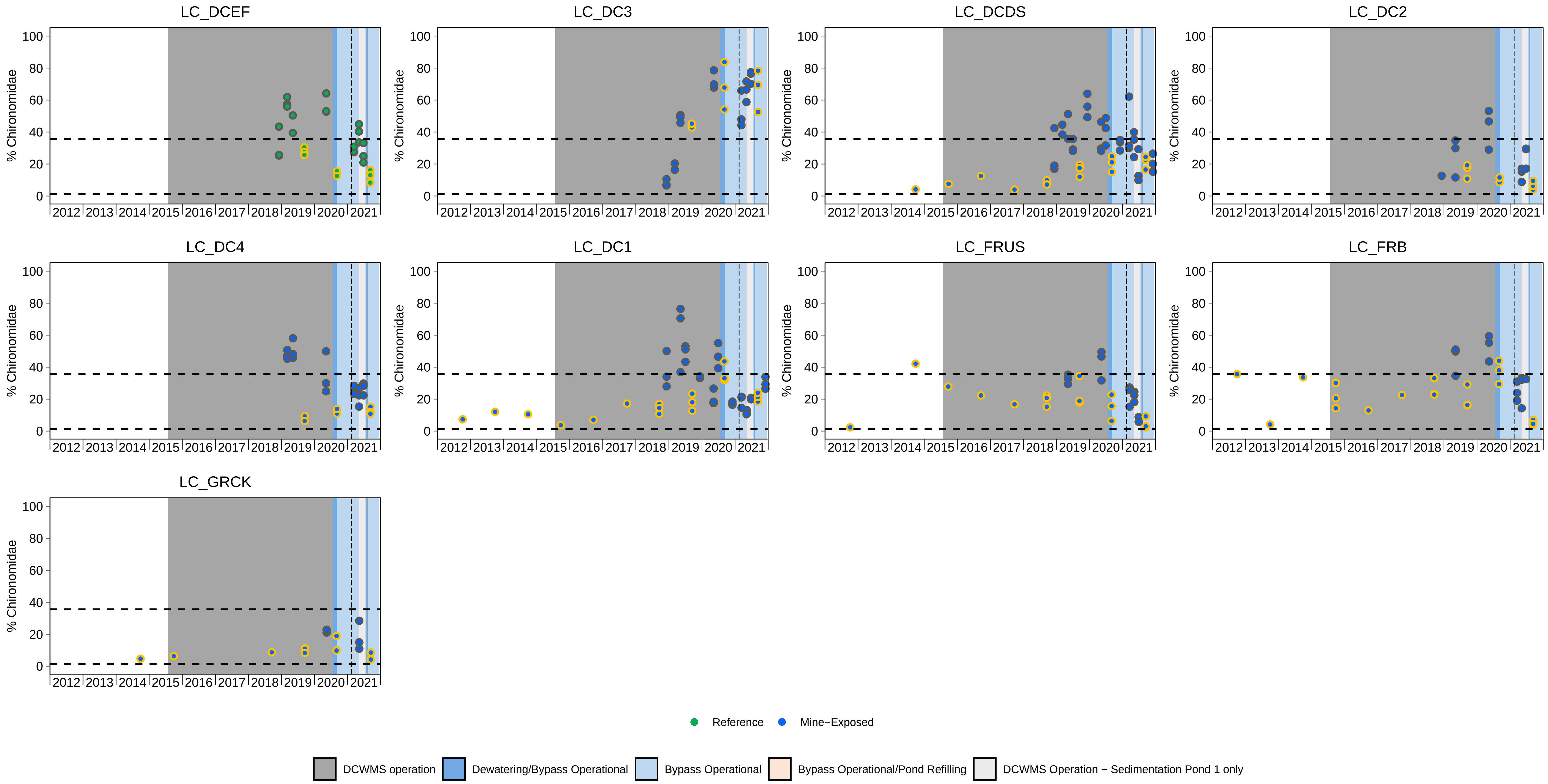

Figure 5.7: **Benthic Invertebrate Community % Chironomidae from Dry Creek LAEMP Sampling Areas, 2012 to 2021**

Notes: Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

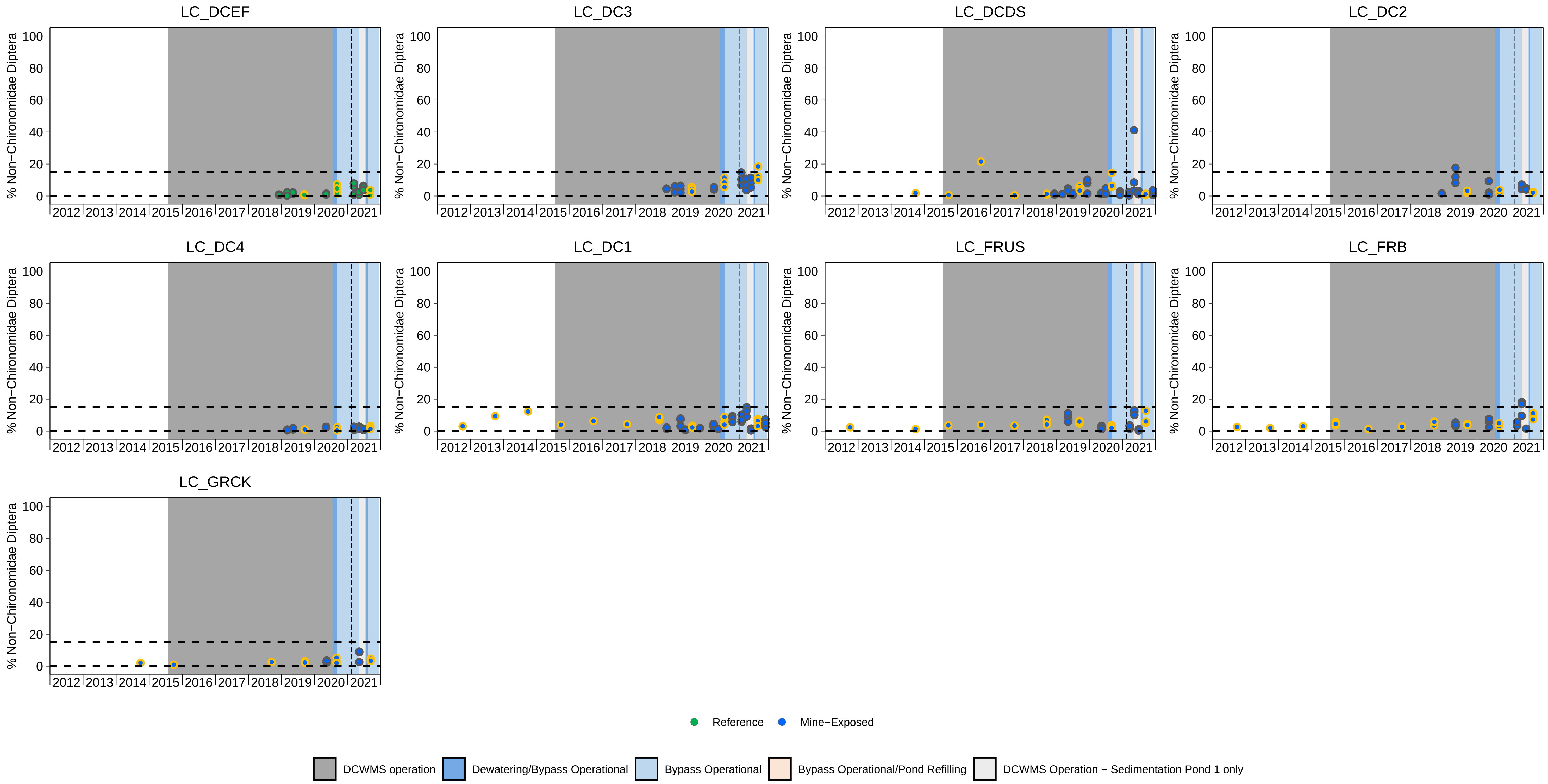

Figure 5.8: **Benthic Invertebrate Community % Non−Chironomidae Diptera from Dry Creek LAEMP Sampling Areas, 2012 to 2021**

Notes: Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

Total abundance of benthic invertebrates did not change significantly between 2020 and 2021 at all areas in Dry Creek (Figure 5.2; Appendix Table E.9). However, total abundance in 2021 (and 2020) was significantly lower than 2019 in all study areas except LC_DC2 (where no temporal differences were observed; Appendix Table E.9). Spatially, almost all mine-exposed areas in Dry Creek had similar total abundance to the reference area (LC_DCEF). The only area that consistently exhibited higher abundance was LC_DC1 (Appendix Table E.9). Except for slightly lower taxonomic richness observed at all Dry Creek study areas in 2020 relative to 2019, and slightly higher richness at LC_DC1 compared to the reference area, there were no spatial or temporal differences in taxonomic richness observed (Figure 5.3). At the Fording River study areas (LC_FRUS and LC_FRB), a similar pattern was observed for total abundance in 2021 (i.e., lower abundance relative to 2018, and no difference in abundance between the downstream and upstream area; Figure 5.2; Appendix Table E.10). Richness was also slightly lower at both study areas in the Fording River in 2021 relative to 2018, but there were no differences between the downstream and upstream area (Figure 5.3; Appendix Table E.10).

Within Dry Creek, percent EPT was significantly lower at LC_DC3 in both 2021 and 2020 relative to 2019 but was relatively unchanged between 2020 and 2021 (Figure 5.4; Appendix Table E.9). Percent EPT was also significantly lower at LC_DC3 compared to the reference area in all three study years, with the magnitude of difference increasing from 2019 through 2021; Appendix Table E.9). The decrease in %EPT at LC_DC3 was largely driven by a decrease in abundance of Ephemeroptera (Appendix Figures E.4 to E.7). Other minor temporal and spatial differences in %EPT were noted, but no differences in %EPT were observed in 2021 relative to both 2019 and 2020, and except for the lower %EPT noted at LC_DC3, none of the mine-exposed areas differed relative to the reference area in 2021 (Figure 5.4; Appendix Table E.9). Within the Fording River, an increase in %EPT was observed at LC_FRB in 2021 relative to earlier study years, resulting in no significant difference in %EPT between LC_FRB and LC_FRUS for the first time since 2018 (Appendix Table E.10).

In addition to assessment of spatial and temporal changes, percent EPT was also compared against the biological trigger (i.e., lower limit) established for this endpoint for Dry Creek LAEMP monitoring areas with available water quality predictions (i.e., two mine-exposed areas [LC_DCDS and LC_DC1]; see Appendix H for details). The percentage of EPT in all samples from both study areas was well above the trigger and within habitat-adjusted normal ranges (Appendix Table H.1). Thus, no further investigation was required.

Significant decreases in %E were observed at all mine-exposed areas in Dry Creek over the 2019 to 2021 period (Figure 5.5; Appendix Table E.9). In some cases, the significant decrease occurred in 2020 (i.e., LC_DC3, LC_DCDS, and LC_DC1), whereas in other cases, the significant decrease occurred in 2021 (i.e., LC_DC2 and LC_DC4; Figure 5.5; Appendix Table E.9). At the reference area (LC_DCEF), %E initially decreased in 2020 relative to 2019, but returned to a similar percentage in 2021 as observed in 2019 (Figure 5.5; Appendix Table E.9). The temporal decreases in %E observed at all mine-exposed areas resulted in all areas having significantly lower %E relative to the reference area in 2021 (and in many cases, 2020 and 2019 as well; Figure 5.5; Appendix Table E.9). The decrease in %E was directly linked to a decrease in overall abundance of Ephemeroptera (Appendix Figure E.5). Within the Fording River, an increase in %E was noted at area LC_FRB in 2021 relative to earlier study years, while no differences in %E were found between LC_FRB and LC_FRUS in any study year (Appendix Table E.10). Thus, the potential mine-related influence on %E within Dry Creek (see Section 5.4 for more detail) does not appear to have been carried through to the immediate downstream receiving environment in the Fording River.

A nearly opposite pattern to that of %E was observed for %P at the Dry Creek study areas, with all mine-exposed areas except LC_DC3 exhibiting a significant increase in %P over time (particularly in 2021 relative to earlier years; Figure 5.6; Appendix Table E.9). Over the same time period, %P measured at the reference area (LC_DCEF) ranged from its lowest in 2019 to highest in 2020, then mid-way between the two in 2021 (Figure 5.6). As a result of the temporal patterns observed at Dry Creek study areas, almost all of the mine-exposed areas differed from the reference area with respect to %P over time, with the greatest magnitudes of difference observed in 2019, when %P was much higher at the mine-exposed areas (except LC-DC3; Figure 5.6; Appendix Table E.9). Due to the substantial increase in %P at the reference area in 2020, most mine-exposed areas exhibited significantly lower %P relative to the reference area that year (Appendix Table E.9). Then in 2021, when %P decreased at the reference area, but increased at almost all mine-exposed areas, significantly higher %P was noted at most mine-exposed areas relative to the reference area (Appendix Table E.9). In the Fording River, %P was highest at both the downstream and upstream study areas in 2018 and 2021, and lowest in 2019 and 2020, with the downstream area consistently exhibiting lower %P than the upstream area (Figure 5.6; Appendix Table E.10).

For most other benthic invertebrate community endpoints (e.g., %Trichoptera, %Oligochaeta, %Chironomidae, and %Non-Chironomidae Diptera), there were either no significant differences, or no obvious patterns of change over time or relative to reference within Dry Creek and the Fording River that would potentially be indicative of a mine-related influence (Figures 5.7 and 5.8; Appendix Figures E.7 to E.9, Appendix Tables E.9 and E.10).

Overall, %E appeared to be the endpoint most likely linked to a mine-related influence. Both the relative proportion and total abundance of Ephemeroptera decreased at all mine-exposed areas on Dry Creek over the 2019 to 2021 monitoring period, and percentages measured at the mine-exposed areas were almost always significantly lower than those measured in the reference area, particularly in 2021. Proportions of EPT generally did not reflect the patterns observed in %E because %P often increased to offset the observed changes. In contrast to Dry Creek, very few differences in benthic invertebrate community endpoints were observed between the areas located immediately downstream and upstream of the mouth of Dry Creek in the Fording River. There were also no obvious temporal changes in benthic community endpoints that would be indicative of an influence of Dry Creek on the downstream receiving environment.

5.4 Correlation Analysis

Spearman Rank Correlation analysis was used to assess relationships between benthic invertebrate community endpoints and physicochemical data (e.g., water quality constituents and habitat variables) collected from all Dry Creek LAEMP study areas in September 2019, 2020, and 2021 (Table 5.1; Appendix Figure E.7). Correlations were considered significant if their correlation coefficient (R_s) was less than or equal to 0.6 or greater than or equal to 0.6, and their p-value was less than 0.0001.

Only three benthic invertebrate community endpoints had correlations with physicochemical variables matching the criteria for significance: %E, total abundance, and %T (Table 5.1). The water quality constituents that correlated with changes in %E included those evaluated in detail in Section 3 (e.g., nitrate, sulphate, selenium, nickel, and cadmium) as well as several others (Table 5.1). Total organism abundance correlated positively with calcite index, percent calcite coverage, and total alkalinity, and negatively with aqueous total lithium (Table 5.1). The only variable that correlated significantly with %T was water temperature (Table 5.1).

Decreasing total and relative abundance of Ephemeroptera was noted in all mine-exposed areas of Dry Creek, particularly over the past two study years (i.e., 2020 and 2021). Over the same time period, concentrations of mine-related constituents in water, including nitrate, selenium, sulphate, cadmium, and nickel, have increased, and at some monitoring locations, are now exceeding water quality benchmarks (see Section 3). Aqueous concentrations of several other metals correlated strongly with known mine-related constituents on PC-1 (Appendix Table E.11), resulting in negative correlations between these metals (and PC-1) with relative and total abundance of Ephemeroptera (Table 5.1; Appendix Figure E.10). Thus, there is evidence that mine-related changes in water quality are causing changes in benthic invertebrate community structure, particularly a reduction in Ephemeroptera abundance.

The positive correlations observed between calcite index and percent calcite coverage with total organism abundance are a little more challenging to interpret from a mine-related perspective. In the current analysis, almost all calcite index values were equal to or less than 1, meaning little

Table 5.1: Spearman's Correlation Relationships between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Dry Creek, 2019 to 2021

Parameter	Abundance (# organisms/ 3 min kick)		Richness (# taxa)		% EPT		% Ephemeroptera		% Plecoptera		% Trichoptera		% Oligochaeta		% Non-Chironomidae Diptera		% Chironomidae	
	r_s	p-value	r_s	p-value	r_s	p-value	r_s	p-value	r_s	p-value	r_s	p-value	r_s	p-value	r_s	p-value	r_s	p-value
Calcite Index	0.624	<0.0001	0.289	0.0339	-0.239	0.0819	0.165	0.233	-0.352	0.00911	-0.337	0.0127	0.181	0.190	0.0473	0.734	0.286	0.0362
Calcite (%)	0.624	<0.0001	0.267	0.0508	-0.174	0.209	0.166	0.230	-0.278	0.0415	-0.274	0.0447	0.177	0.201	0.0522	0.708	0.217	0.115
Concreted (mean)	0.175	0.205	0.103	0.457	-0.383	0.00425	0.0910	0.513	-0.517	<0.0001	-0.471	0.000321	0.0542	0.697	-0.0399	0.775	0.414	0.00184
Embeddedness (%)	0.0543	0.697	0.138	0.320	-0.236	0.0862	0.280	0.0400	-0.315	0.0202	-0.285	0.0370	0.167	0.227	0.154	0.268	0.204	0.139
D16	-0.193	0.163	-0.198	0.152	0.0291	0.834	-0.119	0.393	0.0633	0.649	0.299	0.0280	0.0655	0.638	0.144	0.300	-0.0702	0.614
D84	-0.130	0.351	-0.159	0.251	-0.276	0.0434	0.0885	0.525	-0.403	0.00252	-0.103	0.459	0.188	0.172	0.201	0.145	0.234	0.0885
Water Velocity (m/s)	0.454	0.000563	0.316	0.0201	0.218	0.114	0.0504	0.718	0.236	0.0862	0.173	0.210	0.00490	0.972	-0.0547	0.695	-0.182	0.187
Water Depth (cm)	0.0976	0.483	0.122	0.379	-0.128	0.358	-0.0122	0.930	-0.294	0.0309	0.125	0.368	-0.0367	0.792	0.160	0.249	0.0803	0.564
Annual PC1	-0.195	0.158	0.0523	0.707	-0.295	0.0304	-0.822	<0.0001	0.0345	0.805	0.312	0.0216	0.0845	0.543	0.395	0.00310	0.293	0.0312
Annual PC2	0.0601	0.666	0.291	0.0329	-0.329	0.0151	-0.711	<0.0001	0.160	0.247	0.105	0.451	0.0300	0.830	0.343	0.0111	0.377	0.00494
Annual PC3	-0.393	0.00332	-0.148	0.285	-0.591	<0.0001	-0.251	0.0670	-0.476	0.000270	-0.436	0.000984	0.222	0.106	0.337	0.0126	0.534	<0.0001
Annual Temperature (°C)	0.274	0.0451	0.107	0.442	0.338	0.0123	0.0808	0.562	0.341	0.0115	0.652	<0.0001	0.0313	0.822	-0.0998	0.473	-0.347	0.0101
Annual Total Alkalinity as CaCO3 (mg/L)	0.608	<0.0001	0.343	0.0112	0.131	0.346	0.325	0.0165	-0.0138	0.921	-0.289	0.0339	-0.151	0.277	-0.236	0.0855	-0.0252	0.856
Annual Nitrate (mg/L as N)	-0.204	0.139	0.0634	0.649	-0.225	0.103	-0.817	<0.0001	0.0897	0.519	0.303	0.0260	0.0188	0.893	0.358	0.00794	0.228	0.0977
Annual Nitrite (mg/L s N)	-0.148	0.285	0.00861	0.951	-0.0606	0.663	-0.684	<0.0001	0.160	0.247	0.521	<0.0001	-0.0106	0.940	0.256	0.0613	0.0624	0.654
Annual Ammonia (mg/L as N)	-0.0200	0.886	0.0462	0.740	-0.364	0.00687	-0.259	0.0587	-0.319	0.0189	0.0520	0.709	0.196	0.156	0.217	0.115	0.368	0.00615
Annual Phosphorus (mg/L)	-0.297	0.0293	0.0234	0.867	-0.330	0.0148	-0.671	<0.0001	-0.210	0.128	0.111	0.423	0.182	0.189	0.449	0.000658	0.302	0.0266
Annual Sulphate (mg/L)	-0.165	0.232	0.0512	0.713	-0.252	0.0665	-0.817	<0.0001	0.0636	0.648	0.300	0.0275	0.000515	0.997	0.334	0.0135	0.262	0.0555
Annual Total Dissolved Solids (mg/L)	-0.212	0.124	0.0507	0.716	-0.222	0.107	-0.829	<0.0001	0.125	0.366	0.324	0.0167	0.00991	0.943	0.368	0.00620	0.222	0.106
Annual Dissolved Aluminum (mg/L)	-0.165	0.232	0.0215	0.877	-0.170	0.220	-0.714	<0.0001	0.0563	0.686	0.475	0.000282	0.0990	0.476	0.281	0.0392	0.166	0.230
Annual Total Antimony (mg/L)	-0.0938	0.500	0.134	0.335	-0.217	0.116	-0.735	<0.0001	0.0159	0.909	0.229	0.0959	0.119	0.392	0.284	0.0377	0.244	0.0751
Annual Total Arsenic (mg/L)	-0.210	0.128	0.0889	0.523	-0.418	0.00167	-0.754	<0.0001	-0.132	0.340	0.165	0.234	0.168	0.224	0.521	<0.0001	0.392	0.00336
Annual Total Barium (mg/L)	-0.122	0.378	-0.149	0.282	0.398	0.00291	0.141	0.309	0.450	0.000630	0.0338	0.808	-0.0805	0.563	-0.244	0.0755	-0.398	0.00289
Annual Total Boron (mg/L)	-0.528	<0.0001	-0.130	0.350	-0.241	0.0787	-0.466	0.000380	0.0662	0.634	-0.121	0.383	0.00124	0.993	0.167	0.229	0.196	0.154
Annual Dissolved Cadmium (µg/L)	-0.180	0.194	0.0848	0.542	-0.308	0.0234	-0.800	<0.0001	-0.0512	0.713	0.220	0.109	-0.00296	0.983	0.360	0.00748	0.315	0.0201
Annual Total Chromium (mg/L)	-0.102	0.463	0.115	0.408	-0.302	0.0267	-0.741	<0.0001	0.0239	0.864	0.230	0.0939	0.0582	0.676	0.334	0.0136	0.329	0.0150
Annual Total Cobalt (mg/L)	-0.163	0.239	0.0853	0.539	-0.396	0.00303	-0.778	<0.0001	-0.135	0.332	0.211	0.126	0.139	0.315	0.478	0.000253	0.381	0.00451
Annual Total Copper (mg/L)	-0.172	0.215	0.160	0.247	-0.549	<0.0001	-0.783	<0.0001	0.00630	0.964	0.181	0.191	0.0152	0.913	0.498	0.000126	0.514	<0.0001
Annual Total Iron (mg/L)	-0.138	0.321	0.225	0.102	-0.414	0.00185	-0.820	<0.0001	0.0349	0.802	0.177	0.201	0.0973	0.484	0.420	0.00156	0.424	0.00140
Annual Total Lead (mg/L)	-0.167	0.226	0.102	0.465	-0.250	0.0683	-0.830	<0.0001	0.190	0.168	0.417	0.00170	0.0845	0.543	0.368	0.00612	0.234	0.0880
Annual Total Lithium (mg/L)	-0.612	<0.0001	-0.299	0.0279	-0.192	0.165	-0.506	<0.0001	0.112	0.421	0.0251	0.857	-0.0811	0.560	0.0842	0.545	0.168	0.224
Annual Total Manganese (mg/L)	-0.0734	0.598	0.227	0.0982	-0.206	0.135	-0.798	<0.0001	0.259	0.0582	0.290	0.0335	0.115	0.408	0.312	0.0216	0.229	0.0963
Annual Total Molybdenum (mg/L)	-0.111	0.422	0.171	0.218	-0.211	0.126	-0.768	<0.0001	0.0832	0.550	0.273	0.0456	0.106	0.445	0.285	0.0368	0.232	0.0909
Annual Total Nickel (mg/L)	-0.211	0.126	0.0351	0.801	-0.355	0.00837	-0.723	<0.0001	-0.164	0.235	0.243	0.0768	0.0805	0.563	0.440	0.000869	0.341	0.0117
Annual Total Selenium (µg/L)	-0.201	0.144	0.0428	0.759	-0.226	0.100	-0.824	<0.0001	0.111	0.424	0.323	0.0173	-0.0144	0.918	0.337	0.0127	0.234	0.0890
Annual Total Thallium (mg/L)	-0.234	0.0888	0.0707	0.611	-0.380	0.00455	-0.811	<0.0001	-0.0529	0.704	0.235	0.0878	0.0853	0.540	0.425	0.00137	0.371	0.00578
Annual Total Uranium (mg/L)	-0.146	0.293	0.0872	0.530	-0.339	0.0123	-0.804	<0.0001	-0.0519	0.710	0.242	0.0780	0.0827	0.552	0.400	0.00273	0.342	0.0114
Annual Total Zinc (mg/L)	-0.474	0.000292	-0.219	0.112	-0.496	0.000136	-0.748	<0.0001	-0.0789	0.570	0.0920	0.508	0.109	0.433	0.425	0.00135	0.462	0.000441
Annual Dimethylseleneoxide (µg/L)	-0.243	0.0771	-0.0836	0.548	-0.152	0.272	-0.757	<0.0001	0.106	0.444	0.500	0.000116	-0.0237	0.865	0.331	0.0146	0.125	0.367
Annual Methylseleninic Acid (µg/L)	0.00700	0.960	0.136	0.326	-0.211	0.126	-0.378	0.00488	-0.156	0.260	0.376	0.00505	0.0347	0.803	0.235	0.0876	0.226	0.101
Annual Selenate (µg/L)	-0.221	0.108	0.0489	0.725	-0.212	0.123	-0.824	<0.0001	0.124	0.372	0.324	0.0168	-0.00528	0.970	0.349	0.00977	0.217	0.116
Annual Selenite (µg/L)	-0.174	0.209	0.0744	0.593	-0.285	0.0370	-0.711	<0.0001	-0.0737	0.597	0.352	0.00911	0.0740	0.595	0.377	0.00498	0.272	0.0469
Dimethylseleneoxide (% of Total Selenium)	0.127	0.360	-0.190	0.169	0.296	0.0299	0.774	<0.0001	-0.0862	0.535	-0.134	0.335	-0.00257	0.985	-0.329	0.0153	-0.336	0.0131
Methylseleninic Acid (% of Total Selenium)	0.137	0.325	-0.126	0.363	0.139	0.317	0.776	<0.0001	-0.213	0.121	-0.221	0.108	0.0117	0.933	-0.230	0.0942	-0.186	0.178
Selenate (% of Total Selenium)	0.193	0.162	0.0325	0.816	0.200	0.147	0.146	0.294	0.0608	0.662	0.0361	0.796	-0.0948	0.495	0.0794	0.568	-0.244	0.0754
Selenite (% of Total Selenium)	-0.0832	0.550	-0.143	0.303	-0.0468	0.737	0.512	<0.0001	-0.333	0.0138	-0.246	0.0726	0.151	0.277	-0.0851	0.541	-0.0123	0.930
Benthic Invertebrate Tissue Selenium (mg/kg dw)	0.0915	0.511	-0.0177	0.899	-0.100	0.471	-0.216	0.116	-0.0290	0.835	0.549	<0.0001	-0.0687	0.622	0.231	0.0936	0.0972	0.484

▨ P-value < 0.05/47 (0.05 Bonferroni Corrected for 47 independent comparisons).

🟦 $r_s \leq -0.6$ or $r_s \geq 0.6$.

Notes: D16 and D84 are sediment size parameters corresponding to the 16th and 84th percentile of the sediment size distributions (equivalent to +/- 1SD from a normal distribution). For example, D16 is the sediment size for which 16% of the sediment sample is finer. PC1, PC2, and PC3 are axes from Principal Component Analysis (PCA) of annual water chemistry analytes calculated using data from 2019 to 2021. Annual water chemistry variables were calculated using September data from 2019 to 2021 from: LC_DCEF, LC_DC3, LC_DCDS, LC_DC2, LC_DC4, LC_DC1, LC_GRCK, LC_FRB.

to no concretion. Therefore, even though every substrate particle may be covered in calcite, the total amount of surface area available as benthic invertebrate habitat would still be similar (i.e., the rocks would not be physically attached to each other or the streambed). However, calcite can create a rough surface on an otherwise smooth rock, which in turn could lead to greater surface area for organism attachment on a micro-habitat level. As a result, benthic invertebrate abundance may increase in areas where a greater percentage of the substrate is covered in calcite, as long as the substrate is not concreted. It is important to note, however, that calcite presence on substrate is not unique to mine-exposed areas (although mining can exacerbate formation of calcite). Calcite index values up to 1 were documented in several reference areas associated with the RAEMP. Thus, while an increase in calcite index may lead to an increase in benthic organism abundance (up to a calcite index of 1), the relationship is not necessarily a result of mine-related activities. The positive relationship observed between alkalinity and total organism abundance is inconsistent with the negative relationship observed in the RAEMP (Lotic 2020, Minnow 2020c).

Aqueous concentrations of lithium have been increasing in mine-exposed areas of Dry Creek, particularly over the past three years (Appendix Figure E.11). Over the same time period (i.e., 2019 to 2021), total abundance of benthic organisms in kick and sweep samples decreased in most mine-exposed areas of Dry Creek (Appendix Table E.9). However, despite the observed decrease, total abundance values were still well within normal ranges (Figure 5.2), and no relationship between aqueous lithium and total organism abundance was found in the RAEMP (Minnow 2020c). Thus, the correlation observed in the current study may simply be coincidental.

Overall, there was some evidence that mining activities associated with Dry Creek are having an influence on benthic invertebrate community structure. The relationship between deteriorating water quality and decreasing total and relative abundance of Ephemeroptera was previously documented in the RAEMP, the 2020 Dry Creek LAEMP, and observed in the present study.

5.5 BRN Runout Effects Assessment

As discussed in Section 1.4, a failure associated with the BRN spoil occurred in the Dry Creek watershed on February 11, 2021. To assess the potential effects of the spoil failure on benthic invertebrates located downstream in Dry Creek, community endpoints associated with samples collected in March, May, June, and September 2021 (Appendix Tables E.1 to E.4), were compared to those collected in earlier study years (where data were available).

The March 2021 sampling event was temporally exclusive compared to earlier study years (i.e., samples were not collected in March in any of the previous LAEMP investigations). Thus, benthic invertebrate endpoints associated with sampling in March 2021 could not be compared to previous years using statistical analyses. However, there were no obvious or major changes in the structure of communities located in Dry Creek and the Fording River downstream of the spoil failure based on visual examination of endpoints over time (Figures 5.2 to 5.8; Appendix Figures E.2 to E.9). In almost all cases, endpoints measured in March 2021 were within the range of those measured during previous sampling events (Figures 5.2 to 5.8; Appendix Figures E.2 to E.9).

In May 2021, there was evidence of a decrease in total organism abundance, as well as EPT, Ephemeroptera. and Chironomidae abundance at the sampling areas located closest to the spoil failure (i.e., LC_DC3 and LC_DCDS) relative to data collected in both May 2019 and May 2020 (Appendix Table E.6). However, the only relative abundance endpoints that decreased significantly in May 2021 were %E and %C, and in both cases, no significant differences were noted at the station closest to the spoil failure (i.e., LC_DC3; Appendix Table E.6). Downstream of Dry Creek within the Fording River, the only differences observed were a slight decrease in total abundance (2021 versus 2020 only), and a slight increase in %NCD (relative to both 2020 and 2019; Appendix Table E.7). The increase in %NCD was also noted at LC_DCDS and LC_DC1 in May 2021, but only relative to May 2020 (i.e., no difference in %NCD was observed at either station relative to data collected in May 2019). Thus, based on data collected in May 2021, it is possible that the spoil failure resulted in some decrease in organism abundance in sampling areas closest to the failure, but the changes observed were not corroborated by endpoints associated with relative abundance.

Only two mine-exposed areas were sampled for benthic invertebrate communities in June: LC_DCDS and LC_DC1. At area LC_DCDS, %E and Chironomidae abundance were the only endpoints that differed significantly in June 2021 relative to both 2020 and 2019, with %E having increased, and chironomid abundance having decreased (Appendix Table E.8). Further downstream at LC_DC1, %EPT and %P were higher in June 2021 compared to 2020 and 2019, whereas %C and chironomid abundance were lower (Appendix Table E.8). Since the differences described above are not typically associated with adverse effects, and the same endpoints did not differ at both study areas, the spoil failure likely did not directly influence benthic invertebrate community structure in June 2021.

Differences in benthic invertebrate community structure in September 2021 relative to earlier study years (2020 and 2019) were discussed in Section 5.3. In brief, there were no changes in many invertebrate endpoints, including total invertebrate abundance, taxonomic richness, %EPT, or %T in September 2021 relative to September 2020, while differences in other endpoints (i.e., %E, %P, %C, and %NCD) only occurred at one or more areas downstream of LC_DC3, and not at LC_DC3 itself (the area closest to the spoil failure; Appendix Table E.9). Within the Fording River, the increase in %EPT and %E observed downstream of Dry Creek in September 2021 relative to earlier years (Appendix Table E.10) suggests that Dry Creek and the associated spoil failure did not have an adverse effect on the benthic invertebrate community at LC_FRB.

Overall, the spoil failure may have had some limited (but not lasting) effects on the abundance of benthic invertebrates at study areas located closest to the failure in 2021.

5.6 Summary

Benthic invertebrate community total abundance and taxonomic richness were generally within regional and site-specific (where available) normal ranges at Dry Creek LAEMP sampling areas in 2021. Benthic invertebrate communities in Dry Creek upstream of the DCWMS (LC_DC3) had endpoints outside of normal ranges (particularly %EPT, %E, and %C) most often. Areas located closest to the DCWMS discharge (LC_DCDS and LC_DC2) also tended to have lower %E than other areas and compared to regional and site-specific normal ranges. In contrast, benthic invertebrate communities located upstream and downstream of the mouth of Dry Creek in the Fording River were similar to each other, and community endpoints were within regional normal ranges, suggesting minimal influence of Dry Creek on benthic invertebrate community structure in the downstream receiving environment. The benthic invertebrate community within Grace Creek also had endpoints within regional normal ranges, as expected, based on current lack of mine influence.

Over the 2019 to 2021 monitoring period there were only minor changes in total abundance and taxonomic richness of benthic invertebrate communities located along Dry Creek and within the Fording River upstream and downstream of the mouth of Dry Creek, none of which were potentially associated with mine influence. In contrast, both the relative proportion and total abundance of Ephemeroptera decreased at all mine-exposed areas on Dry Creek, and proportions measured at the mine-exposed areas were almost always significantly lower than those associated with the community in the Dry Creek reference area (LC_DCEF). Proportions of EPT generally did not reflect the patterns observed in %E because %P often increased to offset the decrease in %E. In the Fording River, very few differences in benthic invertebrate community endpoints were observed between the areas located immediately downstream and upstream of the mouth of Dry Creek. There were also no obvious temporal changes in benthic invertebrate community endpoints that would be indicative of an influence of Dry Creek on the downstream receiving environment.

Changes in Dry Creek benthic invertebrate community structure, namely decreases in relative and total abundance of E, were associated with increasing aqueous concentrations of mine-related constituents including nitrate, selenium, sulphate, cadmium, and nickel. It is therefore likely that mining activities are contributing to changes in the benthic invertebrate communities of Dry Creek. An AMP framework is already in place to address increasing concentrations of nitrate, sulphate, and selenium on Dry Creek and the updated DCWMP includes proposed in-stream flow requirements, flushing flows, ramping flows, as well as proposed site performance objectives for selenium, nitrate, sulphate, and cadmium (Teck 2021b).

Few changes in benthic invertebrate community structure were evident in 2021 that could potentially be attributable to the BRN spoil failure. In May 2021, there was some evidence of lower organism abundance in sampling areas closest to the failure, but the changes observed were not corroborated by endpoints associated with relative abundance. Also, when all Dry Creek and Fording River study areas were sampled again in September 2021, the differences in abundance were no longer observed, and more importantly, no significant differences in community structure were noted at the area closest to the spoil failure (i.e., LC_DC3) relative to September 2020.

6 STUDY QUESTION 4: BENTHIC INVERTEBRATE TISSUE SELENIUM

6.1 Overview

To address Study Question #2: “How do selenium concentrations in benthic invertebrate tissue compare to normal ranges and BCWQG or EVWQP benchmarks (Appendix Table F.1), and are they changing over time?”, selenium concentrations in composite-taxa benthic invertebrate tissue samples were evaluated over time and in relation to DCWMS status (see Section 1.3 for additional DCWMS details; Table 1.1). In general, benthic invertebrate tissue selenium concentrations measured at each Dry Creek LAEMP study area in 2021 were within or lower than the range of values previously reported for each study area in 2018 to 2020.

A failure associated with the BRN spoil occurred in the Dry Creek watershed on February 11, 2021, covering 435 m of upper Dry Creek (i.e., ~ 1.5 km upstream of station LC_DC3) in waste rock (see Section 1.4 for details). To assess the potential effects of the spoil failure on benthic invertebrates located downstream in Dry Creek, additional biological sampling events were completed on March 8 to 16 and May 31 to June 2, 2021. Results from the additional sampling were used to determine if the BRN spoil failure impacted the concentrations of selenium in benthic invertebrate tissues, in addition to contributing to the answer for Study Question #2 (Section 6.5).

Benthic invertebrate tissue chemistry data collected for the present study were of good quality as characterized by appropriate LRLs, measurable (i.e., >LRL) concentrations, and excellent laboratory precision and accuracy. Therefore, the associated data were considered acceptable for the purposes of this evaluation (see Appendix B for details).

6.2 Normal Ranges, Benchmarks and Biological Trigger Evaluation

Benthic invertebrate tissue selenium concentrations exceeded the regional normal range (maximum: 7.79 mg/kg dw; Minnow 2020c) in at least one sample from all Dry Creek, Fording River (LC_FRUS and LC_FRB), and Grace Creek (LC_GRCK) study areas in 2021 (Figure 6.1; Appendix Table F.2). Upstream of the DCWMS (at area LC_DC3), tissue selenium concentrations exceeded the regional normal range in at least one sample from every sampling event in 2021, except for March and November (Appendix Table F.2). At the upper to middle portion of Dry Creek, mean tissue selenium concentrations exceeding the normal range were most common in the areas immediately downstream of the DCWMS (LC_DCDS and LC_DC2), with concentrations exceeding the regional normal range in every sampling event in 2021 (Appendix Table F.2). Further downstream of the DCWMS at area LC_DC4, mean benthic

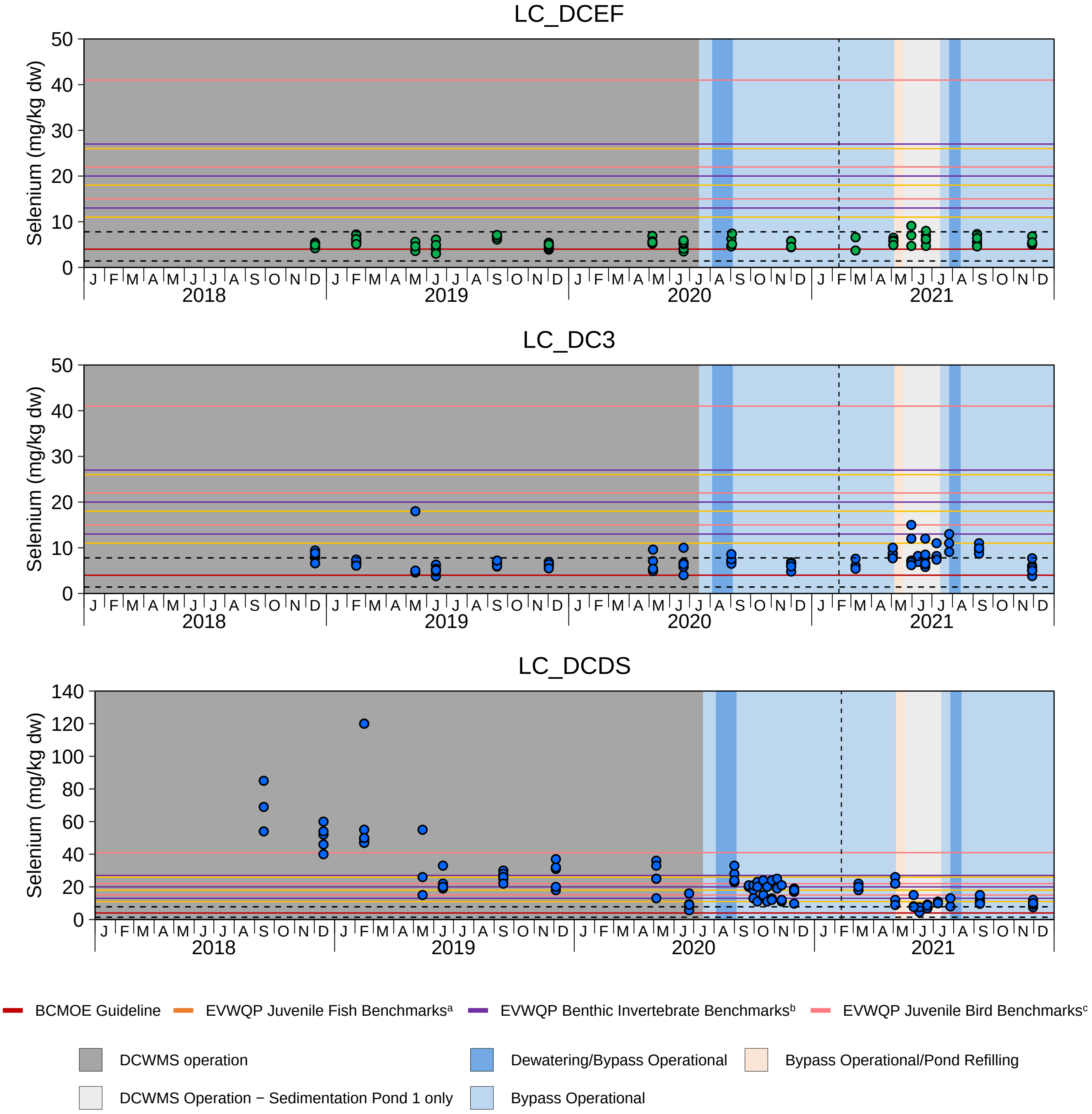

Figure 6.1: Selenium Concentrations (mg/kg dw) in Composite−taxa Benthic Invertebrate Samples from Dry Creek Sampling Areas, 2018 to 2021

Notes: Dashed black vertical line indicates the Burnt Ridge North spoil failure. Dashed black horizontal lines 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. Reference areas are shown in green and mine−exposed areas are shown in blue. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

[a] 11, 18, and 26 mg/kg dw represent the Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP]; Golder, 2014),respectively, for dietary effects to juvenile fish.

[b] 13, 20, and 27 mg/kg dw represent the Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP]; Golder, 2014), respectively, for growth, reproduction, and survival of benthic invertebrates.

[c] 15, 22, and 41 mg/kg dw represent the Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP]; Golder, 2014), respectively, for dietary effects to juvenile birds.

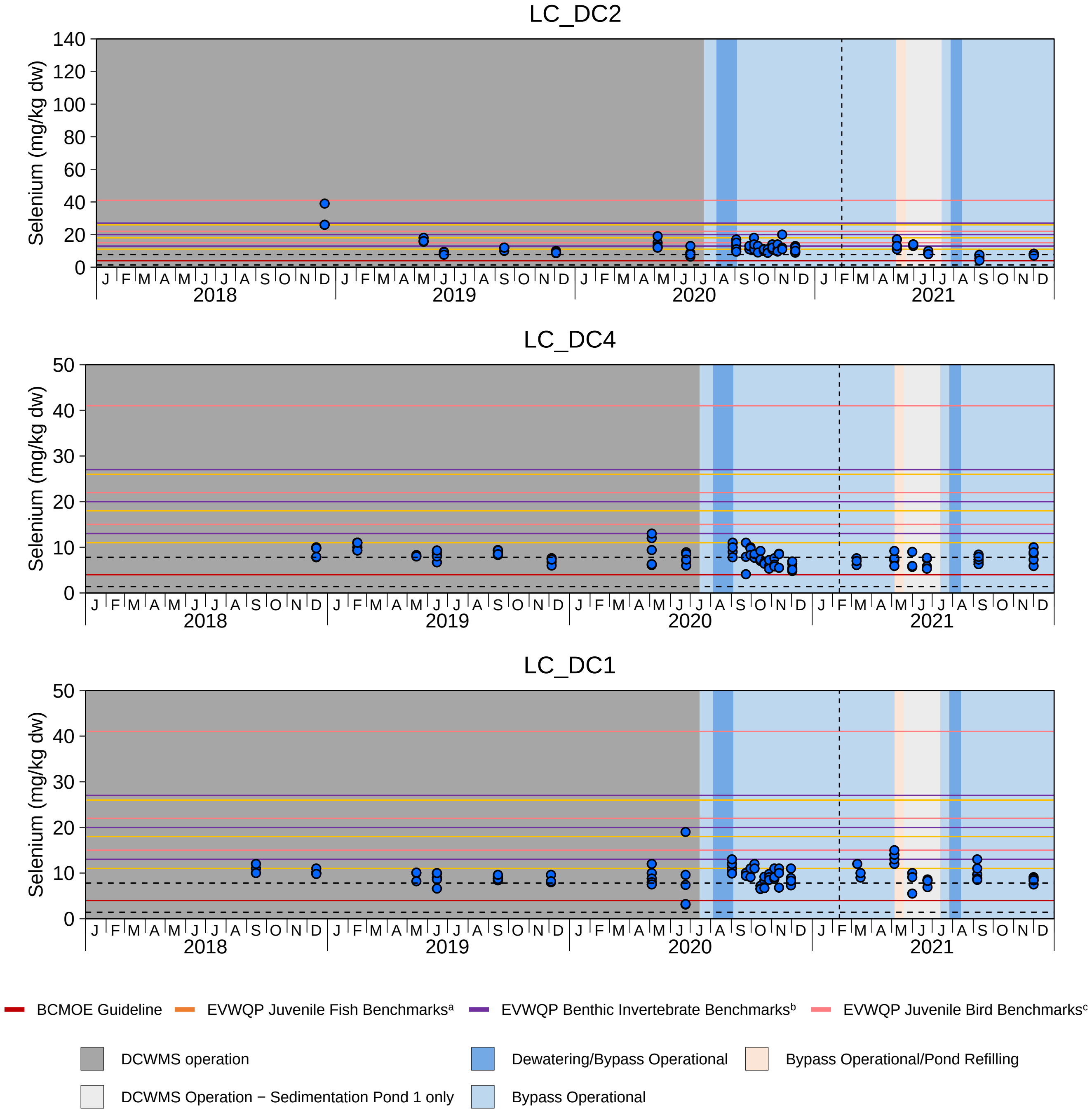

Figure 6.1: **Selenium Concentrations (mg/kg dw) in Composite−taxa Benthic Invertebrate Samples from Dry Creek Sampling Areas, 2018 to 2021**

Notes: Dashed black vertical line indicates the Burnt Ridge North spoil failure. Dashed black horizontal lines 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. Reference areas are shown in green and mine−exposed areas are shown in blue. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

[a] 11, 18, and 26 mg/kg dw represent the Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP]; Golder, 2014),respectively, for dietary effects to juvenile fish.

[b] 13, 20, and 27 mg/kg dw represent the Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP]; Golder, 2014), respectively, for growth, reproduction, and survival of benthic invertebrates.

[c] 15, 22, and 41 mg/kg dw represent the Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP]; Golder, 2014), respectively, for dietary effects to juvenile birds.

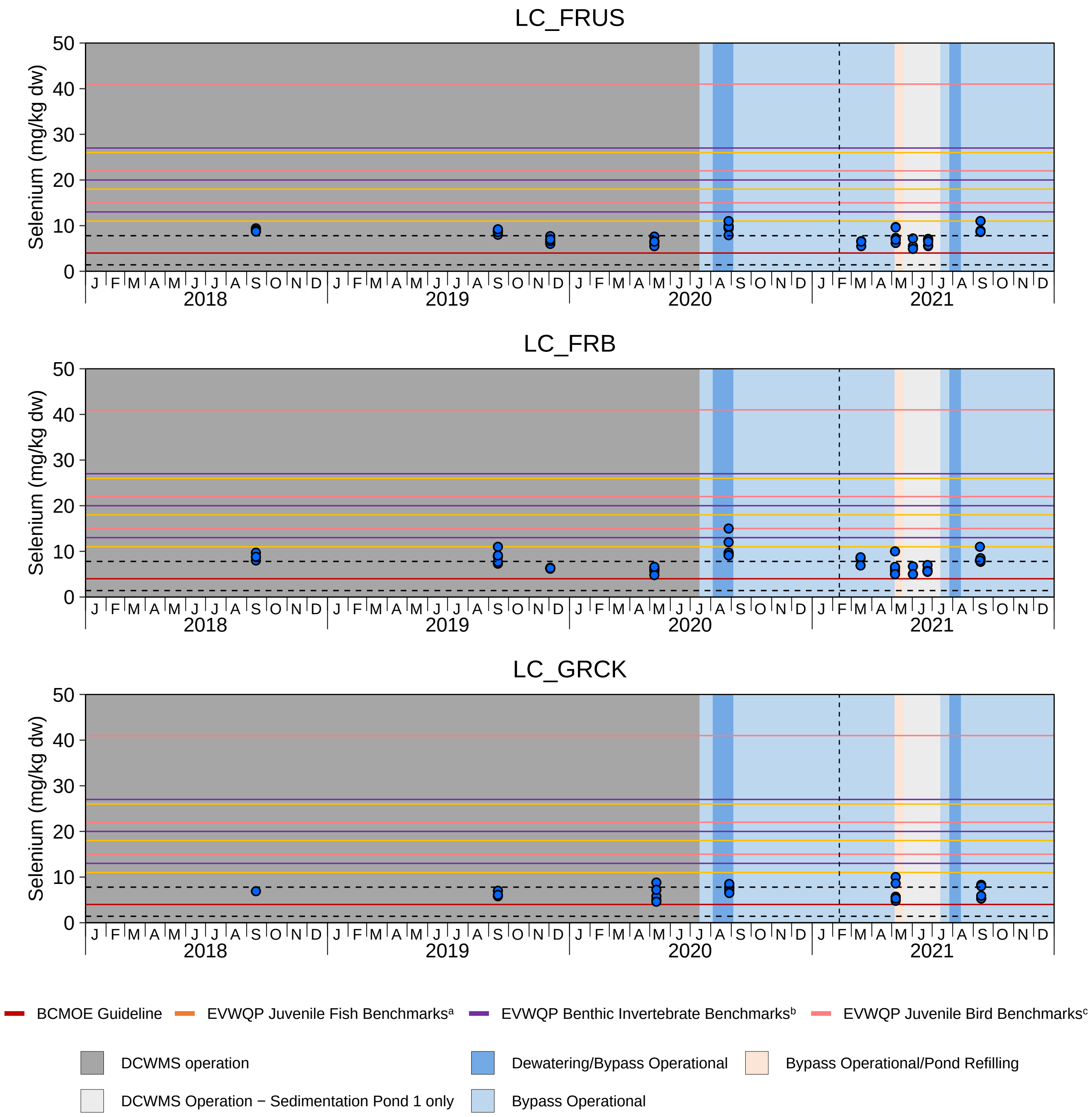

Figure 6.1: **Selenium Concentrations (mg/kg dw) in Composite−taxa Benthic Invertebrate Samples from Dry Creek Sampling Areas, 2018 to 2021**

Notes: Dashed black vertical line indicates the Burnt Ridge North spoil failure. Dashed black horizontal lines 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. Reference areas are shown in green and mine−exposed areas are shown in blue. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

[a] 11, 18, and 26 mg/kg dw represent the Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP]; Golder, 2014),respectively, for dietary effects to juvenile fish.

[b] 13, 20, and 27 mg/kg dw represent the Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP]; Golder, 2014), respectively, for growth, reproduction, and survival of benthic invertebrates.

[c] 15, 22, and 41 mg/kg dw represent the Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP]; Golder, 2014), respectively, for dietary effects to juvenile birds.

invertebrate tissue selenium concentrations only exceeded the regional normal range in December 2021 (Appendix Table F.2). In contrast, mean selenium concentrations measured during all 2021 sampling events at area LC_DC1 exceeded the regional normal range (Appendix Table F.2). In contrast to the mine-exposed areas, mean selenium concentrations were below the regional normal range during all sampling events at the Dry Creek reference area (LC_DCEF; Appendix Table F.2).

Benthic invertebrate tissue selenium concentrations were predicted for Dry Creek areas using the selenium speciation bioaccumulation tool[25] (b-tool; de Bruyn and Luoma 2021; Appendix Table F.3). Field-measured mean benthic invertebrate tissue selenium concentrations were occasionally above b-tool predictions at areas LC_DCDS (in three of nine sampling events) and LC_DC2 (in two of five sampling events; Appendix Table F.3). Conversely, field-measured mean benthic invertebrate tissue selenium concentrations were below b-tool predictions for all sampling events at the reference area (i.e., LC_DCEF) and mine-exposed area LC_DC3 (Appendix Table F.3). Benthic invertebrate tissue selenium concentrations at areas LC_DC4, LC_DC2, and LC_DC1 were also generally constant with the b-tool modelling predictions (Appendix Table F.3; de Bruyn and Luoma 2021).

In the Fording River downstream of Dry Creek, mean benthic invertebrate tissue selenium concentrations in 2021 exceeded the normal range during two out of five sampling events at LC_FRUS (May and September) and LC_FRB (March and September; Appendix Table F.2). Field-measured mean benthic invertebrate tissue selenium concentrations generally aligned well with b-tool predictions at areas LC_FRUS (Appendix Table F.3; de Bruyn and Luoma 2021). At the Grace Creek reference area (LC_GRCK), mean benthic invertebrate tissue selenium concentrations did not exceed the normal range in any sampling event in 2021 (Figure 6.1; Appendix Table F.2), and both field-measured concentrations were greater than b-tool predictions (Appendix Table F.3; de Bruyn and Luoma 2021).

The EVWQP level 3 benchmarks for effects to juvenile birds (41 mg/kg dw), benthic invertebrates (27 mg/kg dw), and juvenile fish (26 mg/kg dw) were not exceeded in 2021 (Appendix Tables F.1 and F.2). At least one composite sample collected at LC_DCDS in March, May, and July 2021 exceeded the EVWQP level 2 benchmarks for effects to juvenile birds (22 mg/kg dw), benthic invertebrates (20 mg/kg dw), or juvenile fish (18 mg/kg dw) (Appendix Tables F.1 and F.2). The elevated selenium concentrations in benthos from LC_DCDS were likely related to enhanced algal selenium bioaccumulation and generation of more bioavailable organoselenium

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[25] The b-tool is a predictive bioaccumulation model that can be used to integrate selenium speciation data and aqueous sulphate concentrations to predict tissue selenium concentrations in benthic invertebrate and periphyton tissue (de Bruyn and Luoma 2021).

in the DCWMS sedimentation ponds upstream of LC_DCDS (Lorax 2020, Minnow 2020c). Benthic invertebrate tissue selenium concentrations that occasionally exceeded the level 2 benchmark for effects to juvenile fish at LC_DCDS were consistent with the results of the Teck Integrated Effects Assessment Modelling (Teck 2020b). This modelling predicted potential effects to the growth of juvenile WCT in Dry Creek as a result of dietary exposure to elevated benthic invertebrate tissue selenium concentrations, and indicated that, for fish in Dry Creek, potential effects would be greatest for fish feeding at area LC_DCDS.

Selenium concentrations in benthic invertebrate tissue samples were frequently below the EVWQP level 2 benchmarks but above the EVWQP level 1 benchmarks at LC_DC3 and LC_DC1 (Figure 6.1, Appendix Table F.2). In contrast, most benthic invertebrate samples collected from LC_DC4 had tissue selenium concentrations below the EVWQP level 1 benchmarks (Figure 6.1; Appendix Table F.2). None of the samples collected from the Fording River study areas upstream and downstream of Dry Creek (i.e., LC_FRUS and LC_FRB) or the reference areas (i.e., LC_DCEF or LC_GRCK) exceeded EVWQP benchmarks in 2021.

Selenium concentrations in benthic invertebrate tissue were 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 H). Similar to the biological trigger evaluation for %EPT, this was completed for each replicate from each of the Dry Creek LAEMP monitoring areas with available water quality predictions (i.e., two mine-exposed areas [LC_DCDS and LC_DC1], see Appendix H for details). Several samples exceeded the biological trigger at both LC_DCDS and LC_DC1 (13 of 35 and 7 of 26 samples, respectively), with tissue selenium concentrations higher than the trigger measured during all sampling events at LC_DCDS in 2021 and in March, May, and September 2021 at LC_DC1 (Section 2.4.3). As noted above, the elevated selenium concentrations in these samples were likely related to enhanced algal selenium bioaccumulation and generation of more bioavailable organoselenium in the DCWMS sedimentation ponds upstream of areas LC_DCDS and LC_DC1 (Lorax 2020, Minnow 2020c). The higher selenium concentrations and greater number of samples exceeding the trigger at LC_DCDS compared to LC_DC1 was likely related to proximity to the DCWMS discharge and higher aqueous selenium concentration.

In 2018, elevated benthic invertebrate tissue selenium concentrations in Dry Creek led to the need for a management response as identified via the AMP response framework (Teck 2019b). Mitigation steps (as well as additional monitoring efforts) were implemented in 2021 to address the elevated benthic invertebrate tissue selenium concentrations associated with the LCO Dry Creek LAEMP. Overall, the current biological trigger was sufficient to identify monitoring areas where elevated tissue selenium concentrations are occurring, and no additional triggers are recommended at this time. Further information regarding the tissue selenium biological trigger as it pertains to the Dry Creek LAEMP can be found in Appendix H.

6.3 Spatiotemporal Trends

In general, benthic invertebrate tissue selenium concentrations measured at each Dry Creek LAEMP study area in 2021 were within or lower than the range of values previously reported for each study area in 2018 to 2020 (Figure 6.1).

Spatial variability in benthic invertebrate tissue selenium concentrations was observed among sampling events on Dry Creek in 2021 (Figure 6.2; Appendix Table F.4). Tissue selenium concentrations were higher at area LC_DCDS than upstream of the DCWMS (LC_DC3) during March, May, and December, but did not differ significantly in early June, late June, and September (Figure 6.2). In March 2021, the highest tissue selenium concentrations were measured at LC_DCDS followed by LC_DC1 and concentrations were significantly higher than the reference area (LC_DCEF), whereas concentrations measured at LC_DC3 and LC_DC4 did not differ significantly from the reference area (Figure 6.2). Samples collected in May 2021 had a similar pattern, with selenium concentrations highest at LC_DCDS and LC_DC2 (the two areas immediately downstream of the DCWMS) and LC_DC1 (furthest downstream; Figure 6.2). Selenium concentrations in benthos from LC_DC3 were significantly lower than those measured in areas downstream of the DCWMS (except LC_DC4), but higher than at the reference area, whereas concentrations measured in samples from LC_DC4 were similar to reference (Figure 6.2). In early June 2021, the only area where benthic invertebrate tissue selenium concentrations were greater than reference was LC_DC2, while in late June 2021 areas all study areas had similar benthic invertebrate tissue selenium concentrations (Figure 6.2). In September 2021, the highest tissue selenium concentrations were measured at areas LC_DC3, LC_DCDS, and LC_DC1, all of which were significantly higher than at the reference area (Figure 6.2). In contrast, benthic invertebrate tissue selenium concentrations measured at areas LC_DC2 and LC_DC4 did not differ from the reference area. In December 2021, benthic invertebrate tissue selenium concentrations measured at areas downstream of the DCWMS did not differ significantly from each other, and only areas LC_DCDS and LC_DC1 had higher tissue selenium concentrations than the reference area (Figure 6.2).

Within Dry Creek, aqueous organoselenium (i.e., DMSeO and MeSe (IV)) concentrations are generally highest at LC_DCDS and decrease downstream; however, there are some exceptions to this pattern. Five times in 2021, organoselenium concentrations at LC_DC1 exceeded concentrations at LC_DCDS; these occurred on April 20th (MeSe (IV)), May 17th (MeSe (IV)), June 14th (MeSe (IV)), July 20th, and August 3rd (DMSeO and MeSe (IV)). Based on the currently available information, the occasionally higher organoselenium concentrations at LC_DC1

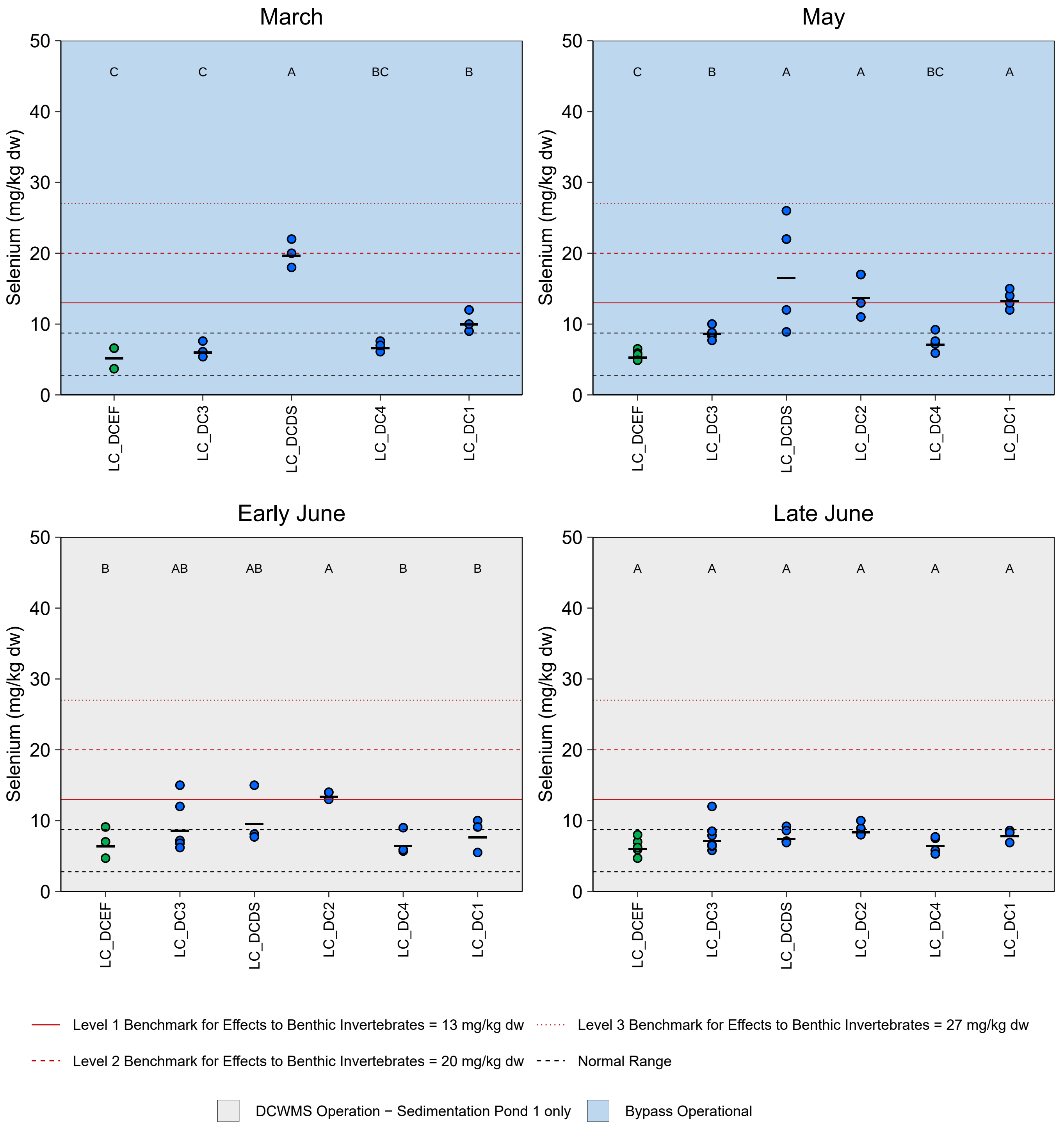


Figure 6.2: Selenium Concentrations (mg/kg dw) in Composite−taxa Benthic Invertebrate Samples from Dry Creek Sampling Areas, 2021

Notes: Dashed black lines 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. Areas that do not share a letter (e.g., a,b,c) are significantly different (*p*−value = 0.05) in a Tukey's HSD test following a two−way ANOVA by area with Selenium log10-transformed. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

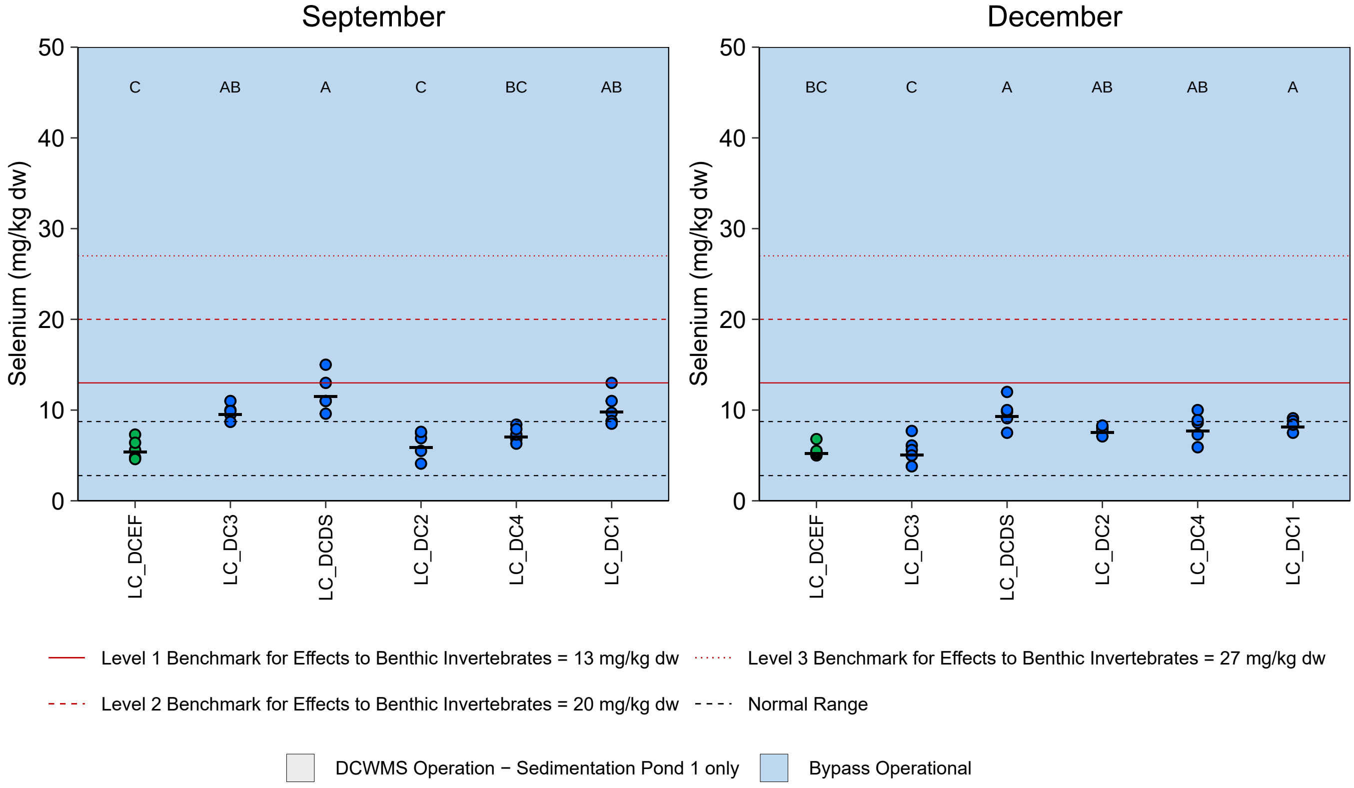


Figure 6.2: **Selenium Concentrations (mg/kg dw) in Composite−taxa Benthic Invertebrate Samples from Dry Creek Sampling Areas, 2021**

Notes: Dashed black lines 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. Areas that do not share a letter (e.g., a,b,c) are significantly different (*p*−value = 0.05) in a Tukey's HSD test following a two−way ANOVA by area with Selenium log10-transformed. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

compared to LC_DCDS cannot be attributed to a specific cause. However, the occasionally higher organoselenium concentrations at LC_DC1 throughout 2021 are consistent with higher mean benthic invertebrate tissue selenium concentrations relative to those measured at LC_DC4, despite LC_DC1 being located further downstream.

Overall, the different spatial patterns observed among sampling seasons in 2021 suggested that position on Dry Creek and proximity to the DCWMS was not a reliable predictor of benthic invertebrate tissue selenium concentrations.

6.4 DCWMS Operational Periods

Higher-than-expected concentrations of aqueous and tissue selenium on Dry Creek in 2018 and 2019 led to mitigative steps including operational changes to the DCWMS in 2020 and 2021 (Section 1.3). To evaluate the potential effects of different operational phases of the DCWMS on benthic invertebrate tissue selenium concentrations, an asymmetric 2-way ANOVA was used to compare results for each mine-exposed area of Dry Creek to reference (LC_DCEF) and the Fording River downstream of Dry Creek (LC_FRB) to upstream (LC_FRUS), over the various DCWMS operational periods (see Section 2.4.3.2 for details).

Significant differences in benthic invertebrate tissue selenium concentrations at areas downstream of the DCWMS were observed among study years (Appendix Tables F.6 to F.11). Specifically, benthic invertebrate tissue selenium concentrations peaked at some areas (particularly LC_DCDS, and LC_DC2) in late 2018 and early 2019 (Figure 6.1), which is well documented in previous reports (Minnow 2019, 2020a, 2021a), and have decreased since. Therefore, data interpretation focused on comparisons of results from mid-2020 onward (i.e., the period during which operational changes to the DCWMS took effect) relative to earlier years to evaluate potential changes in benthic invertebrate tissue selenium associated with management of the DCWMS.

Benthic invertebrate tissue selenium concentrations during initial DCWMS dewatering (sampling conducted in September 2020) and bypass (sampling conducted in December 2020, March 2021 and May 2021) were generally lower than during initial DCWMS operations (relative to changes at reference over the same time frame), except at LC_DC3 and LC_DC1, where concentrations mostly remained unchanged (Figure 6.3; Appendix Tables F.6 to F.10). The lack of change at LC_DC3 is not surprising considering this sampling area is located upstream of the DCWMS, whereas the lack of change at LC_DC1 highlights the fact that operational changes associated with the DCWMS have had minimal influence on benthic invertebrate tissue selenium concentrations in the area of Dry Creek furthest downstream.

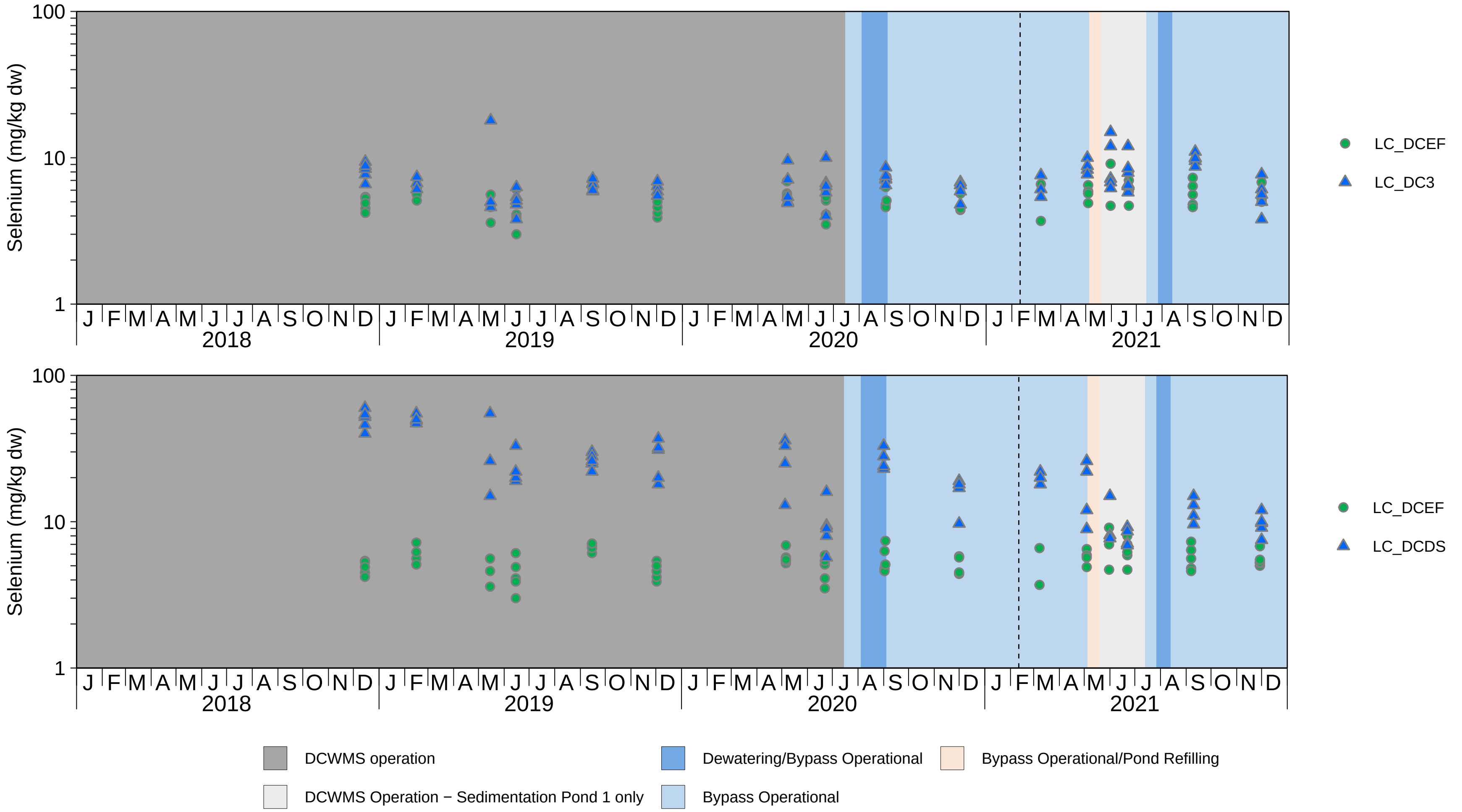


Figure 6.3: **Benthic Invertebrate Selenium Concentrations for LC_DC3, LC_DCDS, LC_DC2, and LC_DC4 (mine−exposed areas) and LC_DCEF (reference area), 2018 to 2021**

Notes: Dashed black vertical line indicates the Burnt Ridge North spoil failure. Only data collected simultaneously at both stations are displayed. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

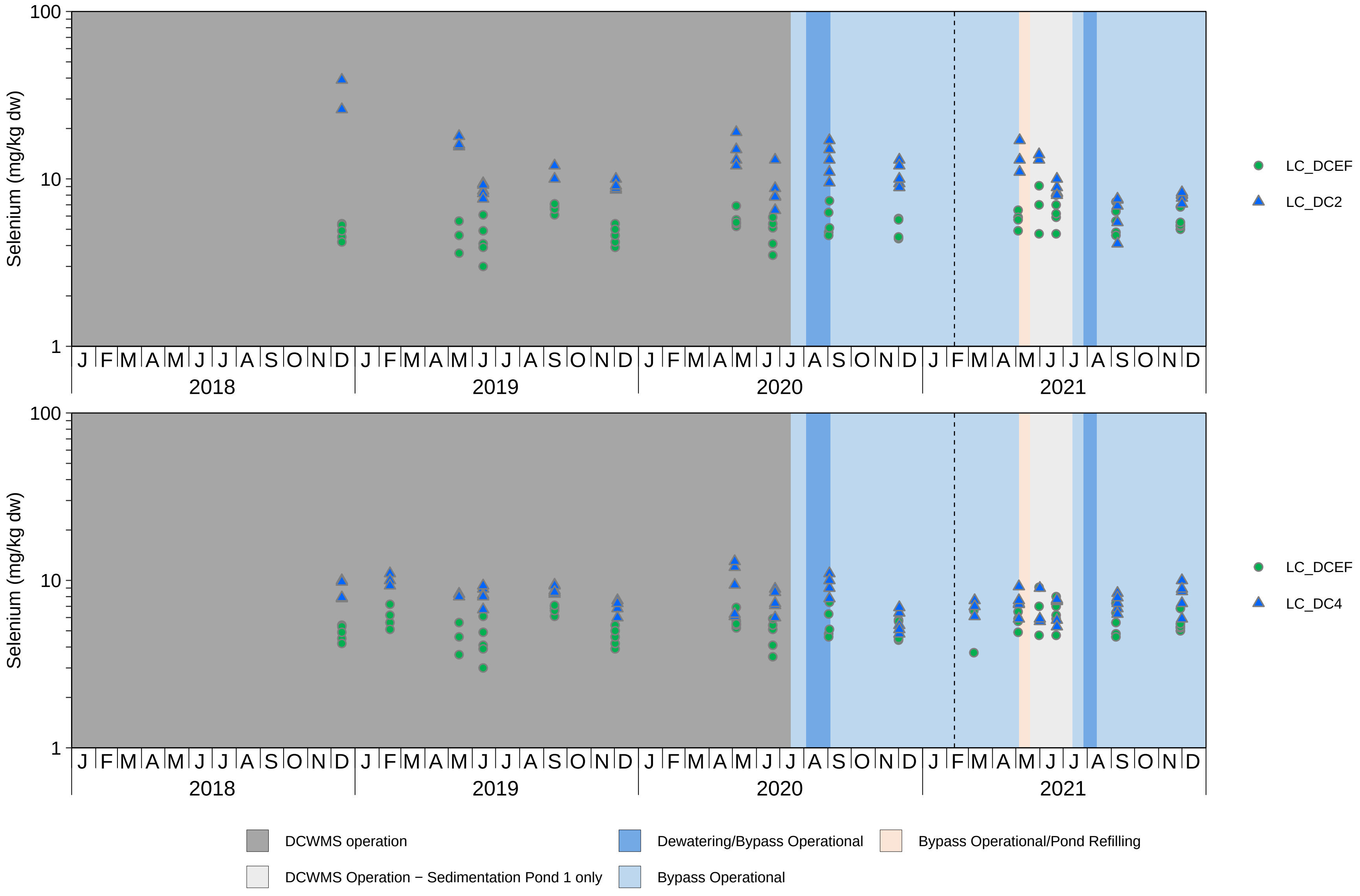


Figure 6.3: Benthic Invertebrate Selenium Concentrations for LC_DC3, LC_DCDS, LC_DC2, and LC_DC4 (mine−exposed areas) and LC_DCEF (reference area), 2018 to 2021

Notes: Dashed black vertical line indicates the Burnt Ridge North spoil failure. Only data collected simultaneously at both stations are displayed. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

During the bypass period in late 2020 through May 4, 2021, selenium concentrations in benthic invertebrates downstream of the DCWMS did not change significantly (Appendix Tables F.7 to F.10). However, a further decrease in benthic invertebrate tissue selenium concentrations (relative to concentrations measured during initial DCWMS operations) was noted when the DCWMS resumed operations in late May 2021 with only Sedimentation Pond 1 in use. This decrease was particularly evident at LC_DCDS, the area located closest to the discharge from the DCWMS (Figure 6.3; Appendix Tables F.7 to F.10). During the final bypass period (August 13, 2021), selenium concentrations in benthic invertebrates did not differ relative to the previous DCWMS operational period at LC_DCDS, but mean selenium concentrations measured in benthic invertebrates at LC_DC2 in September 2021 (but not December 2021) and LC_DC4 increased slightly (Appendix Tables F.7 to F.10). This temporal increase may be a delayed response to elevated aqueous organoselenium species measured during the dewatering phase of the bypass in late July/early August 2021 (Figures 3.5 and 6.4). Further downstream on the Fording River (LC_FRB), benthic invertebrate tissue selenium concentrations did not differ among the various DCWMS operational periods relative to concentrations measured upstream (at LC_FRUS), consistent with the lack of change observed at area LC_DC1 (Appendix Table F.11).

Overall, the management actions implemented at the DCWMS starting in mid-2020 have been effective in reducing selenium concentrations in benthic invertebrates downstream. Initial re-operation of the DCWMS in mid-May through mid-July 2021 did result in an increase in aqueous organoselenium species during the subsequent dewatering phase, which may have been linked to a later increase in benthic invertebrate tissue selenium at some downstream areas; however, selenium concentrations decreased again shortly thereafter, and were in line with those measured during the previous bypass phase.

6.5 BRN Runout Effects Assessment

In February 2021, a failure occurred on the BRN spoil, which resulted in 435 m of upper Dry Creek (i.e., ~ 1.5 km upstream of station LC_DC3) being covered in waste rock (see Section 1.4). To determine if the failure had any influence on downstream benthic invertebrate tissue selenium concentrations, samples were collected in March, May, June, September, and December 2021 and compared to samples collected prior to the failure using an asymmetric two-way ANOVA model which takes into consideration changes at the reference area (i.e., LC_DCEF).

Overall, there was no evidence that the failure resulted in an increase in benthic invertebrate tissue selenium concentrations in downstream areas of Dry Creek. There were very few significant changes in benthic invertebrate tissue selenium concentrations at LC_DC3, the area located closest to the spoil failure (Appendix Table F.6). The only differences noted were slightly

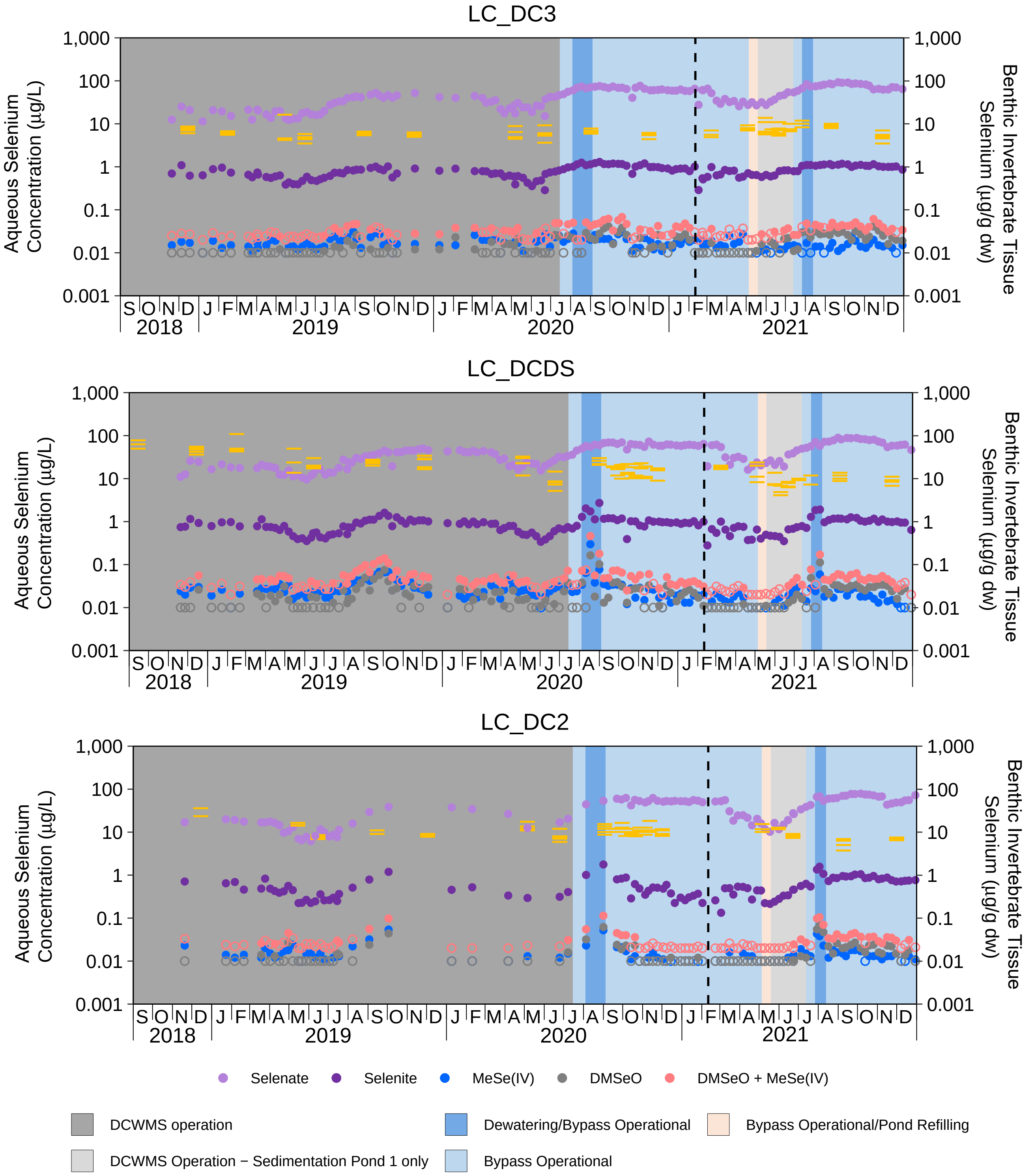


Figure 6.4: **Selenium Species and Benthic Invertebrate Tissue Selenium Concentrations from LCO Dry Creek LAEMP Sampling Areas, September 2018 to December 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted with an open symbol. Benthic composite tissue concentrations plotted with orange bars. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only applies to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1). Biological sampling (including benthic invertebrate tissue selenium monitoring) was discontinued at LC_SPDC following operational changes in October 2020 at this area (see Minnow 2021a).

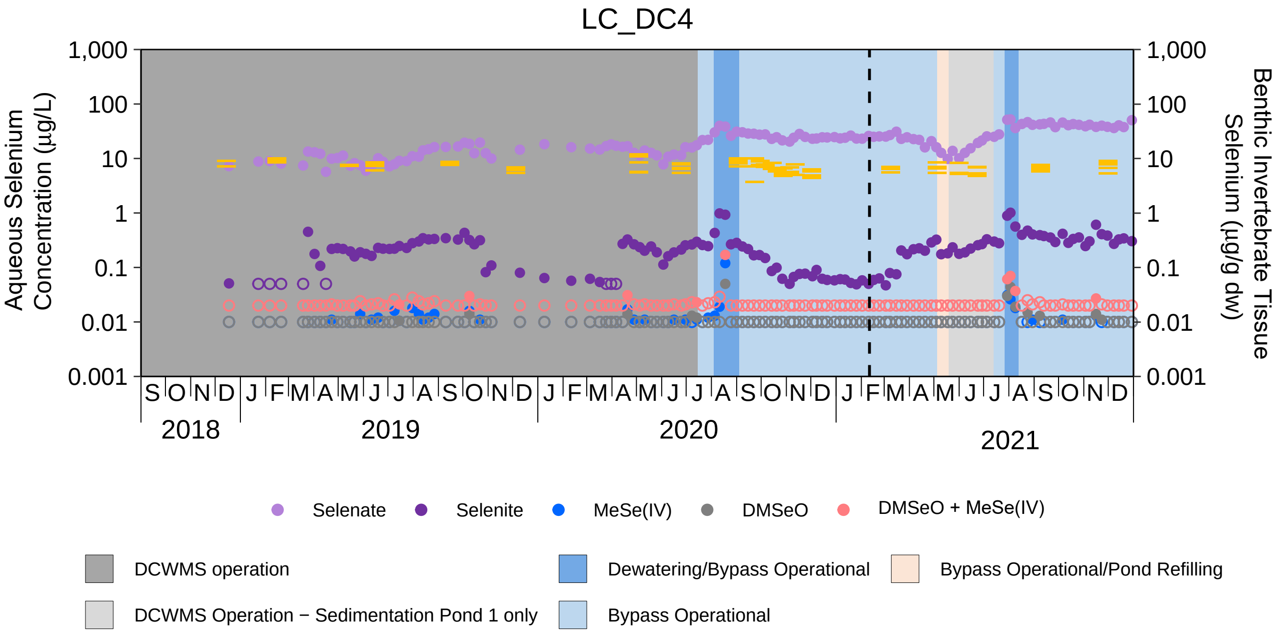


Figure 6.4: Selenium Species and Benthic Invertebrate Tissue Selenium Concentrations from LCO Dry Creek LAEMP Sampling Areas, September 2018 to December 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted with an open symbol. Benthic composite tissue concentrations plotted with orange bars. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only applies to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1). Biological sampling (including benthic invertebrate tissue selenium monitoring) was discontinued at LC_SPDC following operational changes in October 2020 at this area (see Minnow 2021a).

higher tissue selenium in September 2021 relative to September 2019 (but not September 2020), and then lower tissue selenium concentrations in December 2021 relative to December 2018 (but not December 2019 or 2020; Appendix Table F.6). The fact that no differences in tissue selenium were noted in March, May, and June 2021 relative to earlier years, and the differences that were observed were inconsistent among years, suggests that the changes were not likely due to the BRN spoil failure. Further downstream in Dry Creek (i.e., at LC_DCDS, LC_DC2, LC_DC4, and LC_DC1), no changes in benthic invertebrate tissue selenium concentrations were observed in 2021 that could be linked to the BRN spoil failure. Rather, the changes in tissue selenium concentrations observed in these areas starting in June 2021 were linked to the management of the DCWMS (see Section 6.4). Thus, the BRN spoil failure did not appear to have a measurable impact on benthic invertebrate tissue selenium concentrations in Dry Creek.

6.6 Summary

In most areas of Dry Creek downstream of the DCWMS, benthic invertebrate tissue selenium concentrations decreased in 2021 relative to earlier years (although were still often higher than regional normal ranges and concentrations measured at the reference area), while concentrations generally remained unchanged at the area located upstream of the DCWMS (i.e., LC_DC3). The lack of change in benthic invertebrate tissue selenium concentrations from LC_DC3 in 2021 relative to earlier years indicated that the BRN spoil failure did not have a measurable impact on tissue selenium concentrations, nor did increasing total aqueous selenium concentrations measured at this location (Section 3.3). Downstream of the DCWMS (particularly from LC_DCDS through LC_DC4), the decreases in benthic invertebrate tissue selenium concentrations measured in 2021 relative to earlier years were primarily attributable to changes in management of the DCWMS. At the furthest downstream area on Dry Creek (LC_DC1), there was little change in tissue selenium concentrations over time, but higher concentrations observed in this area relative to upstream at LC_DC4 may have been due to occasionally elevated aqueous organoselenium concentrations. Within the Fording River and Grace Creek, benthic invertebrate tissue selenium concentrations generally remained unchanged in 2021 relative to earlier years, indicating that operations at LCO Dry Creek have had limited or no influence on benthic invertebrate tissue selenium concentrations in these areas.

7 STUDY QUESTION 5: FISH AND FISH HABITAT

7.1 Overview

Relevant fish and fish habitat monitoring data collected in Dry Creek and the East Tributary in 2021 were integrated into this report to address Study Question 5: Are changes in fish and fish habitat (including instream flow and calcite index) occurring within Dry Creek as a result of mine operations? Monitoring included a limited survey of fish health, redd surveys, water temperature monitoring, and dissolved oxygen monitoring in Reaches 1 to 4 of Dry Creek. Fish tissue chemistry results are not available in 2021: fish were not retained in formal or opportunistic sampling and no fish mortalities were observed in 2021. Water temperature was assessed based on data collected at six Dry Creek locations, one location in the Dry Creek East Tributary, and at one location in the Fording River directly near Dry Creek. In 2021, flow in Dry Creek was characterized based on data collected at two hydrometric stations (LC_DC1 and LC_DCDS).

7.2 Fish Health

Comparisons of the relative abundance of WCT captured among Reaches 1 to 4 in Dry Creek could not be completed in 2021 as in previous years because electrofishing efforts in 2021 only focussed on Reach 3 where only three fish were captured, which does not support statistical analysis. Past results indicate moderately consistent total catch from 2017 to 2019 (54, 55, 55, respectively; Ecofish 2019 and 2020a), but that total catch in 2016 (92 fish) was nearly double that observed in 2017 to 2019 (Ecofish 2019). Total juvenile biomass (g/100m^2 of age 1 to 3 years) was lower in 2019 (46 g/100m^2) compared to 2018 (59.6 g/100m^2). No fry (age 0+) have been observed in Dry Creek since 2016, although sampling methodologies and timing have not targeted the Age-0 size range.

Three fish were captured in Reach 3 of Dry Creek in 2021 with fork lengths of 127, 164, and 169 mm using open-area electrofishing (Table 7.1). The age of fish collected in 2021 were estimated to range from 2 to 3 years old based on an age length key developed on data from 2016 to 2019 (Table 7.1 and 7.2; Ecofish 2019 and 2020a). Comparisons of the health of individual WCT (length, age, size at age) among years and reaches in Dry Creek could not be completed in 2021 as in previous years due to the limited number of fish captured. Further, a comparison of juvenile biomass (g/100 m^2) in 2021 to previous years is not informative due to the change in electrofishing methods (i.e., closed-area vs open-area) in 2021 compared to all other years.

Fish collection in Dry Creek began in 2009 as part of the baseline environmental assessment (EA; Teck 2011). Further baseline sampling occurred in 2010. Fish community surveys did not

Table 7.1: Individual Fish Metrics from Collected Westslope Cutthroat Trout, Dry Creek, 2021

Sample	Date	Species	Fork Length (mm)	Age[a]	Abnormalities
Dryo-WCT-001	16-Sep	WCT	127	2	-
Dryo-WCT-002	16-Sep	WCT	164	3	-
Dryo-WCT-003	16-Sep	WCT	169	3	-

Notes: "-" indicates data not collected.

[a] Age (years) assigned based on 2020 age-length key (Ecofish 2019 and 2020a).

Table 7.2: Westslope Cutthroat Trout Fork Length Range and Corresponding Age Classes, Dry Creek, 2016 to 2020

Year[a]	Age Class	Fork Length Range (mm)
2016	Fry (0+)	34-67
	Juv. (1+)	68-106
	Juv. (2+)	107-143
	Juv. (3+)	144-176
	Adult (≥4+)	182+
2017	Fry (0+)	-
	Juv. (1+)	70-89
	Juv. (2+)	111-139
	Juv. (3+)	145-179
	Adult (≥4+)	180+
2018	Fry (0+)	-
	Juv. (1+)	66-86
	Juv. (2+)	112-139
	Juv. (3+)	144-175
	Adult (≥4+)	176+
2019	Fry (0+)	-
	Juv. (1+)	67-94
	Juv. (2+)	104-145
	Juv. (3+)	152-172
	Adult (≥4+)	176+
2020	Fry (0+)	34-66
	Juv. (1+)	67-94
	Juv. (2+)	104-143
	Juv. (3+)	144-175
	Adult (≥4+)	176+

Notes: "Juv." = juvenile.

[a] 2016 to 2019 data can be found in Faulkner et al. 2019 and Faulkner et al. 2020.

occur between 2011 and 2015. Annual fish community surveys in Dry Creek were conducted as part of the Dry Creek Fish and Fish Habitat Monitoring Program to support the permit conditions for the Dry Creek Water Management Plan from 2016 until 2019 (Ecofish 2019). No fish collections occurred in 2020 and a small, targeted random tributary survey occurred in 2021 as part of the larger UFR population assessment work. From 2009 to 2021, the total number of WCT collected was 303, and a total of 28 deceased WCT were collected or observed over that period (Table 7.3; Appendix Table G.1).

7.3 Selenium in Fish Tissue

Selenium toxicity in the aquatic environment is associated with bioaccumulation through dietary exposure. Toxicity in fish manifests primarily through maternal uptake and transfer into eggs which results in reproductive effects such as early life stage mortality and developmental deformities (USEPA 2016).

Comparisons of the muscle selenium concentrations of WCT in Dry Creek to the Elk Valley site-specific benchmark (15.5 µg/g dw; Appendix Table F.1) could not be completed in 2021 due to the limited, non-invasive fish survey methods employed in 2021.

In 2020, WCT muscle selenium concentrations were below the Elk Valley site-specific benchmark of 15.5 µg/g dw (n = 21; Figure 7.1; Minnow 2021a) and were not elevated relative to samples collected on the upper and lower Fording River in 2018. The concentrations were also within the range of values for tissue samples collected on Dry Creek in 2019 (Minnow 2021a).

7.4 Redd Surveys

The number of redds observed in Dry Creek ranged from 9 to 39 during the 2016 to 2021 period (Table 7.4). The total number of redds was highest in 2018 and 2019 and has declined since 2018. Nevertheless, the number of redds detected in 2021 was within the range of observations since 2016 (Table 7.4). In Reach 1, where most redds are detected, the number of redds observed in 2021 was comparable to observations in years other than 2018 and 2019. In 2021, no redds were observed in reaches 2, 3, or 4, although the absence of redds in Reach 4 is consistent with all prior years. The absence of redds in Reach 2 and 3 is lower than all prior years; however, the number of redds was consistently very low (often only 1 or 2 redds) in all years except for 2018.

Differences in crews, methods, effort, and observation conditions among years make comparisons somewhat problematic, but the available data for redd abundance and distribution are expected to be indicative of spatial and temporal patterns of spawning within Dry Creek. However, caution is required when assessing causal factors for differences among years or among reaches. Based on previous telemetry and spawning results from Cope et al. (2016),

Table 7.3: Record of Fish Capture and Mortalities in Dry Creek, 2009 to 2021

Year	Reach	Total Catch	Mortalities	Program	Comment
2009	1	22	-	Baseline EA	-
2010	1	2	-	Baseline EA	-
2010	2	1[a]	-	Baseline EA	-
2010	3	2	-	Baseline EA	-
2016	1	29	0	FFHMP survey	-
2016	2	13	0	FFHMP survey	-
2016	3	5	0	FFHMP survey	-
2016	4	45	1	FFHMP survey	Mortality during FFHMP survey
2017	1	18	-	FFHMP survey	-
2017	2	13	-	FFHMP survey	-
2017	3	2	-	FFHMP survey	-
2017	4	21	-	FFHMP survey	-
2018	1	18	-	FFHMP survey	-
2018	2	13	-	FFHMP survey	-
2018	3	1	-	FFHMP survey	-
2018	4	13	-	FFHMP survey	-
2019	1	27	-	FFHMP survey	-
2019	2	23	-	FFHMP survey	
2019	3	5	-	FFHMP survey	-
2019	4	1	-	FFHMP survey	-
2019	-	2	2	-	Collected opportunistically to support tissue sampling program
2020	3	25	25	-	Mortalities associated with a dewatering event; no annual fish survey in 2020
2021	3	3	0	-	-

Notes: "-" indicates no data reported; "EA" = Environmental Assessment; "FFHMP" = Fish and Fish Habitat Monitoring Program (Ecofish 218, Ecofish 2019, Ecofish 2020a).

[a] Fish were observed but not captured.

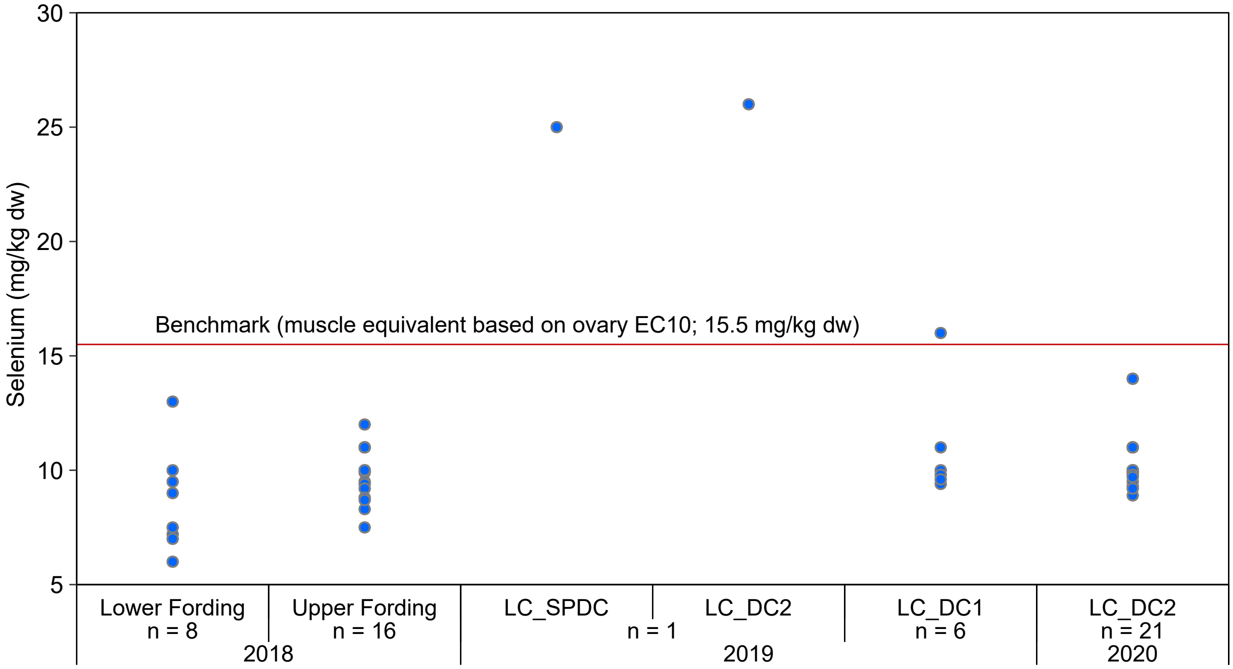


Figure 7.1: **Westslope Cutthroat Trout Muscle Selenium Concentrations Compared between Dry Creek Sampling Areas and Fording River Areas, 2018 and 2020**

Notes: Samples were collected in September 2018, July (LC_DC2, LC_SPDC) and September (LC_DC1) 2019, and October 2020.

Table 7.4: Redd Counts in Dry Creek Between 2016 and 2021

Reach	**Redds Observed**					
	2016	**2017**	**2018**	**2019**	**2020**	**2021**
Reach 1	9	6	26	15	9	10
Reach 2	1	1	5	5	1	0
Reach 3	1	2	8	2	4	0
Reach 4	0	0	0	0	0	0
Total	**11**	**9**	**39**	**22**	**14**	**10**

redds observed upstream of the Fording Highway and rail crossing culverts on Dry Creek have been assumed to be from Dry Creek-resident fish, whereas redds observed downstream may be from adult fish moving from the Fording River to spawn or from Dry Creek-resident fish. Thorley et al. (2022) reviews the spawning redd time series and suggests that access upstream through the culverts is possible during the spawning migration period. A detailed culvert assessment was completed in 2016 in Reach 1 of Dry Creek at the highway and rail crossing culverts. It was determined that at least one of the two culverts at each site was passable to upstream WCT migration under measured flows (September 2016, 0.04 m^3/s at LC_DC1 gauge; Buchanan 2017). Mean flows in 2021 at LC_DC1 during key WCT activity periods (Section 7.5.3) were higher than observed flows in September 2016. No spawning activity was detected upstream of the culverts in 2021 and fish still used the area downstream of the culverts to spawn. Given the recent decline in UFR WCT (Thorley et al. 2022) it is not surprising to see a general decline in redd abundance in Dry Creek after 2019.

7.5 Fish Habitat

7.5.1 Water Temperature

Average daily temperatures did not exceed 18°C at any site within the period of record (Figure 7.1). From 2016 to 2019, Dry Creek upstream of East Tributary (DRY-WQ04; Appendix Figure G.1) had the highest number of days with temperatures below 1°C (169 to 182 days), though DRY-WQ05 (downstream of the sedimentation pond outlet) was similar (156 vs 179 days). In contrast, DRY-WQ03 (located in the East Tributary) had the lowest number of days below 1ºC (0-5 days). Near the confluence of Dry Creek and Fording River, temperatures below 1°C were less frequent than at upstream sites in Dry Creek (excluding the East Tributary), with 40 to 89 days occurring at DRY-WQ01 and 104-132 days occurring at FRD-WQ01 each year from 2016 to 2020 (Figure 7.2).

The BCWQG threshold of ±1°C/hr was exceeded at all locations in Dry Creek. The highest hourly rates of change occurred in the Dry Creek sedimentation pond outlet (DRY-WQ06 and DRY-WQ07) and downstream at DRY-WQ05. The rates of water temperature change at these locations were highest in 2021 and occurred later in the summer than at other locations.

Mean weekly maximum temperature (MWMxT) was assessed in relation to the timing and upper/lower bounds of optimum temperature for the following WCT activity periods (Figure 7.3): spawning migration, spawning, incubation and rearing (Results of this assessment for each WCT activity period are discussed below (Figures 7.4 and 7.5). For a more detailed tabular presentation of MWMxT see Appendix A in Hatfield et al. (2022). Stations installed in 2021, or

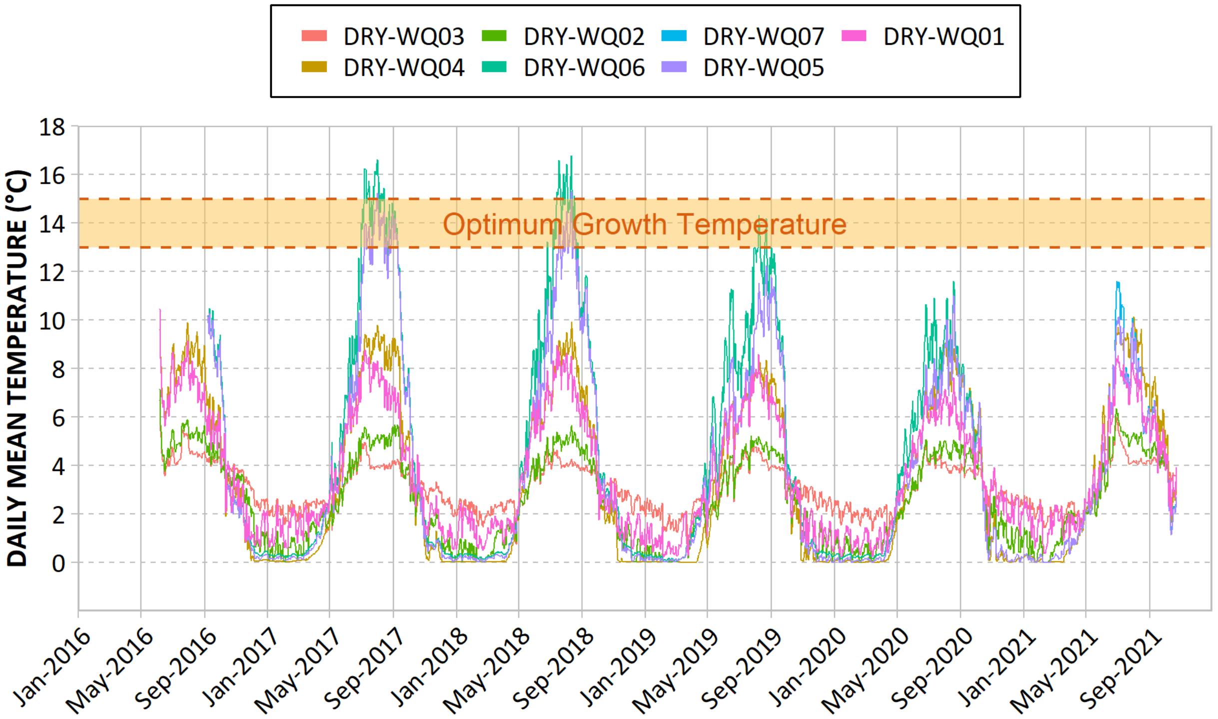


Figure 7.2: **Daily Mean Water Temperature from June 2016 to October 2021 at Dry Creek Monitoring Sites**

Note: the optimum growth range for westslope cutthroat trout (Bear *et al.* 2007) is included for reference.

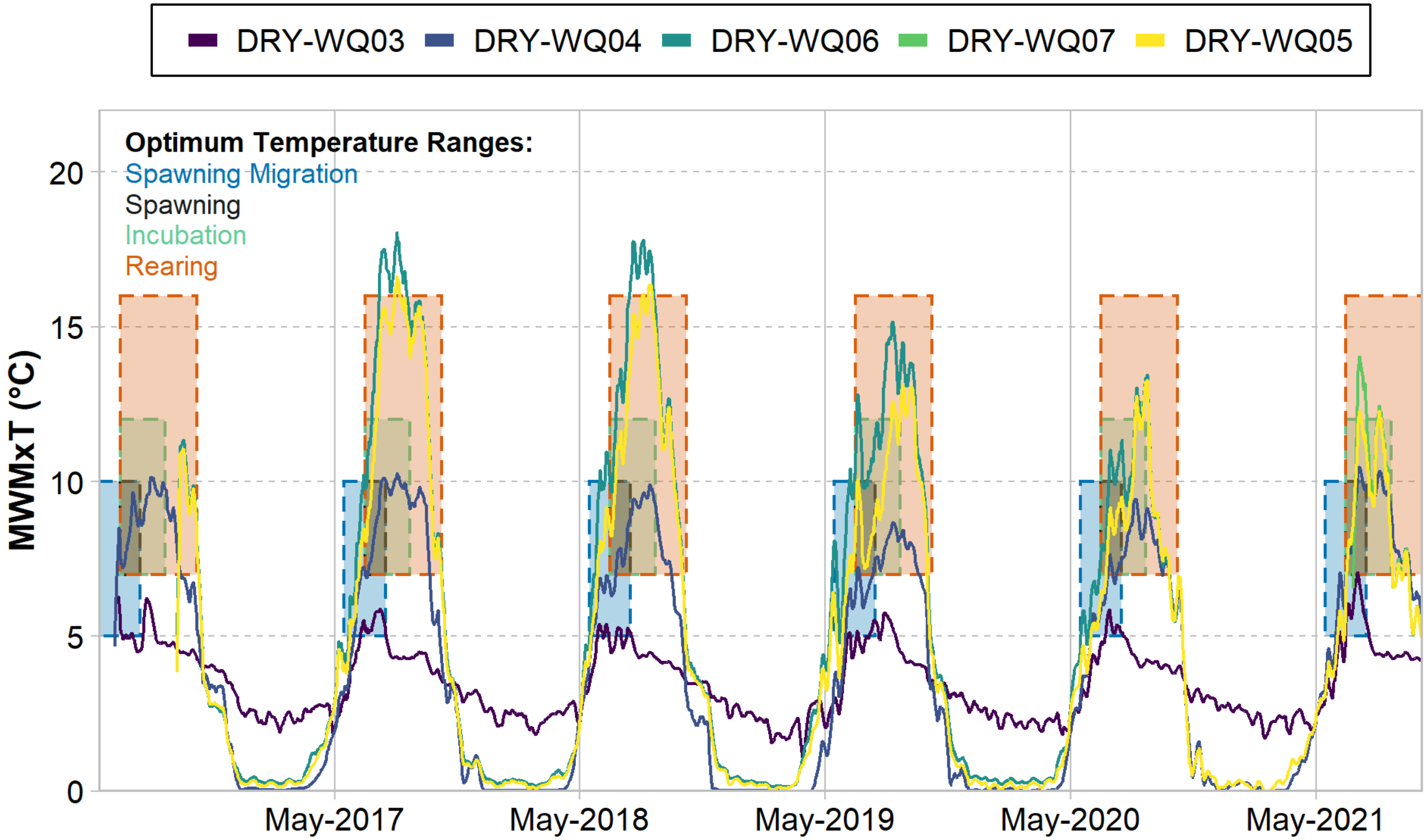


Figure 7.3: **Mean Weekly Maximum Temperatures at Monitoring Stations in Upper Dry Creek Overlayed on Westslope Cutthroat Trout Optimal Temperature Ranges**

Note: DRY-WQ06 was discontinued in October 2020 and replaced by DRY-WQ07 in June 2021.

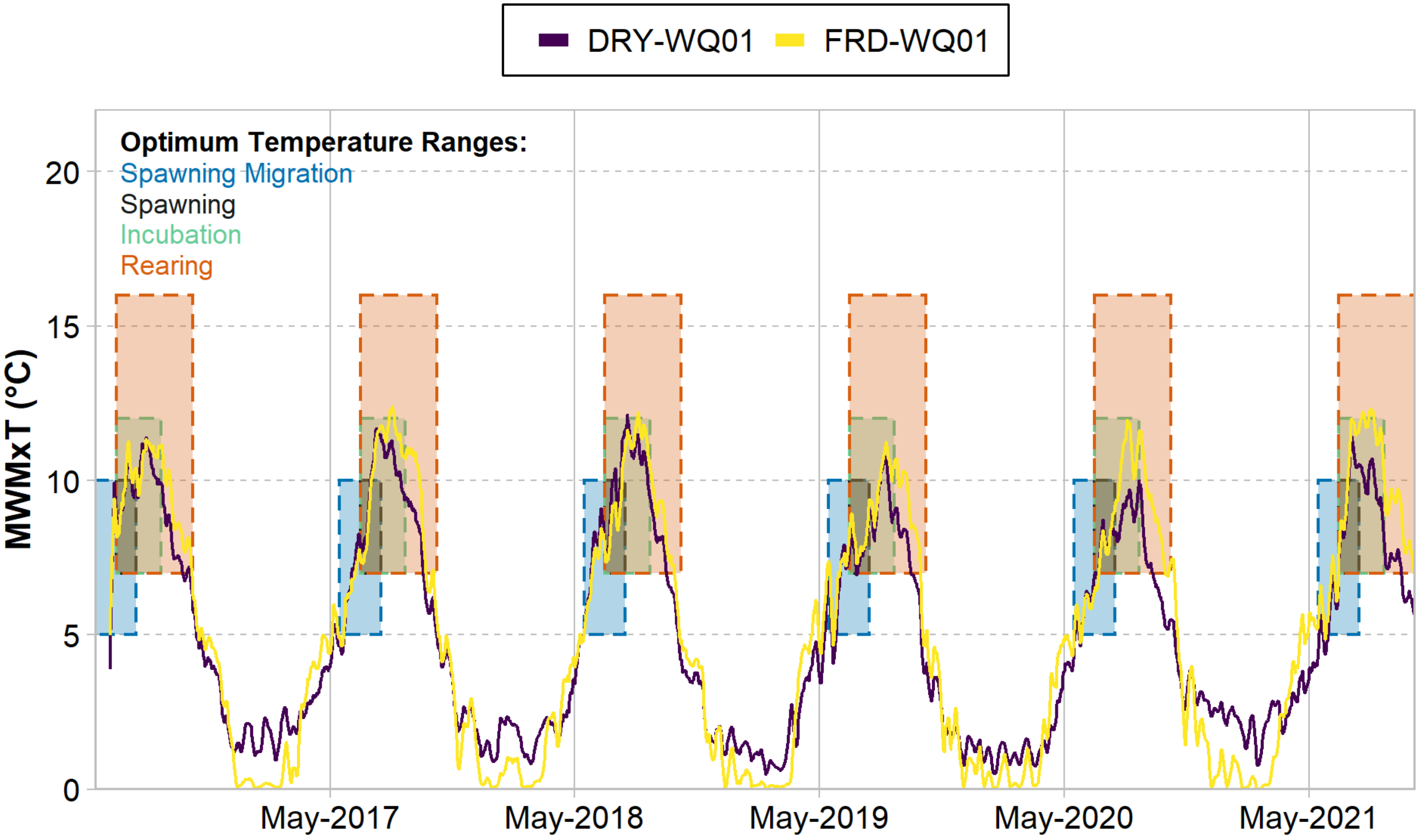


Figure 7.4: **Mean Weekly Temperatures at Monitoring Stations in Lower Dry Creek and Fording River Overlayed on Westslope Cutthroat Trout Optimum Temperature Ranges**

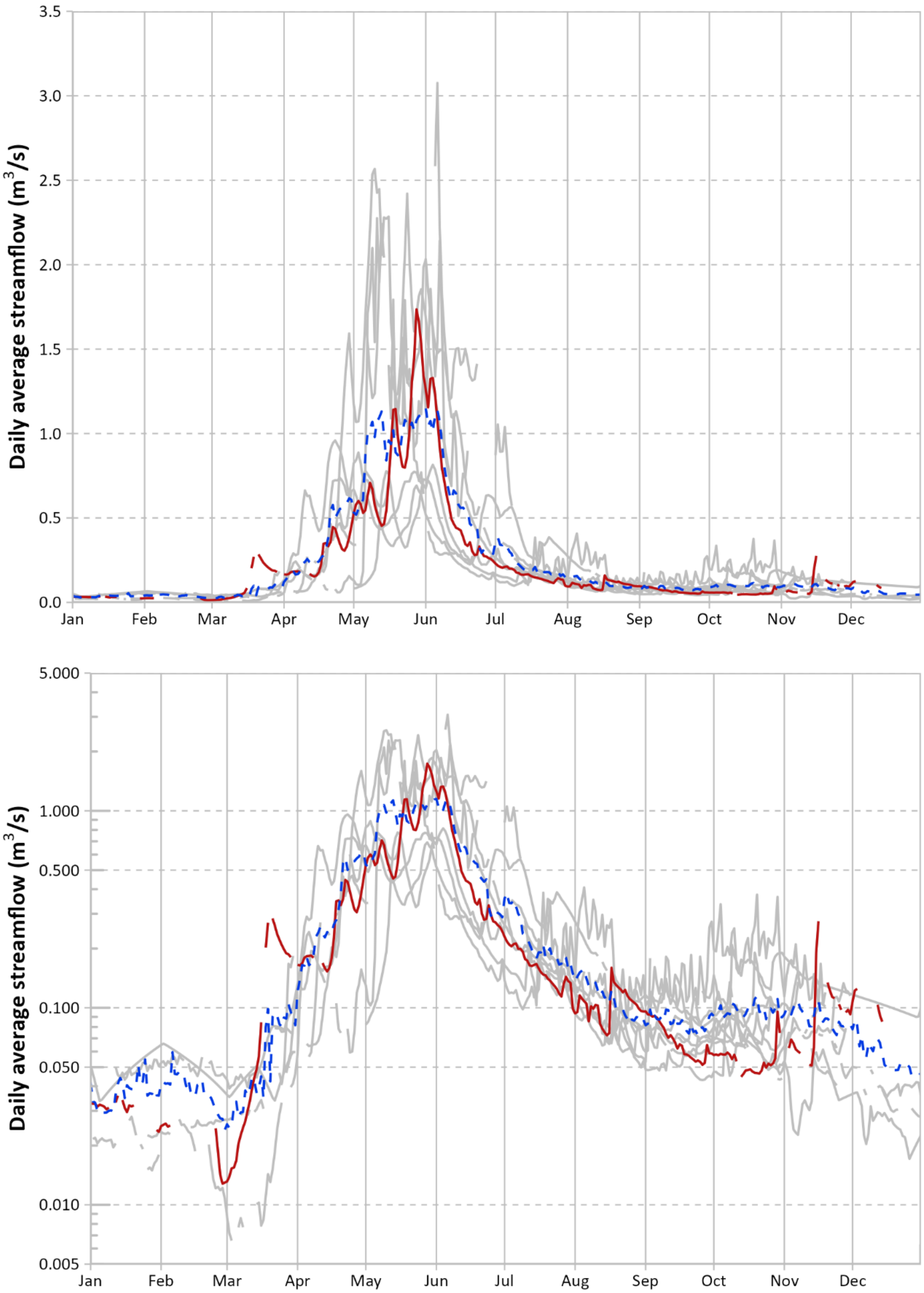


Figure 7.5: Daily Streamflow (m^3/s) at LC_DC1 for Each Year from 2011 to 2021

Notes: 2021 is shown in red; other years are shown in grey; mean daily flow for the period of record is shown with a dashed blue line. The upper panel presents data on a normal scale; the lower panel presents data on a log scale.

those located in areas without fish, were excluded from the figures below. Note that in October 2020 DRY-WQ06 was removed and replaced by DRY-WQ07 in June 2021. Water temperature in Dry Creek is spatially heterogenous as well as seasonally and annually variable among monitoring stations (Figure 7.2 and 7.3). The East Tributary of Dry Creek was consistently the coldest area sampled in the summer (average summer temperature < 5°C) and warmest in the winter. The warmest summer monthly average and instantaneous temperatures have been consistently observed immediately downstream of the sedimentation ponds. Locations in Dry Creek upstream of the East Tributary (DRY-WQ04) and near the confluence with the Fording River (DRY-WQ01) were intermediate in both summer and winter compared to other locations. Operation of the sedimentation ponds (Section 1.3) were changed to seasonal use in 2020 and 2021 instead of the continuous operation used prior. The change in operation appears to have resulted in lower mean daily temperatures immediately downstream of the sedimentation ponds in summer of 2020 and 2021.

7.5.1.1 Spawning Migration

MWMxT at all stations increased to the lower bound of optimum near the beginning of the spawning migration period. Generally, all stations had MWMxT within the bounds of spawning migration optimum for the years measured, except DRY-WQ06/07 and DRY-WQ05 in 2017 and 2018, when water temperature exceeded the upper bound of optimum prior to the end of migration. MWMxT during the spawning migration period has been similar in all years in East Tributary. MWMxT during the spawning migration period at Dry Creek stations in 2021 were similar to 2020, but slightly cooler than during years prior.

7.5.1.2 Spawning

MWMxT exceeded the optimal temperature range for spawning in all years at DRY-WQ06/07, and for all years at DRY-WQ05 except for 2020. In 2017 and 2018 MWMxT at these stations surpassed the upper bound of optimum (10°C) near the beginning of the spawning period, and by midway through spawning the temperature had reached >16°C. Since 2019, MWMxT exceedances have been fewer and of smaller magnitude. At DRY-WQ04 MWMxT was mostly optimal in 2016, 2017 and 2021, but in other years it did not reach optimum until late in the spawning period. The lower elevation stations (DRY-WQ01 and FRD-WQ01) had MWMxT within spawning optimum each year, but in 2016, 2017 and 2021 these stations exceeded optimum by 1 to 2°C in the latter half of the spawning period. Observations in East Tributary have been similar in all years. Spawning temperature observations in Dry Creek in 2021 were similar to 2020, but slightly cooler than in years prior.

7.5.1.3 Incubation

MWMxT at DRY-WQ06/07 and DRY-WQ05 exceeded the incubation optimum temperature range by 5-6°C for most of the incubation period in 2017 and 2018, but generally remained within optimum in 2019 to 2021, except for 1-3°C exceedances for less than half the incubation period. MWMxT at DRY-WQ04 was within the optimal range for incubation in 2016, 2017, and 2021, but was below optimum until late in the incubation period in 2018 and 2019. DRY-WQ01 and FRD-WQ01 both had MWMxT within optimum for the entire incubation period. Observations in East Tributary were slightly warmer in 2021 than previous years. Incubation temperature observations in Dry Creek in 2021 were slightly cooler than in 2020 but were notably cooler than during years prior.

7.5.1.4 Rearing

In 2017 and 2018, the MWMxT at DRY-WQ06/07 and DRY-WQ05 exceeded the upper bound of optimum by 1 to 2°C for brief periods, but otherwise temperatures were within optimum. From 2019 onwards optimum rearing MWMxT was not exceeded at these locations, but in 2020 and 2021 MWMxT declined below optimum roughly two weeks before the end of each rearing period. Each year MWMxT at DRY-WQ04 reached optimum rearing temperature, but for a shorter period of time than optimal. MWMxT at DRY-WQ01 and FRD-WQ01 both reached the lower bound of optimum water temperature at the beginning of the rearing period, but DRY-WQ01 cooled below the lower bound before the end of the rearing period; whereas, FRD-WQ01 tended to remain within optimum until the end of the rearing period. Overall, peak MWMxT was warmest at DRY-WQ06/07 followed by DRY-WQ05; peak MWMxT was coolest at DRY-WQ04, and intermediate at DRY-WQ01 and FRD-WQ01. Observations in East Tributary were similar to previous years. Observations in Dry Creek in 2021 were slightly cooler than in 2020, but were notably cooler than during the years prior.

Growing season (i.e., the period when weekly average temperature >5°C) was summarized by year and monitoring site (Table 7.5). During 2020, weekly average temperature did not exceed 5°C at DRY-WQ2 and DRY-WQ03; thus, there was no growing season at those sites. In contrast, the growing season was not yet over when monitoring ceased at DRY-WQ06 on October 7, 2020. Excluding DRY-WQ06, in 2020 the growing season varied from 694 GSDD (DRY-WQ01) to 919 GSDD (FRD-WQ01). From 2016 to 2021, the length in days of the growing season ranged from zero (e.g., during most years in East Tributary) to a maximum of 140 days (e.g., DRY-WQ06 in 2018).

In 2021, the growing season duration and magnitude ranged from 100 days with 434 GSDD at DRY-WQ03 to 122 days with 964 GSDD at FRD-WQ01. The growing season was not calculated

Table 7.5: Growing Season Statistics for Sites on Dry Creek and the Fording River from June 2016 to October 2021

Site Description	Site	Year	Number of days with valid data	Growing Season				
				Start Date	End Date	Length (days)	Gap (days)	GSDD
East Tributary	DRY-WQ03	2016	208	19-Jul	04-Oct	79	0	346
		2017[1]	365	-	-	0	-	n/a
		2018[1]	365	-	-	0	-	n/a
		2019[1]	365	-	-	0	-	n/a
		2020[1]	366	-	-	0	-	n/a
		2021	295	24-Jun	01-Oct	100	0	434
Dry Creek upstream of the confluence with East Tributary	DRY-WQ04	2017	365	30-May	03-Oct	127	0	959
		2018	365	22-May	29-Sep	130	0	922
		2019	365	31-May	28-Sep	121	0	796
		2020	366	12-Jun	12-Oct	123	0	834
		2021	295	10-Jun	07-Oct	120	0	910
Dry Creek downstream of the confluence with the East Tributary	DRY-WQ02	2016	208	16-Jul	04-Oct	81	0	403
		2017	365	19-Aug	17-Sep	30	0	150
		2018	365	29-Jul	17-Sep	51	0	241
		2019	343	03-Aug	25-Sep	53	0	246
		2020[1]	366	-	-	0	-	n/a
		2021	295	23-Jun	04-Oct	103	0	506
Settling pond outlet channel	DRY-WQ06	2017	364	25-May	11-Oct	139	1	1,589
		2018	365	18-May	04-Oct	140	0	1,523
		2019	365	24-May	03-Oct	133	0	1,300
		2020[3]	280	26-May	04-Oct	132	0	1,017
Downstream of the settling pond outlet channel	DRY-WQ05	2017	365	29-May	09-Oct	134	0	1,419
		2018	365	22-May	02-Oct	134	0	1,309
		2019	365	30-May	01-Oct	125	0	1,023
		2020	366	12-Jun	12-Oct	123	0	850
		2021	296	12-Jun	04-Oct	116	0	793
Dry Creek upstream of the confluence with Fording River	DRY-WQ01	2017	365	29-May	01-Oct	126	0	841
		2018	365	22-May	28-Sep	129	0	854
		2019	365	30-May	27-Sep	121	0	767
		2020	366	11-Jun	11-Oct	123	0	694
		2021	296	12-Jun	05-Oct	116	0	737
Fording River downstream of the Dry Creek confluence	FRD-WQ01	2017	365	28-May	05-Oct	131	0	993
		2018	365	22-May	30-Sep	132	0	966
		2019	365	25-May	29-Sep	128	0	918
		2020	366	09-Jun	14-Oct	127	0	919
		2021	295	10-Jun	08-Oct	122	0	964

[1] Weekly average temperatures never excceded 5°C, no growing season occurred.

[2] Growing season could not be estimated because the period of record does not cover the entire growing season.

[3] Record of growing season was cut short when temperature logger was removed.

Notes: Statistics describing the duration and intensity of the growing season (defined in Table 2.8) as determined for monitoring sites in Dry Creek and Fording River from June or September 2016 through October 2021. Stations with installation dates too late in the year to measure growing season were omitted for that year.

for Dry Creek at the sedimentation pond outlet (typically the warmest location; re-established in 2021 as DRY-WQ07) because this new site was installed after the beginning of the growing season (Table 7.5). The growing season in Dry Creek was broadly similar to conditions in 2020, but both 2020 and 2021 have had considerably fewer GSDD than 2016 to 2019. The2020 and 2021 conditions were near or below 800 GSDD, indicating that water temperature may be limiting for fish recruitment, based on GSDD thresholds proposed in Coleman and Fausch (2007).

7.5.2 Dissolved Oxygen

DO is an important water quality parameter relevant to all aquatic life, and particularly salmonids such as WCT, which are sensitive to low DO concentrations (COSEWIC 2016).

In 2020 and 2021, six surface water quality monitoring stations were evaluated to assess mean annual and mean monthly (30-day mean) DO concentrations relative to the BCWQGs (BCMOECCS 2019) and important WCT life history stages. None of the stations exhibited annual minimum or 30-day mean DO concentrations below the chronic guideline of 8.0 mg/L and DO concentrations in Dry Creek are not considered limiting for juvenile or adult WCT (Table 7.6; Appendix Table G.2). However, mean 30-day DO concentrations at all monitoring stations were below the BCWQG for the protection of buried embryos and alevins (11 mg/L) during July and August of 2020 (Appendix Table G.2), and from May to September in 2021 (Table 7.6). In 2021, DO concentrations ranged between 9.2 mg/L and 10.8 mg/L during the summer (Table 7.6). These results are consistent with DO concentrations observed at the reference area (LC_DCEF) in both 2020 and 2021 (Appendix Table G.2). In 2020 and 2021, three stations (LC_SPDC, LC_DCDS, and LC_DC2) were observed to have annual minimum DO concentrations slightly below the BCWQG instantaneous minimum value for buried life stages (9 mg/L; Appendix Table C.4; Minnow 2021a).

The WCT spawning period in Dry Creek has been observed from mid-June to early July and eggs incubate in gravel redds for 6 to 7 weeks prior to hatching (Northcote and Hartman 1988). Fry typically spend a further 1 to 2 weeks in the interstitial spaces of gravel prior to emergence in early to mid-August depending on temperature and accumulated thermal units (ATUs). Mean monthly DO conditions in Dry Creek (Table 7.6) in 2021 suggest that WCT embryos and alevins may have experienced hypoxic stress in June, July, and August (mean monthly DO concentrations <11 mg/L), which may impact survival and recruitment. However, similar conditions were observed at the reference area (LC_DCEF) suggesting that the decreased DO concentrations are not mine-related. In 2021, WCT redds were found only in Reach 1 (LC_DC1; Table 7.4) where DO concentrations were below the 11 mg/L guideline from June to September. Mean monthly DO concentrations at LC_DC1 ranged from 9.77 mg/L (June)

Table 7.6: Monthly Mean Dissolved Oxygen Concentrations (mg/L) in Dry Creek, 2021

Month	LC_DCEF	LC_SPDC	LC_DCDS	LC_DC2	LC_DC4	LC_DC1
January	10.8	12.0	12.1	11.8	11.5	12.2
February	10.7	11.9	12.4	12.0	11.5	12.0
March	11.1	11.3	11.4	11.2	10.6	11.3
April	10.3	11.3	11.8	11.7	11.6	11.6
May	10.6	10.7	10.9	11.2	11.0	11.0
June	10.3	9.83	9.80	9.74	10.0	9.77
July	10.0	9.15	9.24	9.38	9.89	9.79
August	10.2	9.77	9.85	10.0	10.1	10.2
September	10.3	10.6	10.8	10.8	10.6	10.8
October	10.6	11.2	11.4	11.6	11.1	11.4
November	10.8	11.7	11.7	11.9	11.3	11.8
December	10.6	11.5	11.6	11.5	11.3	11.8

▨ Mean DO concentration lower than water column long-term BCWQG of 11 mg/L for buried embryo/alevin life stages (guideline was applied for all months except April, see notes for details).

Notes: "-" = no data/not recorded. Spawning, incubation, and alevin stages for 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 this species is approximated from COSEWIC (2016), McPhail and Baxter (1996), and McPhail (2007).

to 10.8 mg/L (September); these values were only slightly less than the guideline, indicating that the potential for adverse effects due to long-term reduced DO concentrations is likely limited.

Long-term data to evaluate the 30-day mean DO concentrations are available from monitoring stations LC_DCEF, and LC_DC1 beginning in 2012, and LC_DCDS, beginning in 2013. In all years (2012 to 2021), DO concentrations were below the recommended guideline for embryos and alevins in July and August at station LC_DC1 (except for July in 2018; Appendix Table G.2).

7.5.3 Instream Flow

The annual hydrograph for LC_DC1 gauge at Dry Creek is shown in Figure 7.5. The hydrograph demonstrates a strong seasonal trend with low flow season ranging from late August to March, a period when mean discharge is often below 40% of mean annual discharge (MAD). January, February, and March are the lowest discharge months, when daily average flows are sometimes <10% of MAD. Discharge increases in April, and annual peak flow usually occurs in May. This timing of peak flow is earlier than in the Fording River, where peak flows almost always occur in June (Figure 7.6), a time at which discharge begins to recede rapidly in Dry Creek. A summary of data gaps at LC_DC1 from 2011 to 2021 is provided in (Appendix Table G.3).

Monthly streamflow statistics at Dry Creek (LC_DC1) and Fording River at the Mouth (WSC 08NK018) from 2011 to 2021 are provided in Table 7.7. The timing of peak and low flows does not vary a great deal among years in Dry Creek (Table 7.8), and the patterns are broadly typical of snowmelt-dominated streams. In Dry Creek, years without significant data gaps indicate that seasonal low flows occur between November and March, and seasonal maximum flows occur between April and June. Flow magnitude changed from year to year in both watercourses, with 2013, 2017 and 2018 having the greatest average daily discharge, almost tripling the peak values recorded in 2015, 2016 and 2019. In 2021, the minimum daily average flow for Dry Creek occurred on February 28 (0.026 m^3/s; this is not shown in Table 7.7 because the month had less than 20 days) and reached peak (maximum daily average) flow on May 28 (1.736 m^3/s). In comparison, the minimum daily average flow for Fording River occurred on February 25 (1.83 m^3/s) and peak flow on June 4 (49.6 m^3/s).

Flow conditions in Dry Creek (at LC_DC1) during key WCT activity periods are presented in Table 7.9. From 2011 to 2021, flows have varied considerably from year to year during all activity periods, as indicated by the standard deviation of mean flow. In 2021, mean flow during each of the activity periods (Table 7.9) was within the range of the 2013-2021 annual means in each period. The similar conditions in mean flow, along with the patterns indicated in Figure 7.5

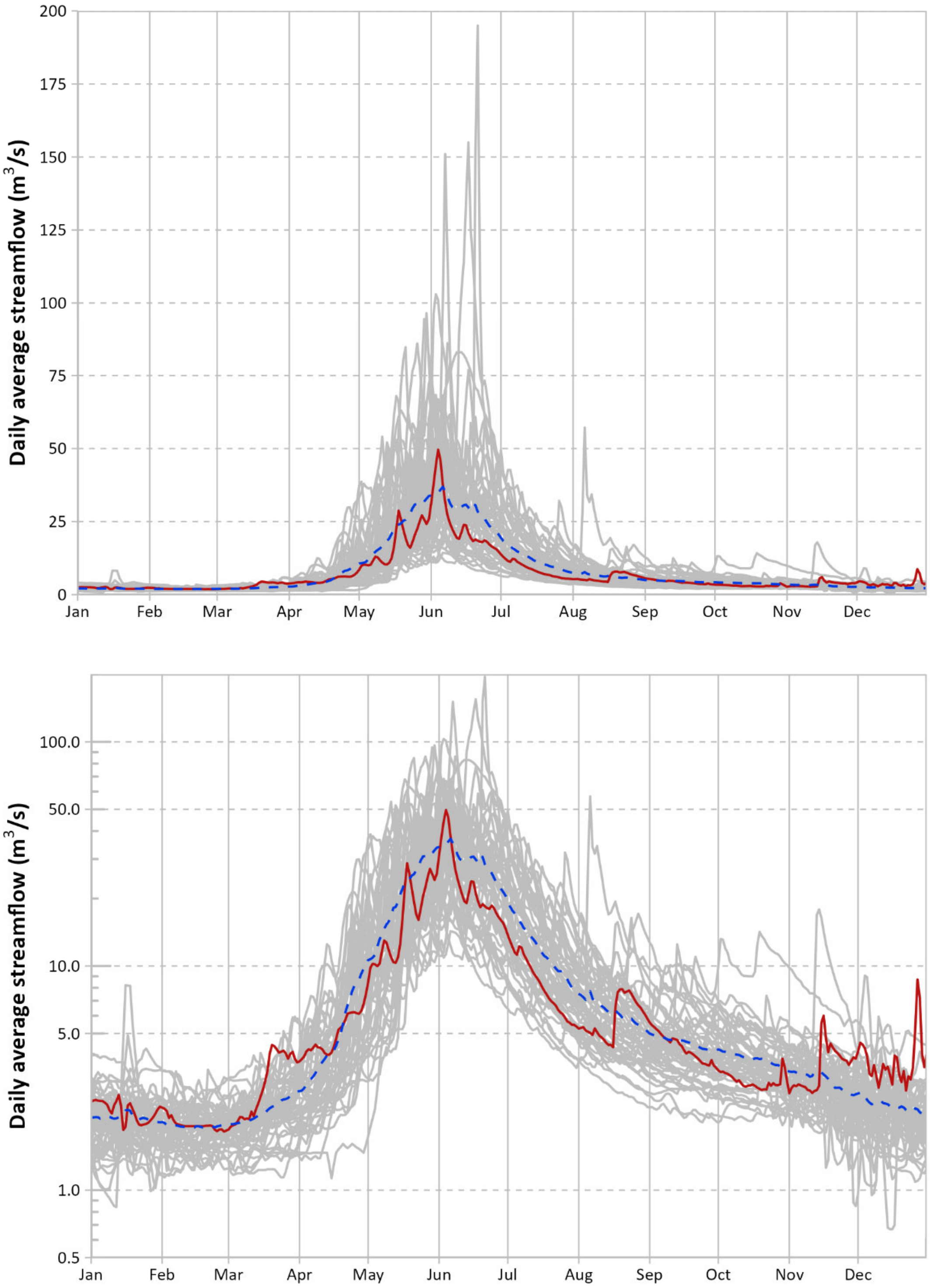


Figure 7.6: **1970 to 2021 Hydrograph for WSC Gauge Fording River at the Mouth (08NK018; WSC 2021)**

Notes: 2021 is shown in red; other years are shown in grey; mean daily flow for the period of record is shown with a dashed blue line. The upper panel presents data on a normal scale; the lower panel presents data on a log scale.

Table 7.7: Mean, Minimum and Maximum Daily Discharge, and Mean Monthly Discharge as a Percent of Mean Annual Discharge (MAD), at Dry Creek (LC_DC1) and Fording River at the Mouth (WSC 08NK018) from 2011 to 2021

Year	Month	Discharge at LC_DC1[1,2]			% of MAD[3]	Discharge at WSC 08NK018			% of MAD[4]
		Average	Minimum	Maximum		Average	Minimum	Maximum	
2011	Jan	NA	NA	NA	NA	2.21	1.36	2.55	28%
	Feb	NA	NA	NA	NA	2.11	1.73	2.47	26%
	Mar	NA	NA	NA	NA	2.14	1.68	2.81	27%
	Apr	NA	NA	NA	NA	3.18	2.67	4.49	40%
	May	NA	NA	NA	NA	18.85	4.39	38.10	237%
	Jun	NA	NA	NA	NA	41.47	28.10	54.00	521%
	Jul	NA	NA	NA	NA	17.65	8.19	34.00	222%
	Aug	NA	NA	NA	NA	5.65	4.34	8.00	71%
	Sep	-	-	-	-	4.04	3.63	4.91	51%
	Oct	0.060	0.043	0.092	25%	4.13	3.66	5.06	52%
	Nov	-	-	-	-	3.23	2.52	3.89	41%
	Dec	NA	NA	NA	NA	2.77	2.43	3.30	35%
2012	Jan	NA	NA	NA	NA	2.39	1.36	2.68	30%
	Feb	NA	NA	NA	NA	2.29	1.97	2.46	29%
	Mar	NA	NA	NA	NA	2.46	2.22	3.01	31%
	Apr	NA	NA	NA	NA	9.78	2.72	29.90	123%
	May	NA	NA	NA	NA	29.27	16.40	53.00	368%
	Jun	-	-	-	-	43.77	26.20	65.10	550%
	Jul	NA	NA	NA	NA	24.37	12.40	42.30	306%
	Aug	-	-	-	-	8.00	5.57	11.80	100%
	Sep	-	-	-	-	4.39	3.52	5.43	55%
	Oct	0.069	0.061	0.094	29%	3.70	3.42	4.79	46%
	Nov	0.074	0.040	0.154	31%	4.02	3.20	4.68	51%
	Dec	NA	NA	NA	NA	2.95	2.01	4.04	37%
2013	Jan	-	-	-	-	2.39	1.79	2.90	30%
	Feb	0.025	0.022	0.027	11%	2.16	1.48	2.58	27%
	Mar	-	-	-	-	2.67	2.16	3.66	34%
	Apr	0.135	0.058	0.243	57%	5.91	4.17	7.86	74%
	May	1.224	0.103	2.275	514%	31.21	7.19	52.10	392%
	Jun	-	-	-	-	47.92	24.60	195.00	602%
	Jul	0.384	0.103	1.053	161%	17.56	9.20	33.90	221%
	Aug	0.205	0.083	0.408	86%	8.73	5.69	14.40	110%
	Sep	0.140	0.098	0.274	59%	5.58	5.16	6.74	70%
	Oct	0.218	0.141	0.376	92%	5.18	4.32	6.60	65%
	Nov	-	-	-	-	3.51	1.69	4.47	44%
	Dec	NA	NA	NA	NA	2.34	0.95	3.33	29%
2014	Jan	NA	NA	NA	NA	2.27	1.45	2.56	29%
	Feb	NA	NA	NA	NA	1.86	1.69	2.13	23%
	Mar	NA	NA	NA	NA	2.08	1.76	2.40	26%
	Apr	NA	NA	NA	NA	4.81	2.36	7.39	60%
	May	NA	NA	NA	NA	26.20	9.09	58.60	329%
	Jun	NA	NA	NA	NA	35.81	24.70	47.50	450%
	Jul	0.174	0.124	0.261	73%	13.60	7.22	23.30	171%
	Aug	0.084	0.058	0.119	35%	5.72	4.91	7.05	72%
	Sep	-	-	-	-	7.01	5.17	10.00	88%
	Oct	0.091	0.065	0.146	38%	4.38	3.81	5.23	55%
	Nov	-	-	-	-	3.04	2.20	4.15	38%
	Dec	NA	NA	NA	NA	2.51	1.58	2.94	31%
2015	Jan	NA	NA	NA	NA	2.34	1.98	2.49	29%
	Feb	NA	NA	NA	NA	2.43	1.70	3.39	31%
	Mar	-	-	-	-	3.42	1.63	5.90	43%
	Apr	-	-	-	-	7.20	4.59	15.30	90%
	May	0.598	0.434	0.774	251%	16.53	11.90	25.70	208%
	Jun	0.397	0.168	0.815	167%	17.50	8.88	32.80	220%
	Jul	0.143	0.100	0.203	60%	6.65	5.14	8.75	83%
	Aug	0.076	0.056	0.103	32%	4.62	4.03	5.26	58%
	Sep	0.072	0.053	0.086	30%	4.37	3.92	4.95	55%
	Oct	0.066	0.048	0.103	27%	3.64	3.27	4.02	46%
	Nov	0.040	0.023	0.061	17%	2.77	1.76	3.71	35%
	Dec	0.026	0.017	0.037	11%	2.21	1.59	3.22	28%

[1] "NA" indicates months with no data.

[2] "-" Indicate months with less than 20 days of data.

[3] MAD at LC_DC1 = 0.238 m^3/s

[4] MAD at WSC 08KN018 = 7.96 m^3/s

Notes: Blue shading indicates each year's highest monthly average discharge and orange shading indicates the lowest monthly average discharge.

Table 7.7: Mean, Minimum and Maximum Daily Discharge, and Mean Monthly Discharge as a Percent of Mean Annual Discharge (MAD), at Dry Creek (LC_DC1) and Fording River at the Mouth (WSC 08NK018) from 2011 to 2021

Year	Month	Discharge at LC_DC1[1,2]			% of MAD[3]	Discharge at WSC 08NK018			% of MAD[4]
		Average	Minimum	Maximum		Average	Minimum	Maximum	
2016	Jan	0.048	0.034	0.064	20%	2.33	1.62	2.61	29%
	Feb	0.052	0.037	0.066	22%	1.90	1.22	2.16	24%
	Mar	0.046	0.034	0.105	19%	2.22	1.95	2.70	28%
	Apr	0.569	0.129	0.959	239%	11.58	2.98	21.40	145%
	May	0.534	0.334	0.780	224%	16.55	12.10	21.30	208%
	Jun	0.266	0.137	0.519	112%	11.82	7.46	18.20	148%
	Jul	0.138	0.098	0.192	58%	8.01	6.16	13.80	101%
	Aug	0.077	0.050	0.117	32%	5.62	4.16	7.45	71%
	Sep	0.055	0.048	0.065	23%	3.78	3.60	4.10	48%
	Oct	0.142	0.073	0.209	60%	4.92	3.90	6.18	62%
	Nov	0.140	0.118	0.182	59%	4.63	3.33	5.38	58%
	Dec	0.103	0.090	0.117	43%	2.45	1.55	3.10	31%
2017	Jan	NA	NA	NA	NA	2.71	2.25	3.36	34%
	Feb	NA	NA	NA	NA	2.04	1.69	2.27	26%
	Mar	-	-	-	-	2.54	1.62	3.61	32%
	Apr	0.253	0.124	0.468	106%	5.81	3.75	9.03	73%
	May	1.548	0.340	2.420	650%	26.90	8.08	44.80	338%
	Jun	0.756	0.274	1.688	317%	26.95	13.50	46.40	339%
	Jul	0.176	0.124	0.263	74%	8.33	5.06	13.20	105%
	Aug	0.105	0.079	0.127	44%	4.06	3.07	4.94	51%
	Sep	0.081	0.074	0.091	34%	2.83	2.61	3.04	36%
	Oct	0.102	0.080	0.191	43%	2.85	2.49	3.53	36%
	Nov	0.091	0.070	0.133	38%	2.83	1.91	3.59	36%
	Dec	-	-	-	-	1.81	1.19	3.24	23%
2018	Jan	0.049	0.043	0.055	20%	1.96	1.31	2.41	25%
	Feb	0.051	0.045	0.057	21%	1.63	1.54	1.77	20%
	Mar	0.059	0.039	0.081	25%	1.95	1.65	2.20	24%
	Apr	0.440	0.064	1.593	185%	5.52	1.77	24.00	69%
	May	1.519	0.642	2.567	637%	34.01	15.90	50.00	427%
	Jun	0.278	0.223	0.422	117%	16.50	12.10	25.90	207%
	Jul	0.187	0.131	0.317	78%	9.45	6.00	13.50	119%
	Aug	0.097	0.066	0.136	41%	4.24	3.60	5.70	53%
	Sep	0.105	0.079	0.147	44%	3.28	3.15	3.56	41%
	Oct	0.078	0.046	0.120	33%	3.23	3.15	3.35	41%
	Nov	-	-	-	-	3.03	2.65	3.23	38%
	Dec	0.040	0.035	0.050	17%	2.28	1.79	3.00	29%
2019	Jan	NA	NA	NA	NA	1.92	1.58	2.24	24%
	Feb	NA	NA	NA	NA	1.64	1.43	1.98	21%
	Mar	NA	NA	NA	NA	2.20	1.17	4.20	28%
	Apr	NA	NA	NA	NA	3.65	2.96	4.85	46%
	May	0.393	0.082	0.777	165%	10.48	4.34	22.70	132%
	Jun	0.441	0.224	0.726	185%	18.88	12.90	29.30	237%
	Jul	0.397	0.245	0.586	167%	14.04	9.80	19.80	176%
	Aug	0.163	0.107	0.274	68%	6.89	5.08	9.32	87%
	Sep	0.101	0.082	0.127	43%	4.53	4.17	4.96	57%
	Oct	0.102	0.092	0.135	43%	3.66	2.47	4.33	46%
	Nov	-	-	-	-	2.86	2.00	3.41	36%
	Dec	-	-	-	-	2.60	2.08	3.45	33%
2020	Jan	-	-	-	-	2.00	1.42	2.68	25%
	Feb	-	-	-	-	1.98	1.72	2.29	25%
	Mar	0.022	0.007	0.060	9%	2.26	1.63	3.03	28%
	Apr	0.411	0.056	0.738	173%	5.24	2.78	9.67	66%
	May	1.009	0.567	1.985	424%	18.47	9.86	58.90	232%
	Jun	1.044	0.333	2.033	438%	31.14	18.90	66.10	391%
	Jul	0.229	0.144	0.354	96%	12.83	6.98	23.20	161%
	Aug	0.116	0.078	0.153	49%	5.15	3.92	7.16	65%
	Sep	0.065	0.057	0.085	27%	3.52	3.25	3.87	44%
	Oct	0.061	0.045	0.068	26%	3.00	2.09	3.22	38%
	Nov	0.084	0.064	0.106	35%	3.06	2.02	3.51	38%
	Dec	-	-	-	-	2.40	1.78	3.06	30%
2021	Jan	-	-	-	-	2.27	1.86	2.66	28%
	Feb	-	-	-	-	1.98	1.83	2.34	25%
	Mar	0.109	0.013	0.284	46%	3.05	1.86	4.45	38%
	Apr	0.265	0.153	0.453	111%	5.02	3.76	7.48	63%
	May	0.862	0.453	1.736	362%	16.78	8.48	28.74	211%
	Jun	0.583	0.245	1.329	245%	24.33	14.71	49.64	306%
	Jul	0.166	0.099	0.230	70%	8.61	5.37	13.75	108%
	Aug	0.105	0.073	0.160	44%	5.95	4.34	7.88	75%
	Sep	0.069	0.051	0.096	29%	4.37	3.52	5.60	55%
	Oct	0.055	0.045	0.096	23%	3.08	2.80	3.86	39%
	Nov	0.097	0.051	0.275	41%	3.60	2.71	6.00	45%
	Dec	-	-	-	-	3.90	2.78	8.70	49%

[1] "NA" indicates months with no data.

[2] "-" Indicate months with less than 20 days of data.

[3] MAD at LC_DC1 = 0.238 m^3/s

[4] MAD at WSC 08KN018 = 7.96 m^3/s

Notes: Blue shading indicates each year's highest monthly average discharge and orange shading indicates the lowest monthly average discharge.

Table 7.8: Date of Annual Minimum and Maximum Streamflow at LC_DC1

Year	Date of Minimum Flow	Date of Maximum Flow
2011	-	-
2012	-	-
2013	11-Jan	11-May
2014	-	-
2015	26-Dec	4-Jun
2016	5-Jan	23-Apr
2017	11-Nov	24-May
2018	16-Dec	10-May
2019	7-Dec	15-May
2020	3-Mar	1-Jun
2021	28-Feb	28-May

"-" Indicates less than 6 months of data

Table 7.9: Mean Daily Streamflow at LC_DC1 During Key WCT Activity Periods

Year	Mean Flow (m^3/s)				
	Over - Wintering[1]	Rearing	Spawning	Early Incubation	Late Incubation
	October 11 to May 27	May 28 to October 10	June 12 to July 11	June 12 to August 12	July 11 to October 31
2013	0.270	**0.402**	**0.789**	**0.420**	**0.192**
2014	0.182	**0.120**	0.256	0.151	0.106
2015	0.297	0.177	0.206	0.162	**0.084**
2016	0.165	0.146	**0.166**	**0.148**	0.101
2017	0.346	0.286	0.329	0.226	0.103
2018	**0.374**	0.173	0.246	0.194	0.107
2019	**0.150**	0.275	0.441	0.361	0.163
2020	0.279	0.382	0.609	0.367	0.106
2021	0.209	0.257	0.287	0.222	0.085
Mean	0.241	0.228	0.327	0.232	0.112
Std dev	0.080	0.101	0.207	0.104	0.036

[1] Overwintering period starts on October 11 of the previous year and goes to May 27 of the current year.

Bold values are highest and lowest on record.

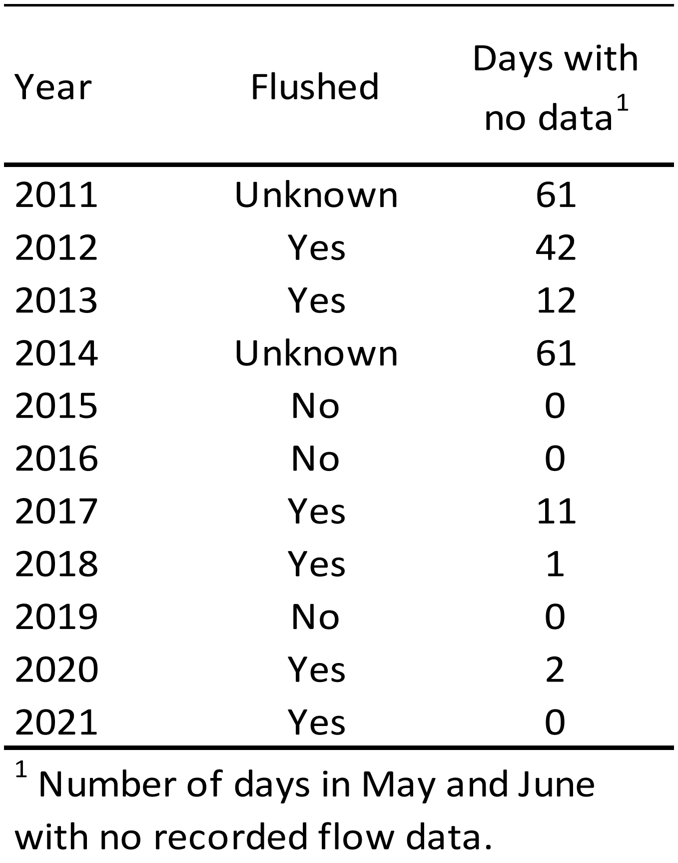
and Table 7.7 indicate that flow-related ecological conditions through most of 2021 were broadly similar to historical average conditions with no notable anomalies. For the late incubation period and the latter part of the rearing period, flows in 2021 were nevertheless low and close to the previous low that occurred in 2015. This is apparent especially in the lower panel of Figure 7.5. It is not possible with current data to quantify biological effects of the lower flows through this period, but since flows were close to the lowest over the period of record, we suggest habitat may have been limiting during this period. In the absence of concurrent fish abundance monitoring, the effects of the observed low flows are unknown. Table 7.10 indicates the years in which flows, as measured at LC_DC1 from 2011-2021, met the flushing flow threshold of 1.0 m^3/s for a 2-day duration (West et al. 2021). Flushing flow conditions reached the threshold in May and in June 2021. In the past 5 years, flows did not reach this threshold in 2019, but did so during the four other years. The record indicates that flushing flows have been occurring regularly in Dry Creek through this period, but current sediment conditions cannot be directly inferred from this record and would require empirical confirmation.

7.5.4 Calcite Coverage

Calcite accumulation has the potential to negatively affect aquatic habitat through changes to stream sediment characteristics (Barrett et al. 2016; Hocking et al. 2020). Calcite concretion can adversely affect fish via reduced suitability of spawning, incubation, and overwintering habitat, or via effects to benthic invertebrates that are important prey for adult and juvenile fish (Robinson 2010; Barrett et al. 2016; Wright et al. 2018; Hocking et al. 2020; Minnow 2022):

- Spawning Habitat—Calcite can reduce spawning habitat suitability by concreting substrate particles and making them immovable for redd construction, which can limit WCT spawning success and recruitment.
- Incubation Habitat—Calcite can reduce hyporheic flow and dissolved oxygen in streambed substrates during egg incubation, which can decrease WCT incubation success and recruitment.
- Overwintering Habitat—Calcite can reduce overwintering habitat suitability (especially for juveniles) by concreting substrate particles and making interstitial spaces inaccessible, which can increase WCT overwintering mortality.
- Invertebrate Habitat—Calcite can reduce benthic invertebrate habitat suitability, which can decrease invertebrate production and prey availability for fish, potentially causing lower WCT growth rates or body condition and lower survival or reproduction.

Table 7.10: Indication of Whether the Historical Flows at LC_DC1 Exceeded the Flushing Flow Threshold of 1.0 m3/s for a 2-Day Duration [2]



Year	Flushed	Days with no data[1]
2011	Unknown	61
2012	Yes	42
2013	Yes	12
2014	Unknown	61
2015	No	0
2016	No	0
2017	Yes	11
2018	Yes	1
2019	No	0
2020	Yes	2
2021	Yes	0

[1] Number of days in May and June with no recorded flow data.

[2] Threshold proposed in West et al. 2021.

Notes: Years marked as “unknown” did not exceed the threshold during periods when data were available and the data gaps precluded a determination.

The mechanisms of effect are mostly clearly related to calcite concretion, rather than calcite presence. Thus, since calcite concretion is 0, calcite levels in Dry Creek continue to be below those expected to result in measurable biological effect, although there is a clear trend toward increased calcite levels.

In addition to the Regional Calcite Monitoring Program results discussed above and detailed in Table 7.11, CI was also measured concurrently with benthic invertebrate community sampling as part of the 2021 LCO Dry Creek LAEMP (Table 2.4). Benthic invertebrate sampling targeted riffle habitat, and calcite measurements were taken in the immediate proximity of benthic invertebrate sampling sites. Consistent with previous years, CI values for LCO Dry Creek LAEMP monitoring locations in 2021 varied spatially and were generally higher than 2020; however, they were generally lower than values from 2019[26] and earlier (Table 7.12). In 2021, Dry Creek CI values were highest at LC_DC1 (0.43 to 0.59) and lowest at areas LC_DCDS (0) and LC_DC2 (0.01 to 0.09). There were no changes in calcite coverage at Dry Creek LAEMP areas indicative of increased calcite deposition in 2021, except at LC_DC4 which increased from 0 presence in 2020 to an average of 0.21.

7.6 Summary

Potential effects to fish health were observed as a result of water quality conditions (i.e., increasing nitrate concentration, changes in benthic invertebrate community composition, and elevated benthic invertebrate tissue selenium concentrations) in Dry Creek in 2019, 2020 and 2021 (Sections 3.2, 4, 5.2, and 6.2), but chronic toxicity testing did not identify adverse effect on fathead minnow or rainbow trout in 2021 (Section 4). Chronic toxicity testing identified likely adverse effects on fathead minnow survival and biomass in 2020, although no water quality constituents were identified as a potential cause of those results (Minnow 2021a). Likely adverse effects on *O. mykiss* survival were identified in chronic toxicity testing at LC_DCDS in 2019, with nitrate identified as the likely cause (Minnow 2021a). Fish sampling in Dry Creek was limited to non-invasive methods (i.e., fish tissue chemistry samples were not collected), and a total of three WCT were captured. WCT muscle selenium concentrations from fish opportunistically sampled at LC_DC2 in October 2020 were all below the lowest EVWQP benchmark; no fish were sampled for selenium in 2021. A total of 10 WCT redds were observed in Dry Creek in 2021; redds have been decreasing since 2018 but in 2021 were in the range of prior years. Redds were only found in Reach 1 in 2021 versus Reaches 1 to 3 in previous years (Minnow 2021a). Caution is required

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[26] Measuring calcite in the presence of encrusting algae is challenging and potentially error-prone. Encrusting material identified as calcite at several areas on Dry Creek and LC_DCEF in 2019 was determined to be non-calcite following additional field consultation in 2020 and those values are considered erroneous.

Table 7.11: Calcite Index Values for reached of LCO Dry Creek 2013 to 2021

Reach	2013	2014	2015	2016	2017	2018	2019	2020	2021
1	0	0	0	0	0.02	0.57	0.65	0.62	0.74
2	0	0	0	0	0	0.24	0.52	0.6	0.71
3	0	0	0	0	0	0.06	0.16	0.29	0.38
4	0	-	0	0	0	0.32	0.15	0.3	0.34

Notes: "-" indicates calcite data not recorded.

Table 7.12: Calcite Index Values for Dry Creek, Grace Creek, and Fording River Areas, LCO Dry Creek LAEMP 2015 to 2021

Area		**Calcite Index (CI)**							**Calcite index (CI')**[a]
		Sep-2015	**Sep-2016**	**Sep-2017**	**Sep-2018**	**Sep-2019**	**Sep-2020**	**Sep-2021**	**Sep-2021**
Dry Creek	**LC_DCEF**	-	-	-	-	*0.99*	0	0	-
						0.96	0	0	-
						1.19	0	0	-
	LC_DC3	-	-	-	-	*1.12*	0.1	0.1	0.02
						1.16	0.35	0.34	0.09
						1.36	0.62	0.78	0.33
	LC_DCDS	0	0.8	0	0.6	*1*	0	0	0
					1	*1*	0.1	0	0
					1	*1*	0.02	0	0
	LC_DC2	-	-	-	-	*1*	0	0.04	0.01
						1	0	0.01	0
						1	0.03	0.09	0.02
	LC_DC4	-	-	-	-	*1*	0	0.45	0.15
						0	0	0.06	0.02
						1	0	0.11	0
	LC_DC1	0	0.6	0	0.92	*1*	0.12	0.45	-
					1.1	*1*	0.19	0.59	-
					1.1	*1*	0.41	0.43	-
Fording River	**LC_FRUS**	1	1	1	1	*1*	0.94	0.96	0.63
					1	*1*	0.96	0.99	0.56
					1	*1*	0.99	0.99	0.63
	LC_FRB	1	1.4	1.2	0.89	*1*	0.11	0.92	0.46
					0.85	*1*	0.03	0.87	0.38
					0.7	*1*	0.92	0.66	0.22
Grace Creek	**LC_GRCK**	-	-	-	-	0	0	0	0
						0.25	0	0	0
						0	0	0	0

Notes: Italicized values indicate calcite index values considered erroneous due to encrusting algae presence. "-" indicates calcite data not recorded. Calcite monitoring in support of biological sampling was discontinued at LC_SPDC, following operational changes in October 2020 (see Minnow 2021a for details). Calcite monitoring results from LC_SPDC are therefore unavailable for 2021, and this area has been excluded from the table.

[a] Calcite indices (CI') were calculated using calcite proportion rather than calcite presence and therefore cannot be compared with previous years.

when interpreting the number of observed redds among years due to changes in sampling crew, effort, and observation conditions.

With respect to fish habitat, mean daily and instantaneous water temperatures in Dry Creek were within limits for WCT rearing and survival in 2021. However, the hourly rate of water temperature change threshold was exceeded at all sites in 2021. In 2021, fish habitat was assessed using water temperature analysis (MWMxT) for each life history stage: spawning migration, spawning, incubation, and rearing. Spawning migration temperature was within the optimum range at all sites; optimal spawning temperature was exceeded in at least one year at all stations except DRY-WQ04. Growing degree days on Dry Creek in 2021 were the lowest reported throughout all years of sampling except at DRY-WQ02 which increased in 2021. Four of the areas on Dry Creek did not meet the 800 degree day recruitment threshold indicating temperature was limiting for growth and recruitment of WCT in these areas. Dissolved oxygen concentrations were above the long-term chronic and instantaneous acute BCWQGs for fish life stages other than buried embryos and alevin for all samples in Dry Creek and the East Tributary in 2021. Dissolved oxygen was below long-term chronic BCWQG (11 mg/L) for embryos and alevins from June to September in Dry Creek and East Tributary (reference) in 2021, suggesting the potential for hypoxic stress in WCT embryos and alevins in June to September. However, this also occurred at the reference area (LC_DCEF). The similar conditions in mean flow from 2013 - 2021 indicate that flow-related ecological conditions through most of 2021 were broadly similar to historical average conditions with no notable anomalies. There were no observed changes in the amount of calcite concretion within Dry Creek LAEMP areas in 2021 and observations in 2021 are consistent with previous trends of increasing calcite presence, absence of calcite concretion, and similar spatial extent of calcite.

8 SUMMARY

Potential effects to Dry Creek due to LCOII development have been evaluated by addressing five study questions, which focus on: 1) potential effects to water quality; 2) changes in toxicity; 3) potential effects to benthic invertebrate communities; 4) benthic invertebrate tissue selenium; and 5) fish and fish habitat.

Evaluation of Study Question #1 (potential effects to water quality) indicated that in general (2014 to 2021) concentrations of aqueous mine-related constituents including nitrate, sulphate, and total selenium have increased over time on Dry Creek (Section 3). Constituents including nitrate and total selenium, exceeded guideline and/or benchmark (where applicable) values on Dry Creek in 2021. Constituent concentrations were more frequently elevated at areas LC_DC3 (the Dry Creek area immediately downstream of LCOII spoiling and prior to DCWMS effects), LC_SPDC, LC_DCDS, and LC_DC2 (the areas immediately downstream of the DCWMS) than at areas LC_DC4 and LC_DC1, likely due to increasing distance from LCOII operations and input of groundwater from reference area LC_DCEF between LC_DC2 and LC_DC4. Aqueous organoselenium (specifically DMSeO and MeSe[IV]) concentrations were elevated at areas LC_SPDC and LC_DCDS during DCWMS sedimentation pond dewatering in August 2021. However, activation of the DCWMS bypass throughout most of the year (except May to July) and decreasing from two ponds used in 2020 to a single pond used in 2021, decreased concentrations to levels lower than observed over the same periods in 2020. Similar increasing trends in aqueous constituents were not detected on Grace Creek (LC_GRCK). With respect to the BRN spoil failure, the quantity of surface water was impacted at time of spoil failure and a short period following but returned to expected conditions by the end of freshet.

Overall, assessment of Study Question #1 indicated that aqueous concentrations of mine-related constituents in Dry Creek are frequently higher than guidelines, interim screening values, benchmarks, and reference values, and are increasing over time relative to reference.

Evaluation of Study Question #2 (changes in toxicity) indicated that chronic toxicity test occurring at LC_DCDS and acute toxicity occurring at LC_SPDC have not increased in 2021 relative to 2020 (Section 4). The frequency of potential adverse responses was similar between 2020 and 2021, and no acute toxicity test failures occurred in either year. Overall, chronic toxicity results have shown a low proportion of adverse responses over time at LC_DCDS, with a frequency and magnitude of responses that is temporally stable (i.e., no apparent consistent pattern of responses over time) and mostly limited to invertebrate endpoints. Acute toxicity testing efforts were greatly increased following the BRN spoil failure, almost daily from February 12 to

March 17, with no effect of the BRN spoil failure seen in these tests. Given that the overall proportion of results were similar to those seen in 2020 (16% and 18%, respectively) and no adverse responses are seen in Q2 (immediately following the BRN spoil failure event) it is unlikely that the BRN spoil failure had an effect on chronic toxicity results in 2021.

Overall, assessment of chronic and acute toxicity indicated similar results and potential for effects between 2019, 2020 and 2021. In 2021, nickel and nitrate were identified as potentially causing the observed effects. Potential adverse effects of Dry Creek water on biota have been attributed to nitrate toxicity intermittently between 2018 and 2020; although there has been no discernable pattern.

Evaluation of Study Question #3 (potential effects to benthic invertebrate communities) indicated that in 2021 benthic invertebrate community total abundance and taxonomic richness were generally within regional and site-specific (where available) normal ranges at Dry Creek LAEMP sampling areas in 2021. Benthic invertebrate communities in Dry Creek upstream of the DCWMS (LC_DC3) had endpoints outside of normal ranges (particularly %EPT, %E, and %C) most often. Considering all the benthic invertebrate community results, the BRN spoil failure may have had some limited (but not lasting) effects on the abundance at study areas located closest to the failure in 2021 (LC_DC3). Areas located closest to the discharge (LC_DCDS and LC_DC2) also tended to have lower %E than other areas and compared to regional and site-specific normal ranges. In contrast, benthic invertebrate communities located upstream and downstream of the mouth of Dry Creek in the Fording River were similar to each other, and community endpoints were within regional normal ranges, suggesting minimal influence of Dry Creek on benthic invertebrate community structure in the downstream receiving environment. The benthic invertebrate community within Grace Creek also had endpoints within regional normal ranges, as expected, based on current lack of mine influence. Temporal changes in Dry Creek benthic invertebrate community structure, namely decreases in relative and total abundance of E, were associated with increasing aqueous concentrations of mine-related constituents including nitrate, selenium, sulphate, cadmium, and nickel. It is therefore likely that mining activities are contributing to changes in the benthic invertebrate communities of Dry Creek.

Overall, most Dry Creek benthic invertebrate community endpoints were within normal ranges at most areas, but some changes are occurring over time that may be related to effects of increasing concentrations of mine-related constituents.

Evaluation of Study Question #4 (benthic invertebrate tissue selenium) indicated in most areas of Dry Creek downstream of the DCWMS, benthic invertebrate tissue selenium concentrations decreased in 2021 relative to earlier years (although were still often higher than regional normal ranges, benchmarks, and concentrations measured at the reference area), while concentrations generally remained unchanged at the area located upstream of the DCWMS (i.e., LC_DC3). The lack of change in benthic invertebrate tissue selenium concentrations from LC_DC3 in 2021 relative to earlier years indicated that the BRN spoil failure did not have a measurable impact on tissue selenium concentrations. Downstream of the DCWMS (particularly from LC_DCDS through LC_DC4), the decreases in benthic invertebrate tissue selenium concentrations measured in 2021 relative to earlier years were primarily attributable to changes in management of the DCWMS. At the furthest downstream area on Dry Creek (LC_DC1), there was little change in tissue selenium concentrations over time, but higher concentrations observed in this area relative to upstream at LC_DC4 may have been due to occasionally elevated aqueous organoselenium concentrations. Based on the currently available information, the occasionally higher organoselenium concentrations at LC_DC1 compared to upstream cannot be attributed to a specific cause. Within the Fording River and Grace Creek, benthic invertebrate tissue selenium concentrations generally remained unchanged in 2021 relative to earlier years, indicating that operations at LCO Dry Creek have had limited or no influence on benthic invertebrate tissue selenium concentrations in these areas.

Overall, Dry Creek benthic invertebrate tissue selenium concentrations are still elevated on Dry Creek but are not currently increasing, and mitigation efforts are likely having a positive effect. There was no evidence that the BRN spoil failure resulted in an increase in benthic invertebrate tissue selenium concentrations in any areas of LCO Dry Creek.

Collectively, from these results (water quality, and benthic invertebrate community and tissue), it's difficult to tease apart changing the effects of changes in water quality from mining activity versus direct effects from the BRN spoil failure. Generally, there was only a short-lived response upstream of the DCWMS (LC_DC3). However, moving downstream (i.e., below the DCWMS) a distinct response from the BRN spoil failure could not be identified as it was compounded by seasonal changes in constituent concentration, changes in DCWMS operational phases, and year on year increases in many miming related constituents.

Evaluation of Study Question #5 (fish health and fish habitat) indicated that with respect to fish habitat, mean daily and instantaneous water temperatures in Dry Creek were within limits for WCT rearing and survival in 2021. Growing degree days on Dry Creek in 2021, were the lowest reported throughout all years of sampling at all monitoring stations except DRY-WQ02 which increased in 2021. Four areas on LCO Dry did not meet the 800 degree day recruitment threshold indicating temperature was limiting for growth and recruitment of WCT in these areas. Dissolved oxygen concentrations were above the long-term chronic and instantaneous acute BCWQGs for fish life stages other than buried embryos and alevin for all samples in Dry Creek and the East Tributary reference area in 2021. Dissolved oxygen was below long-term chronic BCWQG (11 mg/L) for embryos and alevins from June to September in Dry Creek and East Tributary reference area in 2021, suggesting the potential for hypoxic stress in WCT embryos and alevins in June to September. However, this was also observed at the reference area (LC_DCEF). The similar conditions in mean flow from 2013 to 2021 indicate that flow-related ecological conditions through most of 2021 were broadly similar to historical conditions with no notable anomalies. There were no observed changes in the amount of calcite concretion within Dry Creek LAEMP areas in 2021 and levels were below those associated with a biological effect; however, calcite presence continues to increase annually throughout Dry Creek.

The results from the Dry Creek LAEMP provide information that supports Teck's AMP (Teck 2021c), and Table 8.1 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 triggers were assessed at two mine-exposed Dry Creek areas, LC_DC1 and LC_DCDS (Appendix H). Results indicated that all the replicates were above the biological trigger values at LC_DC1 and LC_DCDS for %EPT (i.e., were not indicative of a biological trigger; Table 8.2). At least one replicate in each of the eight sampling events for LC_DCDS exceeded the biological trigger for benthic invertebrate tissue selenium concentrations and at least one replicate from March, May, and September from LC_DC1. The biological trigger exceedances for these samples are likely related to the generation of reduced selenium species in the DCWMS sedimentation ponds upstream of areas LC_DCDS and LC_DC1 (Lorax 2020, Minnow 2020a). Further investigations and mitigation activities are currently underway. Additional responses include development of a biokinetic model for selenium bioaccumulation and modifications to the DCWMS operations in an effort to decrease enhanced primary production and / or heterotrophic microbial activity in the sedimentation ponds that promotes the generation of organoselenium compounds. Monitoring of the benthic invertebrate selenium biological trigger at these areas (and other Dry Creek LAEMP areas) will continue under both the 2022 Dry Creek LAEMP and the RAEMP. Overall, results of the biological trigger evaluation were consistent with the findings of the integrated assessment conducted under the 2021 Dry Creek LAEMP. Given that current biological triggers were sufficient to identify monitoring areas where biological responses are occurring, no additional triggers are recommended at this time.

Table 8.1: Summary of Findings, Responses, and Adjustments Related to the Dry Creek LAEMP, 2021

Key Question(s)	Data Evaluation Process	Outcome(s)	Responses & Adjustments in 2021	EMC Engagement
Are aqueous concentrations of mine-related constituents elevated in relation to British Columbia Water Quality Guidelines (BCWQG) and EVWQP benchmarks, and are concentrations changing over time?	Comparison of water quality data to reference areas (LC_DCEF for Dry Creek areas, LC_FRUS for area LC_FRB) regional and site-specific normal ranges, comparison to BCWQGs and EVWQP benchmarks (and interim screening values for total nickel). Statistical analysis of temporal trends over time and among years.	Statistical analyses were completed for Order Constituents, constituents with early warning triggers under the AMP, and constituents that have previously identified and tracked through SDM and/or AMP response frameworks (listed in Section 2.2.1), detailed data interpretation was focused total selenium, nitrate, sulphate, total and dissolved cadmium, and organoselenium species. Aqueous concentrations of nitrate, sulphate, selenium, total, and other constituents increased in 2021 in Dry Creek compared to baseline and 2020. Site performance objectives (SPO) for total selenium was exceeded at LC_DCDS in 2021. Frequent guideline and benchmark exceedances on Dry Creek in 2021. Aqueous organoselenium concentrations showed inconsistent changes in 2021 - there was no effect of the BRN on organoselenium concentrations.	Ongoing responses through AMP process (triggered in 2018). Implementation of Nitrate Compliance Action Plan, Modification of DCWMS, Implementation of the integrated effects assessment modelling investigation for nitrate, as well as other ongoing investigations into the effects of aqueous mine-related constituents on biota and selenium bioaccumulation. Following the BRN spoil failure sampling was increased and integrated into the report. Ongoing Investigation and consideration of additional mitigation options is ongoing.	EMC involved in BRN response and meeting 2021 data delivered to EMC February 2022, Presentation with 2021 data delivered to EMC on March 8, 2022. Written input from EMC on March draft data package received March 29, 2022. 2021 LAEMP report delivered to EMC by April 30, 2022 2022 Study Design delivered by May 1st, 2022
Is acute or chronic toxicity occurring from water collected at the outlet of the DCWMS (LC_SPDC) or within Dry Creek (LC_DCDS), and is toxicity changing over time?	Quarterly acute toxicity test at LC_SPDC. Comparison of chronic toxicity test results with results from reference area FR_UFR1 and pooled regional references, evaluation of frequency of test failures for acute toxicity tests, comparison to previous years' results.	No acute toxicity test failures at LC_SPDC in 2021. Generally, no change in frequency or severity of potential adverse responses in chronic toxicity testing at LC_DCDS. Acute toxicity testing efforts were greatly increased following the BRN spoil failure, almost daily from February 12 to March 17, with no effect of the BRN spoil failure seen in the these tests. No adverse responses are seen in Q2 in chronic toxicity testing it is unlikely that the BRN spoil failure had an effect.	Increased in sampling frequency related to the BRN spoil failure.	
Are benthic invertebrate community endpoints within normal ranges derived based on samples collected at regional and local reference areas within the Elk River as part of the Regional Aquatic Effects Monitoring Program (RAEMP), and are the endpoints changing over time?	Comparison of benthic invertebrate community endpoints to regional and site-specific normal ranges, statistical evaluation of spatial and temporal trends relative to reference, correlation analysis.	Benthic invertebrate community total abundance and taxonomic richness were generally within regional and site-specific (where available) normal ranges at Dry Creek LAEMP sampling areas in 2021. Benthic invertebrate communities in Dry Creek upstream of the DCWMS (LC_DC3) were most likely to have endpoints outside of normal ranges (particularly %EPT, %E, and %C). Considering all the benthic invertebrate community results, the BRN spoil failure may have had some limited (but not lasting) effects on the abundance at study areas located closest to the failure in 2021 (LC_DC3). %E was correlated nitrate, sulphate, selenium, nickel, and cadmium concentrations, %T was correlated with water temperature, and Total organism abundance correlated positively with calcite index.	Adjustments to DCWMS designed to mitigate water quality effects. Added sampling and analyses to assess potential BRN spoil failure effects.	
How do selenium concentrations in benthic invertebrate tissue compare to normal ranges and BCWQG or EVWQP benchmarks, and are they changing over time?	Comparison of benthic invertebrate tissue selenium concentrations to regional normal range and EVWQP benchmarks, statistical evaluation of temporal and spatial trends relative to reference.	The EVWQP level 3 benchmarks for effects to juvenile birds, benthic invertebrates, and juvenile fish were not exceeded in 2021. At least one composite sample collected at LC_DCDS in March, May, and July 2021 exceeded the EVWQP level 2 benchmarks for effects to juvenile birds, benthic invertebrates, or juvenile fish. Benthic invertebrate tissue selenium concentrations exceeded the regional normal range in at least one sample from all Dry Creek, Fording River (LC_FRUS and LC_FRB), and Grace Creek (LC_GRCK) study areas in 2021. Tissue selenium concentrations were higher at area LC_DCDS than upstream of the DCWMS (LC_DC3) during March, May, and December, but did not differ significantly in early June, late June, and September. It is unlikely that the BRN spoil failure resulted in an increase in benthic invertebrate tissue selenium concentrations.	Operational changes to DCWMS to minimize retention time in pond to reduce bioaccumulation potential. Additional sampling in 2021 associated with evaluating potential BRN effects.	
Are changes in fish and fish habitat (including instream flow and calcite index) occurring within Dry Creek as a result of mine operations?	Flow, temperature, DO, redd survey, and calcite data with previous years' sampling, guidelines, and/or literature (specifically optimal temperature, DO, and flow ranges for different WCT life stages).	There was not fish tissue Se sampling in 2021. Mean daily and instantaneous water temperatures in Dry Creek were within limits for WCT rearing and survival in 2021. Calcite presence continues to increase annually throughout Dry Creek. Dissolved oxygen concentrations were above the long-term chronic and instantaneous acute BCWQGs for fish life stages other than buried embryos and alevin for all samples in Dry Creek and the East Tributary in 2021.	Additional fish habitat monitoring done by Ecofish in response to the BRN spoil failure.	

Table 8.2: Summary of Biological Trigger Analysis for Percent EPT and Selenium Benthic Invertebrate Tissue, LCO Dry Creek LAEMP, 2021

Waterbody	Area		% EPT [a]		Selenium BIT [b]	
			Number Replicates Evaluated	Number of Replicates Reaching Biological Trigger [c]	Number Replicates Evaluated	Number of Replicates Reaching Biological Trigger [d]
Dry Creek	LC_DCDS	Mine-Exposed	3	0	35	13
	LC_DC1		3	0	26	7

Notes: % EPT = Percent EPT (Ephemeroptera ([mayflies], Plecoptera [stoneflies], and Trichoptera [caddisflies]); Selenium BIT = Selenium concentrations in benthic invertebrate tissue (mg/kg dw).

[a] Biological Trigger analysis for % EPT was for the September sampling event.

[b] Biological Trigger analysis for Selenium BIT was for the March, May, June (early, mid and late), September and December LAEMP 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 H.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 H.2.3 for more details.

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APPENDIX A

DATA ANALYSIS

APPENDIX A DATA ANALYSIS

A1 DATA ANALYSIS

A1.1 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. Data extracted from Teck's EQuIS database were screened for text values and converted to a common unit (all metal concentrations were converted to mg/L, except for total and dissolved cadmium, dissolved cobalt, total nickel, total selenium which were stored as µg/L).

Aqueous concentrations of the Order constituents (dissolved cadmium, nitrate, total selenium, sulphate, total dissolved solids and nickel; Teck 2014) measured at each monitoring area for the calendar year (i.e., January to December 2021) were compared to applicable EVWQP level 1, level 2 and/or level 3 benchmarks or interim screening values (Golder 2014a, 2014b; Teck 2014; Appendix Table B.1). Total selenium and total cadmium concentrations were also compared to SPOs outlined in permit 107517; ENV 2021 for designated locations (LC_UC, LC_DCDS, and LC_GRCK). Concentrations of the remaining constituents listed in Section 2.2.1 were compared to applicable BCWQGs (BCMOECCS 2019, 2021), if available. Order Constituents, constituents with early warning triggers under the AMP, constituents with an SPO, and nutrients (Total Kjeldahl Nitrogen, phosphorus and orthophosphate) were plotted using available data from 2012 to 2021 for each monitoring area individually relative to BCWQGs, EVWQP benchmarks, and interim screening values (where applicable), and as combined plots to allow for visual comparison among areas. Concentrations of aqueous selenium species selenate, selenite, DMSeO, MeSe([V], and combined DMSeO and MeSe(IV) were plotted against benthic invertebrate tissue selenium concentrations for each Dry Creek area.

If replicate sample results were available for a given day, the Kaplan-Meier (K-M) mean of the replicates was used. Monthly means were also calculated using the K-M method. The K-M method is non-parametric and can accommodate multiple Laboratory Reporting Limits (LRLs). 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 2020).

A Principal Component Analysis (PCA) was used to condense water quality results for use in benthic invertebrate community correlation analysis (Section A1.2). A PCA is a multivariate approach which transforms a group of 'n' variables into a smaller new set of uncorrelated variables (the principal components; PCs). The principal components are defined to be linear combinations of the original 'n' variables. A PCA was conducted using K-M mean water chemistry parameters calculated from 2019 to 2021 for the biological monitoring stations reported in the LAEMP except LC_FRUS. LC_FRUS is located on the Fording River upstream of Dry Creek and was excluded due to the large distance relative to Dry Creek. For each year, four seasons were defined: winter (December to March), early spring (May), spring (June) and summer (July). Each season had to have at least one recorded result. The yearly mean was calculated as the mean of the seasonal means. If there were missing data for any season, the entire year was excluded. A PCA cannot incorporate values below the LRL, therefore any parameters with >25% of the mean values below the LRL were excluded from the PCA. Kaplan-Meier mean values at the LRL were replaced with the LRL (Farnham et al. 2002). When there was more than one LRL for a given parameter, or detected values were below the highest LRL, these values were replaced with the highest LRL. The contribution of individual parameters to the first two principal components were quantified by calculating their correlation using a Pearson's correlation coefficient. The PCA and correlation analyses were conducted in R (R Core Team 2020).

Quantitative tests for temporal trends in monthly mean concentrations of Order Constituents, constituents with early warning triggers under the AMP, and constituents that have previously been identified by SDM and/or AMP response frameworks were completed using available data from 2012 to 2021. The analyses were completed individually for each monitoring area using two different approaches: 1) a non-parametric seasonal Kendall test and 2) a censored regression Analysis of Variance (ANOVA) model with factors Year and Month.

The non-parametric seasonal Kendall test described by Hirsch et al. (1982) was conducted using scripts written in R software (R Core Team 2020). The seasonal Kendall test assesses temporal trends separately for each season (or month in this case) and combines the results for each season into an overall test for trend. The test is non-parametric and assesses whether there is a monotonic increasing or monotonic decreasing trend over time. The test is conducted by calculating the test statistic S_i which is equal to the sum of the number of increases and decreases from a time period t to all time periods after t for each observation in season i. The overall test statistic S is computed as the sum of S_i for all seasons. The significance of the observed S is determined by comparing it to a critical value of S (at the significance level $\alpha = 0.05$) determined from the exact sampling distribution of S (calculated by determining all possible permutations and combinations of S based on the increases and decreases from the number of pairwise comparisons made; Hirsch et al. 1982). If more than

45 pairwise comparisons are made (equivalent to the number of pairwise comparisons for n = 10 in a single season), then the normal approximation is used to calculate a p-value and to assess significance (Hirsch et al. 1982). The standard normal deviate Z is calculated as:

$$Z = \begin{cases} \dfrac{S-1}{\sqrt{\sigma_S}} if\ S > 0 \\ 0 \quad if\ S = 0 \\ \dfrac{S+1}{\sqrt{\sigma_S}} if\ S < 0 \end{cases}$$

where $\sigma_S = \sum_{i=1}^{k} \frac{n_i(n_i-1)(2n_i+5)-\sum_{T_i} t_i(t_i-1)(2t_i+5)}{18}$ and n_i is the number of samples in month i, t_i is the number of tied values for each tied value T_i, and k is the number of seasons (Hirsch et al. 1982).

An estimate of the trend slope over time was estimated by computing the median of all slopes between data pairs within the same month (Helsel and Hirsch 2002). The slope was reported as a change in concentration per year and as a percentage change in concentration per year. The intercept of a line through the time series was estimated as the median intercept of all lines through each point with the estimated slope (Pohlert 2016). The trend analysis was only conducted with a minimum number of five pairwise comparisons, the minimum number required for all consecutive increases or decrease to be significant at α = 0.05.

An ANOVA model with factors Year and Month was also used to assess temporal changes in monthly mean concentrations for water quality parameters each area (reference and mine-exposed) from 2012 to 2021. Only years with at least six months and only areas with at least three years of data were included in the analysis. Replication at area LC_FRUS was too low from 2015 onwards for analysis of temporal effects using this test methodology. Because of the presence of LRLs for most parameters, a censored regression ANOVA model was used and a log-normal distribution of the response variable was assumed and fit with maximum likelihood estimation for each area. The significance of each term in the model was assessed using likelihood-ratio tests to determine if there is a significant change in log-likelihood with the addition of the term in the model. This tested for an overall difference among years (including the Month term in the model controlled for seasonal effects within a year). If the Year term was significant (α = 0.05) then post-hoc contrasts were conducted to test for pairwise differences among years with an α = 0.05 in a Tukey's Honestly Significant Difference (HSD) test which corrects for the number of comparisons. For each year, a percent magnitude of difference from the base year (i.e., first year with minimum number of months) was calculated as:

Magnitude of Difference = $(\bar{x}_i - \bar{x}_{2012})/\bar{x}_{2012}$ × 100%

where $\bar{x}_i$ is the observed mean for a given year and $\bar{x}_{2012}$ is the observed mean in 2012 (i.e., the base year; the first year with available data).

The analysis was completed twice, once evaluating the significance and direction of change in each endpoint at each area since the base year, and once comparing the 2021 annual mean against all historical means and the previous year (2020).

Complete results for statistical testing of Dry Creek LAEMP water quality data from 2012 to 2021 can be found in Appendix Tables B.2 and B.3 (i.e., all constituents evaluated, see Section 2.2.1). Time-series figures of water quality constituents plotted against BCWQGs, regional benchmarks and normal ranges (where applicable) are included in Appendix B for constituents that were not the focus on more detailed interpretation (i.e., did not meet the criteria listed above).

Changes in concentrations of selenium species before and after the BRN spoil failure were tested using a two-way censored regression ANOVA with a term (BA) for before (before February 2021) and after (after February 2021) the spoil failure, a term for month, and their interaction. Only the months for which post-spoil data were available (March to December) were included, and the analysis was limited to 2020 and 2021 to reduce the confounding effects of annual trends. If the interaction was significant ($\alpha = 0.05$), it suggested concentrations differed before and after the spoil failure, but the effect was dependent on month. Thus, a Tukey's HSD post-hoc test was used to identify which months significantly differed using an $\alpha = 0.05$. A magnitude of difference (MOD) before and after spoil failure was calculated for each month as:

$$MOD = \frac{MCT_{After} - MCT_{Before}}{MCT_{Before}}$$

where the measures of central tendency (MCT) before and after the spoil failure were back-transformed estimated marginal means from the ANOVA model. In cases where the BA term was significant in the absence of an interaction, it suggested differences before and after the spoil failure that were consistent across all months. An MOD was then calculated across all months combined. The censored regression model assumed a log-normal distribution and was fit with maximum-likelihood using R statistical software (R Core Team 2020)

A1.2 Benthic Invertebrate Community

Community endpoints that were evaluated included total abundance, taxonomic richness (to the lowest practicable level of taxonomy), and the abundances and proportional abundances (%) of major taxonomic groups, including the combined orders of Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), collectively known as EPT, Ephemeroptera alone, Plecoptera alone, Chironomidae, non-Chironomidae Diptera, and Oligochaeta. Community data were plotted to show changes over time relative to regional normal ranges[1] as well as site-specific normal ranges[2].

Only two Dry Creek areas (LC_DCDS and LC_DC1) were sampled prior to 2018, limiting statistical assessments of changes in benthic community endpoints over time to previous LAEMP cycles. Several statistical tests were employed in 2021 to address the temporal component of study question #3 (i.e., are benthic invertebrate endpoints changing over time?), to evaluate spatial differences in the benthic invertebrate community, and to also assess correlations between changes in benthic invertebrate community endpoints and potentially influencing variables (e.g., benthic invertebrate tissue selenium, water chemistry, substrate composition, calcite index, water quality variables, principal component axes from PCA analysis, *in situ* water quality measurements, and habitat variables). The regional and site-specific normal ranges used for evaluation of benthic invertebrate community are applicable only to data from September. In addition, the evaluation of data collected in alternate seasons in previous years of Dry Creek LAEMP monitoring (i.e., February, May, June, and December in 2019 and 2020) indicated that benthic community condition in September was clearly distinct from those collected in the remainder of the seasons, with greater variability observed among seasons than spatially among sampling areas (Minnow 2021a). As such, benthic invertebrate community data collected in September were the focus of data analyses and interpretation unless otherwise noted below. Data from other seasons (namely May and June) were used in the temporal evaluation of the potential effects of the BRN spoil failure on the benthic invertebrate community. All statistics were conducted in R (R Core Team 2020).

Temporal changes in benthic invertebrate community endpoints from mine-exposed Dry Creek LAEMP areas relative to reference were assessed using a two-way ANOVA. This was completed for two data groupings: 1) mine-exposed areas of Dry Creek compared to the

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[1] The reference normal range as presented in the RAEMP represents the 2.5th and 75th percentiles of the distribution of reference area data (pooled 2012 to 2019 data) reported in the 2017 to 2019 RAEMP report (Minnow 2020c).

[2] Site-specific normal ranges represent the 2.5th and 97.5 percentile for a given area as determined by habitat predictors for a given site 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 2020c).

reference area LC_DCEF, and 2) the Fording River downstream (LC_FRB) and upstream (LC_FRUS; "reference" for the purposes of the analyses) of Dry Creek to evaluate the potential influence of Dry Creek on the benthic invertebrate community in the Fording River. Data collected in May and September of each year were evaluated using this approach for the two data groupings (i.e., for mine-exposed areas in Dry Creek compared to reference and for LC_FRB compared to LC_FRUS). As outlined above, the analysis of September data was the focus of data interpretation, while data analyses for May data were included only in the evaluation of the potential effects of the BRN spoil failure. Comparisons could only be completed when replicated data were available for paired mine-exposed and reference or paired LC_FRB and LC_FRUS results. As such, temporal comparisons of September and May data were limited to data from 2019 to 2021, except for comparison of LC_FRB and LC_FRUS in September which included data from 2018 to 2021.

Benthic invertebrate community endpoints evaluated across years were those listed above. For each endpoint, an overall ANOVA model with factors Year, Area and Year × Area was fit. The ANOVA models and contrasts were conducted in R (R Core Team 2020) using customized scripts. The best transformation for each end point was chosen as the transformation for which a Shapiro-Wilk's test on the residuals gave the highest p-value (i.e., most normally distributed). Significance of the spatial and temporal pairwise comparisons were assessed separately with an α of 0.1 in a Tukey's HSD which corrects for the number of comparisons.

For each year, a magnitude of difference from the base year (i.e., first year with data) was calculated as:

$$\frac{Year_i - Base\,Year}{SDBase\,Year}$$

For each area, a magnitude of difference from the reference area was calculated as:

$$\frac{Exp - Ref}{SDRef}$$

Tables for visualizing the ANOVA results were prepared in Microsoft Excel, and plots were prepared in R (R Core Team 2020).

Temporal changes (2019 to 2021) in June benthic invertebrate community indices were assessed at LC_DCDS and LC_DC1 using a one-way ANOVA with Year. Transformations were selected using the same approach described for the two-way ANOVAs and post-hoc analyses and MODs were consistent with the two-way temporal contrasts when there was a significant year effect.

Benthic invertebrate community data collected in all seasons (May, June September, and December) were plotted over time to visualize temporal changes, and those collected in September were compared to relative to the regional normal (reference area) range and site-specific normal range. Plots were also prepared that display results from September of each year when replicated samples were collected (2019 to 2021) to show the spatial and temporal variability in benthic invertebrate endpoints for September only relative to the regional and site-specific normal ranges. The regional normal range is defined as the 2.5th and 97.5th percentiles of the distribution of reference area data (pooled 2012 to 2019 data) reported in the 2017 to 2019 RAEMP report (Minnow 2020c). Site-specific normal ranges represent the 2.5th and 97.5 percentile for a given area as determined by habitat predictors for a given site in relation to the complete set of Elk Valley reference monitoring areas. The site-specific normal ranges presented were those estimated using regression modelling for the RAEMP (Minnow 2020c).

An assessment of whether changes in physical and chemical parameters may be related to variability in benthic invertebrate community structure was conducted for September from 2019 to 2021[3] data across all Dry Creek and Fording River areas (i.e., September data only from LC_DCEF, LC_DC3, LC_DCDS, LC_DC2, LC_DC4, LC_DC1, LC_FRUS, LC_FRB, and LC_GRCK). Spearman Rank Correlations were conducted with benthic invertebrate community endpoints including total abundance, taxonomic richness, %EPT, %Ephemeroptera, %Plecoptera, %Trichoptera, %Oligochaeta, %Chironomidae, and %Non-Chironomidae Diptera, against a variety of physical and chemical parameters (including water quality variables, substrate characteristics, habitat variables, and *in situ* water quality measurements; Appendix Figure D.4; Appendix Tables D.6 to D.8). For water chemistry parameters, annual mean concentrations were calculated for different seasons and then averaged across the year prior to the benthic sampling date (2019 to 2021). Seasons were defined based on changes in water chemistry across a year and designed to capture high and low concentration periods throughout a year. For each year, four seasons were defined: winter (December to March), early spring (May), spring (June) and summer (July). Each season had to have at least one record. Spearman rank correlation analysis is a non-parametric method that tests for monotonic increases, with significantly positive or negative correlation coefficients (rho) suggesting an increase or decrease, respectively, in the ranked data with increasing years. Significant correlations were assessed at alpha = 0.05, Bonferroni corrected for 47 independent comparisons (corrected alpha = 0.05/47 = 0.00106).

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[3] September benthic invertebrate data were only collected at LC_DC1 and LC_DCDS prior to 2019, so integration of all Dry Creek sampling areas in correlation analysis is only possible from 2019 onwards.

Water chemistry parameters were also analyzed using PCA (see Section 2.2.3 for details) to combine multiple water quality variables into PC1 and PC2, which were also included in the correlation analysis. To ensure correlations were comparable among different parameters only complete records (i.e., a value for every water and benthic invertebrate community endpoint) were included in the analysis. Scatterplots of area-wise data indicating relationships and r-values for significantly correlated benthic invertebrate community endpoints were generated to visualize relationships.

A1.3 Benthic Invertebrate Tissue Selenium

Composite-taxa benthic invertebrate tissue selenium concentrations were plotted for all areas for 1) 2018 to 2021, and 2) in March, May, early-June, late-June, September and December, 2021 relative to:

- the normal (reference area) range (i.e., 1.41 mg/kg dw - 7.79 mg/kg dw), defined as the 2.5th and 97.5th percentiles of tissue selenium concentrations measured in reference areas that have not been disturbed by mining in historical studies completed in the Elk River watershed from 1996 to 2019 reported in the RAEMP (Minnow 2020c);
- corresponding EVWQP effect benchmarks (outlined in Table E.1);
- shading indicating the DCWMS operational status (DCWMS Operational, DCWMS Operational – Sedimentation Pond 1 only, Bypass Operational/Sedimentation Pond 1 Refilling, Bypass Operational/Dewatering, and Bypass Operational).

Benthic invertebrate tissue selenium data are available for temporal comparisons for all areas from December 2018 onwards, and for areas LC_DC1, LC_DCDS, LC_FRUS, and LC_FRB data are available prior to December 2018 as well.

Teck has developed a selenium speciation bioaccumulation tool to help predict and interpret bioaccumulation in areas with detectable organoselenium species (deBruyn and Luoma 2021). For every 2021 biological sampling event, predicted benthic invertebrate tissue selenium concentrations were generated from water quality data (specifically, selenium speciation data and sulphate concentrations) using this bioaccumulation tool and presented alongside field-measured tissue concentrations.

Potential effects of different operational phases of the DCWMS and of the BRN spoil failure on benthic invertebrate tissue selenium concentrations were evaluated for Dry Creek and Fording River areas from December 2018 through 2021. The analyses were completed by separately evaluating changes at each mine-exposed area of Dry Creek relative to reference (LC_DCEF) and at the Fording River downstream (LC_FRB) and upstream (LC_FRUS[4]) of Dry Creek among DCWMS operational phases (to evaluate potential effects of the DCWMS) that were identified as either before or after the BRN spoil failure (to evaluate potential effects of the BRN spoil failure). The ANOVA model that was fit to the data for each mine-exposed area (and the reference area) 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 = (DCWMS Operational Before BRN spoil failure [December 2018 to June 2020], DCWMS Dewatering/Bypass Operational Before BRN spoil failure [September 2020], DCWMS Bypass Operational Before BRN spoil failure [December 2020], DCWMS Bypass Operational After BRN spoil failure [March 2021 to May 2021], DCWMS Operational After BRN spoil failure [June 2021 to July 2021], DCWMS Bypass Operational After BRN spoil failure [September 2021 to November 2021], where each period included between one to seven individual sampling events and reflected the operational status of the DCWMS);
- $Period \times \mathrm{CI}$ = 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.

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

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[4] LC_FRUS is not in reference condition but is upstream of the mouth of Dry Creek therefore is used as a "reference" in the comparison of conditions in the Fording River downstream of Dry Creek (LC_FRB) to evaluate potential effects of Dry Creek on the Fording River.

mine-exposed and reference areas varied among DCWMS operational periods, but it depended on which sample months were compared. In that case, contrasts were conducted to determine differences between periods for each sampling event using an $\alpha = 0.1$[5], with a Bonferroni correction for the number of between period comparisons. Contrasts were evaluated among all six DCWMS operational periods. Differences among sampling events within a given period were not statistically contrasted.

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;
- $\bar{X}_2$ = 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.

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[5] In this analysis a post-hoc bonferroni correction was required because the post-hoc comparisons were more complex. Because bonferroni correction is a more strict post-hoc correction that Tukey's HSD we used a more conservative p-value of 0.1 in the analysis.

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 DCWMS operational periods (including assessment of before/after the BRN spoil failure). 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 2020).

Changes in composite-taxa benthic invertebrate tissue selenium concentrations among months in 2021 for all Dry Creek monitoring areas (including reference; LC_DCEF) and for the Fording River sampling areas (LC_FRUS and LC_FRB). Areas were quantified using an ANOVA with factors Area and Month and their interaction. The factor Month included March, May, early June, late June, September, and December for each of the sampling areas. Response variables were log10 transformed where necessary to meet the assumption of normality, which was tested using a Shapiro-Wilks test and Q-Q normal plots of the model residuals. When this assumption could not be met, response variables were rank transformed. The significance of the main effects and interaction terms of the ANOVA were assessed using an α of 0.05, and the results of these determined which post-hoc comparisons were then conducted.

When the interaction between Area and Month was significant, it indicated that the differences among the areas changed across months. Post-hoc comparisons were then conducted to 1) test for differences among months for each area, and 2) test for differences among the exposed and reference areas in each month. When the Month was significant rather than the Area and the interaction between Month and Area, it indicated that there were no differences between the areas and monthly differences remained unchanged across areas and post-hoc comparisons were conducted to 1) test for differences between the first month of 2021 sampling and each subsequent month for all areas, and 2) test for differences between the exposed and reference areas in all months.

For all significant post-hoc temporal comparisons, an MOD between years was calculated as:

$$MOD_{Month} = \frac{MCT_{month2} - MCT_{month1}}{MCT_{month1}} \text{ x } 100\%$$

For significant spatial comparisons, a MOD was calculated between the exposed and reference areas within each month as:

$$MOD = \frac{MCT_{Exposed} - MCT_{Reference}}{MCT_{Reference}} \text{ x } 100\%$$

The MCT was calculated as a back-transformed estimated marginal mean. When the analysis was done on the rank-transformed scale, the observed effect size was estimated using median values instead of marginal means.

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 *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 2020) using customized scripts, with letters used to indicate which years differed significantly from one another.

APPENDIX B

DATA QUALITY REVIEW (DQR)

APPENDIX B DATA QUALITY REVIEW (DQR)

B1 INTRODUCTION

B1.1 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 B.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.

B1.2 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 B.1: Laboratory Data Quality Objectives for the Dry Creek LAEMP, 2021

Quality Control Measure	Quality Control Sample Type/Check	Study Component				
		Water Chemistry	**Selenium Speciation**	**Chlorophyll-a and AFDM**	**Benthic Invertebrate Tissue Chemistry**	**Benthic Invertebrate Community**
		ALS	**Brooks**	**ALS**	**TrichAnalytics**	**Cordillera**
Analytical Laboratory LRLs[a]	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	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	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, dissolved orthophosphate, total phosphorus, TOC, DOC, total and dissolved metals) 75 to 125% (ammonia, bromide, chloride, fluoride, nitrate, nitrite, sulphate)	75 to 125% (methylseleninic acid, selenate, selenite, selenocyanate, selenomethionine, total selenium)	-	-	-
	Matrix Spike Duplicate	-	75 to 125% (selenate, selenite, selenocyanate, selenomethionine, total selenium)	-	-	-
	Recovery of Certified Reference Material	210 to 230% (ORP)	75 to 125% (total selenium)	-	60 to 140% (antimony, barium, boron, silver, tin, titanium) 70 to 130% (all remaining analytes) 90 to 110% (selenium)	
	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)	-	80 to 120% (chlorophyll-a)	-	-
	Taxonomic Accuracy	-	-	-	-	<5% TIR

Notes: ALS = ALS Environmental; 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] If no guideline or benchmark exists for an analyte, the LRL should be less than predictions.

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.

B2 WATER CHEMISTRY

B.2.1 Laboratory Reporting Limits

The analytical reports for water chemistry from ALS Environmental (ALS; CG2101306, CG2101807, CG2106159, CG2104066, L2565161, and L2568053; Appendix K) and Brooks Applied Labs (BAL; 2104128, 2105320, 2106211, 2107001, 2112094, 2109232; Appendix K) were examined to assess LRLs relative to analyte concentrations and applicable guidelines (Tables B.2 and B.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 for 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) benchmarks, screening values for water quality (Teck 2014), and relevant site-specific benchmarks. Several analytes were reported at concentrations below the LRL in 100% of samples (Tables B.2 and B.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.

B.2.2 Laboratory and Field Blanks

A total of 113 method blank (MB) samples were analyzed in the ALS laboratory reports (Appendix K). Of the 572 reported method blank results, only one result for acidity (see laboratory report CG2101306 in Appendix K) had a concentration above detection, therefore failing the laboratory DQO. However, this concentration was only marginally above detection and represents only 0.17% of MB samples, and so does not suggest significant laboratory contamination.

A total of 53 method blank (MB) samples were analyzed in the BAL laboratory reports (Appendix K). Of the 245 reported method blank results, 10 results had detectable concentrations: selenite in six blank samples (see laboratory reports 2107001 and 2109232 in Appendix K), total selenium in three blank samples (see laboratory report 2109232), and selenate in one blank sample (see laboratory report 2105320). For all 10 of the above results, concentrations were below the LRL, therefore meeting the DQO (Table B.1) despite exceeding the method detection limit (see Section A.2 for a description of the difference between the method detection limit and laboratory reporting limits). Therefore, all BAL MB samples met the laboratory DQO. As the overall number of DQO exceedances

Table B.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 to 20	-	1 (11.1%)
Turbidity	NTU	-	-	-	0.1	-	1 (11.1%)
Anions amd Nutrients							
Acidity (as $CaCO_3$)	mg/L	-	-	-	1 to 2	-	7 (77.8%)
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	-	-	-	1	-	4 (50%)
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	-	-	-	1	-	9 (100%)
Bromide	mg/L	-	-	-	0.05 to 0.25	-	9 (100%)
Fluoride[d]	mg/L	-	1.45	-	0.02 to 0.1	0	2 (22.2%)
Nitrite (as N)[e]	mg/L	0.0200	0.0600	-	0.001 to 0.005	0	3 (33.3%)
Total Kjeldahl Nitrogen	mg/L	-	-	-	0.05 to 0.25	-	5 (55.5%)
Orthophosphate	mg/L	-	-	-	0.001	-	6 (66.7)
Phosphorus -Total	mg/L	-	-	-	0.002 to 0.004	-	2 (22.2%)
Organic / Inorganic Carbon							
Dissolved Organic Carbon	mg/L	-	-	-	0.5	-	1 (11.1%)
Total Organic Carbon	mg/L	-	-	-	0.5	-	2 (22.2%)
Total Metals							
Aluminum	mg/L	-	-	-	0.003	-	1 (11.1%)
Antimony	mg/L	0.00900	-	-	0.0001	0	3 (33.3%)
Arsenic	mg/L	-	0.00500	-	0.0001	0	2 (22.2%)
Beryllium	µg/L	0.130	-	-	0.02	0	8 (88.8%)
Bismuth	mg/L	-	-	-	0.00005	-	9 (100%)
Boron	mg/L	1.20	-	-	0.01	0	6 (66.7%)
Cobalt	µg/L	4.00	110	-	0.1	0	7 (77.8%)
Copper	mg/L	-	-	-	0.0005	-	8 (88.9%)
Iron	mg/L	-	1.00	-	0.01	0	1 (11.1%)
Lead[d]	mg/L	0.00798	0.120	-	0.00005	0	4 (44.4%)
Manganese	mg/L	1.20	2.03	-	0.0001	0	1 (11.1%)
Mercury[f]	µg/L	0.00125	-	-	0.0005	0	4 (44.4%)
Nickel[d]	mg/L	0.120	-	0.00530	0.0005	0	3 (33.3%)
Silver[d]	mg/L	0.00150	0.00300	-	0.00001	0	9 (100%)
Thallium	mg/L	0.000800	-	-	0.00001	0	8 (88.9%)
Tin	mg/L	-	-	-	0.0001	-	9 (100%)
Titanium	mg/L	-	-	-	0.0003 to 0.01	-	4 (44.4%)
Vanadium	mg/L	-	-	-	0.0005	-	5 (55.6%)
Zinc[d]	mg/L	0.0412	0.0668	-	0.003	0	7 (77.8%)
Dissolved Metals							
Aluminum[g]	mg/L	0.0500	0.100	-	0.001 to 0.003	0	6 (66.7%)
Antimony	mg/L	-	-	-	0.0001	-	3 (33.3%)
Arsenic	mg/L	-	-	-	0.0001	-	4 (44.4%)
Beryllium	µg/L	-	-	-	0.02	-	9 (100%)
Bismuth	mg/L	-	-	-	0.00005	-	9 (100%)
Boron	mg/L	-	-	-	0.01	-	6 (66.7%)
Cadmium[d]	µg/L	0.264	0.801	0.173	0.005	0	1 (11.1%)
Chromium	mg/L	-	-	-	0.0001	-	2 (22.2%)
Cobalt	µg/L	-	-	-	0.1	-	9 (100%)
Copper	mg/L	-	-	-	0.0002	-	8 (88.9%)
Iron	mg/L	-	0.350	-	0.01	0	9 (100%)
Lead	mg/L	-	-	-	0.00005	-	9 (100%)
Manganese	mg/L	-	-	-	0.0001	-	2 (22.2%)
Mercury	µg/L	-	-	-	0.000005	-	9 (100%)
Nickel	mg/L	-	-	-	0.0005	-	5 (55.5%)
Silver	mg/L	-	-	-	0.00001	-	9 (100%)
Thallium	mg/L	-	-	-	0.00001	-	9 (100%)
Tin	mg/L	-	-	-	0.0001	-	9 (100%)
Titanium	mg/L	-	-	-	0.0003 to 0.01	-	9 (100%)
Vanadium	mg/L	-	-	-	0.0005	-	9 (100%)
Zinc	mg/L	-	-	-	0.001	-	4 (44.4%)

Notes: Only analytes with at least one results < Laboratory Reporting Limit (LRL) or LRL were above guidelines were displayed . The total number of samples in 2021 (n) was nine including one field duplicate sample. EVWQP = Elk Valley Water Quality Plan; "-" = no applicable guideline exists/not applicable.

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

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

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

[g] Guideline based on minimum *in situ* pH (7.51).

Table B.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	-	14 (87.5%)
MeSe(IV) - Methylseleninic Acid	mg/L	-	-	-	0.01	-	13 (81.2%)
MeSe(VI) - Methaneselenonic Acid	mg/L	-	-	-	0.01	-	16 (100%)
SeCN - Selenocyanate	mg/L	-	-	-	0.01	-	16 (100%)
SeMe - Selenomethionine	mg/L	-	-	-	0.01	-	16 (100%)
Selenosulfate	mg/L	-	-	-	0.01	-	16 (100%)
Selenium Unknown	mg/L	-	-	-	0.01	-	16 (100%)

Notes: The total number of samples in 2021 (n) was 16. EVWQP = Elk Valley Water Quality Plan; LRL = Laboratory Reporting Limit, "-" = no applicable guideline exists/not applicable. Only analytes with at least one result < LRL or an LRL were 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.

was low (ALS: 0.21%; BAL: 0%), the impacted results were considered to have a negligible impact on data interpretability, and laboratory precision was considered excellent.

One field blank sample and one trip blank sample were submitted to ALS for water chemistry analyses to assess the potential for field sampling contamination (see laboratory report CG2101306 in Appendix K). The same DQOs that were used for laboratory blanks were also used for field blanks (i.e., concentrations should be below the LRL). Of the 94 individual analyte results measured in the field blank, 14 (14.9% of results) were above the LRL and so did not meet the laboratory DQO (Table B.4). Several analytes of primary concern did not meet the laboratory DQO in the field blank sample, including total and dissolved aluminum, total and dissolved barium, total chromium, dissolved manganese, and total and dissolved strontium. Of the 63 individual analyte results measured in the trip blank, 10 (15.9% of results) were above the LRL and so did not meet the laboratory DQO (Table B.4). Several analytes of primary concern did not meet the laboratory DQO in the trip blank sample, including total aluminum, barium, chromium, and strontium. As multiple analytes of concern did not meet the laboratory DQO in both the field and trip blank, potential field contamination will be taken into consideration during data interpretation. Field and trip blanks were not collected for selenium speciation.

B.2.3 Data Precision

A total of 12 laboratory duplicate samples were used to evaluate precision within the ALS laboratory reports (Appendix K). Out of the 394 individual analyte results, only one result did not meet the laboratory DQO (acidity as $CaCO_3$, see laboratory report CG2101306 in Appendix K). As this result only represents 0.25% of duplicate results, ALS laboratory analytical precision was considered excellent.

A total of 11 laboratory duplicate samples were used to evaluate precision within the BAL laboratory reports (Appendix K). Out of the 51 individual analyte results, all met the laboratory DQO. Therefore, BAL laboratory analytical precision was considered excellent.

One set of field duplicate samples was collected to assess field sampling precision for water chemistry analyzed by ALS (Table B.5). Several relative percent differences (RPDs) could not be calculated as both analyte concentrations were below the LRL. Of the 67 RPDs that could be calculated, only six analytes had RPDs greater than 30%, which consisted of oxidation-reduction potential (ORP), acidity (as $CaCO_3$), total ammonia and phosphorus, Total Kjeldahl Nitrogen (TKN), and cation-anion ratio (9.0% of all pairs; Table B.5). Of the comparisons with RPDs greater than 30%, three RPDs resulted from analyte concentrations near and below the LRL, where greater variability is expected (acidity (as $CaCO_3$),

Table B.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	0	1 (100%)
Total Metals				
Aluminum	mg/L	0.003	1 (100%)	1 (100%)
Barium	mg/L	0.001	1 (100%)	1 (100%)
Chromium	mg/L	0.001	1 (100%)	1 (100%)
Magnesium	mg/L	0.001	1 (100%)	1 (100%)
Silicon	mg/L	0.1	1 (100%)	1 (100%)
Sodium	mg/L	0.05	1 (100%)	1 (100%)
Strontium	mg/L	0.0002	1 (100%)	1 (100%)
Dissolved Metals				
Aluminum	mg/L	0.001	1 (100%)	-
Barium	mg/L	0.0001	1 (100%)	-
Magnesium	mg/L	0.005	1 (100%)	1 (100%)
Manganese	mg/L	0.0001	1 (100%)	-
Silicon	mg/L	0.05	1 (100%)	-
Sodium	mg/L	0.05	1 (100%)	1 (100%)
Strontium	mg/L	0.0002	1 (100%)	-

Notes: One field blank and one trip blank sample were collected in 2021. Only analytes with at least one blank results > LRL were displayed. LRL = Laboratory Reporting Limit, "-" indicates where the analyte was not measured (calcium, magnesium, potassium, and sodium are the only dissolved metals measured in trip blank samples).

Table B.5: Field Duplicate Results for Water Chemistry Analyses

Parameter	Unit	LC_FRB_WS_ 2021-05-06_NP	LC_CC2_WS_ 2021-05-07_NP	RPD (%)
Physical Tests				
Hardness (as $CaCO_3$)	mg/L	425	429	0.937
pH	pH	8.38	8.39	0.119
ORP	mV	488	316	42.8
Total Suspended Solids	mg/L	5.00	4.60	8.33
Total Dissolved Solids	mg/L	549	595	8.04
Turbidity	NTU	1.47	1.97	29.1
Anions and Nutrients				
Acidity (as $CaCO_3$)	mg/L	41.8	<2	182
Alkalinity, Bicarbonate (as $CaCO_3$)	mg/L	178	173	2.85
Alkalinity, Carbonate (as $CaCO_3$)	mg/L	7.60	8.20	7.59
Alkalinity, Hydroxide (as $CaCO_3$)	mg/L	<1	<1	-
Alkalinity, Total (as $CaCO_3$)	mg/L	186	181	2.72
Bromide	mg/L	<0.05	<0.05	-
Chloride	mg/L	1.61	1.66	3.06
Fluoride	mg/L	0.126	0.126	0
Ammonia, Total (as N)	mg/L	0.00860	<0.005	52.9
Nitrate (as N)	mg/L	13.1	13.2	0.760
Nitrite (as N)	mg/L	0.00900	0.0103	13.5
Total Kjeldahl Nitrogen	mg/L	0.299	<0.05	143
Orthophosphate	mg/L	<0.001	<0.001	-
Phosphorus -Total	mg/L	0.0116	0.00460	86.4
Sulphate	mg/L	194	194	0
Anion Sum	meq/L	8.74	8.65	1.04
Cation Sum	meq/L	8.62	8.70	0.924
Cation - Anion Difference	%	0.691	0.288	82.3
Cation - Anion Ratio	%	98.6	100	1.41
Organic / Inorganic Carbon				
Dissolved Organic Carbon	mg/L	1.42	1.20	16.8
Total Organic Carbon	mg/L	1.20	1.24	3.28
Total Metals				
Aluminum	mg/L	0.0447	0.0342	26.6
Antimony	mg/L	0.000160	0.000160	0
Arsenic	mg/L	0.000150	0.000130	14.3
Barium	mg/L	0.0950	0.0986	3.72
Beryllium	µg/L	<0.02	<0.02	-
Bismuth	mg/L	<0.00005	<0.00005	-
Boron	mg/L	<0.01	<0.01	-
Cadmium	µg/L	0.0435	0.0400	8.38
Calcium	mg/L	95.7	98.9	3.29
Chromium	mg/L	0.000170	0.000170	0
Cobalt	µg/L	<0.1	<0.1	-
Copper	mg/L	<0.0005	<0.0005	-
Iron	mg/L	0.0740	0.0590	22.6
Lead	mg/L	0.0000520	<0.00005	3.92
Lithium	mg/L	0.0206	0.0221	7.03
Magnesium	mg/L	44.2	45.6	3.12
Manganese	mg/L	0.00558	0.00474	16.3
Mercury	µg/L	0.000730	0.000670	8.57
Molybdenum	mg/L	0.00125	0.00125	0
Nickel	mg/L	0.00192	0.00188	2.11
Potassium	mg/L	1.35	1.37	1.47
Selenium	µg/L	49.9	52.1	4.31
Silicon	mg/L	1.96	1.98	1.02
Silver	mg/L	<0.00001	<0.00001	-
Sodium	mg/L	2.01	2.10	4.38
Strontium	mg/L	0.133	0.136	2.23
Sulphur	mg/L	71.5	72.3	1.11
Thallium	mg/L	<0.00001	<0.00001	-
Tin	mg/L	<0.0001	<0.0001	-
Titanium	mg/L	0.000590	0.000570	3.45
Uranium	mg/L	0.00224	0.00228	1.77
Vanadium	mg/L	<0.0005	<0.0005	-
Zinc	mg/L	<0.003	<0.003	-
Dissolved Metals				
Aluminum	mg/L	0.00140	0.00140	0
Antimony	mg/L	0.000140	0.000140	0
Arsenic	mg/L	0.000100	0.000110	9.52
Barium	mg/L	0.108	0.110	1.83
Beryllium	µg/L	<0.02	<0.02	-
Bismuth	mg/L	<0.00005	<0.00005	-
Boron	mg/L	<0.01	<0.01	-
Cadmium	µg/L	0.0340	0.0325	4.51
Calcium	mg/L	99.1	101	1.90
Chromium	mg/L	<0.0001	0.000110	9.52
Cobalt	µg/L	<0.1	<0.1	-
Copper	mg/L	<0.0002	<0.0002	-
Iron	mg/L	<0.01	<0.01	-
Lead	mg/L	<0.00005	<0.00005	-
Lithium	mg/L	0.0233	0.0248	6.24
Magnesium	mg/L	43.1	42.9	0.465
Manganese	mg/L	0.00244	0.00233	4.61
Mercury	µg/L	<0.005	<0.005	-
Molybdenum	mg/L	0.00130	0.00128	1.55
Nickel	mg/L	0.00180	0.00173	3.97
Potassium	mg/L	1.43	1.45	1.39
Selenium	µg/L	54.1	52.7	2.62
Silicon	mg/L	1.94	1.92	1.04
Silver	mg/L	<0.00001	<0.00001	-
Sodium	mg/L	2.14	2.17	1.39
Strontium	mg/L	0.142	0.145	2.09
Sulphur	mg/L	70.2	70.3	0.142
Thallium	mg/L	<0.00001	<0.00001	-
Tin	mg/L	<0.0001	<0.0001	-
Titanium	mg/L	<0.0003	<0.0003	-
Uranium	mg/L	0.00217	0.00224	3.17
Vanadium	mg/L	<0.0005	<0.0005	-
Zinc	mg/L	0.00130	0.00110	16.7

▨ Indicates RPD exceeded 30%.

Notes: 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. RPD = relative percent difference; "-"= no data/not calculated; LRL = Laboratory Reporting Limit.

total ammonia, and TKN). Since only 9.0% of calculable RPDs exceeded the DQO and did not include any analytes of concern, the data were considered to have high field precision and reproducibility. Field duplicate samples were not collected for selenium speciation.

B.2.4 Data Accuracy

Data accuracy within the ALS laboratory reports was evaluated based on results of 122 Laboratory Control Samples (LCS), 10 Matrix Spike (MS) samples, and two Certified Reference Material (CRM) samples (Appendix K). All 570 LCS results, 344 MS results, and two CRM results met the laboratory DQO. Recovery could not be calculated in numerous MS samples as background levels were greater than or equal to 1-times spike levels. However, as several other QC tests were successful and do not imply uncertainties as to ALS data accuracy, we are not concerned by MS recovery not being calculable in several MS samples. Overall, ALS laboratory analytical precision was considered excellent.

Data accuracy within the BAL laboratory reports was evaluated based on results of 32 LCS, 11 MS samples, 11 Matrix Spike Duplicate (MSD) samples, and 26 Reference Material (RM) samples (Appendix K). All 57 LCS results, 26 MS results, 26 MSD results, and 26 RM results met the laboratory DQO. Therefore, BAL laboratory analytical precision was considered excellent.

B.2.5 Hold Times

The recommended hold times for pH and ORP analyses (0.25 to 0.34 hrs) were exceeded in all samples collected. As *in situ* pH and ORP were used for data interpretation, these hold time exceedances had no impact on data interpretability. The preparation hold times for dissolved organic carbon (DOC) and dissolved phosphorous were exceeded by five days in one sample (VA21B2407; Appendix K). The hold time for nitrate was exceeded by one day in one sample (see laboratory report L2568053 in Appendix K). DOC, phosphorous, and nitrate are analytes of concern, and these hold time exceedances will be considered during data interpretation. All hold times were met for selenium speciation samples.

B.2.6 Other Concerns

Three selenium speciation samples were received by BAL in a cooler at a temperature of 6.7°C. BAL recommends that all samples submitted for selenium speciation analyses remain at a temperature of ≤6°C to maintain sample integrity prior to analysis. All selenium speciation results for these three samples were qualified (Z) due to the elevated temperature in the cooler (see laboratory report 2105320 in Appendix K). Additionally, five results for selenosulfate were flagged as estimates by BAL (see laboratory reports 2107001 and 2104128 in Appendix K). These results were affected by chromatic interference, as indicated by elevated baselines or co-eluting peaks.

B.2.7 Data Quality Statement

Water chemistry data collected for the 2021 LCO Dry Creek LAEMP were of acceptable quality as characterized by good detectability, negligible analyte concentrations in method blanks, good laboratory precision and accuracy, and few hold time exceedances. Therefore, the associated data can be used with a high level of confidence in the derivation of conclusions.

B3 PERIPHYTON COMMUNITY

B.3.1 Sub-sampling Precision

The analytical reports of periphyton community structure from Larratt Aquatic Consulting Ltd. were examined to assess sub-sampling precision (see laboratory reports in Appendix K). Sub-sampling error was evaluated based on duplicate analyses of periphyton community structure sub-samples. Three periphyton sub-samples were randomly selected for duplicate analysis of community structure by the laboratory. At the species level, 86.6% of RPDs were greater than 30%, with 34 instances of species being found in only one of the duplicate samples (Table B.6). One RPD for total cell density was above 30% (LC_DCDS_2021-06-01_01; Table B.6). At the group level, RPDs for green algae were greater than 30% in all sets of samples, and RPDs for chrysophytes were greater than 30% in two sets of duplicate samples (Table B.7). RPDs for diatoms were below 30% in all sets of samples, suggesting that sub-sampling error or discrepancies in identification are taxon-dependent. These results also suggest that sub-sampling errors may result in certain organisms (particularly rarer taxa) being inaccurately reported as absent from a sample. Laboratory sub-sampling procedures could lead to inaccurate estimates of community structure, either due to incomplete homogenization of the sample or because only a very small portion of a collected sample was assessed (e.g., 2 mL sub-sample). These results emphasize the need for establishing quality assurance/quality control (QA/QC) procedures for periphyton community analyses.

B.3.2 Data Quality Statement

Quality control samples for periphyton community data revealed the potential for inaccuracies, particularly at the species level and for rarer or less abundant taxa. Several taxa were only identified in one sample within a duplicate pair, resulting in several high RPDs between duplicate samples. Periphyton community structure data, particularly at the species level, should be treated with a degree of caution.

Table B.6: Laboratory Duplicate Results for Analysis of Periphyton Cell Densities (cells/cm^2) by Species

Group	Species	LC_DCDS-02	LC_DCDS-02-DUP	RPD (%)	LC_DCDS_2021-11-30_01	LC_DCDS_2021-11-30_01-DUP	RPD (%)	LC_DCDS_2021-06-01_01	LC_DCDS_2021-06-01_01-Dup	RPD (%)
Total cell density		6,075,780	6,860,375	12.1	10,969,385	11,247,676	2.51	391,671	228,044	52.8
Richness		77	77	0	77	77	0	77	77	0
Cyanobacteria	*Anathece sp.*	0	0	-	0	0	-	0	0	-
	Chlorogloea sp.	77,300	77,300	0	46,382	115,955	85.7	103,072	33,241	102
	Chroococcus sp.	0	0	-	0	0	-	0	0	-
	Homeothrix sp. (janthina?)	309,200	579,750	60.9	0	0	-	0	0	-
	Homeothrix sp.	0	0	-	1,159,555	1,345,083	14.8	63,131	6,184	164
	Lyngbya sp.	309,200	0	200	0	0	-	0	0	-
	Oscillatoria spp.	0	0	-	0	0	-	0	0	-
	Phormidium autumnale	139,140	270,550	64.2	0	0	-	0	22,418	200
	Plectonema cf. tenue	0	0	-	0	0	-	0	0	-
Chrysophyta	*Hydrurus*	0	0	-	0	0	-	42,517	8,503	133
	Hydrurus foetidus	0	0	-	46,382	23,191	66.7	69,573	24,737	95.1
Diatom	*Achnanthidium linearis*	0	0	-	231,911	510,204	75.0	0	0	-
	Achnanthidium minutissimum	3,014,700	3,459,175	13.7	5,844,156	5,960,111	1.96	18,038	7,730	80.0
	Achnanthidium minutissimum var linearis	185,520	347,850	60.9	0	0	-	0	0	-
	Achnanthidium cf. rivulare	1,051,280	1,449,375	31.8	463,822	533,395	14.0	0	0	-
	Amphora.sp	0	0	-	0	0	-	0	0	-
	Cocconeis placentula	15,460	0	200	0	0	-	0	0	-
	Cyclotella spp.	0	0	-	0	0	-	0	0	-
	Cymbella cistula	0	0	-	0	0	-	0	0	-
	Cymbella excisiformis (Encyonema excisiformis)	0	57,975	200	0	46,382	200	2,577	1,546	50.0
	Cymbella cf. neocistula	0	0	-	0	23,191	200	0	0	-
	Cymbella sp.	0	19,325	200	0	0	-	0	0	-
	Cymbella spp.	0	0	-	115,955	46,382	85.7	3,865	773	133
	Cymbella sp. sm (parva?)	30,920	57,975	60.9	0	0	-	0	0	-
	Diatoma hiemale	0	19,325	200	23,191	0	200	7,730	5,411	35.3
	Diatoma moniliformis	0	19,325	200	0	23,191	200	0	0	-
	Diatoma tenuis	0	0	-	0	0	-	0	0	-
	Diatoma vulgare	30,920	0	200	46,382	0	200	0	0	-
	Encyonema cf. reich	0	0	-	92,764	46,382	66.7	0	773	200
	Encyonema neogracile	0	0	-	46,382	139,146	100	0	0	-
	Encyonema reichardtii	15,460	0	200	0	0	-	0	0	-
	Encyonema silesiacum	30,920	19,325	46.2	231,911	115,955	66.7	7,730	20,099	88.9
	Eucocconeis flexella	0	0	-	0	0	-	0	0	-
	Eunotia (parallel)	0	0	-	46,382	92,764	66.7	2,577	773	108
	Eunotia bilunaris	0	0	-	0	92,764	200	0	0	-
	Eunotia cf. microglossa	0	0	-	115,955	162,338	33.3	1,288	773	50.0
	Eunotia spp.	0	0	-	115,955	139,147	18.2	1,288	0	200
	Frustulia cf. soror	0	0	-	0	0	-	0	0	-
	Frustulia sp.	0	0	-	0	0	-	0	0	-
	Gomphoneis pseudo-okunoi	0	0	-	0	0	-	0	0	-
	Gomphoneis spp.	154,600	19,325	156	0	0	-	0	0	-
	Gomphonema ovilaceum	154,600	270,550	54.5	0	0	-	0	0	-
	Gomphonema parvulum	46,380	0	200	0	0	-	0	0	-
	Gomphonema sp	0	0	-	23,191	0	200	0	0	-
	Gomphonema sp.	0	0	-	371,058	115,955	105	20,614	10,049	68.9
	Hannaea arcus (Ceratoneis arcus)	30,920	0	200	46,382	69,573	40.0	7,730	7,730	0
	Meridion anceps	0	0	-	0	0	-	0	0	-
	Meridion circulare	123,680	38,650	105	278,293	463,822	50.0	6,442	3,865	50.0
	Meridion sp.	0	0	-	0	69,573	200	0	0	-
	Navicula radiosa	0	0	-	0	0	-	0	0	-
	Navicula cryptocephala	0	0	-	23,191	0	200	0	0	-
	Navicula spp.	30,920	0	200	0	0	-	0	0	-
	Nitzschia cf. liebethruthii	0	0	-	0	0	-	28,345	54,113	62.5
	Nitzschia sigma	0	0	-	0	0	-	0	0	-
	Nitzschia palea	0	0	-	1,066,790	997,217	6.74	0	0	-
	Nitzschia sp. (sm)	139,140	77,300	57.1	23,191	0	200	0	0	-
	Pinnularia sp.	0	0	-	0	0	-	0	0	-
	Rhoicosphenia abbreviata	15,460	0	200	0	0	-	0	0	-
	Rossithidium sp.	0	0	-	0	0	-	0	0	-
	Staurosira contruens	0	0	-	0	0	-	0	0	-
	Surirella cf. lacrimula	0	0	-	69,573	92,764	28.6	2,577	2,319	10.5
	Synedra sp.	0	0	-	0	0	-	0	0	-
	UID Pennate Diatom	0	0	-	23,191	0	200	2,577	2,319	10.5
	Ulnaria ulna	0	0	-	0	23,191	200	0	0	-
	Staurosira construens v. ventor	0	0	-	0	0	-	0	0	-
	Staurosirella leptostauron	61,840	0	200	0	0	-	0	0	-
	Surirella cf. lacrimula	30,920	19,325	46.2	0	0	-	0	0	-
	Synedra ulna	30,920	0	200	0	0	-	0	0	-
Green Algae	*Dictyosphaerium pulchellum*	0	0	-	0	0	-	0	0	-
	Gloeocystis sp. (colony)	0	57,975	200	0	0	-	0	0	-
	Scenedesmus abundans	0	0	-	0	0	-	0	0	-
	Ulothrix sp.	0	0	-	0	0	-	0	0	-
	Ulothrix zonata	0	0	-	208,720	0	200	0	0	-
	Unidentified colonial chlorophyte	0	0	-	0	0	-	0	14,688	200
Flagellate	Nano and pico-flagellates	46,380	0	200	0	0	-	0	0	-
	Unidentified flagellate	0	0	-	0	0	-	0	0	-
Rhodophyta	*Audouinella sp.*	0	0	-	208,720	0	200	0	0	-

▨ Indicates RPD exceeded 30%.

Notes: RPD = relative percent difference; DUP = duplicate sample; "-" indicates RPD could not be calculated.

Table B.7: Laboratory Duplicate Results for Analysis of Periphyton Cell Densities (cells/cm^2) by Groups

Group	LC_DCDS-02	LC_DCDS-02-DUP	RPD (%)	LC_DCDS_2021-11-30_01	LC_DCDS_2021-11-30_01-DUP	RPD (%)	LC_DCDS_2021-06-01_01	LC_DCDS_2021-06-01_01-Dup	RPD (%)
Cyanobacteria	834,840	927,600	10.5	1,205,937	1,461,038	19.1	166,203	61,843	91.5
Chrysophyta	0	0	-	46,382	23,191	66.7	112,090	33,240	109
Diatoms	5,194,560	5,874,800	12.3	9,299,626	9,763,447	4.87	113,378	118,273	4.23
Green algae	0	57,975	200	208,720	0	200	0	14,688	200
Flagellates	46,380	0	200	0	0	-	0	0	-
Rhodophyta	0	0	-	208,720	0	200	0	0	-

▨ Indicates RPD exceeded 30%.

Notes: RPD = relative percent difference; DUP = duplicate sample; "-" indicates RPD could not be calculated.

B4 BENTHIC COMMUNITY

B.4.1 Organism Sorting Efficiency

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. Of the 102 benthic invertebrate community samples analyzed, 99 were subsampled (Table B.9). The proportion of sub-sampled material ranged from 5 to 50% of the total sample material (Table B.9). Both the precision and accuracy of the sub-samples randomly chosen for sub-sample assessment (10% of samples that were subsampled; n = 7) met the DQO in all sub-samples (Table B.10). Thus, the precision and accuracy for sub-sampling of the benthic invertebrate community samples was considered excellent.

B.4.2 Subsampling Precision and Accuracy

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 98.7% for the 13 community structure samples evaluated (Table B.8). Recovery in quality control samples was above the laboratory's DQO (95%), and thus organism sorting efficiency was considered excellent.

B.4.3 Taxonomic Identification Accuracy

Cordillera Consulting Inc. performed an internal audit of taxonomic identification for at least 10% of all community structure samples (n = 11; Table B.11). The analysts reported total identification error rate (TIR) of 0 to 0.250%, percent difference in enumeration (PDE) of 0 to 0.563%, percent taxonomic disagreement (PTD) of 0.378 to 2.05%, and Bray Curtis Dissimilarity Index (BCDI, a measure of the differences in identifications between different analysts) of 0.003 to 0.015 (Table B.11). 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.

B.4.4 Data Quality Statement

Benthic community data collected for the 2021 LCO Dry Creek LAEMP were of good quality as characterized by excellent sorting efficiency, subsampling precision and accuracy, and

Table B.8: Benthic Invertebrate Community Sorting Efficiency, 2021

Sample ID	Laboratory ID	Number of Organisms Recovered (Initial Sort)	Number of Organisms in Re-sort	Sorting Efficiency
LC_DC3_BIC-03_2021-03-08	CC211944	365	4	99%
LC_DC1_BIC-02_2021-03-10	CC211955	330	1	100%
LC_FRUS_BIC-02_2021-03-16	CC211961	525	1	100%
LC_DC1_BIC-01_2021-05-05	CC220067	402	15	96%
LC_FRB_BIC-03_2021-05-06	CC220072	365	5	99%
LC_DC2_BIC-02_2021_05-06	CC220080	367	15	96%
LC_DCDS_BIC-02_2021-06-22	CC220146	374	7	98%
LC_FRB_BIC-01_2021-06-24	CC220157	327	4	99%
LC_FRUS_BIC-03_2021-06-25	CC220159	330	0	100%
LC_DCEF_BIC_1_2021-09-07	CC221314	502	6	99%
LC_GRCK_BIC_1_2021-09-13	CC221332	322	2	99%
LC_FRUS_BIC_1_2021-09-12	CC221335	310	1	100%
LC_DCDS_BIC-03_2021-11-30	CC222817	422	10	98%
			Average	**98.7%**

Table B.9: Percent of Sample Sorted and the Total Number of Invertebrates Recovered from the Sampled Fraction, 2021

Sample ID	Laboratory ID	% Sampled	# Invertebrates
LC_DC3_BIC-01_2021-03-08	CC211942	5%	622
LC_DC3_BIC-02_2021-03-08	CC211943	50%	470
LC_DC3_BIC-03_2021-03-08	CC211944	23%	365
LC_DCEF_BIC-01_2021-03-08	CC211945	5%	815
LC_DCEF_BIC-02_2021-03-08	CC211946	5%	446
LC_DCEF_BIC-03_2021-03-08	CC211947	5%	493
LC_DCDS_BIC-01_2021-03-09	CC211948	42%	309
LC_DCDS_BIC-02_2021-03-09	CC211949	25%	310
LC_DCDS_BIC-03_2021-03-09	CC211950	18%	331
LC_DC4_BIC-01_2021-03-09	CC211951	5%	483
LC_DC4_BIC-02_2021-03-09	CC211952	5%	438
LC_DC4_BIC-03_2021-03-09	CC211953	5%	582
LC_DC1_BIC-01_2021-03-10	CC211954	20%	452
LC_DC1_BIC-02_2021-03-10	CC211955	6%	330
LC_DC1_BIC-03_2021-03-10	CC211956	5%	592
LC_FRB_BIC-01_2021-03-15	CC211957	5%	458
LC_FRB_BIC-02_2021-03-15	CC211958	6%	375
LC_FRB_BIC-03_2021-03-15	CC211959	5%	436
LC_FRUS_BIC-01_2021-03-16	CC211960	5%	345
LC_FRUS_BIC-02_2021-03-16	CC211961	5%	525
LC_FRUS_BIC-03_2021-03-16	CC211962	5%	421
LC_DC3_BIC-01_2021-05-03	CC220055	13%	332
LC_DC3_BIC-02_2021-05-03	CC220056	50%	332
LC_DC3_BIC-03_2021-05-03	CC220057	36%	324
LC_DCEF_BIC-01_2021-05-04	CC220058	5%	412
LC_DCEF_BIC-02_2021-05-04	CC220059	6%	387
LC_DCEF_BIC-03_2021-05-04	CC220060	8%	325
LC_DCDS_BIC-01_2021-05-04	CC220061	100%	17
LC_DCDS_BIC-02_2021-05-04	CC220062	27%	386
LC_DCDS_BIC-03_2021-05-04	CC220063	30%	342
LC_DC4_BIC-01_2021-05-05	CC220064	5%	714
LC_DC4_BIC-02_2021-05-05	CC220065	5%	381
LC_DC4_BIC-03_2021-05-05	CC220066	5%	536
LC_DC1_BIC-01_2021-05-05	CC220067	5%	402
LC_DC1_BIC-02_2021-05-05	CC220068	5%	575
LC_DC1_BIC-03_2021-05-05	CC220069	5%	449
LC_FRB_BIC-01_2021-05-06	CC220070	10%	352
LC_FRB_BIC-02_2021-05-06	CC220071	20%	527
LC_FRB_BIC-03_2021-05-06	CC220072	10%	365
LC_FRUS_BIC-01_2021-05-07	CC220073	100%	279
LC_FRUS_BIC-02_2021-05-07	CC220074	20%	324
LC_FRUS_BIC-03_2021-05-07	CC220075	10%	320
LC_GRCK_BIC-01_2021-05-07	CC220076	26%	356
LC_GRCK_BIC-02_2021-05-07	CC220077	7%	362
LC_GRCK_BIC-03_2021-05-07	CC220078	5%	385
LC_DC2_BIC-01_2021_05-06	CC220079	22%	330
LC_DC2_BIC-02_2021_05-06	CC220080	18%	367
LC_DC2_BIC-03_2021_05-06	CC220081	100%	595
LC_DC3_BIC-01_2021-06-21	CC220139	7%	319
LC_DC3_BIC-02_2021-06-21	CC220140	10%	399
LC_DC3_BIC-03_2021-06-21	CC220141	12%	323
LC_DCEF_BIC-01_2021-06-22	CC220142	5%	344
LC_DCEF_BIC-02_2021-06-22	CC220143	6%	333
LC_DCEF_BIC-03_2021-06-22	CC220144	6%	334
LC_DCDS_BIC-01_2021-06-22	CC220145	5%	382
LC_DCDS_BIC-02_2021-06-22	CC220146	5%	374
LC_DCDS_BIC-03_2021-06-22	CC220147	13%	328
LC_DC4_BIC-01_2021-06-23	CC220148	5%	642
LC_DC4_BIC-02_2021-06-23	CC220149	6%	354
LC_DC4_BIC-03_2021-06-23	CC220150	8%	326
LC_DC2_BIC-01_2021-06-23	CC220151	12%	318
LC_DC2_BIC-02_2021-06-23	CC220152	9%	321
LC_DC2_BIC-03_2021-06-23	CC220153	10%	375
LC_DC1_BIC-01_2021-06-24	CC220154	5%	394
LC_DC1_BIC-02_2021-06-24	CC220155	5%	510
LC_DC1_BIC-03_2021-06-24	CC220156	5%	515
LC_FRB_BIC-01_2021-06-24	CC220157	7%	327
LC_FRUS_BIC-02_2021-06-25	CC220158	18%	319
LC_FRUS_BIC-03_2021-06-25	CC220159	12%	330
LC_DCEF_BIC_1_2021-09-07	CC221314	5%	502
LC_DCEF_BIC_2_2021-09-07	CC221315	5%	529
LC_DCEF_BIC_3_2021-09-07	CC221316	5%	324
LC_DC2_BIC_1_2021-09-09	CC221317	5%	728
LC_DC2_BIC_2_2021-09-09	CC221318	5%	627
LC_DC2_BIC_3_2021-09-09	CC221319	5%	929
LC_DC4_BIC_1_2021-09-09	CC221320	5%	837
LC_DC4_BIC_2_2021-09-09	CC221321	5%	661
LC_DC4_BIC_3_2021-09-09	CC221322	5%	691
LC_DC1_BIC_1_2021-09-07	CC221323	5%	922
LC_DC1_BIC_2_2021-09-07	CC221324	5%	846
LC_DC1_BIC_3_2021-09-07	CC221325	5%	1,558
LC_FRB_BIC_1_2021-09-12	CC221326	5%	430
LC_FRB_BIC_2_2021-09-12	CC221327	5%	315
LC_FRB_BIC_3_2021-09-12	CC221328	6%	332
LC_DCDS_BIC_1_2021-09-10	CC221329	5%	418
LC_DCDS_BIC_2_2021-09-10	CC221330	5%	476
LC_DCDS_BIC_3_2021-09-10	CC221331	5%	463
LC_GRCK_BIC_1_2021-09-13	CC221332	8%	322
LC_GRCK_BIC_2_2021-09-13	CC221333	13%	365
LC_GRCK_BIC_3_2021-09-13	CC221334	5%	338
LC_FRUS_BIC_1_2021-09-12	CC221335	7%	310
LC_FRUS_BIC_2_2021-09-12	CC221336	20%	531
LC_FRUS_BIC_3_2021-09-12	CC221337	5%	369
LC_DC3_BIC_1_2021-09-10	CC221338	5%	689
LC_DC3_BIC_2_2021-09-10	CC221339	5%	567
LC_DC3_BIC_3_2021-09-10	CC221340	5%	604
LC_DCDS_BIC-01_2021-11-30	CC222815	5%	329
LC_DCDS_BIC-02_2021-11-30	CC222816	5%	351
LC_DCDS_BIC-03_2021-11-30	CC222817	5%	422
LC_DC1_BIC-01_2021-12-01	CC222818	5%	749
LC_DC1_BIC-02_2021-12-01	CC222819	5%	1,236
LC_DC1_BIC-03_2021-12-01	CC222820	5%	1,198

Table B.10: 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 (%)
LC_DC1_BIC-01_2021-03-10	CC211954	456	445	456	457	504	-	-	-	-	-	2,318	0	11.7	1.42	8.7
LC_DC3_BIC-02_2021-03-08	CC211943	475	483	-	-	-	-	-	-	-	-	958	1.66	1.66	0.84	0.84
LC_DC3_BIC-02_2021-05-03	CC220056	342	316	-	-	-	-	-	-	-	-	658	7.60	7.60	3.95	3.95
LC_FRB_BIC-01_2021-05-06	CC220070	358	388	336	342	343	342	341	382	393	360	3,585	0.00	14.5	0.14	9.62
LC_FRB_BIC-02_2021-05-06	CC220071	565	567	543	556	527	-	-	-	-	-	2,758	0.35	7.05	0.80	4.46
LC_DC3_BIC-02_2021-06-21	CC220140	387	312	310	343	320	324	328	313	315	320	3,272	0.00	19.9	0.24	18.3
LC_DC2_BIC-03_2021-06-23	CC220153	375	359	364	314	373	374	344	342	367	340	3,552	0.27	16.3	1.07	11.6
												Average	**1.41**	**11.2**	**1.21**	**8.21**

Notes: "-" indicates no data available. Data unavailable for September and December sampling events.

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

Sample ID	Laboratory ID	Percent Sampled (%)	Taxa Identified	TIR (%)	PDE (%)	PTD (%)	BCDI
LC_DC3_BIC-02_2021-03-08	CC211943	50	470	0	0	0.426	0.004
LC_DC4_BIC-02_2021-03-09	CC211952	5	440	0	0.228	0.682	0.005
LC_DC3_BIC-01_2021-05-03	CC220055	13	333	0	0.150	0.601	0.005
LC_DC4_BIC-03_2021-05-05	CC220066	5	530	0	0.563	2.05	0.015
LC_FRUS_BIC-01_2021-05-07	CC220073	100	278	0	0.180	0.717	0.005
LC_DC3_BIC-02_2021-06-21	CC220140	10	399	0.250	0	0.501	0.005
LC_DC2_BIC-01_2021-06-23	CC220151	12	319	0	0.157	0.627	0.005
LC_DCEF_BIC_2_2021-09-07	CC221315	5	528	0	0.095	0.378	0.003
LC_DC4_BIC_1_2021-09-09	CC221320	5	840	0.120	0.179	0.833	0.007
LC_FRB_BIC_2_2021-09-12	CC221327	5	313	0	0.318	0.635	0.003
LC_DCDS_BIC-02_2021-11-30	CC222816	5	351	0	0	0.570	0.006

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 K).

taxonomic identification accuracy. Therefore, the associated data can be used with a high level of confidence in the derivation of conclusions.

B5 BENTHIC INVERTEBRATE TISSUE CHEMISTRY

B.5.1 Laboratory Reporting Limits

Analytical reports of benthic invertebrate tissue metal concentrations from TrichAnalytics (see laboratory reports 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 B.12). Arsenic, mercury, and tin were the only analytes that had at least one result below the LRL (Table B.11). However, the sole focus of interpretation of benthic invertebrate tissue chemistry results for the LCO Dry 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.

B.5.2 Data Accuracy and Precision

Data accuracy and precision were evaluated based on the analysis of 42 CRM samples (see laboratory reports in Appendix K). Of the 1,260 CRM results, seven did not meet the laboratory DQO: three precision results for antimony (see laboratory reports 2021-215 and 2021-222 in Appendix K), two precision results for tin (see laboratory reports 2021-215 and 2021-222), one precision result for lead (see laboratory report 2021-215), and one precision result for cadmium (see laboratory report 2021-192). As these results only represent 0.56% of all CRM results and do not include any results for selenium, laboratory accuracy and precision as determined by CRM analyses was considered adequate.

Laboratory precision was also evaluated by duplicate analysis of 36 benthic invertebrate tissue samples (Appendix K). Of the 1,080 duplicate results, only one RPD (cadmium in laboratory report 2021-192) did not meet the laboratory DQO. As cadmium is an analyte of concern, this will be considered during interpretation. As this result only represents 0.09% of duplicate results, laboratory precision as determined by duplicate analyses was considered excellent. Overall, laboratory accuracy and precision were considered excellent.

B.5.3 Data Quality Statement

Benthic invertebrate tissue data collected for the 2021 LCO Dry Creek LAEMP were of good quality as characterized by appropriate LRLs and excellent laboratory precision and accuracy.

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

Parameter	Units	No. Sample Results < LRL	Range of LRLs
Arsenic	ppm	61 (18.7%)	0.282 to 0.536
Mercury	ppm	102 (31.3%)	0.022 to 0.046
Tin	ppm	1 (0.307%)	0.024 to 0.04

Notes: Only analytes with at least one sample results < LRL are displayed. The only relevant guideline for benthic invertebrate tissue is selenium. All LRLs for selenium were below this guideline. Total number of samples (n) was 217. LRL = Laboratory Reporting Limit. LRLs for selenium were below the BC WQG short-term guideline (13 mg/kg dry weight; BCMOECCS 2021a).

Therefore, the associated data can be used with a good level of confidence in the derivation of conclusions for this study.

B6 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 2021LCO Dry Creek LAEMP, with the exception of periphyton community sub-sampling precision. The relatively low degree of precision seen in periphyton sub-sampling illustrates the need for QA/QC procedures during this process.

B7 REFERENCES

BCMOECCS (British Columbia Ministry of Environment and Climate Change Strategy). 2021a. Working Water Quality Guidelines: Aquatic Life, Wildlife and Agriculture. Water Quality Guideline Series, WQG-08. Water Protection and Sustainability Branch, Province of British Columbia, Victoria, B.C.

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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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Teck. 2020. Water Quality Adaptive Management Plan for Teck Coal Operations in the Elk Valley – 2019 Annual Report. Prepared by Teck Coal Limited. July 31, 2020.

APPENDIX C

WATER
QUALITY

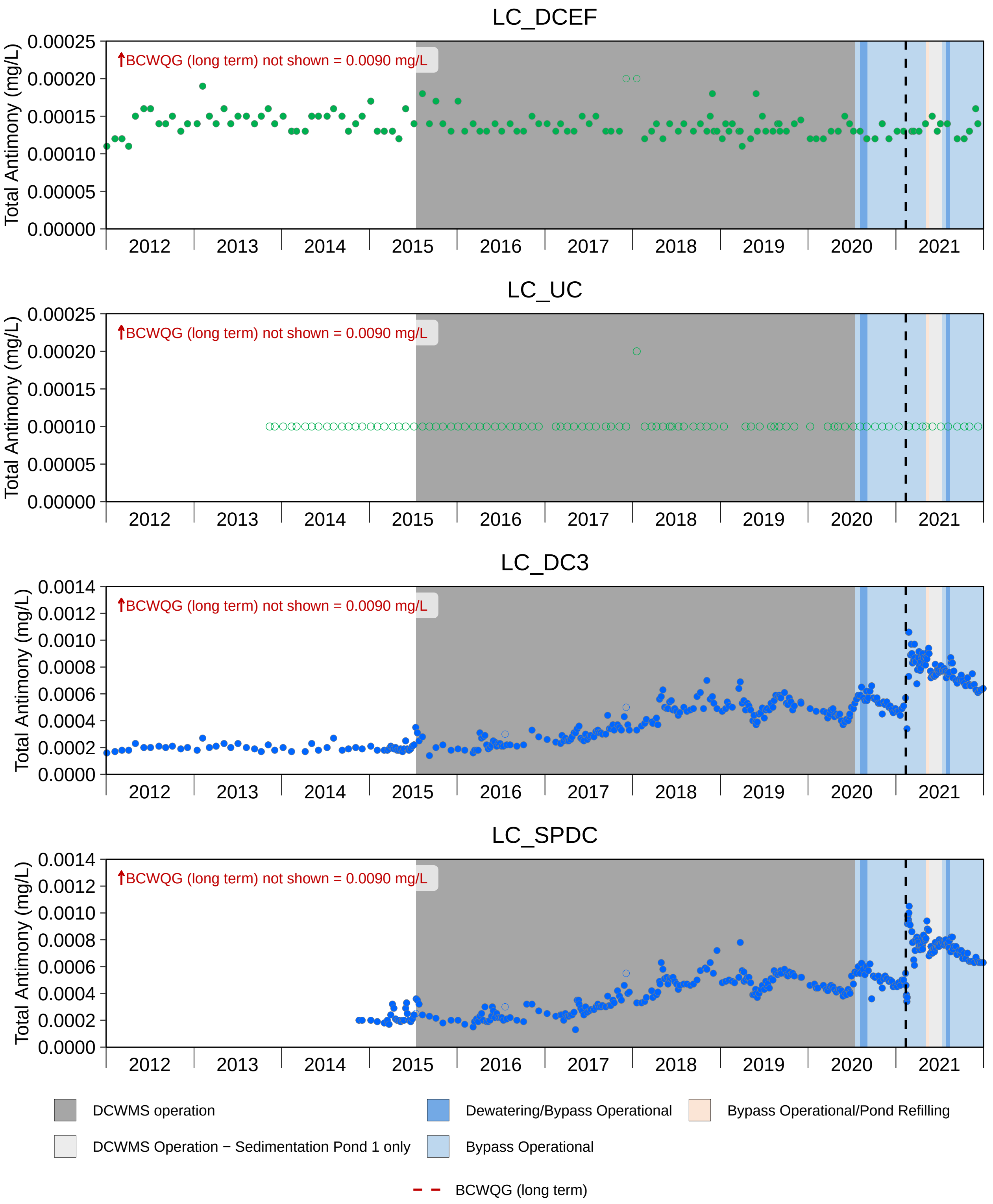
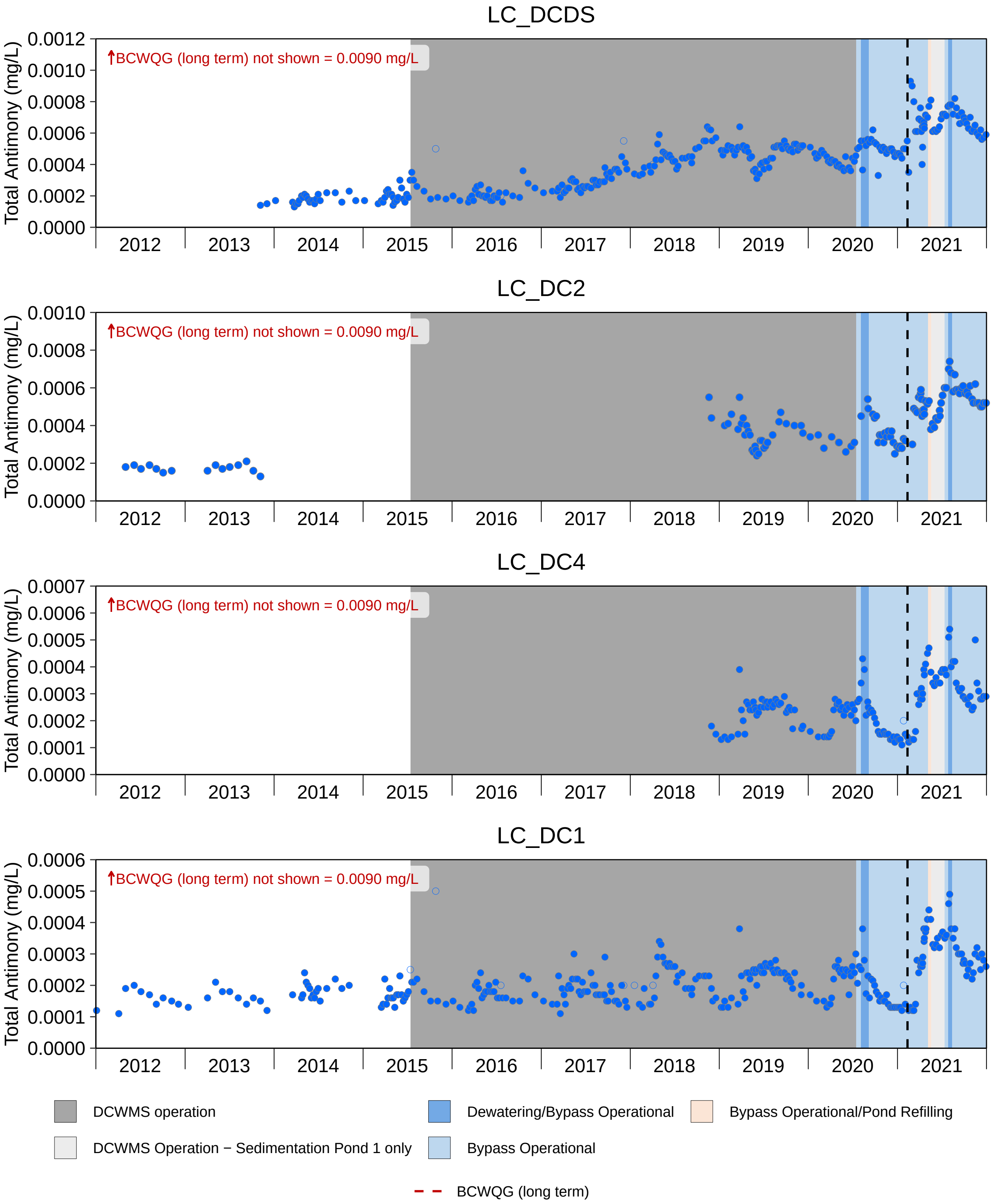


Figure C.1: Time Series Plots for Total Antimony from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).



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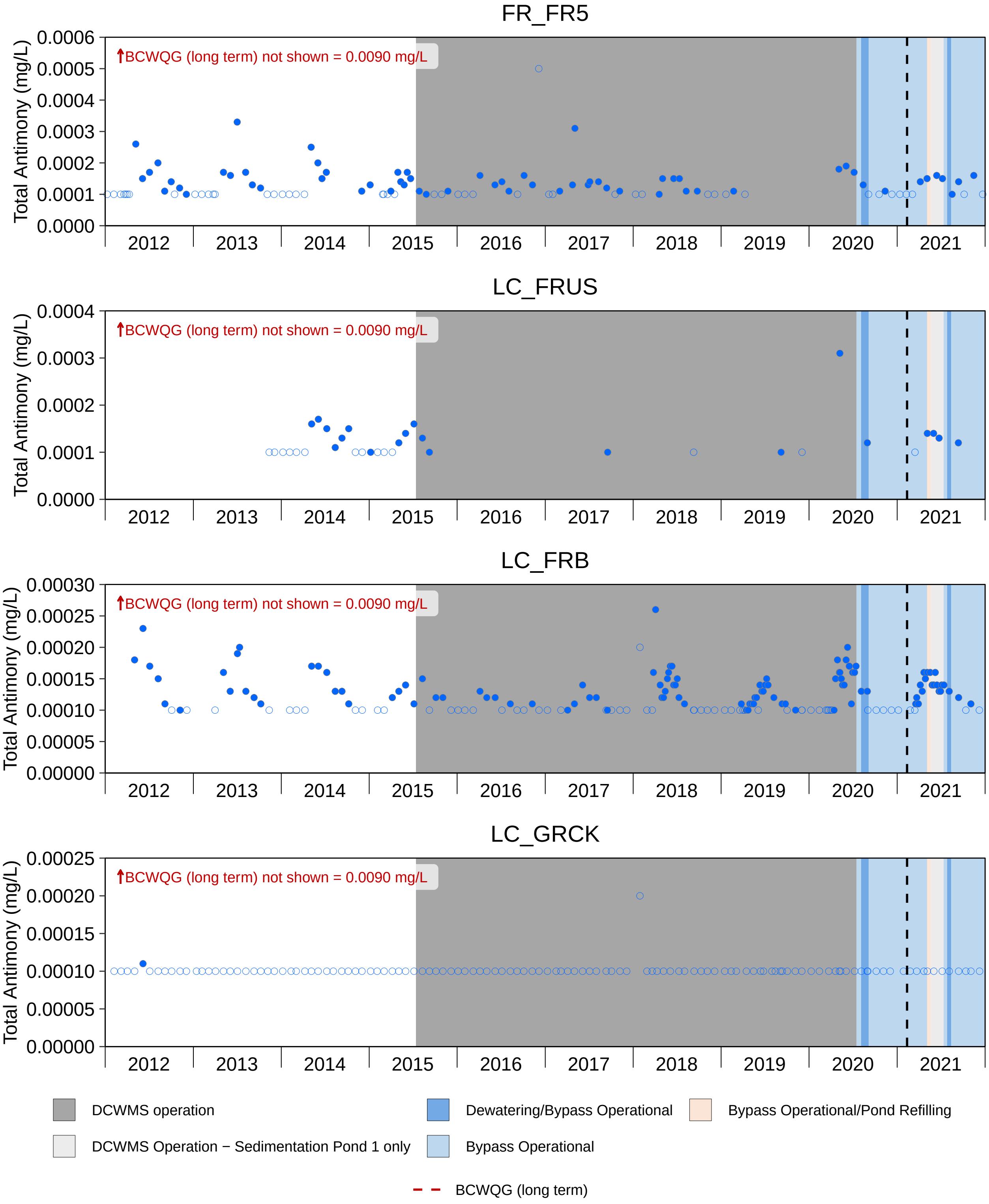


Figure C.1: Time Series Plots for Total Antimony from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

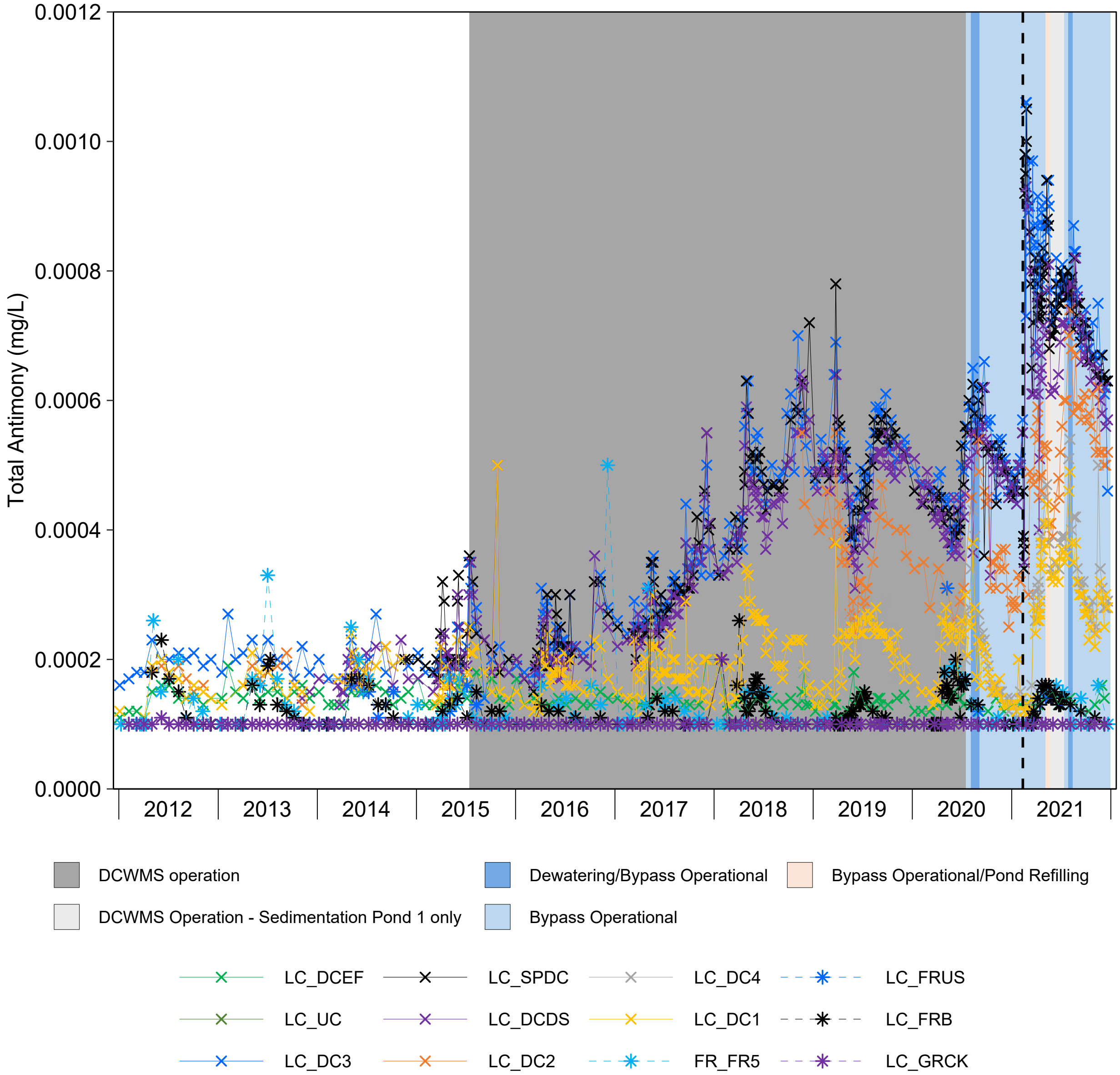


Figure C.2: Time Series Plots for Total Antimony from LCO Dry Creek LAEMP Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.00010 and 0.00055 mg/L). Dashed vertical line indicates the Burnt Ridge North spoil failure.

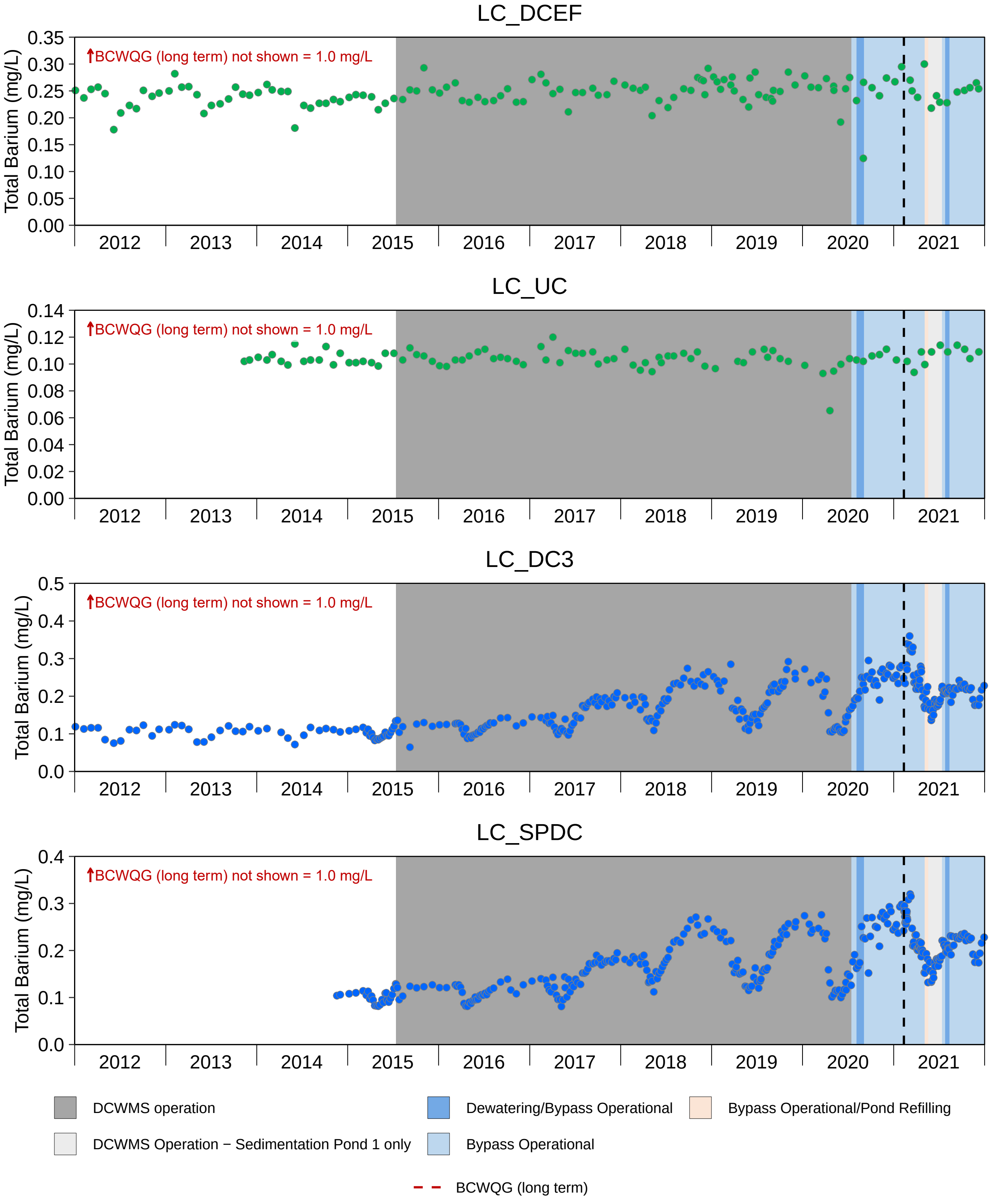


Figure C.3: **Time Series Plots for Total Barium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

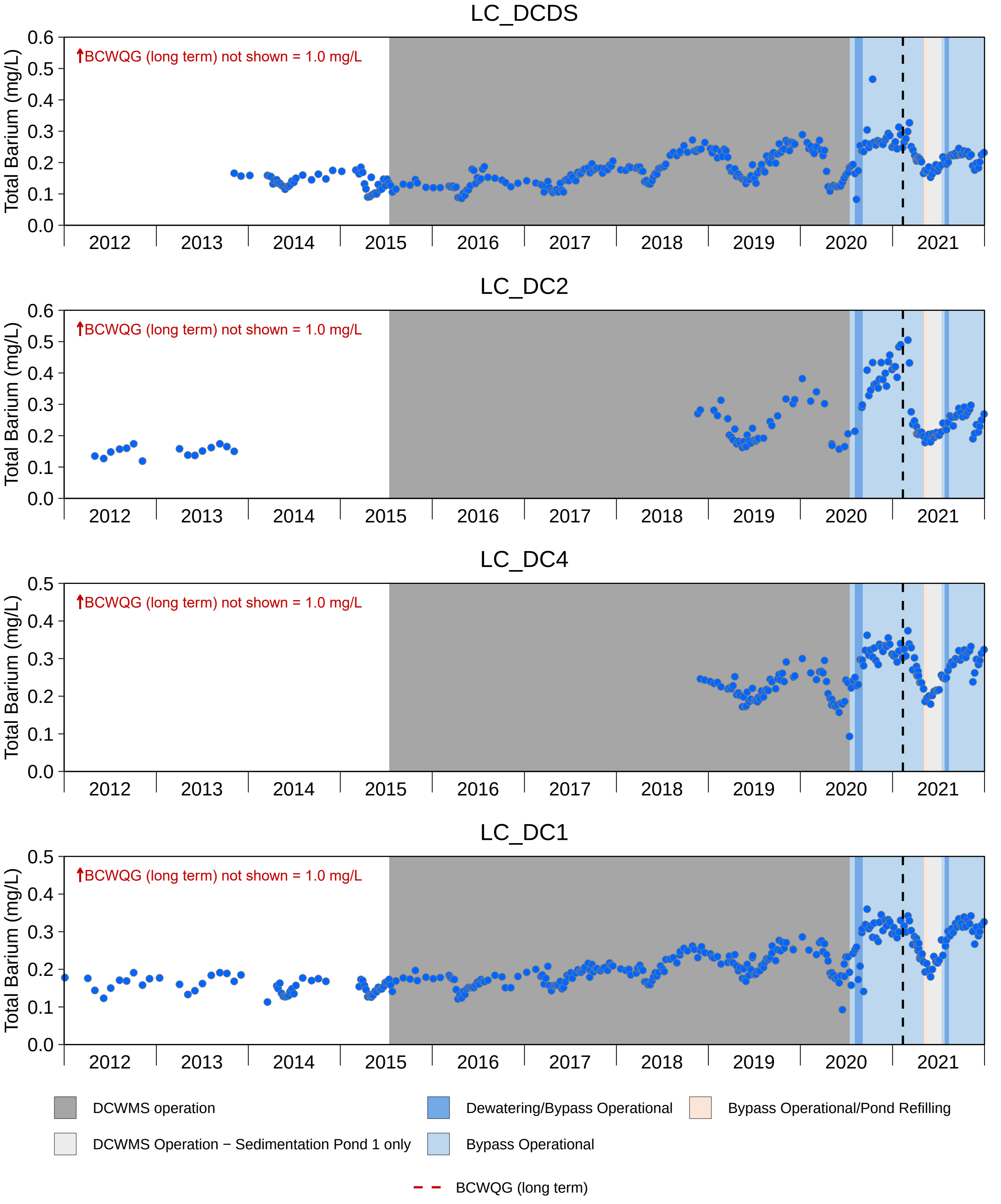


Figure C.3: Time Series Plots for Total Barium from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

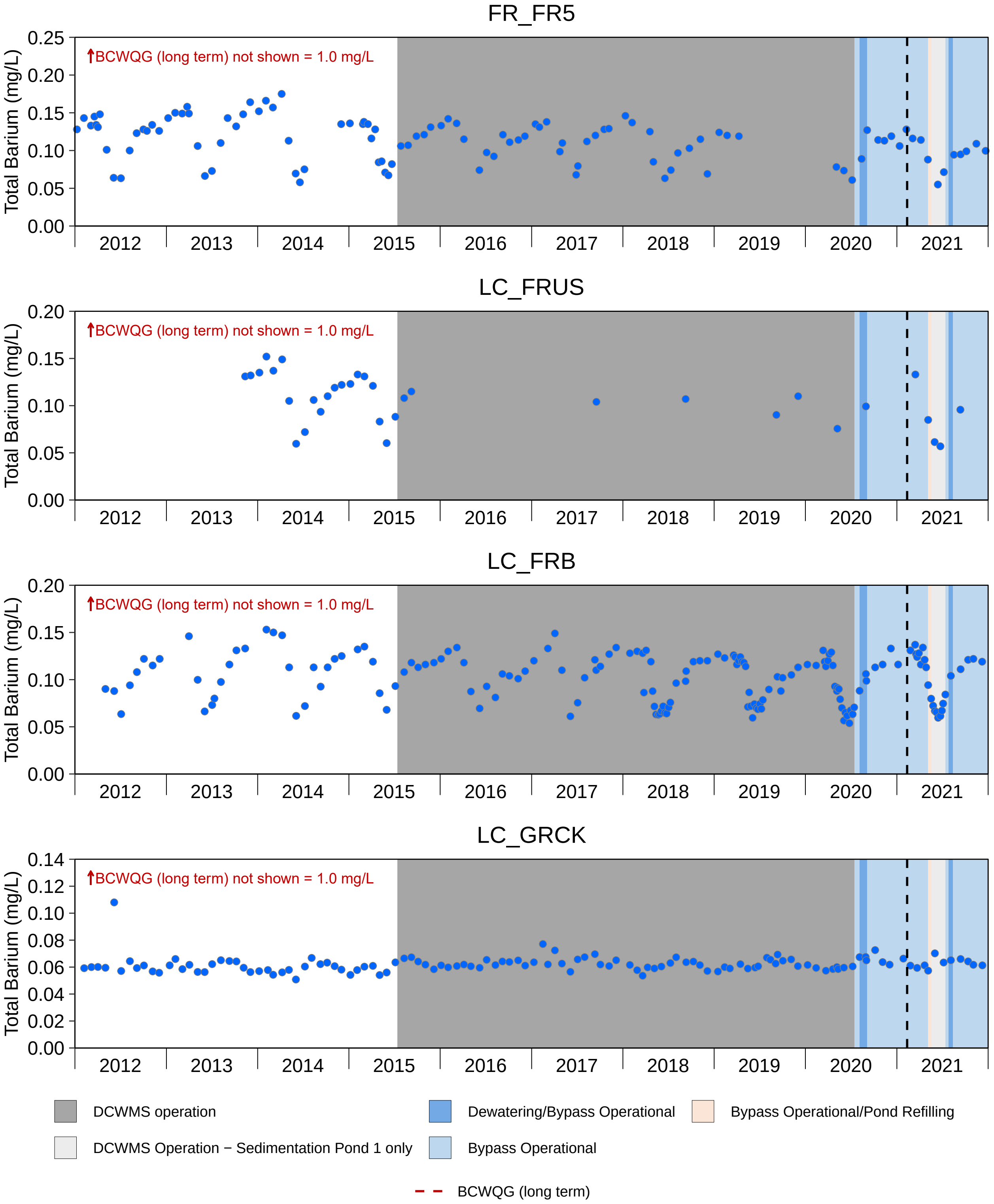


Figure C.3: Time Series Plots for Total Barium from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

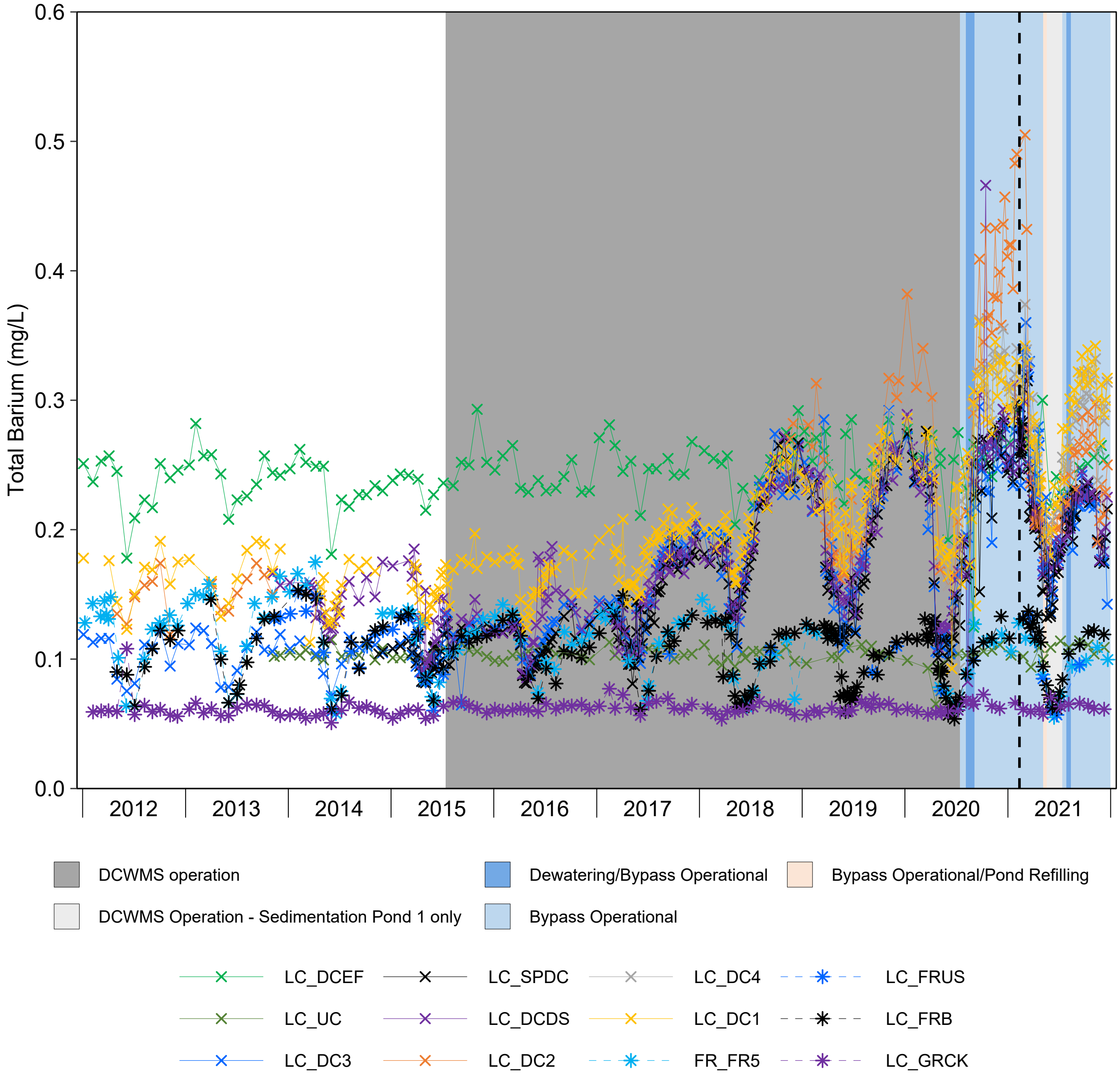


Figure C.4: **Time Series Plots for Total Barium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: No values were reported below the LRL. Dashed vertical line indicates the Burnt Ridge North spoil failure.

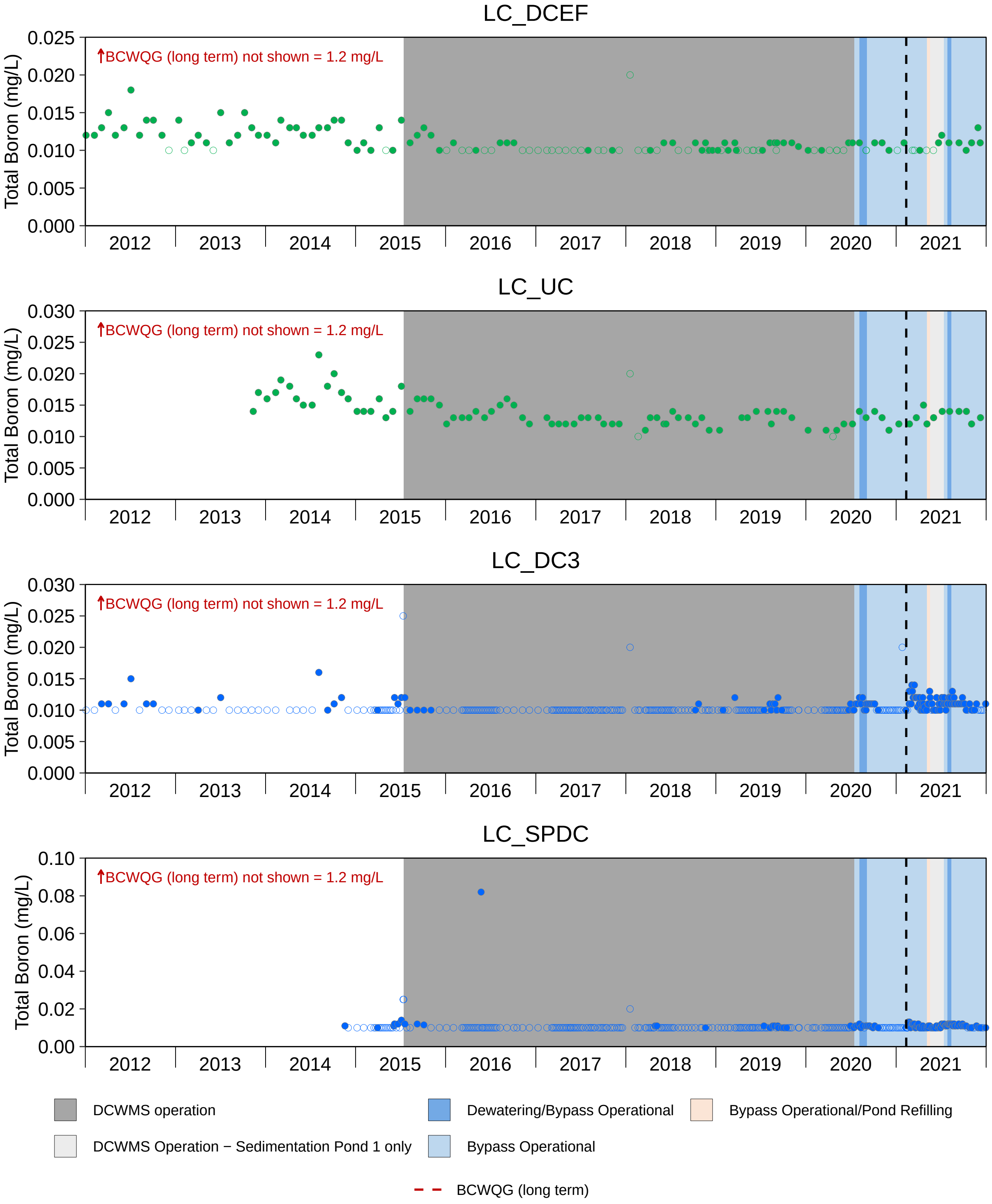


Figure C.5: Time Series Plots for Total Boron from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

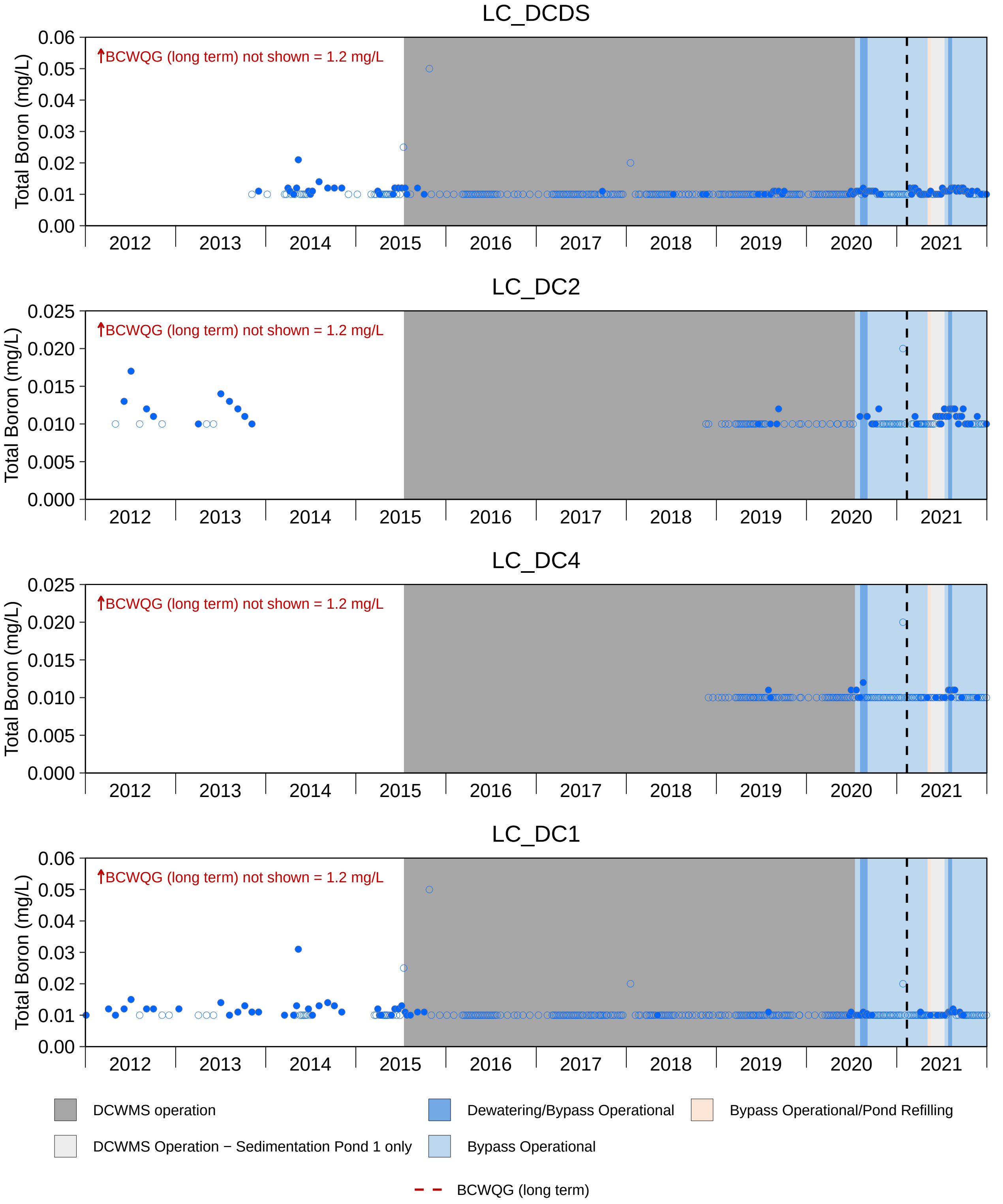


Figure C.5: **Time Series Plots for Total Boron from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

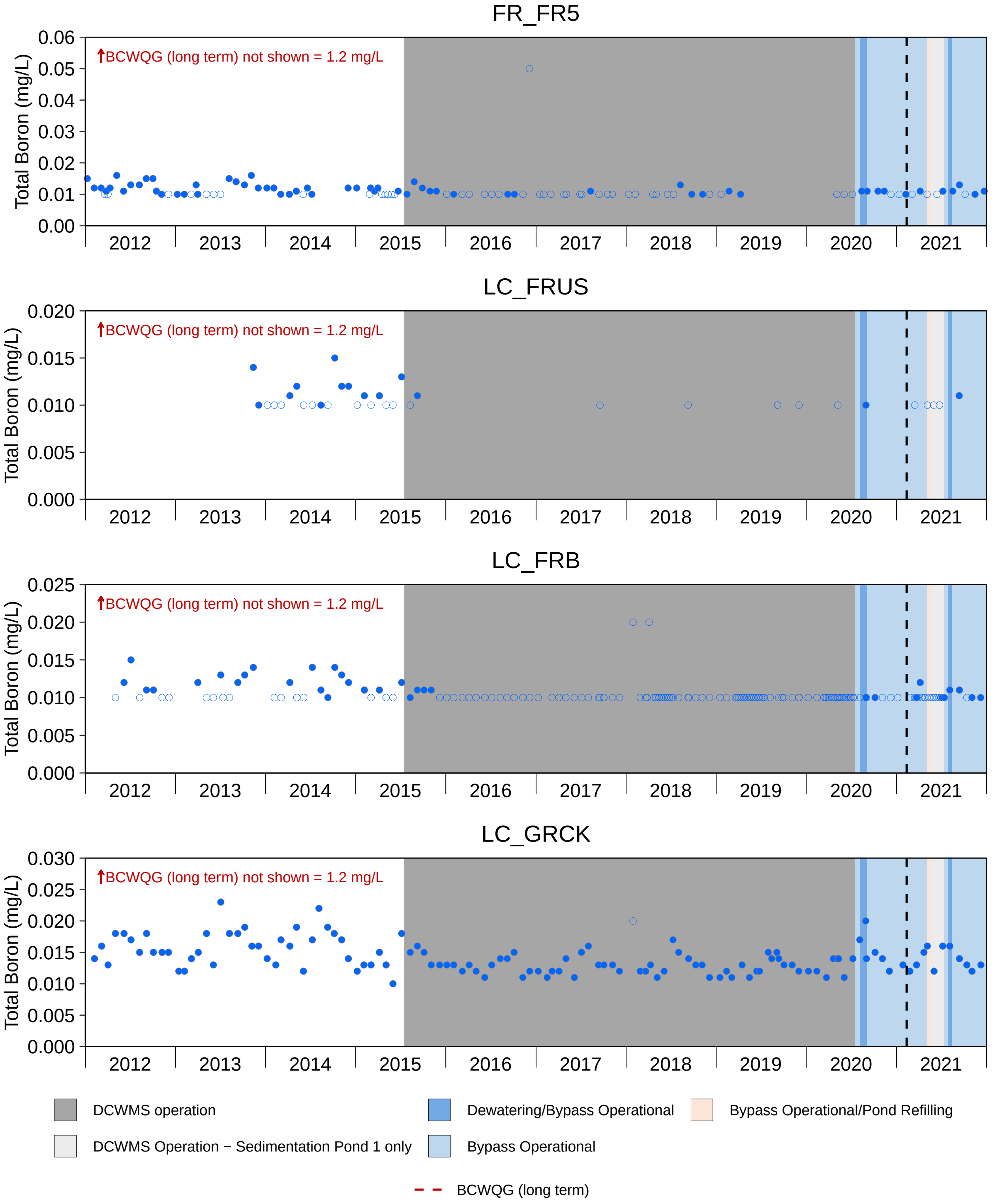


Figure C.5: **Time Series Plots for Total Boron from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

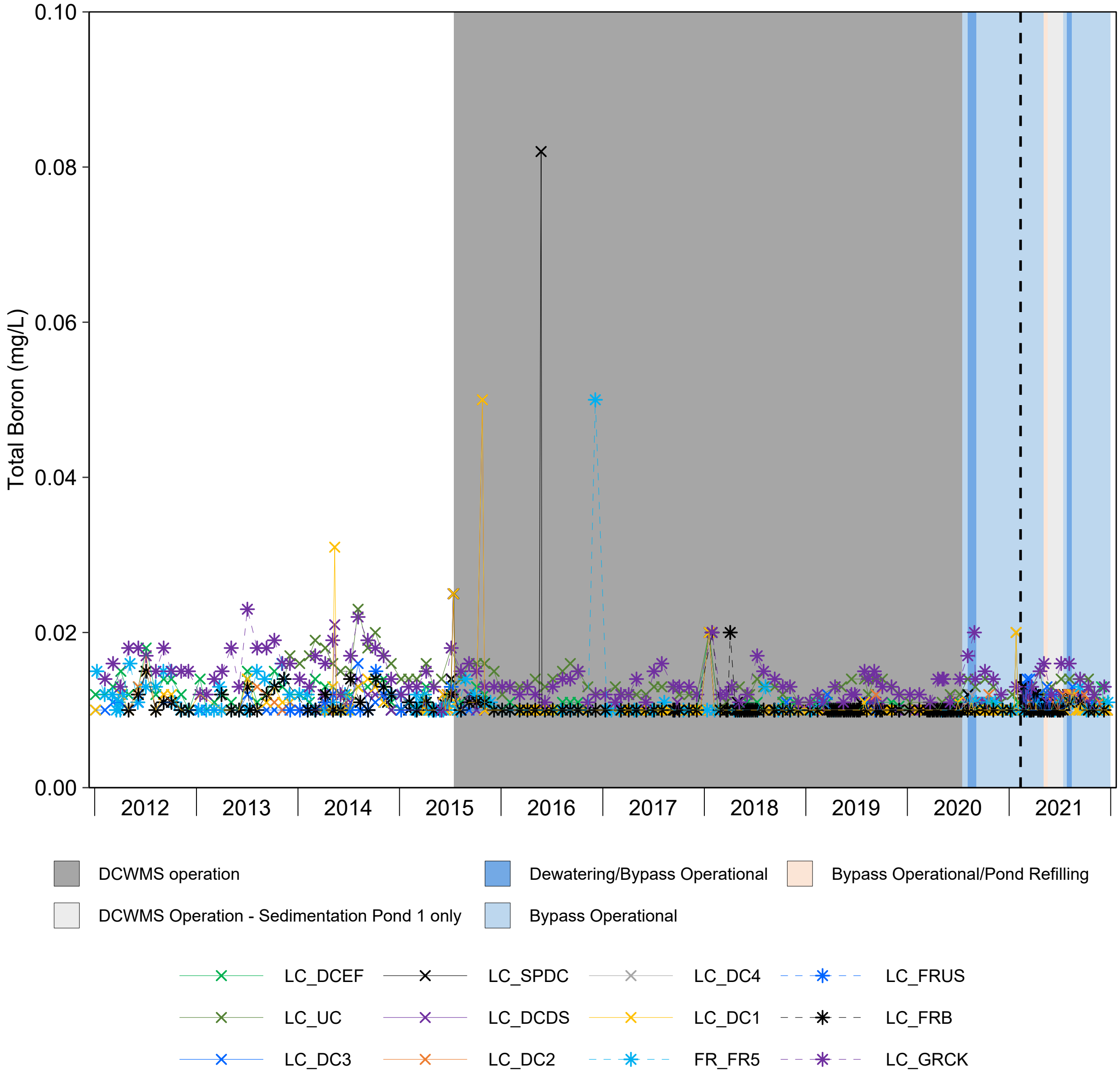


Figure C.6: **Time Series Plots for Total Boron from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.010 and 0.050 mg/L). Dashed vertical line indicates the Burnt Ridge North spoil failure.

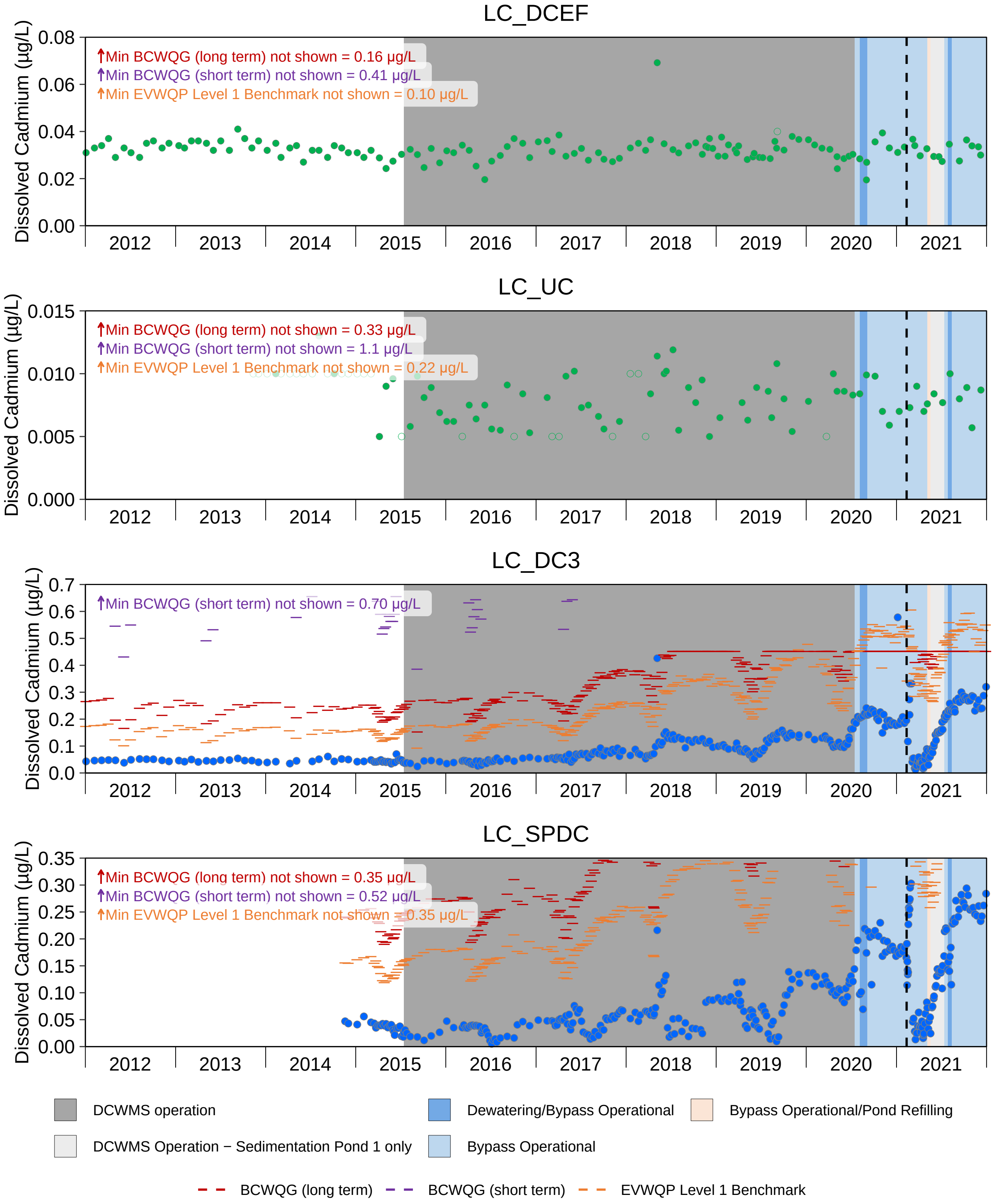


Figure C.7: **Time Series Plots for Dissolved Cadmium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only appy to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

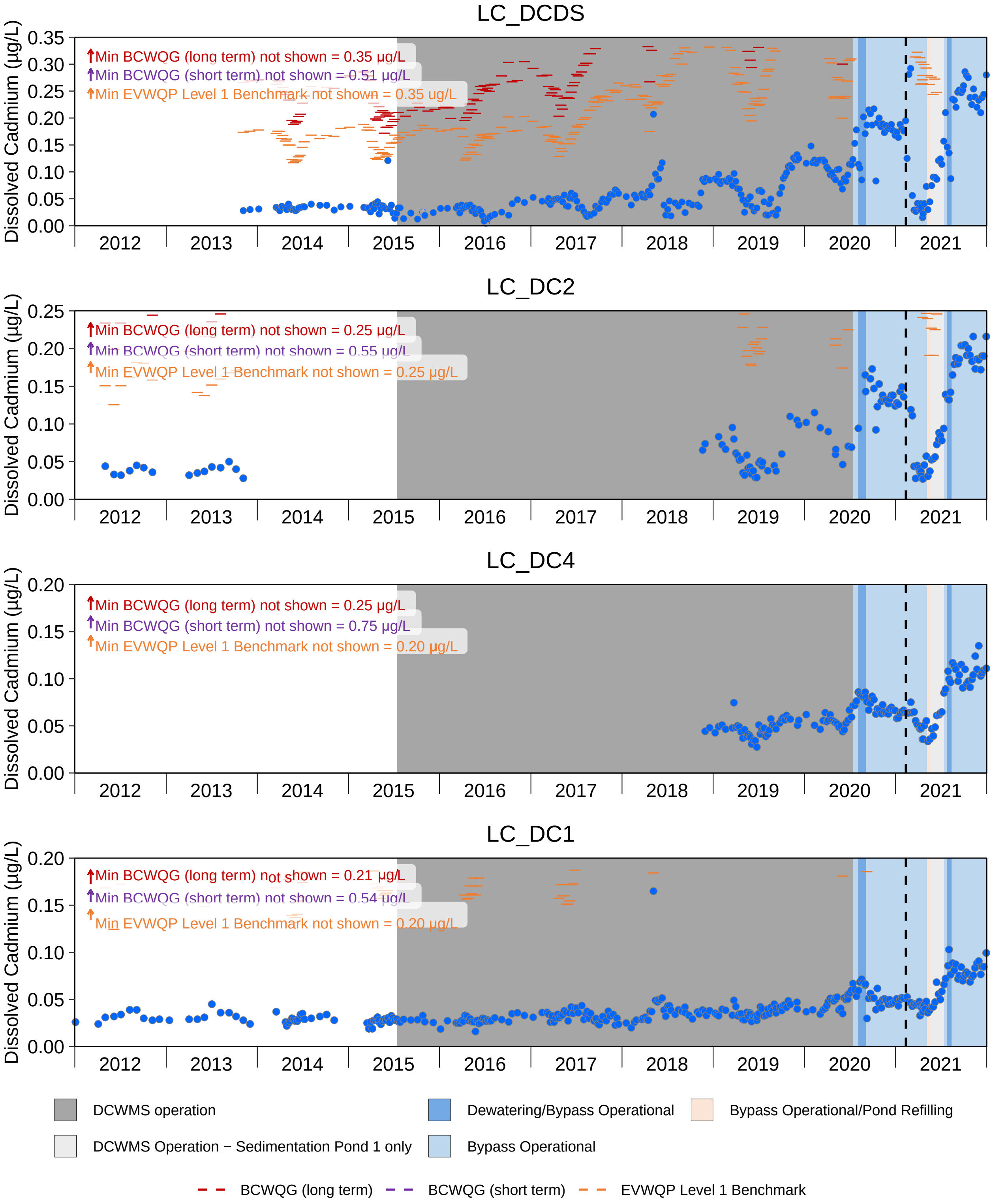


Figure C.7: Time Series Plots for Dissolved Cadmium from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only appy to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

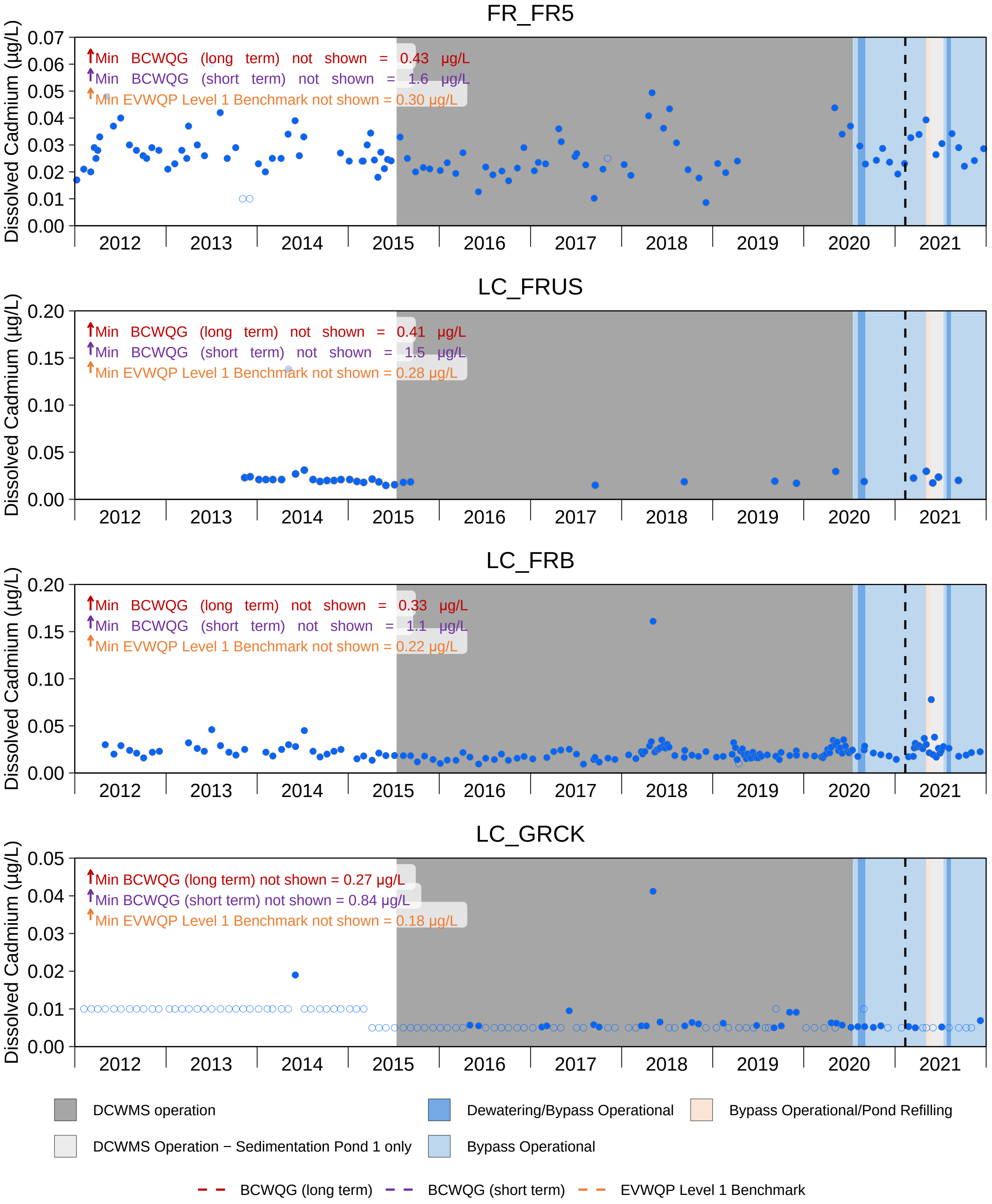


Figure C.7: Time Series Plots for Dissolved Cadmium from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only appy to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

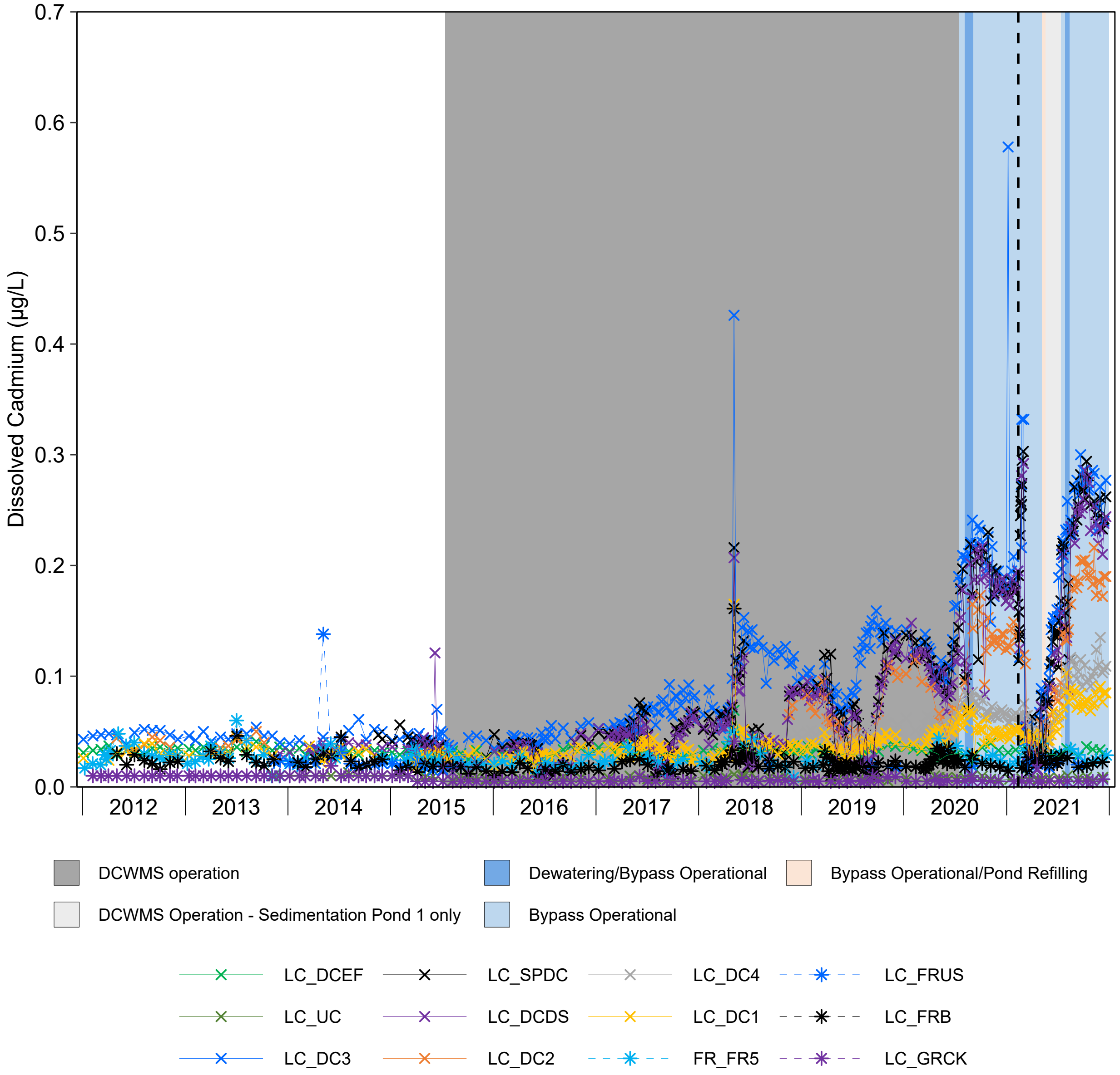


Figure C.8: **Time Series Plots for Dissolved Cadmium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.0050 and 0.040 mg/L). Dashed vertical line indicates the Burnt Ridge North spoil failure.

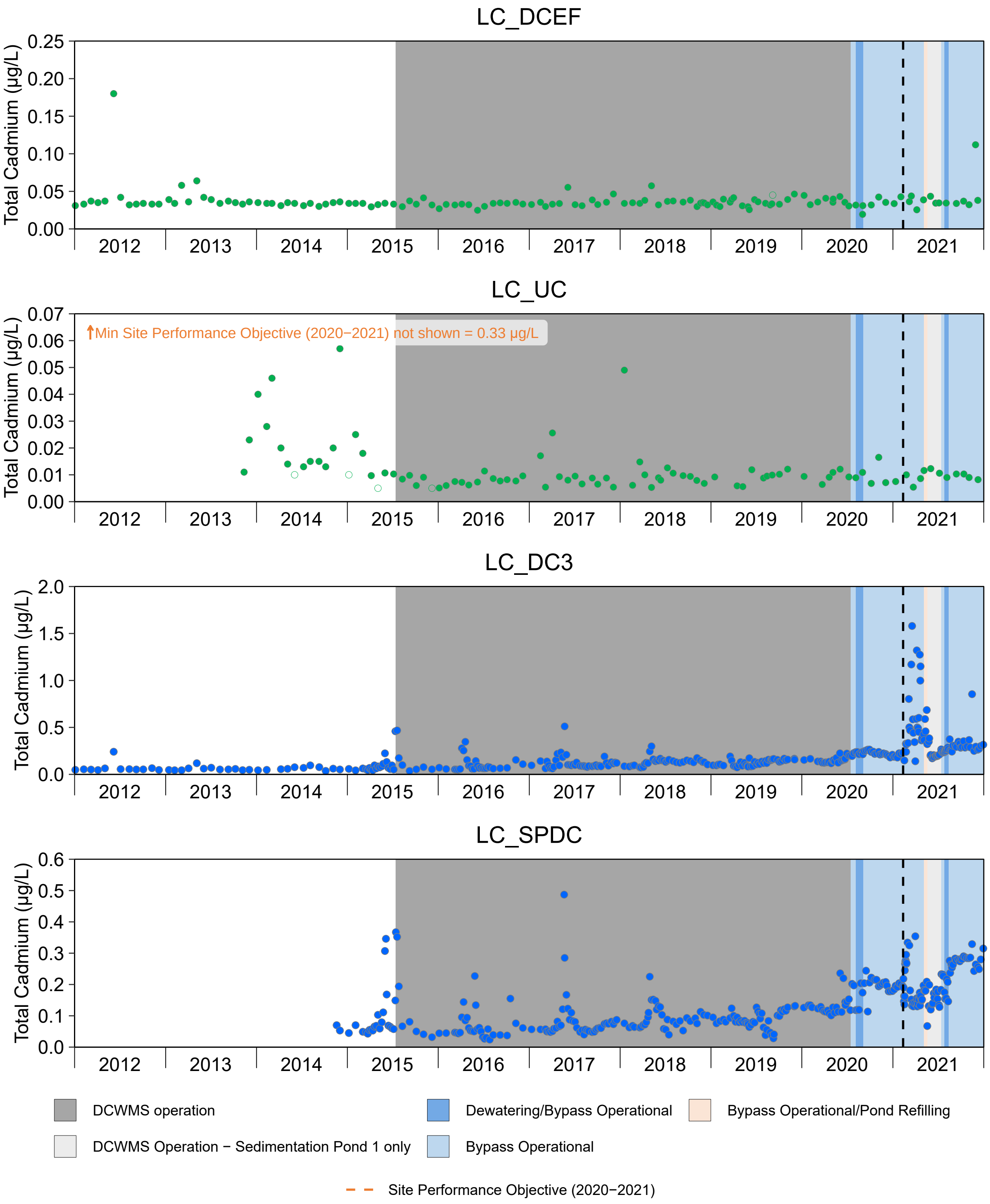


Figure C.9: **Time Series Plots for Total Cadmium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

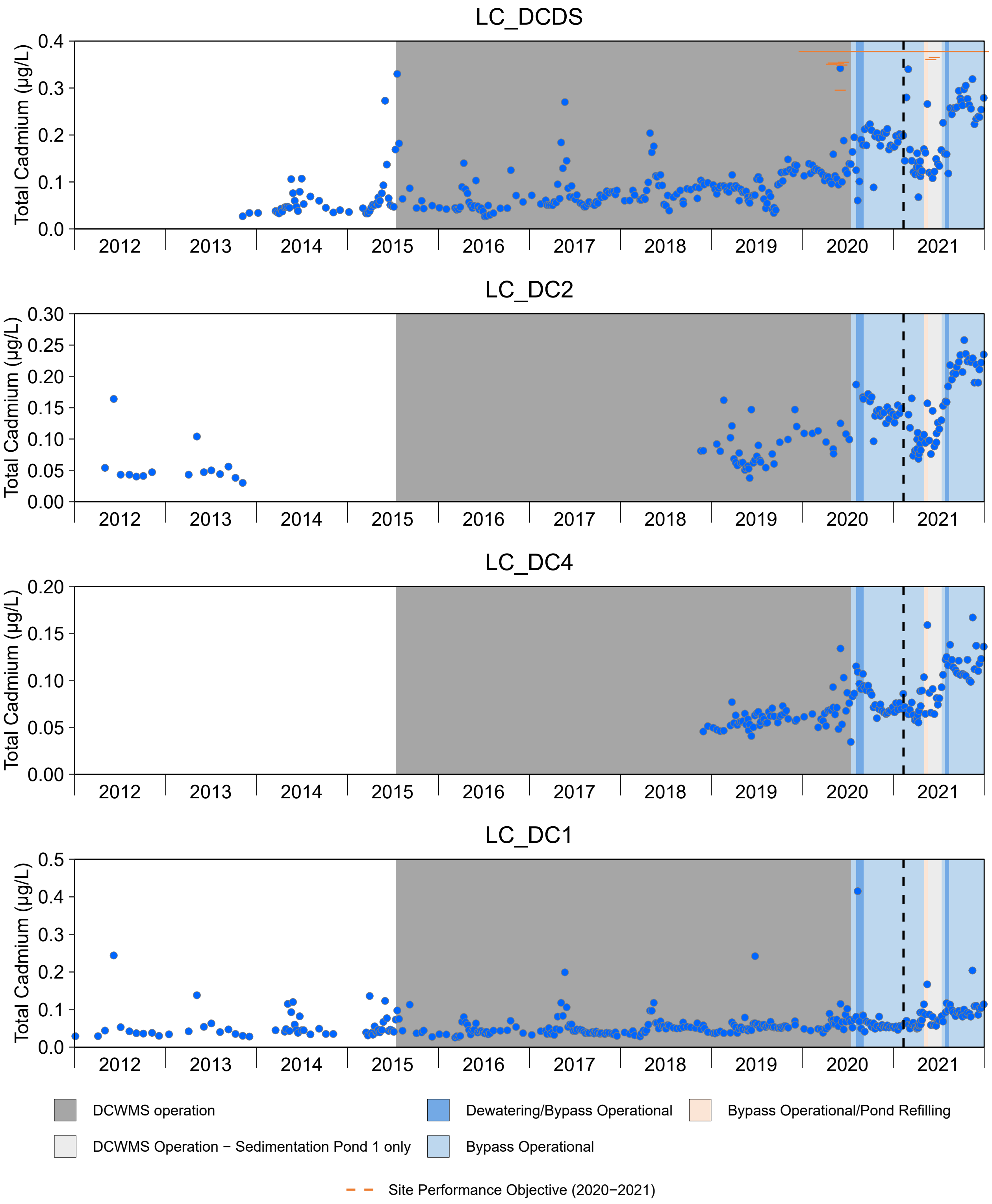


Figure C.9: Time Series Plots for Total Cadmium from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

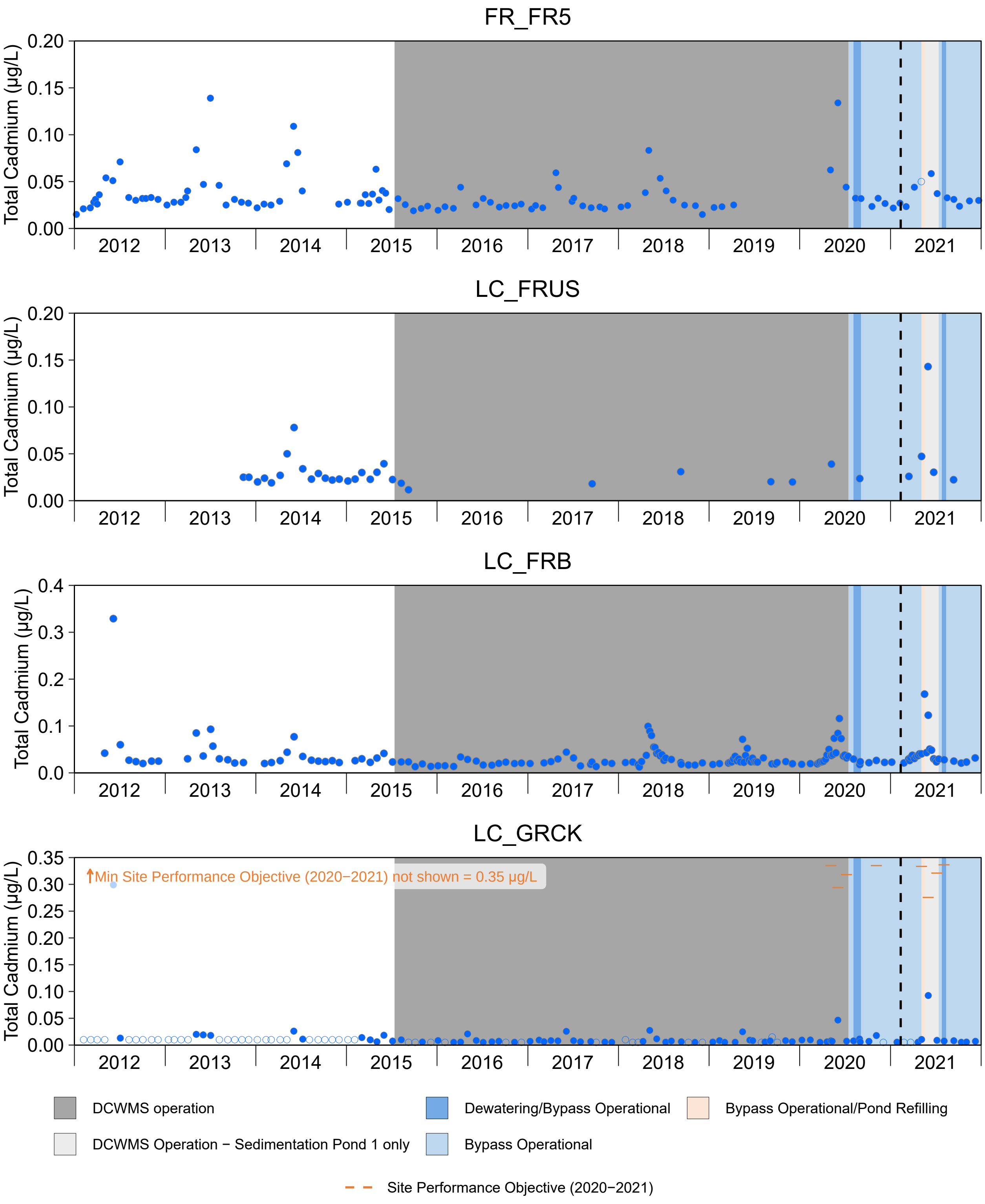


Figure C.9: **Time Series Plots for Total Cadmium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

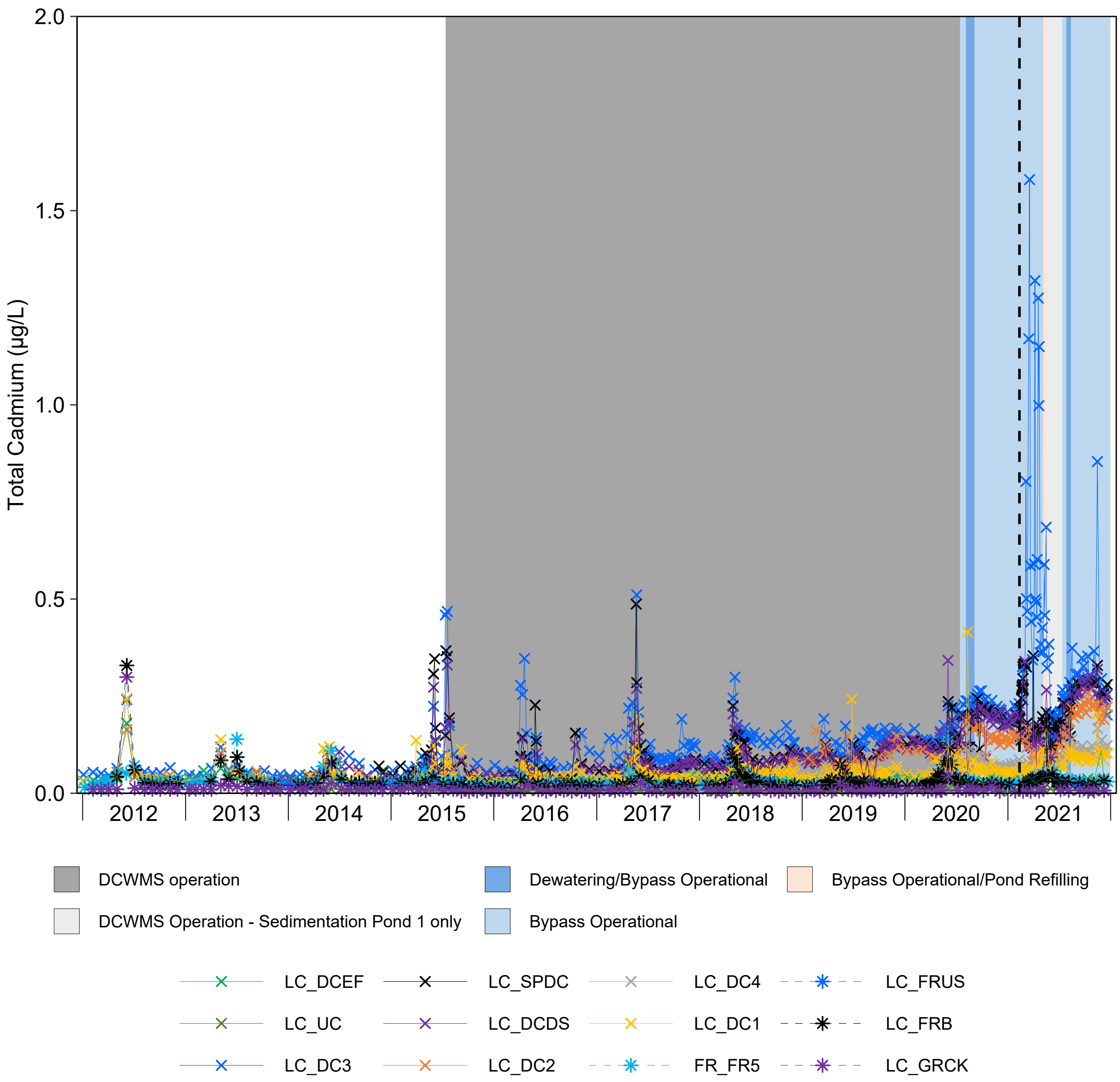


Figure C.10: **Time Series Plots for Total Cadmium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.0050 and 0.050 mg/L). Dashed vertical line indicates the Burnt Ridge North spoil failure.

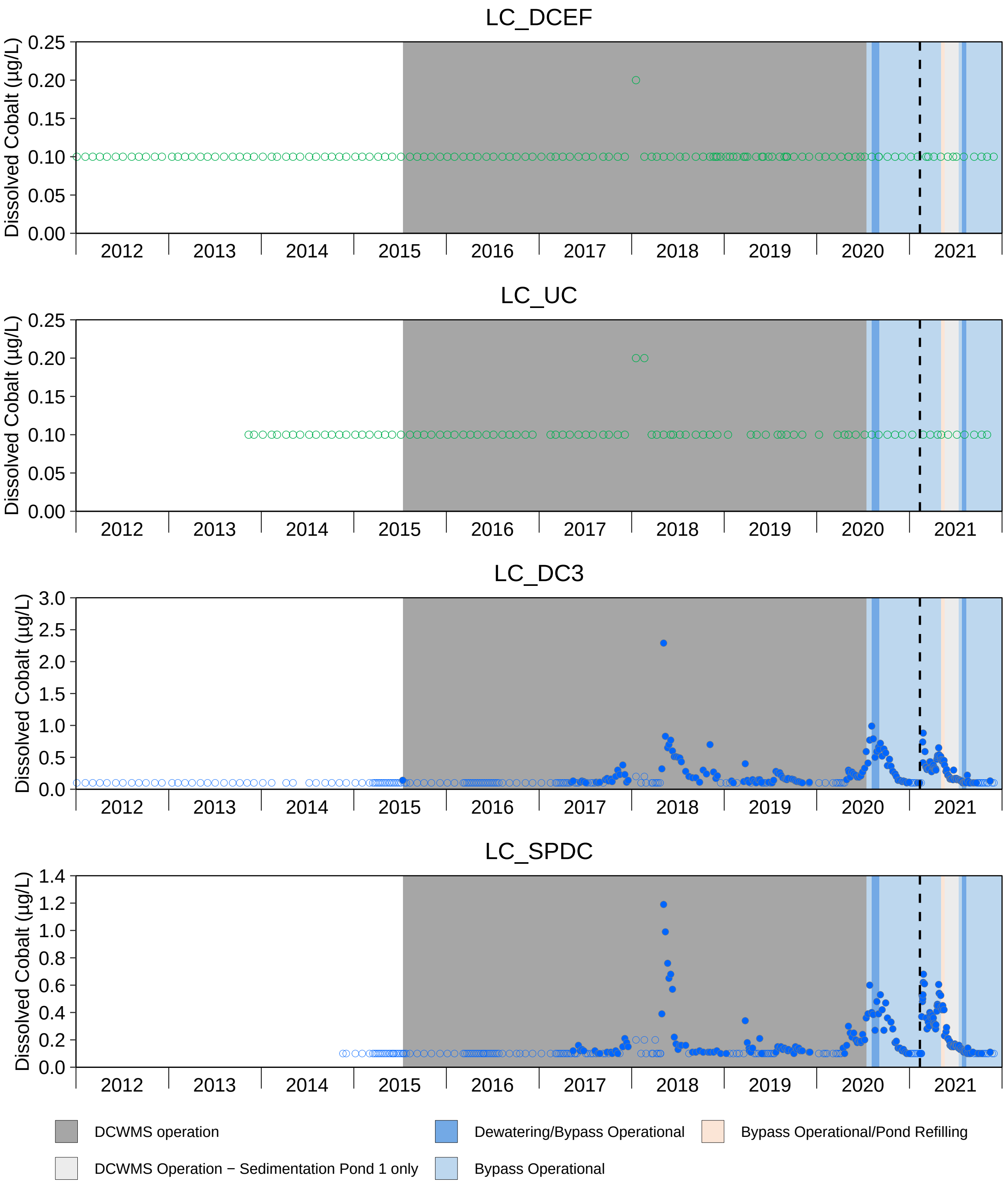


Figure C.11: **Time Series Plots for Dissolved Cobalt from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

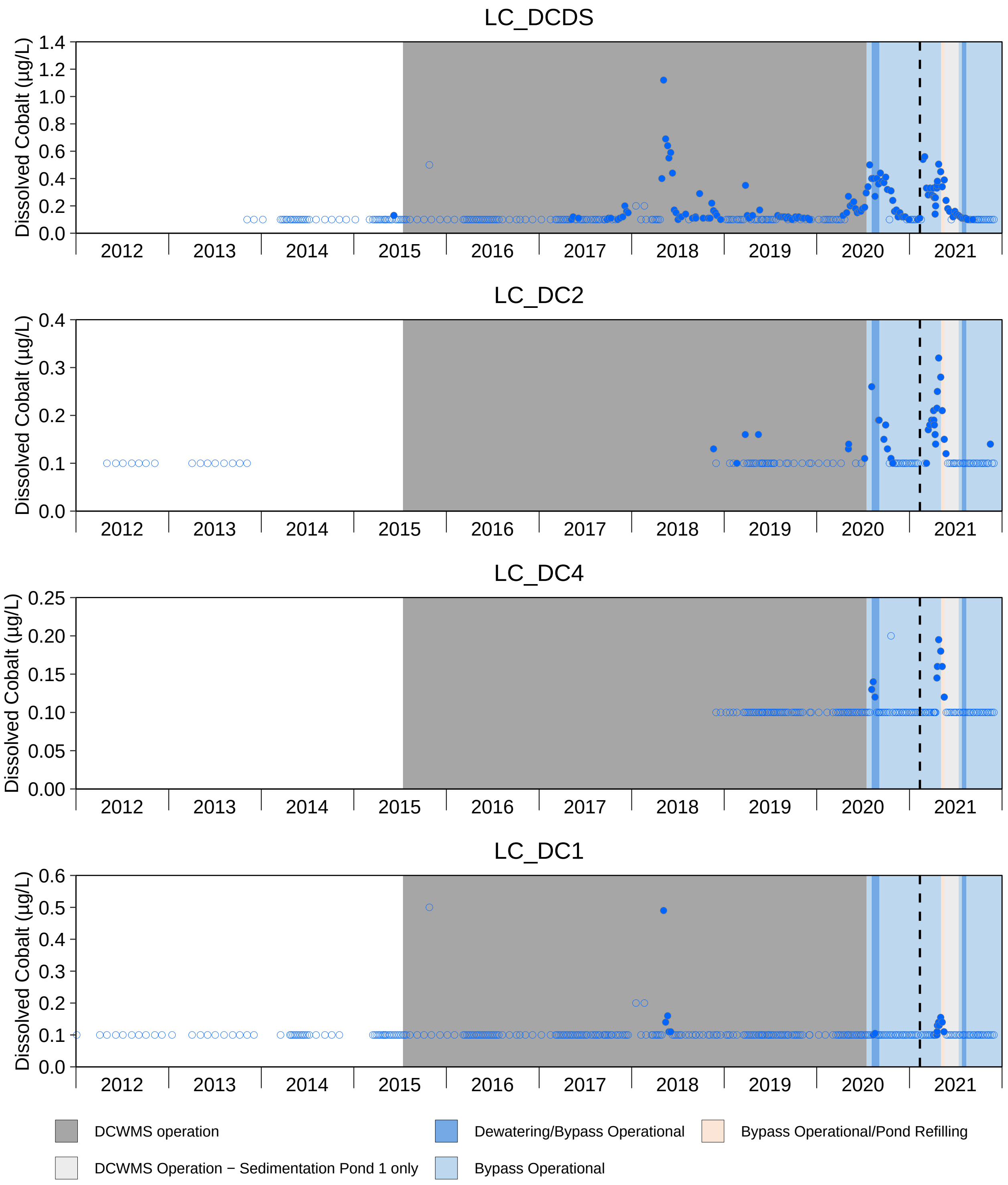


Figure C.11: **Time Series Plots for Dissolved Cobalt from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

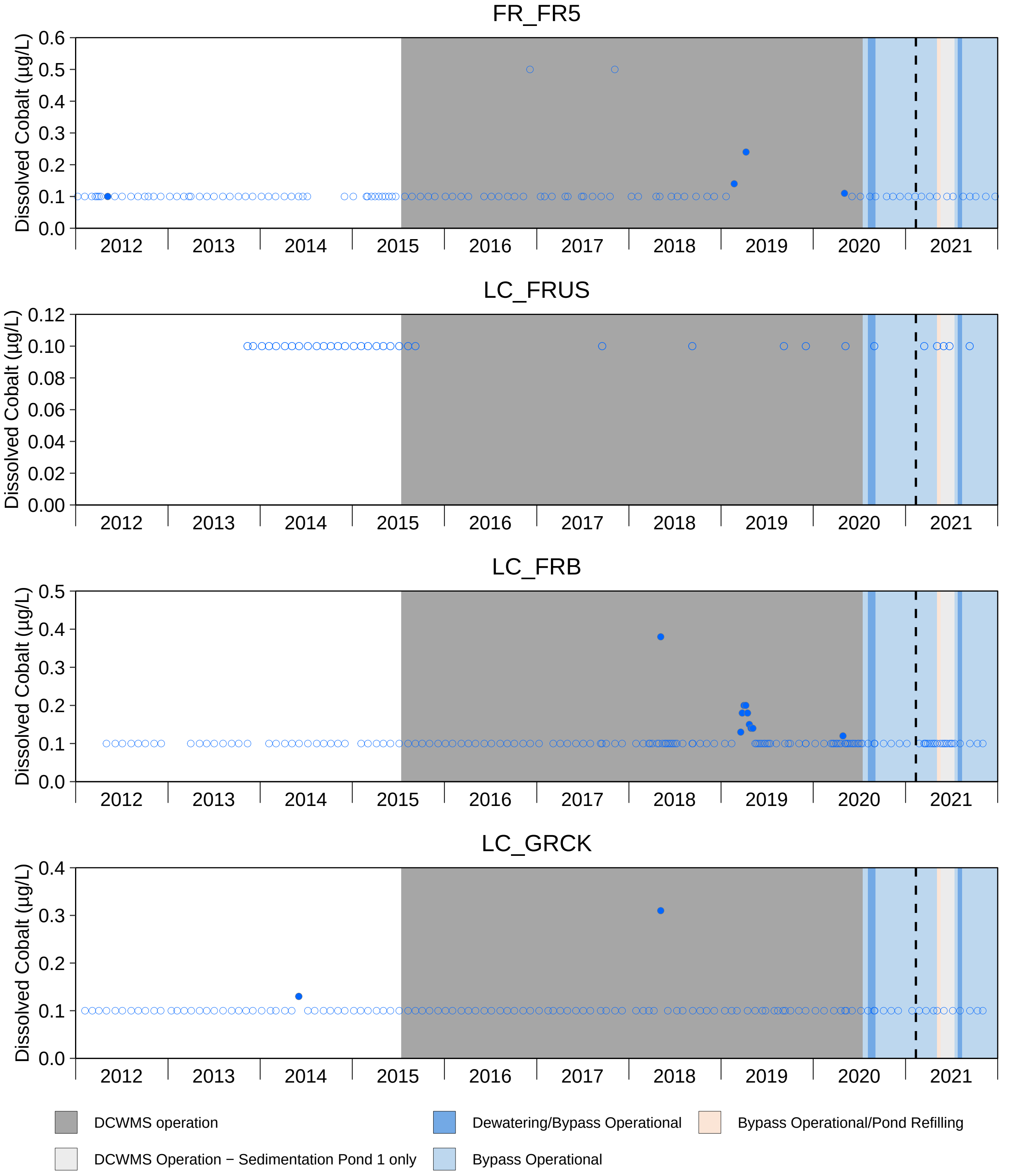


Figure C.11: **Time Series Plots for Dissolved Cobalt from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

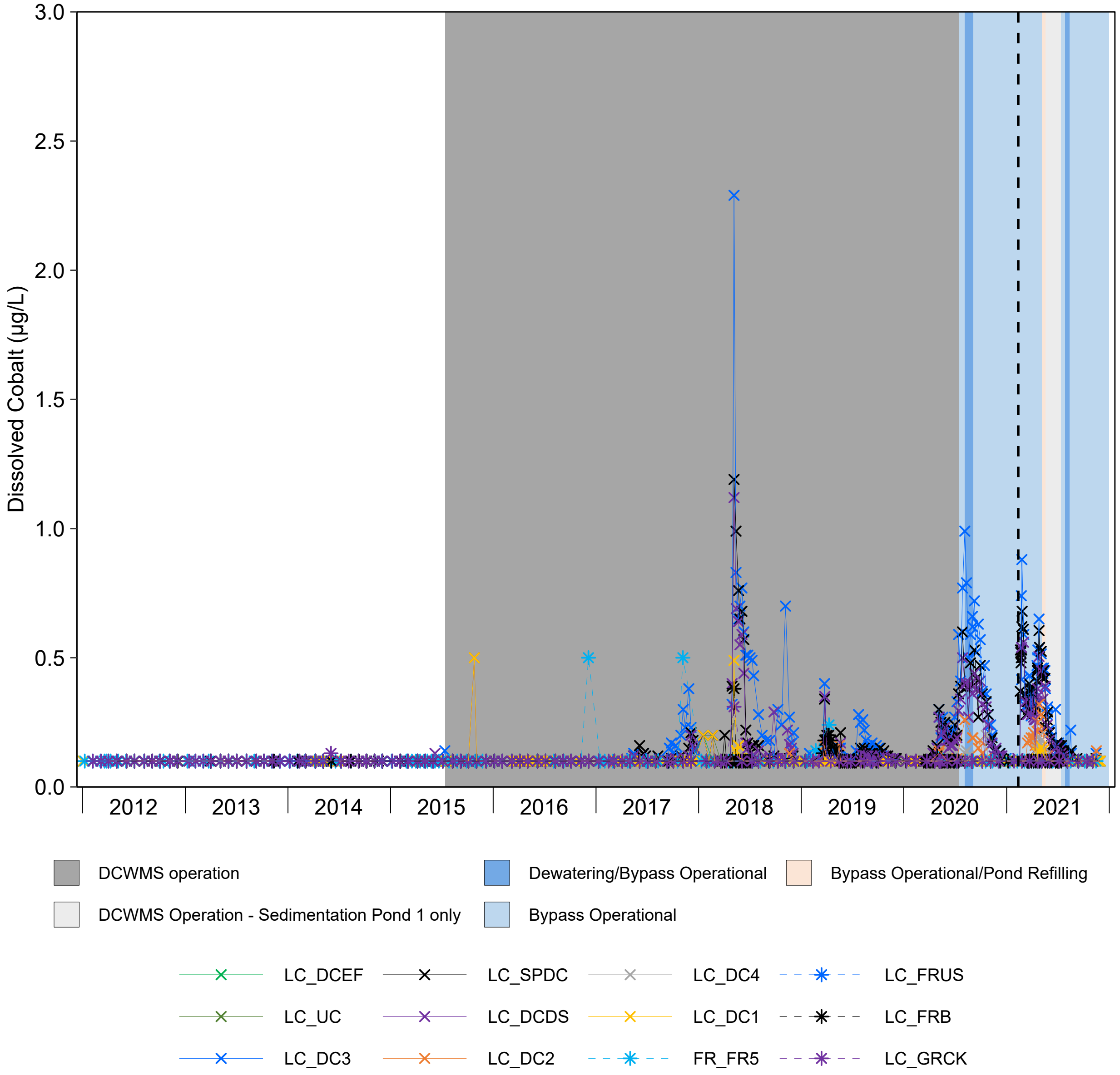


Figure C.12: **Time Series Plots for Dissolved Cobalt from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.10 and 0.50 mg/L). Dashed vertical line indicates the Burnt Ridge North spoil failure.

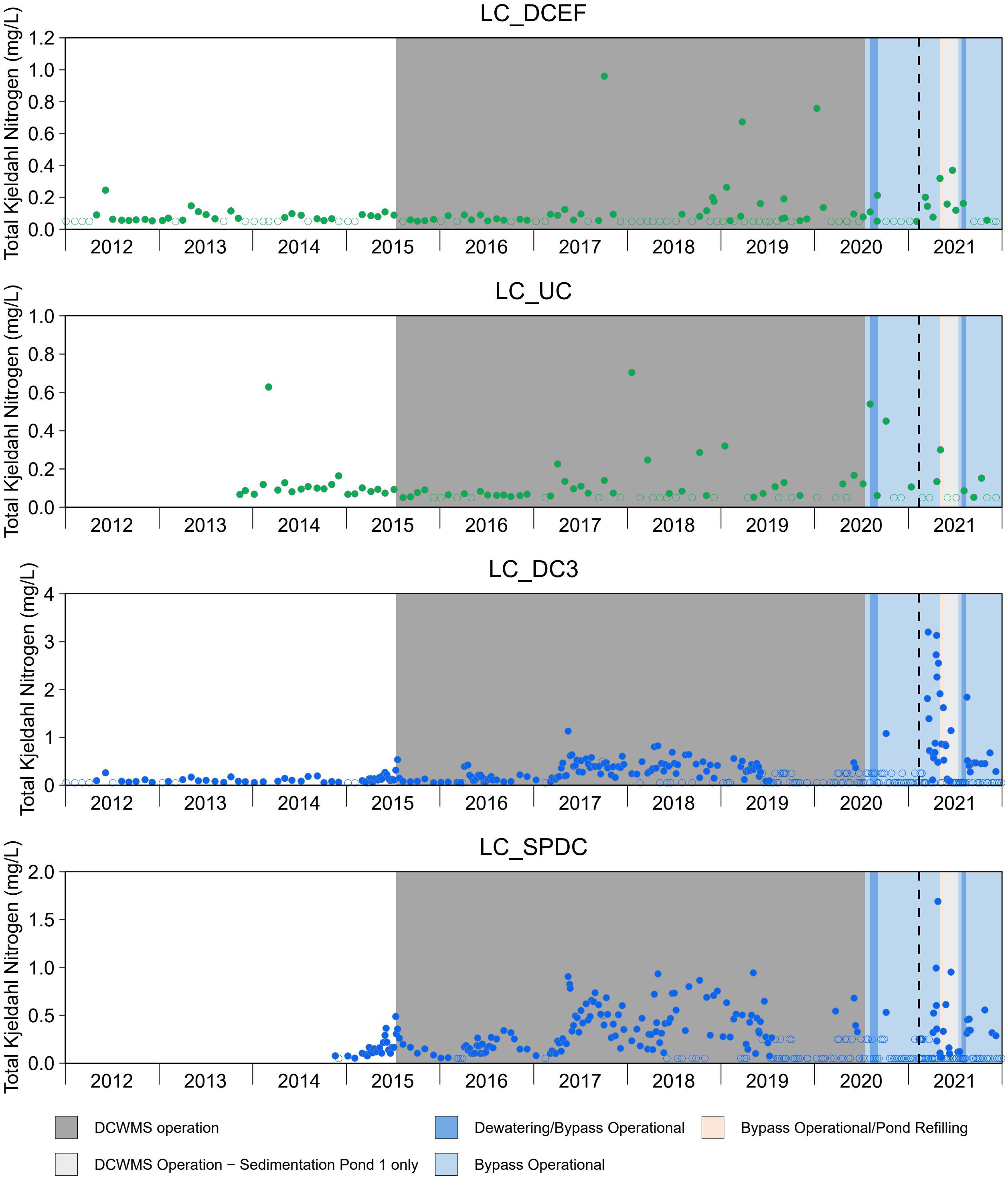


Figure C.13: Time Series Plots for Total Kjeldahl Nitrogen from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

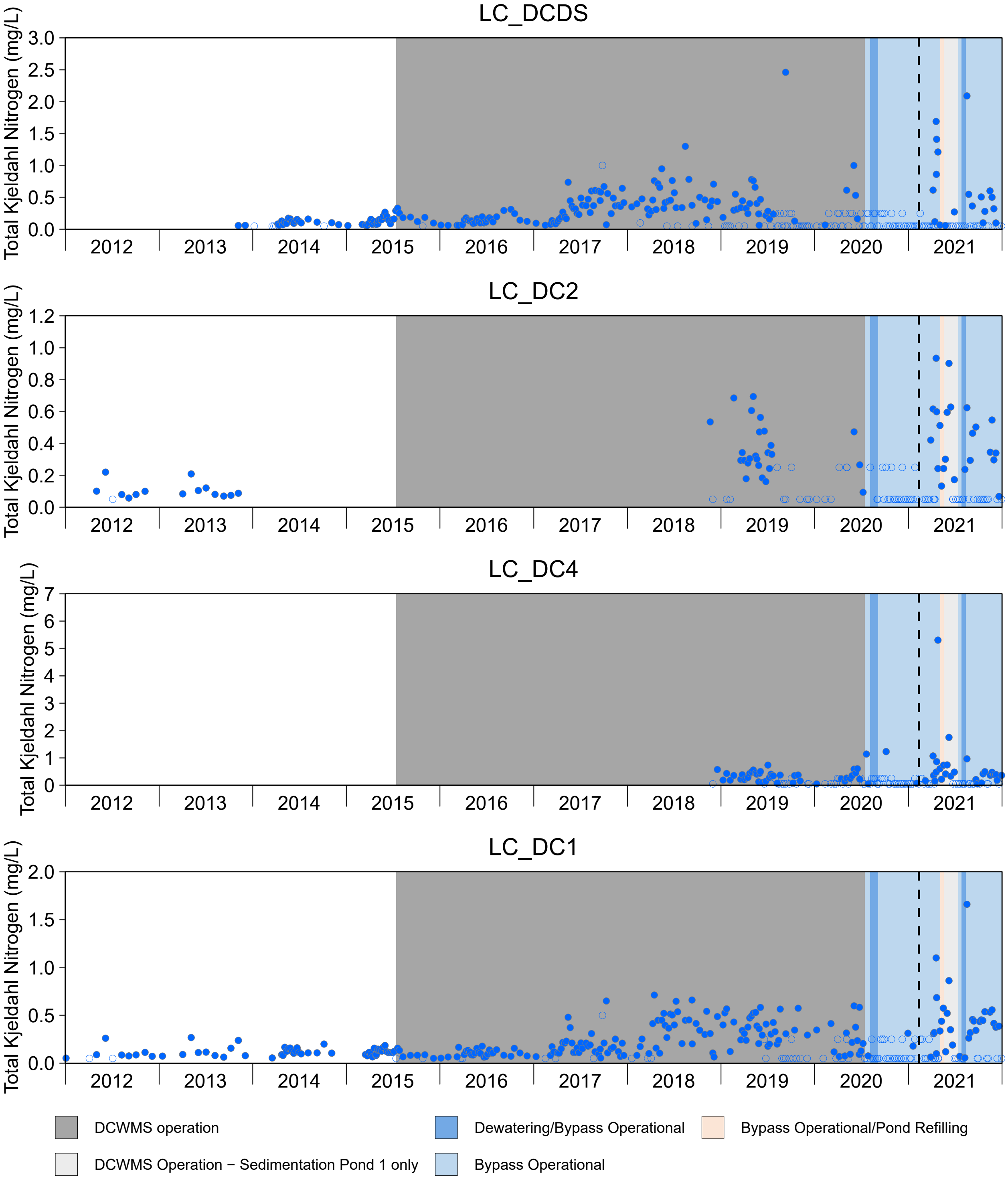


Figure C.13: **Time Series Plots for Total Kjeldahl Nitrogen from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

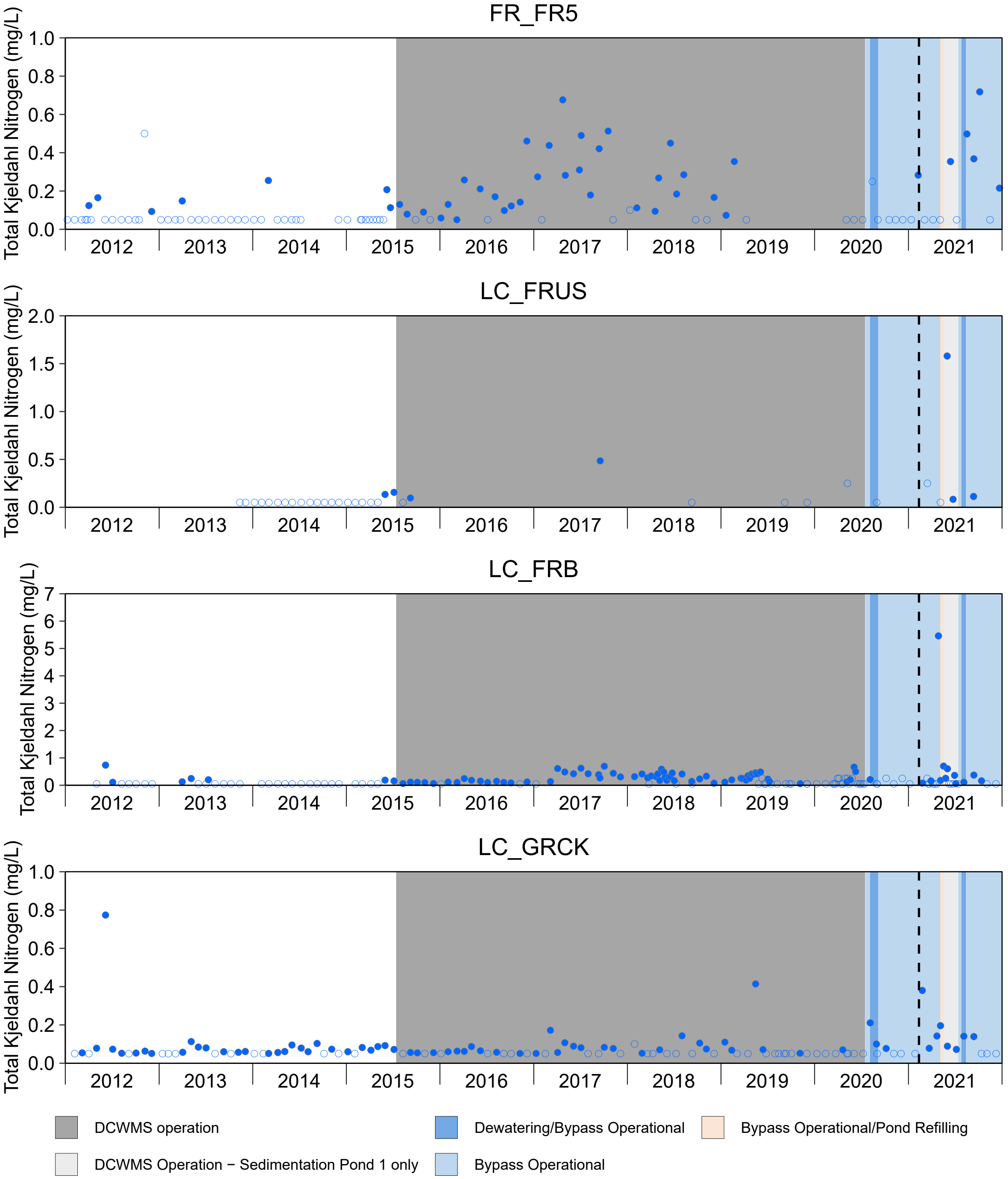


Figure C.13: Time Series Plots for Total Kjeldahl Nitrogen from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

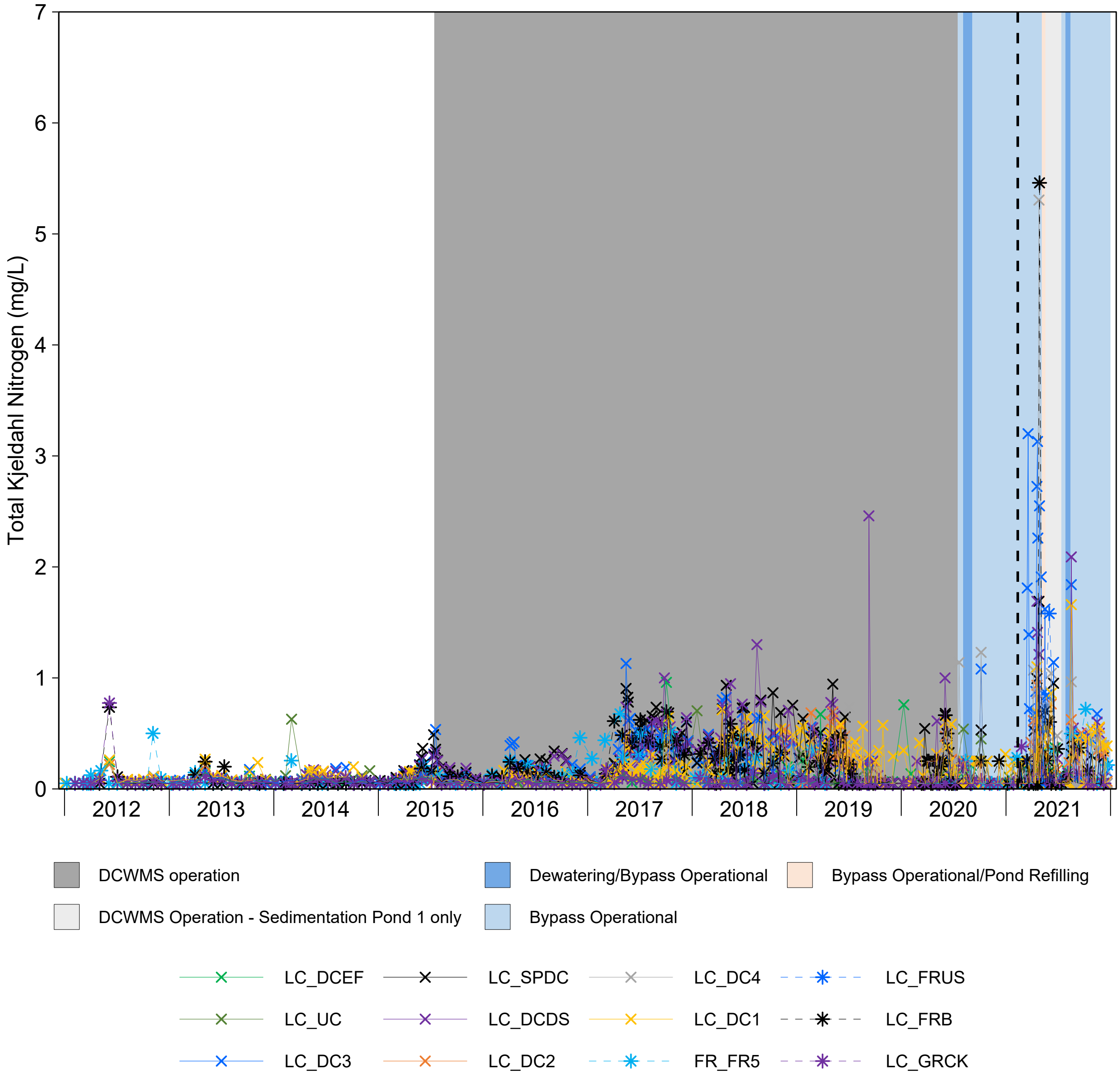


Figure C.14: Time Series Plots for Total Kjeldahl Nitrogen from LCO Dry Creek LAEMP Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.050 and 1.0 mg/L). Dashed vertical line indicates the Burnt Ridge North spoil failure.

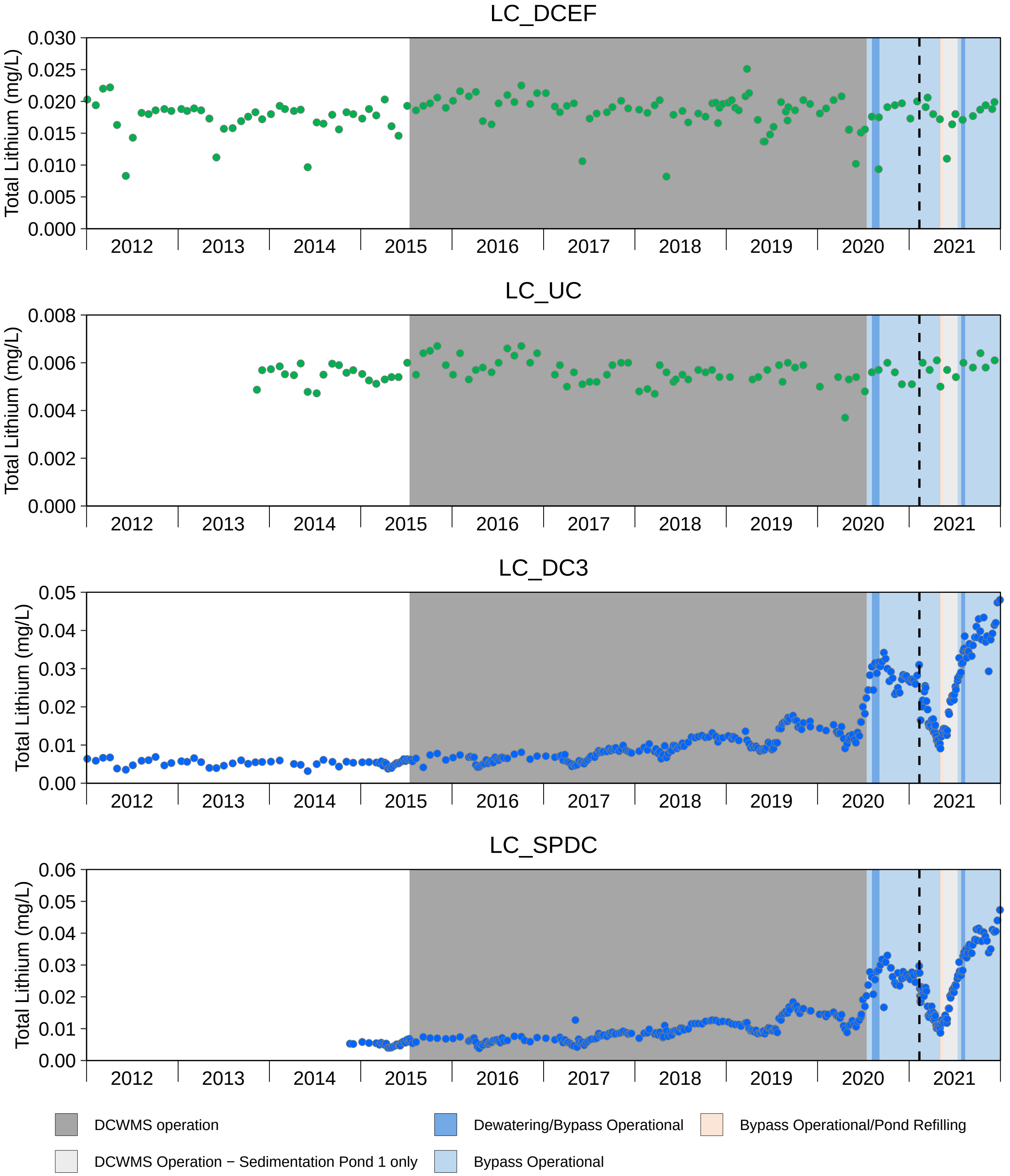


Figure C.15: **Time Series Plots for Total Lithium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

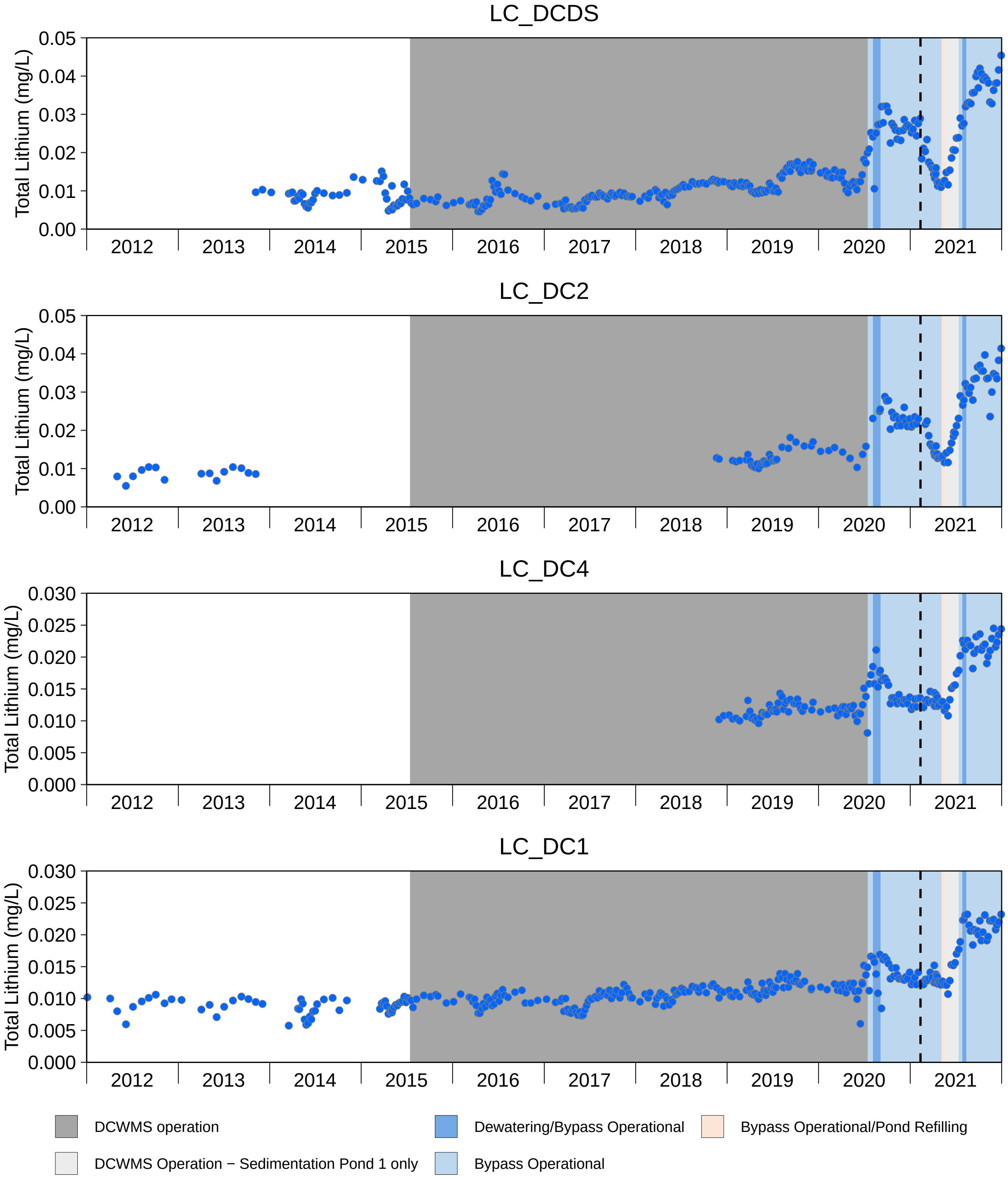


Figure C.15: **Time Series Plots for Total Lithium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

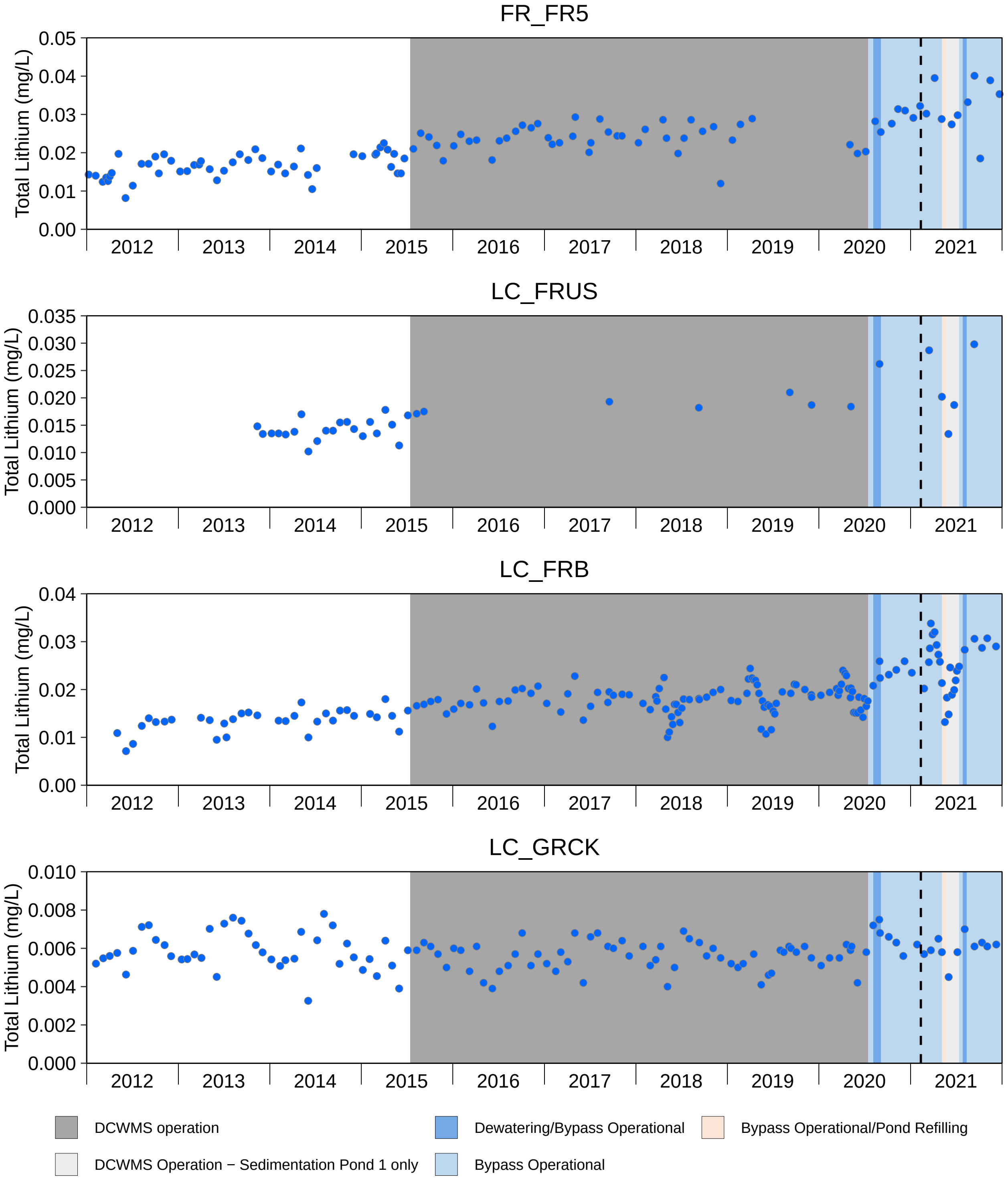


Figure C.15: **Time Series Plots for Total Lithium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

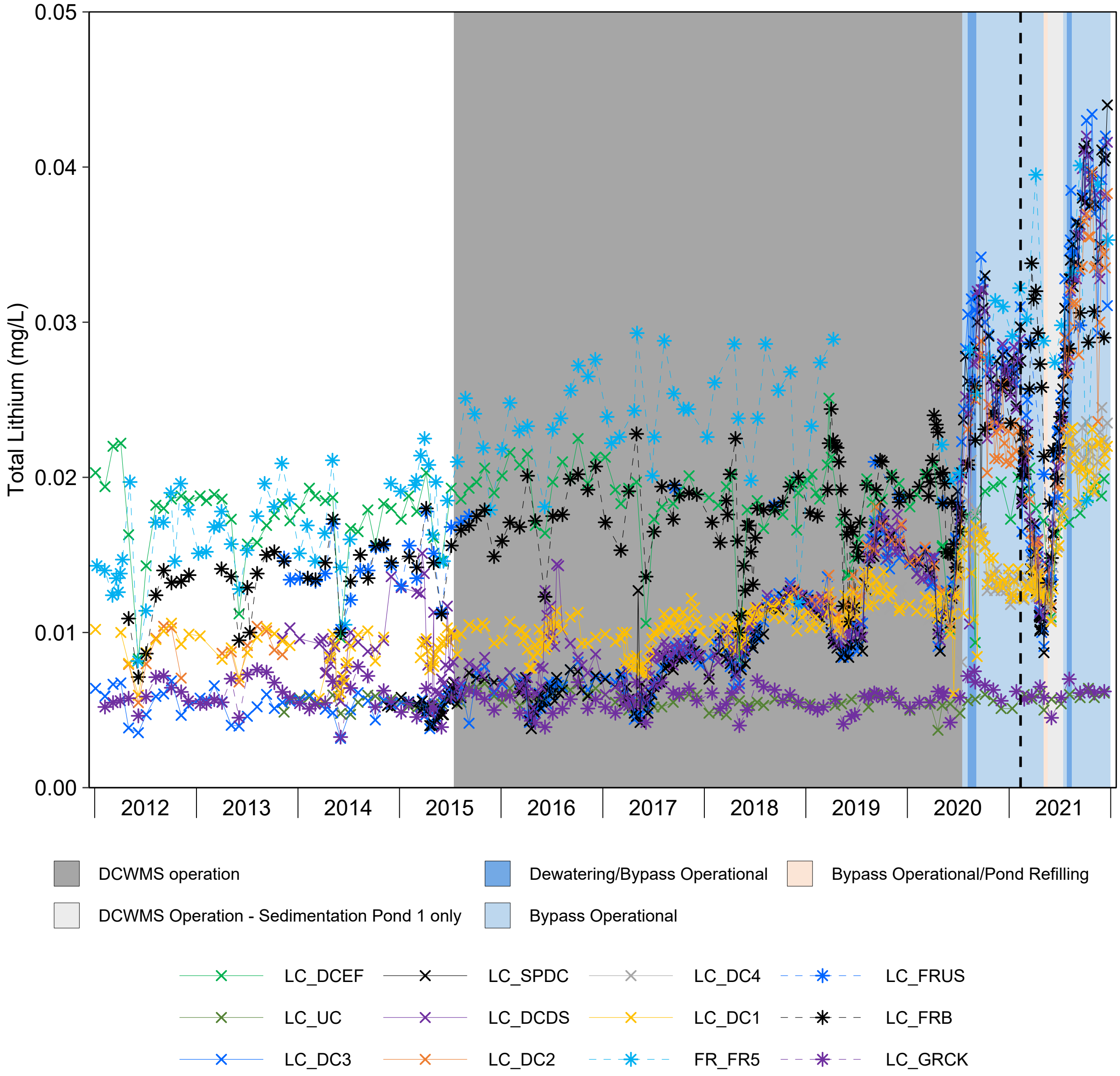


Figure C.16: **Time Series Plots for Total Lithium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: No values were reported below the LRL. Dashed vertical line indicates the Burnt Ridge North spoil failure.

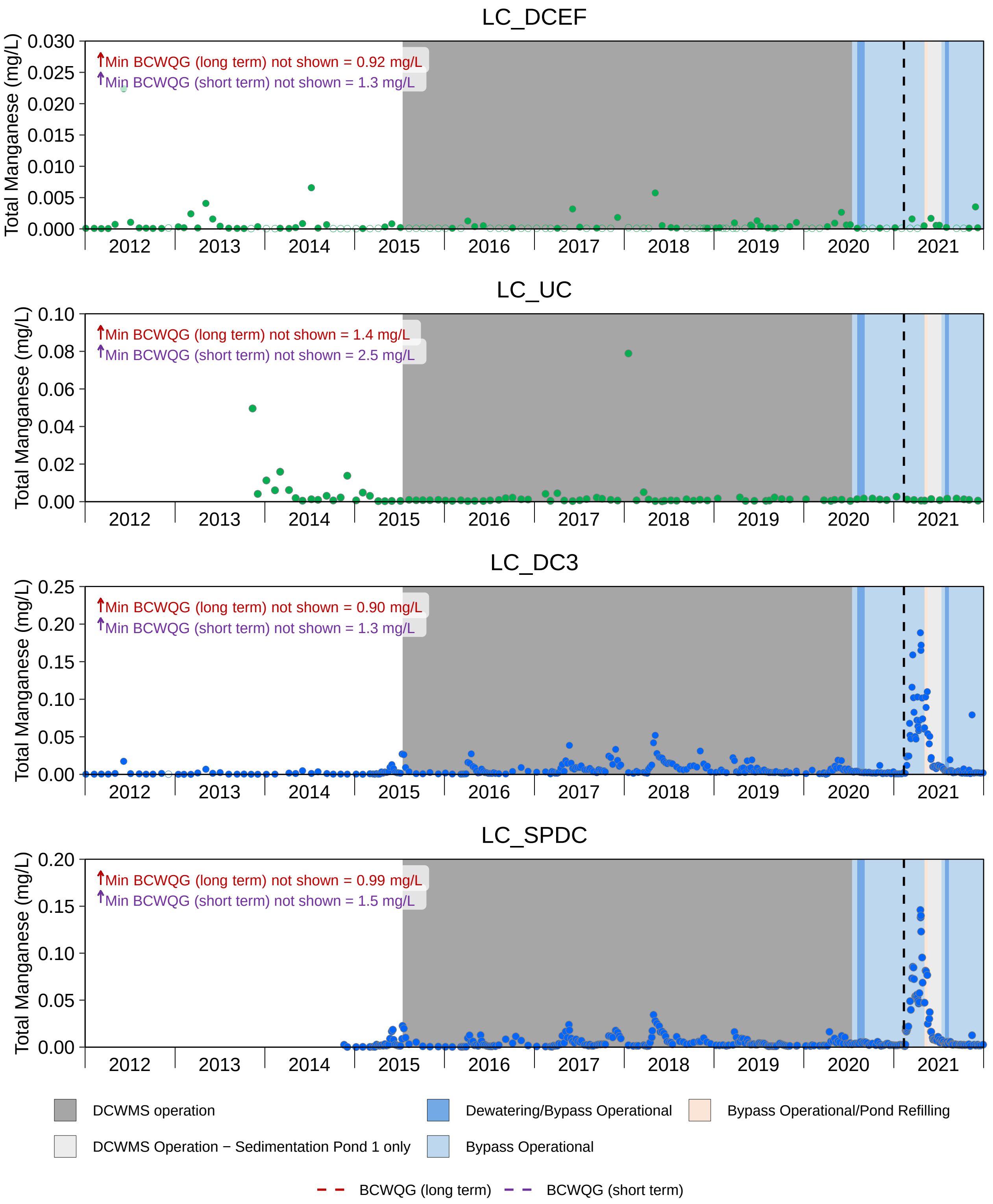


Figure C.17: **Time Series Plots for Total Manganese from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1). Guidelines are dependent on water hardness.

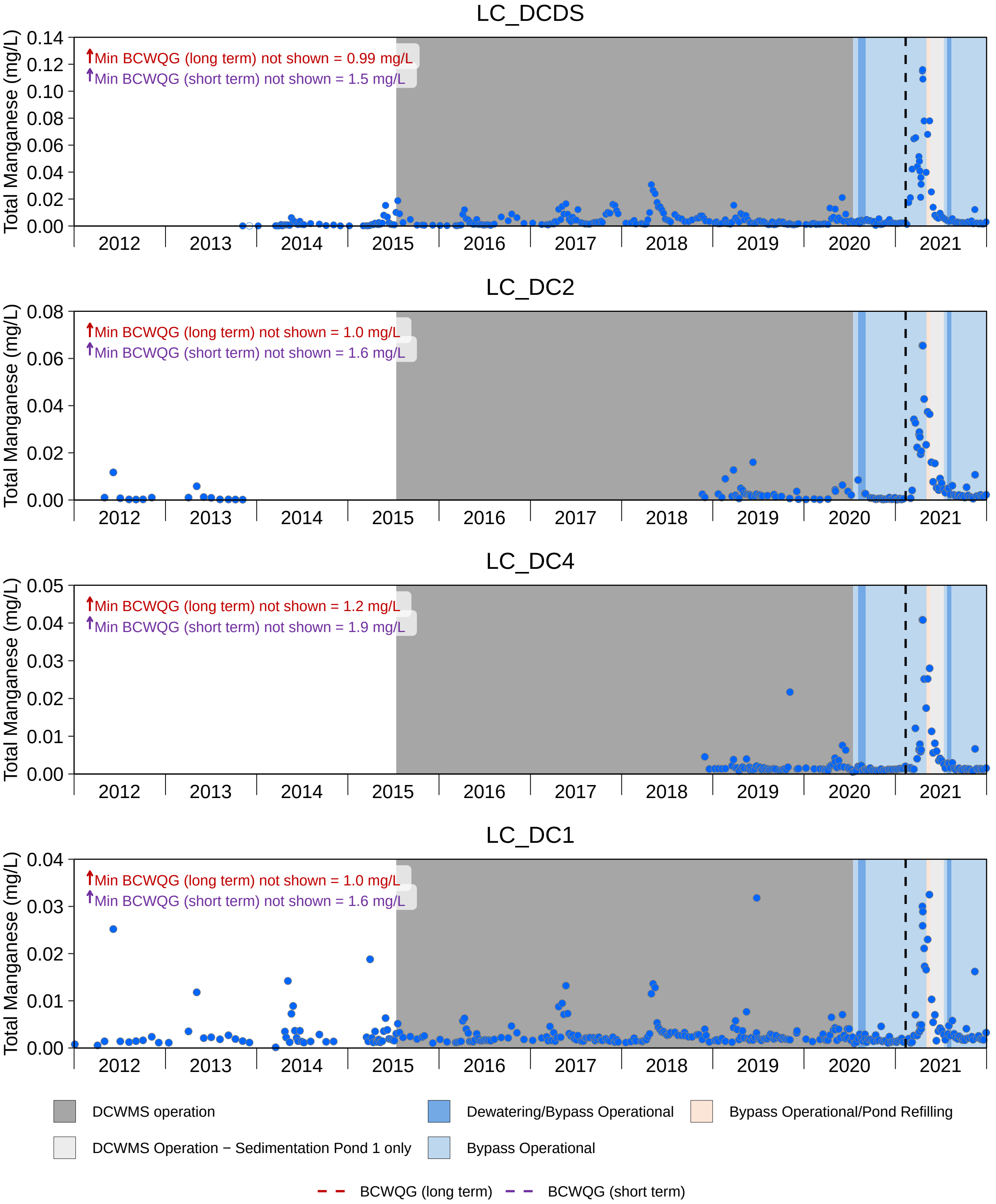


Figure C.17: **Time Series Plots for Total Manganese from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1). Guidelines are dependent on water hardness.

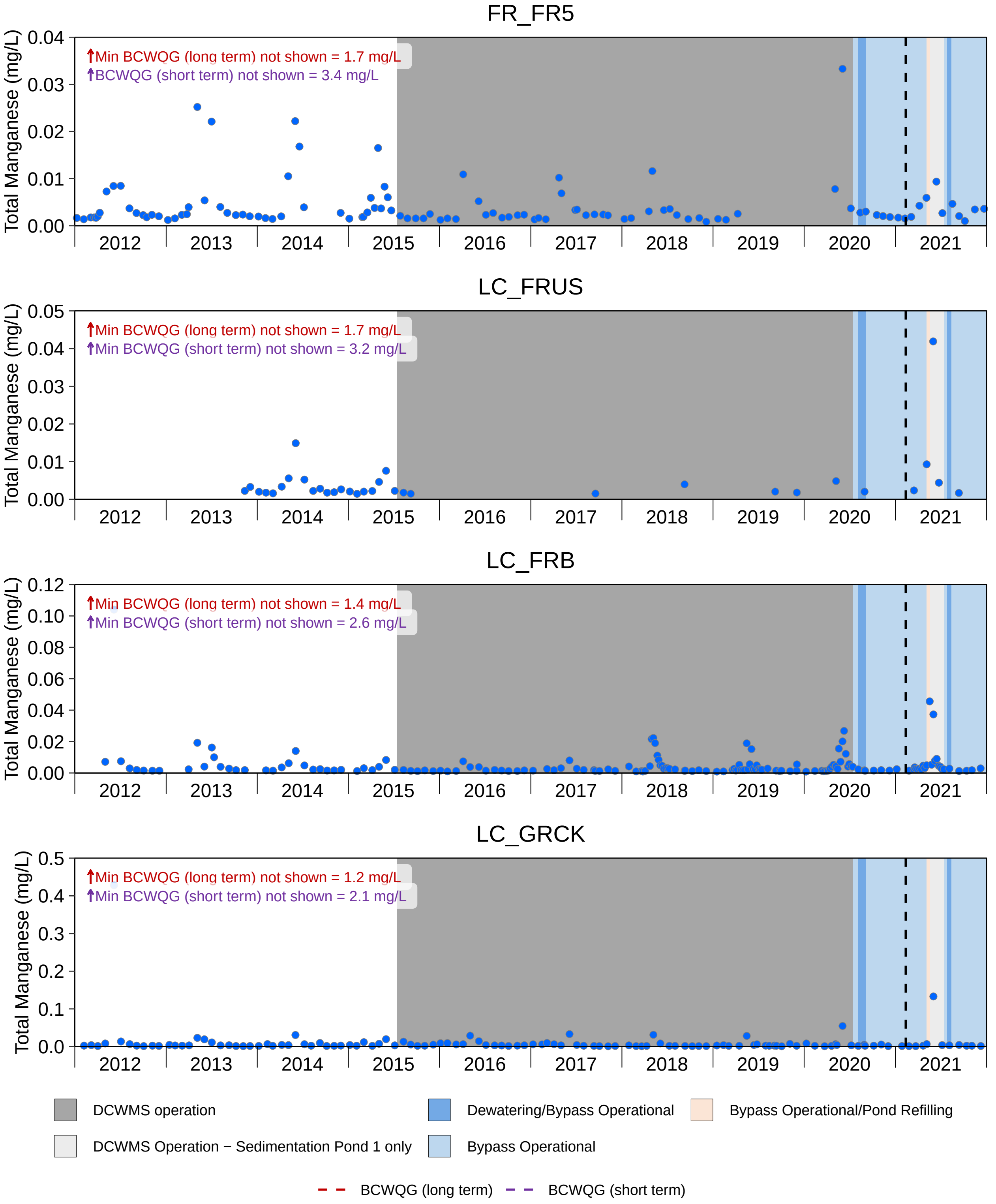


Figure C.17: Time Series Plots for Total Manganese from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1). Guidelines are dependent on water hardness.

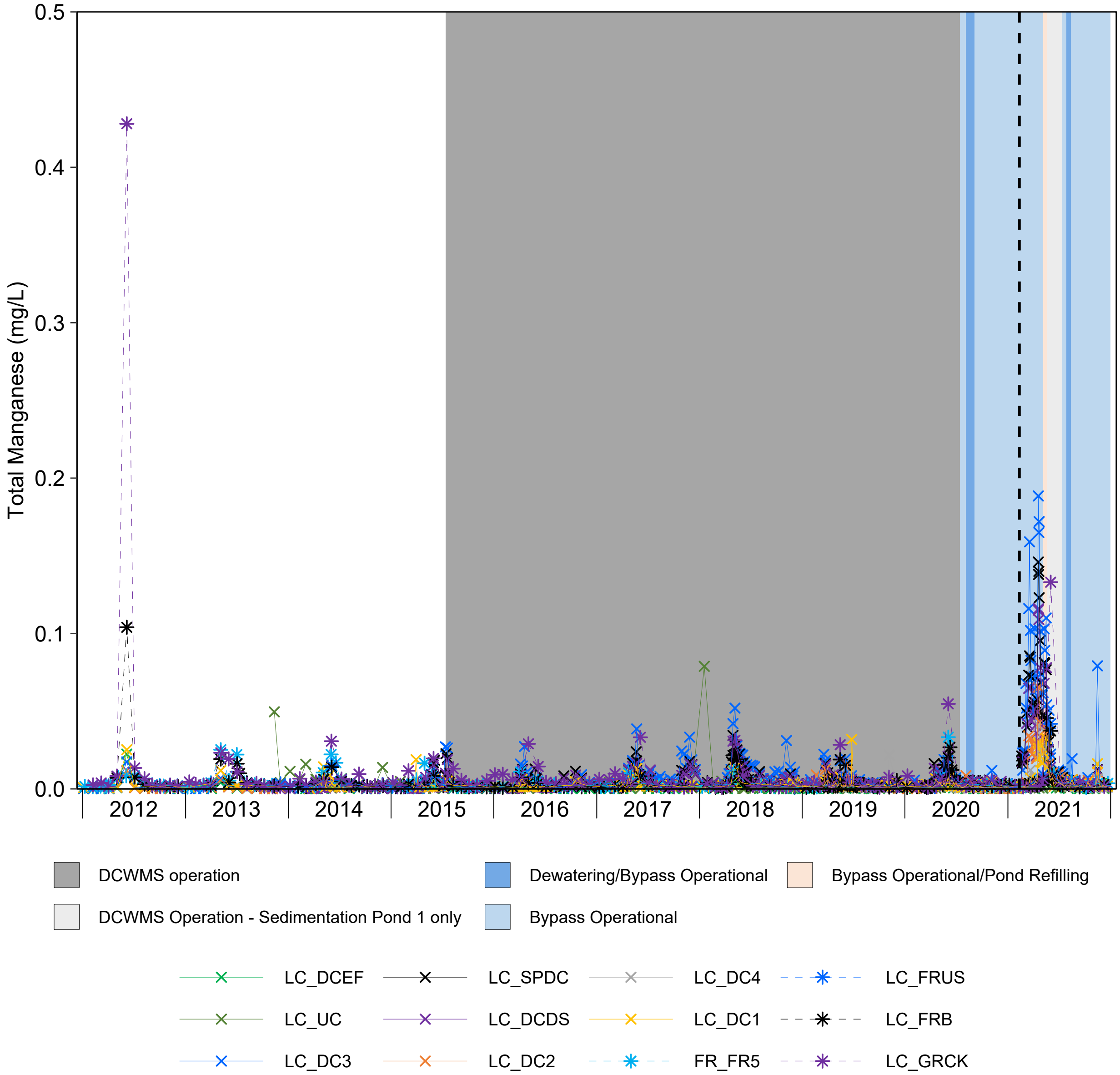


Figure C.18: **Time Series Plots for Total Manganese from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.000050 and 0.00025 mg/L). Dashed vertical line indicates the Burnt Ridge North spoil failure.

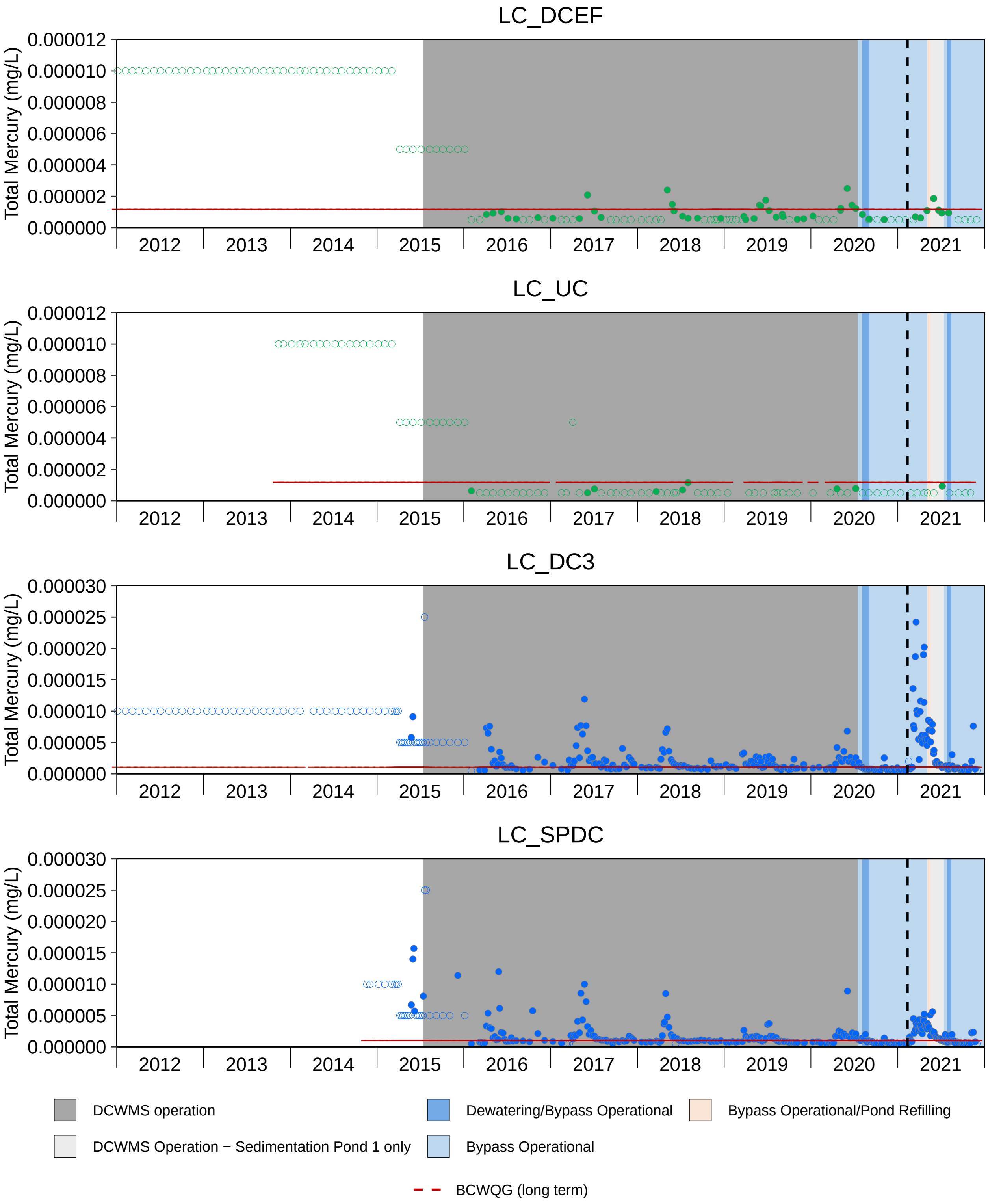


Figure C.19: **Time Series Plots for Total Mercury from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

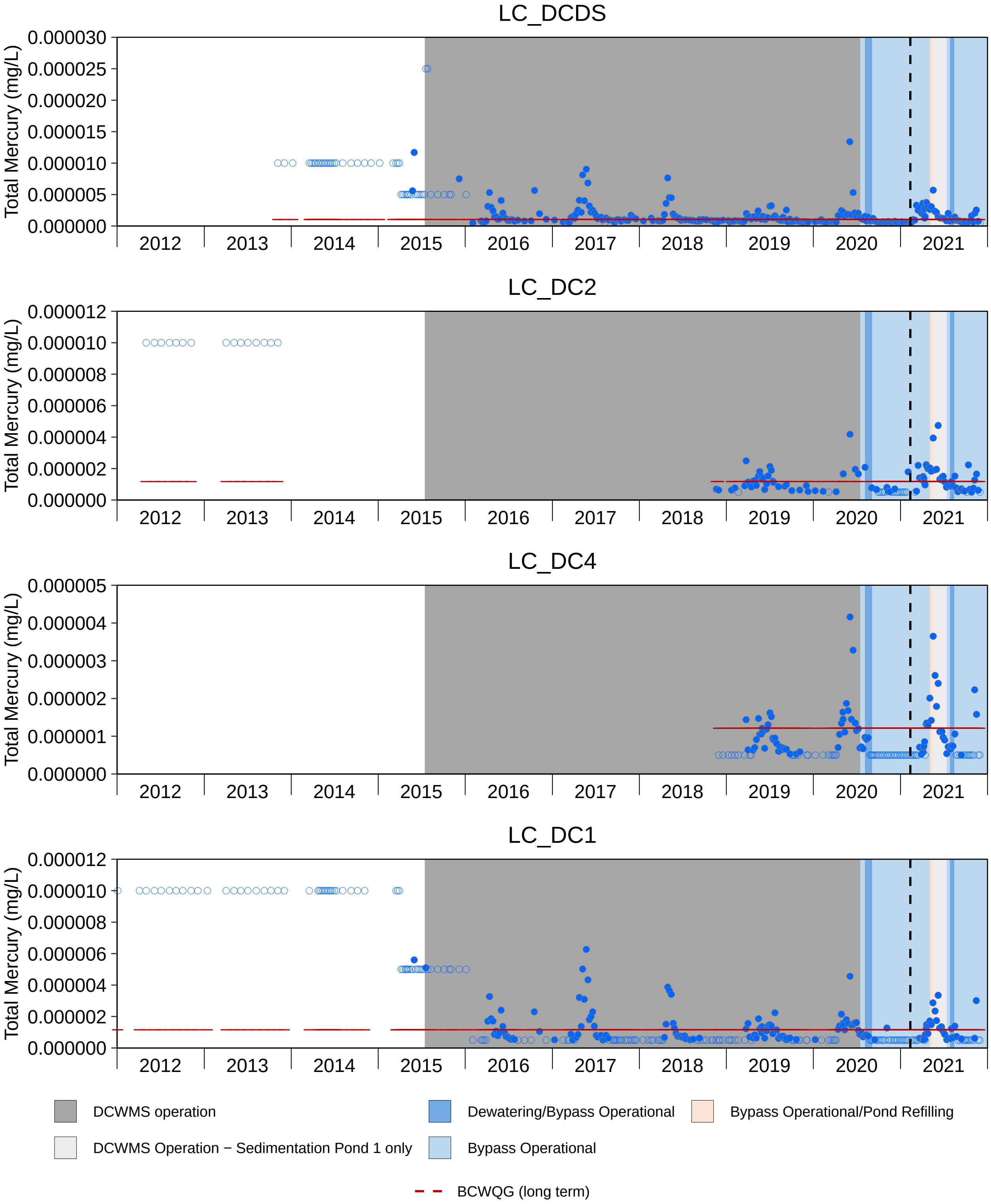


Figure C.19: **Time Series Plots for Total Mercury from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

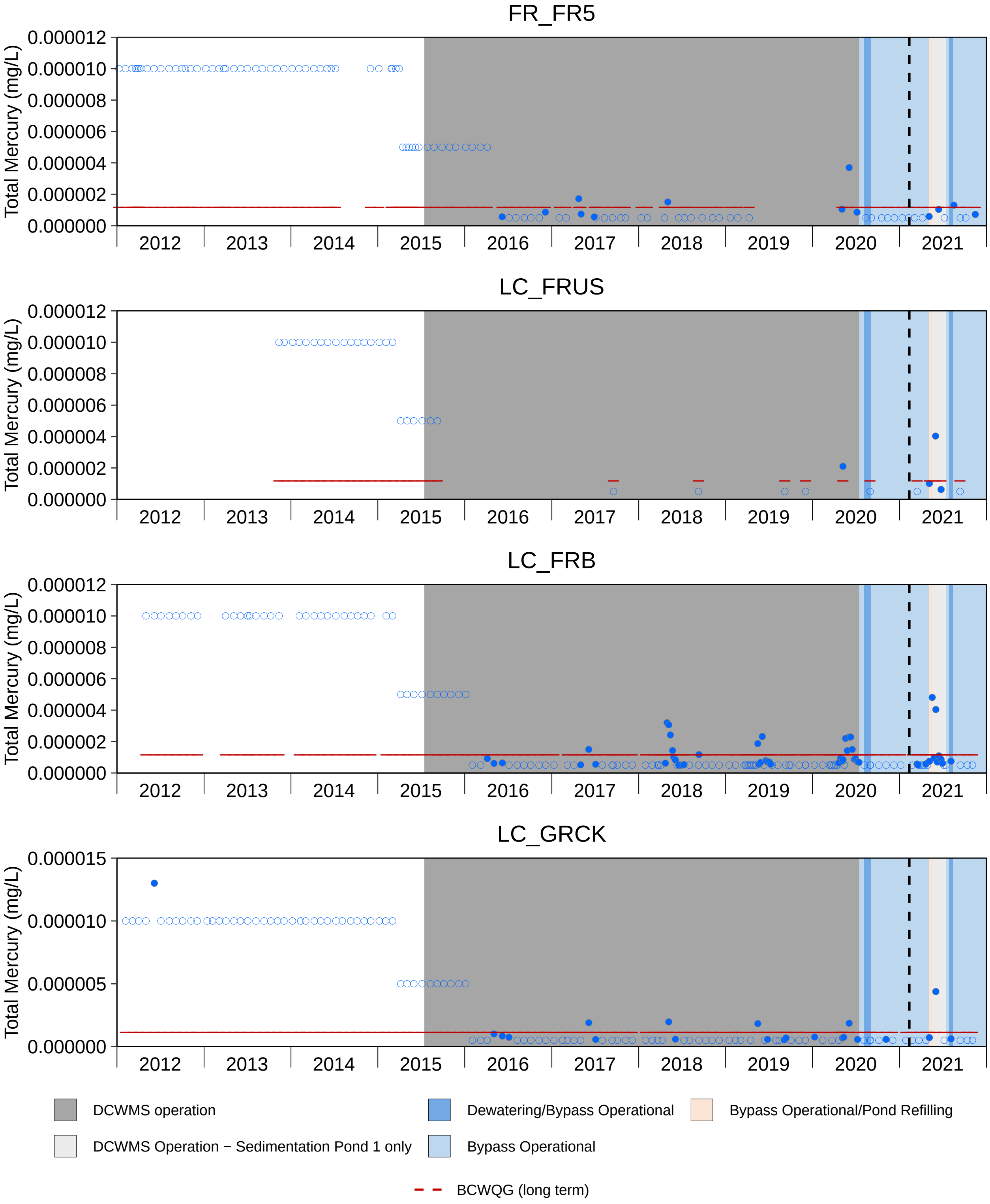


Figure C.19: Time Series Plots for Total Mercury from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

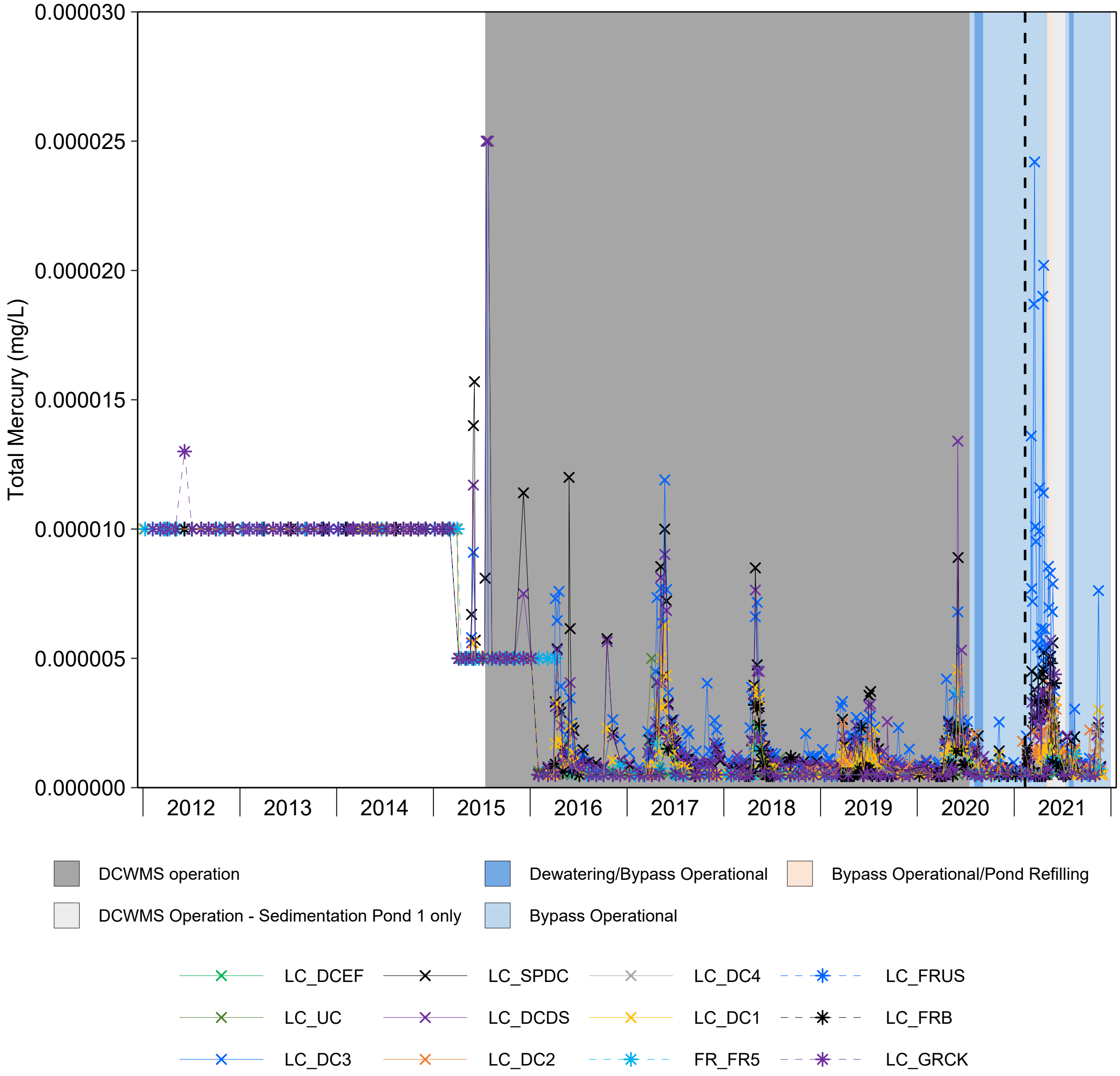


Figure C.20: **Time Series Plots for Total Mercury from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.00000050 and 0.000025 mg/L). Dashed vertical line indicates the Burnt Ridge North spoil failure.

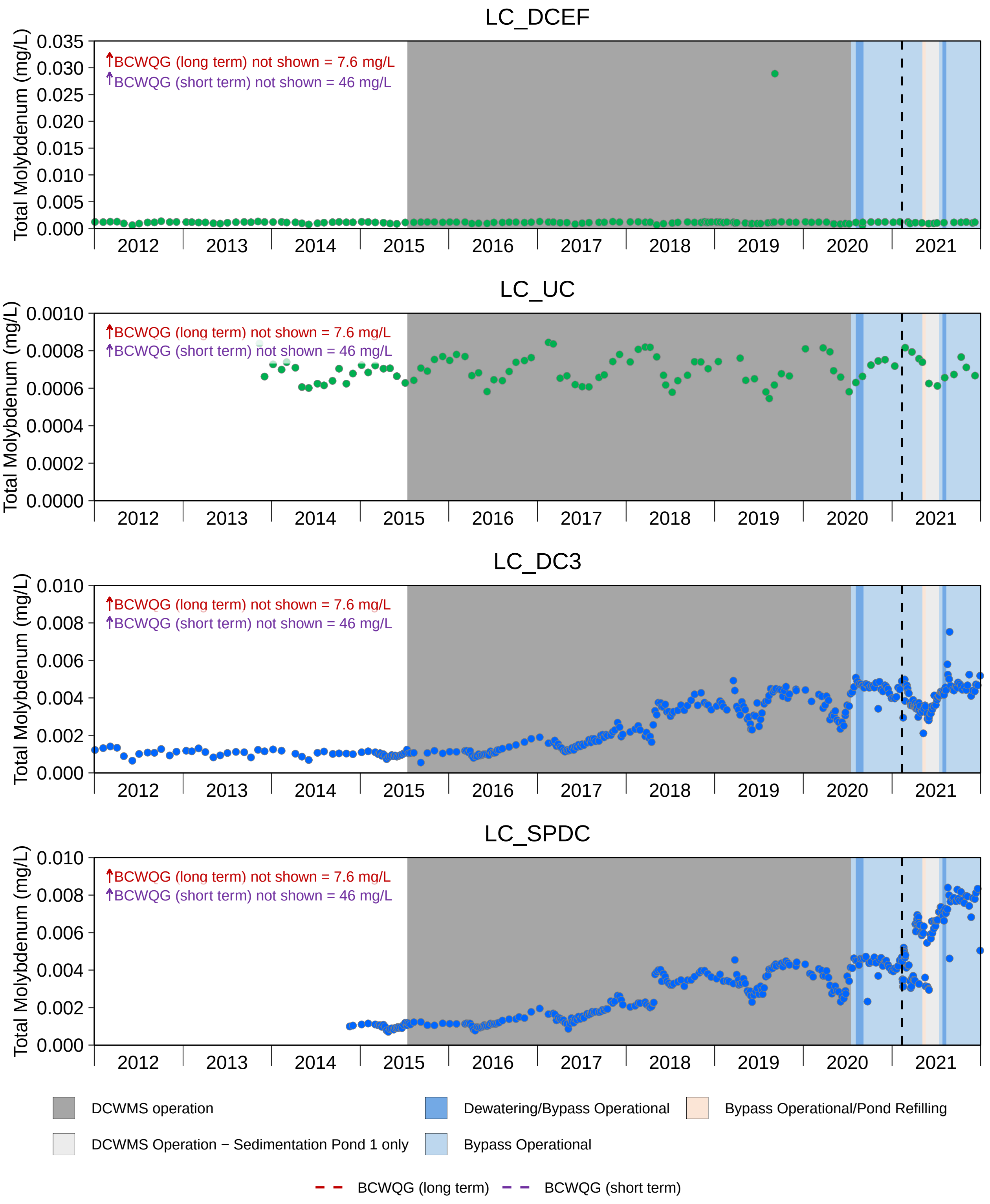


Figure C.21: **Time Series Plots for Total Molybdenum from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

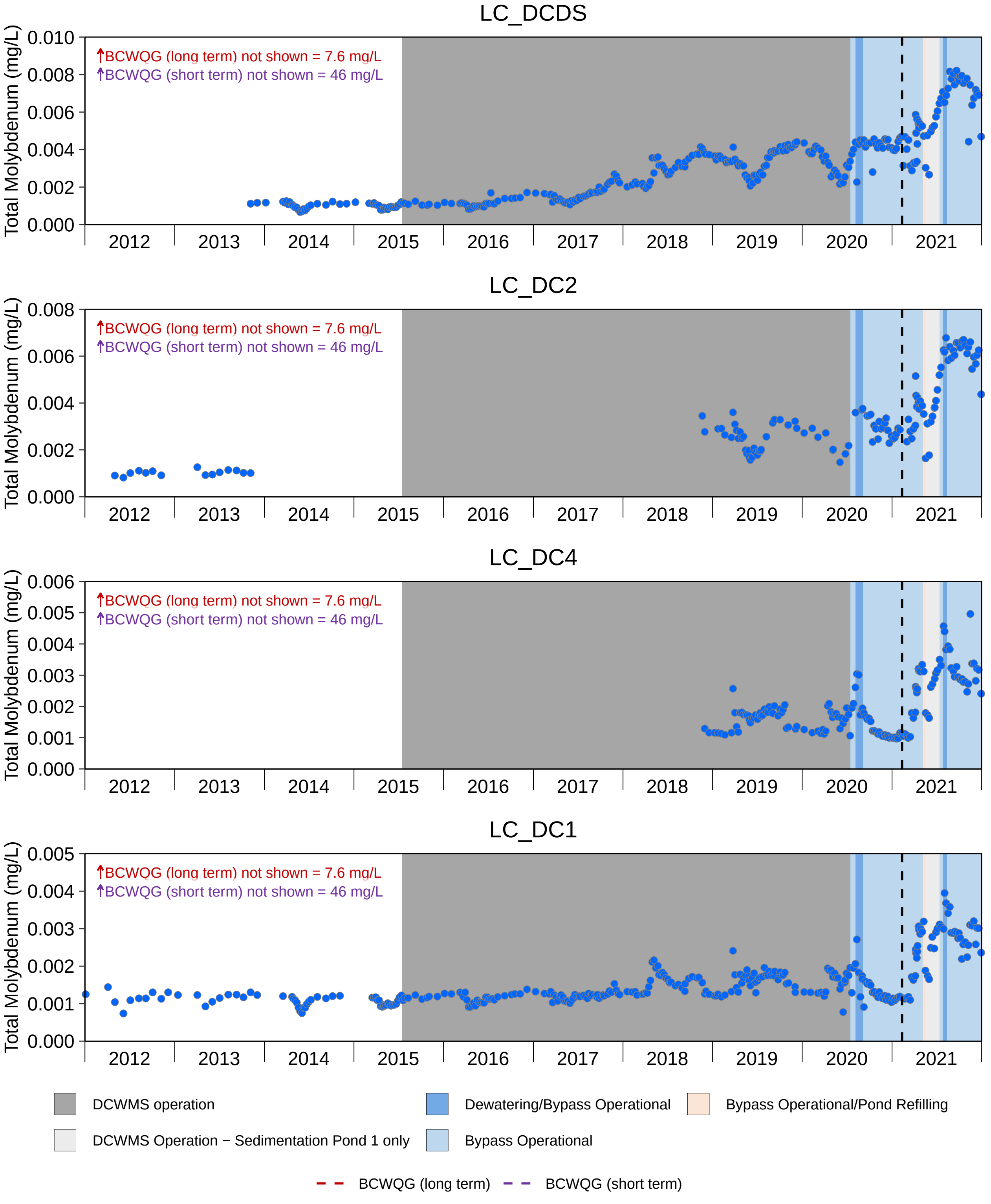


Figure C.21: **Time Series Plots for Total Molybdenum from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

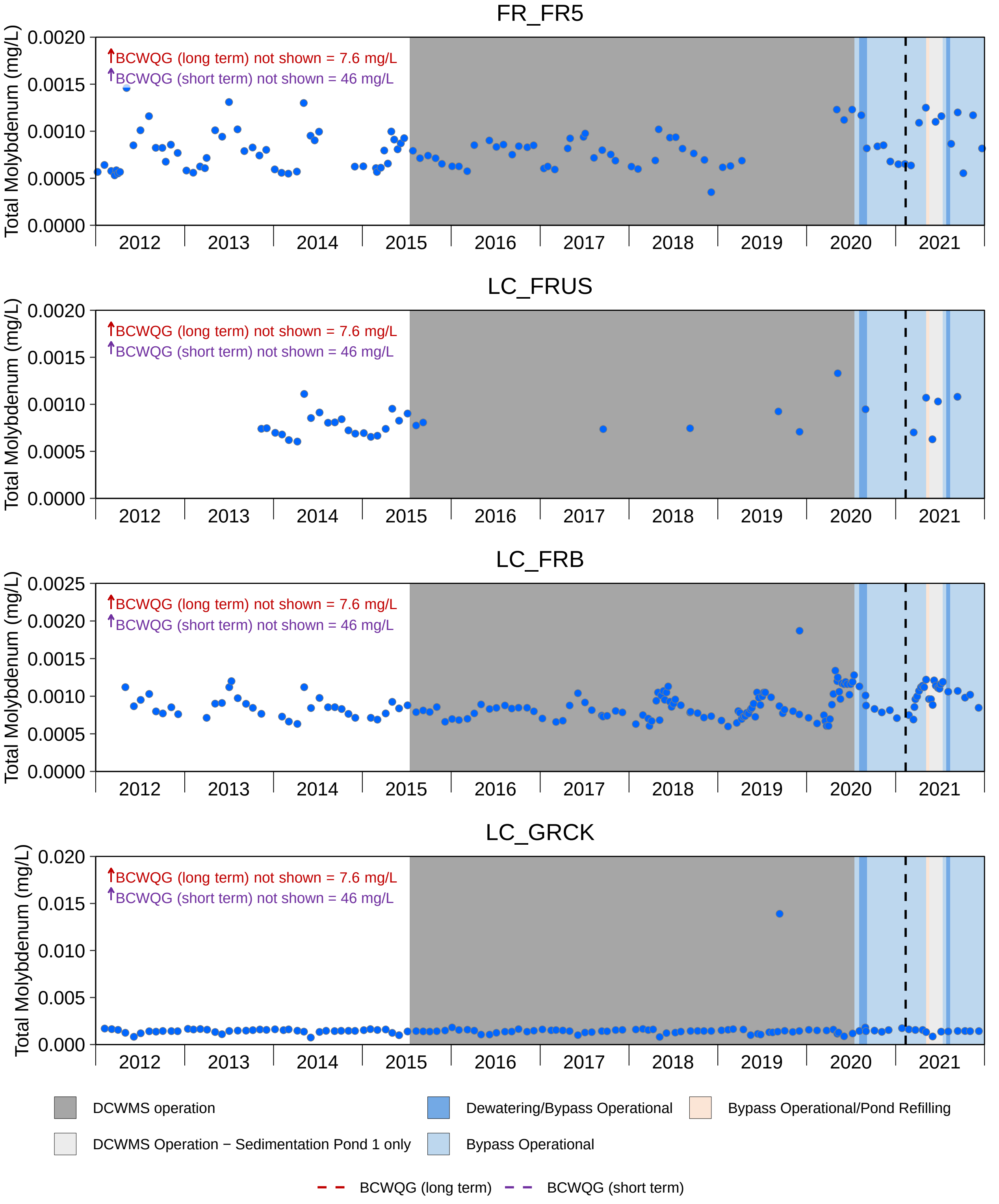


Figure C.21: Time Series Plots for Total Molybdenum from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

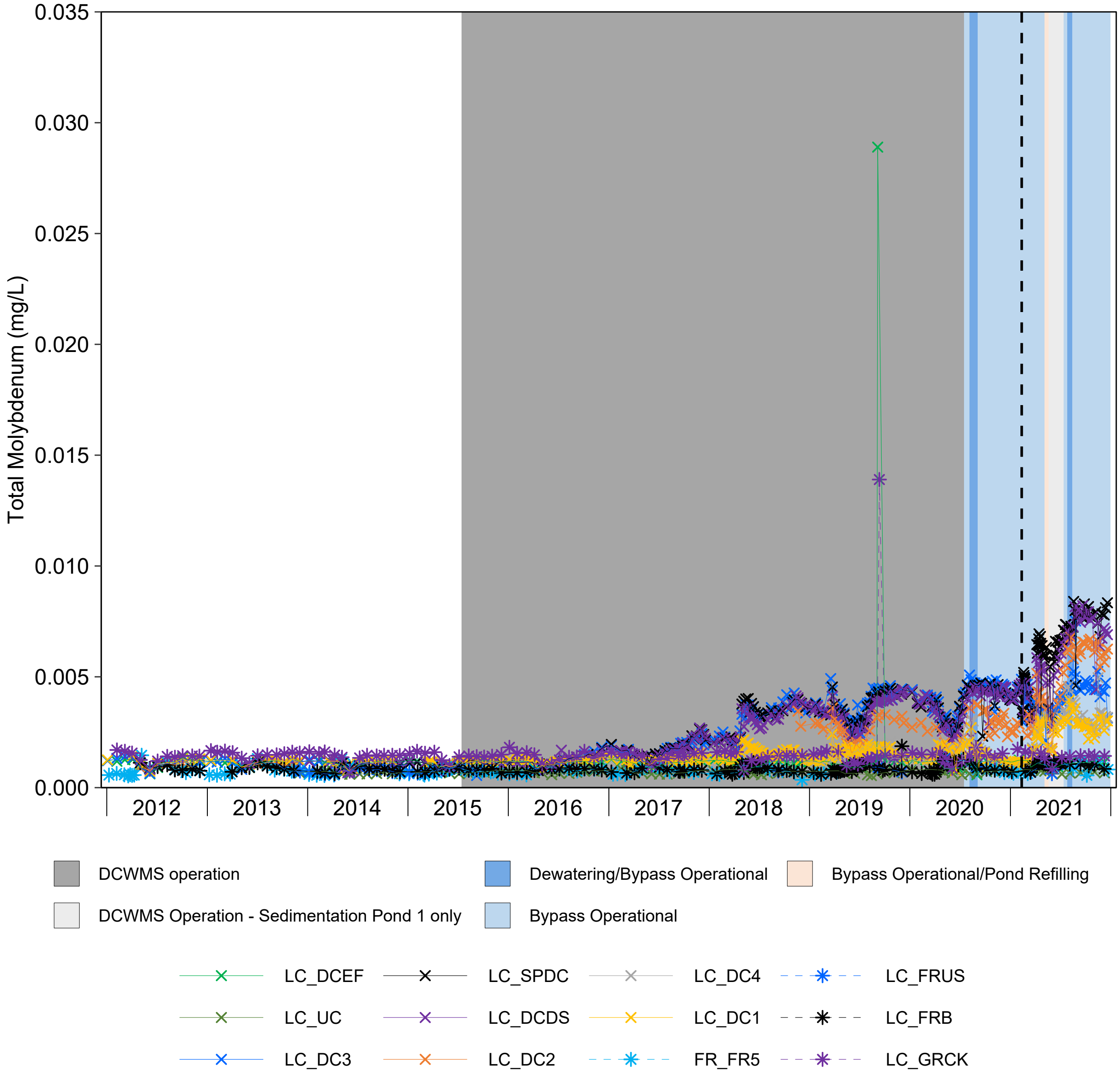


Figure C.22: **Time Series Plots for Total Molybdenum from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: No values were reported below the LRL. Dashed vertical line indicates the Burnt Ridge North spoil failure.

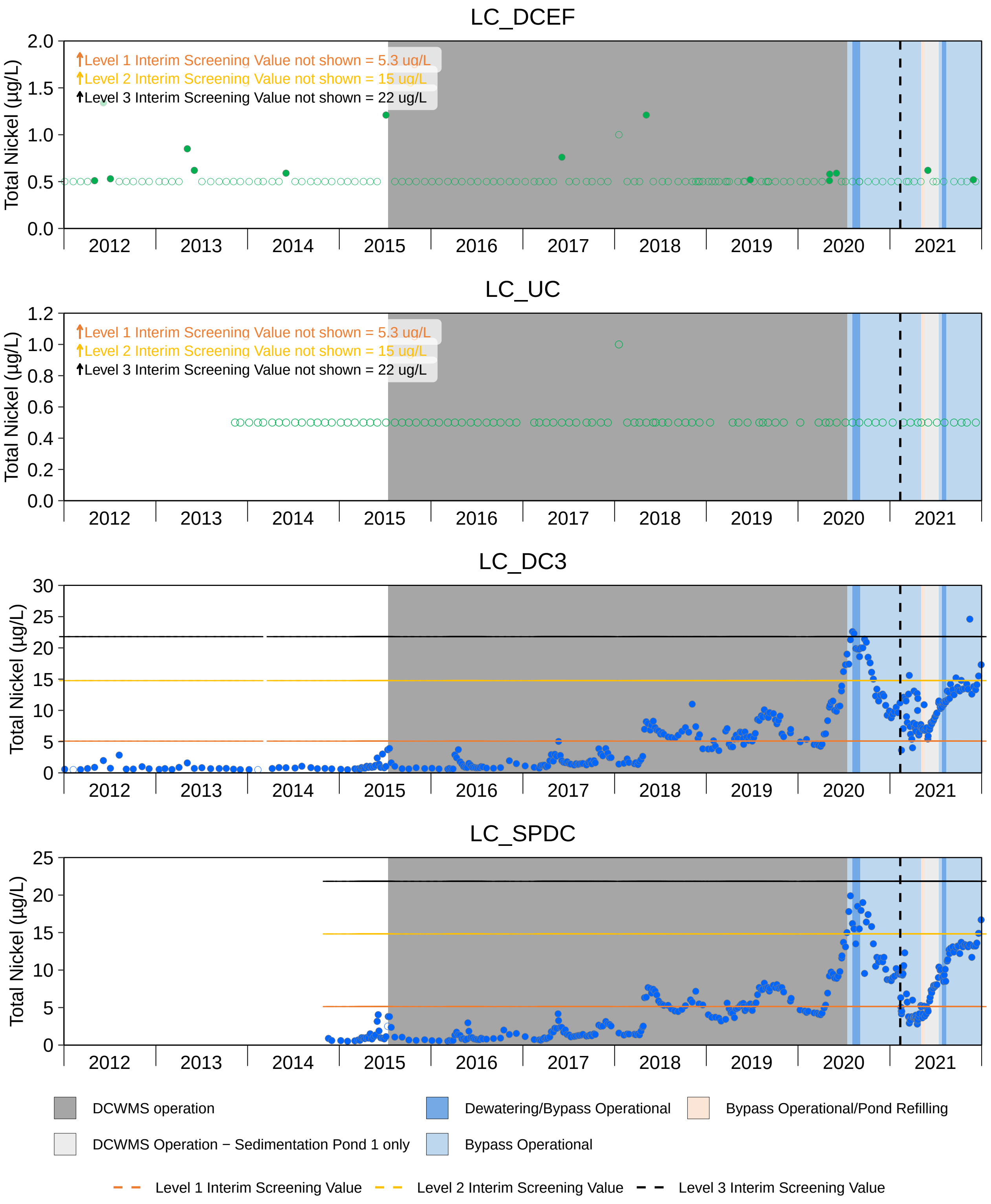


Figure C.23: Time Series Plots for Total Nickel from LCO Dry Creek LAEMP Areas, 2012 to 2021

Note: 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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

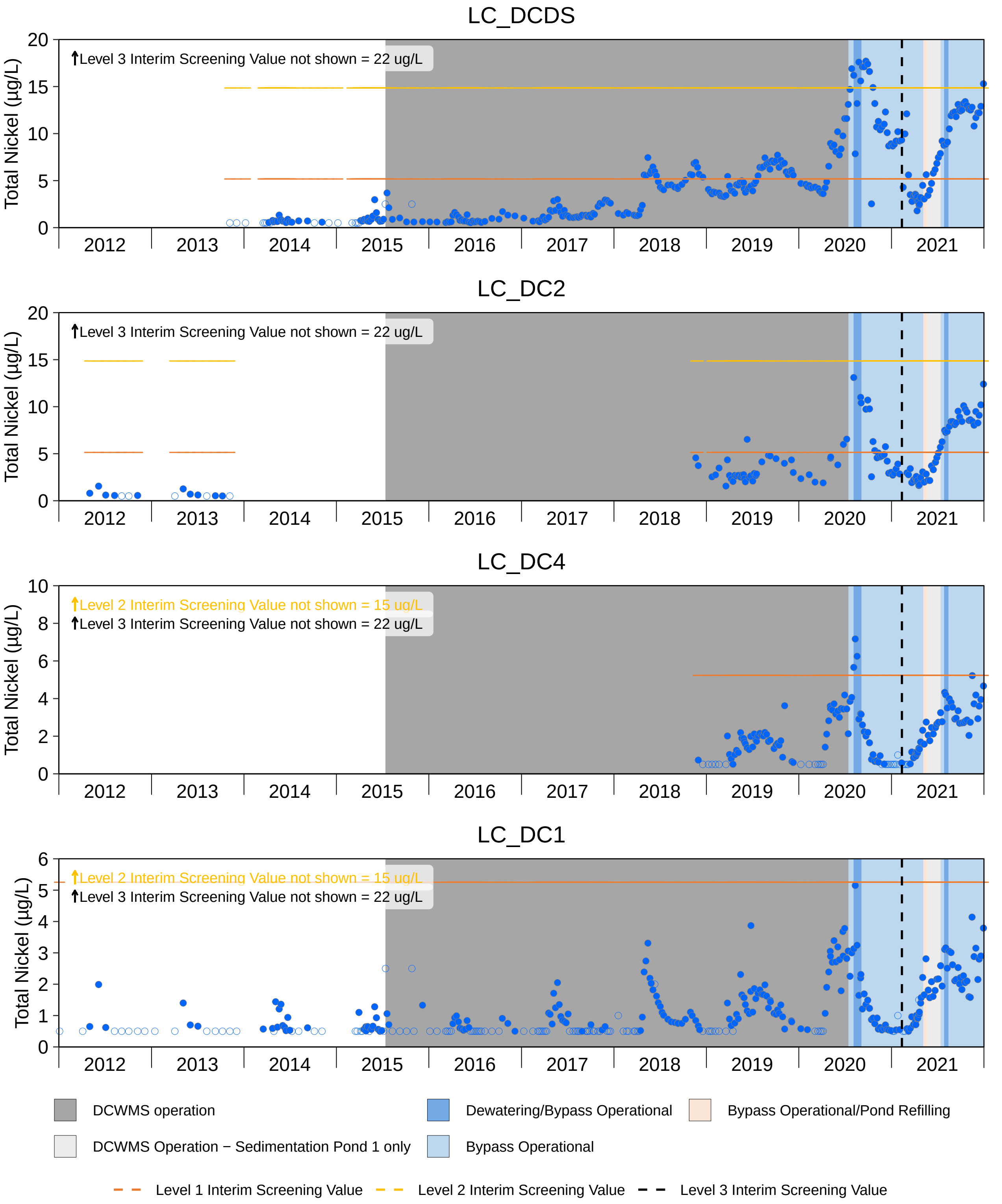


Figure C.23: **Time Series Plots for Total Nickel from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Note: 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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

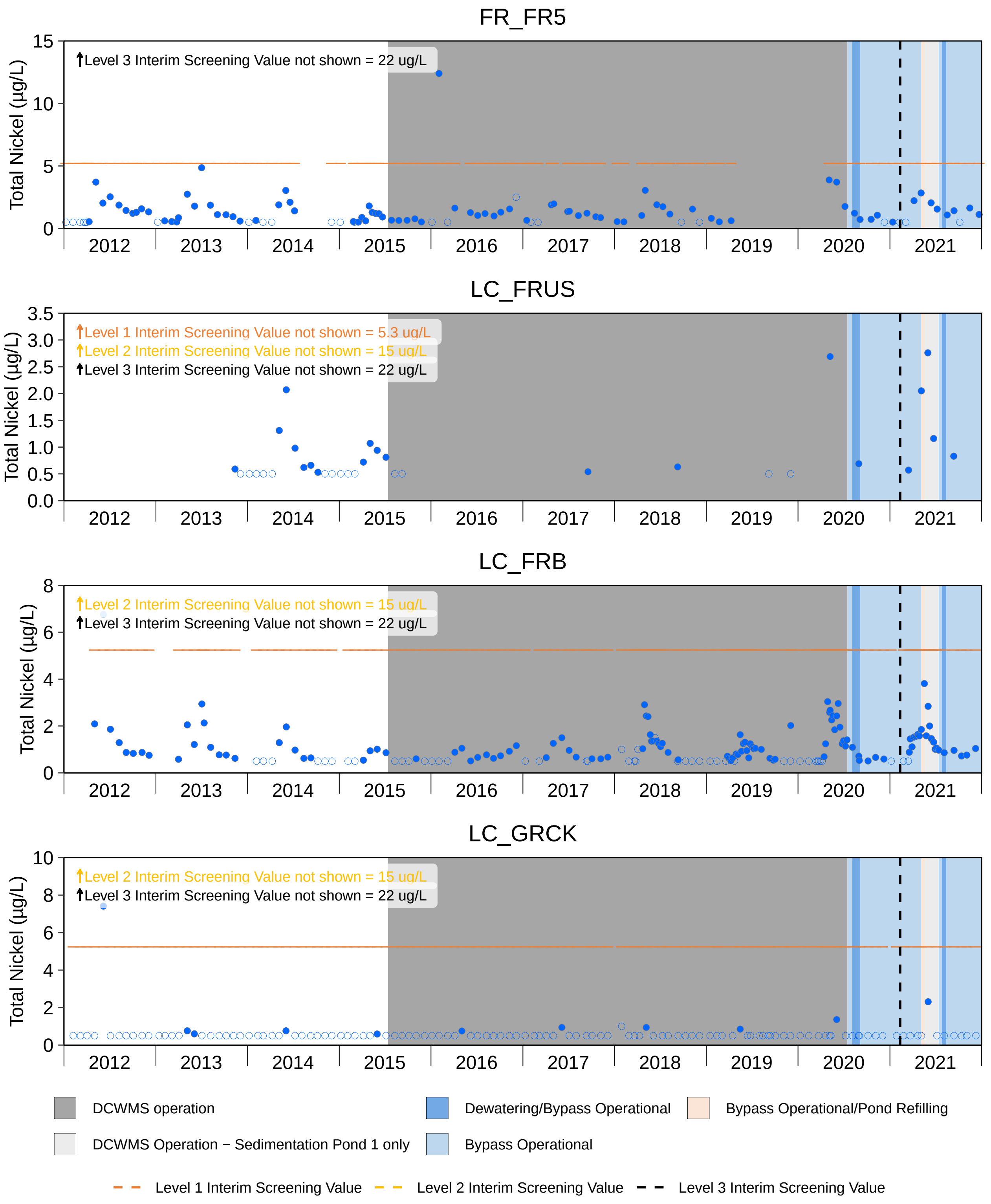


Figure C.23: Time Series Plots for Total Nickel from LCO Dry Creek LAEMP Areas, 2012 to 2021

Note: 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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

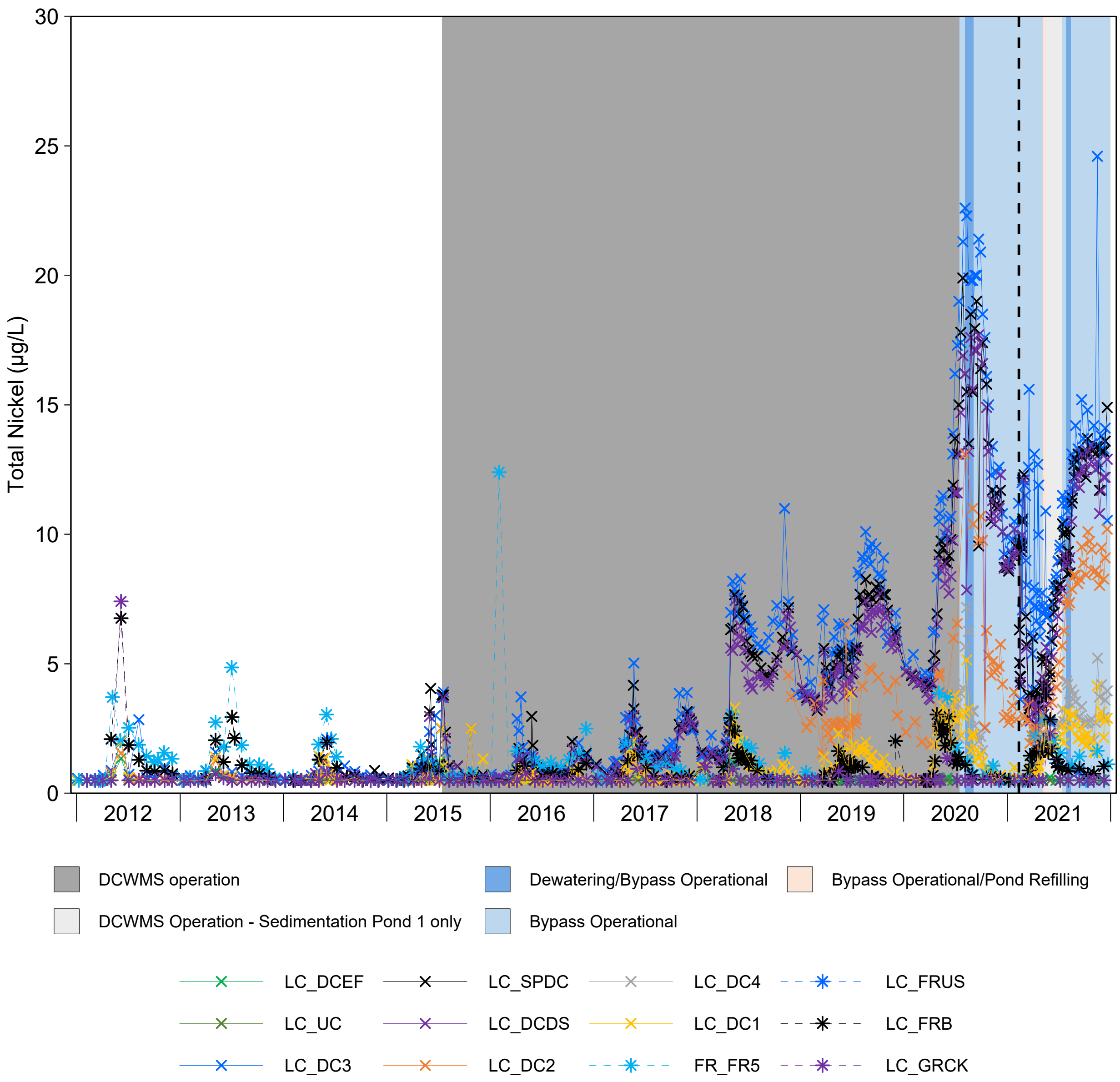


Figure C.24: **Time Series Plots for Total Nickel from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.50 and 2.5 mg/L). Dashed vertical line indicates the Burnt Ridge North spoil failure.

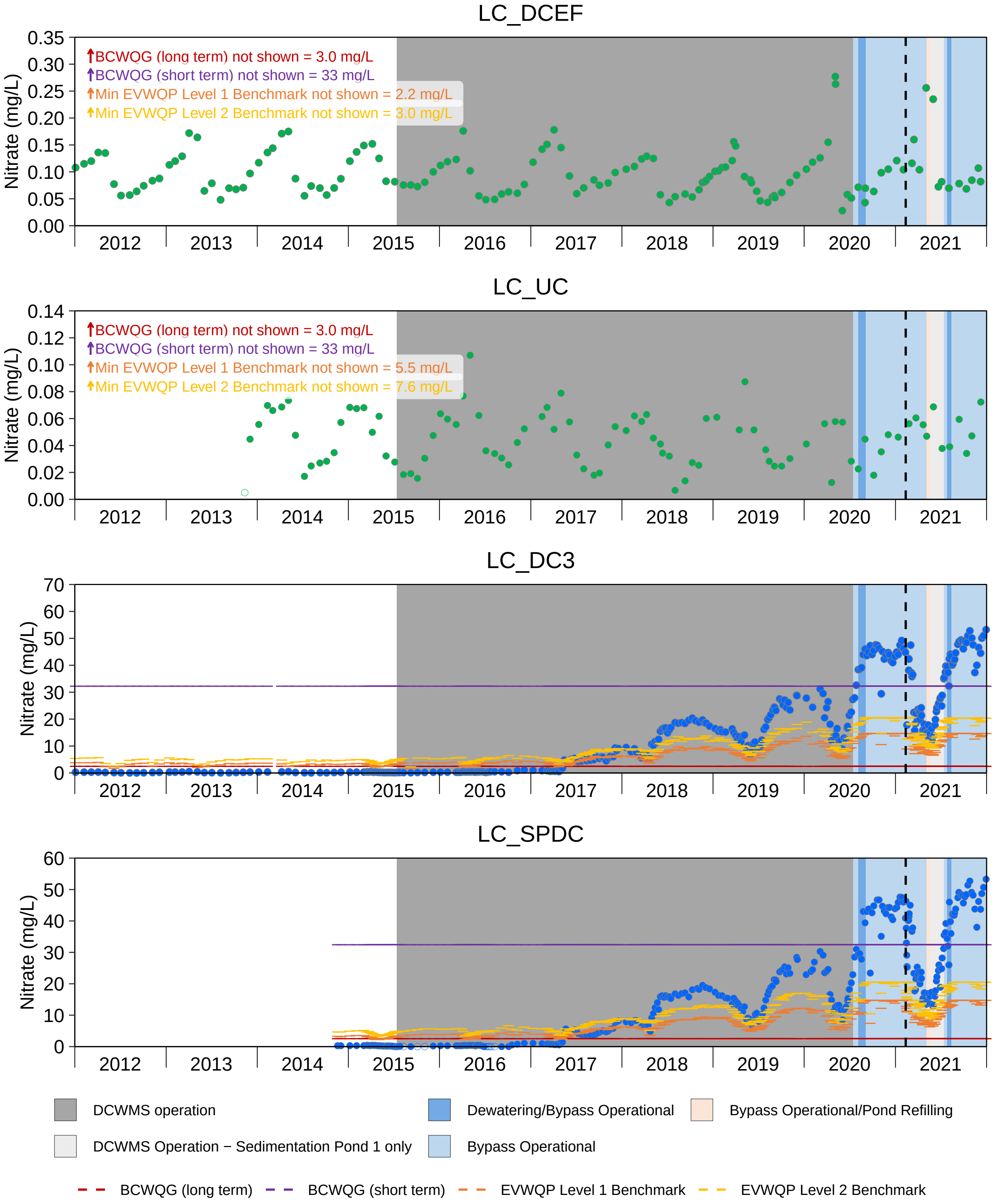


Figure C.25: **Time Series Plots for Nitrate (as N) from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

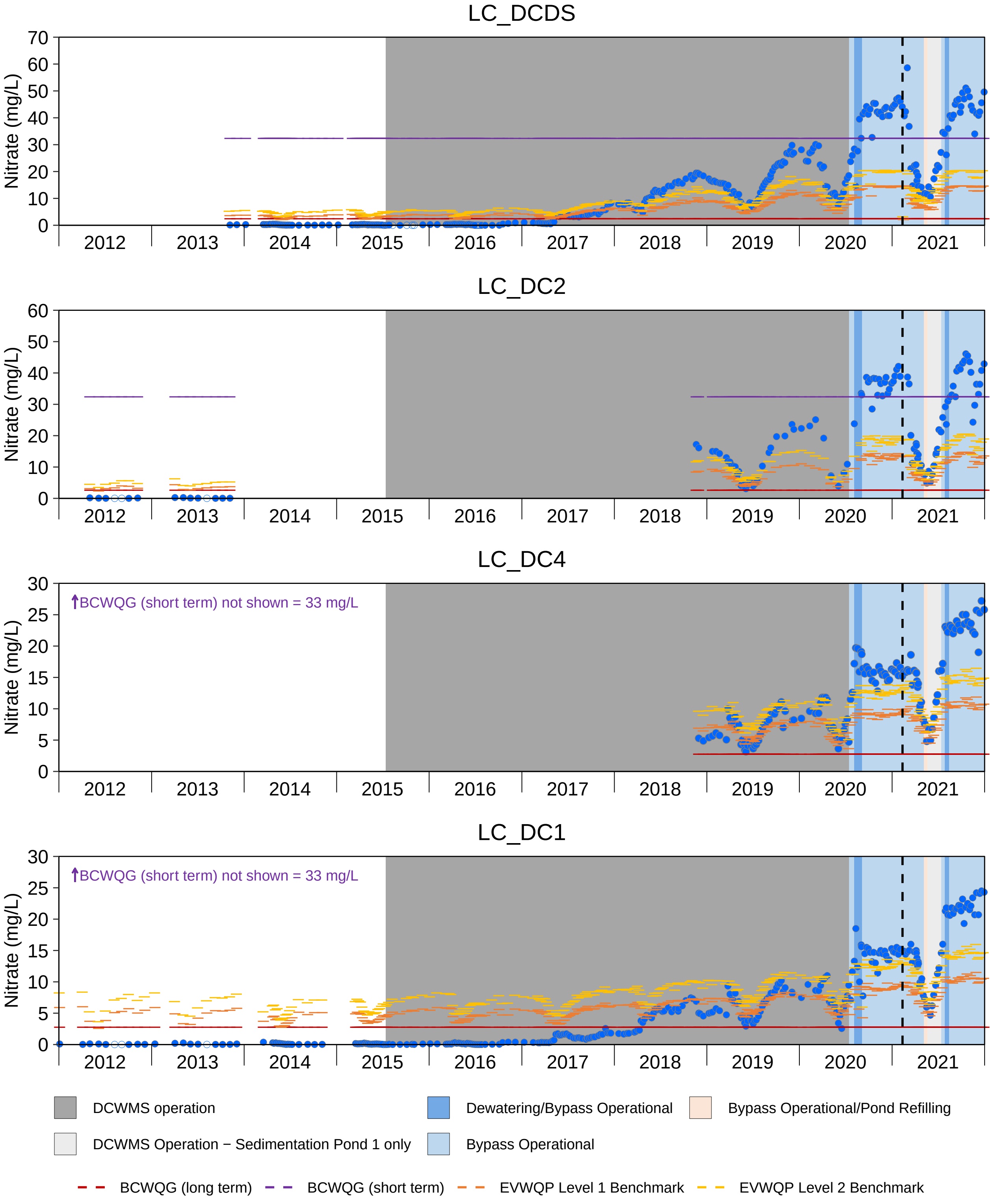


Figure C.25: **Time Series Plots for Nitrate (as N) from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

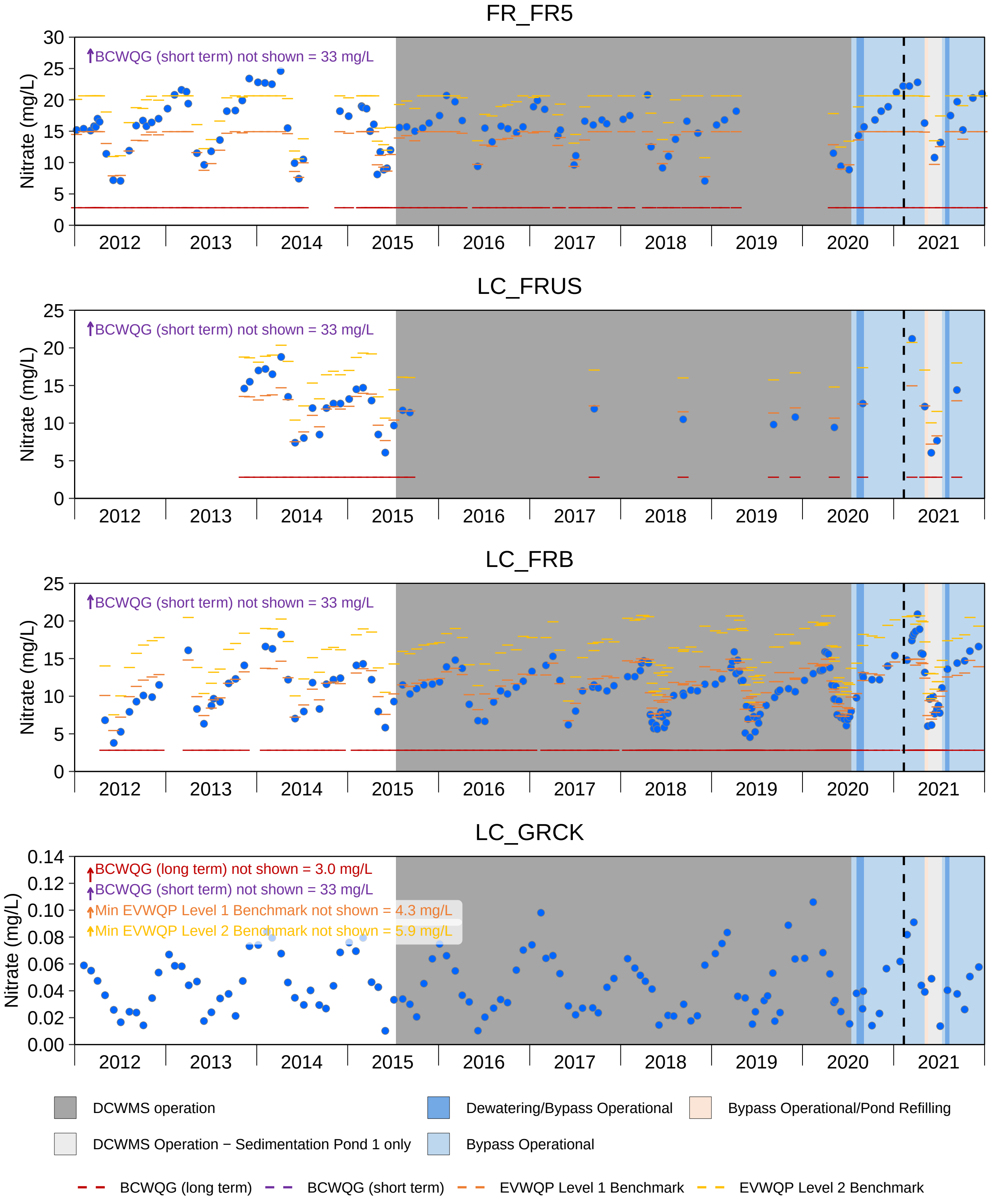


Figure C.25: Time Series Plots for Nitrate (as N) from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

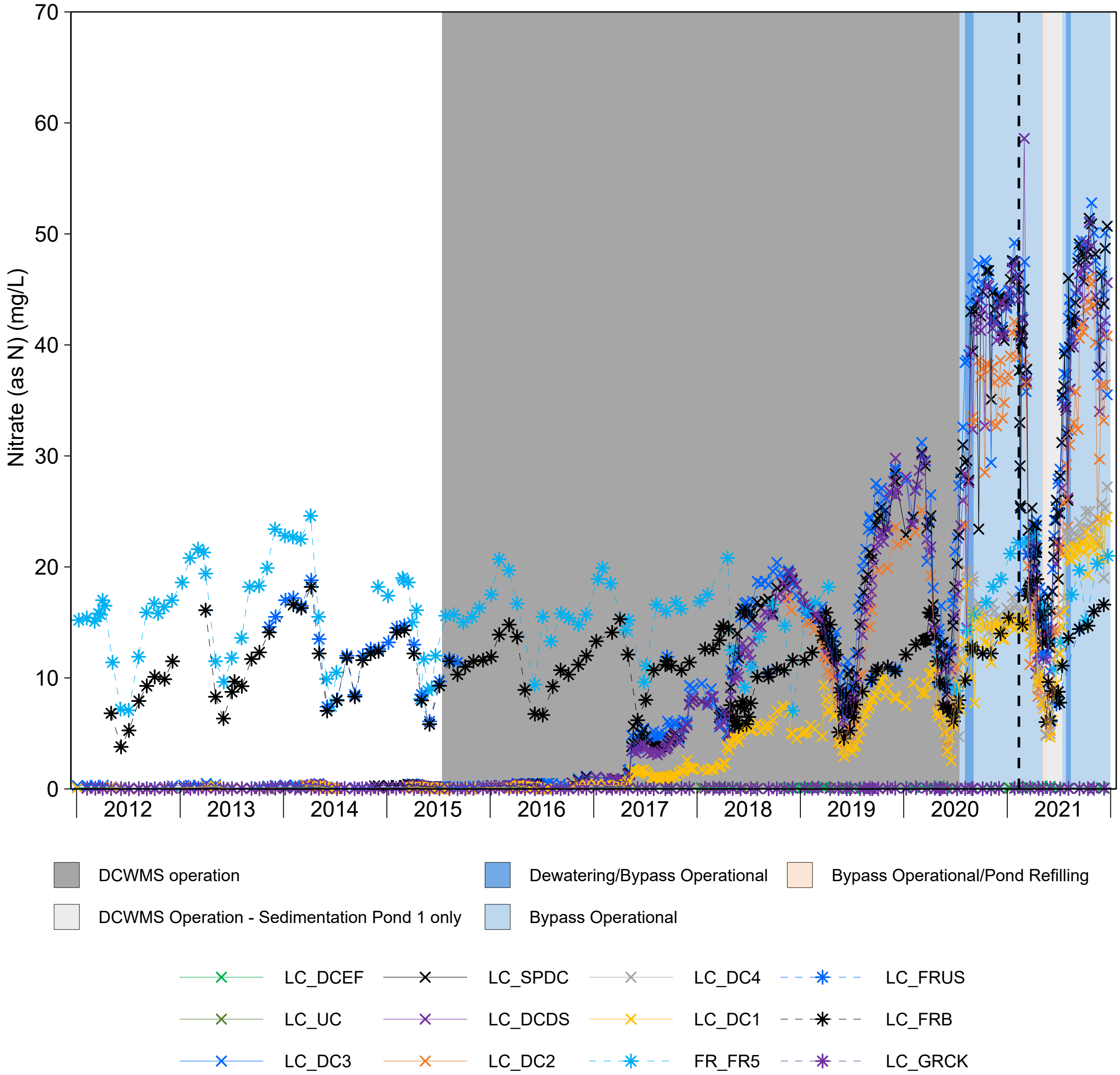


Figure C.26: **Time Series Plots for Nitrate (as N) from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.0050 and 0.0050 mg/L). Dashed vertical line indicates the Burnt Ridge North spoil failure.

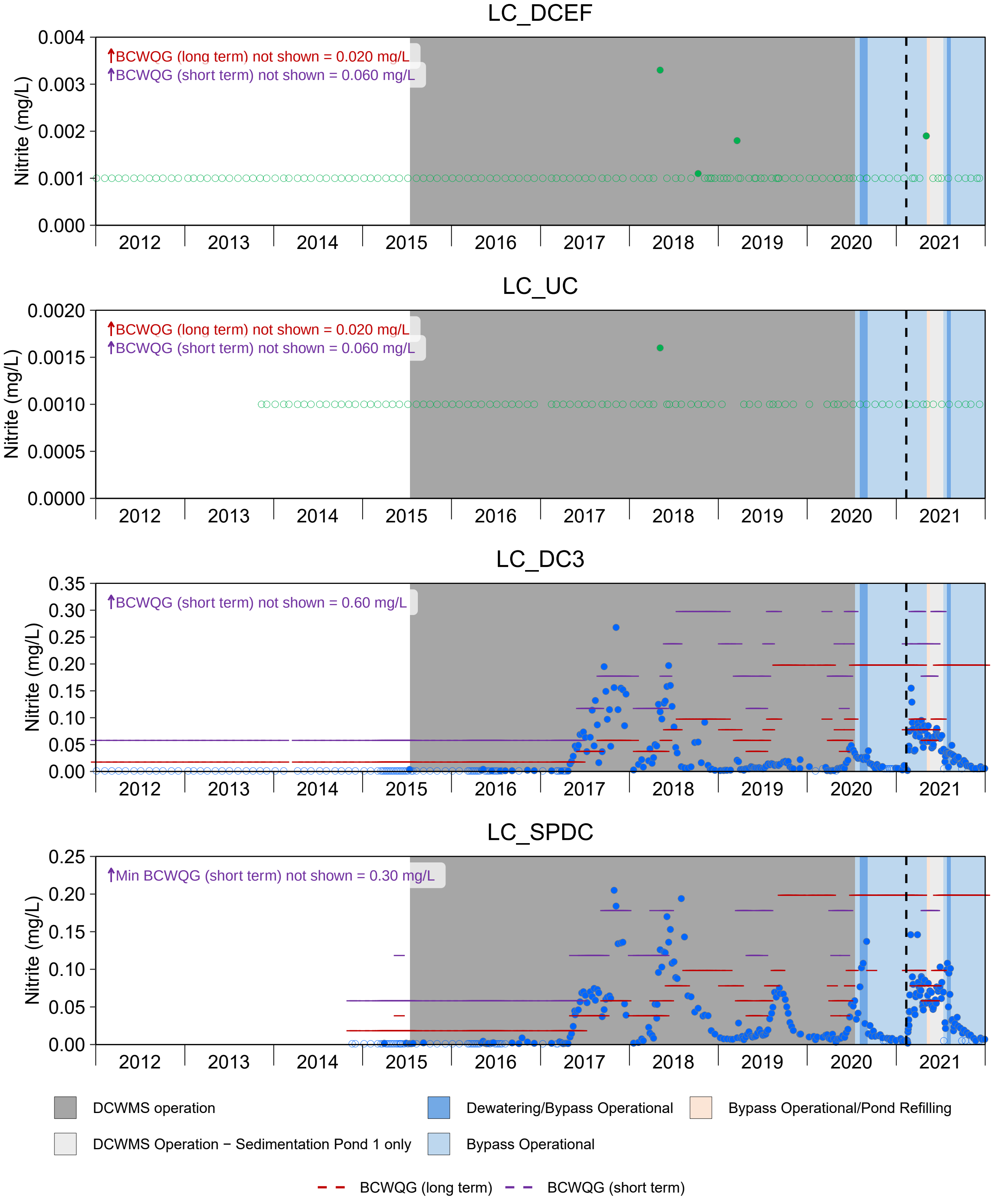


Figure C.27: **Time Series Plots for Nitrite (as N) from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water chloride concenrations. 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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

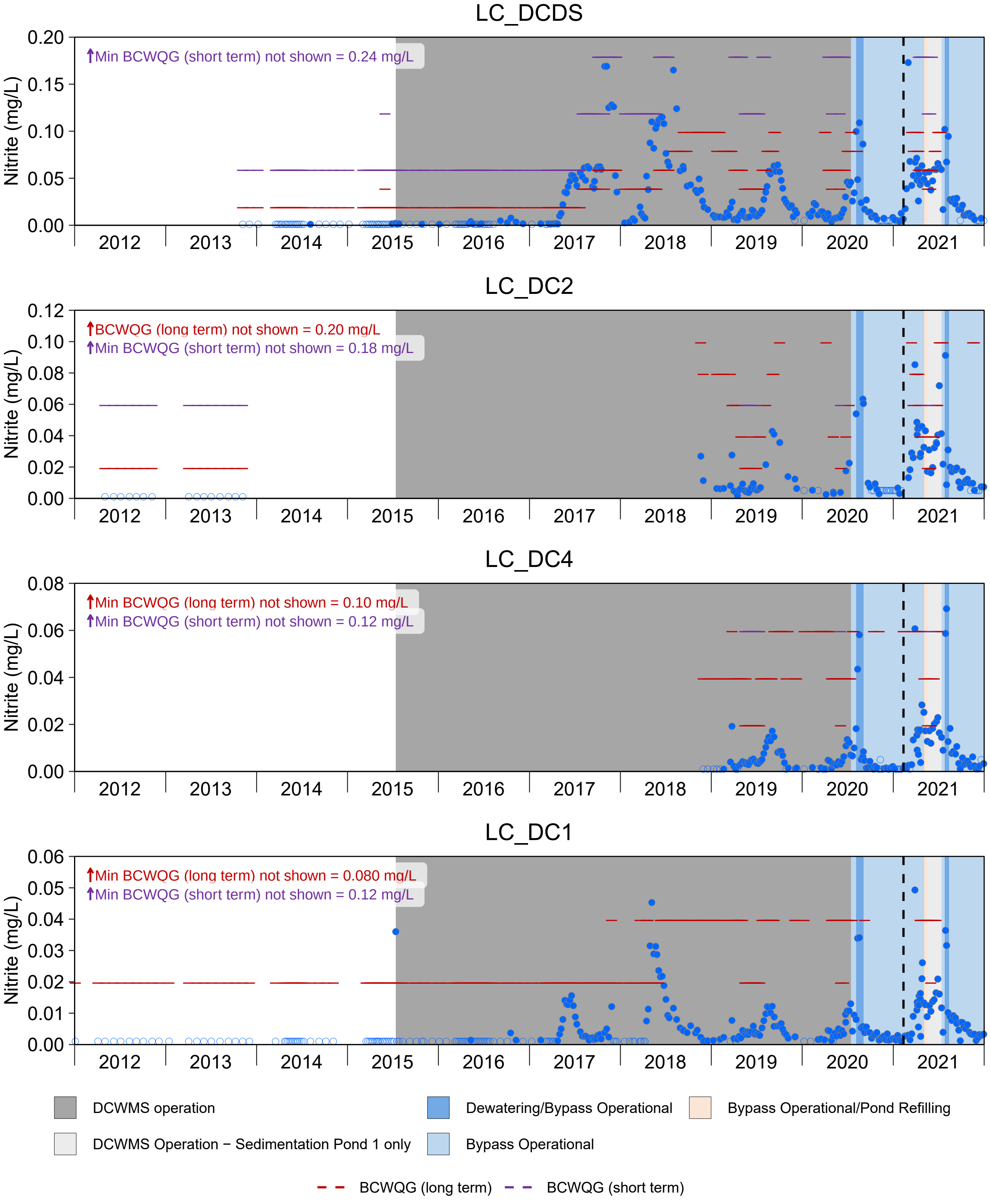


Figure C.27: Time Series Plots for Nitrite (as N) from LCO Dry Creek LAEMP Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water chloride concenrations. 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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

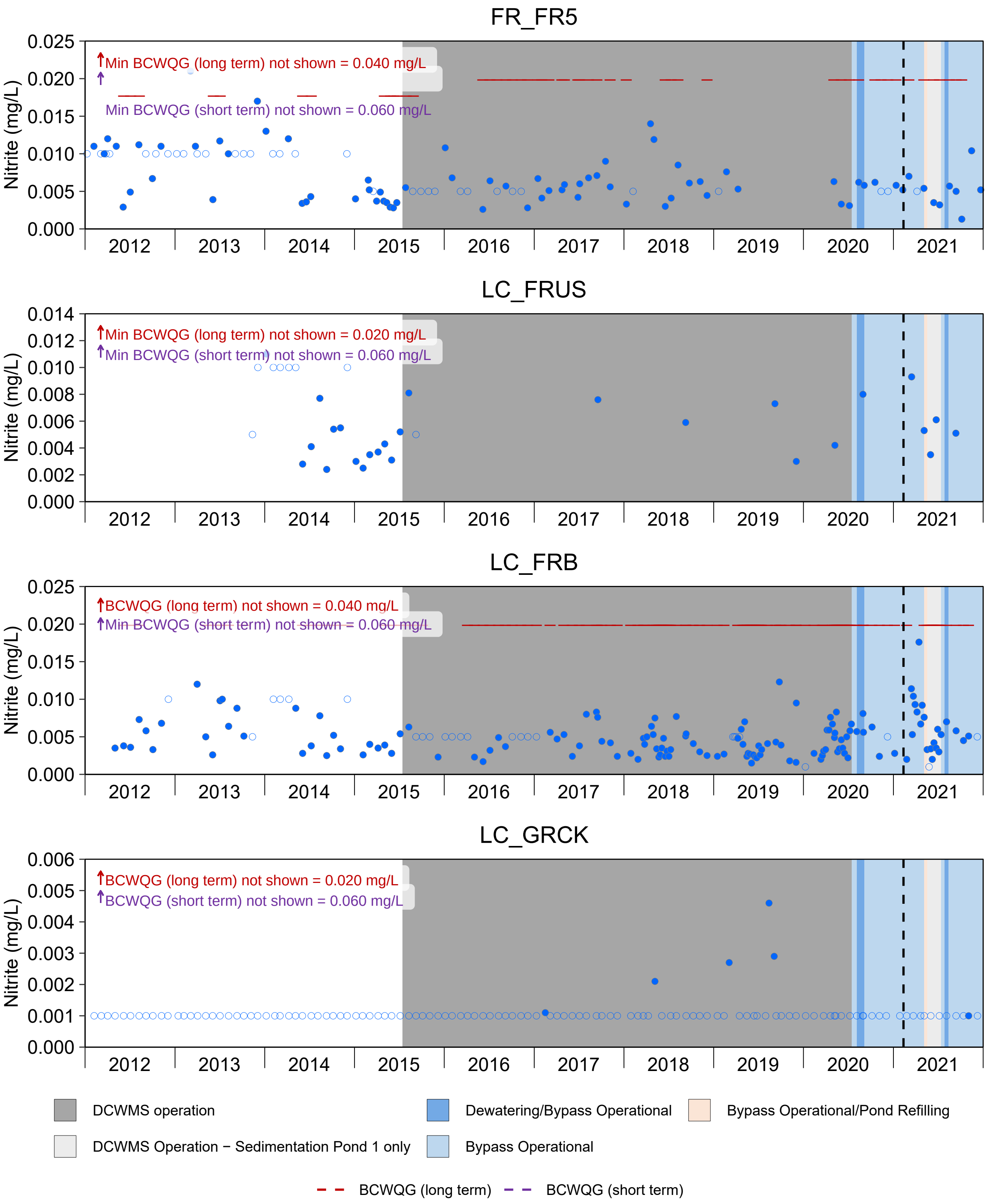


Figure C.27: **Time Series Plots for Nitrite (as N) from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted as open symbols at the LRL. Guidelines are dependent on water chloride concenrations. 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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only applies to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

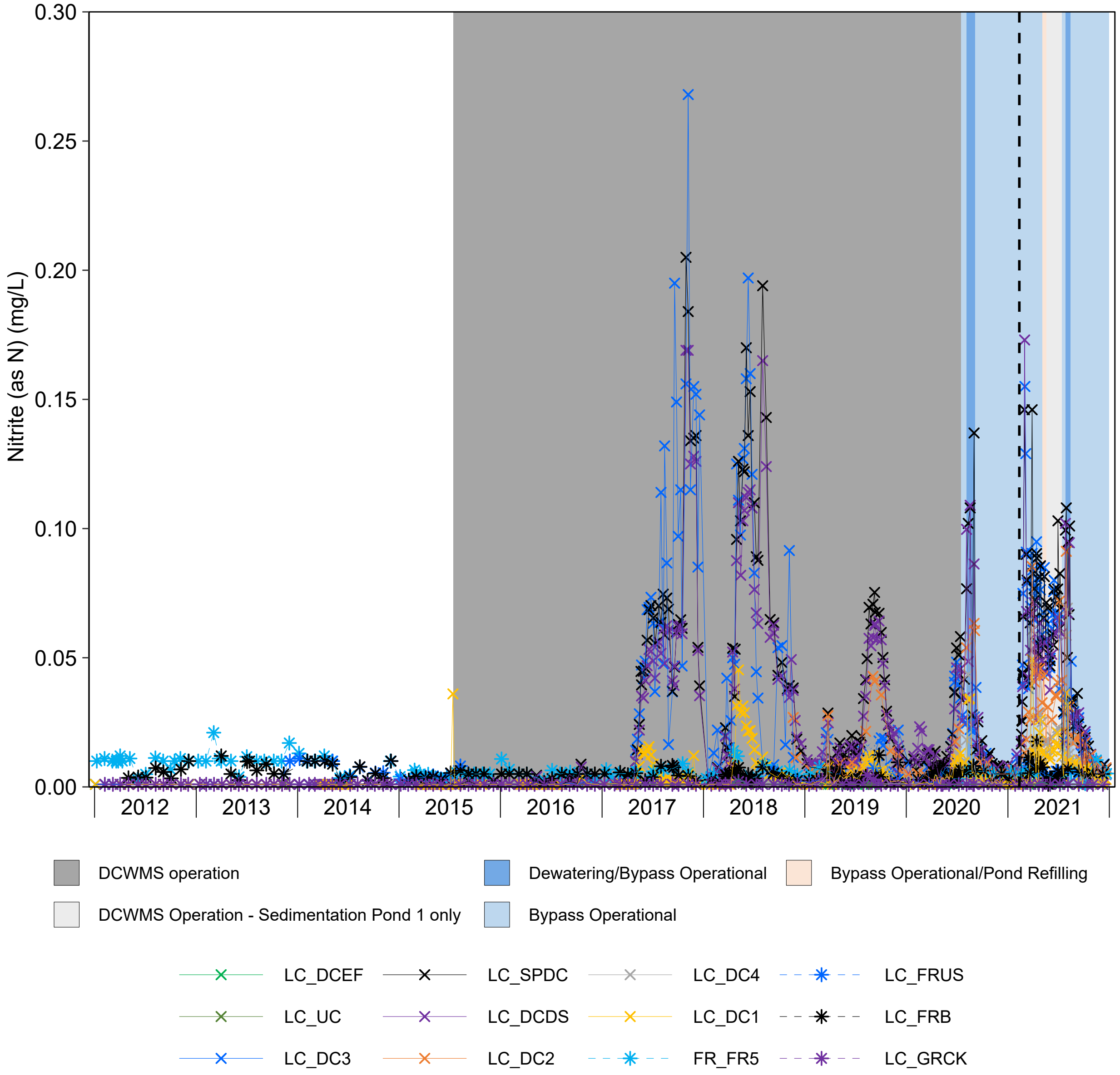


Figure C.28: **Time Series Plots for Nitrite (as N) from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.0010 and 0.010 mg/L). Dashed vertical line indicates the Burnt Ridge North spoil failure.

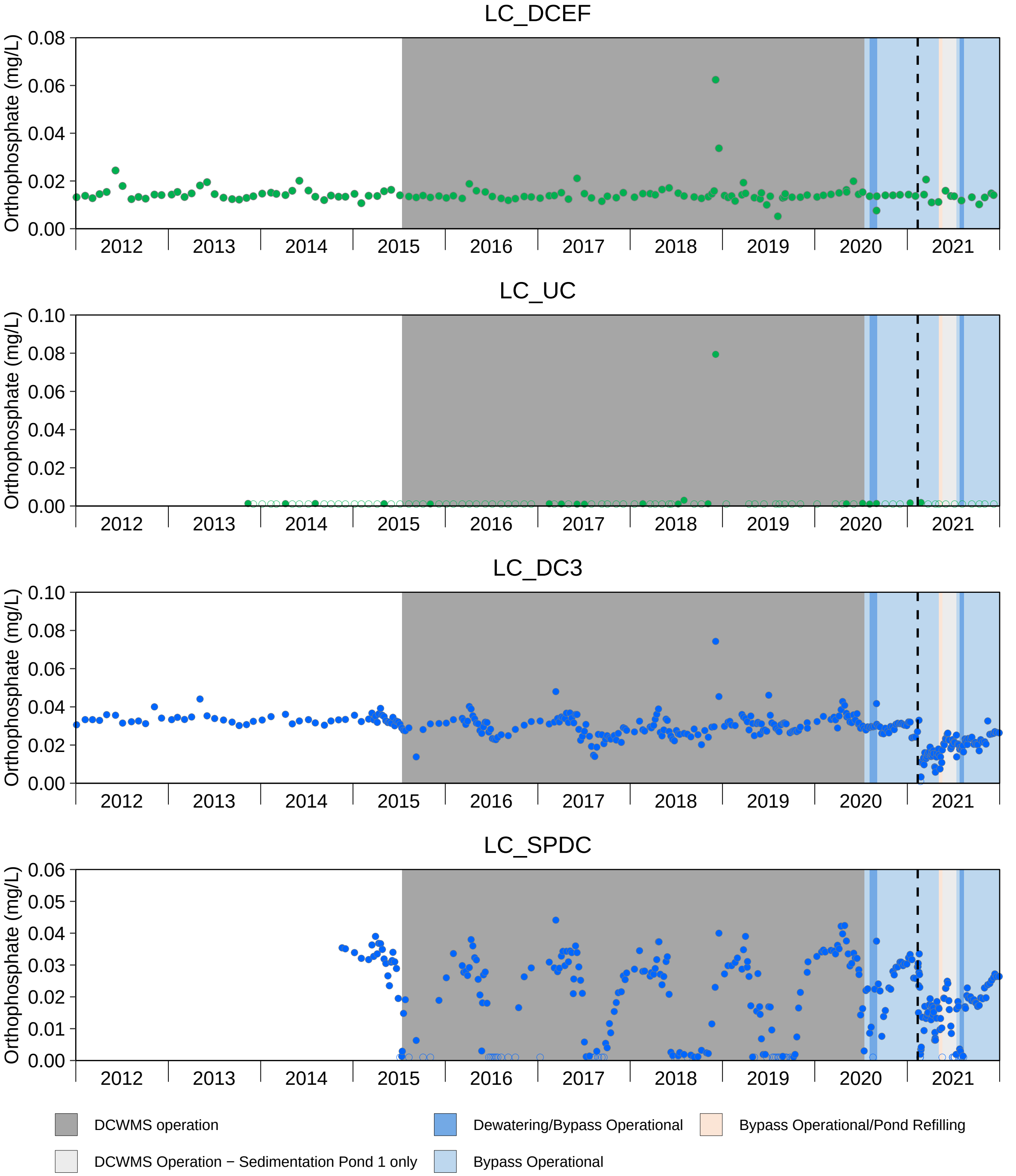
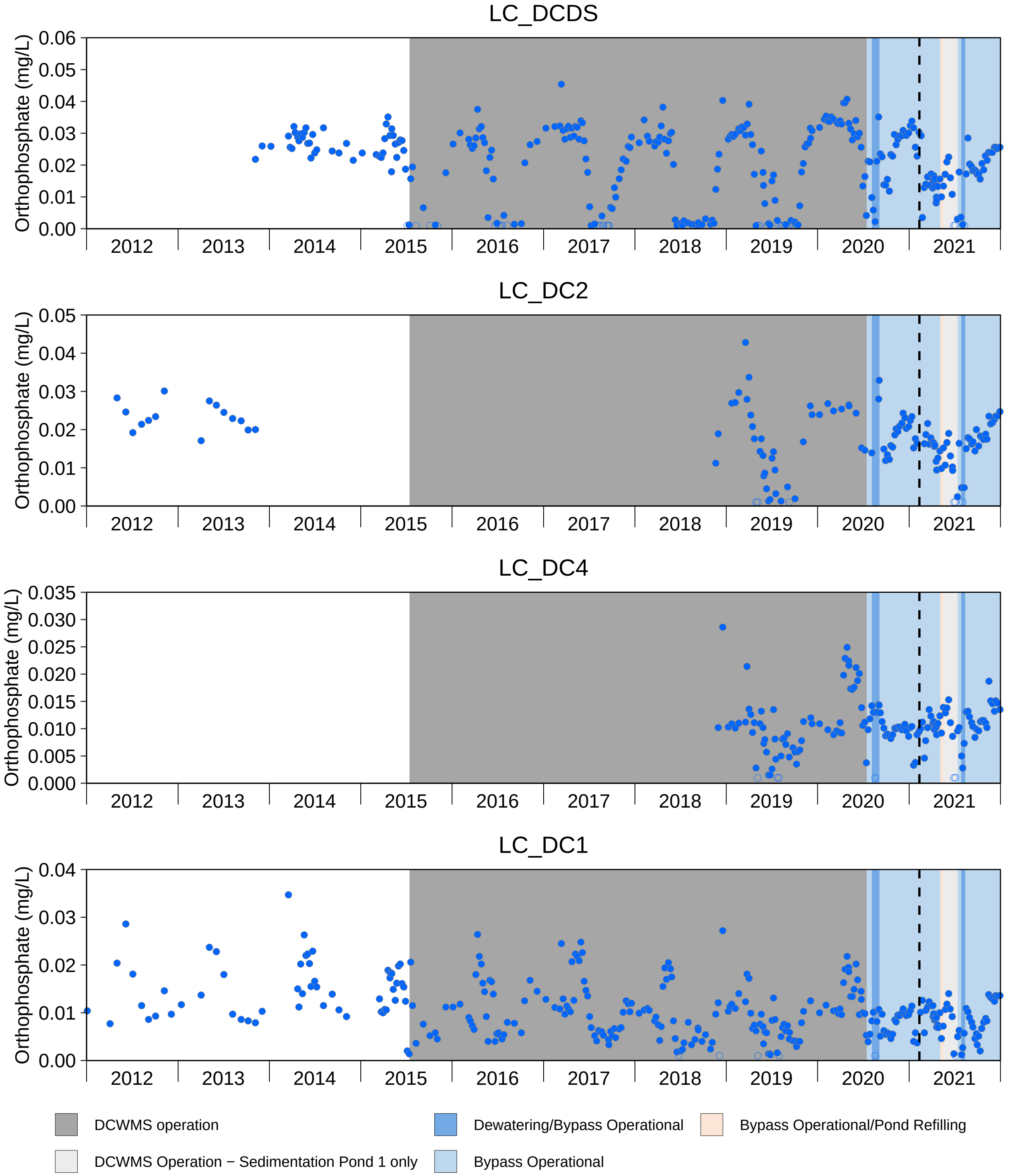


Figure C.29: Time Series Plots for Orthophosphate from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).


LC_DCDS

LC_DC2

LC_DC4

LC_DC1

Figure C.29: Time Series Plots for Orthophosphate from LCO Dry Creek LAEMP 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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

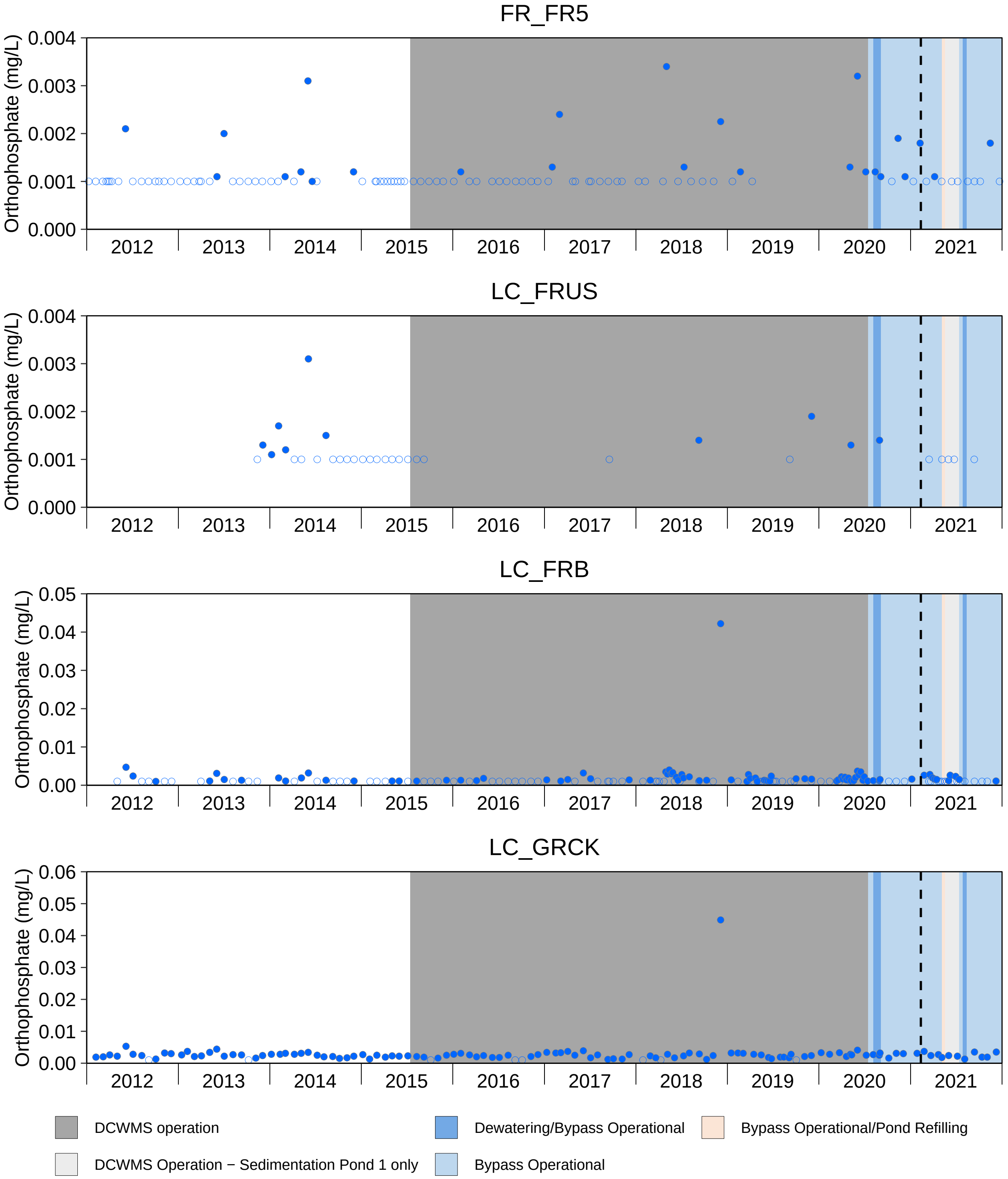


Figure C.29: **Time Series Plots for Orthophosphate from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

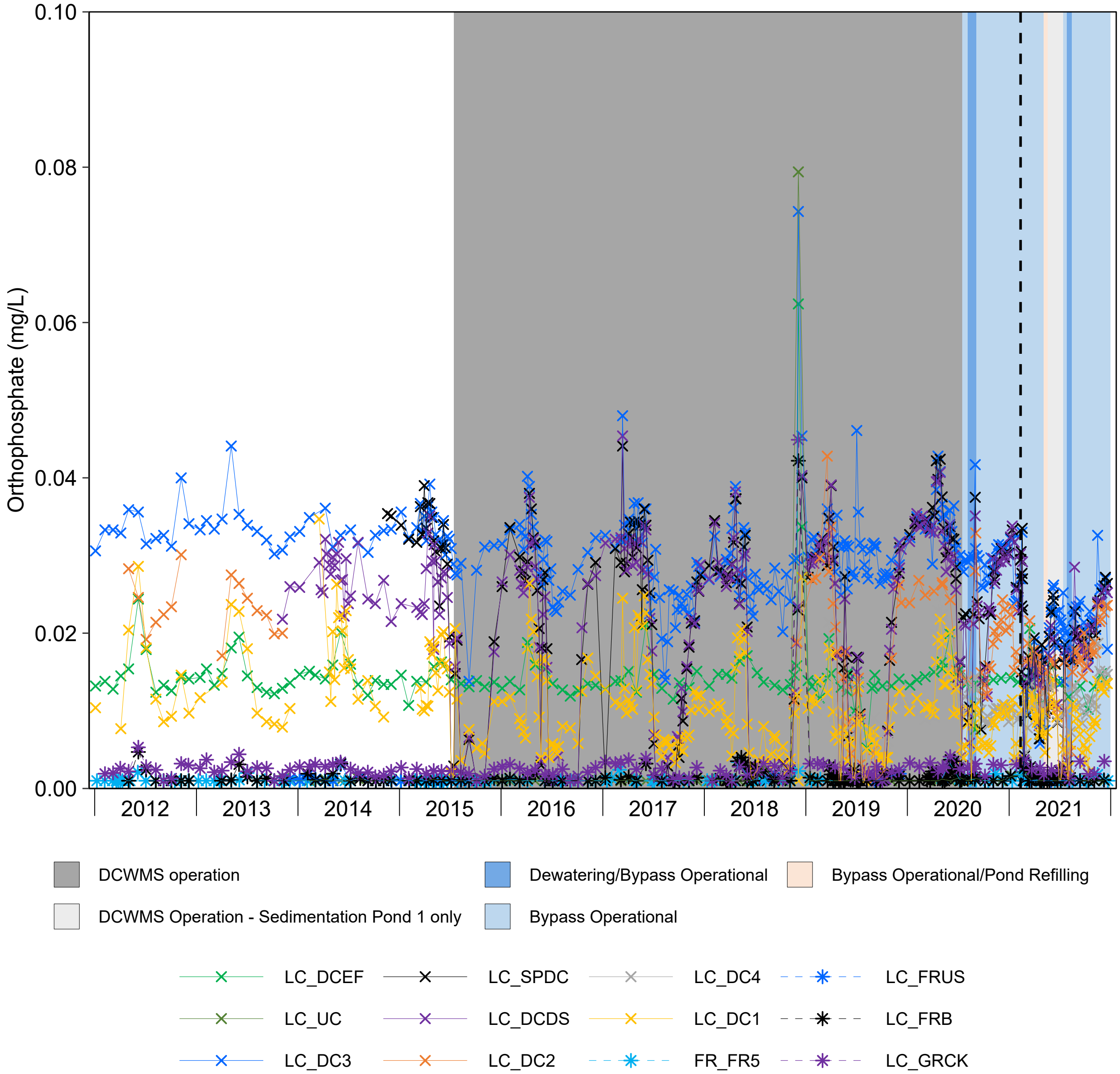


Figure C.30: **Time Series Plots for Orthophosphate from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (0.0010 mg/L).
Dashed vertical line indicates the Burnt Ridge North spoil failure.

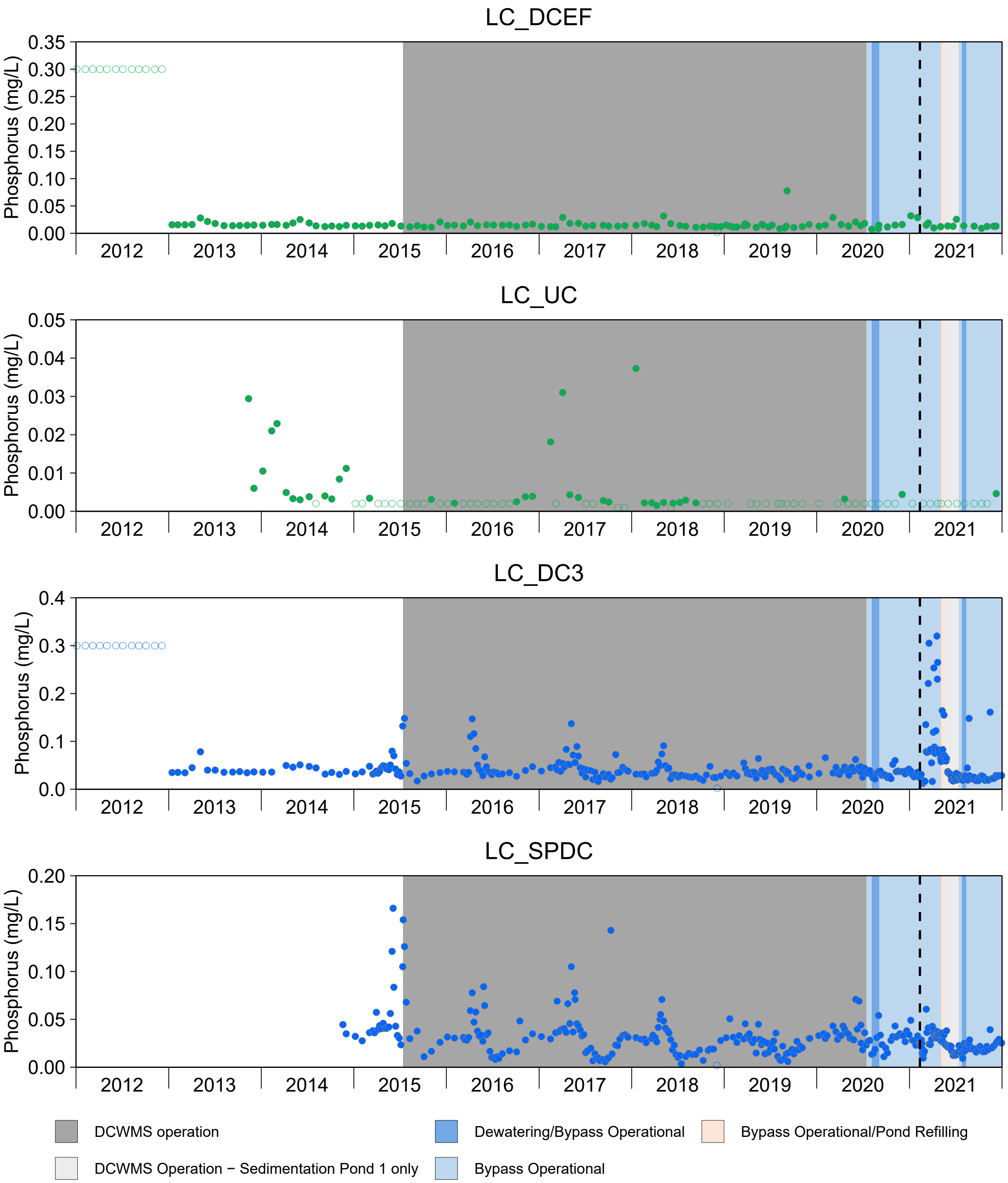


Figure C.31: **Time Series Plots for Phosphorus from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

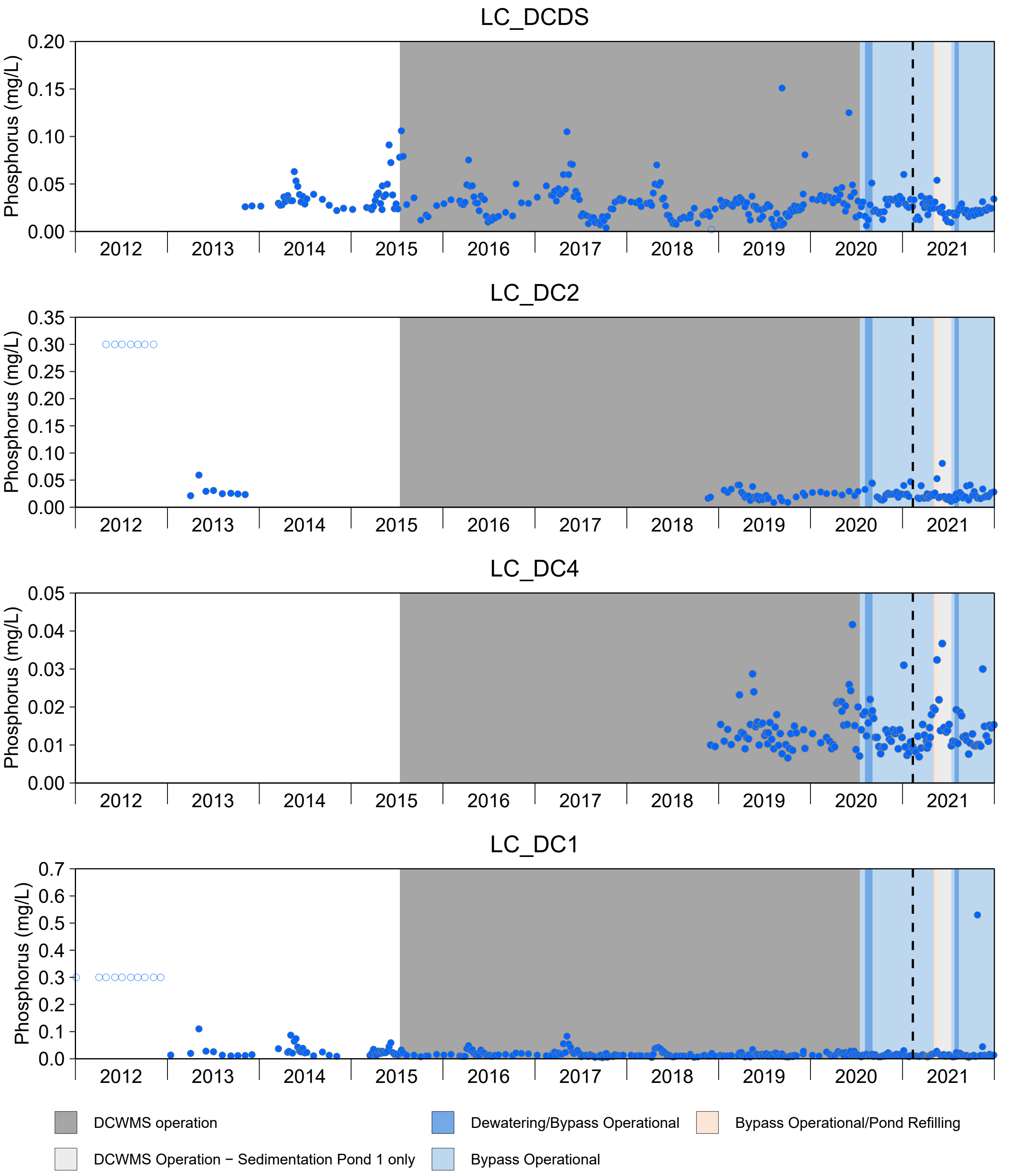


Figure C.31: Time Series Plots for Phosphorus from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

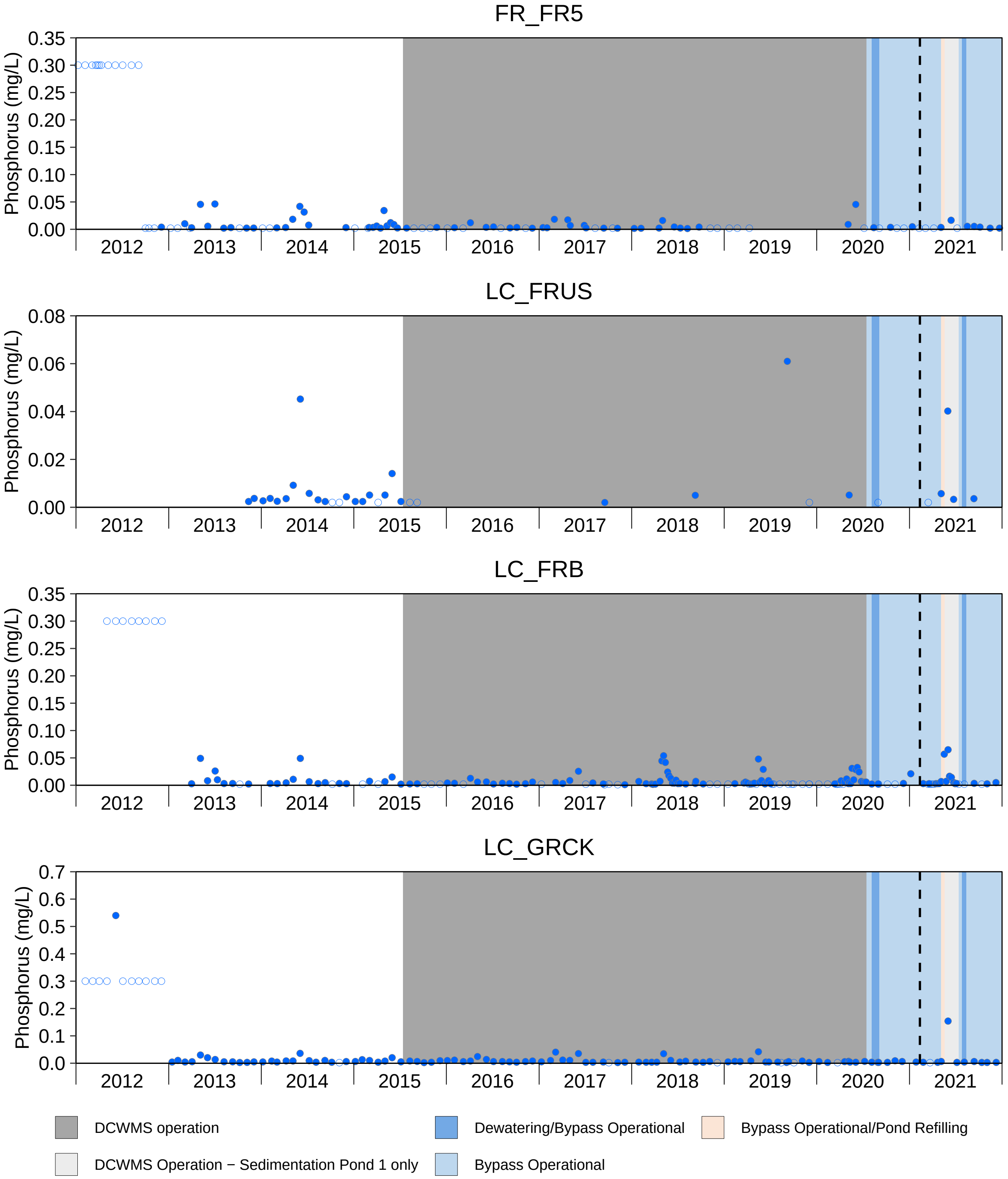


Figure C.31: Time Series Plots for Phosphorus from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

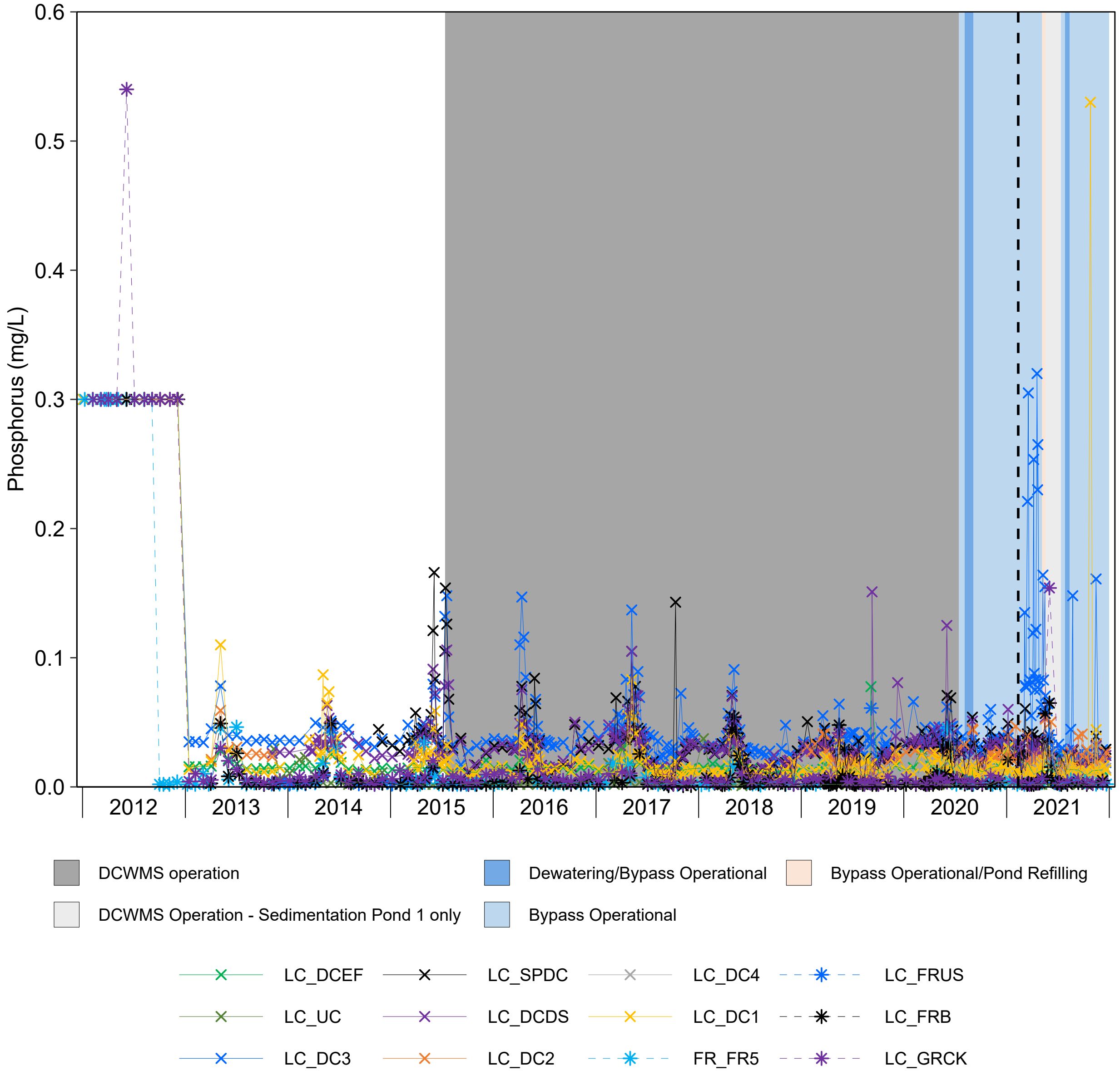


Figure C.32: Time Series Plots for Phosphorus from LCO Dry Creek LAEMP Areas, 2012 to 2021

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.0010 and 0.30 mg/L). Dashed vertical line indicates the Burnt Ridge North spoil failure.

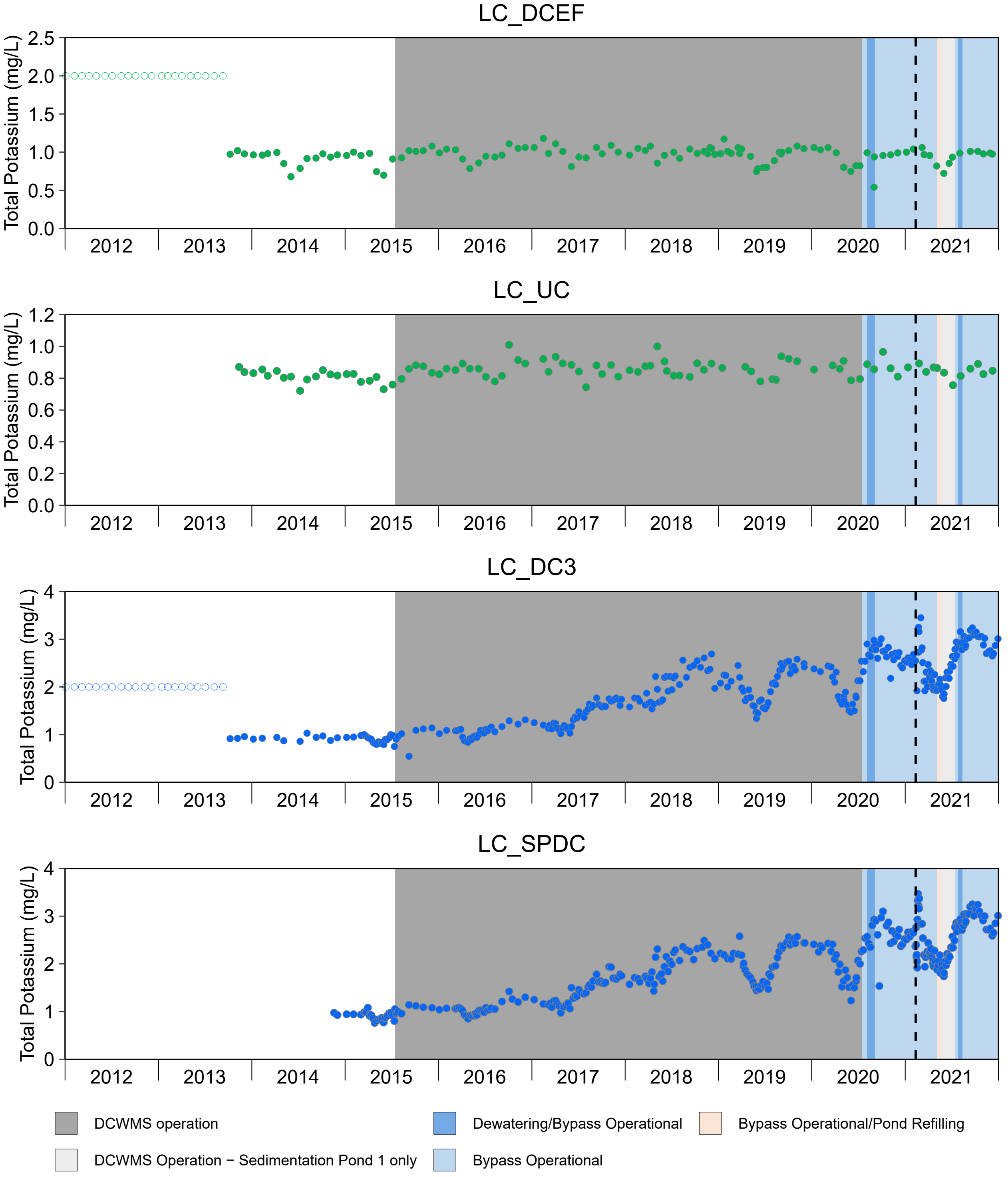


Figure C.33: **Time Series Plots for Total Potassium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

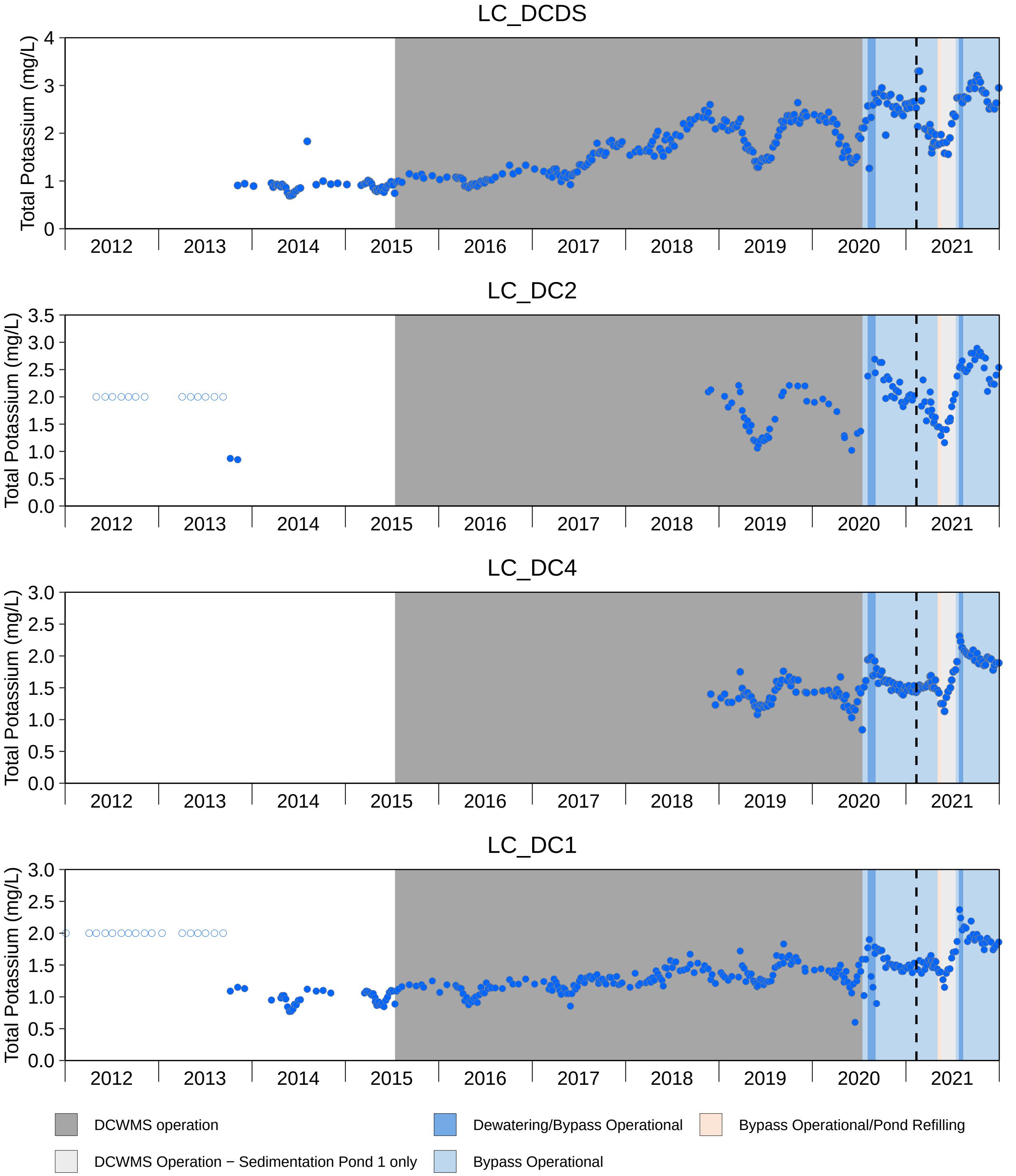


Figure C.33: **Time Series Plots for Total Potassium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

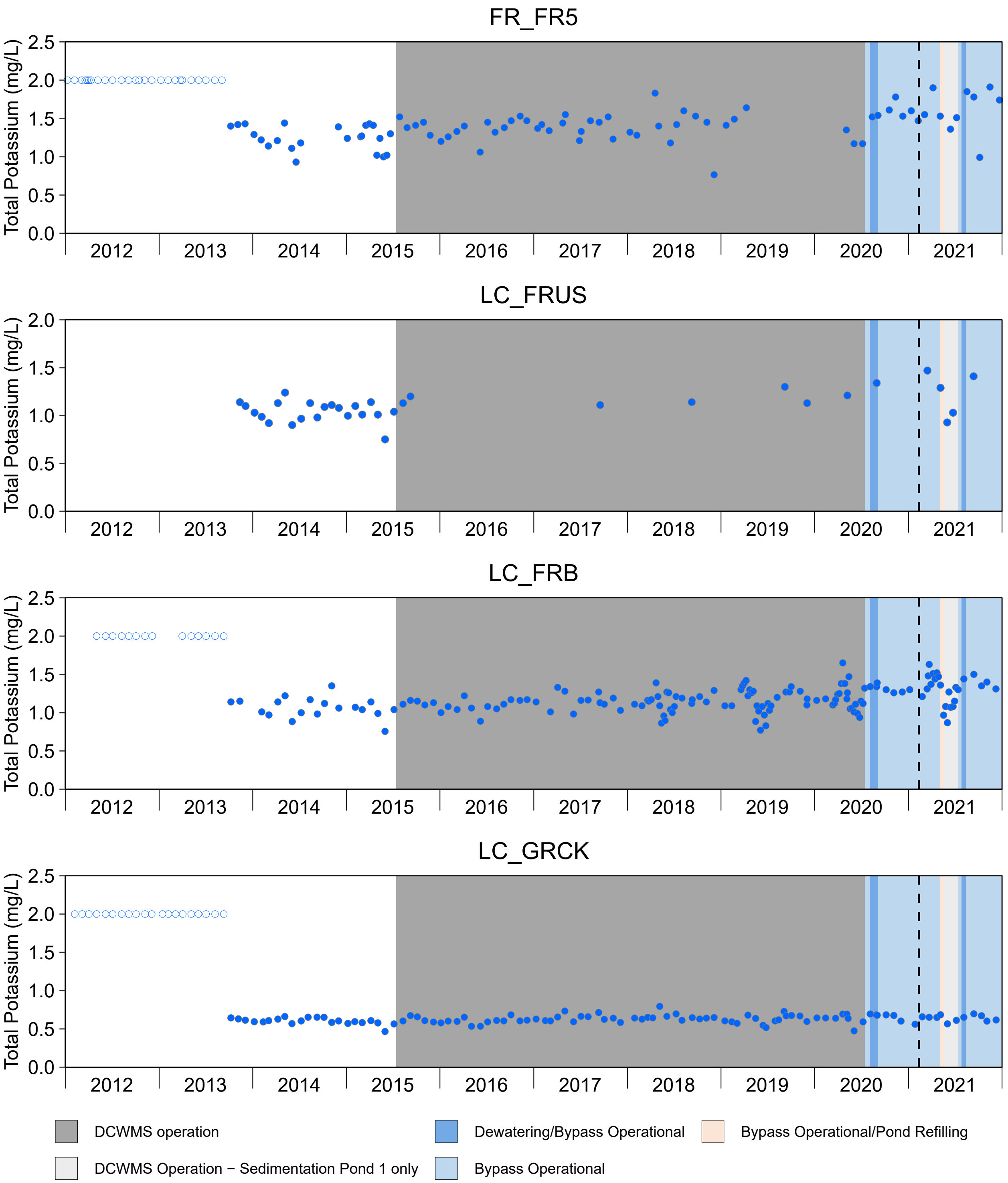


Figure C.33: **Time Series Plots for Total Potassium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

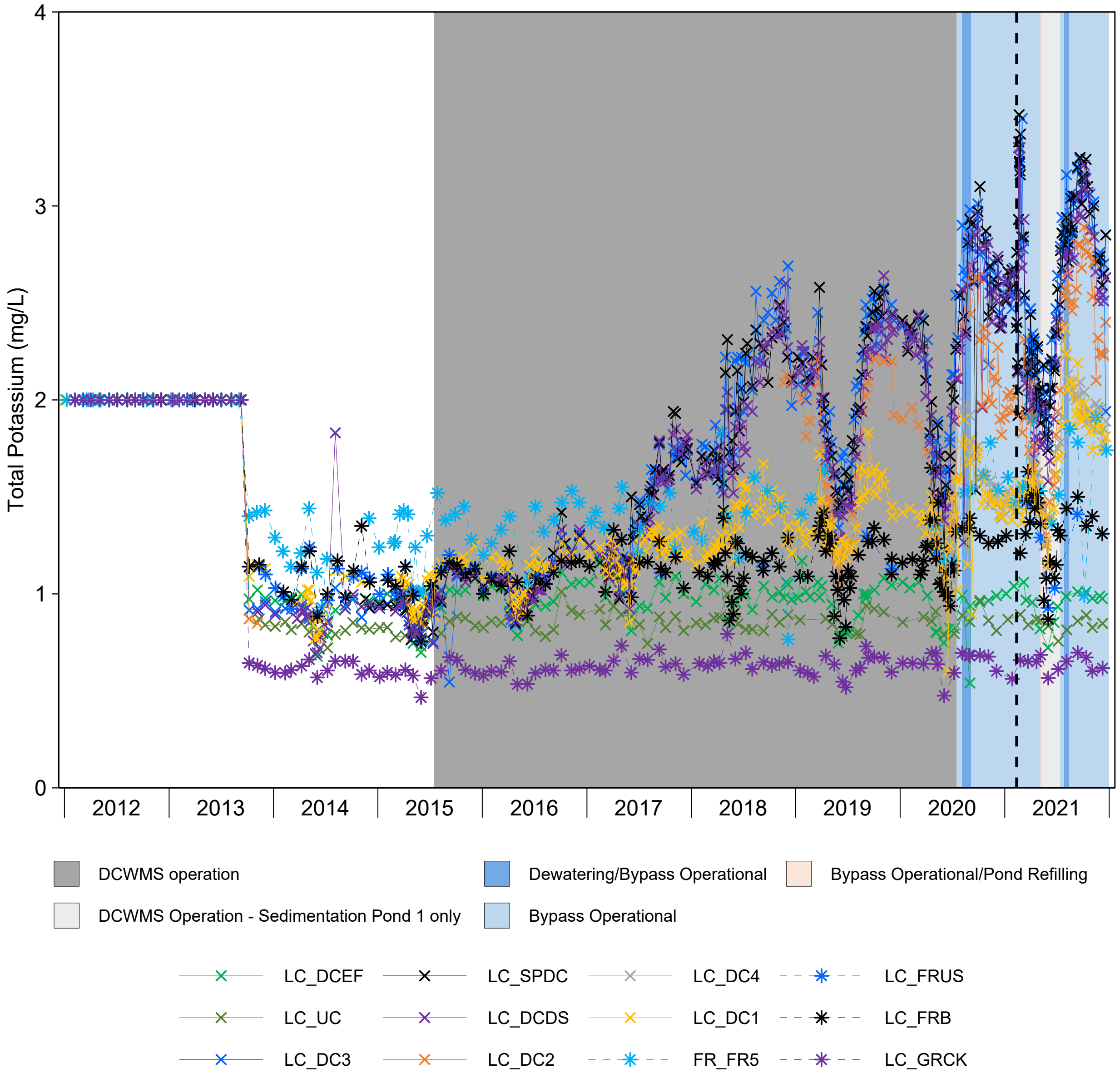


Figure C.34: **Time Series Plots for Total Potassium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 2.0 and 2.0 mg/L). Dashed vertical line indicates the Burnt Ridge North spoil failure.

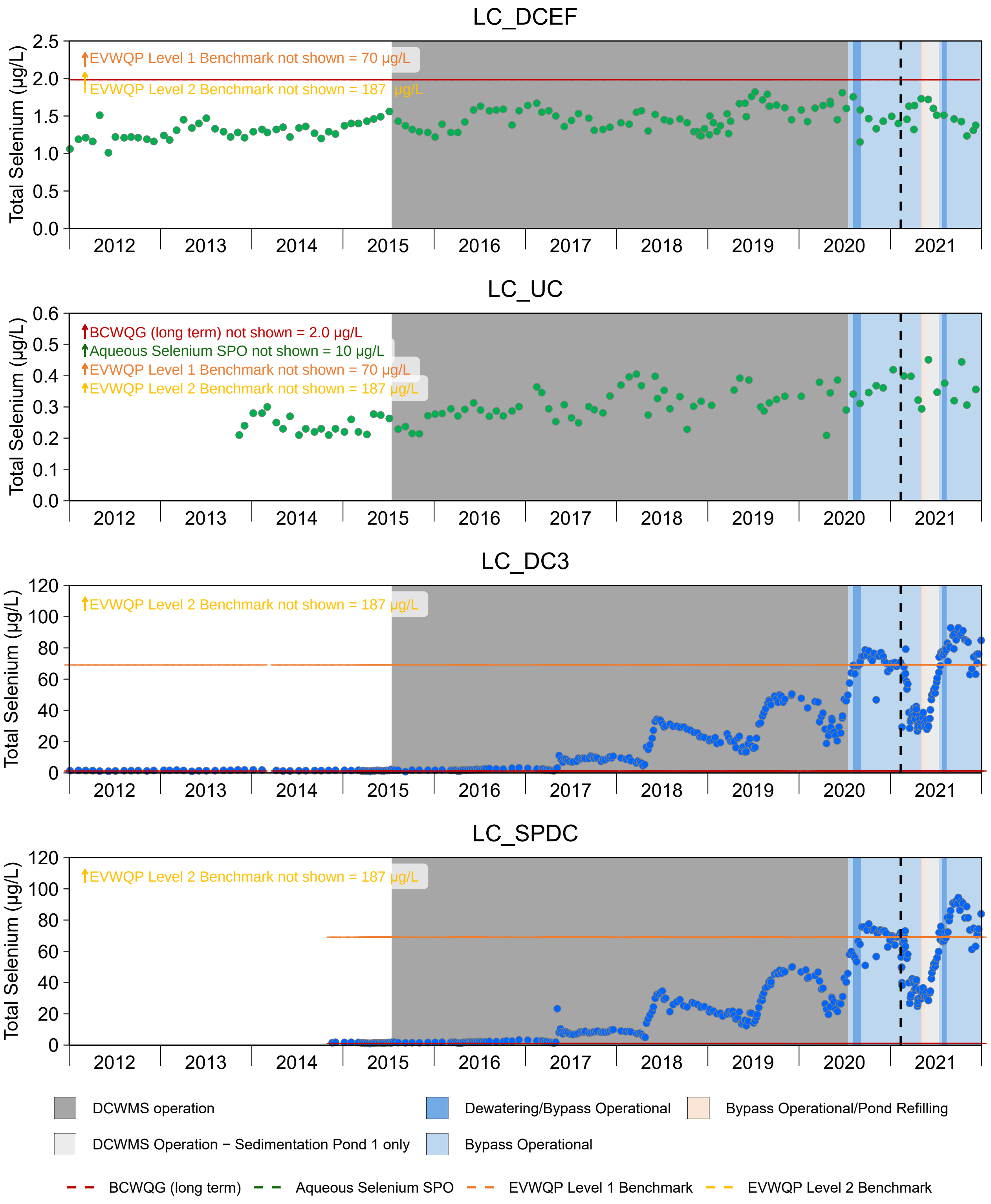


Figure C.35: **Time Series Plots for Total Selenium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

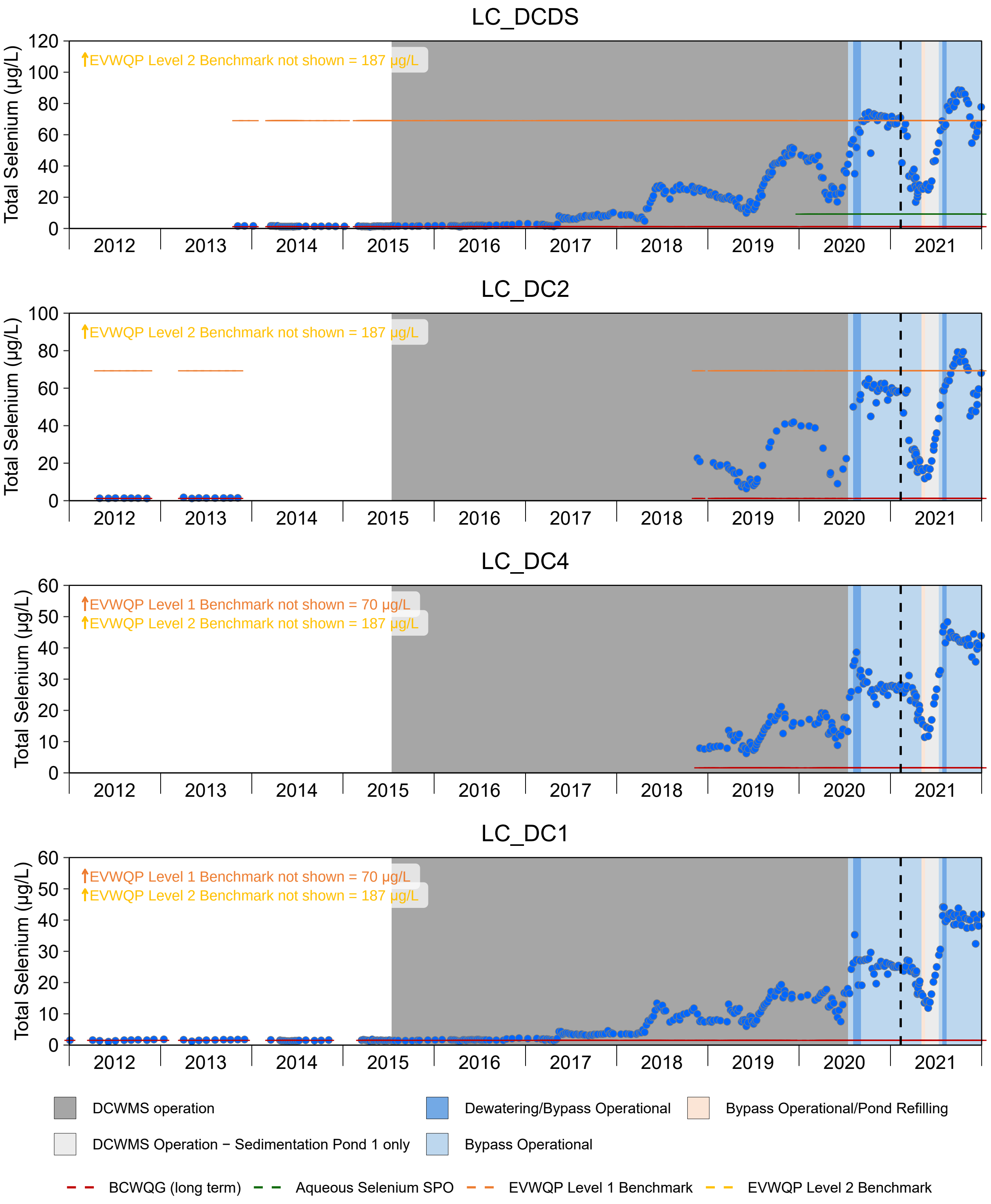


Figure C.35: **Time Series Plots for Total Selenium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

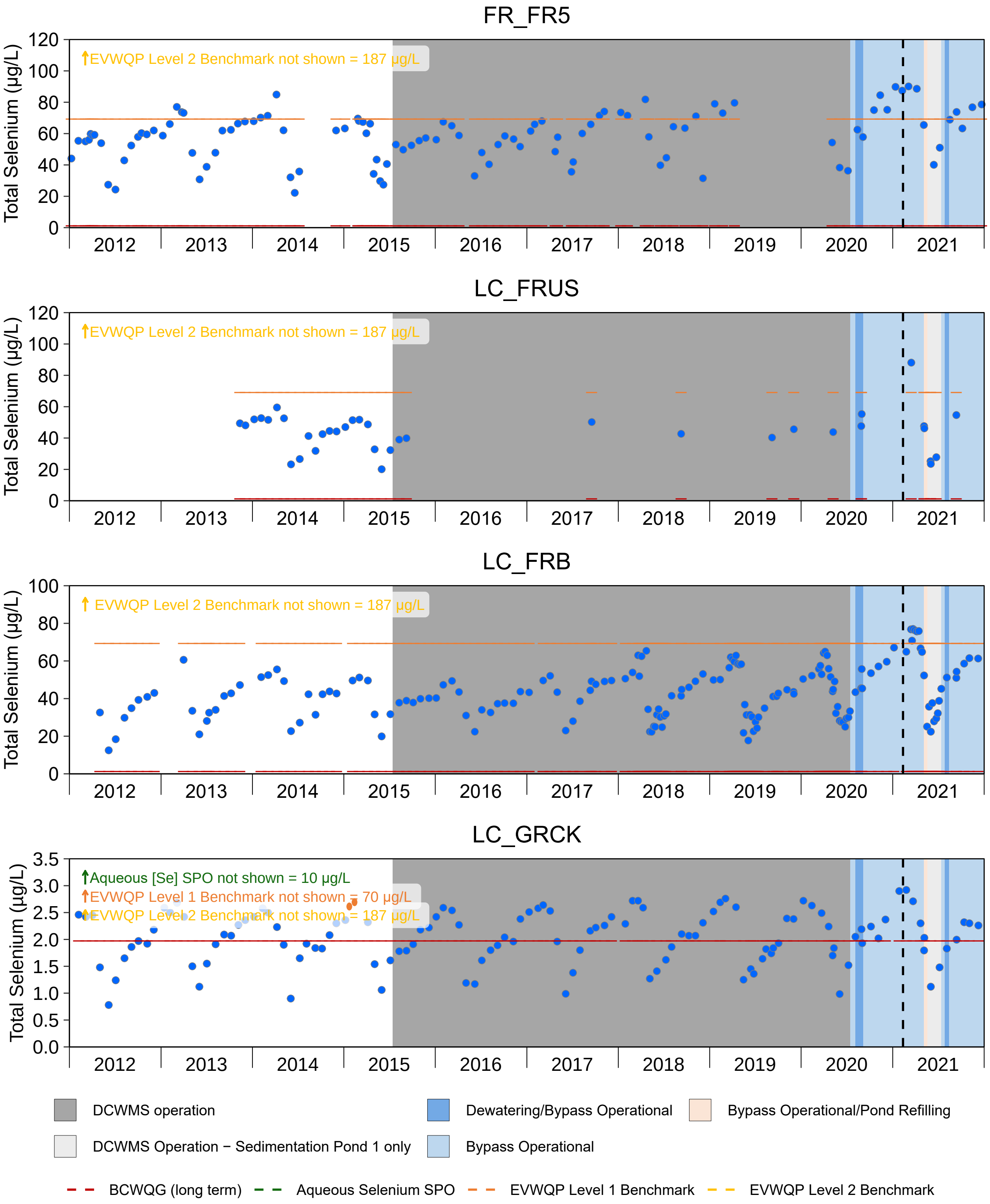


Figure C.35: Time Series Plots for Total Selenium from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

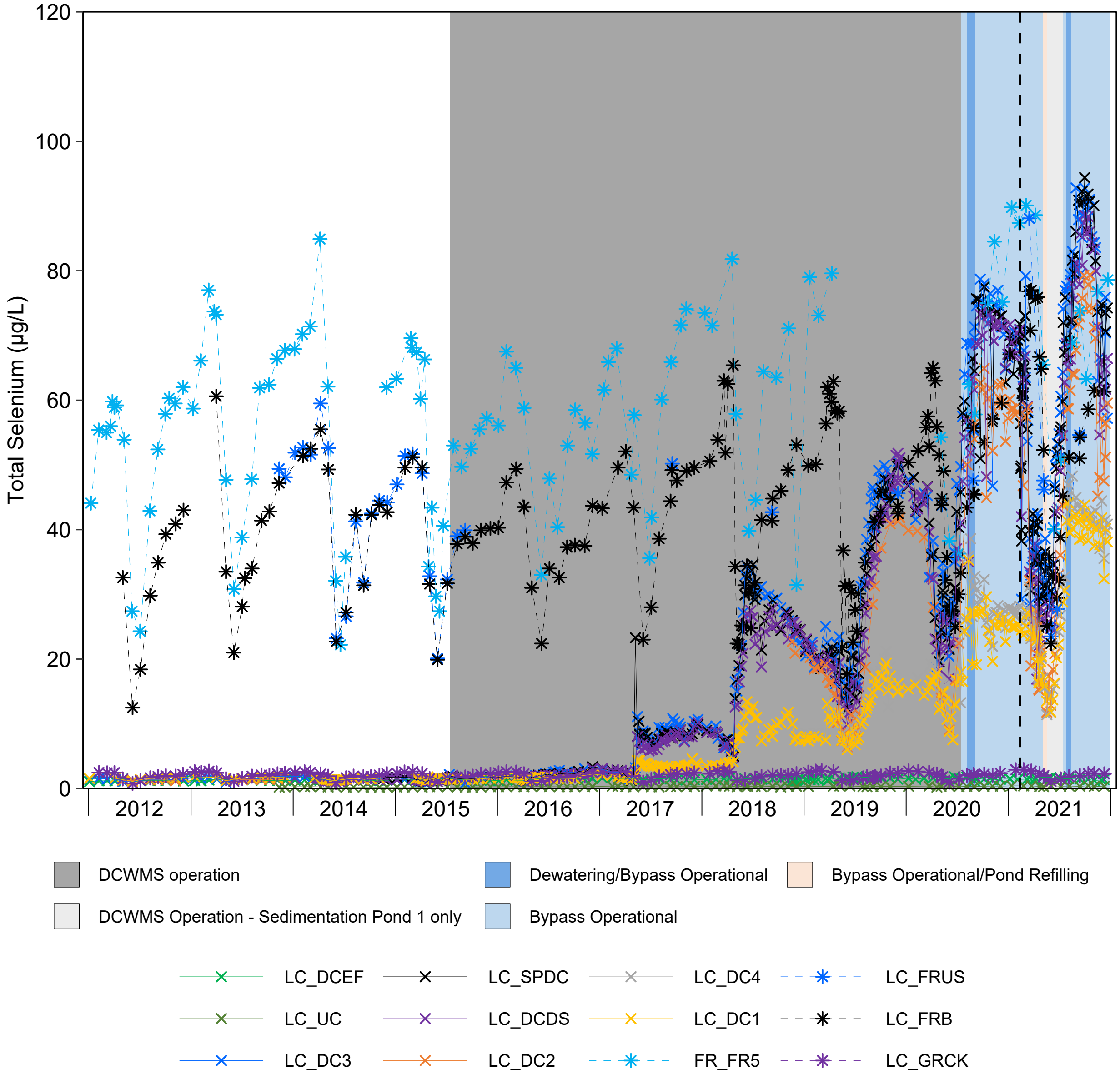


Figure C.36: **Time Series Plots for Total Selenium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: No values were reported below the LRL. Dashed vertical line indicates the Burnt Ridge North spoil failure.

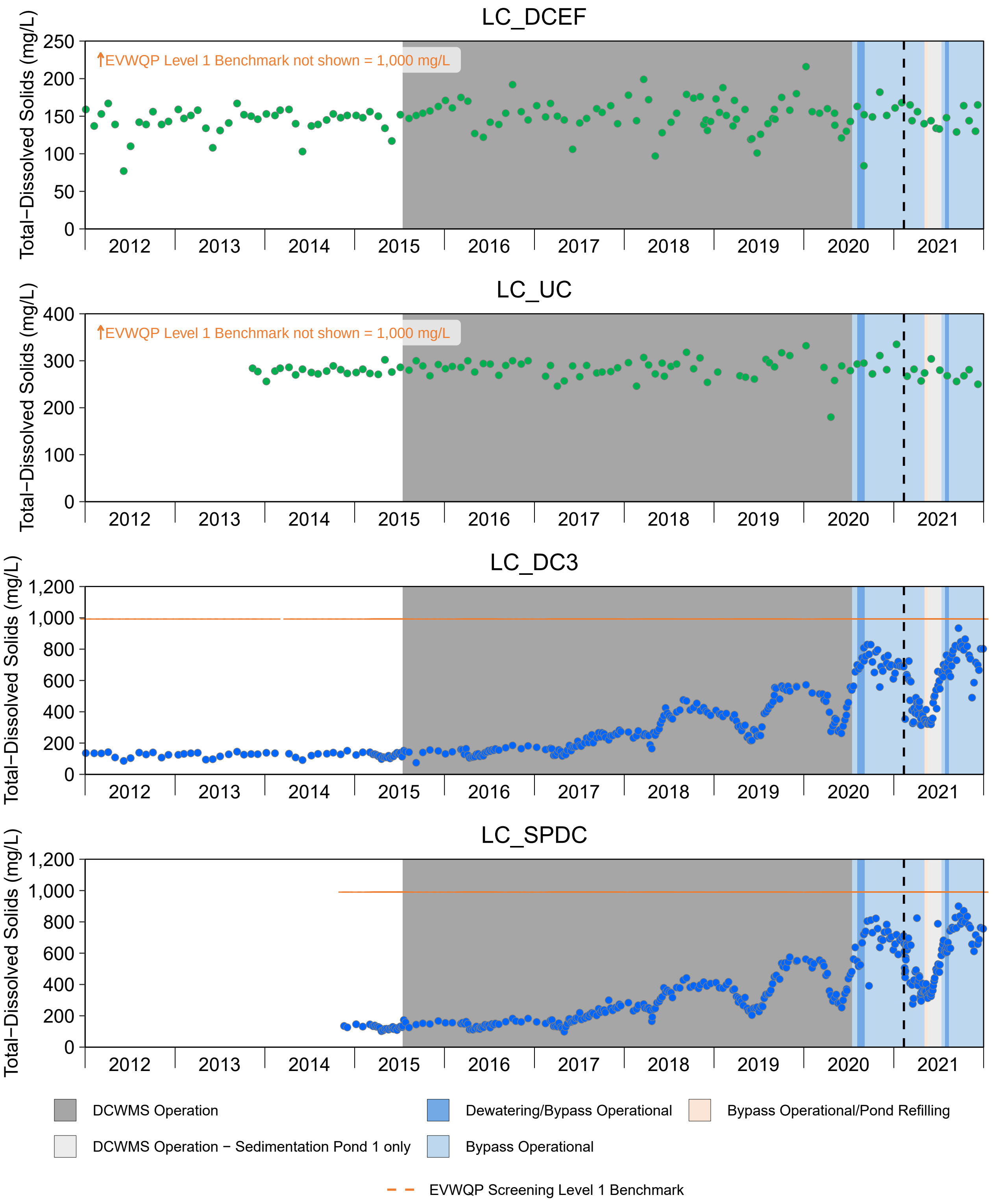


Figure C.37: **Time Series Plots for Total Dissolved Solids from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

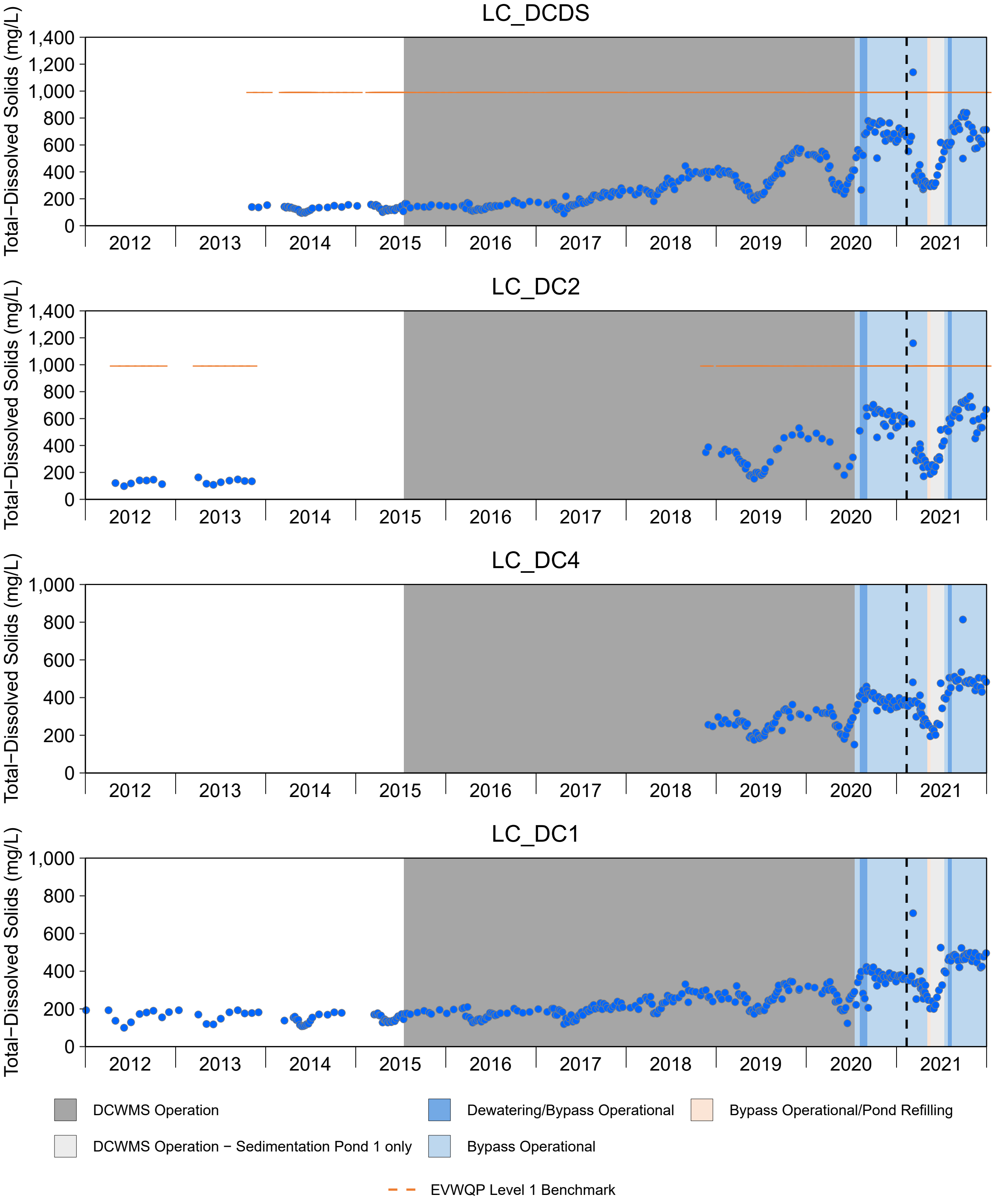


Figure C.37: **Time Series Plots for Total Dissolved Solids from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

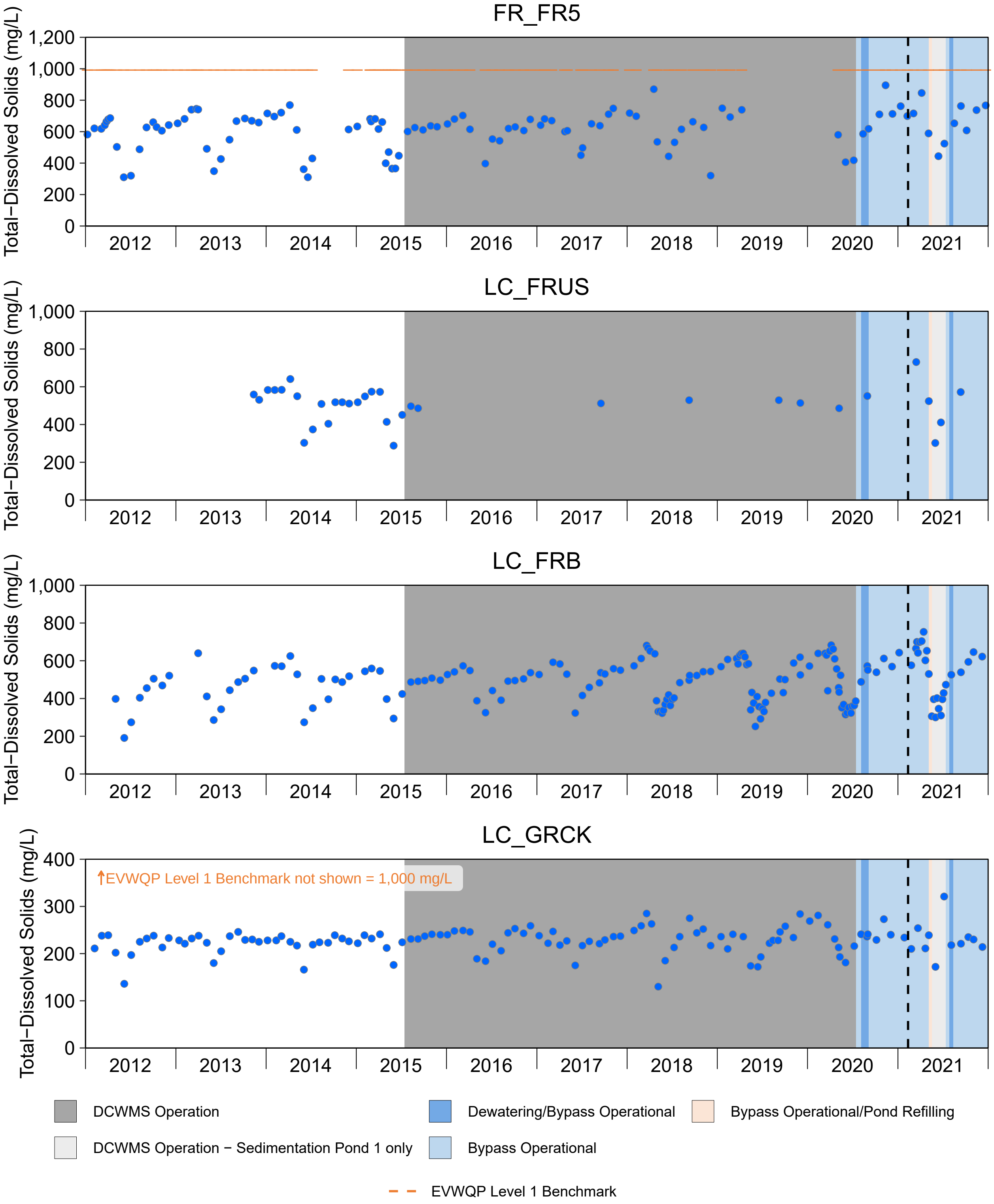


Figure C.37: Time Series Plots for Total Dissolved Solids from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

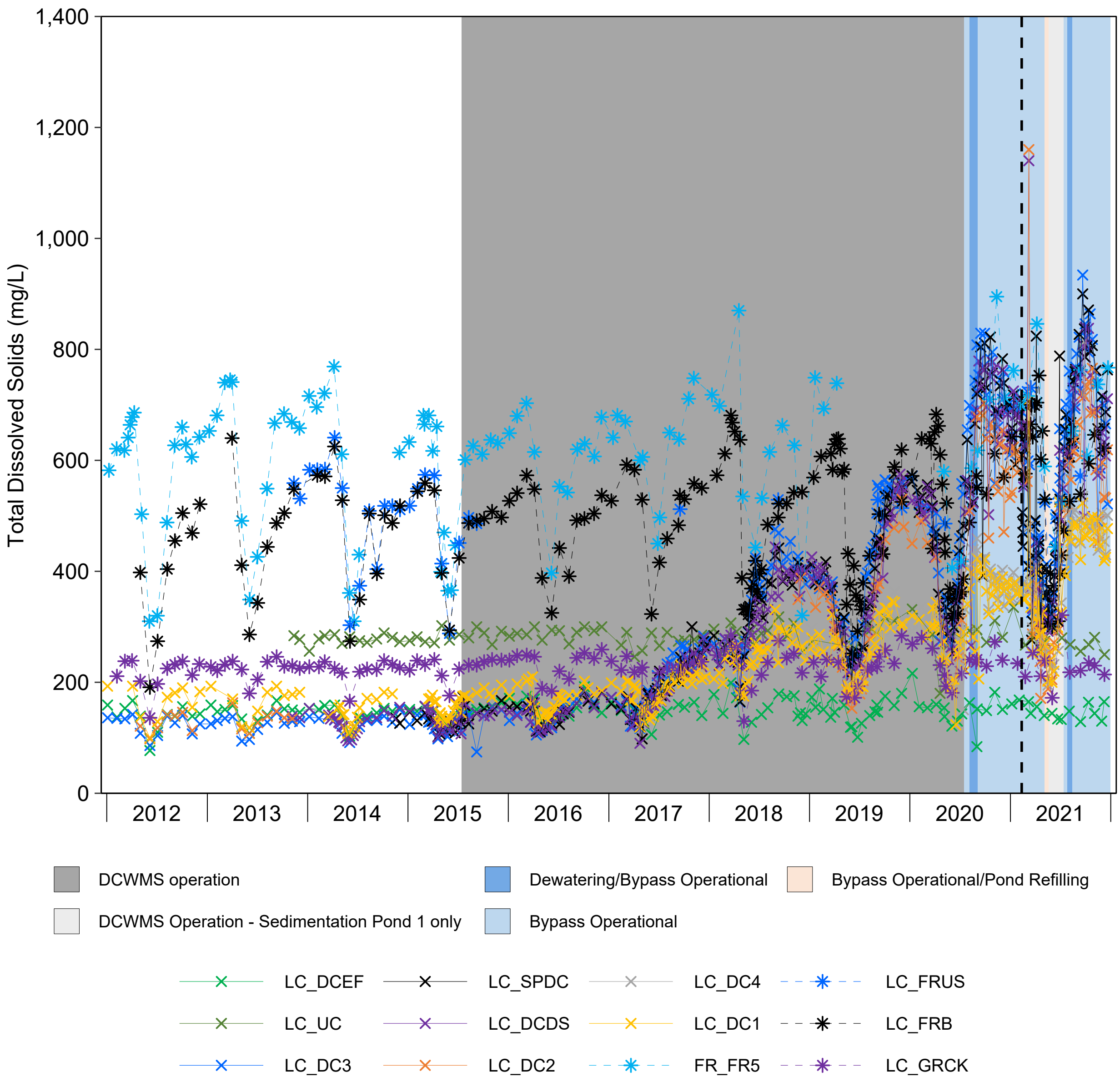


Figure C.38: **Time Series Plots for Total Dissolved Solids from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: No values were reported below the LRL. Dashed vertical line indicates the Burnt Ridge North spoil failure.

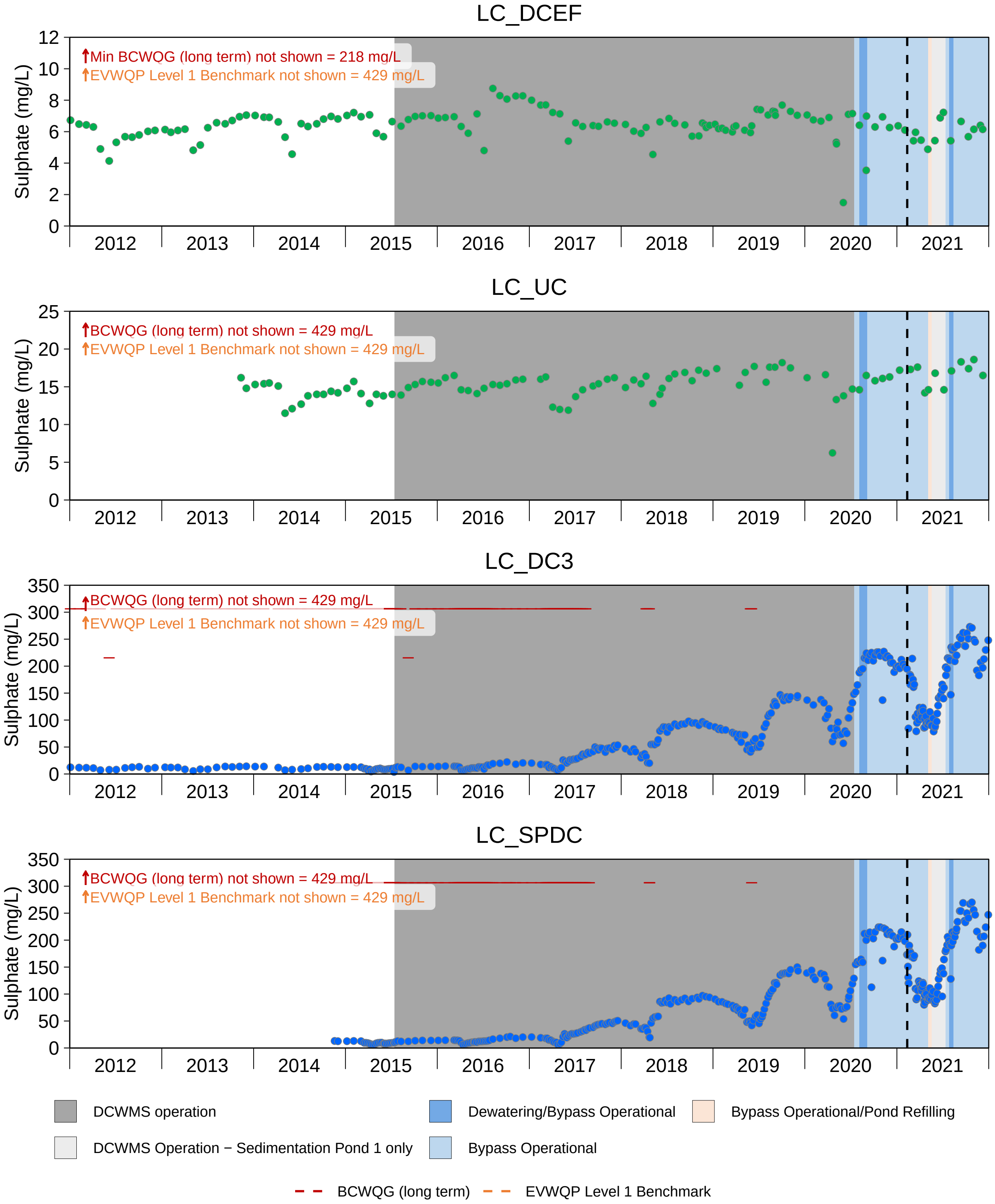


Figure C.39: Time Series Plots for Sulphate from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1). 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.

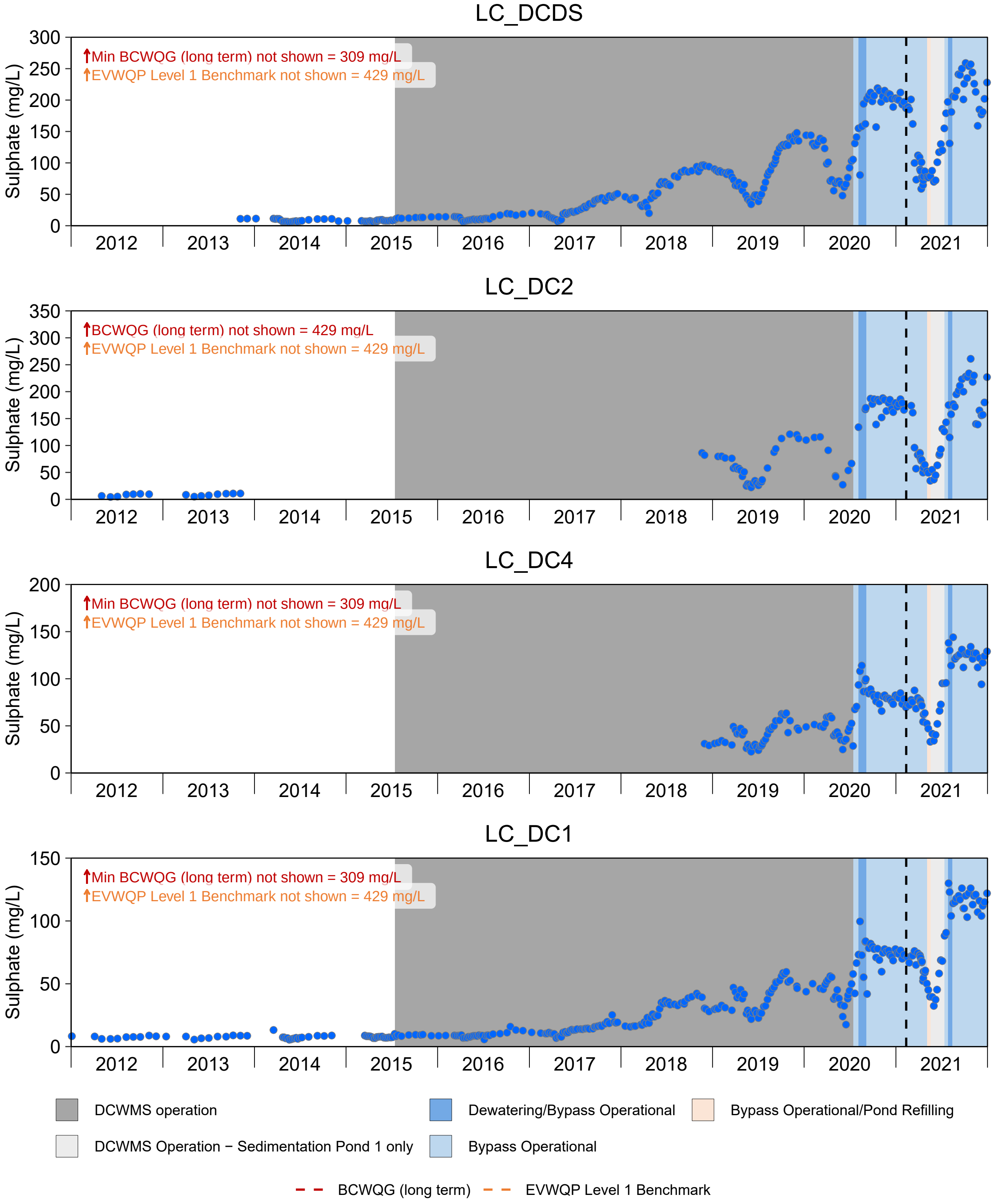


Figure C.39: **Time Series Plots for Sulphate from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1). 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.

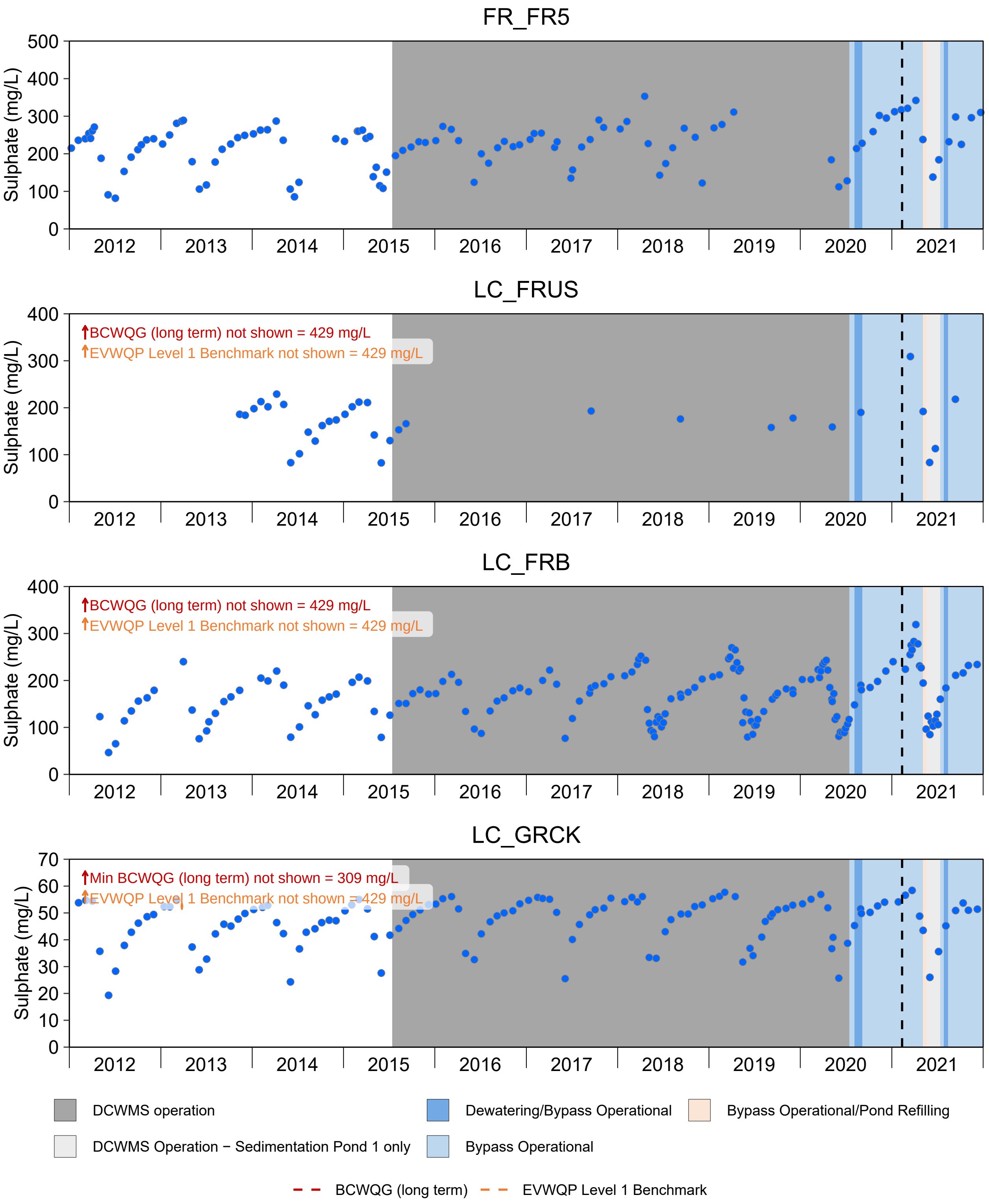


Figure C.39: Time Series Plots for Sulphate from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1). 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.

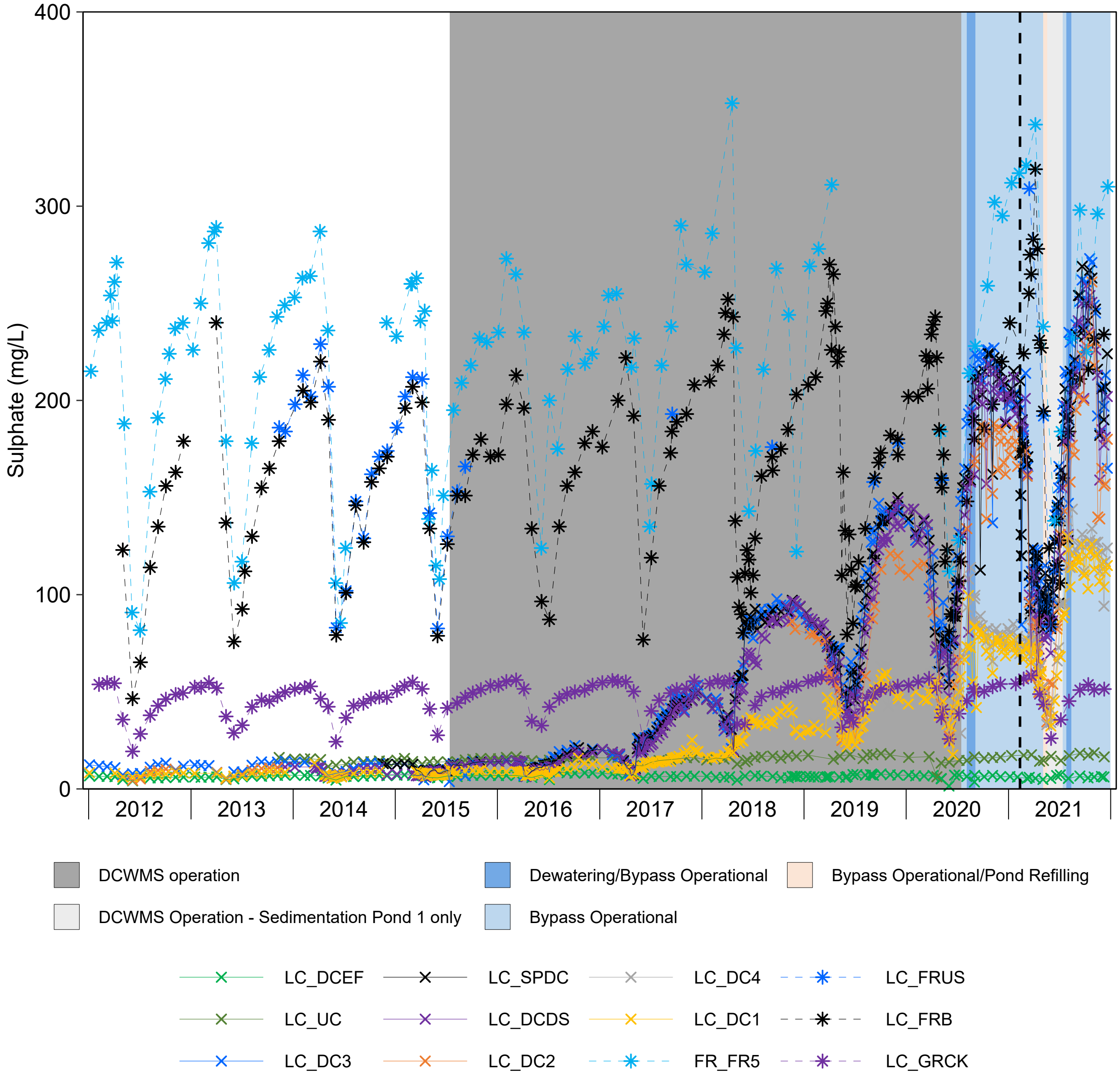


Figure C.40: **Time Series Plots for Sulphate from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: No values were reported below the LRL. Dashed vertical line indicates the Burnt Ridge North spoil failure.

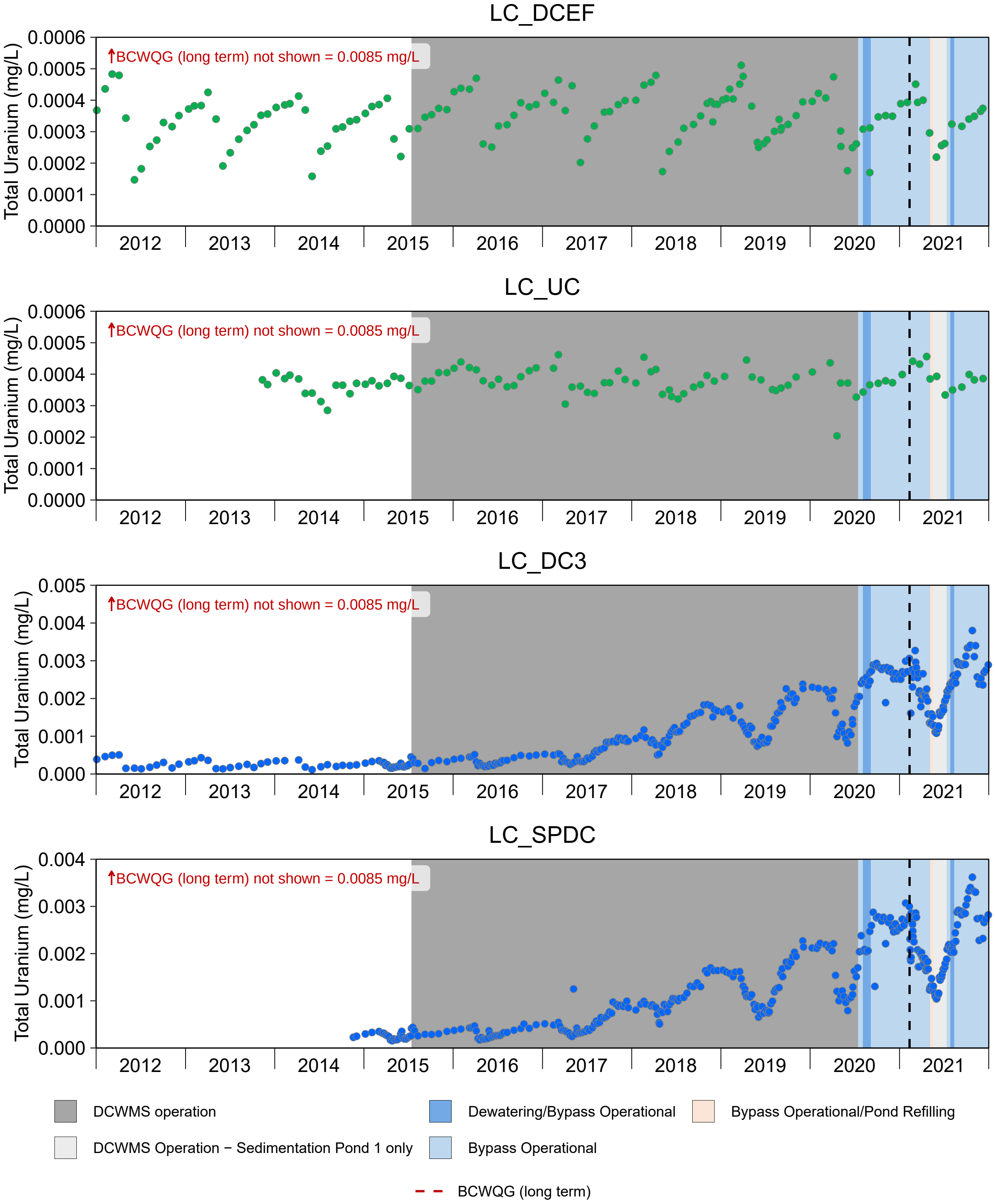


Figure C.41: **Time Series Plots for Total Uranium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

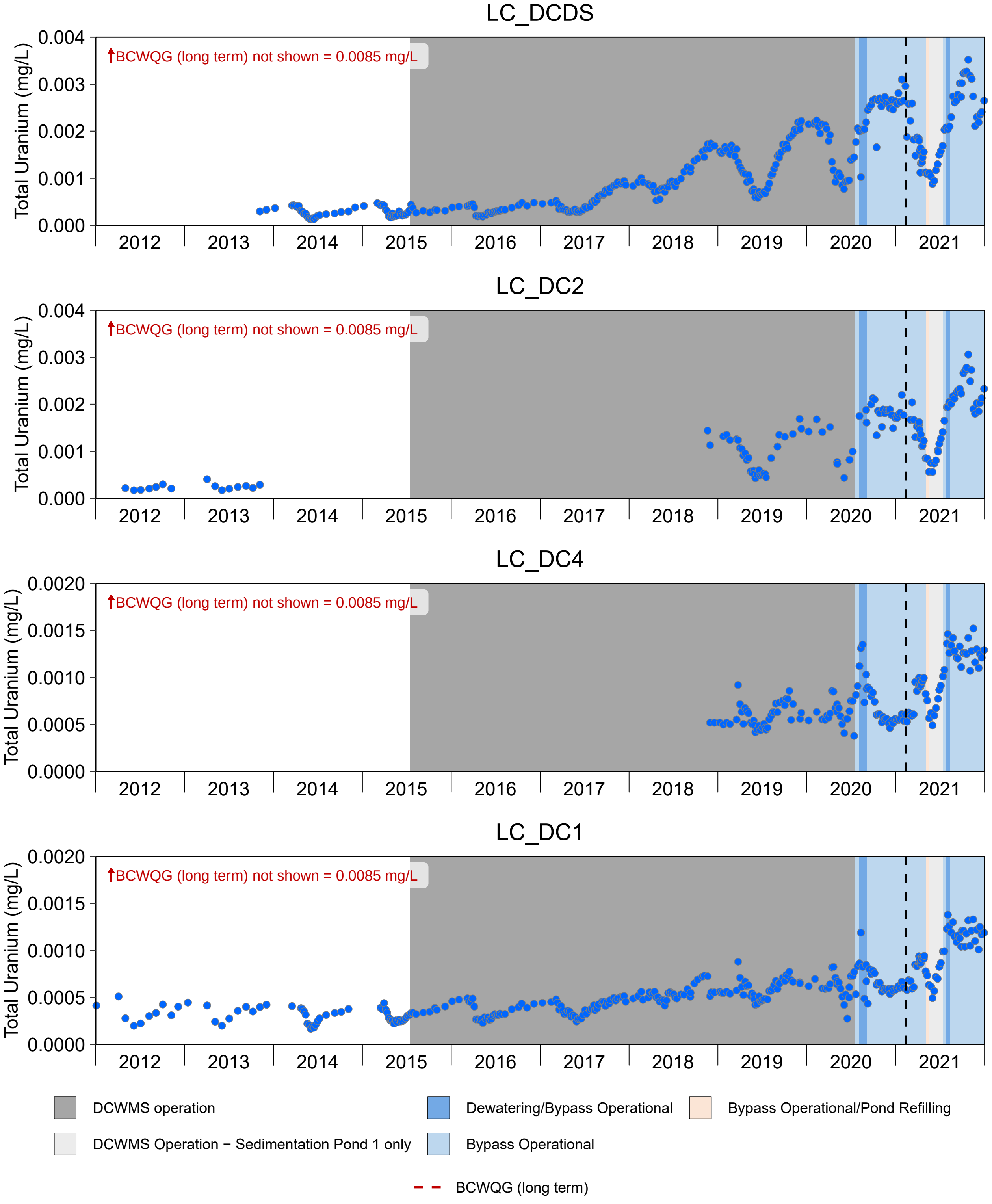


Figure C.41: Time Series Plots for Total Uranium from LCO Dry Creek LAEMP Areas, 2012 to 2021

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

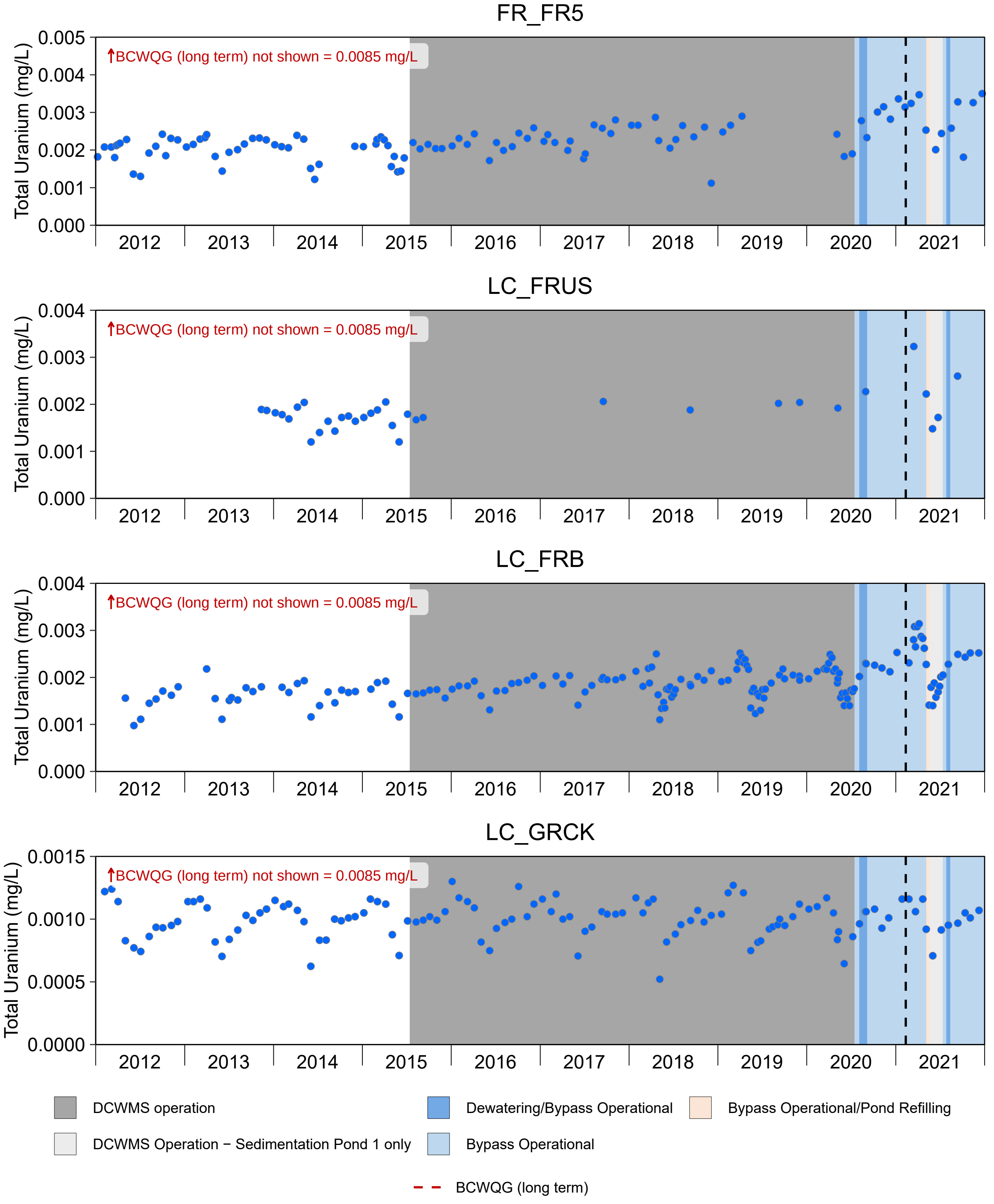


Figure C.41: **Time Series Plots for Total Uranium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

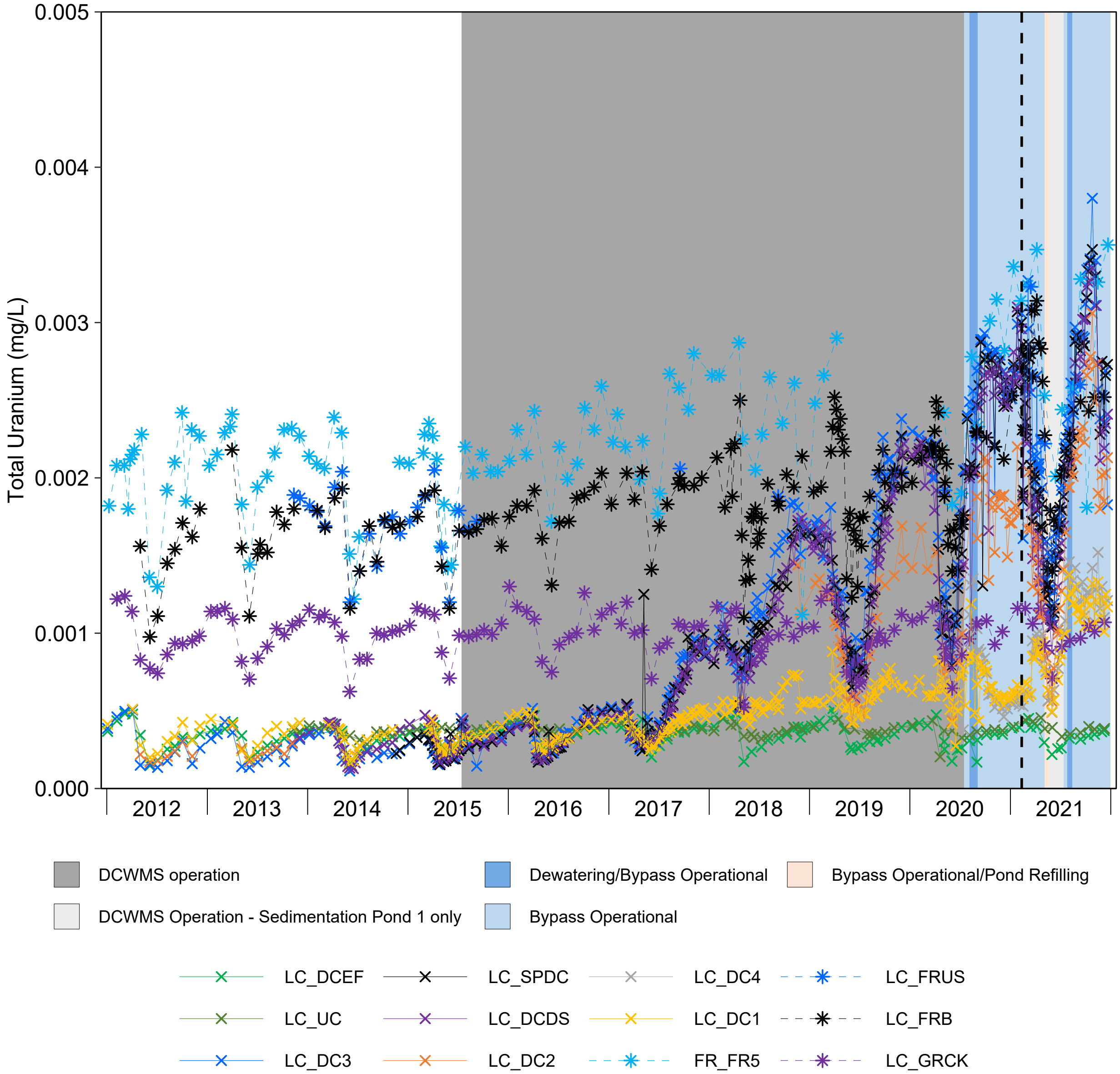


Figure C.42: **Time Series Plots for Total Uranium from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: No values were reported below the LRL. Dashed vertical line indicates the Burnt Ridge North spoil failure.

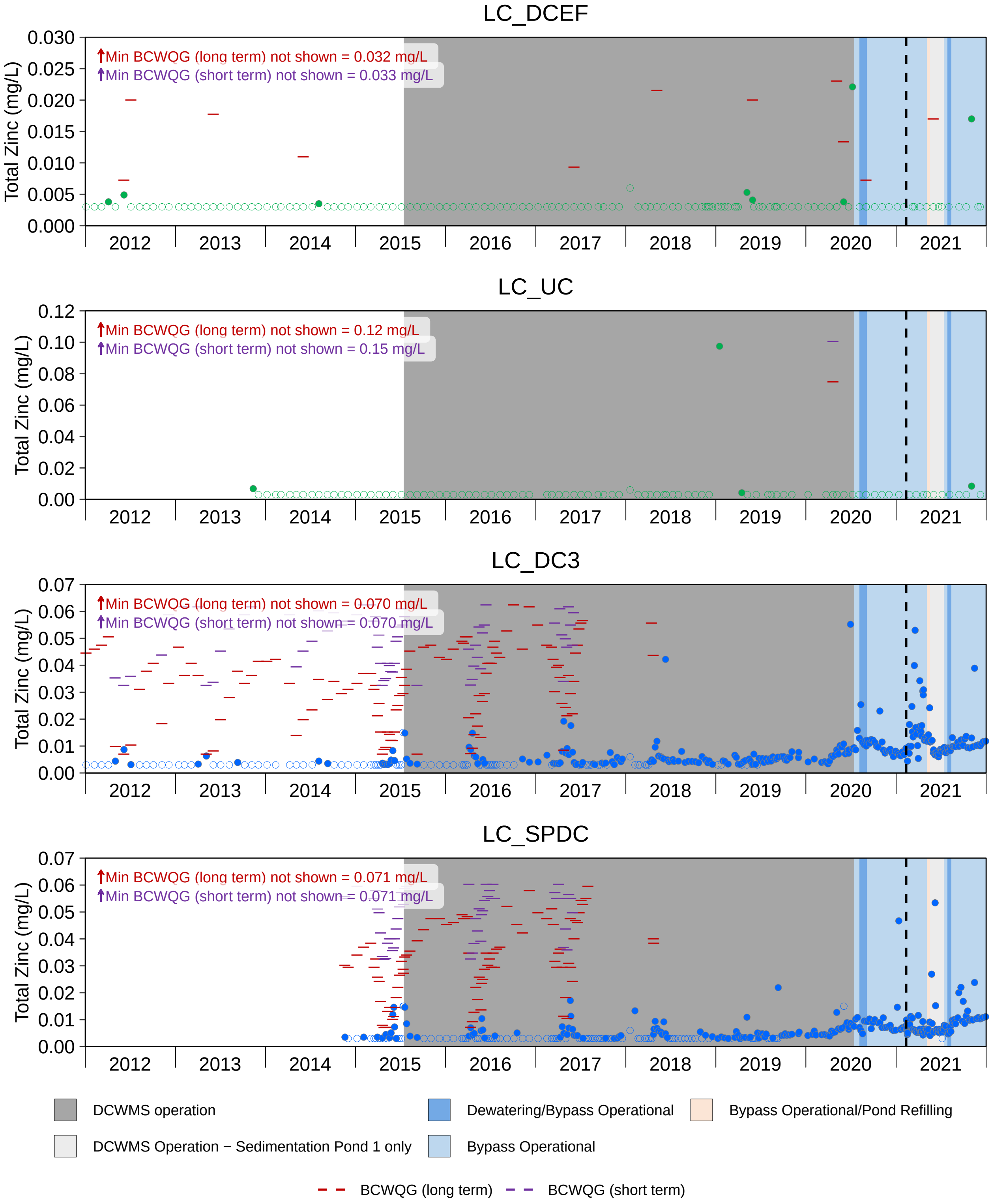


Figure C.43: **Time Series Plots for Total Zinc from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

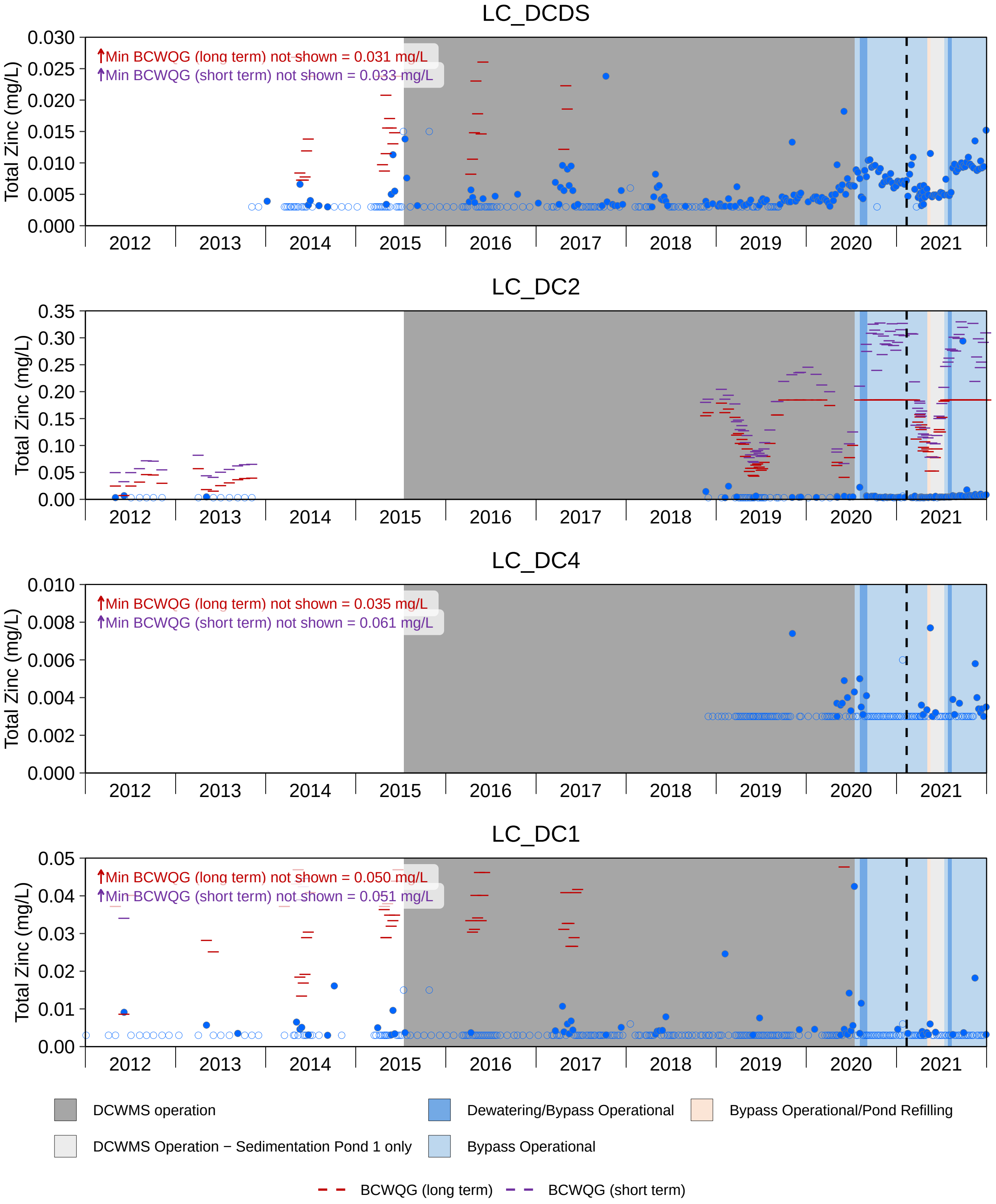


Figure C.43: **Time Series Plots for Total Zinc from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

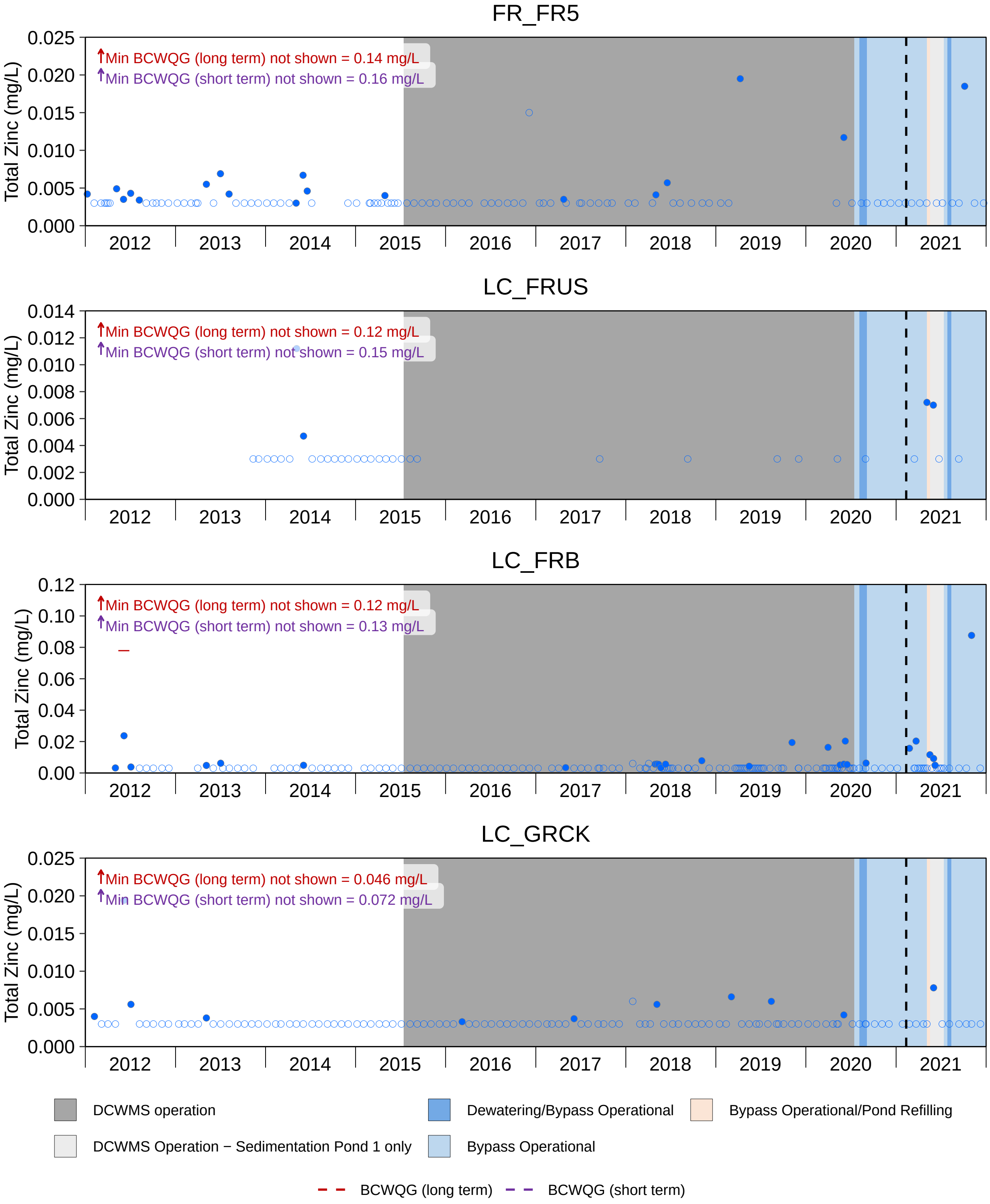


Figure C.43: **Time Series Plots for Total Zinc from LCO Dry Creek LAEMP Areas, 2012 to 2021**

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). Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

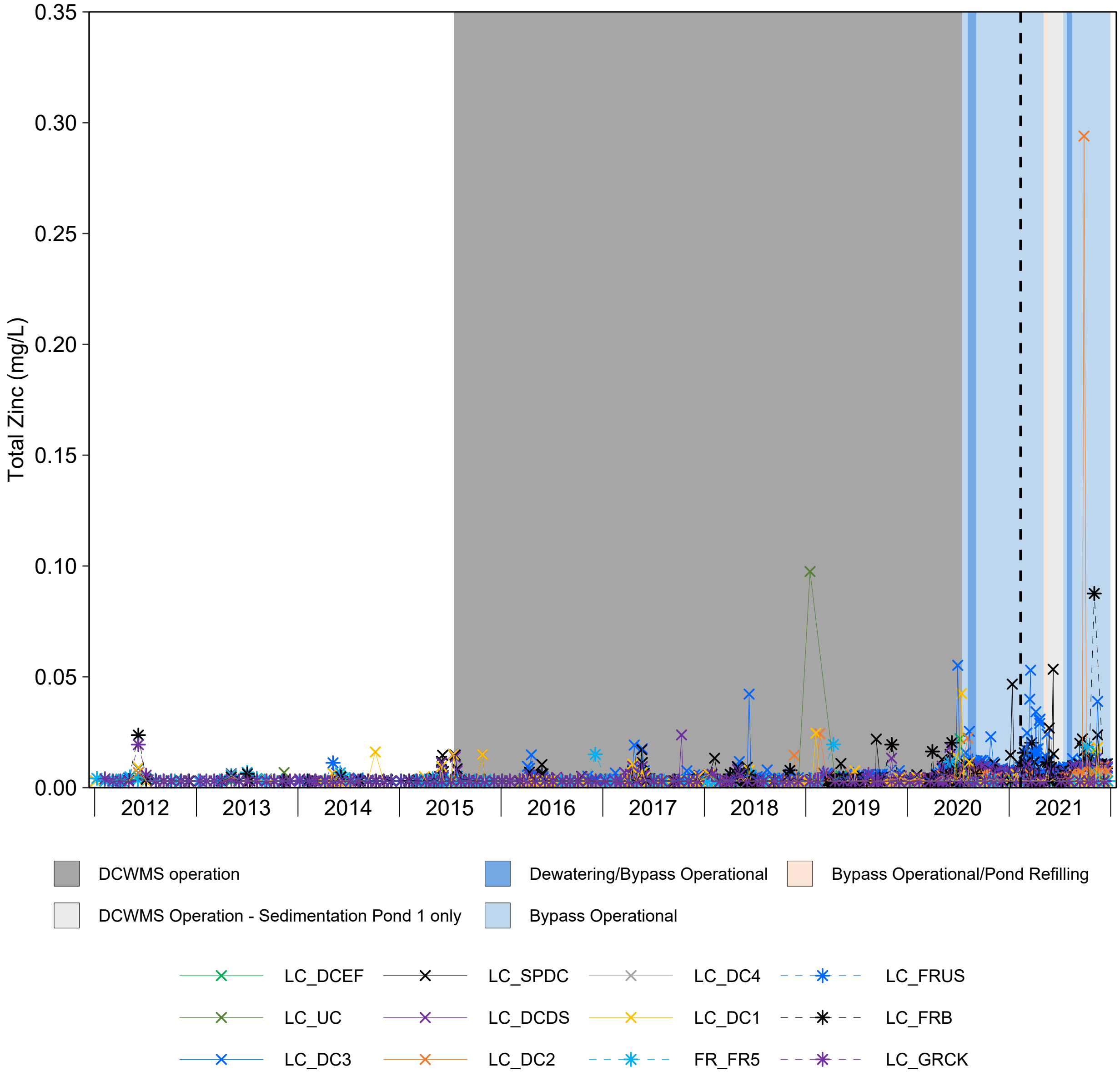


Figure C.44: **Time Series Plots for Total Zinc from LCO Dry Creek LAEMP Areas, 2012 to 2021**

Notes: Concentrations reported below the laboratory reporting limit (LRL) are plotted at the LRL (LRLs between 0.0030 and 0.015 mg/L). Dashed vertical line indicates the Burnt Ridge North spoil failure.

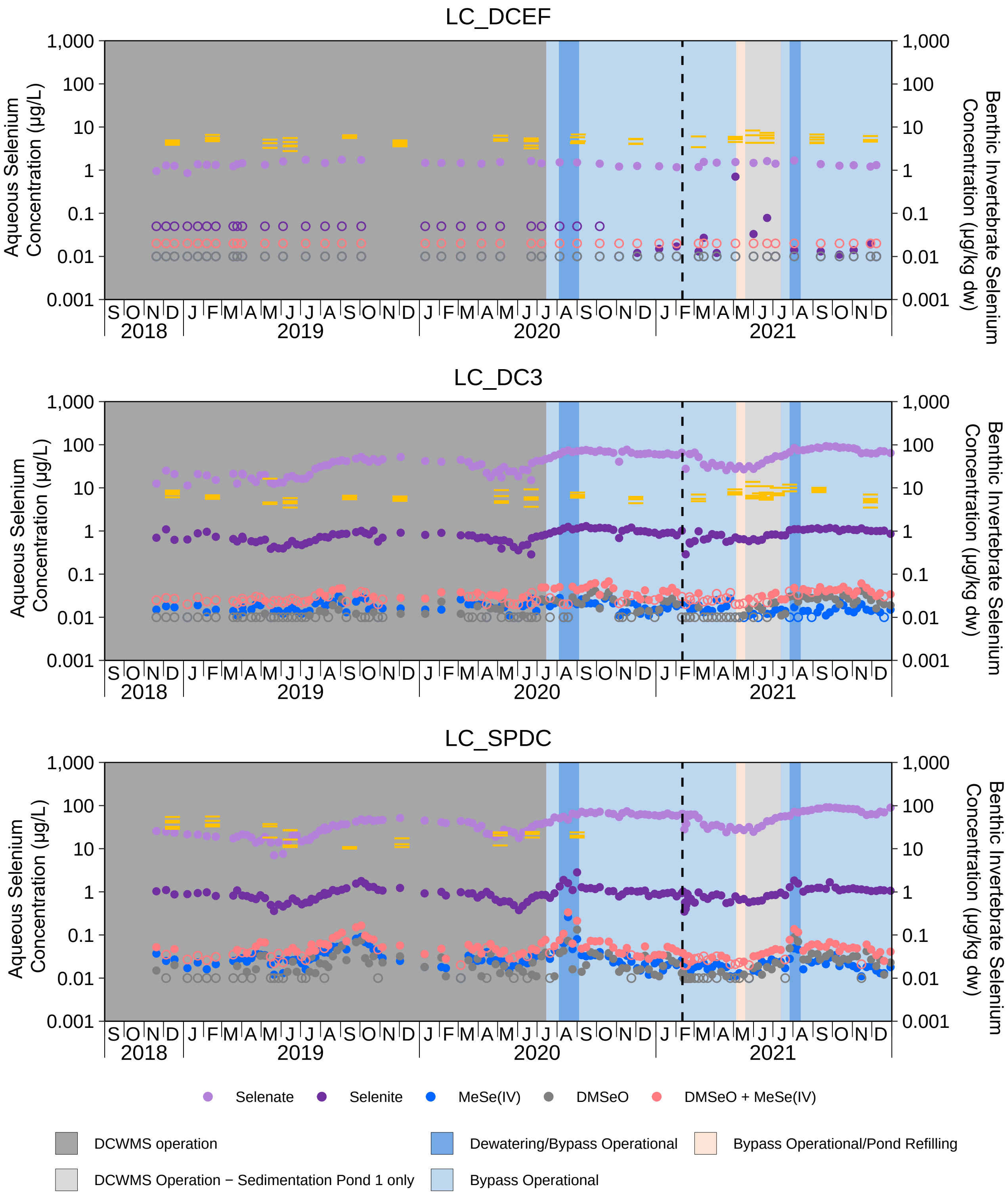


Figure C.45: **Selenium Species and Benthic Invertebrate Tissue Selenium Concentrations from LCO Dry Creek LAEMP Sampling Areas, September 2018 to December 2021**

Notes: Samples at the laboratory reporting limit (LRL) are plotted with an open symbol. Benthic composite tissue concentrations plotted with orange bars. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1). Biological sampling (including benthic invertebrate tissue selenium monitoring) was discontinued at LC_SPDC following operational changes in October 2020 at this area (see Minnow 2021a).

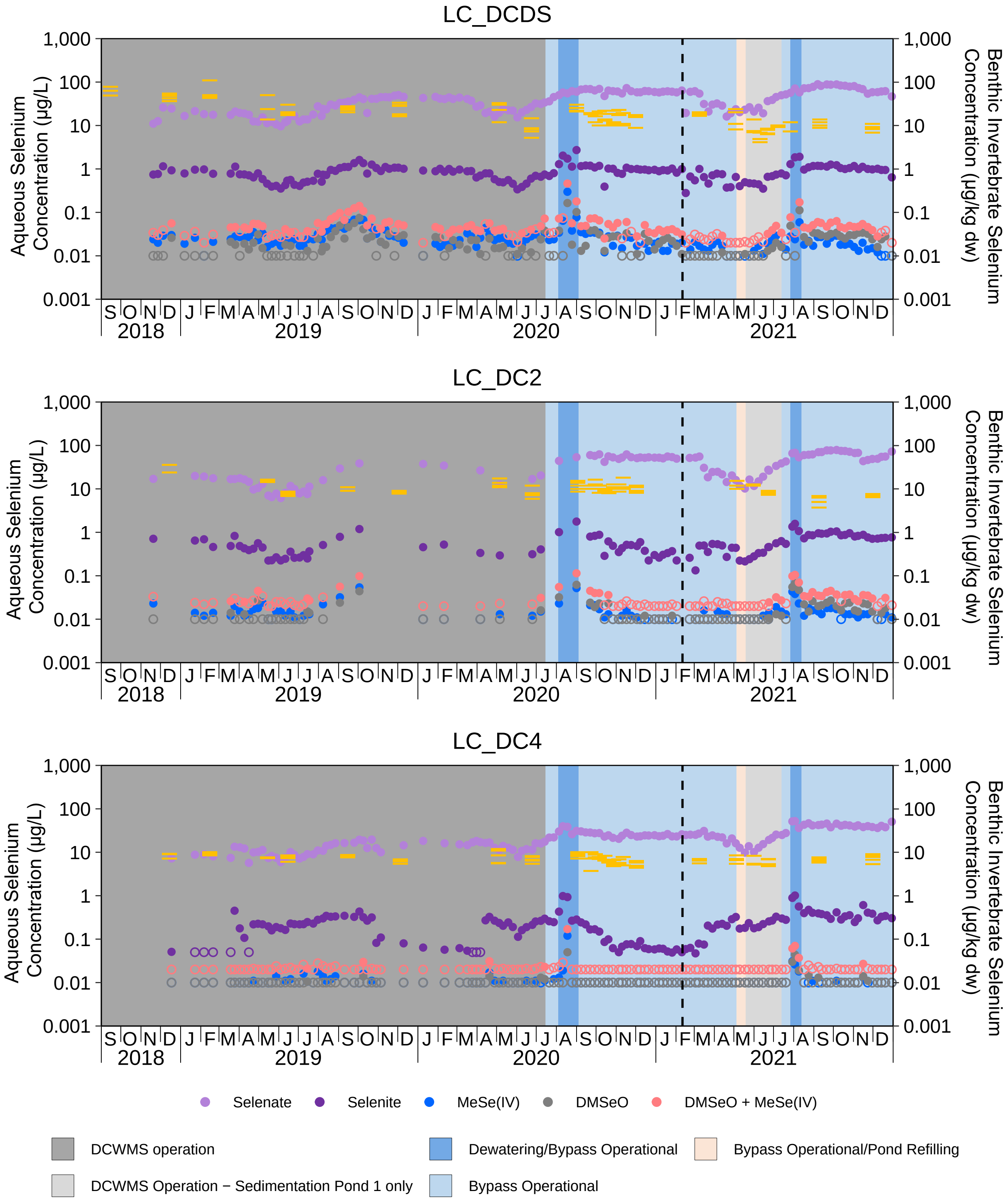


Figure C.45: **Selenium Species and Benthic Invertebrate Tissue Selenium Concentrations from LCO Dry Creek LAEMP Sampling Areas, September 2018 to December 2021**

Notes: Samples at the laboratory reporting limit (LRL) are plotted with an open symbol. Benthic composite tissue concentrations plotted with orange bars. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1). Biological sampling (including benthic invertebrate tissue selenium monitoring) was discontinued at LC_SPDC following operational changes in October 2020 at this area (see Minnow 2021a).

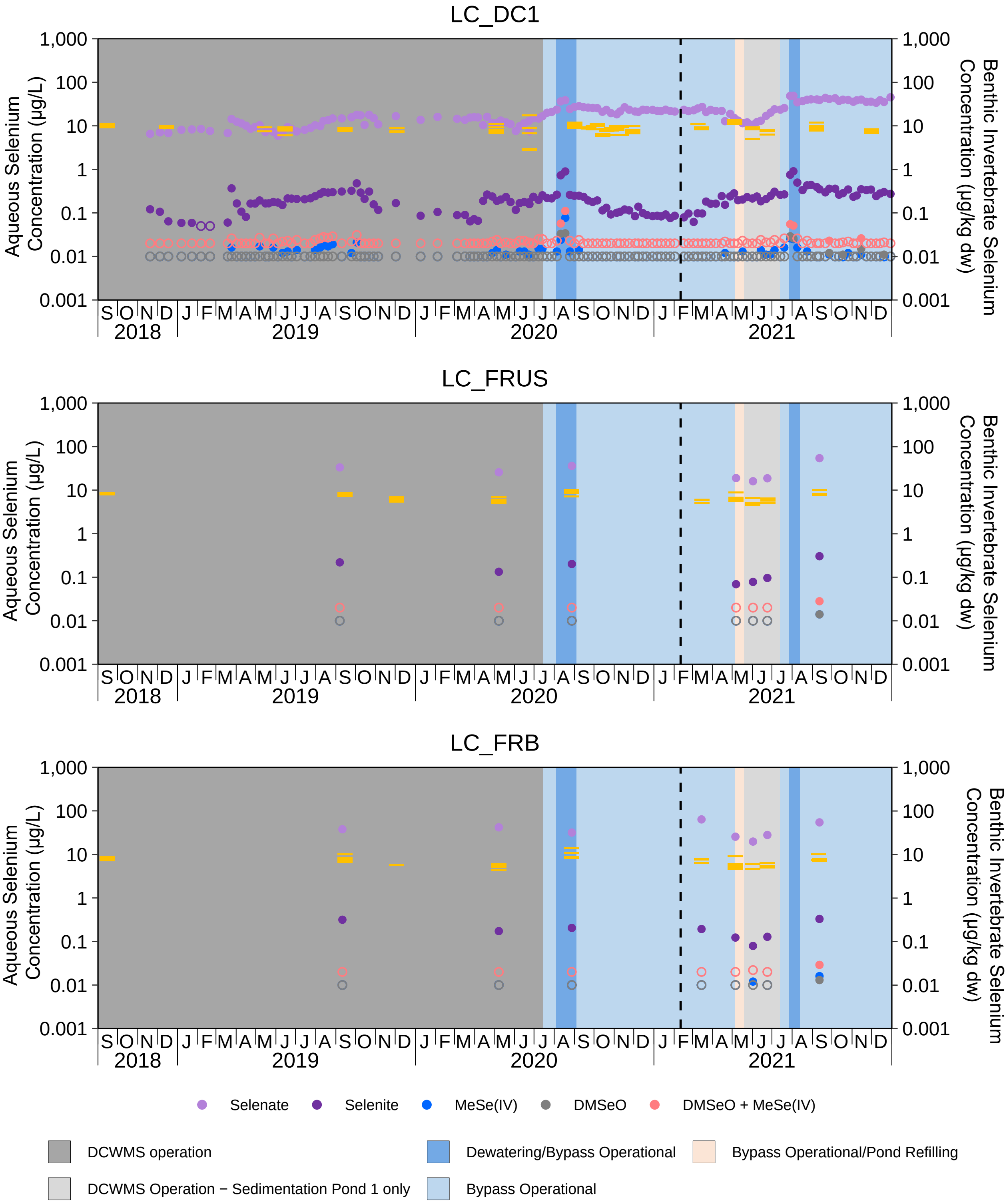


Figure C.45: Selenium Species and Benthic Invertebrate Tissue Selenium Concentrations from LCO Dry Creek LAEMP Sampling Areas, September 2018 to December 2021

Notes: Samples at the laboratory reporting limit (LRL) are plotted with an open symbol. Benthic composite tissue concentrations plotted with orange bars. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1). Biological sampling (including benthic invertebrate tissue selenium monitoring) was discontinued at LC_SPDC following operational changes in October 2020 at this area (see Minnow 2021a).

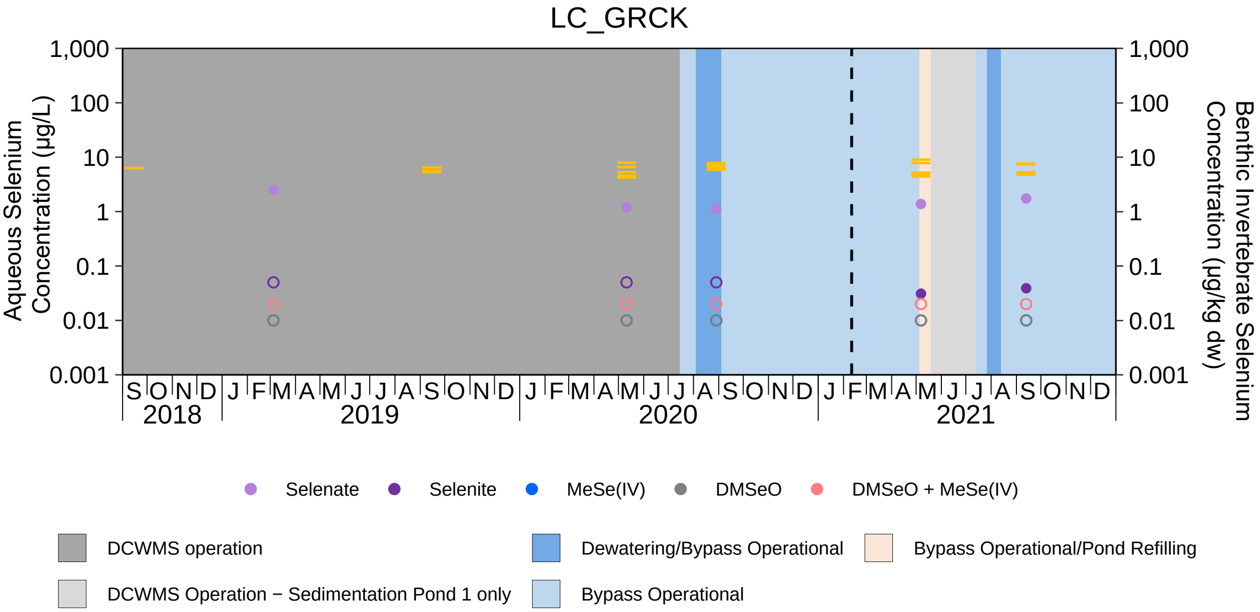


Figure C.45: **Selenium Species and Benthic Invertebrate Tissue Selenium Concentrations from LCO Dry Creek LAEMP Sampling Areas, September 2018 to December 2021**

Notes: Samples at the laboratory reporting limit (LRL) are plotted with an open symbol. Benthic composite tissue concentrations plotted with orange bars. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1). Biological sampling (including benthic invertebrate tissue selenium monitoring) was discontinued at LC_SPDC following operational changes in October 2020 at this area (see Minnow 2021a).

Table C.1: British Columbia Water Quality Guidelines (BCWQG), Site-Specific Elk Valley Water Quality Plan (EVWQP) Benchmarks, and Interim Screening Values for Constituents Assessed in the Line Creek Dry Creek LAEMP, 2021

Constituent			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= $10^{1.0003[\log(hardness)]-1.52}$ Maximum applicable hardness = 500 mg/L Level 2 EVWQP benchmark= $10^{1.0003[\log(hardness)]-1.38}$ 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 = 1000
Metals and Metalloids	Total	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	-
		Cadmium	mg/L	-	-	-	-	Site Performance Objective[j] = $\leq 0.001 \times 10^{0.83(\log 700-\log(hardness))}$ Maximum applicable hardness = 0.00038 mg/L
		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	mg/L	0.004	0.11	2004	Approved	-
		Iron	mg/L	-	1	2008	Approved	-
		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[g]	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 Site Performance Objective[j] = ≤ 10
		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 = $10^{0.83(\log(hardness))-2.53}$ 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 2021a)

[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 applie

[i] The most conservative guideline (0.00000125 mg/L) was applied.

[j] As outlined in Permit 107517.

Table C.2: Seasonal Kendall Trend Analysis For Water Quality Constituents Collected at Routine Monitoring Stations, Dry Creek LAEMP, 2012 to 2021

Constituent	Reference		Mine-exposed									
	LC_DCEF	LC_UC	LC_DC3	LC_SPDC	LC_DCDS	LC_DC2	LC_DC4	LC_DC1	FR_FR5	LC_FRUS	LC_FRB	LC_GRCK
Total Selenium	2.4	6.6	198	59	88	29	57	71	3.3	NS	3.6	1
Nitrate-N	NS	NS	365	65	74	26	55	143	NS	NS	1.4	NS
Nitrite	NS	NS	122	24	36	25	19	64	NS	NS	NS	NS
Total Nickel	NS	NS	64	40	55	20	NS	17	NS	NS	NS	NS
Sulphate	NS	2.2	83	53	51	24	45	51	2.8	NS	2.9	1
Total Phosphorus	-1.6	-17	NS	NS	NS	NS	NS	-3.6	NS	NS	NS	-5.4
Orthophosphate	NS	NS	-2.5	NS	NS	-5.3	NS	-5.7	4	NS	NS	NS
Total Mercury	5	NS	NS	NS	NS	NS	NS	NS	NS	-	10	NS
Total Lithium	NS	NS	20	28	18	14	12	5.8	8.4	6.9	7.2	NS
Total Cobalt	NS	NS	20	7.6	10	2.4	NS	2.5	NS	NS	2.5	NS
Dissolved Cadmium	NS	NS	26	36	32	18	23	7.4	NS	NS	NS	NS
Dissolved Cobalt	NS	NS	12	9.3	6	4.2	NS	1.3	NS	NS	NS	NS
Total Antimony	-1.8	NS	19	17	18	10	NS	5.8	NS	NS	NS	NS
Total Barium	0.8	NS	11	12	8.3	5.1	9.3	6.9	-2.2	NS	-0.9	0.5
Total Boron	-3	-5.1	NS	0.6	NS	NS	NS	-1.4	-2	NS	-2.5	-3.1
Total Cadmium	NS	NS	18	24	23	12	20	6.3	NS	NS	NS	NS
Total Dissolved Solids	0.8	NS	31	30	27	15	20	12	1.7	NS	1.8	0.6
Total Kjeldahl Nitrogen	NS	-5.1	11	NS	NS	NS	NS	15	58	NS	14	NS
Total Manganese	NS	NS	19	10	16	12	NS	5.4	NS	NS	NS	-2.9
Total Molybdenum	NS	NS	27	25	26	10	NS	5.6	1	NS	1.1	NS
Total Uranium	0.9	NS	50	40	38	15	23	11	4.1	6.1	4.2	NS
Total Zinc	NS	NS	18	19	15	7	NS	NS	NS	NS	12	NS
Dimethylselenoxide	NS	-	26	NS	NS	NS	NS	4.2	-	-	-	-
Methylseleninic Acid	NS	-	NS	-17	-21	NS	NS	NS	-	-	-	-
Selenite	NS	-	NS	-17	-21	NS	NS	NS	-	-	-	-
Selenate	NS	-	NS	NS	NS	NS	-	NS	-	-	-	-

🟩 Significant decreasing temporal trend (Seasonal Kendall test for monotonic trend at α = 0.05). Value reported is the Sen's slope reported as a percentage of the median concentration or value.

🟦 Significant increasing temporal trend (Seasonal Kendall test for monotonic trend at α = 0.05). Value reported is the Sen's slope reported as a percentage of the median concentration or value.

Notes: 'NS' = no significant temporal trend (Seasonal Kendall test for monotonic trend at α = 0.05). "-" = no data or insufficient data (n < 5) to test for trend.

Table C.3. Temporal Changes in Water Chemistry Constituents at Stations, Dry Creek LAEMP, 2012 to 2021

Constituent	Area Type	Area	Annual Variation [a]		Q1. Is there a positive or negative change in concentrations since the base year (b) of monitoring?										Q2. Is the 2021 annual mean greater or less than all annual historical means (2012 to 2020) and the previous year (2020)?[c]											
					Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b) [c]																					
			DF	P-Value	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2021 vs. 2012-2020	2021 vs. 2020
Total Selenium	Reference	LC_DCEF	9	<0.001	b	**9.8**	8.4	**17**	**22**	**24**	**19**	**31**	**29**	**25**	F	DE	EF	CDE	ABC	ABC	BCD	A	AB	ABC	No	No
		LC_UC	7	<0.001	-	-	b	-1.5	**17**	**22**	**35**	**40**	**37**	**50**	-	-	D	D	C	BC	AB	AB	AB	A	No	No
	Mine-exposed	LC_DC3	9	<0.001	b	13	7.1	9.6	**64**	**307**	**1,250**	**2,004**	**3,542**	**4,354**	F	F	F	F	E	D	C	B	A	A	No	No
		LC_SPDC	6	<0.001	-	-	-	b	38	**266**	**1,071**	**1,676**	**3,041**	**3,815**	-	-	-	E	E	D	C	B	A	A	No	No
		LC_DCDS	7	<0.001	-	-	b	7.1	**48**	**270**	**1,123**	**1,745**	**3,231**	**3,906**	-	-	F	EF	E	D	C	B	A	A	No	No
		LC_DC2	4	<0.001	b	12	-	-	-	-	-	**1,320**	**2,504**	**3,112**	C	C	-	-	-	-	-	B	A	A	No	No
		LC_DC4	2	<0.001	-	-	-	-	-	-	-	b	**74**	**155**	-	-	-	-	-	-	-	C	B	A	↑	↑
		LC_DC1	9	<0.001	b	8.1	-0.70	-1.0	18	**98**	**389**	**674**	**1,208**	**1,877**	F	F	F	F	F	E	D	C	B	A	↑	↑
		FR_FR5	8	<0.001	b	18	**22**	10	8.9	**21**	**24**	-	**32**	**48**	C	BC	AB	BC	BC	B	AB	-	AB	A	No	No
		LC_FRUS	1	0.148	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	9	<0.001	b	**25**	**26**	17	14	**30**	**32**	**28**	**45**	**66**	E	BCD	CD	CDE	DE	BCD	BC	BCD	AB	A	No	No
		LC_GRCK	9	0.003	b	**12**	8.1	7.5	6.8	**13**	**13**	**13**	**12**	**16**	B	A	AB	AB	AB	A	A	A	A	A	No	No
Nitrate-N	Reference	LC_DCEF	9	<0.001	b	4.4	8.1	13	-10	15	-10	-8.5	4.2	18	AB	AB	AB	A	B	A	B	B	AB	A	No	No
		LC_UC	7	0.003	-	-	b	-14	16	-2.0	-21	5.5	-17	18	-	-	AB	AB	A	AB	B	AB	AB	A	No	No
	Mine-exposed	LC_DC3	9	<0.001	b	46	32	61	**211**	**1,851**	**8,920**	**11,610**	**19,466**	**23,252**	E	E	E	DE	D	C	B	AB	A	A	No	No
		LC_SPDC	6	<0.001	-	-	-	b	99	**4,106**	**19,812**	**25,466**	**42,115**	**52,813**	-	-	-	C	C	B	A	A	A	A	No	No
		LC_DCDS	7	<0.001	-	-	b	-60	20	**2,001**	**9,861**	**12,758**	**21,527**	**26,697**	-	-	C	C	C	B	A	A	A	A	No	No
		LC_DC2	4	<0.001	b	111	-	-	-	-	-	**41,785**	**74,665**	**94,127**	B	B	-	-	-	-	-	A	A	A	No	No
		LC_DC4	2	<0.001	-	-	-	-	-	-	-	b	**63**	**145**	-	-	-	-	-	-	-	C	B	A	↑	↑
		LC_DC1	9	<0.001	b	90	146	106	**367**	**3,620**	**17,471**	**27,504**	**43,273**	**66,931**	E	DE	DE	DE	D	C	B	AB	AB	A	No	No
		FR_FR5	8	<0.001	b	**25**	**32**	13	15	17	3.3	-	14	**36**	D	ABC	AB	BCD	ABCD	ABCD	CD	-	ABCD	A	No	No
		LC_FRUS	1	0.022	-	-	b	**-12**	-	-	-	-	-	-	-	-	A	B	-	-	-	-	-	-	-	-
		LC_FRB	9	<0.001	b	**35**	**39**	**25**	**23**	**31**	**18**	**18**	**33**	**59**	D	BC	B	BC	BC	BC	C	C	BC	A	↑	↑
		LC_GRCK	9	<0.001	b	20	**43**	19	11	27	-2.2	32	10	32	BC	ABC	A	ABC	ABC	ABC	C	AB	ABC	AB	No	No
Nitrite	Reference	LC_DCEF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_UC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mine-exposed	LC_DC3	5	<0.001	-	-	-	-	b	**2,669**	**3,587**	**992**	**950**	**3,293**	-	-	-	-	C	AB	A	AB	B	AB	No	No
		LC_SPDC	6	<0.001	-	-	-	b	103	**3,889**	**7,293**	**3,813**	**3,180**	**5,445**	-	-	-	B	B	A	A	A	A	A	No	No
		LC_DCDS	6	<0.001	-	-	-	b	248	**4,523**	**9,061**	**4,691**	**3,916**	**6,724**	-	-	-	B	B	A	A	A	A	A	No	No
		LC_DC2	2	0.020	-	-	-	-	-	-	-	b	-40	37	-	-	-	-	-	-	-	AB	B	A	No	↑
		LC_DC4	2	<0.001	-	-	-	-	-	-	-	b	-17	**105**	-	-	-	-	-	-	-	B	B	A	↑	↑
		LC_DC1	5	<0.001	-	-	-	-	b	**355**	**694**	**599**	**468**	**1,272**	-	-	-	-	C	B	AB	AB	B	A	No	↑
		FR_FR5	8	<0.001	b	7.3	-14	**-49**	**-42**	-26	-27	-	-37	**-41**	A	A	AB	B	B	AB	AB	-	AB	B	No	No
		LC_FRUS	1	0.171	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	9	<0.001	b	25	-5.2	-19	-41	-2.6	-11	-15	-8.8	13	AB	A	AB	AB	B	AB	AB	AB	AB	A	No	No
		LC_GRCK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

▨ P-value < 0.05 (annual variation).
🟩 > 0% Decrease in concentration.
🟩 > 3% Decrease in concentration.
🟩 > 3% Decrease in concentration.
🟩 > 0% Decrease in concentration.
🟦 > 5% Increase in concentration.
🟦 > 0% Increase in concentration.
🟦 > 5% Increase in concentration.
🟦 > 100% Increase in concentration.
***Bold** Significant increase or decrease from base year [b].

Notes: "ns" = not significant; "-" insufficient data for comparison, where insufficient data is less than 6 months of recorded data or > 75% LRL data in a given year.

[a] The presence of annual variation was determined by a significant Year term (α = 0.05) using an ANOVA with factors Year and Month.

[b] Magnitude of Difference (MOD) was calculated as the concentrations in each year minus the concentration in the first year divided by the concentration in the fist year × 100.

[c] Significance between each year determined using all pairwise comparisons with Tukey correction.

Table C.3. Temporal Changes in Water Chemistry Constituents at Stations, Dry Creek LAEMP, 2012 to 2021

Constituent	Area Type	Area	Annual Variation [a]		Q1. Is there a positive or negative change in concentrations since the base year (b) of monitoring? Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b) [c]										Q2. Is the 2021 annual mean greater or less than all annual historical means (2012 to 2020) and the previous year (2020)?[c]											
			DF	P-Value	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2021 vs. 2012-2020	2021 vs. 2020
Total Nickel	Reference	LC_DCEF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_UC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mine-exposed	LC_DC3	9	<0.001	b	-11	-16	9.2	26	**113**	**437**	**679**	**1,215**	**1,224**	D	D	D	D	D	C	B	B	A	A	No	No
		LC_SPDC	6	<0.001	-	-	-	b	3.4	**58**	**314**	**494**	**886**	**817**	-	-	-	D	D	C	B	B	A	A	No	No
		LC_DCDS	7	<0.001	-	-	b	45	**66**	**170**	**595**	**881**	**1,559**	**1,446**	-	-	E	DE	D	C	B	B	A	A	No	No
		LC_DC2	4	<0.001	b	-7.5	-	-	-	-	-	**573**	**802**	**877**	B	B	-	-	-	-	-	A	A	A	No	No
		LC_DC4	2	0.038	-	-	-	-	-	-	-	b	7.0	59	-	-	-	-	-	-	-	A	A	A	No	No
		LC_DC1	9	<0.001	b	-3.7	20	29	16	32	**112**	**159**	**240**	**329**	D	D	CD	CD	D	CD	BC	AB	AB	A	No	No
		FR_FR5	8	0.061	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRUS	1	0.033	-	-	b	-24	-	-	-	-	-	-	-	-	A	A	-	-	-	-	-	-	-	-
		LC_FRB	9	<0.001	b	-28	**-54**	**-62**	**-45**	**-48**	**-44**	**-41**	-33	-16	A	ABC	CD	D	BCD	CD	BCD	BCD	ABC	AB	No	No
		LC_GRCK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulphate	Reference	LC_DCEF	9	<0.001	b	7.2	12	**17**	**24**	**18**	6.6	**18**	8.0	4.0	D	BCD	ABCD	ABC	A	AB	BCD	AB	BCD	CD	No	No
		LC_UC	7	<0.001	-	-	b	4.2	9.9	3.6	**13**	**25**	2.0	**19**	-	-	D	CD	BCD	CD	ABC	A	CD	AB	No	↑
	Mine-exposed	LC_DC3	9	<0.001	b	3.8	4.9	0.97	**42**	**154**	**525**	**770**	**1,270**	**1,540**	F	F	F	F	E	D	C	B	A	A	No	No
		LC_SPDC	6	<0.001	-	-	-	b	**29**	**136**	**486**	**700**	**1,143**	**1,407**	-	-	-	F	E	D	C	B	A	A	No	No
		LC_DCDS	7	<0.001	-	-	b	11	**51**	**179**	**585**	**826**	**1,364**	**1,657**	-	-	F	F	E	D	C	B	A	A	No	No
		LC_DC2	4	<0.001	b	16	-	-	-	-	-	**713**	**1,224**	**1,554**	D	D	-	-	-	-	-	C	B	A	↑	↑
		LC_DC4	2	<0.001	-	-	-	-	-	-	-	b	**52**	**120**	-	-	-	-	-	-	-	C	B	A	↑	↑
		LC_DC1	9	<0.001	b	2.9	9.3	12	**34**	**83**	**272**	**429**	**664**	**1,037**	G	G	FG	FG	F	E	D	C	B	A	↑	↑
		FR_FR5	8	<0.001	b	10	15	12	14	**21**	**22**	-	21	**40**	C	BC	ABC	BC	BC	AB	AB	-	ABC	A	No	No
		LC_FRUS	1	0.993	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	9	<0.001	b	**23**	**23**	**24**	**21**	**35**	**33**	**34**	**36**	**55**	C	B	B	B	B	B	B	B	AB	A	No	No
		LC_GRCK	9	<0.001	b	6.5	5.0	**12**	**14**	**16**	**15**	**15**	**13**	**13**	C	ABC	BC	AB	AB	A	AB	A	AB	AB	No	No
Total Phosphorus	Reference	LC_DCEF	8	0.826	-	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_UC	3	0.002	-	-	b	-	**-80**	-52	-61	-	-	-	-	-	A	-	B	AB	AB	-	-	-	-	-
	Mine-exposed	LC_DC3	8	0.105	-	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_SPDC	6	0.008	-	-	-	b	-22	-18	**-40**	-32	-9.2	-31	-	-	-	A	AB	AB	B	AB	AB	AB	No	No
		LC_DCDS	7	0.025	-	-	b	-3.9	-15	-12	**-35**	-20	-4.2	-26	-	-	A	AB	AB	AB	B	AB	AB	AB	No	No
		LC_DC2	3	<0.001	-	b	-	-	-	-	-	**-38**	-19	-23	-	A	-	-	-	-	-	B	A	AB	No	No
		LC_DC4	2	0.292	-	-	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC1	8	0.080	-	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FR5	7	0.737	-	ns	ns	ns	ns	ns	ns	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRUS	1	<0.001	-	-	b	**-40**	-	-	-	-	-	-	-	-	A	B	-	-	-	-	-	-	-	-
		LC_FRB	8	0.020	-	b	-0.21	-50	-18	-48	-11	-51	-40	-9.7	-	A	A	A	A	A	A	A	A	A	No	No
		LC_GRCK	8	0.173	-	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-

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🟩	> 0% Decrease in concentration.
🟦	> 5% Increase in concentration.
🟦	> 0% Increase in concentration.
🟦	> 5% Increase in concentration.
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*Bold	Significant increase or decrease from base year [b].

Notes: "ns" = not significant; "-" insufficient data for comparison, where insufficient data is less than 6 months of recorded data or > 75% LRL data in a given year.

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Table C.3. Temporal Changes in Water Chemistry Constituents at Stations, Dry Creek LAEMP, 2012 to 2021

Constituent	Area Type	Area	Annual Variation [a]		Q1. Is there a positive or negative change in concentrations since the base year (b) of monitoring?										Q2. Is the 2021 annual mean greater or less than all annual historical means (2012 to 2020) and the previous year (2020)?[c]											
					Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b) [c]																					
			DF	P-Value	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2021 vs. 2012-2020	2021 vs. 2020
Orthophosphate	Reference	LC_DCEF	9	0.058	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_UC	2	0.303	-	-	-	-	-	ns	ns	-	ns	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mine-exposed	LC_DC3	9	<0.001	b	0.90	-1.5	-11	-12	-17	-13	-8.9	-4.9	**-41**	AB	A	AB	AB	AB	B	AB	AB	AB	C	↓	↓
		LC_SPDC	6	0.011	-	-	-	b	0.75	10	-3.1	3.9	**182**	79	-	-	-	B	B	AB	B	AB	A	AB	No	No
		LC_DCDS	7	<0.001	-	-	b	**-70**	**-62**	-50	**-68**	**-64**	-11	-42	-	-	A	C	BC	ABC	C	C	AB	ABC	No	No
		LC_DC2	4	<0.001	b	-11	-	-	-	-	-	**-70**	-36	**-54**	A	A	-	-	-	-	-	C	AB	BC	No	No
		LC_DC4	2	0.006	-	-	-	-	-	-	-	b	**39**	20	-	-	-	-	-	-	-	B	A	AB	No	No
		LC_DC1	9	<0.001	b	-2.2	21	-32	-21	-24	**-45**	**-42**	-27	**-41**	AB	AB	A	BC	ABC	BC	C	C	BC	C	No	No
		FR_FR5	3	0.163	-	-	ns	-	-	-	ns	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRUS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	9	0.028	b	1.9	-0.016	-36	-38	1.5	83	13	2.6	1.0	AB	AB	AB	B	B	AB	A	AB	AB	AB	No	No
		LC_GRCK	9	0.462	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
Total Mercury	Reference	LC_DCEF	5	0.269	-	-	-	-	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_UC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mine-exposed	LC_DC3	5	0.021	-	-	-	-	b	55	13	19	2.0	62	-	-	-	-	A	A	A	A	A	A	No	No
		LC_SPDC	6	<0.001	-	-	-	b	**-67**	**-69**	**-73**	**-75**	**-75**	**-69**	-	-	-	A	B	B	B	B	B	B	No	No
		LC_DCDS	6	<0.001	-	-	-	b	**-64**	**-60**	**-67**	**-69**	**-69**	**-63**	-	-	-	A	B	B	B	B	B	B	No	No
		LC_DC2	2	0.224	-	-	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC4	2	0.628	-	-	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC1	5	0.746	-	-	-	-	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FR5	3	0.548	-	-	-	-	ns	ns	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRUS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	5	0.069	-	-	-	-	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_GRCK	3	0.682	-	-	-	-	ns	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
Total Lithium	Reference	LC_DCEF	9	0.005	b	-3.0	-2.9	5.4	15	3.9	-1.0	6.3	-0.30	3.0	AB	B	B	AB	A	AB	B	AB	B	AB	No	No
		LC_UC	7	<0.001	-	-	b	3.4	8.4	-0.81	-3.5	1.3	-6.2	3.7	-	-	ABC	AB	A	BC	BC	ABC	C	AB	No	↑
	Mine-exposed	LC_DC3	9	<0.001	b	-3.6	-6.6	4.8	20	**30**	**85**	**131**	**250**	**373**	FG	G	G	FG	EF	E	D	C	B	A	↑	↑
		LC_SPDC	6	<0.001	-	-	-	b	9.0	**21**	**68**	**110**	**214**	**325**	-	-	-	F	EF	E	D	C	B	A	↑	↑
		LC_DCDS	7	<0.001	-	-	b	-10	-9.8	-18	15	**42**	**103**	**179**	-	-	DE	E	E	E	CD	C	B	A	↑	↑
		LC_DC2	4	<0.001	b	12	-	-	-	-	-	**73**	**124**	**200**	D	D	-	-	-	-	-	C	B	A	↑	↑
		LC_DC4	2	<0.001	-	-	-	-	-	-	-	b	**12**	**43**	-	-	-	-	-	-	-	C	B	A	↑	↑
		LC_DC1	9	<0.001	b	-0.26	-8.3	5.2	9.9	8.2	**19**	**31**	**43**	**83**	EF	EF	F	E	DE	DE	CD	BC	B	A	↑	↑
		FR_FR5	8	<0.001	b	13	15	**36**	**62**	**64**	**55**	-	**69**	**111**	E	E	DE	CD	BC	B	BC	-	B	A	↑	↑
		LC_FRUS	1	<0.001	-	-	b	**13**	-	-	-	-	-	-	-	-	B	A	-	-	-	-	-	-	-	-
		LC_FRB	9	<0.001	b	**17**	**24**	**36**	**57**	**57**	**52**	**63**	**83**	**125**	G	F	EF	DE	C	C	CD	BC	B	A	↑	↑
		LC_GRCK	9	0.001	b	5.0	-2.6	-8.1	-9.8	-1.8	-3.4	-8.0	0.083	2.2	ABC	A	ABC	BC	C	ABC	ABC	BC	ABC	AB	No	No

▨ P-value < 0.05 (annual variation).
🟩 > 0% Decrease in concentration.
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***Bold** Significant increase or decrease from base year [b].

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Table C.3. Temporal Changes in Water Chemistry Constituents at Stations, Dry Creek LAEMP, 2012 to 2021

Constituent	Area Type	Area	Annual Variation [a]		Q1. Is there a positive or negative change in concentrations since the base year (b) of monitoring?										Q2. Is the 2021 annual mean greater or less than all annual historical means (2012 to 2020) and the previous year (2020)?[c]											
					Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]																					
			DF	P-Value	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2021 vs. 2012-2020	2021 vs. 2020
Total Cobalt	Reference	LC_DCEF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_UC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mine-exposed	LC_DC3	6	<0.001	-	-	-	b	13	123	**289**	**190**	**311**	**268**	-	-	-	B	B	AB	A	A	A	A	No	No
		LC_SPDC	6	<0.001	-	-	-	b	-6.2	49	**133**	62	**125**	**110**	-	-	-	B	B	AB	A	AB	A	A	No	No
		LC_DCDS	6	<0.001	-	-	-	b	-16	45	**135**	55	**123**	**95**	-	-	-	B	B	AB	A	AB	A	A	No	No
		LC_DC2	2	0.971	-	-	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC4	2	0.798	-	-	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC1	4	0.655	-	-	-	ns	-	-	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FR5	3	0.325	ns	-	ns	-	-	-	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRUS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	3	0.440	ns	ns	-	-	-	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_GRCK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Cadmium	Reference	LC_DCEF	9	<0.001	b	6.4	-3.8	-12	-8.6	-5.0	8.7	-1.6	-4.3	-3.9	AB	A	AB	B	B	AB	A	AB	AB	AB	No	No
		LC_UC	7	0.022	-	-	b	-16	-25	-22	-5.9	-14	-4.5	-4.9	-	-	A	A	A	A	A	A	A	A	No	No
	Mine-exposed	LC_DC3	9	<0.001	b	-2.3	-4.9	-13	-6.0	**38**	**122**	**127**	**233**	**254**	D	D	D	D	D	C	B	B	A	A	No	No
		LC_SPDC	6	<0.001	-	-	-	b	2.1	58	**94**	**144**	**403**	**425**	-	-	-	C	C	BC	B	B	A	A	No	No
		LC_DCDS	7	<0.001	-	-	b	-24	-16	27	58	**84**	**287**	**308**	-	-	CDE	E	DE	BCD	BC	B	A	A	No	No
		LC_DC2	4	<0.001	b	3.3	-	-	-	-	-	47	**145**	**176**	B	B	-	-	-	-	-	B	A	A	No	No
		LC_DC4	2	<0.001	-	-	-	-	-	-	-	b	**30**	**55**	-	-	-	-	-	-	-	C	B	A	↑	↑
		LC_DC1	9	<0.001	b	1.6	-3.6	-13	-7.5	6.7	19	**26**	**59**	**99**	DE	DE	DE	E	E	CDE	CD	C	B	A	↑	↑
		FR_FR5	8	0.023	b	-13	-11	-18	-27	-25	-11	-	2.7	-2.8	A	A	A	A	A	A	A	-	A	A	No	No
		LC_FRUS	1	0.005	-	-	b	**-34**	-	-	-	-	-	-	-	-	A	B	-	-	-	-	-	-	-	-
		LC_FRB	9	<0.001	b	15	7.7	**-26**	**-33**	**-26**	5.5	-13	0.035	4.3	AB	A	AB	CD	D	CD	AB	BC	AB	AB	No	No
		LC_GRCK	4	0.340	-	-	-	-	-	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
Dissolved Cobalt	Reference	LC_DCEF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_UC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mine-exposed	LC_DC3	4	0.038	-	-	-	-	-	b	**117**	37	98	70	-	-	-	-	-	B	A	AB	AB	AB	No	No
		LC_SPDC	4	0.013	-	-	-	-	-	b	60	30	**101**	**96**	-	-	-	-	-	B	AB	AB	A	A	No	No
		LC_DCDS	4	0.005	-	-	-	-	-	b	78	21	**107**	85	-	-	-	-	-	B	AB	AB	A	AB	No	No
		LC_DC2	2	0.210	-	-	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FR5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRUS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_GRCK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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			DF	P-Value	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2021 vs. 2012-2020	2021 vs. 2020
Total Antimony	Reference	LC_DCEF	9	<0.001	b	**12**	6.1	6.7	2.3	1.0	-0.77	-0.69	-5.9	-0.91	BC	A	AB	AB	ABC	ABC	BC	BC	C	BC	No	No
		LC_UC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mine-exposed	LC_DC3	9	<0.001	b	6.1	1.2	4.3	16	**55**	**144**	**168**	**157**	**269**	D	D	D	D	D	C	B	B	B	A	↑	↑
		LC_SPDC	6	<0.001	-	-	-	b	2.7	**33**	**116**	**131**	**119**	**220**	-	-	-	D	D	C	B	B	B	A	↑	↑
		LC_DCDS	7	<0.001	-	-	b	11	**18**	**55**	**146**	**162**	**154**	**257**	-	-	E	DE	D	C	B	B	B	A	↑	↑
		LC_DC2	4	<0.001	b	0.17	-	-	-	-	-	**125**	**105**	**192**	C	C	-	-	-	-	-	B	B	A	↑	↑
		LC_DC4	2	<0.001	-	-	-	-	-	-	-	b	-11	**27**	-	-	-	-	-	-	-	B	B	A	↑	↑
		LC_DC1	9	<0.001	b	2.4	17	8.4	14	18	**37**	**47**	**30**	**79**	E	E	CDE	DE	CDE	CDE	BC	B	BCD	A	↑	↑
		FR_FR5	8	0.452	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRUS	1	0.176	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	9	0.007	b	-11	-10	-15	**-26**	**-26**	-13	-20	-14	-9.4	A	AB	AB	AB	B	B	AB	AB	AB	AB	No	No
		LC_GRCK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Barium	Reference	LC_DCEF	9	<0.001	b	4.4	-0.20	4.3	3.1	8.1	5.7	**9.8**	7.4	**9.1**	B	AB	B	AB	AB	AB	AB	A	AB	A	No	No
		LC_UC	7	0.015	-	-	b	-0.78	-1.3	2.0	-2.0	-1.0	-6.9	1.4	-	-	AB	AB	AB	A	AB	AB	B	A	No	↑
	Mine-exposed	LC_DC3	9	<0.001	b	2.0	0.041	2.5	18	**46**	**93**	**95**	**95**	**112**	C	C	C	C	C	B	A	A	A	A	No	No
		LC_SPDC	6	<0.001	-	-	-	b	4.4	**31**	**79**	**76**	**82**	**94**	-	-	-	C	C	B	A	A	A	A	No	No
		LC_DCDS	7	<0.001	-	-	b	-12	-12	-0.099	**33**	**36**	**42**	**45**	-	-	B	B	B	B	A	A	A	A	No	No
		LC_DC2	4	<0.001	b	6.5	-	-	-	-	-	**44**	**76**	**64**	C	C	-	-	-	-	-	B	A	AB	No	No
		LC_DC4	2	<0.001	-	-	-	-	-	-	-	b	**14**	**21**	-	-	-	-	-	-	-	B	A	A	No	No
		LC_DC1	9	<0.001	b	3.6	-4.5	0.82	1.3	**15**	**31**	**40**	**53**	**72**	E	E	E	E	E	D	C	BC	B	A	↑	↑
		FR_FR5	8	<0.001	b	11	13	0.58	-0.92	-0.15	-10	-	-7.5	**-14**	AB	A	A	AB	AB	AB	BC	-	BC	C	No	No
		LC_FRUS	1	0.359	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	9	<0.001	b	6.1	3.9	1.2	-4.9	3.5	-6.7	-7.1	-6.9	-1.9	AB	A	AB	AB	AB	AB	B	B	B	AB	No	No
		LC_GRCK	9	0.054	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
Total Boron	Reference	LC_DCEF	8	<0.001	b	-7.3	-2.3	**-13**	**-24**	-	**-24**	**-21**	**-22**	**-19**	A	AB	A	BC	D	-	D	CD	CD	CD	No	No
		LC_UC	7	<0.001	-	-	b	**-14**	**-22**	**-30**	**-30**	**-26**	**-32**	**-24**	-	-	A	B	C	DE	DE	CDE	E	CD	No	↑
	Mine-exposed	LC_DC3	5	0.032	b	-	-1.4	-7.5	-	-	-	-8.5	-8.3	4.1	A	-	A	A	-	-	-	A	A	A	No	No
		LC_SPDC	4	<0.001	-	-	-	b	-	-	-6.7	**-7.4**	-4.5	4.0	-	-	-	AB	-	-	BC	C	BC	A	No	↑
		LC_DCDS	4	<0.001	-	-	b	**-9.9**	-	-	-	**-15**	**-13**	-5.4	-	-	A	BC	-	-	-	C	BC	AB	No	No
		LC_DC2	4	0.003	b	-1.6	-	-	-	-	-	**-19**	**-17**	-8.2	A	AB	-	-	-	-	-	C	BC	ABC	No	No
		LC_DC4	1	0.739	-	-	-	-	-	-	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC1	5	<0.001	b	-0.12	6.9	-6.2	-	-	-	-	**-16**	-12	AB	AB	A	ABC	-	-	-	-	C	BC	No	No
		FR_FR5	7	<0.001	b	-7.3	-5.7	-11	**-29**	-	**-26**	-	**-23**	**-18**	A	AB	AB	ABC	D	-	CD	-	BCD	BCD	No	No
		LC_FRUS	1	0.267	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	4	0.161	ns	ns	ns	ns	-	-	-	-	-	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_GRCK	9	<0.001	b	1.9	4.4	**-12**	**-18**	**-18**	**-18**	**-19**	**-14**	**-12**	A	A	A	B	B	B	B	B	B	B	No	No

▨	P-value < 0.05 (annual variation).
🟩	> 0% Decrease in concentration.
🟩	> 3% Decrease in concentration.
🟩	> 3% Decrease in concentration.
🟩	> 0% Decrease in concentration.
🟦	> 5% Increase in concentration.
🟦	> 0% Increase in concentration.
🟦	> 5% Increase in concentration.
🟦	> 100% Increase in concentration.
***Bold**	Significant increase or decrease from base year [b].

Notes: "ns" = not significant; "-" insufficient data for comparison, where insufficient data is less than 6 months of recorded data or > 75% LRL data in a given year.

[a] The presence of annual variation was determined by a significant Year term (α = 0.05) using an ANOVA with factors Year and Month.

[b] Magnitude of Difference (MOD) was calculated as the concentrations in each year minus the concentration in the first year divided by the concentration in the fist year × 100.

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Table C.3. Temporal Changes in Water Chemistry Constituents at Stations, Dry Creek LAEMP, 2012 to 2021

Constituent	Area Type	Area	Annual Variation [a]		Q1. Is there a positive or negative change in concentrations since the base year (b) of monitoring?										Q2. Is the 2021 annual mean greater or less than all annual historical means (2012 to 2020) and the previous year (2020)?[c]											
					Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]																					
			DF	P-Value	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2021 vs. 2012-2020	2021 vs. 2020
Total Cadmium	Reference	LC_DCEF	9	0.097	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_UC	7	<0.001	-	-	b	**-56**	**-63**	**-55**	**-50**	**-55**	**-53**	**-55**	-	-	A	B	B	B	B	B	B	B	No	No
	Mine-exposed	LC_DC3	9	<0.001	b	-7.0	-3.7	20	38	**89**	**106**	**111**	**200**	**431**	E	E	E	E	DE	CD	BCD	BC	B	A	↑	↑
		LC_SPDC	6	<0.001	-	-	-	b	-18	2.0	25	28	**123**	**210**	-	-	-	BC	C	BC	B	B	A	A	No	No
		LC_DCDS	7	<0.001	-	-	b	28	5.8	41	**63**	**76**	**201**	**305**	-	-	C	BC	C	BC	B	B	A	A	No	No
		LC_DC2	4	<0.001	b	-6.5	-	-	-	-	-	**56**	**125**	**183**	C	C	-	-	-	-	-	B	A	A	No	No
		LC_DC4	2	<0.001	-	-	-	-	-	-	-	b	**27**	**63**	-	-	-	-	-	-	-	C	B	A	↑	↑
		LC_DC1	9	<0.001	b	2.0	-0.44	15	-0.78	3.5	18	26	**49**	**87**	C	BC	C	BC	C	BC	BC	BC	AB	A	No	No
		FR_FR5	8	0.002	b	18	0.99	-17	-18	-19	-7.6	-	16	-2.8	AB	A	AB	B	B	B	AB	-	AB	AB	No	No
		LC_FRUS	1	0.004	-	-	b	**-24**	-	-	-	-	-	-	-	-	A	B	-	-	-	-	-	-	-	-
		LC_FRB	9	<0.001	b	-15	-25	**-40**	**-47**	**-41**	-30	**-36**	-27	-19	A	AB	ABC	BC	C	BC	ABC	BC	ABC	AB	No	No
		LC_GRCK	7	0.349	-	ns	-	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
Total Dissolved Solids	Reference	LC_DCEF	9	0.029	b	6.2	5.8	8.7	**13**	8.9	**12**	10	**13**	9.5	B	AB	AB	AB	A	AB	A	AB	A	AB	No	No
		LC_UC	7	0.438	-	-	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
	Mine-exposed	LC_DC3	9	<0.001	b	0.98	2.9	3.2	**22**	**58**	**174**	**220**	**345**	**380**	E	DE	DE	DE	D	C	B	B	A	A	No	No
		LC_SPDC	6	<0.001	-	-	-	b	10	**37**	**139**	**176**	**286**	**330**	-	-	-	E	E	D	C	B	A	A	No	No
		LC_DCDS	7	<0.001	-	-	b	4.1	12	**40**	**136**	**173**	**277**	**324**	-	-	D	D	D	C	B	B	A	A	No	No
		LC_DC2	4	<0.001	b	7.9	-	-	-	-	-	**136**	**228**	**269**	C	C	-	-	-	-	-	B	A	A	No	No
		LC_DC4	2	<0.001	-	-	-	-	-	-	-	b	**22**	**48**	-	-	-	-	-	-	-	C	B	A	↑	↑
		LC_DC1	9	<0.001	b	2.2	-3.7	4.2	8.0	**18**	**54**	**64**	**93**	**140**	E	E	E	E	DE	D	C	C	B	A	↑	↑
		FR_FR5	8	0.006	b	10	13	7.8	10	15	11	-	18	**23**	B	AB	AB	AB	AB	AB	AB	-	AB	A	No	No
		LC_FRUS	1	0.287	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	9	<0.001	b	**15**	**15**	**14**	**14**	**22**	**21**	**19**	**25**	**32**	C	B	B	B	B	AB	AB	AB	AB	A	No	No
		LC_GRCK	9	0.264	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
Total Kjeldahl Nitrogen	Reference	LC_DCEF	9	0.507	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_UC	7	0.240	-	-	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
	Mine-exposed	LC_DC3	8	<0.001	b	37	59	52	99	**356**	**433**	47	-	**247**	C	C	BC	C	BC	A	A	C	-	AB	No	-
		LC_SPDC	6	<0.001	-	-	-	b	2.8	109	141	-5.7	**-69**	-35	-	-	-	AB	AB	A	A	ABC	C	BC	No	No
		LC_DCDS	7	<0.001	-	-	b	71	81	**257**	**436**	100	-44	40	-	-	CD	BC	BC	AB	A	BC	D	CD	No	No
		LC_DC2	3	0.273	ns	ns	-	-	-	-	-	ns	-	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC4	2	0.014	-	-	-	-	-	-	-	b	**-60**	-3.0	-	-	-	-	-	-	-	A	B	A	No	↑
		LC_DC1	9	<0.001	b	46	40	16	35	89	**263**	**232**	20	**172**	C	BC	BC	C	C	ABC	A	A	C	AB	No	↑
		FR_FR5	5	<0.001	b	-	-	44	**393**	**915**	**329**	-	-	**294**	C	-	-	BC	AB	A	AB	-	-	AB	No	-
		LC_FRUS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	8	<0.001	b	-5.6	-	53	145	**702**	**467**	137	-9.8	193	C	C	-	C	BC	A	AB	BC	C	ABC	No	No
		LC_GRCK	9	0.157	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-

▨ P-value < 0.05 (annual variation).
🟩 > 0% Decrease in concentration.
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***Bold** Significant increase or decrease from base year [b].

Notes: "ns" = not significant; "-" insufficient data for comparison, where insufficient data is less than 6 months of recorded data or > 75% LRL data in a given year.

[a] The presence of annual variation was determined by a significant Year term (α = 0.05) using an ANOVA with factors Year and Month.

[b] Magnitude of Difference (MOD) was calculated as the concentrations in each year minus the concentration in the first year divided by the concentration in the fist year × 100.

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Table C.3. Temporal Changes in Water Chemistry Constituents at Stations, Dry Creek LAEMP, 2012 to 2021

Constituent	Area Type	Area	Annual Variation [a]		Q1. Is there a positive or negative change in concentrations since the base year (b) of monitoring?										Q2. Is the 2021 annual mean greater or less than all annual historical means (2012 to 2020) and the previous year (2020)?[c]											
					Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]																					
			DF	P-Value	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2021 vs. 2012-2020	2021 vs. 2020
Total Manganese	Reference	LC_DCEF	9	0.016	b	50	-45	-78	-54	-50	-57	3.6	-41	9.9	AB	A	AB	B	AB	AB	AB	AB	AB	AB	No	No
		LC_UC	7	<0.001	-	-	b	**-74**	**-74**	-58	-60	**-64**	**-66**	**-65**	-	-	A	B	B	AB	AB	B	B	B	No	No
	Mine-exposed	LC_DC3	9	<0.001	b	-28	30	152	**273**	**1,076**	**1,318**	**630**	**436**	**1,521**	FG	G	EFG	DEF	CDE	AB	AB	ABC	BCD	A	No	↑
		LC_SPDC	6	<0.001	-	-	-	b	42	148	**255**	74	127	**453**	-	-	-	C	BC	ABC	AB	BC	ABC	A	No	No
		LC_DCDS	7	<0.001	-	-	b	117	**212**	**599**	**774**	**355**	**434**	**1,169**	-	-	E	DE	CD	ABC	AB	BCD	ABCD	A	No	No
		LC_DC2	4	<0.001	b	-25	-	-	-	-	-	**304**	64	**528**	C	C	-	-	-	-	-	AB	BC	A	No	↑
		LC_DC4	2	0.017	-	-	-	-	-	-	-	b	-23	54	-	-	-	-	-	-	-	AB	B	A	No	↑
		LC_DC1	9	0.005	b	36	-10	45	32	50	71	65	37	**131**	B	AB	B	AB	AB	AB	AB	AB	AB	A	No	No
		FR_FR5	8	0.100	ns	ns	ns	ns	ns	ns	ns	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRUS	1	<0.001	-	-	b	**-28**	-	-	-	-	-	-	-	-	A	B	-	-	-	-	-	-	-	-
		LC_FRB	9	0.014	b	-9.4	-26	-46	**-48**	-44	-33	-42	-39	-20	A	AB	AB	AB	B	AB	AB	AB	AB	AB	No	No
		LC_GRCK	9	0.115	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
Total Molybdenum	Reference	LC_DCEF	9	0.450	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_UC	7	<0.001	-	-	b	5.5	6.0	5.4	**8.5**	0.94	**8.4**	**7.0**	-	-	C	ABC	ABC	ABC	A	BC	A	AB	No	No
	Mine-exposed	LC_DC3	9	<0.001	b	-1.4	-6.5	-9.6	13	**55**	**180**	**247**	**266**	**277**	DE	DE	DE	E	D	C	B	A	A	A	No	No
		LC_SPDC	6	<0.001	-	-	-	b	15	**60**	**187**	**240**	**259**	**458**	-	-	-	E	E	D	C	B	B	A	↑	↑
		LC_DCDS	7	<0.001	-	-	b	0.11	16	**57**	**177**	**227**	**251**	**431**	-	-	E	E	E	D	C	B	B	A	↑	↑
		LC_DC2	4	<0.001	b	7.4	-	-	-	-	-	**176**	**176**	**351**	C	C	-	-	-	-	-	B	B	A	↑	↑
		LC_DC4	2	<0.001	-	-	-	-	-	-	-	b	-5.7	**52**	-	-	-	-	-	-	-	B	B	A	↑	↑
		LC_DC1	9	<0.001	b	2.7	-3.8	-2.9	6.3	9.8	**35**	**42**	**30**	**102**	D	D	D	D	D	CD	B	B	BC	A	↑	↑
		FR_FR5	8	<0.001	b	0.35	-7.6	-11	-0.67	-6.9	-14	-	10	12	ABC	ABC	ABC	C	ABC	BC	C	-	AB	A	No	No
		LC_FRUS	1	0.980	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	9	<0.001	b	0.33	-3.9	-5.9	-3.0	-5.8	-3.1	1.8	7.6	**17**	BC	BC	BC	C	BC	C	BC	BC	AB	A	No	No
		LC_GRCK	9	0.557	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
Total Uranium	Reference	LC_DCEF	9	0.003	b	2.7	0.40	7.8	**16**	15	8.1	13	5.1	8.2	B	AB	B	AB	A	AB	AB	AB	AB	AB	No	No
		LC_UC	7	0.012	-	-	b	6.3	**11**	5.3	4.5	9.5	0.34	10	-	-	B	AB	A	AB	AB	AB	AB	AB	No	No
	Mine-exposed	LC_DC3	9	<0.001	b	-4.3	-7.6	3.4	**45**	**112**	**359**	**480**	**713**	**816**	E	E	E	E	D	C	B	B	A	A	No	No
		LC_SPDC	6	<0.001	-	-	-	b	**25**	**93**	**288**	**390**	**601**	**699**	-	-	-	F	E	D	C	B	A	A	No	No
		LC_DCDS	7	<0.001	-	-	b	10	**27**	**81**	**276**	**372**	**568**	**655**	-	-	F	EF	E	D	C	B	A	A	No	No
		LC_DC2	4	<0.001	b	14	-	-	-	-	-	**316**	**474**	**596**	C	C	-	-	-	-	-	B	A	A	No	No
		LC_DC4	2	<0.001	-	-	-	-	-	-	-	b	11	**55**	-	-	-	-	-	-	-	B	B	A	↑	↑
		LC_DC1	9	<0.001	b	3.9	-3.5	-0.035	12	21	**65**	**82**	**98**	**171**	CD	CD	D	CD	CD	C	B	B	B	A	↑	↑
		FR_FR5	8	<0.001	b	7.0	4.2	3.3	13	17	18	-	**32**	**45**	C	C	C	C	BC	BC	BC	-	AB	A	No	No
		LC_FRUS	1	0.291	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	9	<0.001	b	11	9.1	9.6	**18**	**25**	**25**	**29**	**37**	**56**	E	DE	DE	DE	CD	BC	BC	BC	B	A	↑	↑
		LC_GRCK	9	0.259	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-

▨ P-value < 0.05 (annual variation).
🟩 > 0% Decrease in concentration.
🟩 > 3% Decrease in concentration.
🟩 > 3% Decrease in concentration.
🟩 > 0% Decrease in concentration.
🟦 > 5% Increase in concentration.
🟦 > 0% Increase in concentration.
🟦 > 5% Increase in concentration.
🟦 > 100% Increase in concentration.
***Bold** Significant increase or decrease from base year [b].

Notes: "ns" = not significant; "-" insufficient data for comparison, where insufficient data is less than 6 months of recorded data or > 75% LRL data in a given year.

[a] The presence of annual variation was determined by a significant Year term (α = 0.05) using an ANOVA with factors Year and Month.

[b] Magnitude of Difference (MOD) was calculated as the concentrations in each year minus the concentration in the first year divided by the concentration in the fist year × 100.

[c] Significance between each year determined using all pairwise comparisons with Tukey correction.

Table C.3. Temporal Changes in Water Chemistry Constituents at Stations, Dry Creek LAEMP, 2012 to 2021

Constituent	Area Type	Area	Annual Variation[a]		Q1. Is there a positive or negative change in concentrations since the base year (b) of monitoring?										Q2. Is the 2021 annual mean greater or less than all annual historical means (2012 to 2020) and the previous year (2020)?[c]											
					Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]																					
			DF	P-Value	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2021 vs. 2012-2020	2021 vs. 2020
Total Zinc	Reference	LC_DCEF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_UC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mine-exposed	LC_DC3	8	<0.001	b	-5.1	-	19	21	**90**	**86**	**106**	**249**	**374**	D	D	-	CD	BCD	BC	BC	B	A	A	No	No
		LC_SPDC	6	<0.001	-	-	-	b	-21	-12	1.2	16	**90**	**176**	-	-	-	B	B	B	B	B	A	A	No	No
		LC_DCDS	7	<0.001	-	-	b	4.5	-7.5	36	6.6	31	**121**	**158**	-	-	B	B	B	B	B	B	A	A	No	No
		LC_DC2	3	0.002	b	-	-	-	-	-	-	56	126	**260**	B	-	-	-	-	-	-	B	AB	A	No	No
		LC_DC4	1	0.415	-	-	-	-	-	-	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC1	6	0.654	-	-	ns	ns	-	ns	ns	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FR5	2	0.397	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRUS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	4	0.381	ns	ns	-	-	-	-	ns	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_GRCK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenite	Reference	LC_DCEF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_UC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mine-exposed	LC_DC3	2	<0.001	-	-	-	-	-	-	-	b	**21**	**24**	-	-	-	-	-	-	-	B	A	A	No	No
		LC_SPDC	2	0.623	-	-	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DCDS	2	0.428	-	-	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC2	2	0.627	-	-	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC4	2	0.002	-	-	-	-	-	-	-	b	-11	**51**	-	-	-	-	-	-	-	B	B	A	↑	↑
		LC_DC1	2	0.001	-	-	-	-	-	-	-	b	-3.9	**40**	-	-	-	-	-	-	-	B	B	A	↑	↑
		FR_FR5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRUS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_GRCK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methylseleninic Acid	Reference	LC_DCEF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_UC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mine-exposed	LC_DC3	2	0.011	-	-	-	-	-	-	-	b	8.8	-8.3	-	-	-	-	-	-	-	AB	A	B	No	↓
		LC_SPDC	2	<0.001	-	-	-	-	-	-	-	b	-5.7	**-35**	-	-	-	-	-	-	-	A	A	B	↓	↓
		LC_DCDS	2	<0.001	-	-	-	-	-	-	-	b	-3.9	**-38**	-	-	-	-	-	-	-	A	A	B	↓	↓
		LC_DC2	2	0.002	-	-	-	-	-	-	-	b	**-31**	**-33**	-	-	-	-	-	-	-	A	B	B	No	No
		LC_DC4	2	0.504	-	-	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC1	2	0.886	-	-	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FR5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRUS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_GRCK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

▨	P-value < 0.05 (annual variation).
🟩	> 0% Decrease in concentration.
🟩	> 3% Decrease in concentration.
🟩	> 3% Decrease in concentration.
🟩	> 0% Decrease in concentration.
🟦	> 5% Increase in concentration.
🟦	> 0% Increase in concentration.
🟦	> 5% Increase in concentration.
🟦	> 100% Increase in concentration.
***Bold**	Significant increase or decrease from base year[b].

Notes: "ns" = not significant; "-" insufficient data for comparison, where insufficient data is less than 6 months of recorded data or > 75% LRL data in a given year.

[a] The presence of annual variation was determined by a significant Year term (α = 0.05) using an ANOVA with factors Year and Month.

[b] Magnitude of Difference (MOD) was calculated as the concentrations in each year minus the concentration in the first year divided by the concentration in the fist year × 100.

[c] Significance between each year determined using all pairwise comparisons with Tukey correction.

Table C.3. Temporal Changes in Water Chemistry Constituents at Stations, Dry Creek LAEMP, 2012 to 2021

Constituent	Area Type	Area	Annual Variation [a]		Q1. Is there a positive or negative change in concentrations since the base year (b) of monitoring?										Q2. Is the 2021 annual mean greater or less than all annual historical means (2012 to 2020) and the previous year (2020)?[c]											
					Magnitude of Difference (MOD)[b] and Significance (bolded) from Base Year (b)[c]																					
			DF	P-Value	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2021 vs. 2012-2020	2021 vs. 2020
Dimethylselenoxide	Reference	LC_DCEF	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_UC	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Mine-exposed	LC_DC3	2	<0.001	-	-	-	-	-	-	-	b	**75**	**91**	-	-	-	-	-	-	-	B	A	A	No	No
		LC_SPDC	2	0.344	-	-	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DCDS	2	0.358	-	-	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC2	2	0.356	-	-	-	-	-	-	-	ns	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC4	1	0.114	-	-	-	-	-	-	-	-	ns	ns	-	-	-	-	-	-	-	-	-	-	-	-
		LC_DC1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		FR_FR5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRUS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_FRB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		LC_GRCK	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

▨ P-value < 0.05 (annual variation).
🟩 > 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 [b].

Notes: "ns" = not significant; "-" insufficient data for comparison, where insufficient data is less than 6 months of recorded data or > 75% LRL data in a given year.

[a] The presence of annual variation was determined by a significant Year term (α = 0.05) using an ANOVA with factors Year and Month.

[b] Magnitude of Difference (MOD) was calculated as the concentrations in each year minus the concentration in the first year divided by the concentration in the fist year × 100.

[c] Significance between each year determined using all pairwise comparisons with Tukey correction.

Table C.4: Summary of Water Chemistry Data for Key Parameters for the Dry Creek LAEMP Monitoring Stations, 2021

Area	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)	Total Phosphorus (mg/L)	Orthophosphate (mg/L)	Sulphate (mg/L)	Total Chloride (mg/L)	Total Fluoride (mg/L)	Total Antimony (mg/L)	Total Arsenic (mg/L)
LC_DCEF	**n**	15	15	14	14	15	15	15	15	15	15	15	15	15	15	15
	Annual Minimum	129	7.93	7.35	9.97	103	0.0684	<0.001	<0.005	0.00900	0.0102	4.88	0.150	0.0630	0.000120	0.000160
	Annual Maximum	168	8.36	8.16	11.3	157	0.256	0.00190	0.0985	0.0320	0.0206	7.22	0.370	0.136	0.000160	0.000250
	Annual Mean	148	8.10	7.91	10.6	142	0.116	0.00106	0.0159	0.0162	0.0137	6.01	0.267	0.0966	0.000135	0.000195
	Annual Median	144	8.10	7.96	10.6	147	0.104	<0.001	<0.005	0.0131	0.0137	6.10	0.260	0.0940	0.000130	0.000190
	% < LRL	0%	0%	0%	0%	0%	0%	93%	67%	0%	0%	0%	0%	0%	0%	0%
	% > BCWQG^a	-	-	0%	0%	0%	0%	0%	0%	-	-	0%	0%	-	0%	-
	% > BCWQG^b	-	-	0%	0%	-	0%	0%	0%	-	-	-	0%	0%	-	0%
	% > Level 1 Benchmark	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_DC3	**n**	84	84	129	124	89	84	84	84	84	84	84	84	84	84	84
	Annual Minimum	314	7.65	7.69	8.74	103	12.1	0.00190	<0.005	0.0120	<0.001	78.9	4.32	0.0290	0.000340	0.000300
	Annual Maximum	934	8.49	8.39	12.2	175	53.2	0.155	0.145	0.320	0.0330	273	39.9	0.160	0.00106	0.00200
	Annual Mean	573	8.13	8.09	10.9	142	32.8	0.0435	0.0198	0.0613	0.0192	168	12.8	0.0815	0.000760	0.000539
	Annual Median	607	8.14	8.12	10.8	144	36.2	0.0407	0.0108	0.0286	0.0202	170	13.2	0.0770	0.000770	0.000385
	% < LRL	0%	0%	0%	0%	0%	0%	10%	26%	0%	1%	0%	0%	40%	0%	0%
	% > BCWQG^a	-	-	0%	0%	0%	100%	5%	0%	-	-	0%	0%	-	0%	-
	% > BCWQG^b	-	-	0%	0%	-	54%	0%	0%	-	-	-	0%	0%	-	0%
	% > Level 1 Benchmark	0%	-	-	-	-	100%	-	-	-	-	0%	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_SPDC	**n**	94	94	132	127	99	94	94	94	94	94	94	94	94	94	94
	Annual Minimum	276	7.67	7.72	8.56	78.6	12.7	0.00190	<0.005	0.00920	<0.001	80.1	4.71	0.0320	0.000340	0.000280
	Annual Maximum	900	8.52	9.16	12.5	215	53.3	0.146	0.111	0.0606	0.0335	270	23.1	2.05	0.00105	0.000630
	Annual Mean	570	8.18	8.17	11.0	141	32.6	0.0450	0.0210	0.0246	0.0159	163	12.6	0.0998	0.000725	0.000383
	Annual Median	608	8.18	8.17	11.0	141	35.8	0.0462	0.0137	0.0238	0.0170	172	12.7	0.0760	0.000750	0.000360
	% < LRL	0%	0%	0%	0%	0%	0.0%	13%	10%	0%	11%	0%	0%	44%	0%	0%
	% > BCWQG^a	-	-	1%	0%	0%	100%	5%	0%	-	-	0%	0%	-	0%	-
	% > BCWQG^b	-	-	1%	0%	-	53%	0%	0%	-	-	-	0%	1%	-	0%
	% > Level 1 Benchmark	0%	-	-	-	-	100%	-	-	-	-	0%	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_DCDS	**n**	59	59	69	61	66	59	59	59	59	59	59	59	59	59	59
	Annual Minimum	270	7.62	7.83	8.69	102	10.4	0.00430	<0.005	0.00940	<0.001	58.7	3.86	0.0260	0.000350	0.000260
	Annual Maximum	1,140	8.54	8.61	13.5	173	58.6	0.173	0.0938	0.0600	0.0338	259	22.0	0.144	0.000930	0.000500
	Annual Mean	559	8.19	8.16	11.1	141	32.3	0.0368	0.0180	0.0245	0.0172	160	12.3	0.0753	0.000652	0.000347
	Annual Median	608	8.19	8.14	11.3	143	36.8	0.0287	0.0121	0.0240	0.0172	181	13.2	0.0740	0.000650	0.000340
	% < LRL	0%	0%	0%	0%	0%	0.0%	12%	10%	0%	5%	0%	0%	44%	0%	0%
	% > BCWQG^a	-	-	0%	0%	0%	100%	3%	0%	-	-	0%	0%	-	0%	-
	% > BCWQG^b	-	-	0%	0%	-	58%	0%	0%	-	-	-	0%	0%	-	0%
	% > Level 1 Benchmark^c	2%	-	-	-	-	100%	-	-	-	-	0%	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	100%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_DC2	**n**	54	54	58	52	59	54	54	54	54	54	54	54	54	54	54
	Annual Minimum	171	7.65	7.71	8.87	88.0	4.89	0.00310	<0.005	0.0107	<0.001	34.5	1.61	0.0260	0.000280	0.000190
	Annual Maximum	1,160	8.51	8.47	12.3	203	46.1	0.0912	0.0364	0.0808	0.0247	261	20.2	0.134	0.000740	0.000480
	Annual Mean	494	8.14	8.11	11.0	142	26.6	0.0240	0.0101	0.0238	0.0155	137	10.5	0.0769	0.000511	0.000294
	Annual Median	528	8.16	8.09	11.2	143	29.4	0.0185	0.00755	0.0200	0.0164	150	10.8	0.0750	0.000520	0.000300
	% < LRL	0%	0%	0%	0%	0%	0%	13%	19%	0%	6%	0%	0%	31%	0%	0%
	% > BCWQG^a	-	-	0%	0%	0%	100%	4%	0%	-	-	0%	0%	-	0%	-
	% > BCWQG^b	-	-	0%	0%	-	43%	0%	0%	-	-	-	0%	0%	-	0%
	% > Level 1 Benchmark	2%	-	-	-	-	100%	-	-	-	-	0%	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	89%	-	-	-	-	-	-	-	-	-
	% > 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.

[c] LC_DCDS, LC_UC, and LC_GRCK Site Performance Objective for Total Cadmium.

Table C.4: Summary of Water Chemistry Data for Key Parameters for the Dry Creek LAEMP Monitoring Stations, 2021

Area	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)	Total Phosphorus (mg/L)	Orthophosphate (mg/L)	Sulphate (mg/L)	Total Chloride (mg/L)	Total Fluoride (mg/L)	Total Antimony (mg/L)	Total Arsenic (mg/L)
LC_DC4	n	56	56	63	55	63	56	56	56	56	56	56	56	56	56	56
	Annual Minimum	195	7.71	7.39	9.32	112	4.82	<0.001	<0.005	0.00690	<0.001	33.1	1.62	<0.02	0.000110	0.000120
	Annual Maximum	814	8.58	8.32	12.1	187	27.2	0.0692	0.129	0.0367	0.0187	144	11.2	0.110	0.000540	0.000360
	Annual Mean	398	8.15	7.97	10.9	160	17.4	0.0116	0.0106	0.0138	0.0104	91.6	6.94	0.0791	0.000303	0.000206
	Annual Median	396	8.16	7.96	11.1	166	16.2	0.00733	0.00595	0.0120	0.0108	82.6	6.66	0.0780	0.000310	0.000200
	% < LRL	0%	0%	0%	0%	0%	0.0%	11%	45%	0%	4%	0%	0%	2%	2%	2%
	% > BCWQG[a]	-	-	0%	0%	0%	100%	0%	0%	-	-	0%	0%	-	0%	-
	% > BCWQG[b]	-	-	0%	0%	-	0%	0%	0%	-	-	-	0%	0%	-	0%
	% > Level 1 Benchmark	0%	-	-	-	-	100%	-	-	-	-	0%	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	89%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_DC1	n	59	59	66	58	66	59	59	59	59	59	59	59	59	59	59
	Annual Minimum	200	7.72	7.53	9.18	119	4.68	0.00100	<0.005	0.00510	<0.001	32.4	1.75	0.0200	0.000120	0.000130
	Annual Maximum	708	8.50	8.63	12.4	194	24.5	0.0493	0.0330	0.530	0.0140	130	10.5	0.116	0.000490	0.000380
	Annual Mean	388	8.26	8.20	11.1	163	16.1	0.00966	0.00882	0.0218	0.00844	85.1	6.43	0.0814	0.000287	0.000207
	Annual Median	380	8.26	8.20	11.3	166	15.0	0.00710	0.00550	0.0116	0.00890	74.3	6.18	0.0820	0.000290	0.000190
	% < LRL	0%	0%	0%	0%	0%	0.0%	0%	39%	0%	2%	0%	0%	2%	2%	2%
	% > BCWQG[a]	-	-	0%	0%	0%	100%	0%	0%	-	-	0%	0%	-	0%	-
	% > BCWQG[b]	-	-	0%	0%	-	0%	0%	0%	-	-	-	0%	0%	-	0%
	% > Level 1 Benchmark	0%	-	-	-	-	98%	-	-	-	-	0%	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	86%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
FR_FR5	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Annual Minimum	444	7.88	7.92	9.26	175	10.8	0.00130	<0.005	<0.002	<0.001	138	0.780	<0.1	<0.0001	<0.0001
	Annual Maximum	846	8.37	8.31	12.2	270	22.8	0.0104	0.0459	0.0165	0.00180	342	2.78	0.184	0.000160	0.000150
	Annual Mean	676	8.24	8.11	10.9	223	18.5	0.00503	0.0162	0.00430	0.00114	268	1.81	0.131	0.000125	0.000112
	Annual Median	708	8.27	8.10	10.9	227	20.0	0.00520	0.0118	0.00275	<0.001	297	1.83	0.120	0.000120	0.000105
	% < LRL	0%	0%	0%	0%	0%	0.0%	8%	33%	33%	75%	0%	0%	17%	42%	42%
	% > BCWQG[a]	-	-	0%	0%	0%	100%	0%	0%	-	-	0%	0%	-	0%	-
	% > BCWQG[b]	-	-	0%	0%	-	0%	0%	0%	-	-	-	0%	0%	-	0%
	% > Level 1 Benchmark	0%	-	-	-	-	100%	-	-	-	-	0%	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	42%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_FRUS	n	5	5	1	1	5	5	5	5	5	5	5	5	5	5	5
	Annual Minimum	302	7.96	8.14	11.5	150	6.06	0.00350	<0.005	<0.002	<0.001	83.4	0.690	<0.1	<0.0001	<0.0001
	Annual Maximum	731	8.39	8.14	11.5	233	21.2	0.00930	0.0135	0.0402	<0.001	309	3.51	0.180	0.000140	0.000360
	Annual Mean	508	8.24	8.14	11.5	186	12.3	0.00586	0.00918	0.0110	<0.001	183	1.63	0.148	0.000126	0.000194
	Annual Median	524	8.32	8.14	11.5	177	12.2	0.00530	0.00930	0.00360	<0.001	192	1.46	0.148	0.000130	0.000190
	% < LRL	0%	0%	0%	0%	0%	0.0%	0%	20%	20%	100%	0%	0%	20%	20%	20%
	% > BCWQG[a]	-	-	0%	0%	0%	100%	0%	0%	-	-	0%	0%	-	0%	-
	% > BCWQG[b]	-	-	0%	0%	-	0%	0%	0%	-	-	-	0%	0%	-	0%
	% > Level 1 Benchmark	0%	-	-	-	-	40%	-	-	-	-	0%	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	20%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_FRB	n	25	25	26	26	25	25	25	25	25	25	25	25	25	25	25
	Annual Minimum	300	7.92	7.94	9.78	139	6.02	<0.001	<0.005	<0.002	<0.001	84.8	0.620	0.0640	<0.0001	<0.0001
	Annual Maximum	753	8.48	8.43	12.6	227	20.9	0.0176	0.0954	0.0649	0.00280	319	3.50	0.196	0.000160	0.000500
	Annual Mean	538	8.25	8.22	11.0	195	13.5	0.00591	0.0136	0.00952	0.00139	196	1.78	0.131	0.000129	0.000159
	Annual Median	576	8.28	8.25	10.9	209	14.7	0.00530	0.00780	0.00300	<0.001	216	1.72	0.127	0.000130	0.000130
	% < LRL	0%	0%	0%	0%	0%	0.0%	8%	32%	28%	56%	0%	0%	8%	20%	16%
	% > BCWQG[a]	-	-	0%	0%	0%	100%	0%	0%	-	-	0%	0%	-	0%	-
	% > BCWQG[b]	-	-	0%	0%	-	0%	0%	0%	-	-	-	0%	0%	-	0%
	% > Level 1 Benchmark	0%	-	-	-	-	72%	-	-	-	-	0%	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	4%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

▒ > 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.

[c] LC_DCDS, LC_UC, and LC_GRCK Site Performance Objective for Total Cadmium.

Table C.4: Summary of Water Chemistry Data for Key Parameters for the Dry Creek LAEMP Monitoring Stations, 2021

Area	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)	Total Phosphorus (mg/L)	Orthophosphate (mg/L)	Sulphate (mg/L)	Total Chloride (mg/L)	Total Fluoride (mg/L)	Total Antimony (mg/L)	Total Arsenic (mg/L)
LC_GRCK	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Annual Minimum	172	8.05	8.17	9.50	132	0.0137	<0.001	<0.005	<0.002	0.00130	26.0	0.140	0.0930	<0.0001	<0.0001
	Annual Maximum	321	8.44	8.45	12.6	188	0.0910	0.00100	0.0531	0.154	0.00370	58.4	0.620	0.332	<0.0001	0.000600
	Annual Mean	230	8.29	8.32	11.2	167	0.0494	0.00100	0.0152	0.0163	0.00253	47.9	0.240	0.140	<0.0001	0.000154
	Annual Median	226	8.31	8.32	11.4	169	0.0465	<0.001	0.00770	0.00335	0.00240	51.0	0.177	0.122	<0.0001	0.000110
	% < LRL	0%	0%	0%	0%	0%	0.0%	92%	42%	8%	0%	0%	0%	0%	100%	25%
	% > BCWQG[a]	-	-	0%	0%	0%	0%	0%	0%	-	-	0%	0%	-	0%	-
	% > BCWQG[b]	-	-	0%	0%	-	0%	0%	0%	-	-	-	0%	0%	-	0%
	% > Level 1 Benchmark[c]	0%	-	-	-	-	0%	-	-	-	-	0%	-	-	-	-
	% > Level 2 Benchmark	-	-	-	-	-	0%	-	-	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LC_UC	n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
	Annual Minimum	250	8.09	7.94	9.62	256	0.0341	<0.001	<0.005	<0.002	<0.001	14.2	<0.1	0.119	<0.0001	<0.0001
	Annual Maximum	335	8.48	8.28	12.3	294	0.0723	<0.001	0.0499	0.00460	0.00180	18.6	0.220	0.171	<0.0001	0.000120
	Annual Mean	277	8.28	8.10	10.7	271	0.0520	<0.001	0.0128	0.00222	0.00112	16.7	0.158	0.145	<0.0001	0.000103
	Annual Median	271	8.26	8.10	10.5	272	0.0512	<0.001	<0.005	<0.002	<0.001	17.2	0.150	0.148	<0.0001	<0.0001
	% < LRL	0%	0%	0%	0%	0%	0.0%	100%	67%	92%	83%	0%	8%	0%	100%	75%
	% > BCWQG[a]	-	-	0%	0%	0%	0%	0%	0%	-	-	0%	0%	-	0%	-
	% > BCWQG[b]	-	-	0%	0%	-	0%	0%	0%	-	-	-	0%	0%	-	0%
	% > Level 1 Benchmark[c]	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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Table C.4: Summary of Water Chemistry Data for Key Parameters for the Dry Creek LAEMP Monitoring Stations, 2021

Area	Summary Statistic	Total Barium (mg/L)	Total Beryllium (mg/L)	Total Boron (mg/L)	Total Cadmium (µg/L)	Total Chromium (mg/L)	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)
LC_DCEF	n	15	15	15	15	15	15	15	15	15	15	14	15	15	16	15
	Annual Minimum	0.218	<0.00002	<0.01	0.0255	<0.0001	<0.1	<0.01	<0.00005	0.0110	<0.0001	<0.0000005	0.000903	<0.5	1.24	<0.00001
	Annual Maximum	0.300	<0.00002	0.0130	0.112	0.000240	<0.1	0.0770	0.0000600	0.0206	0.00352	0.00000186	0.00124	0.620	1.73	<0.00001
	Annual Mean	0.254	<0.00002	0.0107	0.0414	0.000115	<0.1	0.0160	0.0000507	0.0179	0.000645	0.000000769	0.00108	0.509	1.49	<0.00001
	Annual Median	0.251	<0.00002	0.0110	0.0363	<0.0001	<0.1	<0.01	<0.00005	0.0180	0.000190	0.000000560	0.00109	<0.5	1.48	<0.00001
	% < LRL	0%	100%	33%	0%	73%	100%	73%	93%	0%	33%	50%	0%	87%	0%	100%
	% > BCWQG[a]	0%	0%	0%	-	0%	0%	-	0%	-	0%	7%	0%	-	0%	0%
	% > BCWQG[b]	-	-	-	-	-	0%	0%	0%	-	0%	-	0%	-	-	0%
	% > Level 1 Benchmark	-	-	-	0%	-	-	-	-	-	-	-	-	0%	0%	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	0%	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	-	-
LC_DC3	n	84	84	84	84	84	84	84	84	84	84	80	84	84	88	84
	Annual Minimum	0.136	<0.00002	<0.01	0.140	<0.0001	<0.1	<0.01	<0.00005	0.00910	0.000730	<0.0000005	0.00211	3.62	26.8	<0.00001
	Annual Maximum	0.360	0.000243	<0.02	1.58	0.00350	2.44	3.43	0.00381	0.0480	0.188	0.0000242	0.00752	24.6	92.8	0.000243
	Annual Mean	0.224	0.0000418	0.0110	0.389	0.000552	0.530	0.421	0.000431	0.0253	0.0343	0.00000406	0.00407	10.4	58.9	0.0000297
	Annual Median	0.219	<0.00002	0.0110	0.293	0.000150	0.220	0.0460	<0.00005	0.0248	0.0101	0.00000143	0.00409	10.5	62.5	<0.00001
	% < LRL	0%	67%	23%	0%	37%	7%	11%	52%	0%	0%	3%	0%	0%	0%	64%
	% > BCWQG[a]	0%	8%	0%	-	14%	0%	-	0%	-	0%	55%	0%	-	100%	0%
	% > BCWQG[b]	-	-	-	-	-	0%	12%	0%	-	0%	-	0%	-	-	0%
	% > Level 1 Benchmark	-	-	-	0%	-	-	-	-	-	-	-	-	98%	39%	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	6%	0%	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	1%	-	-
LC_SPDC	n	94	94	94	94	94	94	94	94	94	94	90	94	94	96	94
	Annual Minimum	0.132	<0.00002	<0.01	0.0673	<0.0001	<0.1	<0.01	<0.00005	0.00870	0.00106	<0.0000005	0.00294	2.80	24.9	<0.00001
	Annual Maximum	0.320	0.0000400	0.0130	0.354	0.00146	0.740	0.665	0.000646	0.0473	0.146	0.00000560	0.00840	16.7	94.4	0.0000390
	Annual Mean	0.217	0.0000210	0.0108	0.207	0.000197	0.298	0.0952	0.000118	0.0241	0.0254	0.00000178	0.00578	8.24	57.6	0.0000124
	Annual Median	0.212	<0.00002	0.0100	0.193	0.000105	0.175	0.0135	<0.00005	0.0227	0.00757	0.00000118	0.00614	8.54	60.8	<0.00001
	% < LRL	0%	87%	31%	0%	43%	15%	40%	64%	0%	0%	7%	0%	0%	0%	73%
	% > BCWQG[a]	0%	0%	0%	-	1%	0%	-	0%	-	0%	48%	0%	-	100%	0%
	% > BCWQG[b]	-	-	-	-	-	0%	0%	0%	-	0%	-	0%	-	-	0%
	% > Level 1 Benchmark	-	-	-	0%	-	-	-	-	-	-	-	-	67%	28%	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	1%	0%	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	-	-
LC_DCDS	n	59	59	59	59	59	59	59	59	59	59	55	59	59	62	59
	Annual Minimum	0.153	<0.00002	<0.01	0.0676	<0.0001	<0.1	<0.01	<0.00005	0.0110	0.00123	<0.0000005	0.00266	1.79	16.9	<0.00001
	Annual Maximum	0.327	0.0000300	0.0120	0.340	0.000910	0.780	0.402	0.000456	0.0454	0.116	0.00000570	0.00821	15.3	88.6	0.0000200
	Annual Mean	0.219	0.0000202	0.0106	0.197	0.000176	0.237	0.0752	0.0000996	0.0258	0.0214	0.00000163	0.00565	8.19	55.6	0.0000109
	Annual Median	0.218	<0.00002	0.0100	0.185	0.000100	0.130	0.0120	<0.00005	0.0252	0.00489	0.00000125	0.00538	8.86	63.0	<0.00001
	% < LRL	0%	97%	31%	0%	47%	17%	39%	64%	0%	0%	5%	0%	0%	0%	76%
	% > BCWQG[a]	0%	0%	0%	-	0%	0%	-	0%	-	0%	47%	0%	-	100%	0%
	% > BCWQG[b]	-	-	-	-	-	0%	0%	0%	-	0%	-	0%	-	-	0%
	% > Level 1 Benchmark[c]	-	-	-	0%	-	-	-	-	-	-	-	-	68%	32%	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	2%	0%	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	-	-
LC_DC2	n	54	54	54	54	54	54	54	54	54	54	50	54	54	59	54
	Annual Minimum	0.178	<0.00002	<0.01	0.0684	<0.0001	<0.1	<0.01	<0.00005	0.0116	0.000130	<0.0000005	0.00164	1.62	11.8	<0.00001
	Annual Maximum	0.505	<0.00004	<0.02	0.258	0.000930	0.405	0.436	0.000407	0.0414	0.0655	0.00000474	0.00678	12.4	79.4	0.0000250
	Annual Mean	0.259	0.0000203	0.0104	0.155	0.000182	0.161	0.0564	0.0000778	0.0242	0.0116	0.00000129	0.00461	5.52	45.1	0.0000105
	Annual Median	0.233	<0.00002	<0.01	0.151	0.000110	0.110	0.0305	<0.00005	0.0227	0.00435	0.00000117	0.00434	4.34	48.0	<0.00001
	% < LRL	0%	98%	54%	0%	50%	44%	30%	67%	0%	0%	14%	0%	0%	0%	85%
	% > BCWQG[a]	0%	0%	0%	-	0%	0%	-	0%	-	0%	48%	0%	-	100%	0%
	% > BCWQG[b]	-	-	-	-	-	0%	0%	0%	-	0%	-	0%	-	-	0%
	% > Level 1 Benchmark	-	-	-	0%	-	-	-	-	-	-	-	-	46%	15%	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	0%	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	-	-

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[c] LC_DCDS, LC_UC, and LC_GRCK Site Performance Objective for Total Cadmium.

Table C.4: Summary of Water Chemistry Data for Key Parameters for the Dry Creek LAEMP Monitoring Stations, 2021

Area	Summary Statistic	Total Barium (mg/L)	Total Beryllium (mg/L)	Total Boron (mg/L)	Total Cadmium (µg/L)	Total Chromium (mg/L)	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)
LC_DC4	n	56	56	56	56	56	56	56	56	56	56	52	56	56	61	56
	Annual Minimum	0.179	<0.00002	<0.01	0.0552	<0.0001	<0.1	<0.01	<0.00005	0.0108	0.000860	<0.0000005	0.000971	<0.5	11.4	<0.00001
	Annual Maximum	0.374	<0.00004	<0.02	0.167	0.000630	0.350	0.286	0.000270	0.0245	0.0408	0.00000365	0.00496	5.22	48.3	<0.00002
	Annual Mean	0.276	<0.00002	0.0101	0.0940	0.000137	0.119	0.0329	0.0000603	0.0170	0.00587	0.000000902	0.00259	2.24	30.6	0.0000101
	Annual Median	0.284	<0.00002	<0.01	0.0901	<0.0001	<0.1	0.0130	<0.00005	0.0153	0.00160	0.000000530	0.00280	2.46	27.6	<0.00001
	% < LRL	0%	100%	80%	0%	61%	80%	29%	84%	0%	0%	46%	0%	16%	0%	96%
	% > BCWQG[a]	0%	0%	0%	-	0%	0%	-	0%	-	0%	21%	0%	-	100%	0%
	% > BCWQG[b]	-	-	-	-	-	0%	0%	0%	-	0%	-	0%	-	-	0%
	% > Level 1 Benchmark	-	-	-	0%	-	-	-	-	-	-	-	-	0%	0%	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	0%	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	-	-
LC_DC1	n	59	59	59	59	59	59	59	59	59	59	55	59	59	63	59
	Annual Minimum	0.180	<0.00002	<0.01	0.0458	<0.0001	<0.1	<0.01	<0.00005	0.0107	0.00108	<0.0000005	0.00109	<0.5	11.8	<0.00001
	Annual Maximum	0.342	<0.00004	<0.02	0.204	0.000510	0.370	0.315	0.000246	0.0232	0.0325	0.00000335	0.00395	4.14	44.2	<0.00002
	Annual Mean	0.279	0.0000200	0.0101	0.0816	0.000131	0.118	0.0402	0.0000634	0.0167	0.00613	0.000000920	0.00245	1.77	29.5	0.0000101
	Annual Median	0.289	<0.00002	<0.01	0.0811	<0.0001	<0.1	0.0180	<0.00005	0.0152	0.00264	0.000000600	0.00264	1.81	25.6	<0.00001
	% < LRL	0%	98%	78%	0%	71%	81%	8%	81%	0%	0%	42%	0%	10%	0%	95%
	% > BCWQG[a]	0%	0%	0%	-	0%	0%	-	0%	-	0%	24%	0%	-	100%	0%
	% > BCWQG[b]	-	-	-	-	-	0%	0%	0%	-	0%	-	0%	-	-	0%
	% > Level 1 Benchmark	-	-	-	0%	-	-	-	-	-	-	-	-	0%	0%	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	0%	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	-	-
FR_FR5	n	12	12	12	12	12	12	12	12	12	12	11	12	12	12	12
	Annual Minimum	0.0550	<0.00002	<0.01	0.0218	<0.0001	<0.1	<0.01	<0.00005	0.0185	0.000990	<0.0000005	0.000554	<0.5	40.1	<0.00001
	Annual Maximum	0.128	<0.00002	0.0130	0.0585	0.000200	0.130	0.105	0.000108	0.0401	0.00936	0.00000131	0.00125	2.84	90.1	<0.00001
	Annual Mean	0.0979	<0.00002	0.0106	0.0324	0.000148	0.103	0.0288	0.0000548	0.0319	0.00350	0.000000651	0.000929	1.33	72.8	<0.00001
	Annual Median	0.0993	<0.00002	0.0100	0.0299	0.000140	<0.1	0.0210	<0.00005	0.0312	0.00306	<0.0000005	0.000978	1.27	75.3	<0.00001
	% < LRL	0%	100%	42%	8%	8%	75%	33%	92%	0%	0%	64%	0%	25%	0%	100%
	% > BCWQG[a]	0%	0%	0%	-	0%	0%	-	0%	-	0%	9%	0%	-	100%	0%
	% > BCWQG[b]	-	-	-	-	-	0%	0%	0%	-	0%	-	0%	-	-	0%
	% > Level 1 Benchmark	-	-	-	0%	-	-	-	-	-	-	-	-	0%	58%	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	0%	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	-	-
LC_FRUS	n	5	5	5	5	5	5	5	5	5	5	5	5	5	7	5
	Annual Minimum	0.0569	<0.00002	<0.01	0.0223	0.000150	<0.1	0.0140	<0.00005	0.0134	0.00170	<0.0000005	0.000628	0.570	23.5	<0.00001
	Annual Maximum	0.133	0.0000310	0.0110	0.143	0.000700	0.380	0.392	0.000598	0.0298	0.0419	0.00000403	0.00108	2.76	88.1	<0.00001
	Annual Mean	0.0864	0.0000222	0.0102	0.0537	0.000322	0.164	0.130	0.000174	0.0222	0.0119	0.00000133	0.000902	1.47	44.7	<0.00001
	Annual Median	0.0849	<0.00002	<0.01	0.0303	0.000250	<0.1	0.0620	0.0000560	0.0202	0.00441	0.000000630	0.00103	1.16	46.2	<0.00001
	% < LRL	0%	80%	80%	0%	0%	60%	0%	40%	0%	0%	40%	0%	0%	0%	100%
	% > BCWQG[a]	0%	0%	0%	-	0%	0%	-	0%	-	0%	20%	0%	-	100%	0%
	% > BCWQG[b]	-	-	-	-	-	0%	0%	0%	-	0%	-	0%	-	-	0%
	% > Level 1 Benchmark	-	-	-	0%	-	-	-	-	-	-	-	-	0%	14%	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	0%	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	-	-
LC_FRB	n	25	25	25	25	25	25	25	25	25	25	24	25	25	26	25
	Annual Minimum	0.0596	<0.00002	<0.01	0.0208	<0.0001	<0.1	<0.01	<0.00005	0.0132	0.00126	<0.0000005	0.000690	<0.5	22.4	<0.00001
	Annual Maximum	0.137	0.0000440	0.0120	0.168	0.00142	0.530	0.848	0.000602	0.0338	0.0456	0.00000481	0.00122	3.81	77.0	0.0000200
	Annual Mean	0.102	0.0000219	0.0102	0.0411	0.000244	0.132	0.105	0.0000995	0.0251	0.00644	0.000000932	0.00101	1.34	53.9	0.0000107
	Annual Median	0.113	<0.00002	<0.01	0.0307	0.000140	<0.1	0.0300	<0.00005	0.0257	0.00277	0.000000510	0.00106	1.11	56.4	<0.00001
	% < LRL	0%	92%	68%	0%	4%	84%	8%	76%	0%	0%	50%	0%	12%	0%	92%
	% > BCWQG[a]	0%	0%	0%	-	4%	0%	-	0%	-	0%	8%	0%	-	100%	0%
	% > BCWQG[b]	-	-	-	-	-	0%	0%	0%	-	0%	-	0%	-	-	0%
	% > Level 1 Benchmark	-	-	-	0%	-	-	-	-	-	-	-	-	0%	23%	-
	% > 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.

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Table C.4: Summary of Water Chemistry Data for Key Parameters for the Dry Creek LAEMP Monitoring Stations, 2021

Area	Summary Statistic	Total Barium (mg/L)	Total Beryllium (mg/L)	Total Boron (mg/L)	Total Cadmium (µg/L)	Total Chromium (mg/L)	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)
LC_GRCK	n	12	12	12	12	12	12	12	12	12	12	11	12	12	13	12
	Annual Minimum	0.0574	<0.00002	0.0120	<0.005	0.000110	<0.1	<0.01	<0.00005	0.00450	0.00124	<0.0000005	0.000858	<0.5	1.12	<0.00001
	Annual Maximum	0.0702	0.0000600	0.0160	0.0925	0.00114	0.880	1.32	0.00104	0.00700	0.133	0.00000438	0.00174	2.31	2.92	<0.00001
	Annual Mean	0.0631	0.0000233	0.0138	0.0138	0.000285	0.165	0.140	0.000135	0.00601	0.0137	0.000000884	0.00143	0.651	2.15	<0.00001
	Annual Median	0.0626	<0.00002	0.0130	0.00630	0.000225	<0.1	0.0230	<0.00005	0.00610	0.00237	<0.0000005	0.00144	<0.5	2.26	<0.00001
	% < LRL	0%	92%	0%	17%	0%	92%	17%	83%	0%	0%	73%	0%	92%	0%	100%
	% > BCWQG[a]	0%	0%	0%	-	8%	0%	-	0%	-	0%	9%	0%	-	62%	0%
	% > BCWQG[b]	-	-	-	-	-	0%	8%	0%	-	0%	-	0%	-	-	0%
	% > Level 1 Benchmark[c]	-	-	-	0%	-	-	-	-	-	-	-	-	0%	0%	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	0%	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	-	-
LC_UC	n	12	12	12	12	12	12	12	12	12	12	11	12	12	12	12
	Annual Minimum	0.0938	<0.00002	0.0120	0.00540	<0.0001	<0.1	<0.01	<0.00005	0.00500	0.000550	<0.0000005	0.000612	<0.5	0.294	<0.00001
	Annual Maximum	0.114	<0.00002	0.0150	0.0123	0.000120	<0.1	0.0130	<0.00005	0.00640	0.00263	0.000000930	0.000816	<0.5	0.451	<0.00001
	Annual Mean	0.106	<0.00002	0.0132	0.00940	0.000102	<0.1	0.0102	<0.00005	0.00576	0.00116	0.000000539	0.000711	<0.5	0.369	<0.00001
	Annual Median	0.109	<0.00002	0.0130	0.00950	<0.0001	<0.1	<0.01	<0.00005	0.00580	0.00104	<0.0000005	0.000715	<0.5	0.366	<0.00001
	% < LRL	0%	100%	0%	0%	92%	100%	92%	100%	0%	0%	91%	0%	100%	0%	100%
	% > BCWQG[a]	0%	0%	0%	-	0%	0%	-	0%	-	0%	0%	0%	-	0%	0%
	% > BCWQG[b]	-	-	-	-	-	0%	0%	0%	-	0%	-	0%	-	-	0%
	% > Level 1 Benchmark[c]	-	-	-	0%	-	-	-	-	-	-	-	-	0%	0%	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	0%	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-	-	-	-	-	-	0%	-	-

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Table C.4: Summary of Water Chemistry Data for Key Parameters for the Dry Creek LAEMP Monitoring Stations, 2021

Area	Summary Statistic	Total Thallium (mg/L)	Total Uranium (mg/L)	Total Zinc (mg/L)	Dissolved Aluminum (mg/L)	Dissolved Cadmium (µg/L)	Dissolved Copper (mg/L)	Dissolved Iron (mg/L)
LC_DCEF	n	15	15	15	15	15	15	15
	Annual Minimum	<0.00001	0.000219	<0.003	<0.001	0.0273	<0.0002	<0.01
	Annual Maximum	<0.00001	0.000451	0.0170	<0.004	0.0367	0.000320	<0.01
	Annual Mean	<0.00001	0.000342	0.00393	0.00123	0.0320	0.000235	<0.01
	Annual Median	<0.00001	0.000349	<0.003	<0.001	0.0327	0.000210	<0.01
	% < LRL	100%	0%	93%	73%	0%	33%	100%
	% > BCWQG[a]	0%	0%	0%	0%	0%	0%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > Level 1 Benchmark	-	-	-	-	0%	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-
LC_DC3	n	84	84	84	84	84	84	84
	Annual Minimum	<0.00001	0.00108	0.00440	0.00220	0.0125	<0.0002	<0.01
	Annual Maximum	0.000168	0.00380	0.0530	0.0178	0.578	0.00108	0.0950
	Annual Mean	0.0000343	0.00230	0.0129	0.00664	0.169	0.000286	0.0114
	Annual Median	0.0000215	0.00237	0.0101	0.00440	0.187	0.000260	<0.01
	% < LRL	2%	0%	0%	12%	0%	18%	86%
	% > BCWQG[a]	0%	0%	0%	0%	1%	0%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > Level 1 Benchmark	-	-	-	-	1%	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-
LC_SPDC	n	94	94	94	94	94	94	94
	Annual Minimum	<0.00001	0.00104	<0.003	0.00220	0.0132	<0.0002	<0.01
	Annual Maximum	0.0000440	0.00362	0.0534	0.0205	0.303	0.000410	0.0110
	Annual Mean	0.0000209	0.00219	0.00926	0.00705	0.155	0.000259	0.0100
	Annual Median	0.0000205	0.00211	0.00750	0.00475	0.154	0.000250	<0.01
	% < LRL	4%	0%	1%	19%	0%	18%	99%
	% > BCWQG[a]	0%	0%	0%	0%	0%	2%	-
	% > BCWQG[b]	-	-	0%	0%	0%	2%	0%
	% > Level 1 Benchmark	-	-	-	-	0%	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-
LC_DCDS	n	59	59	59	59	59	59	59
	Annual Minimum	<0.00001	0.000879	<0.003	0.00190	0.0149	<0.0002	<0.01
	Annual Maximum	0.0000360	0.00352	0.0152	0.0233	0.292	0.000600	0.0120
	Annual Mean	0.0000185	0.00214	0.00729	0.00622	0.152	0.000263	0.0100
	Annual Median	0.0000180	0.00211	0.00700	0.00400	0.164	0.000240	<0.01
	% < LRL	3%	0%	2%	15%	0%	19%	97%
	% > BCWQG[a]	0%	0%	0%	0%	0%	7%	-
	% > BCWQG[b]	-	-	0%	0%	0%	7%	0%
	% > Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-
LC_DC2	n	54	54	54	54	54	54	54
	Annual Minimum	<0.00001	0.000561	<0.003	0.00140	0.0272	<0.0002	<0.01
	Annual Maximum	0.0000220	0.00306	0.294	0.0107	0.216	0.000830	<0.01
	Annual Mean	0.0000135	0.00172	0.0105	0.00441	0.119	0.000252	<0.01
	Annual Median	0.0000130	0.00178	0.00440	0.00360	0.130	0.000240	<0.01
	% < LRL	15%	0%	11%	17%	0%	28%	100%
	% > BCWQG[a]	0%	0%	2%	0%	0%	4%	-
	% > BCWQG[b]	-	-	0%	0%	0%	4%	0%
	% > Level 1 Benchmark	-	-	-	-	0%	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-

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Area	Summary Statistic	Total Thallium (mg/L)	Total Uranium (mg/L)	Total Zinc (mg/L)	Dissolved Aluminum (mg/L)	Dissolved Cadmium (µg/L)	Dissolved Copper (mg/L)	Dissolved Iron (mg/L)
LC_DC4	n	56	56	56	56	56	56	56
	Annual Minimum	<0.00001	0.000490	<0.003	<0.001	0.0336	<0.0002	<0.01
	Annual Maximum	0.0000220	0.00152	0.00770	0.0107	0.135	0.000460	0.0200
	Annual Mean	0.0000105	0.000970	0.00323	0.00263	0.0769	0.000223	0.0103
	Annual Median	<0.00001	0.000964	<0.003	0.00190	0.0648	<0.0002	<0.01
	% < LRL	84%	0%	71%	29%	0%	63%	95%
	% > BCWQG^{a}	0%	0%	0%	0%	0%	4%	-
	% > BCWQG^{b}	-	-	0%	0%	0%	4%	0%
	% > Level 1 Benchmark	-	-	-	-	0%	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-
LC_DC1	n	59	59	59	59	59	59	59
	Annual Minimum	<0.00001	0.000494	<0.003	<0.001	0.0329	<0.0002	<0.01
	Annual Maximum	0.0000200	0.00138	0.0182	0.0191	0.103	0.00302	0.0260
	Annual Mean	0.0000103	0.000936	0.00341	0.00259	0.0611	0.000266	0.0103
	Annual Median	<0.00001	0.000933	<0.003	0.00180	0.0526	<0.0002	<0.01
	% < LRL	92%	0%	80%	36%	0%	66%	97%
	% > BCWQG^{a}	0%	0%	0%	0%	0%	2%	-
	% > BCWQG^{b}	-	-	0%	0%	0%	0%	0%
	% > Level 1 Benchmark	-	-	-	-	0%	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-
FR_FR5	n	12	12	12	12	12	12	12
	Annual Minimum	<0.00001	0.00181	<0.003	<0.001	0.0192	<0.0002	<0.01
	Annual Maximum	<0.00001	0.00350	0.0185	0.00300	0.0393	<0.0002	<0.01
	Annual Mean	<0.00001	0.00288	0.00429	0.00127	0.0286	<0.0002	<0.01
	Annual Median	<0.00001	0.00319	<0.003	<0.001	0.0288	<0.0002	<0.01
	% < LRL	100%	0%	92%	58%	0%	100%	100%
	% > BCWQG^{a}	0%	0%	0%	0%	0%	0%	-
	% > BCWQG^{b}	-	-	0%	0%	0%	0%	0%
	% > Level 1 Benchmark	-	-	-	-	0%	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-
LC_FRUS	n	5	5	5	5	5	5	5
	Annual Minimum	<0.00001	0.00148	<0.003	<0.001	0.0174	<0.0002	<0.01
	Annual Maximum	0.0000130	0.00323	0.00720	0.00550	0.0298	0.000350	<0.01
	Annual Mean	0.0000106	0.00225	0.00464	0.00238	0.0227	0.000230	<0.01
	Annual Median	<0.00001	0.00222	<0.003	0.00120	0.0226	<0.0002	<0.01
	% < LRL	80%	0%	60%	40%	0%	80%	100%
	% > BCWQG^{a}	0%	0%	0%	0%	0%	0%	-
	% > BCWQG^{b}	-	-	0%	0%	0%	0%	0%
	% > Level 1 Benchmark	-	-	-	-	0%	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-
LC_FRB	n	25	25	25	25	25	25	25
	Annual Minimum	<0.00001	0.00140	<0.003	<0.001	0.0144	<0.0002	<0.01
	Annual Maximum	0.0000270	0.00314	0.0876	<0.003	0.0779	0.000380	<0.01
	Annual Mean	0.0000111	0.00232	0.00825	0.00135	0.0265	0.000214	<0.01
	Annual Median	<0.00001	0.00243	<0.003	0.00130	0.0258	<0.0002	<0.01
	% < LRL	92%	0%	76%	44%	0%	80%	100%
	% > BCWQG^{a}	0%	0%	0%	0%	0%	8%	-
	% > BCWQG^{b}	-	-	0%	0%	0%	8%	0%
	% > Level 1 Benchmark	-	-	-	-	0%	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-
	% > 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.

[c] LC_DCDS, LC_UC, and LC_GRCK Site Performance Objective for Total Cadmium.

Table C.4: Summary of Water Chemistry Data for Key Parameters for the Dry Creek LAEMP Monitoring Stations, 2021

Area	Summary Statistic	Total Thallium (mg/L)	Total Uranium (mg/L)	Total Zinc (mg/L)	Dissolved Aluminum (mg/L)	Dissolved Cadmium (µg/L)	Dissolved Copper (mg/L)	Dissolved Iron (mg/L)
LC_GRCK	**n**	12	12	12	12	12	12	12
	Annual Minimum	<0.00001	0.000708	<0.003	<0.001	<0.005	<0.0002	<0.01
	Annual Maximum	0.0000400	0.00116	0.00780	<0.003	0.00690	0.000220	<0.01
	Annual Mean	0.0000125	0.00101	0.00340	0.00133	0.00520	0.000202	<0.01
	Annual Median	<0.00001	0.00103	<0.003	<0.001	<0.005	<0.0002	<0.01
	% < LRL	92%	0%	92%	67%	67%	92%	100%
	% > BCWQG[a]	0%	0%	0%	0%	0%	0%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-
	% > Level 3 Benchmark	-	-	-	-	-	-	-
LC_UC	**n**	12	12	12	12	12	12	12
	Annual Minimum	<0.00001	0.000334	<0.003	<0.001	0.00570	<0.0002	<0.01
	Annual Maximum	<0.00001	0.000456	0.00840	<0.003	0.0100	<0.0002	<0.01
	Annual Mean	<0.00001	0.000393	0.00345	0.00105	0.00794	<0.0002	<0.01
	Annual Median	<0.00001	0.000390	<0.003	<0.001	0.00785	<0.0002	<0.01
	% < LRL	100%	0%	92%	83%	0%	100%	100%
	% > BCWQG[a]	0%	0%	0%	0%	0%	0%	-
	% > BCWQG[b]	-	-	0%	0%	0%	0%	0%
	% > Level 1 Benchmark[c]	-	-	-	-	0%	-	-
	% > Level 2 Benchmark	-	-	-	-	-	-	-
	% > 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.

[c] LC_DCDS, LC_UC, and LC_GRCK Site Performance Objective for Total Cadmium.

Table C.5: Concentrations of Selenium Species in Water Samples from LCO Dry Creek LAEMP Sites, 2021

Water Body		Biological Monitoring Area	Sample Date	Selenate (µg/L)	Selenite (µg/L)	Dimethylselenoxide (µg/L)	Methylseleninic Acid (µg/L)	Methaneselenonic Acid (µg/L)	Selenocyanate (µg/L)	Selenomethionine (µg/L)	Selenosulphate (µg/L)	Unknown Species (µg/L)	Sum of Species (µg/L)
Dry Creek East Tributary	Reference	LC_DCEF	06-Jan-21	1.23	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.25
		LC_DCEF	02-Feb-21	1.17	0.0170	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.19
		LC_DCEF	08-Mar-21	1.18	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.19
		LC_DCEF	16-Mar-21	1.55	0.0270	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.58
		LC_DCEF	05-Apr-21	1.49	0.0120	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.50
		LC_DCEF	04-May-21	1.54	0.706	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	2.25
		LC_DCEF	01-Jun-21	1.47	0.0330	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.50
		LC_DCEF	22-Jun-21	1.62	0.0780	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.70
		LC_DCEF	05-Jul-21	1.41	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.41
		LC_DCEF	03-Aug-21	1.67	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.68
		LC_DCEF	13-Sep-21	1.38	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.39
		LC_DCEF	12-Oct-21	1.27	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.28
		LC_DCEF	03-Nov-21	1.30	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.31
		LC_DCEF	29-Nov-21	1.21	0.0190	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.23
		LC_DCEF	08-Dec-21	1.31	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.31
Grace Creek		LC_GRCK	07-May-21	1.38	0.0310	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.41
		LC_GRCK	13-Sep-21	1.74	0.0390	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	1.78
Dry Creek	Mine-exposed	LC_SPDC	06-Jan-21	57.7	0.850	0.0110	0.0240	<0.01	<0.01	<0.01	<0.01	<0.01	58.6
		LC_SPDC	12-Jan-21	60.3	0.915	0.0190	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	61.2
		LC_SPDC	19-Jan-21	65.6	0.938	0.0330	0.0200	<0.01	<0.01	<0.01	<0.01	<0.01	66.6
		LC_SPDC	26-Jan-21	59.4	0.967	0.0250	0.0240	<0.01	<0.01	<0.01	<0.01	0.0250	60.4
		LC_SPDC	02-Feb-21	58.0	0.786	0.0220	0.0200	<0.01	<0.01	<0.01	<0.01	<0.01	58.8
		LC_SPDC	10-Feb-21	63.6	0.935	0.0130	0.0260	<0.01	<0.01	<0.01	<0.01	<0.01	64.6
		LC_SPDC	12-Feb-21	63.9	1.02	0.0140	0.0240	<0.01	<0.01	<0.01	<0.01	<0.01	65.0
		LC_SPDC	14-Feb-21	28.1	0.348	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	28.4
		LC_SPDC	15-Feb-21	50.2	0.567	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	50.8
		LC_SPDC	16-Feb-21	37.6	0.402	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	38.0
		LC_SPDC	17-Feb-21	37.8	0.498	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	38.3
		LC_SPDC	18-Feb-21	59.1	0.910	<0.01	0.0180	<0.01	0.0420	<0.01	<0.01	<0.01	60.1
		LC_SPDC	19-Feb-21	61.2	0.878	<0.01	0.0200	<0.01	0.0400	<0.01	0.0290	<0.01	62.2
		LC_SPDC	20-Feb-21	57.7	0.749	<0.01	0.0210	<0.01	0.0560	<0.01	<0.01	<0.01	58.5
		LC_SPDC	21-Feb-21	57.7	0.700	<0.01	0.0190	<0.01	0.0390	<0.01	<0.01	<0.01	58.5
		LC_SPDC	22-Feb-21	59.2	0.622	<0.01	0.0160	<0.01	0.0430	<0.01	0.0120	<0.01	59.9
		LC_SPDC	23-Feb-21	59.7	0.646	<0.01	0.0180	<0.01	0.0240	<0.01	<0.01	<0.01	60.4
		LC_SPDC	24-Feb-21	62.2	0.689	<0.01	0.0150	<0.01	0.0170	<0.01	0.0150	<0.01	62.9
		LC_SPDC	02-Mar-21	61.9	0.562	<0.01	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	62.5
		LC_SPDC	08-Mar-21	51.3	0.969	<0.01	0.0190	<0.01	<0.01	<0.01	<0.01	<0.01	52.3
		LC_SPDC	16-Mar-21	36.0	0.757	<0.01	0.0220	<0.01	<0.01	<0.01	<0.01	<0.01	36.8
		LC_SPDC	22-Mar-21	28.9	0.686	<0.01	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	29.6
		LC_SPDC	29-Mar-21	34.5	0.819	0.0120	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	35.3
		LC_SPDC	05-Apr-21	35.7	0.875	<0.01	0.0220	<0.01	<0.01	<0.01	<0.01	<0.01	36.6
		LC_SPDC	12-Apr-21	32.5	0.825	0.0140	0.0190	<0.01	<0.01	<0.01	<0.01	<0.01	33.4
		LC_SPDC	20-Apr-21	24.1	0.547	0.0110	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	24.7
		LC_SPDC	26-Apr-21	32.0	0.573	<0.01	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	32.6
		LC_SPDC	04-May-21	27.3	0.785	<0.01	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	28.1
		LC_SPDC	10-May-21	30.3	0.651	<0.01	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	31.0
		LC_SPDC	17-May-21	26.9	0.683	0.0120	0.0120	<0.01	<0.01	<0.01	<0.01	<0.01	27.6
		LC_SPDC	25-May-21	31.8	0.568	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	32.4
		LC_SPDC	01-Jun-21	24.6	0.601	0.0170	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	25.2
		LC_SPDC	08-Jun-21	30.3	0.610	0.0190	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	30.9
		LC_SPDC	14-Jun-21	33.6	0.630	0.0120	0.0240	<0.01	<0.01	<0.01	<0.01	<0.01	34.3
		LC_SPDC	22-Jun-21	43.3	0.798	0.0180	0.0210	<0.01	<0.01	<0.01	<0.01	<0.01	44.1
		LC_SPDC	29-Jun-21	44.5	0.839	0.0160	0.0270	<0.01	<0.01	<0.01	<0.01	<0.01	45.4
		LC_SPDC	05-Jul-21	51.4	0.845	0.0230	0.0240	<0.01	<0.01	<0.01	<0.01	<0.01	52.3
		LC_SPDC	13-Jul-21	55.3	0.958	0.0210	0.0240	<0.01	<0.01	<0.01	<0.01	<0.01	56.3
		LC_SPDC	20-Jul-21	56.4	0.838	<0.01	0.0170	<0.01	<0.01	<0.01	<0.01	<0.01	57.3
		LC_SPDC	27-Jul-21	57.8	1.28	0.0490	0.0280	<0.01	<0.01	<0.01	<0.01	<0.01	59.2
		LC_SPDC	03-Aug-21	71.9	1.83	0.0880	0.0490	<0.01	<0.01	<0.01	<0.01	<0.01	73.9
		LC_SPDC	09-Aug-21	68.7	1.56	0.0700	0.0460	<0.01	<0.01	<0.01	<0.01	<0.01	70.4
		LC_SPDC	17-Aug-21	74.6	1.01	0.0270	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	75.7
		LC_SPDC	24-Aug-21	75.8	1.16	0.0270	0.0260	<0.01	<0.01	<0.01	<0.01	<0.01	77.0
		LC_SPDC	30-Aug-21	79.3	1.18	0.0370	0.0230	<0.01	<0.01	<0.01	<0.01	<0.01	80.5
		LC_SPDC	08-Sep-21	85.0	1.24	0.0360	0.0250	<0.01	<0.01	<0.01	<0.01	<0.01	86.3
		LC_SPDC	12-Sep-21	85.1	1.24	0.0270	0.0270	<0.01	<0.01	<0.01	<0.01	<0.01	86.4
		LC_SPDC	21-Sep-21	91.3	1.17	0.0320	0.0210	<0.01	<0.01	<0.01	<0.01	<0.01	92.5
		LC_SPDC	27-Sep-21	91.0	1.67	0.0380	0.0300	<0.01	<0.01	<0.01	<0.01	<0.01	92.7
		LC_SPDC	06-Oct-21	89.3	1.25	0.0280	0.0340	<0.01	<0.01	<0.01	<0.01	<0.01	90.6
		LC_SPDC	12-Oct-21	87.4	1.08	0.0230	0.0190	<0.01	<0.01	<0.01	<0.01	<0.01	88.5
		LC_SPDC	18-Oct-21	84.9	1.13	0.0280	0.0260	<0.01	<0.01	<0.01	<0.01	<0.01	86.1
		LC_SPDC	26-Oct-21	84.0	1.16	0.0270	0.0210	<0.01	<0.01	<0.01	<0.01	<0.01	85.2
		LC_SPDC	02-Nov-21	83.2	1.21	0.0320	0.0190	<0.01	<0.01	<0.01	<0.01	<0.01	84.5
		LC_SPDC	08-Nov-21	81.6	1.15	0.0320	0.0170	<0.01	<0.01	<0.01	<0.01	<0.01	82.8
		LC_SPDC	15-Nov-21	71.4	1.14	<0.01	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	72.6
		LC_SPDC	23-Nov-21	60.5	1.10	0.0420	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	61.7
		LC_SPDC	30-Nov-21	63.4	1.04	0.0270	0.0190	<0.01	<0.01	<0.01	<0.01	<0.01	64.5
		LC_SPDC	08-Dec-21	62.3	1.05	0.0190	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	63.4
		LC_SPDC	14-Dec-21	72.1	1.10	0.0270	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	73.2
		LC_SPDC	20-Dec-21	69.6	1.08	0.0120	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	70.7
		LC_SPDC	30-Dec-21	89.5	1.06	0.0230	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	90.6

Note: values below the laboratory detection limit were not included in the Sum of Species calculation.

Table C.5: Concentrations of Selenium Species in Water Samples from LCO Dry Creek LAEMP Sites, 2021

Water Body		Biological Monitoring Area	Sample Date	Selenate (µg/L)	Selenite (µg/L)	Dimethylselenoxide (µg/L)	Methylseleninic Acid (µg/L)	Methaneselenonic Acid (µg/L)	Selenocyanate (µg/L)	Selenomethionine (µg/L)	Selenosulphate (µg/L)	Unknown Species (µg/L)	Sum of Species (µg/L)
Dry Creek	Mine-exposed	LC_DCDS	06-Jan-21	57.7	0.886	0.0190	0.0210	<0.01	<0.01	<0.01	<0.01	<0.01	58.6
		LC_DCDS	12-Jan-21	60.2	0.942	0.0230	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	61.2
		LC_DCDS	19-Jan-21	61.5	0.920	0.0260	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	62.5
		LC_DCDS	26-Jan-21	60.1	1.02	0.0220	0.0190	<0.01	<0.01	<0.01	<0.01	0.0220	61.2
		LC_DCDS	02-Feb-21	57.9	0.819	0.0170	0.0190	<0.01	<0.01	<0.01	<0.01	<0.01	58.8
		LC_DCDS	10-Feb-21	63.9	0.992	0.0110	0.0200	<0.01	<0.01	<0.01	<0.01	<0.01	64.9
		LC_DCDS	16-Feb-21	19.4	0.279	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	19.7
		LC_DCDS	23-Feb-21	59.7	0.669	<0.01	0.0140	<0.01	0.0260	<0.01	<0.01	<0.01	60.4
		LC_DCDS	02-Mar-21	61.8	0.547	<0.01	0.0210	<0.01	<0.01	<0.01	<0.01	<0.01	62.4
		LC_DCDS	09-Mar-21	54.3	1.00	<0.01	0.0170	<0.01	<0.01	<0.01	<0.01	<0.01	55.3
		LC_DCDS	16-Mar-21	31.3	0.650	<0.01	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	32.0
		LC_DCDS	23-Mar-21	21.0	0.460	<0.01	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	21.5
		LC_DCDS	29-Mar-21	30.3	0.712	<0.01	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	31.0
		LC_DCDS	05-Apr-21	32.2	0.779	<0.01	0.0220	<0.01	<0.01	<0.01	<0.01	<0.01	33.0
		LC_DCDS	13-Apr-21	28.7	0.756	0.0120	0.0170	<0.01	<0.01	<0.01	<0.01	<0.01	29.5
		LC_DCDS	20-Apr-21	16.1	0.372	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	16.5
		LC_DCDS	26-Apr-21	19.1	0.380	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	19.5
		LC_DCDS	04-May-21	23.7	0.653	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	24.4
		LC_DCDS	10-May-21	20.3	0.402	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	20.7
		LC_DCDS	18-May-21	23.1	0.495	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	23.6
		LC_DCDS	25-May-21	26.4	0.469	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	26.9
		LC_DCDS	01-Jun-21	20.9	0.460	<0.01	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	21.4
		LC_DCDS	08-Jun-21	25.7	0.443	<0.01	0.0170	<0.01	<0.01	<0.01	<0.01	<0.01	26.2
		LC_DCDS	15-Jun-21	19.1	0.351	<0.01	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	19.5
		LC_DCDS	22-Jun-21	36.4	0.659	0.0130	0.0190	<0.01	<0.01	<0.01	<0.01	<0.01	37.1
		LC_DCDS	29-Jun-21	38.8	0.682	0.0150	0.0240	<0.01	<0.01	<0.01	<0.01	<0.01	39.5
		LC_DCDS	05-Jul-21	45.3	0.741	0.0200	0.0290	<0.01	<0.01	<0.01	<0.01	<0.01	46.1
		LC_DCDS	13-Jul-21	49.7	0.787	0.0160	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	50.5
		LC_DCDS	20-Jul-21	52.1	0.714	<0.01	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	52.8
		LC_DCDS	27-Jul-21	56.7	1.29	0.0490	0.0280	<0.01	<0.01	<0.01	<0.01	<0.01	58.1
		LC_DCDS	03-Aug-21	71.2	1.85	<0.01	0.0240	<0.01	<0.01	<0.01	<0.01	<0.01	73.1
		LC_DCDS	10-Aug-21	57.9	1.91	0.112	0.0590	<0.01	<0.01	<0.01	<0.01	<0.01	60.0
		LC_DCDS	17-Aug-21	72.0	0.965	0.0270	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	73.0
		LC_DCDS	24-Aug-21	72.6	1.09	0.0210	0.0220	<0.01	<0.01	<0.01	<0.01	<0.01	73.7
		LC_DCDS	31-Aug-21	77.9	1.17	0.0340	0.0170	<0.01	<0.01	<0.01	<0.01	<0.01	79.1
		LC_DCDS	07-Sep-21	89.3	1.18	0.0330	0.0270	<0.01	<0.01	<0.01	<0.01	<0.01	90.5
		LC_DCDS	12-Sep-21	81.8	1.17	0.0300	0.0270	<0.01	<0.01	<0.01	<0.01	<0.01	83.0
		LC_DCDS	21-Sep-21	88.2	1.13	0.0280	0.0190	<0.01	<0.01	<0.01	<0.01	<0.01	89.4
		LC_DCDS	27-Sep-21	87.0	1.26	0.0320	0.0260	<0.01	<0.01	<0.01	<0.01	<0.01	88.3
		LC_DCDS	06-Oct-21	88.4	1.22	0.0340	0.0290	<0.01	<0.01	<0.01	<0.01	<0.01	89.7
		LC_DCDS	12-Oct-21	83.6	1.05	0.0280	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	84.7
		LC_DCDS	19-Oct-21	82.4	0.995	0.0250	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	83.4
		LC_DCDS	26-Oct-21	78.7	1.05	0.0300	0.0190	<0.01	<0.01	<0.01	<0.01	<0.01	79.8
		LC_DCDS	02-Nov-21	80.9	1.17	0.0300	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	82.1
		LC_DCDS	09-Nov-21	72.8	0.990	0.0340	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	73.8
		LC_DCDS	15-Nov-21	68.9	1.12	0.0340	0.0200	<0.01	<0.01	<0.01	<0.01	<0.01	70.1
		LC_DCDS	23-Nov-21	54.0	0.999	0.0320	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	55.0
		LC_DCDS	30-Nov-21	58.4	0.975	0.0240	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	59.4
		LC_DCDS	08-Dec-21	58.6	1.01	0.0160	0.0120	<0.01	<0.01	<0.01	<0.01	<0.01	59.6
		LC_DCDS	14-Dec-21	60.8	0.948	0.0240	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	61.8
		LC_DCDS	20-Dec-21	61.9	0.947	0.0280	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	62.9
		LC_DCDS	30-Dec-21	46.7	0.640	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	47.3
		LC_DC3	06-Jan-21	59.1	0.817	0.0150	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	59.9
		LC_DC3	12-Jan-21	59.1	0.882	0.0240	0.0170	<0.01	<0.01	<0.01	<0.01	<0.01	60.0
		LC_DC3	19-Jan-21	62.9	0.909	0.0230	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	63.8
		LC_DC3	26-Jan-21	58.5	0.913	0.0270	0.0210	<0.01	<0.01	<0.01	<0.01	0.0270	59.5
		LC_DC3	02-Feb-21	57.8	0.792	0.0200	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	58.6
		LC_DC3	10-Feb-21	65.3	1.01	<0.01	0.0200	<0.01	<0.01	<0.01	<0.01	<0.01	66.3
		LC_DC3	16-Feb-21	27.7	0.288	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	28.0
		LC_DC3	22-Feb-21	61	0.540	<0.01	0.0195	<0.01	0.0200	<0.01	0.0110	<0.01	61.6
		LC_DC3	23-Feb-21	60.5	0.510	<0.01	0.0150	<0.01	0.0270	<0.01	<0.01	<0.01	61.1
		LC_DC3	02-Mar-21	65.9	0.584	<0.01	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	66.5
		LC_DC3	08-Mar-21	51.7	0.986	0.0170	0.0190	<0.01	<0.01	<0.01	<0.01	<0.01	52.7
		LC_DC3	16-Mar-21	34.6	0.632	<0.01	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	35.2
		LC_DC3	22-Mar-21	29.2	0.664	<0.01	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	29.9
		LC_DC3	29-Mar-21	37.9	0.846	<0.01	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	38.8
		LC_DC3	05-Apr-21	32.1	0.799	<0.01	0.0250	<0.01	<0.01	<0.01	<0.01	<0.01	32.9
		LC_DC3	12-Apr-21	34.0	0.815	<0.01	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	34.8
		LC_DC3	20-Apr-21	25.7	0.559	<0.01	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	26.3
		LC_DC3	26-Apr-21	32.8	0.590	<0.01	0.0270	<0.01	<0.01	<0.01	<0.01	<0.01	33.4
		LC_DC3	04-May-21	27.5	0.710	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	28.2
		LC_DC3	10-May-21	31.8	0.648	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	32.4
		LC_DC3	17-May-21	26.9	0.644	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	27.6
		LC_DC3	25-May-21	31.8	0.580	0.0160	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	32.4
		LC_DC3	01-Jun-21	27.5	0.647	<0.01	0.0120	<0.01	<0.01	<0.01	<0.01	<0.01	28.2
		LC_DC3	08-Jun-21	32.8	0.596	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	33.4
		LC_DC3	14-Jun-21	36.7	0.628	0.0150	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	37.4
		LC_DC3	22-Jun-21	44.5	0.799	<0.01	0.0120	<0.01	<0.01	<0.01	<0.01	<0.01	45.3
		LC_DC3	29-Jun-21	46.9	0.827	0.0210	0.0120	<0.01	<0.01	<0.01	<0.01	<0.01	47.8

Note: values below the laboratory detection limit were not included in the Sum of Species calculation.

Table C.5: Concentrations of Selenium Species in Water Samples from LCO Dry Creek LAEMP Sites, 2021

Water Body		Biological Monitoring Area	Sample Date	Selenate (µg/L)	Selenite (µg/L)	Dimethylselenoxide (µg/L)	Methylseleninic Acid (µg/L)	Methaneselenonic Acid (µg/L)	Selenocyanate (µg/L)	Selenomethionine (µg/L)	Selenosulphate (µg/L)	Unknown Species (µg/L)	Sum of Species (µg/L)
Dry Creek	Mine-exposed	LC_DC3	05-Jul-21	54.2	0.830	0.0220	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	55.1
		LC_DC3	14-Jul-21	53.9	0.790	0.0110	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	54.7
		LC_DC3	20-Jul-21	58.7	0.793	0.0120	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	59.5
		LC_DC3	27-Jul-21	67.1	1.05	0.0300	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	68.2
		LC_DC3	03-Aug-21	84.1	1.10	0.0310	0.0170	<0.01	<0.01	<0.01	<0.01	<0.01	85.2
		LC_DC3	09-Aug-21	74.1	1.10	0.0230	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	75.2
		LC_DC3	17-Aug-21	74.6	1.06	0.0310	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	75.7
		LC_DC3	24-Aug-21	77.7	1.10	0.0270	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	78.8
		LC_DC3	30-Aug-21	81.6	1.13	0.0280	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	82.8
		LC_DC3	08-Sep-21	86.4	1.16	0.0260	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	87.6
		LC_DC3	12-Sep-21	83.3	1.09	0.0330	0.0170	<0.01	<0.01	<0.01	<0.01	<0.01	84.4
		LC_DC3	21-Sep-21	92.8	1.12	0.0290	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	94.0
		LC_DC3	27-Sep-21	90.2	1.18	0.0310	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	91.4
		LC_DC3	06-Oct-21	91.5	1.14	0.0260	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	92.7
		LC_DC3	12-Oct-21	84.7	0.994	0.0200	0.0240	<0.01	<0.01	<0.01	<0.01	<0.01	85.7
		LC_DC3	18-Oct-21	86.8	1.07	0.0320	0.0190	<0.01	<0.01	<0.01	<0.01	<0.01	87.9
		LC_DC3	26-Oct-21	84.7	1.11	0.0270	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	85.9
		LC_DC3	03-Nov-21	82.4	1.06	0.0200	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	83.5
		LC_DC3	08-Nov-21	77.5	1.05	0.0240	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	78.6
		LC_DC3	15-Nov-21	63.2	1.15	0.0410	0.0200	<0.01	<0.01	<0.01	<0.01	<0.01	64.4
		LC_DC3	23-Nov-21	65.2	1.03	0.0330	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	66.3
		LC_DC3	30-Nov-21	62.4	0.999	0.0250	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	63.4
		LC_DC3	08-Dec-21	63.1	0.996	0.0160	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	64.1
		LC_DC3	14-Dec-21	71.4	1.00	0.0230	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	72.4
		LC_DC3	20-Dec-21	70.4	1.02	0.0200	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	71.4
		LC_DC3	30-Dec-21	64.4	0.861	0.0190	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	65.3
		LC_DC2	06-Jan-21	52.3	0.261	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	52.6
		LC_DC2	12-Jan-21	50.4	0.304	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	50.7
		LC_DC2	19-Jan-21	55.7	0.333	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	56.0
		LC_DC2	26-Jan-21	53.9	0.369	0.0120	<0.01	<0.01	<0.01	<0.01	<0.01	0.0120	54.3
		LC_DC2	02-Feb-21	49.6	0.225	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	49.8
		LC_DC2	22-Feb-21	51.7	0.259	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	52.0
		LC_DC2	03-Mar-21	52.6	0.133	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	52.7
		LC_DC2	09-Mar-21	55.6	0.494	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	56.1
		LC_DC2	16-Mar-21	30.6	0.498	<0.01	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	31.1
		LC_DC2	22-Mar-21	18.5	0.353	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	18.9
		LC_DC2	29-Mar-21	24.5	0.540	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	25.0
		LC_DC2	06-Apr-21	24.8	0.533	<0.01	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	25.3
		LC_DC2	13-Apr-21	21.6	0.497	<0.01	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	22.1
		LC_DC2	20-Apr-21	14.4	0.271	<0.01	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	14.7
		LC_DC2	28-Apr-21	20.4	0.442	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	20.8
		LC_DC2	04-May-21	16.0	0.439	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	16.4
		LC_DC2	10-May-21	11.8	0.223	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	12.0
		LC_DC2	18-May-21	10.2	0.214	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	10.4
		LC_DC2	25-May-21	16.4	0.241	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	16.6
		LC_DC2	01-Jun-21	11.7	0.280	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	12.0
		LC_DC2	08-Jun-21	14.9	0.333	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	15.2
		LC_DC2	15-Jun-21	19.1	0.339	<0.01	0.0120	<0.01	<0.01	<0.01	<0.01	<0.01	19.5
		LC_DC2	23-Jun-21	27.6	0.457	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	28.1
		LC_DC2	24-Jun-21	26.4	0.460	0.0105	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	26.9
		LC_DC2	05-Jul-21	33.8	0.560	0.0130	0.0190	<0.01	<0.01	<0.01	<0.01	<0.01	34.4
		LC_DC2	13-Jul-21	38.6	0.628	0.0120	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	39.3
		LC_DC2	20-Jul-21	42.9	0.542	<0.01	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	43.5
		LC_DC2	30-Jul-21	65.9	1.35	0.0550	0.0430	<0.01	<0.01	<0.01	<0.01	<0.01	67.3
		LC_DC2	03-Aug-21	67.9	1.57	0.0670	0.0380	<0.01	<0.01	<0.01	<0.01	<0.01	69.6
		LC_DC2	09-Aug-21	53.3	1.07	0.0470	0.0230	<0.01	<0.01	<0.01	<0.01	<0.01	54.4
		LC_DC2	17-Aug-21	60.1	0.726	0.0220	0.0120	<0.01	<0.01	<0.01	<0.01	<0.01	60.9
		LC_DC2	24-Aug-21	61.2	0.871	0.0150	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	62.1
		LC_DC2	30-Aug-21	62.3	0.853	0.0260	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	63.2
		LC_DC2	08-Sep-21	70.1	0.953	0.0200	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	71.1
		LC_DC2	13-Sep-21	70.5	0.928	0.0210	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	71.5
		LC_DC2	21-Sep-21	77.1	0.941	0.0240	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	78.1
		LC_DC2	27-Sep-21	76.8	1.03	0.0270	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	77.9
		LC_DC2	06-Oct-21	78.7	1.05	0.0200	0.0170	<0.01	<0.01	<0.01	<0.01	<0.01	79.8
		LC_DC2	13-Oct-21	75.0	0.853	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	75.9
		LC_DC2	19-Oct-21	74.5	0.872	0.0230	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	75.4
		LC_DC2	26-Oct-21	71.6	0.958	0.0240	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	72.6
		LC_DC2	03-Nov-21	66.8	0.801	0.0160	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	67.6
		LC_DC2	08-Nov-21	67.7	0.829	0.0150	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	68.6
		LC_DC2	16-Nov-21	43.5	0.878	0.0230	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	44.4
		LC_DC2	23-Nov-21	46.3	0.764	0.0220	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	47.1
		LC_DC2	30-Nov-21	48.9	0.710	0.0150	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	49.6
		LC_DC2	08-Dec-21	49.3	0.716	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	50.0
		LC_DC2	14-Dec-21	54.7	0.738	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	55.5
		LC_DC2	20-Dec-21	55.5	0.748	0.0180	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	56.3
		LC_DC2	30-Dec-21	72.4	0.765	<0.01	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	73.2
		LC_DC4	06-Jan-21	23.4	0.0610	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	23.5
		LC_DC4	12-Jan-21	24.0	0.0600	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	24.1
		LC_DC4	19-Jan-21	26.3	0.0520	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	26.4

Note: values below the laboratory detection limit were not included in the Sum of Species calculation.

Table C.5: Concentrations of Selenium Species in Water Samples from LCO Dry Creek LAEMP Sites, 2021

Water Body		Biological Monitoring Area	Sample Date	Selenate (µg/L)	Selenite (µg/L)	Dimethylselenoxide (µg/L)	Methylseleninic Acid (µg/L)	Methaneselenonic Acid (µg/L)	Selenocyanate (µg/L)	Selenomethionine (µg/L)	Selenosulphate (µg/L)	Unknown Species (µg/L)	Sum of Species (µg/L)
Dry Creek	Mine-exposed	LC_DC4	26-Jan-21	23.2	0.0490	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	23.2
		LC_DC4	02-Feb-21	23.1	0.0580	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	23.2
		LC_DC4	10-Feb-21	25.9	0.0500	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	26.0
		LC_DC4	16-Feb-21	25.0	0.0590	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	25.1
		LC_DC4	23-Feb-21	25.4	0.0630	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	25.5
		LC_DC4	03-Mar-21	25.2	0.0470	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	25.2
		LC_DC4	08-Mar-21	26.9	0.0790	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	27.0
		LC_DC4	16-Mar-21	31.0	0.0750	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	31.1
		LC_DC4	22-Mar-21	22.9	0.205	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	23.1
		LC_DC4	29-Mar-21	24.5	0.175	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	24.7
		LC_DC4	06-Apr-21	22.7	0.216	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	22.9
		LC_DC4	13-Apr-21	22.0	0.225	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	22.2
		LC_DC4	20-Apr-21	16.0	0.203	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	16.2
		LC_DC4	28-Apr-21	20.8	0.288	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	21.1
		LC_DC4	04-May-21	16.1	0.324	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	16.4
		LC_DC4	10-May-21	12.7	0.175	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	12.9
		LC_DC4	18-May-21	9.83	0.182	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	10.0
		LC_DC4	24-May-21	13.8	0.234	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	14.0
		LC_DC4	01-Jun-21	10.1	0.178	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	10.3
		LC_DC4	08-Jun-21	12.7	0.189	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	12.9
		LC_DC4	15-Jun-21	15.4	0.222	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	15.6
		LC_DC4	24-Jun-21	19.3	0.256	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	19.6
		LC_DC4	29-Jun-21	21.4	0.268	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	21.7
		LC_DC4	05-Jul-21	25.5	0.329	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	25.8
		LC_DC4	14-Jul-21	25.0	0.299	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	25.3
		LC_DC4	20-Jul-21	27.7	0.278	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	28.0
		LC_DC4	30-Jul-21	51.4	0.891	0.0300	0.0310	<0.01	<0.01	<0.01	<0.01	<0.01	52.4
		LC_DC4	03-Aug-21	52.2	1.01	0.0440	0.0260	<0.01	<0.01	<0.01	<0.01	<0.01	53.3
		LC_DC4	09-Aug-21	36.2	0.563	0.0190	0.0180	<0.01	<0.01	<0.01	<0.01	<0.01	36.8
		LC_DC4	17-Aug-21	43.0	0.397	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	43.4
		LC_DC4	24-Aug-21	46.5	0.474	0.0150	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	47.0
		LC_DC4	30-Aug-21	41.5	0.404	<0.01	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	41.9
		LC_DC4	08-Sep-21	42.3	0.392	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	42.7
		LC_DC4	13-Sep-21	43.2	0.377	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	43.6
		LC_DC4	21-Sep-21	45.8	0.355	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	46.2
		LC_DC4	27-Sep-21	37.6	0.293	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	37.9
		LC_DC4	06-Oct-21	45.6	0.415	<0.01	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	46.0
		LC_DC4	13-Oct-21	40.8	0.283	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	41.1
		LC_DC4	19-Oct-21	42.8	0.334	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	43.1
		LC_DC4	26-Oct-21	41.5	0.356	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	41.9
		LC_DC4	03-Nov-21	39.0	0.247	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	39.2
		LC_DC4	08-Nov-21	41.7	0.302	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	42.0
		LC_DC4	16-Nov-21	38.0	0.608	0.0140	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	38.6
		LC_DC4	23-Nov-21	40.0	0.408	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	40.4
		LC_DC4	30-Nov-21	38.1	0.385	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	38.5
		LC_DC4	08-Dec-21	36.2	0.271	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	36.5
		LC_DC4	14-Dec-21	40.6	0.327	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	40.9
		LC_DC4	20-Dec-21	37.7	0.342	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	38.0
		LC_DC4	30-Dec-21	50.5	0.304	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	50.8
		LC_DC1	06-Jan-21	22.1	0.0860	<0.01	<0.01	<0.01	0.0110	<0.01	<0.01	<0.01	22.2
		LC_DC1	12-Jan-21	21.8	0.0830	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	21.9
		LC_DC1	19-Jan-21	23.5	0.0920	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	23.6
		LC_DC1	26-Jan-21	22.0	0.0760	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	22.1
		LC_DC1	02-Feb-21	21.3	0.0860	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	21.4
		LC_DC1	16-Feb-21	23.3	0.0790	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	23.4
		LC_DC1	23-Feb-21	21.8	0.0970	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	21.9
		LC_DC1	03-Mar-21	22.7	0.0620	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	22.8
		LC_DC1	09-Mar-21	25.0	0.0980	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	25.1
		LC_DC1	16-Mar-21	27.2	0.0970	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	27.3
		LC_DC1	22-Mar-21	20.7	0.182	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	20.9
		LC_DC1	29-Mar-21	23.2	0.162	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	23.4
		LC_DC1	06-Apr-21	22.0	0.163	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	22.2
		LC_DC1	15-Apr-21	22.0	0.243	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	22.2
		LC_DC1	20-Apr-21	12.8	0.154	<0.01	0.0120	<0.01	<0.01	<0.01	<0.01	<0.01	13.0
		LC_DC1	28-Apr-21	18.8	0.239	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.0270	19.1
		LC_DC1	04-May-21	15.2	0.282	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	15.5
		LC_DC1	10-May-21	13.2	0.195	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	13.4
		LC_DC1	17-May-21	11.5	0.203	<0.01	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	11.7
		LC_DC1	24-May-21	12.0	0.231	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	12.2
		LC_DC1	01-Jun-21	10.6	0.214	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	10.8
		LC_DC1	08-Jun-21	12.2	0.238	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	12.4
		LC_DC1	14-Jun-21	13.1	0.185	<0.01	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	13.3
		LC_DC1	22-Jun-21	16.9	0.208	<0.01	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	17.1
		LC_DC1	29-Jun-21	20.1	0.246	<0.01	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	20.4
		LC_DC1	05-Jul-21	24.0	0.307	<0.01	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	24.3
		LC_DC1	14-Jul-21	23.5	0.260	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	23.8
		LC_DC1	20-Jul-21	25.6	0.266	<0.01	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	25.9
		LC_DC1	29-Jul-21	48.6	0.752	0.0290	0.0260	<0.01	<0.01	<0.01	<0.01	<0.01	49.4
		LC_DC1	03-Aug-21	49.0	0.904	0.0260	0.0250	<0.01	<0.01	<0.01	<0.01	<0.01	50.0

Note: values below the laboratory detection limit were not included in the Sum of Species calculation.

Table C.5: Concentrations of Selenium Species in Water Samples from LCO Dry Creek LAEMP Sites, 2021

Water Body		Biological Monitoring Area	Sample Date	Selenate (µg/L)	Selenite (µg/L)	Dimethylselenoxide (µg/L)	Methylseleninic Acid (µg/L)	Methaneselenonic Acid (µg/L)	Selenocyanate (µg/L)	Selenomethionine (µg/L)	Selenosulphate (µg/L)	Unknown Species (µg/L)	Sum of Species (µg/L)
Dry Creek	Mine-exposed	LC_DC1	09-Aug-21	34.6	0.497	<0.01	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	35.1
		LC_DC1	17-Aug-21	37.0	0.334	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	37.3
		LC_DC1	24-Aug-21	39.7	0.430	<0.01	0.0130	<0.01	<0.01	<0.01	<0.01	<0.01	40.1
		LC_DC1	30-Aug-21	40.6	0.441	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	41.0
		LC_DC1	08-Sep-21	40.4	0.391	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	40.8
		LC_DC1	12-Sep-21	39.1	0.349	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	39.4
		LC_DC1	21-Sep-21	43.8	0.296	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	44.1
		LC_DC1	27-Sep-21	41.3	0.359	0.0120	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	41.7
		LC_DC1	06-Oct-21	43.0	0.359	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	43.4
		LC_DC1	12-Oct-21	37.4	0.262	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	37.7
		LC_DC1	18-Oct-21	39.8	0.284	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	40.1
		LC_DC1	26-Oct-21	39.2	0.345	<0.01	0.0120	<0.01	<0.01	<0.01	<0.01	<0.01	39.6
		LC_DC1	03-Nov-21	35.7	0.235	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	35.9
		LC_DC1	08-Nov-21	38.5	0.251	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	38.8
		LC_DC1	15-Nov-21	40.0	0.349	0.0150	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	40.4
		LC_DC1	23-Nov-21	35.5	0.333	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	35.8
		LC_DC1	30-Nov-21	35.8	0.343	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	36.1
		LC_DC1	08-Dec-21	33.8	0.243	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	34.0
		LC_DC1	14-Dec-21	38.7	0.280	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	39.0
		LC_DC1	20-Dec-21	35.3	0.302	0.0110	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	35.6
		LC_DC1	30-Dec-21	45.3	0.273	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	45.6
Fording River		LC_FRB	15-Mar-21	63.6	0.193	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	63.8
		LC_FRB	06-May-21	25.5	0.123	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	25.6
		LC_FRB	02-Jun-21	19.7	0.0790	<0.01	0.0120	<0.01	<0.01	<0.01	<0.01	<0.01	19.8
		LC_FRB	24-Jun-21	27.9	0.128	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	28.0
		LC_FRB	12-Sep-21	54.4	0.329	0.0130	0.0160	<0.01	<0.01	<0.01	<0.01	<0.01	54.8
		LC_FRUS	07-May-21	18.9	0.0690	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	19.0
		LC_FRUS	02-Jun-21	16.0	0.0780	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	16.1
		LC_FRUS	24-Jun-21	18.7	0.0960	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	18.8
		LC_FRUS	12-Sep-21	54.1	0.303	0.0140	0.0140	<0.01	<0.01	<0.01	<0.01	<0.01	54.4

Note: values below the laboratory detection limit were not included in the Sum of Species calculation.

Table C.6: Differences in Selenate Concentrations Before and After LCO Dry Creek Burnt Ridge North Spoil Failure, 2020 and 2021

Analyte	Area	ANOVA Model[a]			Post-Hoc Comparisons[b]			
		BA	Month	BA x Month	Month	Mean Before	Mean After	Magnitude of Difference[c]
Selenate (µg/L)	LC_DC3	<0.001	<0.001	NS	all	44.8	54.5	22
	LC_SPDC	<0.001	<0.001	NS	all	43.6	53.7	23
	LC_DCDS	<0.001	<0.001	NS	all	40.4	46.8	16
	LC_DC2	0.002	<0.001	0.007	Mar	-	-	-
					Apr	26.6	19.9	-25
					May	12.5	13.3	6.6
					Jun	16.9	18.9	12
					Jul	20.4	43.8	115
					Aug	44.2	60.8	38
					Sep	57.0	73.5	29
					Oct	52.9	74.9	42
					Nov	54.2	53.7	-1.0
					Dec	52.3	57.4	9.6
	LC_DC4	<0.001	<0.001	0.015	Mar	16.2	26.0	61
					Apr	15.6	20.2	29
					May	12.4	12.9	4.4
					Jun	11.3	15.2	35
					Jul	19.1	30.9	61
					Aug	33.2	43.6	31
					Sep	29.2	42.1	44
					Oct	24.1	42.6	77
					Nov	24.2	39.3	62
					Dec	24.0	40.9	71
	LC_DC1	<0.001	<0.001	NS	all	18.1	27.1	49

▨ ANOVA P-value for BA or Interaction < 0.05.

🟦 Significant increase (α = 0.05) in after period

🟩 Significant decrease (α = 0.05) in after period

Notes: "-" = no data; "NS" = not significant and removed from model.

[a] Censored regression ANOVA model assuming a log-normal distribution with factors Month and Before/After (BA) the spoil failure. Only months with data before and after the spoil failure were included.

[b] Post-hoc comparison for each month conducted using Tukey's Honestly Significant Difference test (α = 0.05) when Month x BA was significant in the ANOVA model.

[c] Magnitude of difference (MOD) calculated as (After-Before)/Before x 100%, where After and Before are the estimated marginal means from the ANOVA model.

Table C.7: Differences in Selenite Concentrations Before and After the LCO Dry Creek Burnt Ridge North Spoil Failure, 2020 and 2021

Analyte	Area	ANOVA Model[a]			Post-Hoc Comparisons[b]			
		BA	Month	BA x Month	Month	Mean Before	Mean After	Magnitude of Difference[c]
Selenite (µg/L)	LC_DC3	0.045	<0.001	0.010	Mar	0.761	0.728	-4.3
					Apr	0.654	0.681	4.1
					May	0.507	0.644	27
					Jun	0.475	0.693	46
					Jul	0.860	0.860	-0.0099
					Aug	1.12	1.10	-1.9
					Sep	1.19	1.14	-4.7
					Oct	1.14	1.08	-5.8
					Nov	0.976	1.06	8.3
					Dec	0.961	0.967	0.65
	LC_SPDC	0.464	<0.001	NS	all	0.915	0.942	2.9
	LC_DCDS	0.578	<0.001	NS	all	0.830	0.806	-2.8
	LC_DC2	<0.001	<0.001	0.030	Mar	-	-	-
					Apr	0.335	0.422	26
					May	0.294	0.267	-9.3
					Jun	0.313	0.367	17
					Jul	0.404	0.712	76
					Aug	1.01	0.980	-2.9
					Sep	1.05	0.962	-8.7
					Oct	0.525	0.930	77
					Nov	0.446	0.794	78
					Dec	0.373	0.742	99
	LC_DC4	<0.001	<0.001	<0.001	Mar	0.0465	0.100	115
					Apr	0.182	0.231	27
					May	0.217	0.222	2.2
					Jun	0.180	0.220	22
					Jul	0.265	0.395	49
					Aug	0.568	0.534	-6.2
					Sep	0.211	0.352	66
					Oct	0.0942	0.344	265
					Nov	0.0665	0.372	459
					Dec	0.0667	0.310	365
	LC_DC1	<0.001	<0.001	<0.001	Mar	0.0779	0.112	43
					Apr	0.167	0.195	17
					May	0.200	0.225	13
					Jun	0.168	0.217	29
					Jul	0.221	0.355	61
					Aug	0.459	0.491	6.8
					Sep	0.218	0.347	59
					Oct	0.128	0.310	143
					Nov	0.110	0.298	171
					Dec	0.0973	0.274	181

▨	ANOVA P-value for BA or Interaction < 0.05.
🟦	Significant increase (α = 0.05) in after period.
🟩	Significant decrease (α = 0.05) in after period.

Notes: "-" = no data; "NS" = not significant and removed from model.

[a] Censored regression ANOVA model assuming a log-normal distribution with factors Month and Before/After (BA) the spoil failure. Only months with data before and after the spoil failure were included.

[b] Post-hoc comparison for each month conducted using Tukey's Honestly Significant Difference test (α = 0.05) when Month x BA was significant in the ANOVA model.

[c] Magnitude of difference (MOD) calculated as (After-Before)/Before x 100%, where After and Before are the estimated marginal means from the ANOVA model.

Table C.8: Differences in Methylseleninic Acid Concentrations Before and After the LCO Dry Creek Burnt Ridge North Spoil Failure, 2020 and 2021

Analyte	Area	ANOVA Model[a]			Post-Hoc Comparisons[b]			
		BA	Month	BA x Month	Month	Mean Before	Mean After	Magnitude of Difference[c]
Methylseleninic Acid (µg/L)	LC_DC3	<0.001	<0.001	0.028	Mar	0.0211	0.0153	-28
					Apr	0.0151	0.0210	39
					May	0.0137	0.00825	-40
					Jun	0.0149	0.0119	-20
					Jul	0.0216	0.0129	-40
					Aug	0.0149	0.0120	-20
					Sep	0.0217	0.0133	-39
					Oct	0.0232	0.0179	-23
					Nov	0.0142	0.0154	8.5
					Dec	0.0143	0.0126	-12
	LC_SPDC	<0.001	<0.001	NS	all	0.0290	0.0192	-34
	LC_DCDS	<0.001	<0.001	0.011	Mar	0.0241	0.0164	-32
					Apr	0.0301	0.0125	-58
					May	0.0223	0.00129	-94
					Jun	0.0201	0.0162	-20
					Jul	0.0259	0.0213	-18
					Aug	0.0705	0.0249	-65
					Sep	0.0398	0.0245	-38
					Oct	0.0210	0.0206	-2.1
					Nov	0.0235	0.0154	-34
					Dec	0.0146	0.00779	-47
	LC_DC2	0.564	<0.001	0.042	Mar	-	-	-
					Apr	0.00191	0.0121	536
					May	0.0130	0.00191	-85
					Jun	0.0120	0.00963	-20
					Jul	0.0150	0.0200	33
					Aug	0.0230	0.0198	-14
					Sep	0.0284	0.0159	-44
					Oct	0.0120	0.0125	4.5
					Nov	0.0118	0.0129	9.6
					Dec	0.00774	0.00974	26
	LC_DC1	0.893	<0.001	NS	all	0.00487	0.00478	-1.9

▨ ANOVA P-value for BA or Interaction < 0.05.

🟦 Significant increase (α = 0.05) in after period

🟩 Significant decrease (α = 0.05) in after period

Notes: "-" = no data; "NS" = not significant and removed from model.

[a] Censored regression ANOVA model assuming a log-normal distribution with factors Month and Before/After (BA) the spoil failure. Only months with data before and after the spoil failure were included.

[b] Post-hoc comparison for each month conducted using Tukey's Honestly Significant Difference test (α = 0.05) when Month x BA was significant in the ANOVA model.

[c] Magnitude of difference (MOD) calculated as (After-Before)/Before x 100%, where After and Before are the estimated marginal means from the ANOVA model.

Table C.9: Differences in Dimethylseleneoxide Concentrations Before and After the LCO Dry Creek Burnt Ridge North Spoil Failure, 2020 and 2021

Analyte	Area	ANOVA Model[a]			Post-Hoc Comparisons[b]			
		BA	Month	BA x Month	Month	Mean Before	Mean After	Magnitude of Difference[c]
Dimethylseleneoxide (µg/L)	LC_DC3	0.034	<0.001	0.001	Mar	0.0106	0.00826	-22
					Apr	0.0111	0.00119	-89
					May	0.0107	0.0100	-7.2
					Jun	0.00679	0.0130	91
					Jul	0.0192	0.0172	-10
					Aug	0.0145	0.0278	93
					Sep	0.0285	0.0296	4.1
					Oct	0.0262	0.0259	-1.3
					Nov	0.0097	0.0277	185
					Dec	0.0140	0.0193	38
	LC_SPDC	0.535	<0.001	0.046	Mar	0.0180	0.00663	-63
					Apr	0.0161	0.00912	-43
					May	0.0124	0.00707	-43
					Jun	0.0133	0.0162	22
					Jul	0.0182	0.0210	15
					Aug	0.0372	0.0441	19
					Sep	0.0353	0.0330	-6.7
					Oct	0.0324	0.0264	-19
					Nov	0.0132	0.0250	89
					Dec	0.0172	0.0194	13
	LC_DCDS	0.410	<0.001	0.037	Mar	0.0191	0.000338	-98
					Apr	0.0129	0.00629	-51
					May	0.0098	0.00605	-38
					Jun	0.00943	0.00825	-13
					Jul	0.0146	0.0185	27
					Aug	0.0308	0.0280	-9.2
					Sep	0.0320	0.0307	-4.0
					Oct	0.0233	0.0291	25
					Nov	0.0146	0.0306	109
					Dec	0.0150	0.0167	11
	LC_DC2	0.025	<0.001	NS	all	0.00536	0.00771	44

▨	ANOVA P-value for BA or Interaction < 0.05.
🟦	Significant increase (α = 0.05) in after period.
🟩	Significant decrease (α = 0.05) in after period.

Notes: "-" = no data; "NS" = not significant and removed from model.

[a] Censored regression ANOVA model assuming a log-normal distribution with factors Month and Before/After (BA) the spoil failure. Only months with data before and after the spoil failure were included.

[b] Post-hoc comparison for each month conducted using Tukey's Honestly Significant Difference test (α = 0.05) when Month x BA was significant in the ANOVA model.

[c] Magnitude of difference (MOD) calculated as (After-Before)/Before x 100%, where After and Before are the estimated marginal means from the ANOVA model.

APPENDIX D

TOXICITY

Table D.1: Summary of 2021 LC_SPDC Acute Toxicity Results

EMS ID	Area	Sample Date	Endpoint	Result 96-Hour Rainbow Trout	Result 48-Hour *Daphnia magna*
E295211	LC_SPDC	02-Feb-21	% Mortality	0	3
		12-Feb-21		0	0
		13-Feb-21		0	3
		14-Feb-21		0	0
		15-Feb-21		0	3
		16-Feb-21		0	0
		17-Feb-21		0	0
		18-Feb-21		0	3
		19-Feb-21		0	0
		21-Feb-21		0	0
		22-Feb-21		0	3
		24-Feb-21		0	0
		25-Feb-21		0	3
		26-Feb-21		0	3
		27-Feb-21		0	0
		28-Feb-21		0	0
		01-Mar-21		0	0
		02-Mar-21		0	0
		03-Mar-21		0	0
		04-Mar-21		0	0
		05-Mar-21		0	10
		06-Mar-21		0	3
		07-Mar-21		0	3
		08-Mar-21		0	0
		09-Mar-21		0	0
		10-Mar-21		0	0
		11-Mar-21		0	0
		12-Mar-21		0	0
		13-Mar-21		10	0
		14-Mar-21		0	0
		15-Mar-21		0	0
		16-Mar-21		0	3
		17-Mar-21		0	0
		22-Mar-21		0	7
		29-Mar-21		0	0
		05-Apr-21		0	7
		07-Apr-21		0	0
		09-Apr-21		0	0
		12-Apr-21		0	0
		13-Apr-21		0	0
		14-Apr-21		0	0
		19-Apr-21		0	0
		21-Apr-21		0	0
		21-Apr-21		0	0
		26-Apr-21		0	0
		26-Apr-21		0	0
		04-May-21		0	0
		04-May-21		0	0
		10-May-21		0	0
		10-May-21		0	0
		17-May-21		0	0
		25-May-21		0	0
		01-Jun-21		0	0
		08-Jun-21		0	0
		14-Jun-21		0	0
		22-Jun-21		0	0
		29-Jun-21		0	0
		05-Jul-21		0	0
		24-Aug-21		0	0
		30-Sep-21		0	0
		18-Oct-21		0	0
		02-Nov-21		0	0

APPENDIX E

BENTHIC INVERTEBRATE COMMUNITY

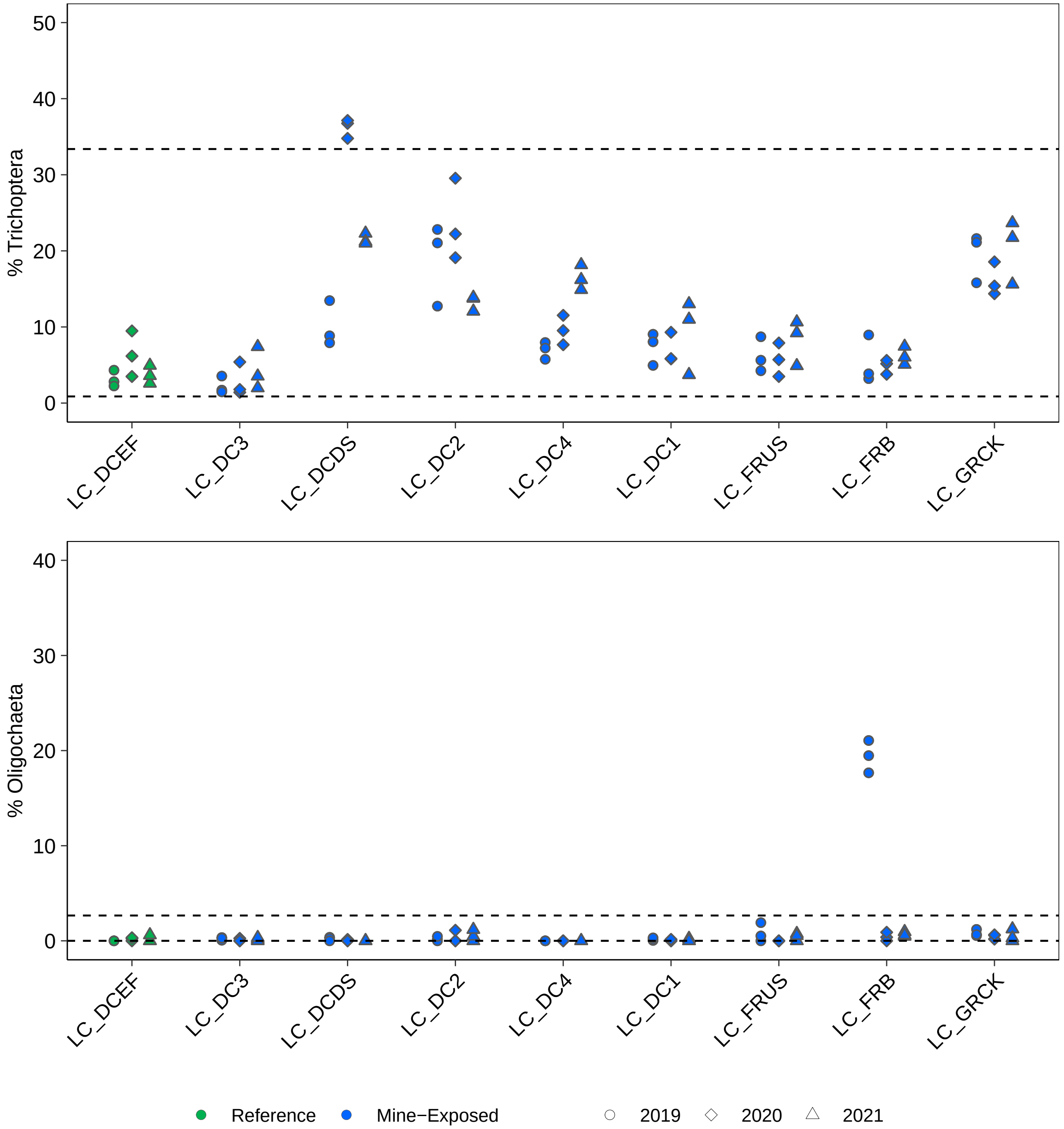


Figure E.1: Benthic Invertebrate Community Endpoints at Upper and Lower Dry Creek Sampling Areas, and at Upstream and Downstream Fording River Sampling Areas, Dry Creek LAEMP, September 2019 to 2021

Notes: Upper and Lower Dry Creek = LC_DCDS and LC_DC1, respectively, and upstream and downstream in the Fording River = FR_FR5/LC_FRUS and LC_FRB , respectively. Site specific normal ranges using regression models shown with grey shading (when available). Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines.

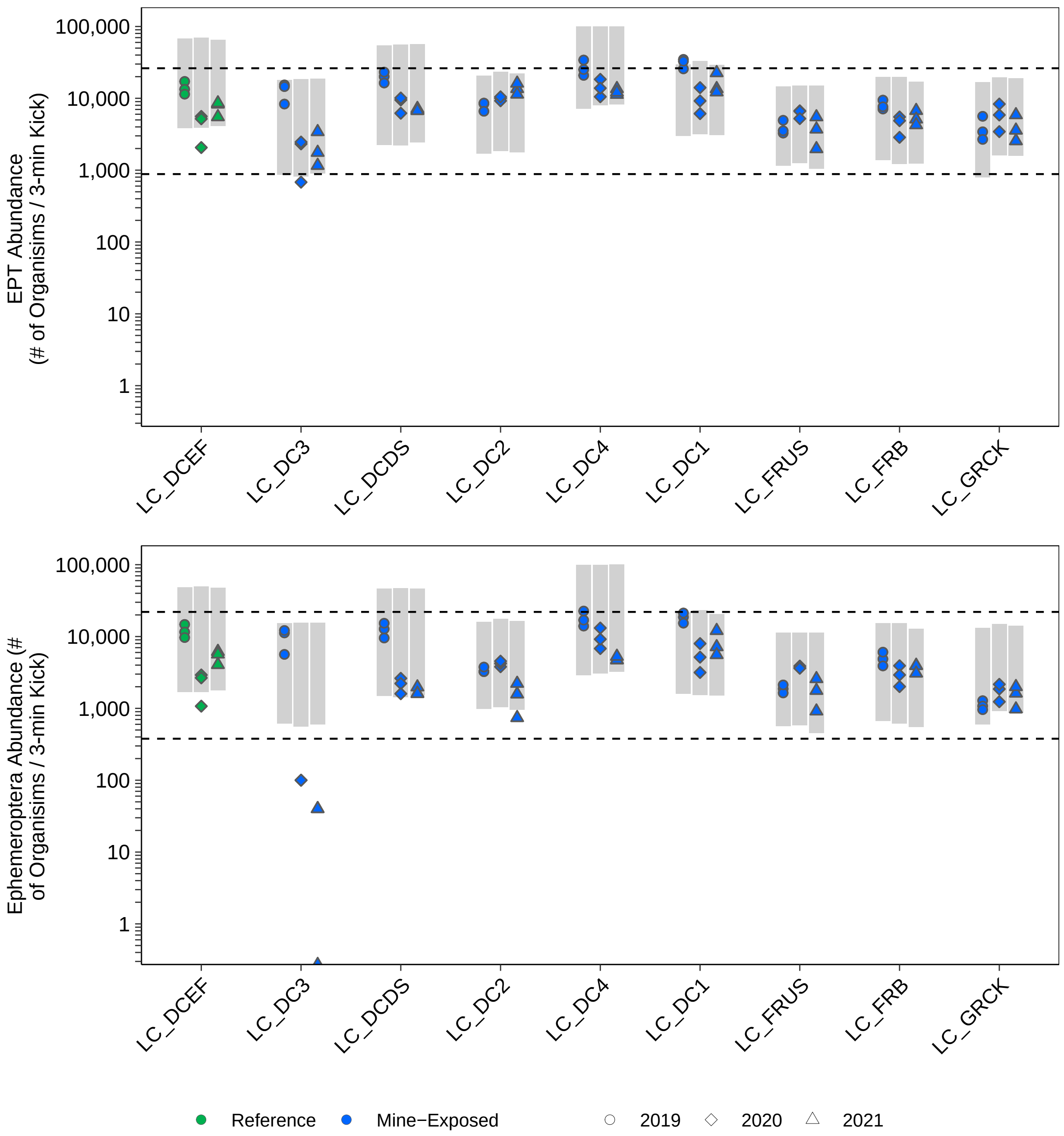


Figure E.1: **Benthic Invertebrate Community Endpoints at Upper and Lower Dry Creek Sampling Areas, and at Upstream and Downstream Fording River Sampling Areas, Dry Creek LAEMP, September 2019 to 2021**

Notes: Upper and Lower Dry Creek = LC_DCDS and LC_DC1, respectively, and upstream and downstream in the Fording River = FR_FR5/LC_FRUS and LC_FRB , respectively. Site specific normal ranges using regression models shown with grey shading (when available). Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines.

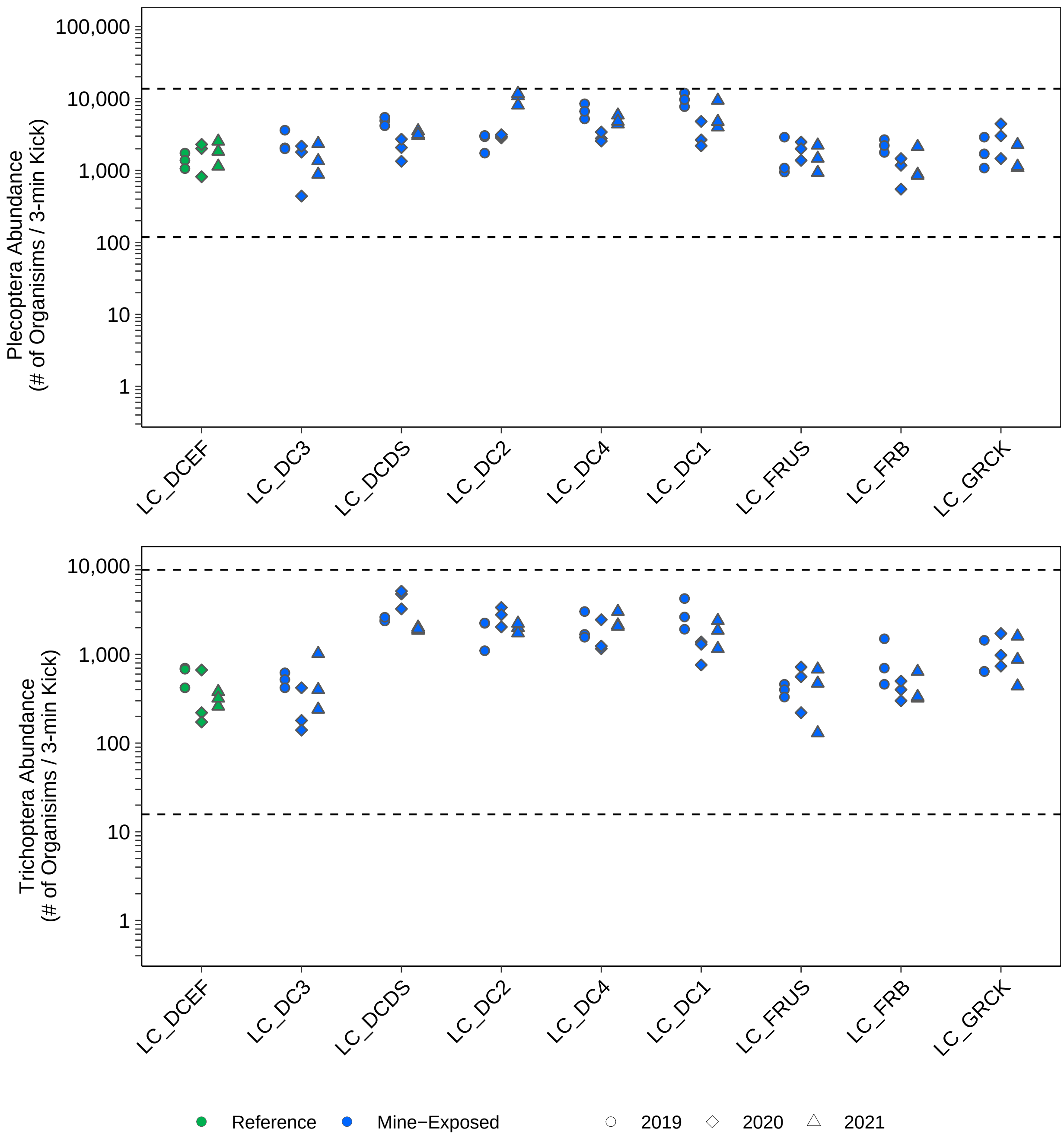


Figure E.1: Benthic Invertebrate Community Endpoints at Upper and Lower Dry Creek Sampling Areas, and at Upstream and Downstream Fording River Sampling Areas, Dry Creek LAEMP, September 2019 to 2021

Notes: Upper and Lower Dry Creek = LC_DCDS and LC_DC1, respectively, and upstream and downstream in the Fording River = FR_FR5/LC_FRUS and LC_FRB , respectively. Site specific normal ranges using regression models shown with grey shading (when available). Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines.

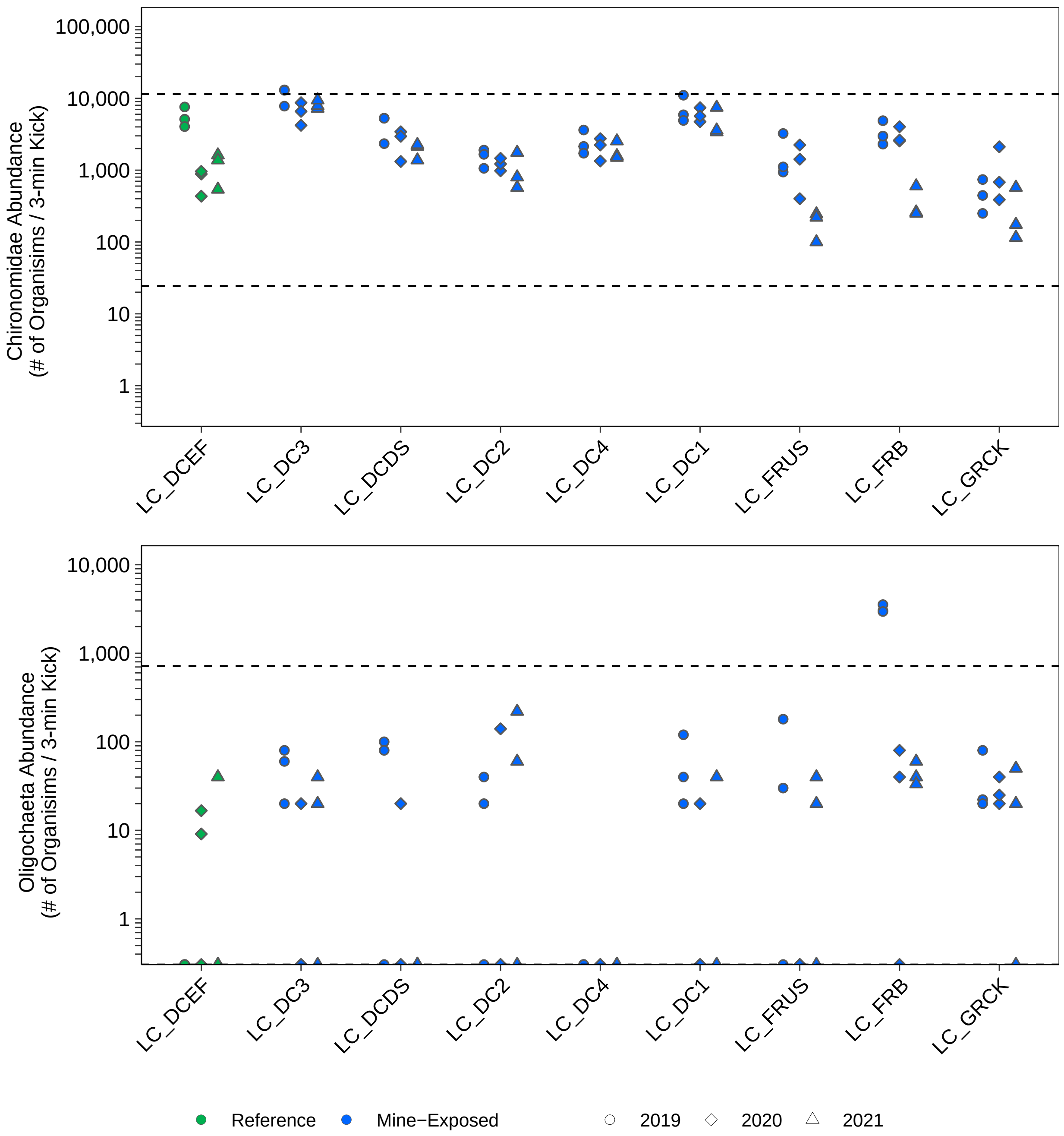


Figure E.1: Benthic Invertebrate Community Endpoints at Upper and Lower Dry Creek Sampling Areas, and at Upstream and Downstream Fording River Sampling Areas, Dry Creek LAEMP, September 2019 to 2021

Notes: Upper and Lower Dry Creek = LC_DCDS and LC_DC1, respectively, and upstream and downstream in the Fording River = FR_FR5/LC_FRUS and LC_FRB , respectively. Site specific normal ranges using regression models shown with grey shading (when available). Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines.

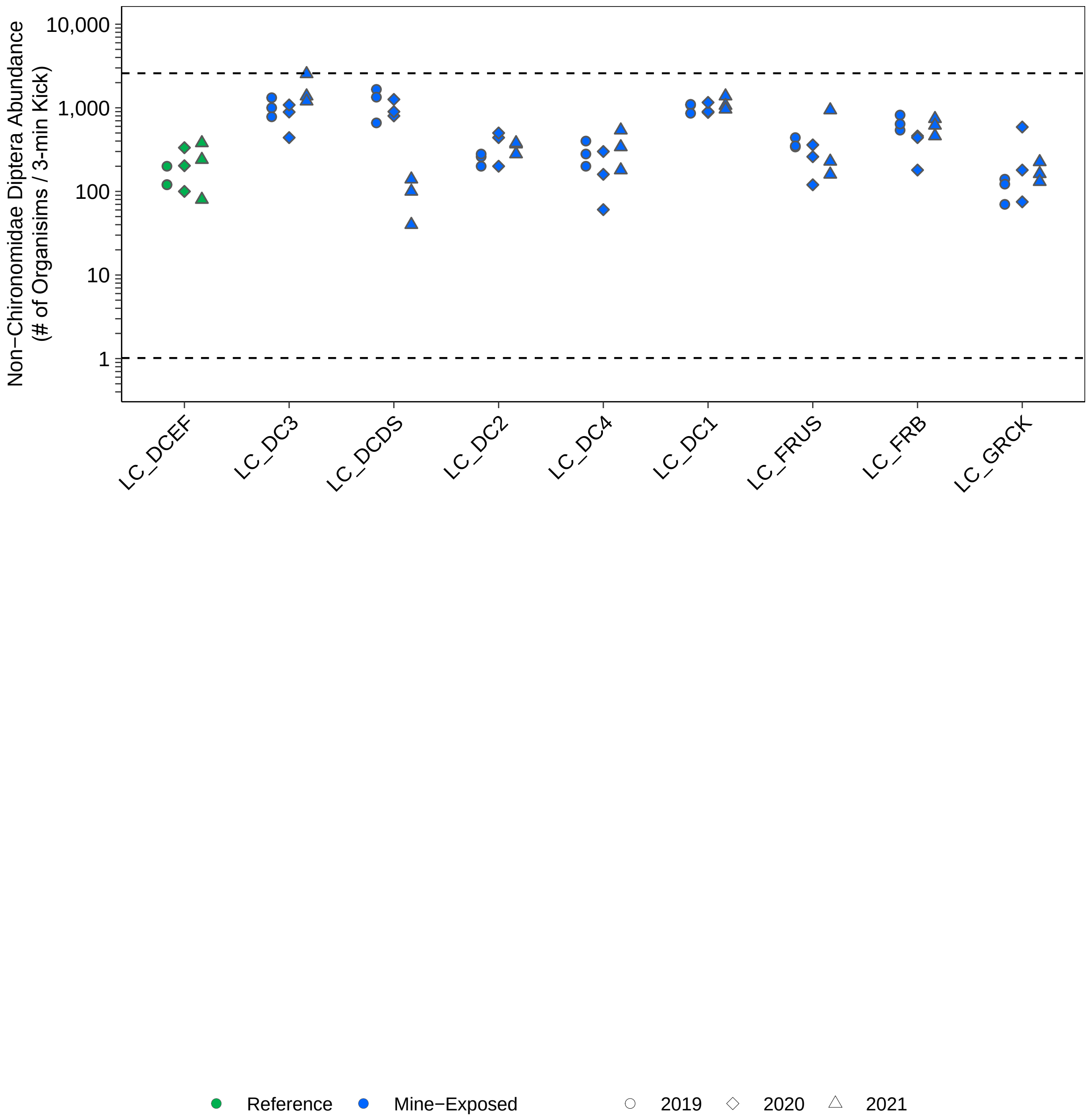


Figure E.1: **Benthic Invertebrate Community Endpoints at Upper and Lower Dry Creek Sampling Areas, and at Upstream and Downstream Fording River Sampling Areas, Dry Creek LAEMP, September 2019 to 2021**

Notes: Upper and Lower Dry Creek = LC_DCDS and LC_DC1, respectively, and upstream and downstream in the Fording River = FR_FR5/LC_FRUS and LC_FRB , respectively. Site specific normal ranges using regression models shown with grey shading (when available). Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines.

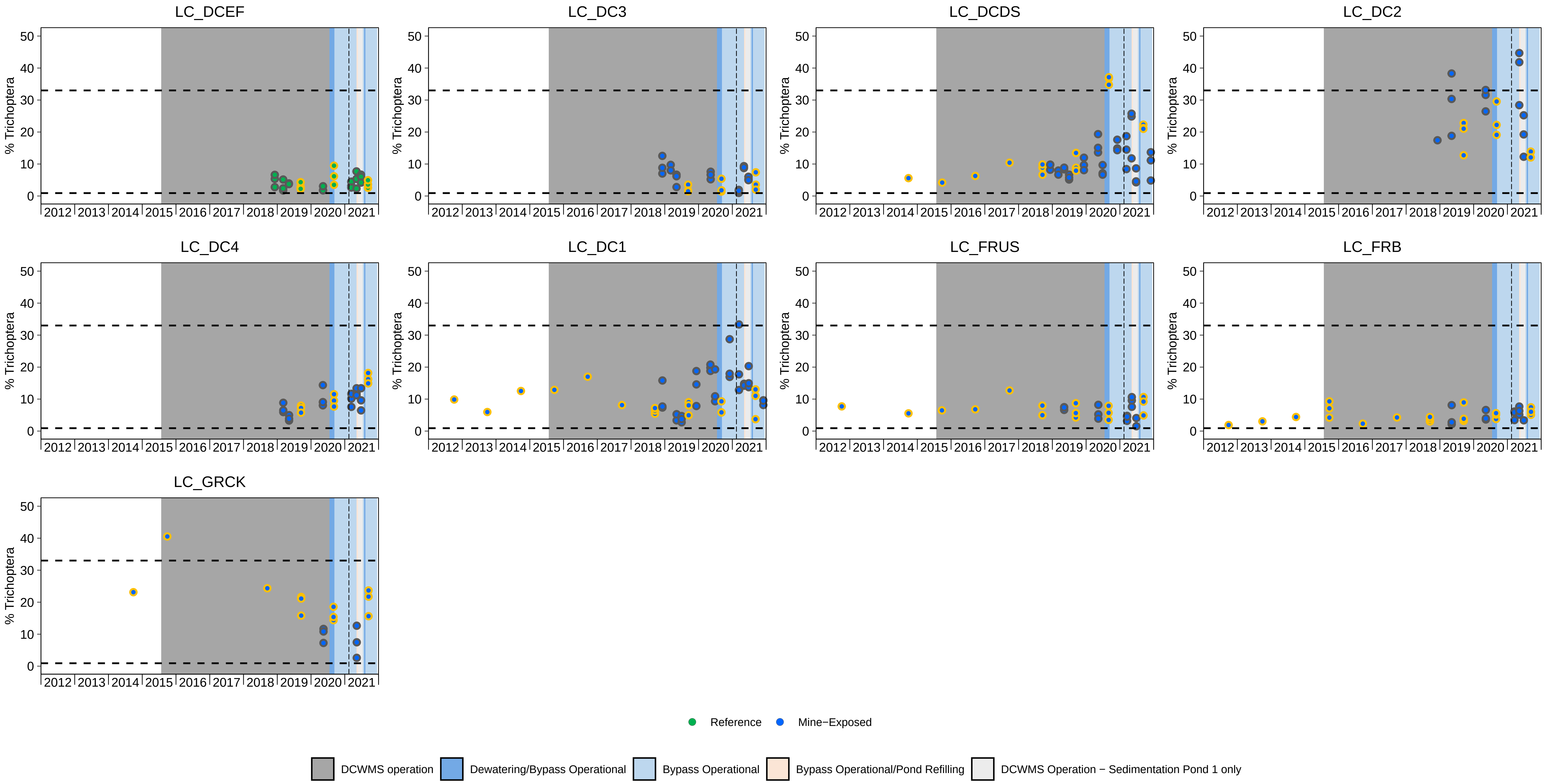


Figure E.2: **Benthic Invertebrate Community % Trichoptera from Dry Creek LAEMP Sampling Areas, 2012 to 2021**

Notes: Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

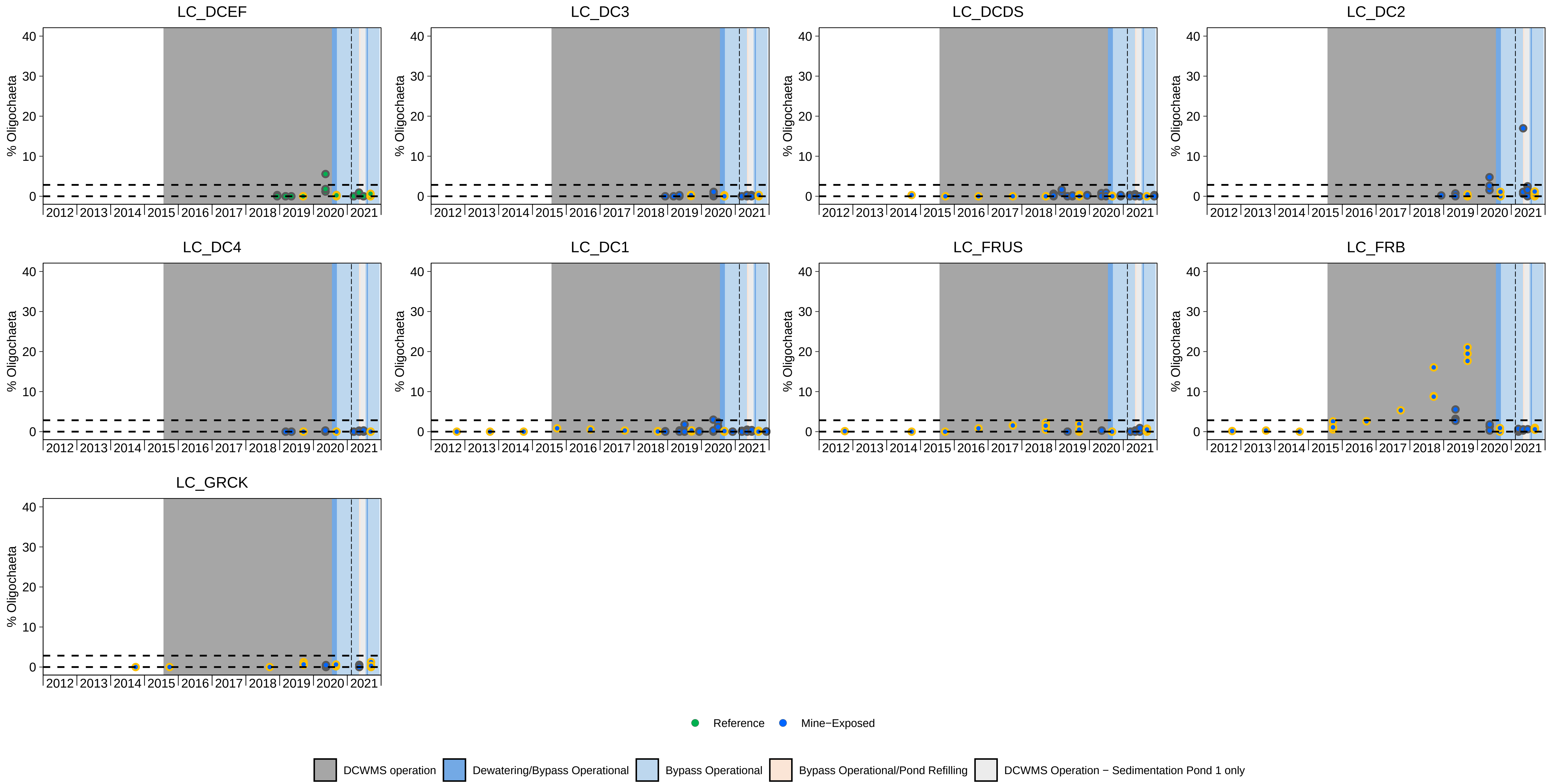


Figure E.3: Benthic Invertebrate Community % Oligochaeta from Dry Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

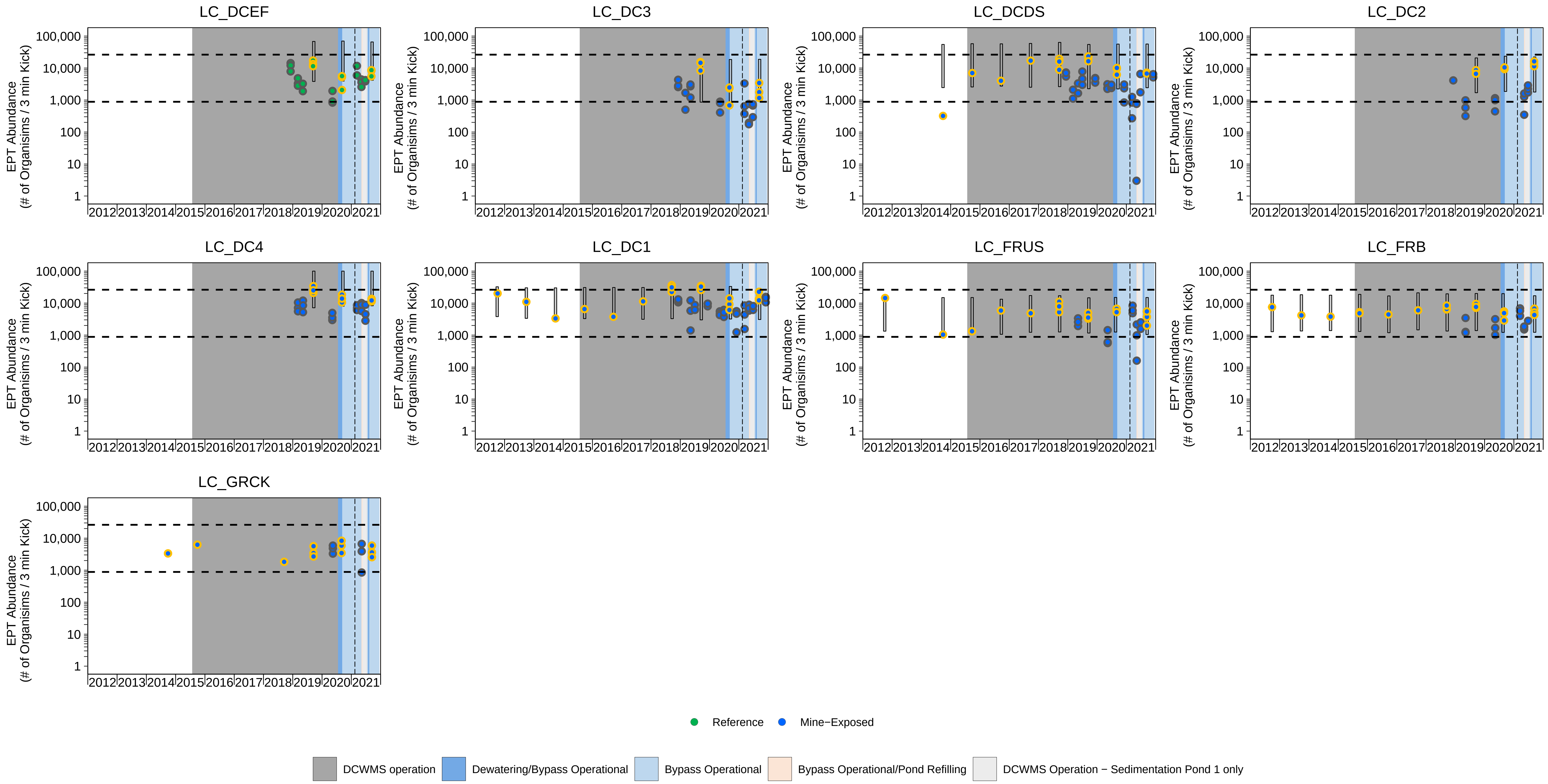


Figure E.4: **Benthic Invertebrate Community EPT Abundance (# of Organisms / 3 min Kick) from Dry Creek LAEMP Sampling Areas, 2012 to 2021**

Notes: Site specific normal ranges using regression models shown with grey shading and black rectangles (when available). Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

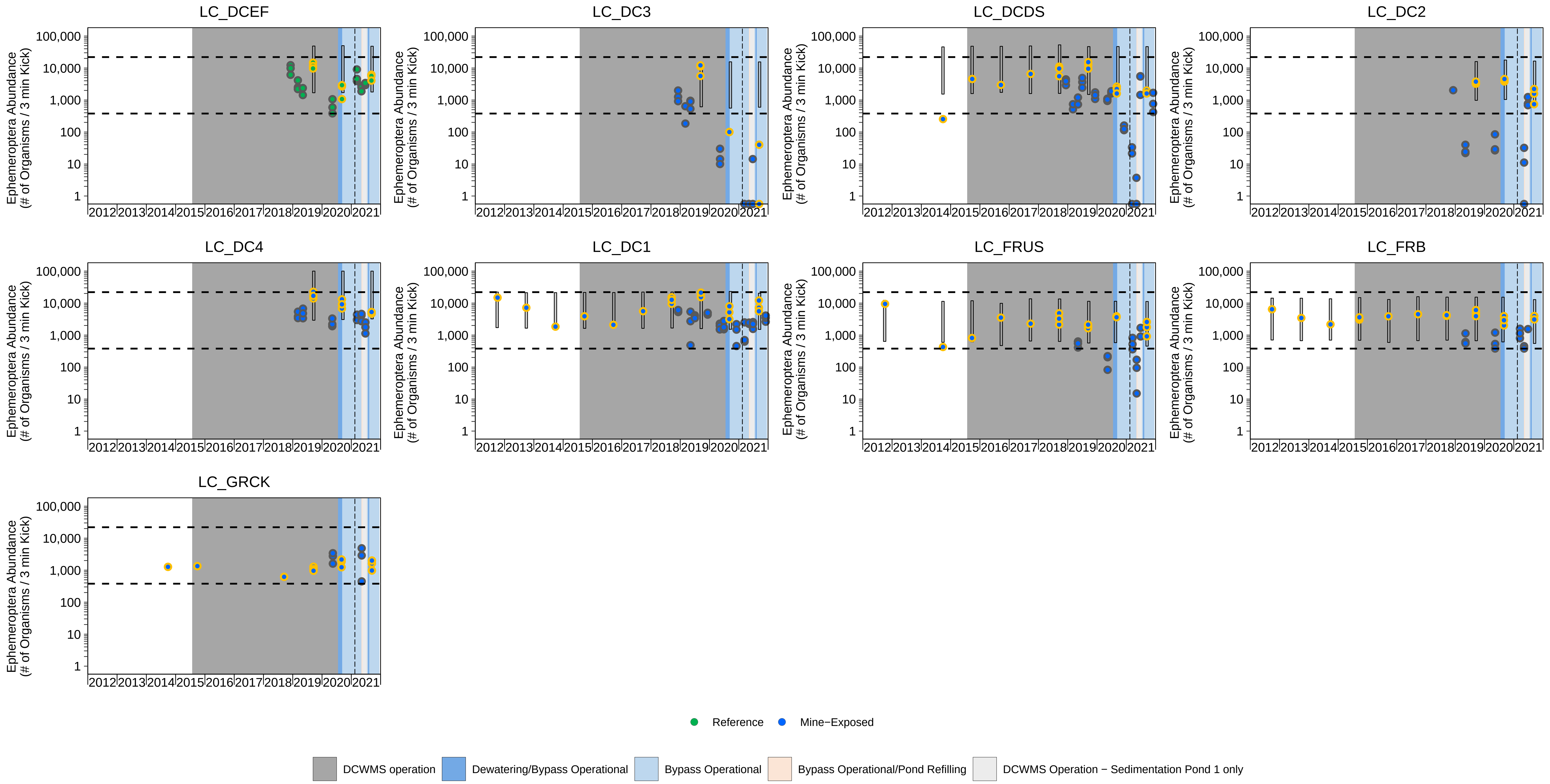


Figure E.5: **Benthic Invertebrate Community Ephemeroptera Abundance (# of Organisms / 3 min Kick) from Dry Creek LAEMP Sampling Areas, 2012 to 2021**

Notes: Site specific normal ranges using regression models shown with grey shading and black rectangles (when available). Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

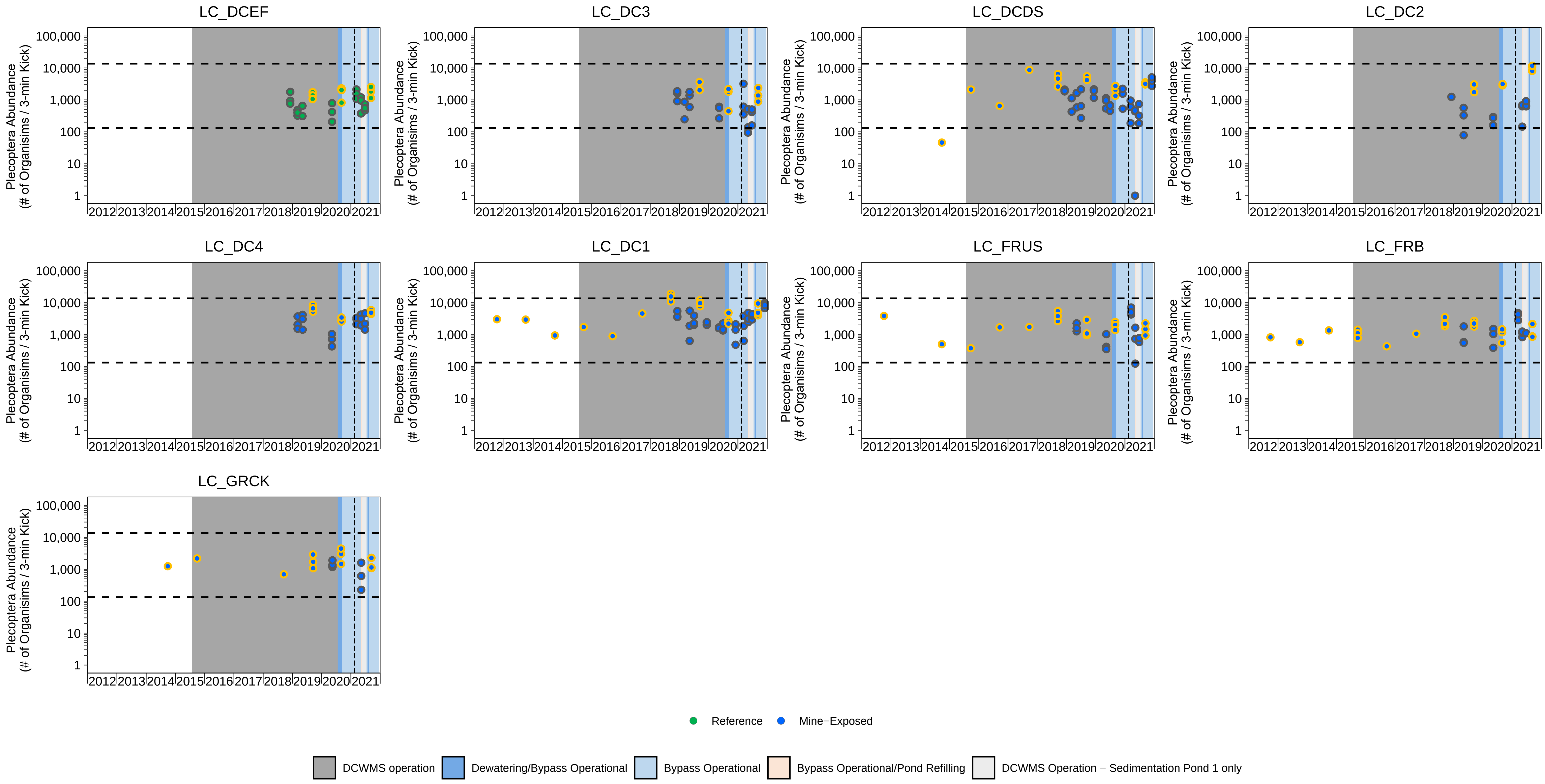


Figure E.6: **Benthic Invertebrate Community Plecoptera Abundance (# of Organisms / 3-min Kick) from Dry Creek LAEMP Sampling Areas, 2012 to 2021**

Notes: Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only applies to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

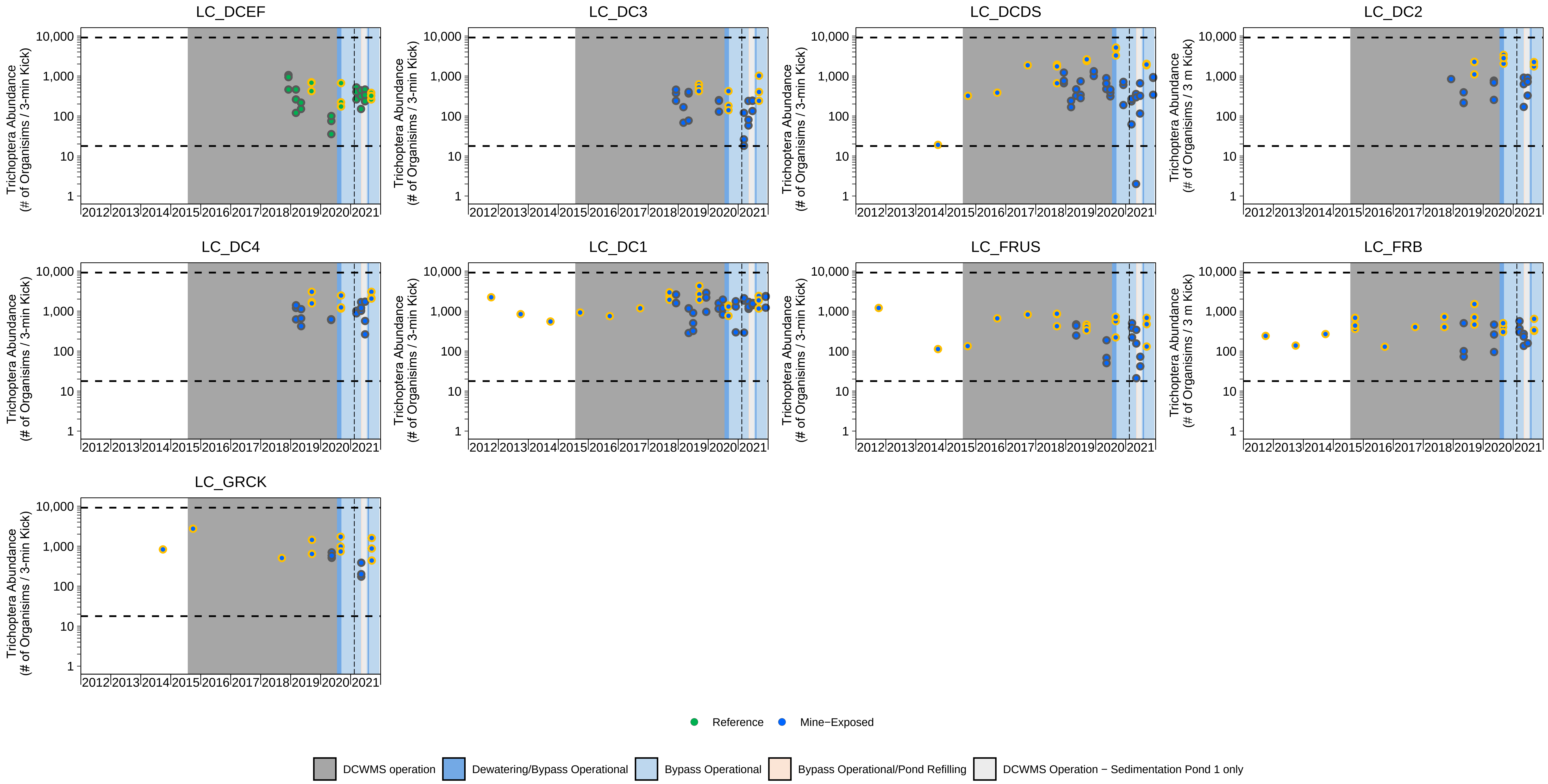


Figure E.7: Benthic Invertebrate Community Trichoptera Abundance (# of Organisms / 3-min Kick) from Dry Creek LAEMP Sampling Areas, 2012 to 2021

Notes: Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

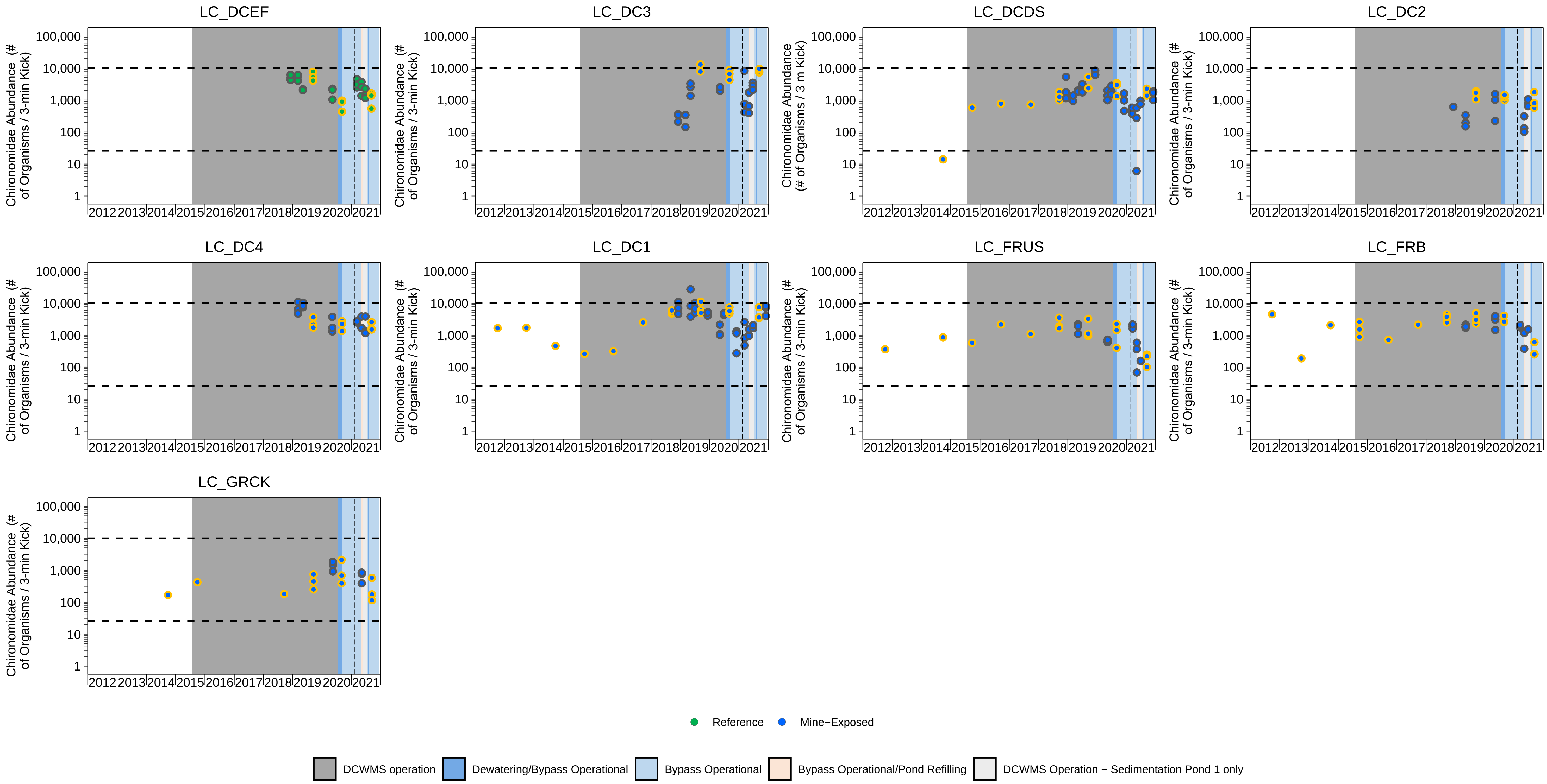


Figure E.8: **Benthic Invertebrate Community Chironomidae Abundance (# of Organisms / 3-min Kick) from Dry Creek LAEMP Sampling Areas, 2012 to 2021**

Notes: Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

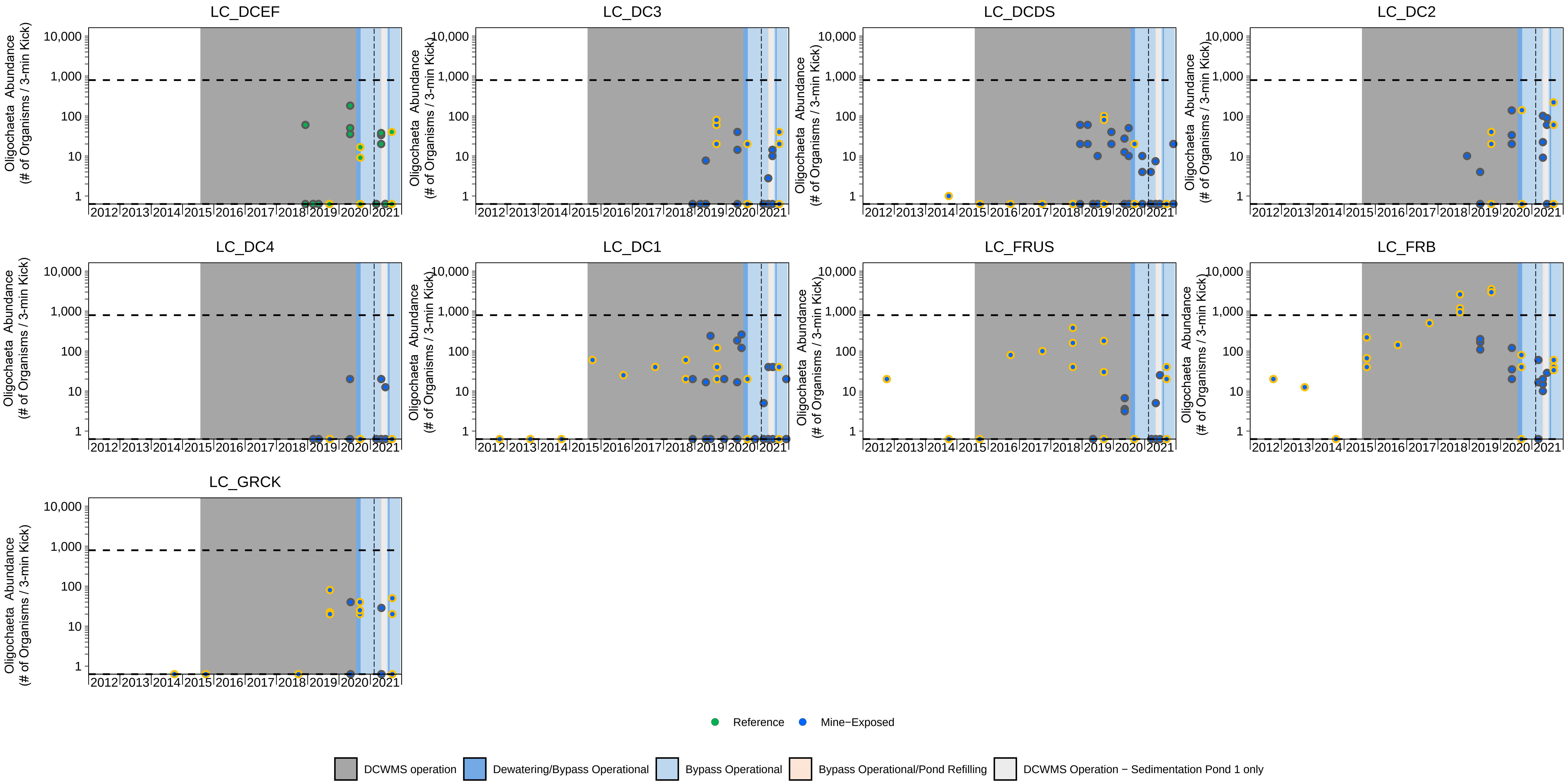


Figure E.9: **Benthic Invertebrate Community Oligochaeta Abundance (# of Organisms / 3-min Kick) from Dry Creek LAEMP Sampling Areas, 2012 to 2021**

Notes: Normal ranges using percentiles of reference areas from 2012 to 2019 shown as dashed horizontal lines. Orange outline indicates September sampling. Dashed vertical line indicates the Burnt Ridge North spoil failure. Dry Creek Water Management System (DCWMS) operational timelines are displayed for each monitoring area to provide context, but only apply to Dry Creek areas downstream of the DCWMS (LC_SPDC, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1).

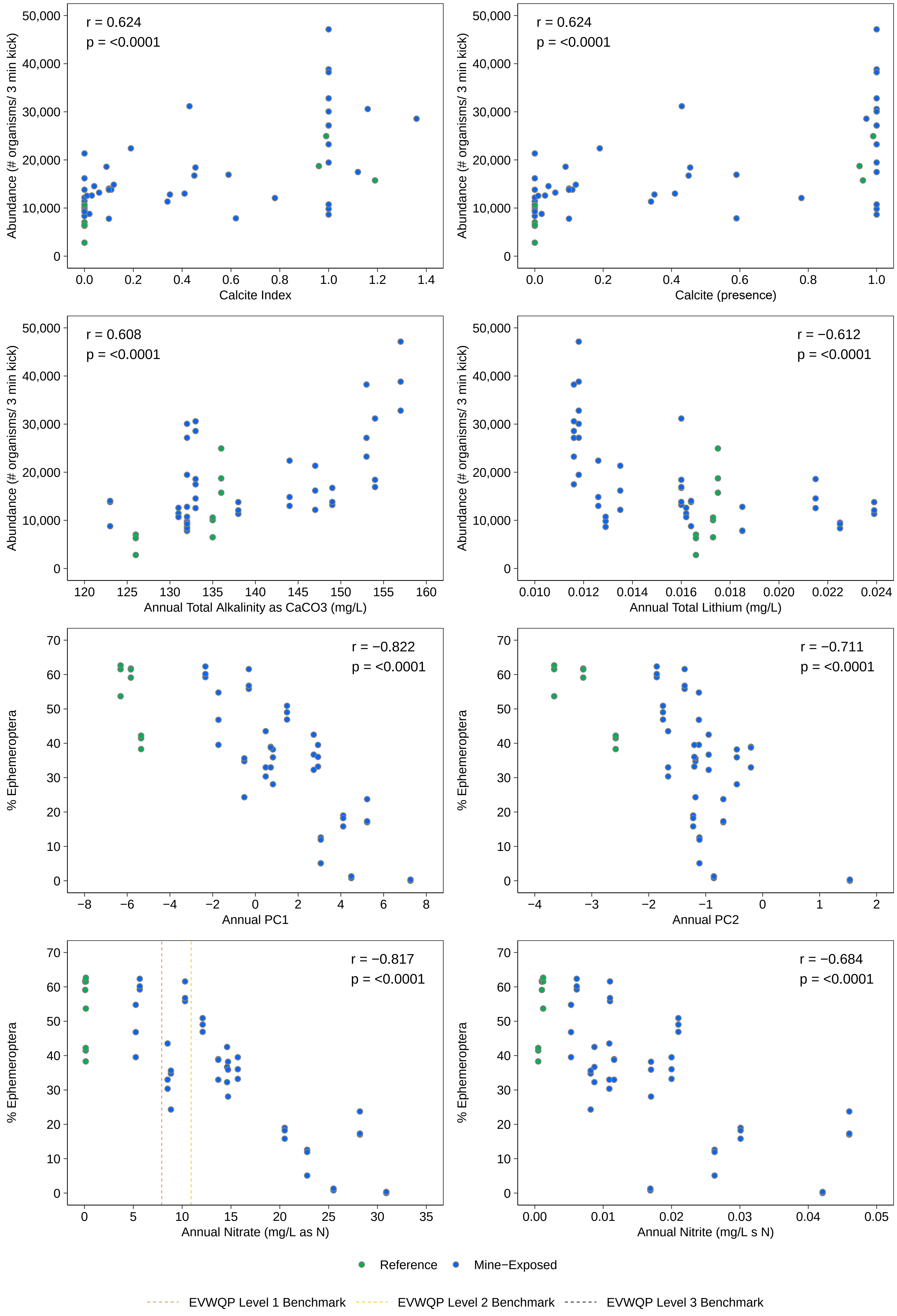


Figure E.10: Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Dry Creek, 2019 to 2021

Notes: Annual = averaged mean based on the previous year of water quality sampling. See methods for details. For Benthic Invertebrate Tissue, orange, yellow, and black represent Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP];Golder, 2014), respectively, for growth, reproduction, and survival of benthic invertebrates.

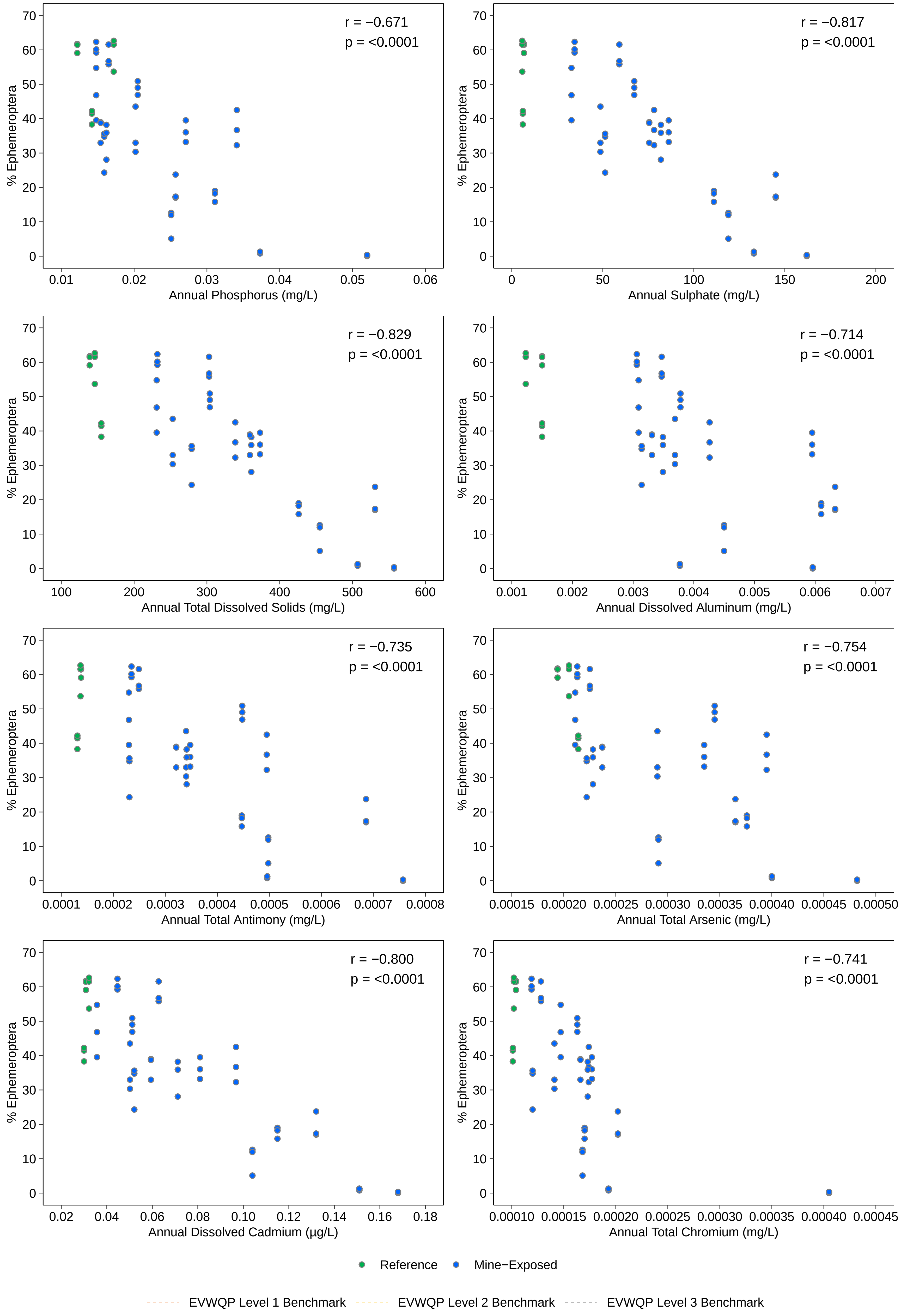


Figure E.10: Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Dry Creek, 2019 to 2021

Notes: Annual = averaged mean based on the previous year of water quality sampling. See methods for details. For Benthic Invertebrate Tissue, orange, yellow, and black represent Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP];Golder, 2014), respectively, for growth, reproduction, and survival of benthic invertebrates.

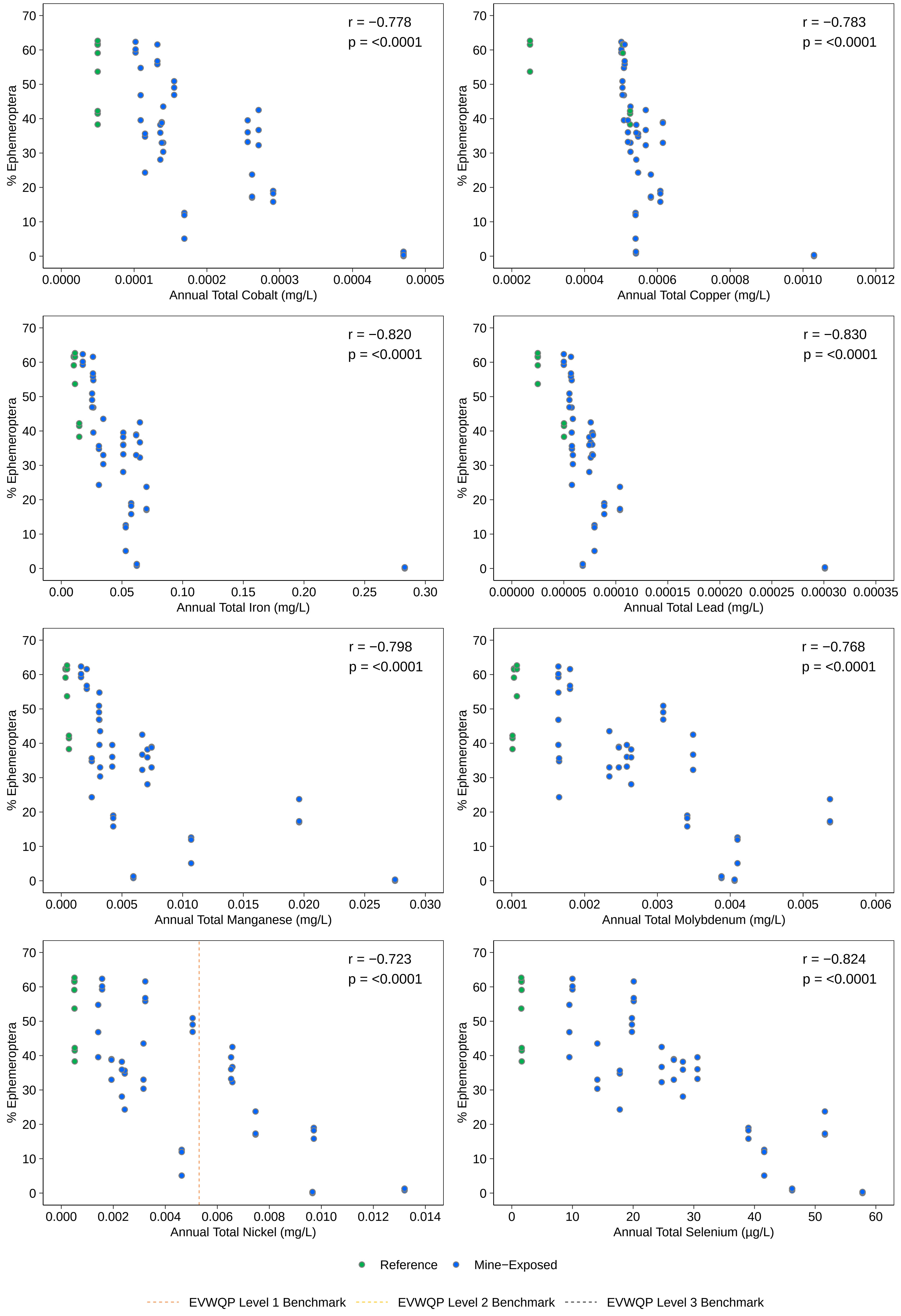


Figure E.10: **Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Dry Creek, 2019 to 2021**

Notes: Annual = averaged mean based on the previous year of water quality sampling. See methods for details. For Benthic Invertebrate Tissue, orange, yellow, and black represent Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP];Golder, 2014), respectively, for growth, reproduction, and survival of benthic invertebrates.

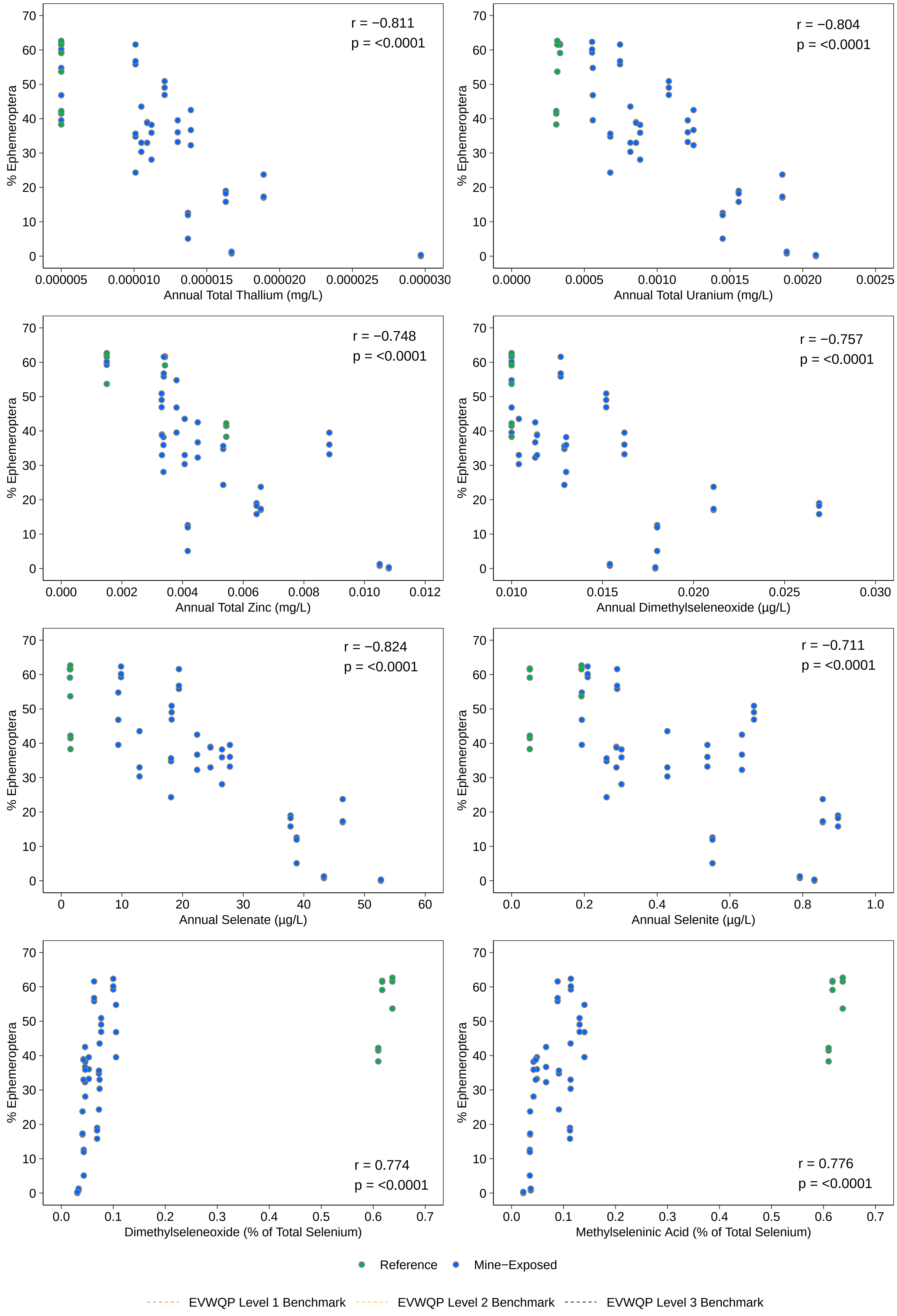


Figure E.10: **Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Dry Creek, 2019 to 2021**

Notes: Annual = averaged mean based on the previous year of water quality sampling. See methods for details. For Benthic Invertebrate Tissue, orange, yellow, and black represent Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP];Golder, 2014), respectively, for growth, reproduction, and survival of benthic invertebrates.

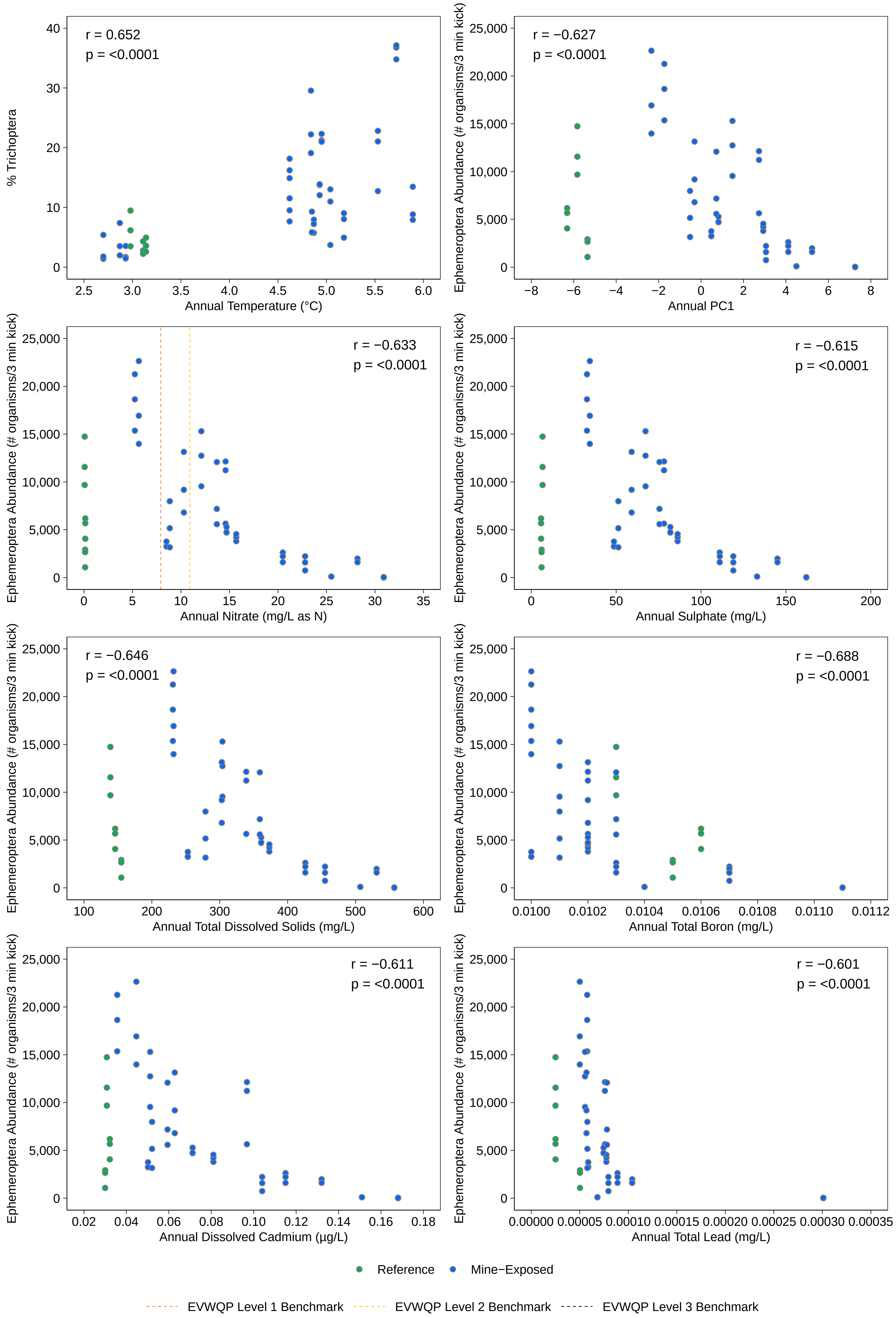


Figure E.10: Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Dry Creek, 2019 to 2021

Notes: Annual = averaged mean based on the previous year of water quality sampling. See methods for details. For Benthic Invertebrate Tissue, orange, yellow, and black represent Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP];Golder, 2014), respectively, for growth, reproduction, and survival of benthic invertebrates.

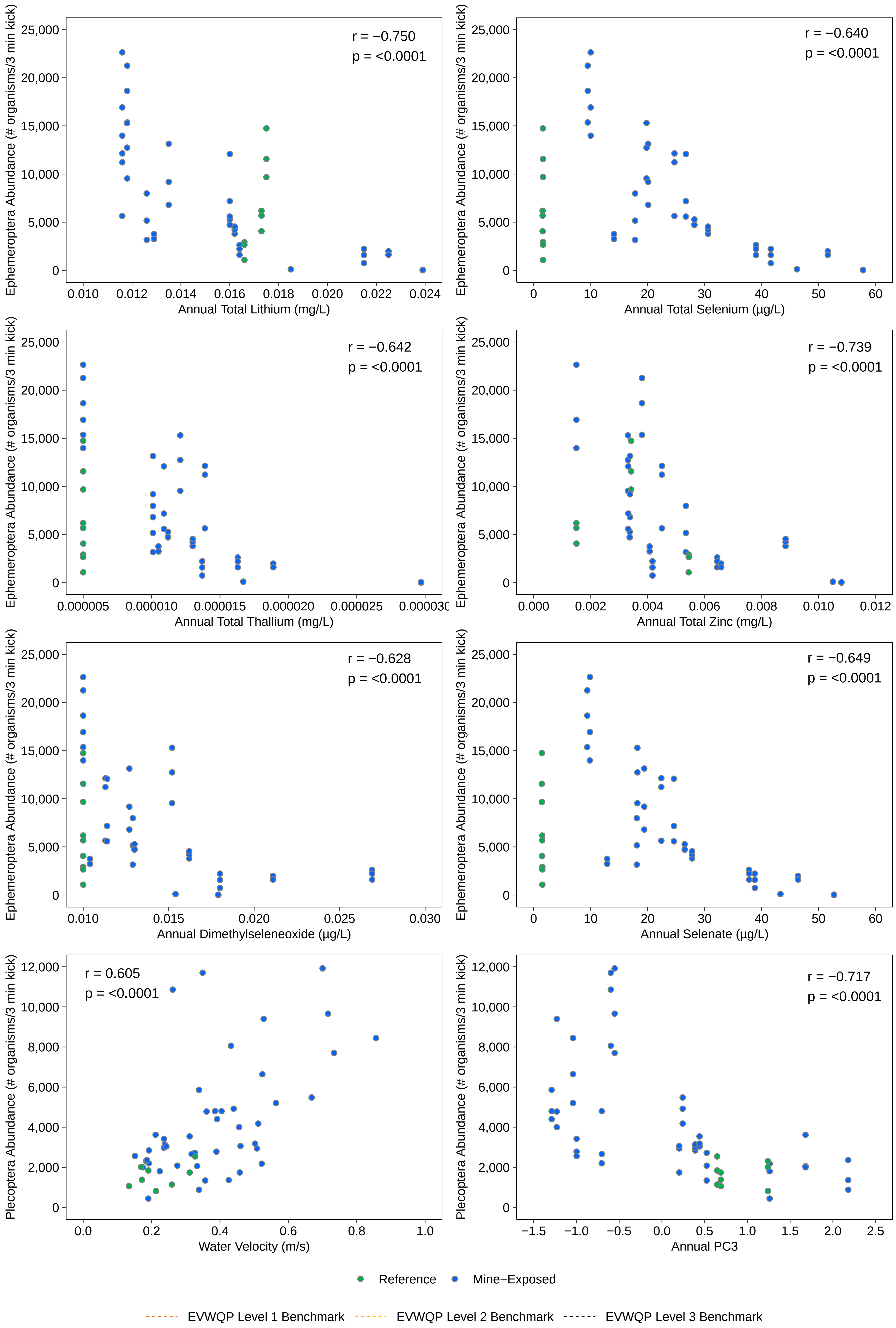


Figure E.10: **Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Dry Creek, 2019 to 2021**

Notes: Annual = averaged mean based on the previous year of water quality sampling. See methods for details. For Benthic Invertebrate Tissue, orange, yellow, and black represent Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP];Golder, 2014), respectively, for growth, reproduction, and survival of benthic invertebrates.

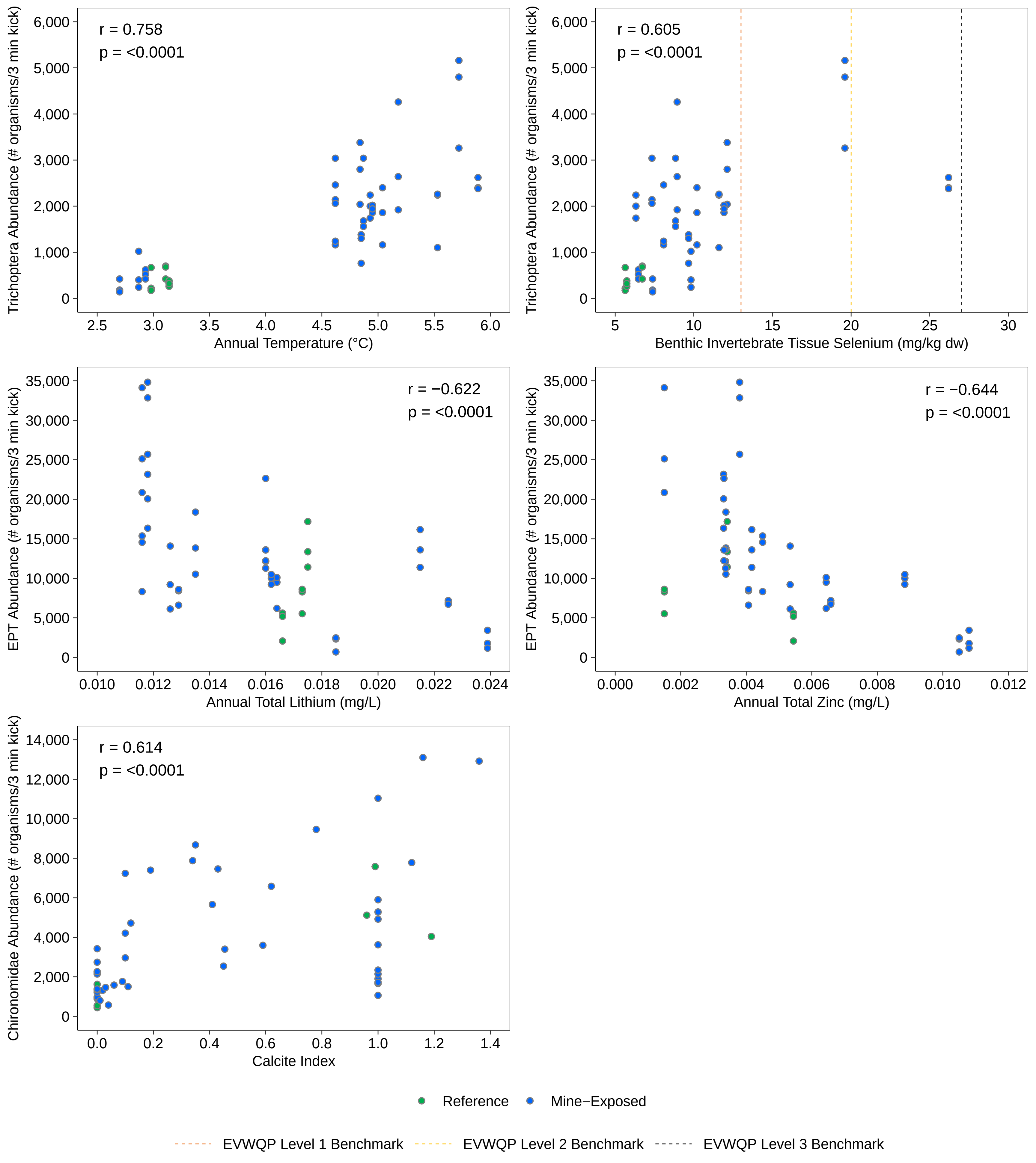


Figure E.10: **Scatterplots of Spearman's Correlation Relationships (r > 0.6 or r < −0.6) Between Benthic Invertebrate Community Metrics and Physical and Chemical Parameters, Dry Creek, 2019 to 2021**

Notes: Annual = averaged mean based on the previous year of water quality sampling. See methods for details. For Benthic Invertebrate Tissue, orange, yellow, and black represent Level 1, 2, and 3 Benchmarks (Elk Valley Water Quality Plan [EVWQP];Golder, 2014), respectively, for growth, reproduction, and survival of benthic invertebrates.

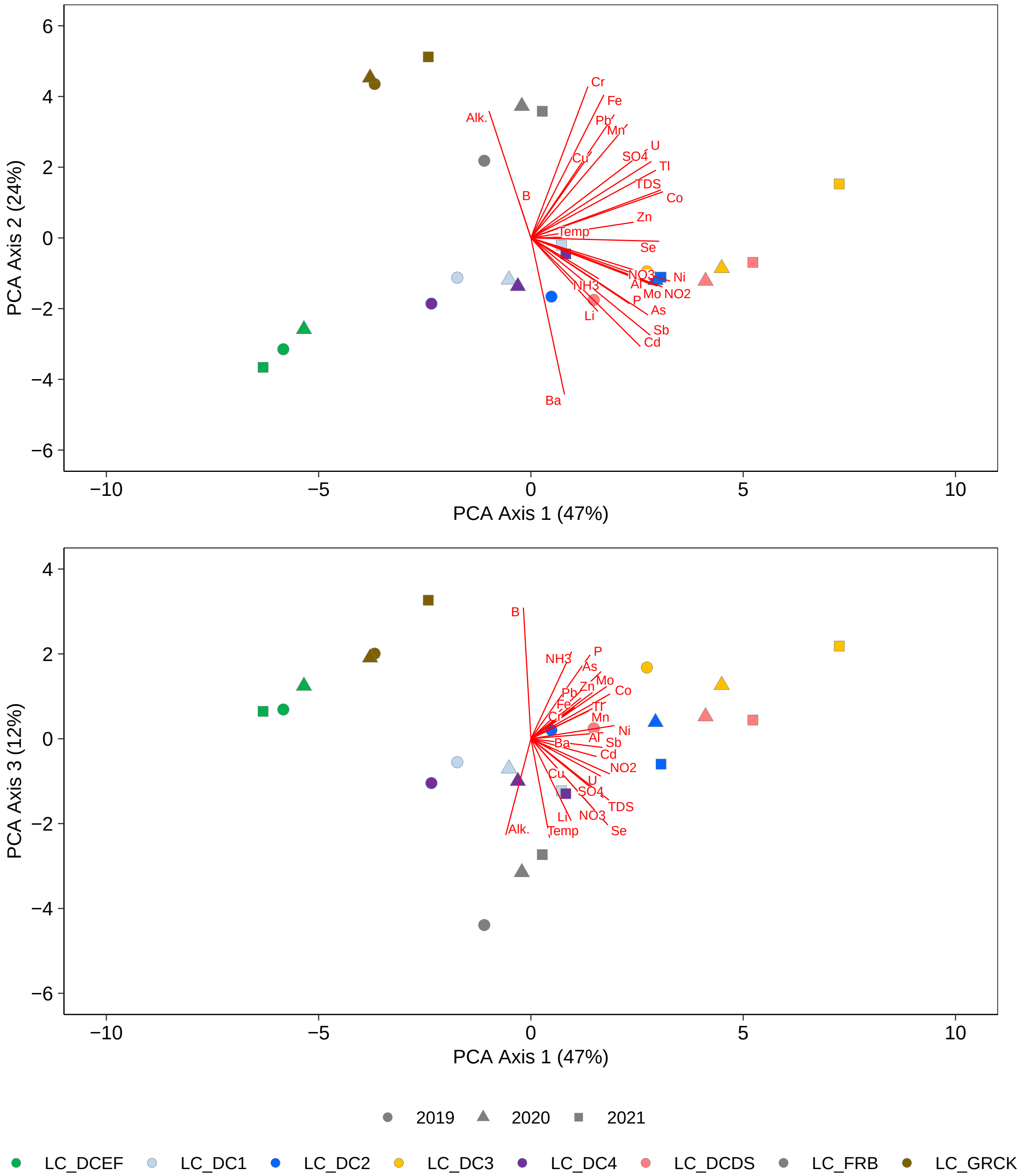


Figure E.11: Principal Components for Water Chemistry Concentrations, Dry Creek LAEMP, 2019 to 2021

Notes: Green symbols represent reference stations and other colours represents mine−exposed stations. PCA conducted on correlation matrix with log10−transformed concentrations. Vectors represent the PC loadings for each parameter (scaled). Parameters that had more than 25% censored data were excluded from the analyses.

Table E.1: Summary of Benthic Invertebrate Endpoints Collected by 3-Minute Kick and Sweep Sampling at Dry Creek and Fording River, March 2021

Area Type		Biological Area Code	Area	Date	Total Abundance (# org/ 3-min kick)	LPL Richness (# of taxa)	EPT		Ephemeroptera		Chironomidae		Non-Chironomidae Diptera		Oligochaeta		Trichoptera		Plecoptera	
							Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)
Dry Creek	Reference	**LC_DCEF**	LC_DCEF-1	08-Mar-21	16,300	28	11,680	0.717	9,040	0.555	4,460	0.274	120	0.00736	0	0	520	0.0319	2,120	0.130
			LC_DCEF-2		8,920	37	5,880	0.659	3,920	0.439	2,480	0.278	520	0.0583	0	0	400	0.0448	1,560	0.175
			LC_DCEF-3		9,860	34	5,920	0.600	4,580	0.465	3,040	0.308	780	0.0791	0	0	260	0.0264	1,080	0.110
Dry Creek	Mine-Exposed	**LC_DC3**	LC_DC3-1	08-Mar-21	12,440	28	3,300	0.265	0	0	8,200	0.659	840	0.0675	0	0	120	0.00965	3,180	0.256
			LC_DC3-2		940	29	368	0.391	0	0	416	0.443	138	0.147	0	0	18	0.0191	350	0.372
			LC_DC3-3		1,587	30	639	0.403	0	0	761	0.479	165	0.104	0	0	26	0.0164	613	0.386
		LC_DCDS	LC_DCDS-1	09-Mar-21	736	33	269	0.366	21.4	0.0291	457	0.621	7.14	0.00971	0	0	62	0.0841	186	0.252
			LC_DCDS-2		1,240	25	832	0.671	0	0	372	0.300	32.0	0.0258	4.00	0.00323	232	0.187	600	0.484
			LC_DCDS-3		1,839	22	1,250	0.680	33.3	0.0181	578	0.314	5.56	0.00302	0	0	267	0.145	950	0.517
		LC_DC4	LC_DC4-1	09-Mar-21	9,660	30	7,040	0.729	3,060	0.317	2,540	0.263	60.0	0.00621	0	0	980	0.101	3,000	0.311
			LC_DC4-2		8,760	31	6,080	0.694	2,960	0.338	2,480	0.283	200	0.0228	0	0	1,020	0.116	2,100	0.240
			LC_DC4-3		11,640	37	8,600	0.739	4,360	0.375	2,700	0.232	320	0.0275	0	0	880	0.0756	3,360	0.289
		LC_DC1	LC_DC1-1	10-Mar-21	2,260	34	1,550	0.686	625	0.277	475	0.210	230	0.102	5.00	0.00221	290	0.128	635	0.281
			LC_DC1-2		5,500	23	4,383	0.797	700	0.127	800	0.145	317	0.0576	0	0	1,833	0.333	1,850	0.336
			LC_DC1-3		11,840	31	8,440	0.713	2,500	0.211	2,540	0.215	840	0.0709	0	0	2,100	0.177	3,840	0.324
Fording River	Mine-Exposed	**LC_FRUS**	LC_FRUS-1	16-Mar-21	6,900	24	4,840	0.701	360	0.0522	1,880	0.272	100.0	0.0145	0	0	220	0.0319	4,260	0.617
			LC_FRUS-2		10,500	27	8,340	0.794	820	0.0781	1,600	0.152	380	0.0362	0	0	500	0.0476	7,020	0.669
			LC_FRUS-3		8,420	28	5,860	0.696	520	0.0618	2,160	0.257	260	0.0309	0	0	380	0.0451	4,960	0.589
		LC_FRB	LC_FRB-1	15-Mar-21	9,160	32	6,860	0.749	1,580	0.172	1,740	0.190	480	0.0524	0	0	560	0.0611	4,720	0.515
			LC_FRB-2		6,250	33	3,983	0.637	800	0.128	1,933	0.309	200	0.0320	16.7	0.00267	367	0.0587	2,817	0.451
			LC_FRB-3		8,720	39	5,760	0.661	1,140	0.131	2,080	0.239	500	0.0573	60.0	0.00688	300	0.0344	4,320	0.495

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

Table E.2: Summary of Benthic Invertebrate Endpoints Collected by 3-Minute Kick and Sweep Sampling at Dry Creek, Fording River, and Grace Creek, May 2021

Area Type		Biological Area Code	Area	Date	Total Abundance (# org/ 3-min kick)	LPL Richness (# of taxa)	EPT		Ephemeroptera		Chironomidae		Non-Chironomidae Diptera		Oligochaeta		Trichoptera		Plecoptera	
							Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)
Dry Creek	Reference	LC_DCEF	LC_DCEF-1	04-May-21	8,240	31	4,400	0.534	2,760	0.335	3,700	0.449	60.0	0.00728	20.0	0.00243	440	0.0534	1,200	0.146
			LC_DCEF-2		6,450	32	3,583	0.556	2,483	0.385	2,600	0.403	167	0.0258	33.3	0.00517	150	0.0233	950	0.147
			LC_DCEF-3		4,062	28	2,562	0.631	1,875	0.462	1,362	0.335	100	0.0246	37.5	0.00923	312	0.0769	375	0.0923
Dry Creek	Mine-Exposed	LC_DC3	LC_DC3-1	03-May-21	2,554	27	754	0.295	0	0	1,700	0.666	92.3	0.0361	0	0	238	0.0934	515	0.202
			LC_DC3-2		664	41	196	0.295	0	0	390	0.587	72.0	0.108	0	0	58.0	0.0873	138	0.208
			LC_DC3-3		900	34	175	0.194	0	0	644	0.716	61.1	0.0679	2.78	0.00309	80.6	0.0895	94.4	0.105
		LC_DCDS	LC_DCDS-1	04-May-21	17.0	6	3.00	0.176	0	0	6.00	0.353	7.00	0.412	0	0	2.00	0.118	1.00	0.0588
			LC_DCDS-2		1,430	40	796	0.557	3.70	0.00259	570	0.399	48.1	0.0337	7.41	0.00518	356	0.249	437	0.306
			LC_DCDS-3		1,140	32	757	0.664	0	0	277	0.243	96.7	0.0848	0	0	293	0.257	463	0.406
		LC_DC2	LC_DC2-1	06-May-21	1,500	32	1,255	0.836	0	0	132	0.0879	95.5	0.0636	9.09	0.00606	627	0.418	627	0.418
			LC_DC2-2		2,039	29	1,600	0.785	11.1	0.00545	311	0.153	88.9	0.0436	22.2	0.0109	911	0.447	678	0.332
			LC_DC2-3		595	38	346	0.582	32.0	0.0538	101	0.170	42.6	0.0716	101	0.170	169	0.284	145	0.244
		LC_DC4	LC_DC4-1	05-May-21	14,280	40	10,060	0.704	4,140	0.290	3,820	0.268	400	0.0280	0	0	1,680	0.118	4,240	0.297
			LC_DC4-2		7,620	32	5,660	0.743	2,720	0.357	1,700	0.223	180	0.0236	20.0	0.00262	1,020	0.134	1,920	0.252
			LC_DC4-3		10,720	37	8,920	0.832	4,600	0.429	1,640	0.153	160	0.0149	0	0	1,200	0.112	3,120	0.291
		LC_DC1	LC_DC1-1	05-May-21	8,040	33	5,820	0.724	2,240	0.279	980	0.122	1,200	0.149	40.0	0.00498	1,140	0.142	2,440	0.303
			LC_DC1-2		11,500	33	8,920	0.776	2,440	0.212	1,520	0.132	1,040	0.0904	0	0	1,700	0.148	4,780	0.416
			LC_DC1-3		8,960	30	6,880	0.768	2,460	0.275	940	0.105	1,140	0.127	0	0	1,280	0.143	3,140	0.350
Fording River	Mine-Exposed	LC_FRUS	LC_FRUS-1	07-May-21	277	30	159	0.574	15.0	0.0542	68.0	0.245	33.0	0.119	0	0	21.0	0.0758	123	0.444
			LC_FRUS-2		1,620	43	985	0.608	95.0	0.0586	363	0.224	212	0.131	5.00	0.00309	155	0.0957	735	0.454
			LC_FRUS-3		3,200	43	2,150	0.672	170	0.0531	580	0.181	320	0.100	0	0	340	0.106	1,640	0.512
		LC_FRB	LC_FRB-1	06-May-21	3,520	39	1,500	0.426	400	0.114	1,170	0.332	640	0.182	10.0	0.00284	270	0.0767	830	0.236
			LC_FRB-2		2,630	43	1,720	0.654	450	0.171	375	0.143	445	0.169	15.0	0.00570	135	0.0513	1,135	0.432
			LC_FRB-3		3,650	46	1,850	0.507	380	0.104	1,170	0.321	350	0.0959	20.0	0.00548	230	0.0630	1,240	0.340
Grace Creek	Reference	LC_GRCK	LC_GRCK-1	07-May-21	1,369	37	846	0.618	446	0.326	388	0.284	119	0.0871	0	0	173	0.126	227	0.166
			LC_GRCK-2		5,171	35	3,886	0.751	2,886	0.558	771	0.149	471	0.0912	28.6	0.00552	386	0.0746	614	0.119
			LC_GRCK-3		7,700	32	6,640	0.862	4,840	0.629	840	0.109	200	0.0260	0	0	200	0.0260	1,600	0.208

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

Table E.3: **Summary of Benthic Invertebrate Endpoints Collected by 3-Minute Kick and Sweep Sampling at Dry Creek and Fording River, June 2021**

Area Type		Biological Area Code	Area	Date	Total Abundance (# org/ 3-min kick)	LPL Richness (# of taxa)	EPT		Ephemeroptera		Chironomidae		Non-Chironomidae Diptera		Oligochaeta		Trichoptera		Plecoptera	
							Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)
Dry Creek	Reference	**LC_DCEF**	LC_DCEF-1	22-Jun-21	6,880	37	4,100	0.596	2,920	0.424	2,280	0.331	440	0.0640	0	0	460	0.0669	720	0.105
			LC_DCEF-2		5,550	29	3,833	0.691	3,033	0.547	1,383	0.249	300	0.0541	0	0	333	0.0601	467	0.0841
			LC_DCEF-3		5,567	23	4,200	0.754	3,417	0.614	1,167	0.210	200	0.0359	0	0	233	0.0419	550	0.0988
Dry Creek	Mine-Exposed	**LC_DC3**	LC_DC3-1	21-Jun-21	4,557	35	671	0.147	14.3	0.00313	3,486	0.765	243	0.0533	14.3	0.00313	243	0.0533	414	0.0909
			LC_DC3-2		3,990	25	740	0.185	0	0	2,800	0.702	350	0.0877	10.0	0.00251	240	0.0602	500	0.125
			LC_DC3-3		2,692	24	292	0.108	0	0	2,083	0.774	308	0.115	0	0	133	0.0495	158	0.0588
		LC_DCDS	LC_DCDS-1	22-Jun-21	7,640	33	6,560	0.859	5,580	0.730	960	0.126	80.0	0.0105	0	0	660	0.0864	320	0.0419
			LC_DCDS-2		7,480	30	6,480	0.866	5,420	0.725	740	0.0989	240	0.0321	0	0	320	0.0428	740	0.0989
			LC_DCDS-3		2,523	32	1,746	0.692	1,446	0.573	738	0.293	38.5	0.0152	0	0	115	0.0457	185	0.0732
		LC_DC2	LC_DC2-1	23-Jun-21	2,650	37	1,725	0.651	775	0.292	775	0.292	133	0.0503	0	0	325	0.123	625	0.236
			LC_DC2-2		3,567	36	2,244	0.629	689	0.193	1,056	0.296	156	0.0436	88.9	0.0249	900	0.252	656	0.184
			LC_DC2-3		3,740	43	2,870	0.767	1,240	0.332	640	0.171	150	0.0401	60.0	0.0160	720	0.193	910	0.243
		LC_DC4	LC_DC4-1	23-Jun-21	12,840	37	8,840	0.688	2,500	0.195	3,820	0.298	160	0.0125	0	0	1,720	0.134	4,620	0.360
			LC_DC4-2		5,900	32	4,517	0.766	1,767	0.299	1,317	0.223	33.3	0.00565	0	0	567	0.0960	2,183	0.370
			LC_DC4-3		4,062	37	2,812	0.692	1,125	0.277	1,150	0.283	62.5	0.0154	12.5	0.00308	262	0.0646	1,425	0.351
		LC_DC1	LC_DC1-1	24-Jun-21	7,880	37	6,120	0.777	1,560	0.198	1,640	0.208	120	0.0152	0	0	1,600	0.203	2,960	0.376
			LC_DC1-2		10,200	37	7,940	0.778	2,560	0.251	2,060	0.202	160	0.0157	40.0	0.00392	1,400	0.137	3,980	0.390
			LC_DC1-3		10,300	39	8,120	0.788	2,220	0.216	2,040	0.198	40.0	0.00388	40.0	0.00388	1,540	0.150	4,360	0.423
Fording River	Mine-Exposed	**LC_FRUS**	LC_FRUS-2	25-Jun-21	1,772	34	1,561	0.881	906	0.511	156	0.0878	22.2	0.0125	0	0	72.2	0.0408	583	0.329
			LC_FRUS-3		2,750	28	2,508	0.912	1,683	0.612	158	0.0576	8.33	0.00303	25.0	0.00909	41.7	0.0152	783	0.285
		LC_FRB	LC_FRB-1		4,671	34	2,800	0.599	1,543	0.330	1,514	0.324	71.4	0.0153	28.6	0.00612	157	0.0336	1,100	0.235

Notes: LPL= Lowest Practical Level; EPT= Ephemeroptera, Plecoptera, and Trichoptera. Due to safety concerns from high water levels, only two samples were collected from LC_FRUS and only one sample was collected from LC_FRB.

Table E.4: Summary of Benthic Invertebrate Endpoints Collected by 3-Minute Kick and Sweep Sampling at Dry Creek, Fording River, and Grace Creek, September 2021

Area Type		Biological Area Code	Area	Date	Total Abundance (# org/ 3-min kick)	LPL Richness (# of taxa)	EPT		Ephemeroptera		Chironomidae		Non-Chironomidae Diptera		Oligochaeta		Trichoptera		Plecoptera	
							Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)
Dry Creek	Reference	LC_DCEF	LC_DCEF-1	07-Sep-21	10,040	31	8,280	0.825	6,180	0.616	1,620	0.161	80.0	0.00797	0	0	260	0.0259	1,840	0.183
			LC_DCEF-2		10,580	42	8,600	0.813	5,680	0.537	1,380	0.130	380	0.0359	0	0	380	0.0359	2,540	0.240
			LC_DCEF-3		6,480	36	5,520	0.852	4,060	0.627	540	0.0833	240	0.0370	40.0	0.00617	320	0.0494	1,140	0.176
Dry Creek	Mine-Exposed	LC_DC3	LC_DC3-1	10-Sep-21	13,780	40	3,420	0.248	40.0	0.00290	7,235	0.525	2,545	0.185	20.0	0.00145	1,020	0.0740	2,360	0.171
			LC_DC3-2		11,340	33	1,760	0.155	0	0	7,880	0.695	1,380	0.122	0	0	400	0.0353	1,360	0.120
			LC_DC3-3		12,080	34	1,160	0.0960	40.0	0.00331	9,460	0.783	1,200	0.0993	40.0	0.00331	240	0.0199	880	0.0728
		LC_DCDS	LC_DCDS-1	10-Sep-21	8,340	35	6,880	0.825	1,980	0.237	1,380	0.165	40.0	0.00480	0	0	1,860	0.223	3,040	0.365
			LC_DCDS-2		9,520	42	7,180	0.754	1,620	0.170	2,140	0.225	140	0.0147	0	0	2,020	0.212	3,540	0.372
			LC_DCDS-3		9,240	40	6,720	0.727	1,600	0.173	2,260	0.245	100.0	0.0108	0	0	1,940	0.210	3,180	0.344
		LC_DC2	LC_DC2-1	09-Sep-21	14,540	32	13,600	0.935	740	0.0509	572	0.0394	368	0.0253	0	0	2,000	0.138	10,860	0.747
			LC_DC2-2		12,540	40	11,380	0.907	1,580	0.126	800	0.0638	280	0.0223	60.0	0.00478	1,740	0.139	8,060	0.643
			LC_DC2-3		18,580	39	16,160	0.870	2,220	0.119	1,760	0.0947	380	0.0205	220	0.0118	2,240	0.121	11,700	0.630
		LC_DC4	LC_DC4-1	09-Sep-21	16,740	39	13,600	0.812	4,700	0.281	2,540	0.152	540	0.0323	0	0	3,040	0.182	5,860	0.350
			LC_DC4-2		13,200	35	11,280	0.855	4,740	0.359	1,580	0.120	340	0.0258	0	0	2,140	0.162	4,400	0.333
			LC_DC4-3		13,820	38	12,140	0.878	5,280	0.382	1,500	0.109	180	0.0130	0	0	2,060	0.149	4,800	0.347
		LC_DC1	LC_DC1-1	07-Sep-21	18,420	43	13,580	0.737	7,180	0.390	3,400	0.185	1,380	0.0749	0	0	2,400	0.130	4,000	0.217
			LC_DC1-2		16,920	42	12,220	0.722	5,580	0.330	3,595	0.212	1,065	0.0629	40.0	0.00236	1,860	0.110	4,780	0.283
			LC_DC1-3		31,160	42	22,640	0.727	12,080	0.388	7,460	0.239	960	0.0308	0	0	1,160	0.0372	9,400	0.302
Fording River	Mine-Exposed	LC_FRUS	LC_FRUS-1	12-Sep-21	4,429	31	3,714	0.839	1,771	0.400	100.0	0.0226	229	0.0516	0	0	471	0.106	1,471	0.332
			LC_FRUS-2		2,655	42	1,980	0.746	915	0.345	245	0.0923	160	0.0603	20.0	0.00753	130	0.0490	935	0.352
			LC_FRUS-3		7,380	39	5,500	0.745	2,580	0.350	220	0.0298	940	0.127	40.0	0.00542	680	0.0921	2,240	0.304
		LC_FRB	LC_FRB-1	11-Sep-21	8,600	40	6,740	0.784	3,960	0.460	600	0.0698	740	0.0860	40.0	0.00465	640	0.0744	2,140	0.249
			LC_FRB-2		6,300	35	5,120	0.813	3,920	0.622	260	0.0413	460	0.0730	60.0	0.00952	320	0.0508	880	0.140
			LC_FRB-3		5,533	34	4,267	0.771	3,083	0.557	250	0.0452	617	0.111	33.3	0.00602	333	0.0602	850	0.154
Grace Creek	Reference	LC_GRCK	LC_GRCK-1	13-Sep-21	4,025	44	3,588	0.891	1,625	0.404	175	0.0435	162	0.0404	50.0	0.0124	875	0.217	1,088	0.270
			LC_GRCK-2		2,808	44	2,554	0.910	977	0.348	115	0.0411	131	0.0466	0	0	438	0.156	1,138	0.405
			LC_GRCK-3		6,760	45	5,880	0.870	2,000	0.296	574	0.0849	226	0.0334	20.0	0.00296	1,600	0.237	2,280	0.337

Notes: LPL= Lowest Practical Level; EPT= Ephemeroptera, Plecoptera, and Trichoptera. LPL for richness for September is preliminary, waiting on data finalization.

Table E.5: **Summary of Benthic Invertebrate Endpoints Collected by 3-Minute Kick and Sweep Sampling at Dry Creek and Fording River, November and December 2021**

Area Type		Biological Area Code	Area	Date	Total Abundance (# org/ 3-min kick)	LPL Richness (# of taxa)	EPT		Ephemeroptera		Chironomidae		Non-Chironomidae Diptera		Oligochaeta		Trichoptera		Plecoptera	
							Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)
Dry Creek	Mine-Exposed	**LC_DCDS**	LC_DCDS-1	30-Nov-21	6,580	36	5,320	0.809	1,680	0.255	1,000	0.152	220	0.0334	20	0.00304	900	0.137	2,740	0.416
			LC_DCDS-2		7,020	26	5,100	0.726	760	0.108	1,860	0.265	40.0	0.00570	0	0	340	0.0484	4,000	0.570
			LC_DCDS-3		8,440	34	6,440	0.763	420	0.0498	1,700	0.201	300	0.0355	0	0	940	0.111	5,080	0.602
		LC_DC1	LC_DC1-1	01-Dec-21	14,980	42	10,580	0.706	2,620	0.175	3,960	0.264	400	0.0267	0	0	1,220	0.0814	6,740	0.450
			LC_DC1-2		24,720	38	15,620	0.632	3,480	0.141	7,240	0.293	1,820	0.0736	0	0	2,380	0.0963	9,760	0.395
			LC_DC1-3		23,960	41	14,620	0.610	4,080	0.170	8,120	0.339	1,180	0.0492	20	0.000835	2,280	0.0952	8,260	0.345

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

Table E.6: Statistical Comparison of Benthic Invertebrate Community Endpoints in Dry Creek, May 2019 to 2021

Endpoint	Transformation	Year	Area	Year x Area	Area		Do endpoints differ between years for each area?[a]			Do endpoints for exposed areas differ from the reference area within each year?[b]		
							2019 vs 2020	2019 vs 2021	2020 vs 2021	2019	2020	2021
Abundance	rank	<0.001	<0.001	<0.001	Reference	LC_DCEF	ns	ns	ns	nc	nc	nc
					Mine-Exposed	LC_DC3	ns	-3.2	-6.0	ns	ns	-2.1
						LC_SPDC	-1.1	-	-	ns	ns	-
						LC_DCDS	2.7	-2.3	-9.2	ns	ns	-2.0
						LC_DC2	12	ns	ns	ns	ns	-1.9
						LC_DC4	ns	ns	ns	11	ns	ns
						LC_DC1	ns	ns	ns	16	1.9	ns
LPL Richness	rank	0.023	0.006	0.321	Reference	LC_DCEF	-1.1	ns	ns	nc		
					Mine-Exposed	LC_DC3				ns		
						LC_SPDC				-4.0		
						LC_DCDS				ns		
						LC_DC2				ns		
						LC_DC4				ns		
						LC_DC1				ns		
% EPT	none	0.012	<0.001	<0.001	Reference	LC_DCEF	ns	ns	2.0	nc	nc	nc
					Mine-Exposed	LC_DC3	-9.2	-7.6	ns	ns	ns	-6.1
						LC_SPDC	ns	-	-	-5.9	-3.4	-
						LC_DCDS	ns	ns	ns	ns	ns	ns
						LC_DC2	ns	ns	2.8	ns	ns	ns
						LC_DC4	ns	4.3	ns	ns	ns	ns
						LC_DC1	2.1	2.2	ns	ns	3.8	ns
% Ephemeroptera	rank	<0.001	<0.001	<0.001	Reference	LC_DCEF	-2.6	ns	1.7	nc	nc	nc
					Mine-Exposed	LC_DC3	-5.6	-5.8	ns	-3.9	-3.1	-5.2
						LC_SPDC	ns	-	-	-6.9	-3.0	-
						LC_DCDS	ns	-23	-200	-3.3	ns	-5.2
						LC_DC2	ns	ns	ns	-6.4	-2.8	-5.1
						LC_DC4	5.9	ns	ns	ns	2.4	ns
						LC_DC1	10	9.5	ns	-5.4	ns	-1.5
% Plecoptera	log10	0.056	<0.001	0.031	Reference	LC_DCEF	ns	ns	ns	nc	nc	nc
					Mine-Exposed	LC_DC3	ns	ns	ns	ns	ns	ns
						LC_SPDC	1.6	-	-	-6.9	-5.5	-
						LC_DCDS	ns	ns	ns	ns	ns	ns
						LC_DC2	ns	ns	2.3	ns	ns	ns
						LC_DC4	ns	ns	3.5	ns	ns	ns
						LC_DC1	ns	1.4	ns	ns	ns	3.9
% Trichoptera	rank	<0.001	<0.001	<0.001	Reference	LC_DCEF	ns	ns	41	nc	nc	nc
					Mine-Exposed	LC_DC3	ns	3.8	1.6	ns	56	1.0
						LC_SPDC	ns	-	-	ns	ns	-
						LC_DCDS	16	41	ns	30	154	5.6
						LC_DC2	ns	ns	ns	165	347	10
						LC_DC4	5.9	9.0	ns	ns	84	1.8
						LC_DC1	245	152	ns	ns	209	2.6
% Oligochaeta	rank	<0.001	<0.001	0.348	Reference	LC_DCEF	Positive	Positive	ns	nc		
					Mine-Exposed	LC_DC3				ns		
						LC_SPDC				-0.81		
						LC_DCDS				ns		
						LC_DC2				ns		
						LC_DC4				-0.81		
						LC_DC1				ns		
% Chironomidae	log10	<0.001	<0.001	<0.001	Reference	LC_DCEF	ns	ns	ns	nc	nc	nc
					Mine-Exposed	LC_DC3	ns	ns	ns	ns	ns	ns
						LC_SPDC	ns	-	-	ns	ns	-
						LC_DCDS	ns	ns	ns	ns	ns	ns
						LC_DC2	1.0	-0.93	-3.6	ns	ns	-7.4
						LC_DC4	ns	-7.0	ns	ns	ns	ns
						LC_DC1	-2.6	-4.0	-2.3	ns	-9.1	-8.1
% Non-Chironomidae Diptera	log10	<0.001	<0.001	0.031	Reference	LC_DCEF	ns	ns	ns	nc	nc	nc
					Mine-Exposed	LC_DC3	ns	ns	ns	ns	5.2	1.9
						LC_SPDC	ns	-	-	7.3	9.9	-
						LC_DCDS	ns	ns	6.8	ns	ns	2.6
						LC_DC2	-3.9	ns	ns	4.6	ns	ns
						LC_DC4	ns	ns	ns	ns	ns	ns
						LC_DC1	ns	ns	4.0	ns	ns	2.7
EPT Abundance	rank	0.003	<0.001	0.001	Reference	LC_DCEF	ns	ns	ns	nc	nc	nc
					Mine-Exposed	LC_DC3	ns	-4.5	-6.0	ns	ns	-2.8
						LC_SPDC	ns	-	-	-2.3	-7.8	-
						LC_DCDS	ns	-1.4	-9.1	ns	ns	-2.3
						LC_DC2	3.6	ns	ns	-2.0	ns	-1.9
						LC_DC4	ns	ns	ns	5.9	25	ns
						LC_DC1	ns	ns	ns	ns	36	ns
Ephemeroptera Abundance	rank	<0.001	<0.001	<0.001	Reference	LC_DCEF	ns	ns	2.1	nc	nc	nc
					Mine-Exposed	LC_DC3	-12	-12	-2.2	ns	-1.9	-6.1
						LC_SPDC	ns	-	-	-2.7	-1.9	-
						LC_DCDS	ns	-2.8	-11	ns	ns	-6.1
						LC_DC2	ns	ns	-7.1	-2.7	ns	-6.0
						LC_DC4	ns	ns	ns	4.2	5.3	ns
						LC_DC1	ns	ns	-1.5	ns	4.4	ns
Chironomidae Abundance	rank	<0.001	<0.001	<0.001	Reference	LC_DCEF	ns	ns	ns	nc	nc	nc
					Mine-Exposed	LC_DC3	1.7	ns	-4.4	ns	ns	ns
						LC_SPDC	-5.8	-	-	ns	ns	-
						LC_DCDS	ns	-15	-2.2	ns	ns	-1.4
						LC_DC2	27	ns	-1.2	-19	ns	-1.5
						LC_DC4	ns	-5.6	-1.4	60	ns	ns
						LC_DC1	-0.93	-1.1	-7.8	60	ns	ns

▨ p-value < 0.1.

🟩 MOD > 2.

🟦 MOD < -2.

Notes: "nc" = no relevant comparison; "ns" = not significant; "-"= no data collected. In cases where MOD could not be calculated (SD$_{LC\_DCEF}$ = 0), only directionality is shown.

[a] MOD = MCTyr$_2$-MCTyr$_1$/SDyr$_1$ where Measure of Central Tendency (MCT) is the mean for untransformed data, geometric mean for log10-transformed data and median for rank transformed data. Median Absolute Deviation (MAD) was used instead of standard deviation for rank-transformed data.

[b] MOD = MCT$_{stn}$-MCT$_{LC\_DCEF}$/SD$_{LC\_DCEF}$ where MCT is the mean for untransformed data, geometric mean for log10-transformed data and median for rank transformed data. Median Absolute Deviation (MAD) was used instead of standard deviation for rank-transformed data.

Table E.7: Statistical Comparison of Benthic Invertebrate Community Endpoints in Fording River, May 2019 to 2021

Endpoint	Transformation	Year	Area	Year x Area	Area		Do endpoints differ among years for each area?[a]			Do endpoints differ from LC_FRUS within a year?[b]		
							2019 vs 2020	2019 vs 2021	2020 vs 2021	2019	2020	2021
Abundance	none	0.016	0.025	0.021	Upstream	LC_FRUS	ns	ns	ns	nc	nc	nc
					Downstream	LC_FRB	4.2	ns	-1.6	ns	6.7	ns
LPL Richness	log10	0.088	0.697	0.538	Upstream	LC_FRUS	3.1	ns	ns	nc		
					Downstream	LC_FRB				ns		
% EPT	log10	0.075	0.034	0.713	Upstream	LC_FRUS	ns	ns	0.99	nc		
					Downstream	LC_FRB				-1.5		
% Ephemeroptera	none	0.186	0.008	0.703	Upstream	LC_FRUS	ns	ns	ns	nc		
					Downstream	LC_FRB				1.8		
% Plecoptera	log10	0.008	<0.001	0.525	Upstream	LC_FRUS	ns	1.2	1.1	nc		
					Downstream	LC_FRB				-2.2		
% Trichoptera	log10	0.13	0.035	0.535	Upstream	LC_FRUS	ns	ns	ns	nc		
					Downstream	LC_FRB				-1.4		
% Oligochaeta	rank	0.455	<0.001	0.022	Upstream	LC_FRUS	ns	ns	ns	nc	nc	nc
					Downstream	LC_FRB	ns	-3.5	ns	positive[c]	39	positive[c]
% Chrinomidae	log10	0.001	0.085	0.838	Upstream	LC_FRUS	ns	-2.2	-3.2	nc		
					Downstream	LC_FRB				0.69		
% Non-Chironomidae Diptera	log10	<0.001	0.481	0.01	Upstream	LC_FRUS	-4.6	ns	3.5	nc	nc	nc
					Downstream	LC_FRB	ns	4.2	1.8	-2.3	1.8	ns
EPT Abundance	log10	0.15	0.206	0.242	Upstream	LC_FRUS	ns	ns	ns	nc		
					Downstream	LC_FRB				ns		
Ephemeroptera Abundance	log10	0.004	0.002	0.142	Upstream	LC_FRUS	ns	-4.0	-1.5	nc		
					Downstream	LC_FRB				1.0		
Chironomidae Abundance	log10	<0.001	0.008	0.187	Upstream	LC_FRUS	ns	-5.4	-2.2	nc		
					Downstream	LC_FRB				0.83		

▨	P-value < 0.1.
🟩	MOD > 2.
🟦	MOD < -2.

Notes: "nc" = no relevant comparison; "ns" = not significant.

[a] MOD = MCT_{yr2}-MCT_{yr1}/SD_{yr1} where Measure of Central Tendency (MCT) is the mean for untransformed data, geometric mean for log10-transformed data and median for rank transformed data. Median Absolute Deviation (MAD) was used instead of standard deviation for rank-transformed data.

[b] MOD = MCT_{LC_FRB}-MCT_{LC_FRUS}/SD_{LC_FRUS} where MCT is the mean for untransformed data, geometric mean for log10-transformed data and median for rank transformed data. Median Absolute Deviation (MAD) was used instead of standard deviation for rank-transformed data.

[c] MOD could not be calculated because SD_{LC_FRUS} = 0.

Table E.8: Statistical Comparison of Benthic Invertebrate Communities in Dry Creek, June 2019 to 2021

Area	Endpoint	Transformation	Measure of Central Tendency[a]			Year P-Value	2019 vs 2020		2019 vs 2021		2020 vs 2021	
			2019	2020	2021		P-Value	MOD[b]	P-Value	MOD[b]	P-Value	MOD[b]
LC_DCDS	Abundance	none	7,510	4,953	5,881	0.499	ns	ns	ns	ns	ns	ns
	LPL Richness	none	42.7	37.0	31.7	0.008	0.099	-1.4	0.006	-2.6	0.120	ns
	% EPT	log10	67.1	55.3	80.1	0.020	0.172	ns	0.214	ns	0.017	2.9
	% Ephemeroptera	none	49.8	35.7	67.6	0.003	0.090	-2.6	0.039	3.3	0.003	6.7
	% Plecoptera	log10	10.1	11.9	6.72	0.335	ns	ns	ns	ns	ns	ns
	% Trichoptera	log10	5.83	7.71	5.53	0.320	ns	ns	ns	ns	ns	ns
	% Oligochaeta	log10(x+1)	0.0687	0.366	0	0.283	ns	ns	ns	ns	ns	ns
	% Chironomidae	none	31	40.9	17.2	0.034	0.363	ns	0.181	ns	0.029	-2.7
	% Non-Chironomidae Diptera	none	1.24	2.71	1.93	0.440	ns	ns	ns	ns	ns	ns
	EPT Abundance	none	5,127	2,732	4,929	0.374	ns	ns	ns	ns	ns	ns
	Ephemeroptera Abundance	log10	3,513	1,746	3,523	0.212	ns	ns	ns	ns	ns	ns
	Chironomidae Abundance	none	2,257	2,050	813	0.047	0.904	ns	0.054	-1.9	0.092	-1.8
LC_DC1	Abundance	log10	14,392	9,864	9,390	0.054	0.098	-1.5	0.064	-1.7	0.942	ns
	LPL Richness	log10	37.3	38.3	37.7	0.851	ns	ns	ns	ns	ns	ns
	% EPT	log10	48.9	49.5	78.1	0.003	0.990	ns	0.005	4.3	0.005	2.9
	% Ephemeroptera	none	27.2	20.1	22.1	0.325	ns	ns	ns	ns	ns	ns
	% Plecoptera	log10	18.1	16.4	39.6	<0.001	0.656	ns	<0.001	7.6	<0.001	4.5
	% Trichoptera	log10	3.64	12.5	16.1	0.002	0.005	4.6	0.002	5.5	0.579	ns
	% Oligochaeta	log10(x+1)	0.597	1.65	0.26	0.122	ns	ns	ns	ns	ns	ns
	% Chironomidae	log10	48.9	46.5	20.3	<0.001	0.855	ns	<0.001	-8.2	<0.001	-4.9
	% Non-Chironomidae Diptera	none	0.842	1.35	1.16	0.349	ns	ns	ns	ns	ns	ns
	EPT Abundance	log10	7,032	4,878	7,335	0.098	0.157	ns	0.967	ns	0.115	ns
	Ephemeroptera Abundance	log10	3,812	1,947	2,070	0.026	0.033	-6.2	0.047	-5.7	0.949	ns
	Chironomidae Abundance	log10	7,045	4,587	1,903	<0.001	0.115	ns	<0.001	-3.7	0.006	-13

▨ P-Value < 0.1

🟦 MOD < -2

🟩 MOD > 2

Notes: "nc" = no relevant comparison; "ns" = not significant.

[a] Measure of Central Tendency (MCT) is a mean for untransformed data, geometric mean for log10-transformed data and a median for rank transformed data.

[b] MOD = $(MCT_{yr2} - MCT_{yr1})/SD_{yr1}$

Table E.9: Statistical Comparison of Benthic Invertebrate Community Endpoints in Dry Creek, September 2019 to 2021

Endpoint	Transformation	Year	Area	Year:Area	Station		Do endpoints differ between years for each station?[a]						Do endpoints for exposed areas differ from the reference area within each year?[b]		
							2019	2020	2021	2019 vs 2020	2019 vs 2021	2020 vs 2021	2019	2020	2021
Abundance	none	<0.001	<0.001	0.002	Reference	LC_DCEF	A	B	B	-3.1	-2.3	ns	nc	nc	nc
					Mine-Exposed	LC_DC3	A	B	B	-2.3	-1.9	ns	ns	ns	ns
						LC_DCDS	A	B	B	-2.4	-3.0	ns	ns	ns	ns
						LC_DC2	A	A	A	ns	ns	ns	-2.1	ns	ns
						LC_DC4	A	B	B	-1.7	-1.9	ns	ns	4.9	ns
						LC_DC1	A	B	B	-3.2	-2.4	ns	4.2	5.0	5.9
LPL Richness	log10	0.015	0.018	0.344	Reference	LC_DCEF	A	B	AB	-0.85	ns	ns	nc		
					Mine-Exposed	LC_DC3	A	B	AB				ns		
						LC_DCDS	A	B	AB				ns		
						LC_DC2	A	B	AB				ns		
						LC_DC4	A	B	AB				ns		
						LC_DC1	A	B	AB				1.6		
% EPT	none	<0.001	<0.001	<0.001	Reference	LC_DCEF	B	AB	A	ns	6.4	ns	nc	nc	nc
					Mine-Exposed	LC_DC3	A	B	B	-17	-19	ns	-11	-14	-33
						LC_DCDS	A	A	A	ns	ns	ns	ns	ns	ns
						LC_DC2	B	AB	A	ns	2.1	ns	ns	ns	ns
						LC_DC4	A	A	A	ns	ns	ns	10	ns	ns
						LC_DC1	A	B	A	-4.0	ns	1.8	ns	-4.9	ns
% Ephemeroptera	log10	<0.001	<0.001	<0.001	Reference	LC_DCEF	A	B	A	-15	ns	8.4	nc	nc	nc
					Mine-Exposed	LC_DC3	A	B	B	-8.1	-8.4	ns	-17	-22	-15
						LC_DCDS	A	B	B	-18	-17	ns	-8.4	-12	-9.3
						LC_DC2	A	A	B	ns	-4.1	-9.3	-19	ns	-12
						LC_DC4	A	A	B	ns	-18	-8.5	ns	7.9	-5.6
						LC_DC1	A	B	B	-2.1	-1.4	ns	-9.9	-4.6	-4.9
% Plecoptera	none	<0.001	<0.001	<0.001	Reference	LC_DCEF	C	A	B	76	40	-2.6	nc	nc	nc
					Mine-Exposed	LC_DC3	A	A	A	ns	ns	ns	ns	-3.7	ns
						LC_DCDS	B	B	A	ns	8.8	8.0	38	-3.4	4.6
						LC_DC2	B	B	A	ns	7.8	24	60	ns	13
						LC_DC4	B	B	A	ns	8.8	3.4	50	-3.0	4.1
						LC_DC1	AB	B	A	ns	ns	3.4	54	-2.9	ns
% Trichoptera	log10	0.003	<0.001	0.022	Reference	LC_DCEF	B	A	AB	2.0	ns	ns	nc	nc	nc
					Mine-Exposed	LC_DC3	A	A	A	ns	ns	ns	ns	-1.8	ns
						LC_DCDS	B	A	A	4.7	2.8	ns	3.5	3.6	5.6
						LC_DC2	A	A	A	ns	ns	ns	5.4	2.7	4.0
						LC_DC4	B	AB	A	ns	5.2	ns	ns	ns	4.7
						LC_DC1	A	A	A	ns	ns	ns	2.6	ns	ns
% Oligochaeta	rank	0.448	0.072	0.426	Reference	LC_DCEF	A	A	A	ns	ns	ns	nc		
					Mine-Exposed	LC_DC3	A	A	A				ns		
						LC_DCDS	A	A	A				ns		
						LC_DC2	A	A	A				ns		
						LC_DC4	A	A	A				ns		
						LC_DC1	A	A	A				ns		
% Chironomidae	log10	0.043	<0.001	<0.001	Reference	LC_DCEF	A	B	B	-7.7	-9.8	ns	nc	nc	nc
					Mine-Exposed	LC_DC3	B	A	A	15	14	ns	ns	13	5.0
						LC_DCDS	A	A	A	ns	ns	ns	-6.4	ns	1.6
						LC_DC2	A	A	B	ns	-2.9	-3.1	-6.9	ns	-2.0
						LC_DC4	B	A	A	1.9	1.9	ns	-14	ns	ns
						LC_DC1	B	A	B	2.3	ns	-3.1	ns	7.8	1.7
% Non-Chironomidae Diptera	log10	0.002	<0.001	<0.001	Reference	LC_DCEF	B	A	A	4.1	2.8	ns	nc	nc	nc
					Mine-Exposed	LC_DC3	B	AB	A	ns	3.1	ns	4.3	ns	2.0
						LC_DCDS	A	A	B	ns	-5.4	-4.4	4.6	ns	ns
						LC_DC2	A	A	A	ns	ns	ns	3.1	ns	ns
						LC_DC4	AB	B	A	ns	ns	0.96	ns	-1.9	ns
						LC_DC1	A	A	A	ns	ns	ns	3.2	ns	ns

⬜ P-value < 0.1.

🟩 MOD > 2.

🟦 MOD < -2.

Notes: "nc" = no relevant comparison; "ns" = not significant.

[a] MOD = MCT_{year2}-MCTyear1/SD_{year1} where MCT is the median for rank transformed data and the back-transformed estimated marginal means for others.

[b] MOD = MCT_{stn}-MCT_{LC_DCEF}/SD_{LC_DCEF} where MCT is the median for rank transformed data and the back-transformed estimated marginal means for others.

Table E.10: **Statistical Comparison of Benthic Invertebrate Community Endpoints in Fording River, September 2018 to 2021**

Endpoint	Transformation	Year	Area	Year:Area	Station		Do endpoints differ between years for each station?[a]							Do endpoints differ from LC_FRUS within a year?[b]			
							2018	2019	2020	2021	2018 vs 2019	2018 vs 2020	2018 vs 2021	2018	2019	2020	2021
Abundance	log10	0.002	0.010	0.087	Reference	LC_FRUS	A	AB	A	B	ns	ns	-2.7	nc	nc	nc	nc
					Mine-Exposed	LC_FRB	AB	A	BC	C	ns	ns	-3.3	ns	2.9	ns	ns
LPL Richness	log10	0.090	0.883	0.699	Reference	LC_FRUS	A	AB	AB	B	ns	ns	-1.4	nc			
					Mine-Exposed	LC_FRB	A	AB	AB	B				ns			
% EPT	log10	<0.001	<0.001	0.010	Reference	LC_FRUS	AB	B	A	A	ns	ns	ns	nc	nc	nc	nc
					Mine-Exposed	LC_FRB	B	B	B	A	ns	ns	3.1	-2.5	-1.9	-3.6	ns
% Ephemeroptera	none	0.002	0.339	0.017	Reference	LC_FRUS	B	B	A	AB	ns	7.0	ns	nc	nc	nc	nc
					Mine-Exposed	LC_FRB	B	B	B	A	ns	ns	4.1	ns	ns	ns	ns
% Plecoptera	log10	0.006	<0.001	0.895	Reference	LC_FRUS	A	B	B	A	-0.98	-1.1	ns	nc			
					Mine-Exposed	LC_FRB	A	B	B	A				-2.4			
% Trichoptera	none	0.259	0.096	0.895	Reference	LC_FRUS	A	A	A	A	ns	ns	ns	nc			
					Mine-Exposed	LC_FRB	A	A	A	A				-0.67	-0.67	-0.67	-0.67
% Oligochaeta	rank	<0.001	0.002	0.193	Reference	LC_FRUS	A	AB	C	BC	ns	-1.0	-0.90	nc			
					Mine-Exposed	LC_FRB	A	AB	C	BC	ns	-1.0	-0.90	6.0			
% Chironomidae	log10	<0.001	0.054	0.159	Reference	LC_FRUS	A	A	A	B	ns	ns	-6.4	nc			
					Mine-Exposed	LC_FRB	A	A	A	B				0.43			
% Non-Chironomidae Diptera	log10	<0.001	0.786	0.156	Reference	LC_FRUS	AB	BC	C	A	ns	-1.7	ns	nc			
					Mine-Exposed	LC_FRB	AB	BC	C	A				ns			

▨ P-value < 0.1.

🟩 MOD > 2.

🟦 MOD < -2.

Notes: "nc" = no relevant comparison; "ns" = not significant.

[a] MOD = $\text{MCT}_{\text{year2}}$-MCTyear1/$\text{SD}_{\text{year1}}$ where Measure of Central Tendency (MCT) is the median for rank transformed data and the back-transformed estimated marginal means for others.

[b] MOD = MCT_{stn}-$\text{MCT}_{\text{LC\_FRUS}}$/$\text{SD}_{\text{LC\_FRUS}}$ where Measure of Central Tendency (MCT) is the median for rank transformed data and the back-transformed estimated marginal means for others.

Table E.11: Pearson Correlations of Annual Water Analytes and Principal Components Analysis (PCA) Axis Scores, Dry Creek LAEMP, 2019 to 2021

Variable	PCA1 (47%)		PCA2 (24%)		PCA3 (12%)	
	P-value	r_s	P-value	r_s	P-value	r_s
Temperature (°C)	0.325	0.210	0.985	0.00395	0.004	-0.560
Total Dissolved Solids (mg/L)	<0.001	0.879	0.188	0.278	0.096	-0.347
Alkalinity (mg/L as CaCO3)	0.179	-0.284	<0.001	0.737	0.006	-0.544
Nitrate (mg/L)	<0.001	0.828	0.245	-0.247	0.022	-0.467
Nitrite (mg/L)	<0.001	0.890	0.178	-0.285	0.351	-0.199
Ammonia (mg/L)	0.024	0.459	0.265	-0.237	0.014	0.493
Phosphorus (mg/L)	<0.001	0.666	0.065	-0.382	0.019	0.475
Sulphate (mg/L)	<0.001	0.814	0.030	0.444	0.112	-0.333
Dissolved Aluminum (mg/L)	<0.001	0.816	0.200	-0.271	0.873	0.0345
Total Antimony (mg/L)	<0.001	0.806	0.004	-0.565	0.820	-0.0490
Total Arsenic (mg/L)	<0.001	0.791	0.029	-0.447	0.067	0.380
Total Barium (mg/L)	0.287	0.227	<0.001	-0.908	0.797	-0.0554
Total Boron (mg/L)	0.692	-0.0851	0.293	0.224	<0.001	0.742
Dissolved Cadmium (mg/L)	<0.001	0.739	<0.001	-0.630	0.640	-0.101
Total Chromium (mg/L)	0.063	0.385	<0.001	0.879	0.463	0.157
Total Cobalt (mg/L)	<0.001	0.893	0.205	0.268	0.231	0.254
Total Copper (mg/L)	0.046	0.410	0.013	0.501	0.453	-0.161
Total Iron (mg/L)	0.014	0.493	<0.001	0.831	0.403	0.179
Total Lead (mg/L)	0.004	0.563	<0.001	0.716	0.277	0.231
Total Lithium (mg/L)	0.026	0.453	0.037	-0.427	0.022	-0.464
Total Manganese (mg/L)	<0.001	0.652	<0.001	0.661	0.462	0.158
Total Molybdenum (mg/L)	<0.001	0.853	0.185	-0.280	0.160	0.296
Total Nickel (mg/L)	<0.001	0.941	0.237	-0.251	0.729	0.0745
Total Selenium (mg/L)	<0.001	0.867	0.928	-0.0195	0.015	-0.488
Total Thallium (mg/L)	<0.001	0.845	0.057	0.393	0.330	0.208
Total Uranium (mg/L)	<0.001	0.787	0.010	0.515	0.321	-0.212
Total Zinc (mg/L)	<0.001	0.693	0.672	0.0912	0.216	0.262

🟦 $r_s \geq 0.6$ or ≤ -0.6.

▒ Significant correlation (*p* -value < 0.05).

Table E.12: Principal Components Analysis (PCA) Scores for Annual Water Chemistry, Dry Creek LAEMP, 2019 to 2021

Year	Station	PCA1 (47%)	PCA 2 (24%)	PCA 3 (12%)
2019	LC_DC1	-1.73	-1.12	-0.553
	LC_DC2	0.483	-1.66	0.203
	LC_DC3	2.73	-0.948	1.68
	LC_DC4	-2.34	-1.86	-1.04
	LC_DCDS	1.48	-1.75	0.243
	LC_DCEF	-5.83	-3.15	0.689
	LC_FRB	-1.10	2.18	-4.39
	LC_GRCK	-3.68	4.35	2.01
2020	LC_DC1	-0.518	-1.18	-0.704
	LC_DC2	2.93	-1.20	0.390
	LC_DC3	4.49	-0.857	1.26
	LC_DC4	-0.308	-1.37	-0.998
	LC_DCDS	4.11	-1.22	0.524
	LC_DCEF	-5.35	-2.58	1.24
	LC_FRB	-0.215	3.73	-3.15
	LC_GRCK	-3.79	4.53	1.91
2021	LC_DC1	0.719	-0.206	-1.23
	LC_DC2	3.06	-1.11	-0.598
	LC_DC3	7.26	1.53	2.18
	LC_DC4	0.821	-0.454	-1.29
	LC_DCDS	5.23	-0.691	0.440
	LC_DCEF	-6.31	-3.66	0.646
	LC_FRB	0.267	3.58	-2.73
	LC_GRCK	-2.42	5.12	3.26

APPENDIX F

BENTHIC
INVERTEBRATE TISSUE
CHEMISTRY

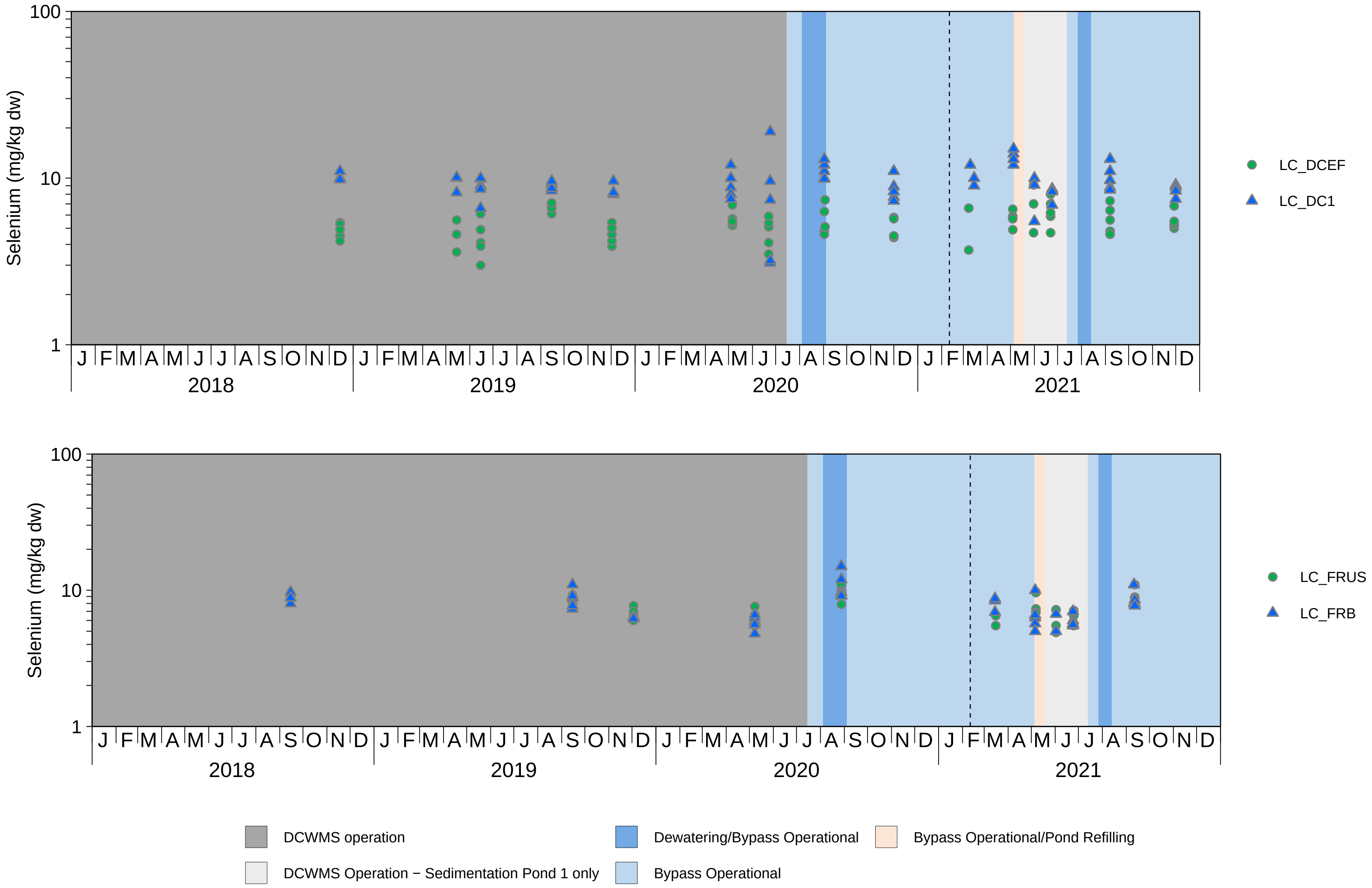


Figure F.1: **Benthic Invertebrate Selenium Concentrations, for LC_DC1 (Mine−exposed Areas) Relative to LC_DCEF (Reference Area) and for LC_FRB (Downstream) Relative to LC_FRUS (Upstream), 2018 to 2021**

Notes: Dashed black vertical line indicates the Burnt Ridge North spoil failure. Only data collected simultaneously at both stations are displayed.

Table F.1: Selenium Benchmarks for Benthic Invertebrates in the Elk Valley

Endpoint	Tissue Type	Benchmark			Source
		Value (µg/g dw)	Type	Description	
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	Golder (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)
Benthic Invertebrates	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)

[a] BC guidelines were not used in assessment of benthic invertebrate and fish 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]).

Table F.2: Selenium Concentrations in Benthic Invertebrate Composite-Taxa and Taxon-Specific Samples Collected from Dry Creek, Fording River, and Grace Creek, Dry Creek LAEMP, January to December 2021

Waterbody		Sample Type	Sample Type	Sample Code	Sample Date	Selenium Concentration (mg/kg dw)					
						Sample	Area Mean	Area Median	Area Minimum	Area Maximum	Area Standard Deviation
Dry Creek	Mine-Exposed	Composite	LC_DC3	LC_DC3_INV-01_2021-03-08	08-Mar-21	6.10	6.37	6.10	5.40	7.60	1.12
				LC_DC3_INV-02_2021-03-08	08-Mar-21	5.40					
				LC_DC3_INV-03_2021-03-08	08-Mar-21	7.60					
				LC_DC3_INV-01_2021-05-03	03-May-21	8.30	8.96	8.80	7.70	10.0	1.03
				LC_DC3_INV-02_2021-05-03	03-May-21	10.0					
				LC_DC3_INV-03_2021-05-03	03-May-21	8.80					
				LC_DC3_INV-04_2021-05-03	03-May-21	7.70					
				LC_DC3_INV-05_2021-05-03	03-May-21	10.0					
				LC_DC3_INV-01_20210531	01-Jun-21	15.0	9.44	7.20	6.20	15.0	3.87
				LC_DC3_INV-02_20210531	01-Jun-21	12.0					
				LC_DC3_INV-03_20210531	01-Jun-21	7.20					
				LC_DC3_INV-04_20210531	01-Jun-21	6.80					
				LC_DC3_INV-05_20210531	01-Jun-21	6.20					
				LC_DC3_INV-01_20210610	10-Jun-21	7.20	7.43	7.20	6.90	8.20	0.681
				LC_DC3_INV-02_20210610	10-Jun-21	6.90					
				LC_DC3_INV-03_20210610	10-Jun-21	8.20					
				LC_DC3_INV-01_2021-06-21	21-Jun-21	7.90	7.67	6.60	5.80	12.0	2.13
				LC_DC3_INV-02_2021-06-21	21-Jun-21	12.0					
				LC_DC3_INV-03_2021-06-21	21-Jun-21	6.60					
				LC_DC3_INV-04_2021-06-21	21-Jun-21	5.80					
				LC_DC3_INV-05_2021-06-21	21-Jun-21	6.40					
				LC_DC3_INV-06_2021-06-21	21-Jun-21	8.50					
				LC_DC3_INV-07_2021-06-21	21-Jun-21	6.50					
				LC_DC3_INV-01_2021-07-08	08-Jul-21	8.20	8.87	8.20	7.40	11.0	1.89
				LC_DC3_INV-02_2021-07-08	08-Jul-21	7.40					
				LC_DC3_INV-03_2021-07-08	08-Jul-21	11.0					
				LC_DC3_INV-01_2021-07-27	27-Jul-21	13.0	11.0	11.0	9.10	13.0	1.95
				LC_DC3_INV-02_2021-07-27	27-Jul-21	9.10					
				LC_DC3_INV-03_2021-07-27	27-Jul-21	11.0					
				LC_DC3_INV-1_2021-09-10	10-Sep-21	9.50	9.82	9.90	8.70	11.0	0.835
				LC_DC3_INV-2_2021-09-10	10-Sep-21	10.0					
				LC_DC3_INV-3_2021-09-10	10-Sep-21	11.0					
				LC_DC3_INV-4_2021-09-10	10-Sep-21	8.70					
				LC_DC3_INV-5_2021-09-10	10-Sep-21	9.90					
				LC_DC3_INV-01_2021-11-29	29-Nov-21	6.10	5.46	5.00	3.80	7.70	1.21
				LC_DC3_INV-02_2021-11-29	29-Nov-21	5.00					
				LC_DC3_INV-03_2021-11-29	29-Nov-21	5.60					
				LC_DC3_INV-04_2021-11-29	29-Nov-21	7.70					
				LC_DC3_INV-05_2021-11-29	29-Nov-21	5.00					
				LC_DC3_INV-06_2021-11-29	29-Nov-21	3.80					
				LC_DC3_INV-07_2021-11-29	29-Nov-21	5.00					
			LC_DCDS	LC_DCDS_INV-01_2021-03-09	09-Mar-21	22.0	20.0	20.0	18.0	22.0	2.00
				LC_DCDS_INV-02_2021-03-09	09-Mar-21	18.0					
				LC_DCDS_INV-03_2021-03-09	09-Mar-21	20.0					
				LC_DCDS_INV-01_2021-05-04	04-May-21	12.0	18.2	22.0	8.90	26.0	7.33
				LC_DCDS_INV-02_2021-05-04	04-May-21	8.90					
				LC_DCDS_INV-03_2021-05-04	04-May-21	22.0					
				LC_DCDS_INV-04_2021-05-04	04-May-21	26.0					
				LC_DCDS_INV-05_2021-05-04	04-May-21	22.0					
				LC_DCDS_INV-01_20210601	01-Jun-21	8.10	10.3	8.10	7.70	15.0	4.10
				LC_DCDS_INV-02_20210601	01-Jun-21	7.70					
				LC_DCDS_INV-03_20210601	01-Jun-21	15.0					
				LC_DCDS_INV-01_20210610	10-Jun-21	5.30	5.77	5.30	4.50	7.50	1.55
				LC_DCDS_INV-02_20210610	10-Jun-21	4.50					
				LC_DCDS_INV-03_20210610	10-Jun-21	7.50					
				LC_DCDS_INV-01_2021-06-22	22-Jun-21	7.10	7.78	7.10	6.90	9.20	1.05
				LC_DCDS_INV-02_2021-06-22	22-Jun-21	9.20					
				LC_DCDS_INV-03_2021-06-22	22-Jun-21	7.10					
				LC_DCDS_INV-04_2021-06-22	22-Jun-21	6.90					
				LC_DCDS_INV-05_2021-06-22	22-Jun-21	8.60					
				LC_DCDS_INV-01_2021-07-08	08-Jul-21	11.0	10.3	10.0	10.0	11.0	0.577
				LC_DCDS_INV-02_2021-07-08	08-Jul-21	10.0					
				LC_DCDS_INV-03_2021-07-08	08-Jul-21	10.0					
				LC_DCDS_INV-01_2021-07-27	27-Jul-21	13.0	11.3	13.0	8.00	13.0	2.89
				LC_DCDS_INV-02_2021-07-27	27-Jul-21	8.00					
				LC_DCDS_INV-03_2021-07-27	27-Jul-21	13.0					
				LC_DCDS_INV_1_2021-09-10	10-Sep-21	13.0	11.9	11.0	9.60	15.0	2.11
				LC_DCDS_INV_2_2021-09-10	10-Sep-21	11.0					
				LC_DCDS_INV_3_2021-09-10	10-Sep-21	11.0					
				LC_DCDS_INV_4_2021-09-10	10-Sep-21	15.0					
				LC_DCDS_INV_5_2021-09-10	10-Sep-21	9.60					
				LC_DCDS_INV-01_2021-11-30	30-Nov-21	12.0	9.68	9.80	7.50	12.0	1.63
				LC_DCDS_INV-02_2021-11-30	30-Nov-21	7.50					
				LC_DCDS_INV-03_2021-11-30	30-Nov-21	9.80					
				LC_DCDS_INV-04_2021-11-30	30-Nov-21	9.10					
				LC_DCDS_INV-05_2021-11-30	30-Nov-21	10.0					

Table F.2: Selenium Concentrations in Benthic Invertebrate Composite-Taxa and Taxon-Specific Samples Collected from Dry Creek, Fording River, and Grace Creek, Dry Creek LAEMP, January to December 2021

Waterbody		Sample Type	Sample Type	Sample Code	Sample Date	Selenium Concentration (mg/kg dw)					
						Sample	Area Mean	Area Median	Area Minimum	Area Maximum	Area Standard Deviation
	Mine-Exposed	Composite	LC_DC4	LC_DC4_INV-01_2021-03-09	09-Mar-21	6.10	6.90	7.00	6.10	7.60	0.755
				LC_DC4_INV-02_2021-03-09	09-Mar-21	7.60					
				LC_DC4_INV-03_2021-03-09	09-Mar-21	7.00					
				LC_DC4_INV-01_2021-05-05	05-May-21	7.30	7.44	7.30	5.90	9.20	1.18
				LC_DC4_INV-02_2021-05-05	05-May-21	7.20					
				LC_DC4_INV-03_2021-05-05	05-May-21	7.60					
				LC_DC4_INV-04_2021-05-05	05-May-21	9.20					
				LC_DC4_INV-05_2021-05-05	05-May-21	5.90					
				LC_DC4_INV-01_20210601	01-Jun-21	9.00	6.87	5.90	5.70	9.00	1.85
				LC_DC4_INV-02_20210601	01-Jun-21	5.70					
				LC_DC4_INV-03_20210601	01-Jun-21	5.90					
				LC_DC4_INV-01_2021-06-23	23-Jun-21	7.50	6.78	7.50	5.30	7.70	1.14
				LC_DC4_INV-02_2021-06-23	23-Jun-21	5.80					
				LC_DC4_INV-03_2021-06-23	23-Jun-21	7.60					
				LC_DC4_INV-04_2021-06-23	23-Jun-21	7.70					
				LC_DC4_INV-05_2021-06-23	23-Jun-21	5.30					
				LC_DC4_INV-1_2021-09-09	09-Sep-21	6.80	7.34	7.30	6.30	8.40	0.838
				LC_DC4_INV-2_2021-09-09	09-Sep-21	8.40					
				LC_DC4_INV-3_2021-09-09	09-Sep-21	6.30					
				LC_DC4_INV-4_2021-09-09	09-Sep-21	7.30					
				LC_DC4_INV-5_2021-09-09	09-Sep-21	7.90					
				LC_DC4_INV-01_2021-12-01	01-Dec-21	8.60	8.14	8.60	5.90	10.0	1.58
				LC_DC4_INV-02_2021-12-01	01-Dec-21	5.90					
				LC_DC4_INV-03_2021-12-01	01-Dec-21	10.0					
				LC_DC4_INV-04_2021-12-01	01-Dec-21	7.30					
				LC_DC4_INV-05_2021-12-01	01-Dec-21	8.90					
			LC_DC2	LC_DC2_INV-01_2021-05-06	06-May-21	17.0	14.2	13.0	11.0	17.0	2.68
				LC_DC2_INV-02_2021-05-06	06-May-21	17.0					
				LC_DC2_INV-03_2021-05-06	06-May-21	11.0					
				LC_DC2_INV-04_2021-05-06	06-May-21	13.0					
				LC_DC2_INV-05_2021-05-06	06-May-21	13.0					
				LC_DC2_INV-01_20210531	31-May-21	13.0	13.7	14.0	13.0	14.0	0.577
				LC_DC2_INV-02_20210531	31-May-21	14.0					
				LC_DC2_INV-03_20210531	31-May-21	14.0					
				LC_DC2_INV-01_2021-06-23	23-Jun-21	8.30	8.68	8.30	8.00	10.0	0.811
				LC_DC2_INV-02_2021-06-23	23-Jun-21	8.20					
				LC_DC2_INV-03_2021-06-23	23-Jun-21	8.90					
				LC_DC2_INV-04_2021-06-23	23-Jun-21	10.0					
				LC_DC2_INV-05_2021-06-23	23-Jun-21	8.00					
				LC_DC2_INV-1_2021-09-09	09-Sep-21	5.50	6.32	6.90	4.10	7.60	1.50
				LC_DC2_INV-2_2021-09-09	09-Sep-21	7.50					
				LC_DC2_INV-3_2021-09-09	09-Sep-21	6.90					
				LC_DC2_INV-4_2021-09-09	09-Sep-21	7.60					
				LC_DC2_INV-5_2021-09-09	09-Sep-21	4.10					
				LC_DC2_INV-01_2021-12-01	01-Dec-21	8.10	7.84	8.00	7.10	8.30	0.467
				LC_DC2_INV-02_2021-12-01	01-Dec-21	8.00					
				LC_DC2_INV-03_2021-12-01	01-Dec-21	7.70					
				LC_DC2_INV-04_2021-12-01	01-Dec-21	8.30					
				LC_DC2_INV-05_2021-12-01	01-Dec-21	7.10					
			LC_DC1	LC_DC1_INV-01_2021-03-10	15-Mar-21	12.0	10.3	10.0	9.00	12.0	1.53
				LC_DC1_INV-02_2021-03-15	15-Mar-21	9.00					
				LC_DC1_INV-03_2021-03-15	15-Mar-21	10.0					
				LC_DC1_INV-01_2021-05-05	05-May-21	12.0	13.6	14.0	12.0	15.0	1.14
				LC_DC1_INV-02_2021-05-05	05-May-21	14.0					
				LC_DC1_INV-03_2021-05-05	05-May-21	13.0					
				LC_DC1_INV-04_2021-05-05	05-May-21	14.0					
				LC_DC1_INV-05_2021-05-05	05-May-21	15.0					
				LC_DC1_INV-01_20210601	01-Jun-21	10.0	8.20	9.10	5.50	10.0	2.38
				LC_DC1_INV-02_20210601	01-Jun-21	9.10					
				LC_DC1_INV-03_20210601	01-Jun-21	5.50					
				LC_DC1_INV-01_2021-06-24	24-Jun-21	8.40	8.10	8.30	6.90	8.60	0.682
				LC_DC1_INV-02_2021-06-24	24-Jun-21	6.90					
				LC_DC1_INV-03_2021-06-24	24-Jun-21	8.60					
				LC_DC1_INV-04_2021-06-24	24-Jun-21	8.30					
				LC_DC1_INV-05_2021-06-24	24-Jun-21	8.30					
				LC_DC1_INV-1_2021-09-07	07-Sep-21	9.70	10.2	9.70	8.50	13.0	1.84
				LC_DC1_INV-2_2021-09-07	07-Sep-21	8.80					
				LC_DC1_INV-3_2021-09-07	07-Sep-21	11.0					
				LC_DC1_INV-4_2021-09-07	07-Sep-21	8.50					
				LC_DC1_INV-5_2021-09-07	07-Sep-21	13.0					
				LC_DC1_INV-01_2021-12-01	01-Dec-21	9.10	8.44	8.40	7.50	9.10	0.602
				LC_DC1_INV-02_2021-12-01	01-Dec-21	7.50					
				LC_DC1_INV-03_2021-12-01	01-Dec-21	8.80					
				LC_DC1_INV-04_2021-12-01	01-Dec-21	8.40					
				LC_DC1_INV-05_2021-12-01	01-Dec-21	8.40					

Table F.2: Selenium Concentrations in Benthic Invertebrate Composite-Taxa and Taxon-Specific Samples Collected from Dry Creek, Fording River, and Grace Creek, Dry Creek LAEMP, January to December 2021

Waterbody		Sample Type	Sample Type	Sample Code	Sample Date	Selenium Concentration (mg/kg dw)					
						Sample	Area Mean	Area Median	Area Minimum	Area Maximum	Area Standard Deviation
Dry Creek	Mine-Exposed	Non-perlid Plecoptera	LC_DC3	LC_DC3_PLEC-01_2021-05-03	03-May-21	7.70	8.93	9.20	7.70	9.90	1.12
				LC_DC3_PLEC-02_2021-05-03	03-May-21	9.20					
				LC_DC3_PLEC-03_2021-05-03	03-May-21	9.90					
				LC_DC3_PLEC-01_20210531	01-Jun-21	11.0	12.3	11.0	10.0	16.0	3.21
				LC_DC3_PLEC-02_20210531	01-Jun-21	10.0					
				LC_DC3_PLEC-03_20210531	01-Jun-21	16.0					
				LC_DC3_PLEC-01_20210610	10-Jun-21	12.0	12.0	12.0	12.0	12.0	0
				LC_DC3_PLEC-02_20210610	10-Jun-21	12.0					
				LC_DC3_PLEC-03_20210610	10-Jun-21	12.0					
				LC_DC3_INVPLE-01_2021-06-21	21-Jun-21	8.60	9.57	9.10	8.60	11.0	1.27
				LC_DC3_INVPLE-02_2021-06-21	21-Jun-21	11.0					
				LC_DC3_INVPLE-03_2021-06-21	21-Jun-21	9.10					
				LC_DC3_INVPLE-01_2021-07-08	08-Jul-21	10.0	11.0	11.0	10.0	12.0	1.00
				LC_DC3_INVPLE-02_2021-07-08	08-Jul-21	12.0					
				LC_DC3_INVPLE-03_2021-07-08	08-Jul-21	11.0					
				LC_DC3_INVPLE-01_2021-07-27	27-Jul-21	11.0	10.7	11.0	7.10	14.0	3.46
				LC_DC3_INVPLE-02_2021-07-27	27-Jul-21	14.0					
				LC_DC3_INVPLE-03_2021-07-27	27-Jul-21	7.10					
				LC_DC3_INVPLE-1_2021-09-10	10-Sep-21	5.40	5.80	6.00	5.40	6.00	0.346
				LC_DC3_INVPLE-2_2021-09-10	10-Sep-21	6.00					
				LC_DC3_INVPLE-3_2021-09-10	10-Sep-21	6.00					
				LC_DC3_INVPLE-01_2021-11-29	29-Nov-21	4.90	5.40	5.50	4.90	5.80	0.458
				LC_DC3_INVPLE-02_2021-11-29	29-Nov-21	5.80					
				LC_DC3_INVPLE-03_2021-11-29	29-Nov-21	5.50					
			LC_DCDS	LC_DCDS_PLEC-01_2021-05-04	04-May-21	9.90	10.1	9.90	9.30	11.0	0.862
				LC_DCDS_PLEC-02_2021-05-04	04-May-21	9.30					
				LC_DCDS_PLEC-03_2021-05-04	04-May-21	11.0					
				LC_DCDS_PLEC-01_20210601	01-Jun-21	7.90	8.17	7.90	7.70	8.90	0.643
				LC_DCDS_PLEC-02_20210601	01-Jun-21	7.70					
				LC_DCDS_PLEC-03_20210601	01-Jun-21	8.90					
				LC_DCDS_PLEC-01_20210610	10-Jun-21	5.00	4.97	5.00	4.90	5.00	0.0577
				LC_DCDS_PLEC-02_20210610	10-Jun-21	4.90					
				LC_DCDS_PLEC-03_20210610	10-Jun-21	5.00					
				LC_DCDS_INVPLE-01_2021-06-22	22-Jun-21	4.80	5.50	5.20	4.80	6.50	0.889
				LC_DCDS_INVPLE-02_2021-06-22	22-Jun-21	5.20					
				LC_DCDS_INVPLE-03_2021-06-22	22-Jun-21	6.50					
				LC_DCDS_INVPLE-01_2021-07-08	08-Jul-21	8.50	7.57	7.70	6.50	8.50	1.01
				LC_DCDS_INVPLE-02_2021-07-08	08-Jul-21	7.70					
				LC_DCDS_INVPLE-03_2021-07-08	08-Jul-21	6.50					
				LC_DCDS_INVPLE-01_2021-07-27	27-Jul-21	9.10	8.33	8.70	7.20	9.10	1.00
				LC_DCDS_INVPLE-02_2021-07-27	27-Jul-21	8.70					
				LC_DCDS_INVPLE-03_2021-07-27	27-Jul-21	7.20					
				LC_DCDS_INVPLE-1_2021-09-10	10-Sep-21	9.10	7.63	7.60	6.20	9.10	1.45
				LC_DCDS_INVPLE-2_2021-09-10	10-Sep-21	6.20					
				LC_DCDS_INVPLE-3_2021-09-10	10-Sep-21	7.60					
				LC_DCDS_INVPLE-01_2021-11-30	30-Nov-21	10.0	8.93	10.0	6.37	10.4	2.22
				LC_DCDS_INVPLE-02_2021-11-30	30-Nov-21	10.4					
				LC_DCDS_INVPLE-03_2021-11-30	30-Nov-21	6.37					
		Oligochaeta	LC_DC2	LC_DC2_INVOLI-1_2021-09-09	09-Sep-21	47.0	47.0	47.0	47.0	47.0	-
		Rhyacophilidate	LC_DC3	LC_DC3_RHYA-01_2021-05-03	03-May-21	9.60	9.43	9.60	7.70	11.0	1.66
				LC_DC3_RHYA-02_2021-05-03	03-May-21	11.0					
				LC_DC3_RHYA-03_2021-05-03	03-May-21	7.70					
				LC_DC3_RHYA-01_20210531	01-Jun-21	10.0	10.7	10.0	9.00	13.0	2.08
				LC_DC3_RHYA-02_20210531	01-Jun-21	9.00					
				LC_DC3_RHYA-03_20210531	01-Jun-21	13.0					
				LC_DC3_RHYA-01_20210610	10-Jun-21	14.0	15.0	14.0	14.0	17.0	1.73
				LC_DC3_RHYA-02_20210610	10-Jun-21	14.0					
				LC_DC3_RHYA-03_20210610	10-Jun-21	17.0					
				LC_DC3_INVRHY-01_2021-06-21	21-Jun-21	10.0	9.33	9.30	8.70	10.0	0.651
				LC_DC3_INVRHY-02_2021-06-21	21-Jun-21	8.70					
				LC_DC3_INVRHY-03_2021-06-21	21-Jun-21	9.30					
				LC_DC3_INVRHY-01_2021-07-08	08-Jul-21	8.70	9.27	8.70	8.10	11.0	1.53
				LC_DC3_INVRHY-02_2021-07-08	08-Jul-21	11.0					
				LC_DC3_INVRHY-03_2021-07-08	08-Jul-21	8.10					
				LC_DC3_INVRHY-01_2021-07-27	27-Jul-21	10.0	10.1	10.0	9.40	11.0	0.808
				LC_DC3_INVRHY-02_2021-07-27	27-Jul-21	11.0					
				LC_DC3_INVRHY-03_2021-07-27	27-Jul-21	9.40					
				LC_DC3_INVRHY-1_2021-09-10	10-Sep-21	14.0	11.7	11.0	10.0	14.0	2.08
				LC_DC3_INVRHY-2_2021-09-10	10-Sep-21	10.0					
				LC_DC3_INVRHY-3_2021-09-10	10-Sep-21	11.0					
				LC_DC3_INVRHY-01_2021-11-29	29-Nov-21	5.40	6.17	5.90	5.40	7.20	0.929
				LC_DC3_INVRHY-02_2021-11-29	29-Nov-21	5.90					
				LC_DC3_INVRHY-03_2021-11-29	29-Nov-21	7.20					

Table F.2: Selenium Concentrations in Benthic Invertebrate Composite-Taxa and Taxon-Specific Samples Collected from Dry Creek, Fording River, and Grace Creek, Dry Creek LAEMP, January to December 2021

Waterbody		Sample Type	Sample Type	Sample Code	Sample Date	Selenium Concentration (mg/kg dw)					
						Sample	Area Mean	Area Median	Area Minimum	Area Maximum	Area Standard Deviation
Dry Creek	Mine-Exposed	Rhyacophilidate	LC_DCDS	LC_DCDS_RHYA-01_2021-05-04	04-May-21	18.0	20.0	20.0	18.0	22.0	2.00
				LC_DCDS_RHYA-02_2021-05-04	04-May-21	22.0					
				LC_DCDS_RHYA-03_2021-05-04	04-May-21	20.0					
				LC_DCDS_RHYA-01_20210601	01-Jun-21	21.0	17.3	18.0	13.0	21.0	4.04
				LC_DCDS_RHYA-02_20210601	01-Jun-21	18.0					
				LC_DCDS_RHYA-03_20210601	01-Jun-21	13.0					
				LC_DCDS_RHYA-01_20210610	10-Jun-21	7.90	7.90	7.90	6.50	9.30	1.40
				LC_DCDS_RHYA-02_20210610	10-Jun-21	9.30					
				LC_DCDS_RHYA-03_20210610	10-Jun-21	6.50					
				LC_DCDS_INVRHY-01_2021-06-22	22-Jun-21	8.20	8.43	8.20	7.90	9.20	0.681
				LC_DCDS_INVRHY-02_2021-06-22	22-Jun-21	7.90					
				LC_DCDS_INVRHY-03_2021-06-22	22-Jun-21	9.20					
				LC_DCDS_INVRHY-01_2021-07-08	08-Jul-21	9.90	10.6	9.90	9.90	12.0	1.21
				LC_DCDS_INVRHY-02_2021-07-08	08-Jul-21	12.0					
				LC_DCDS_INVRHY-03_2021-07-08	08-Jul-21	9.90					
				LC_DCDS_INVRHY-01_2021-07-27	27-Jul-21	20.0	18.7	18.0	18.0	20.0	1.15
				LC_DCDS_INVRHY-02_2021-07-27	27-Jul-21	18.0					
				LC_DCDS_INVRHY-03_2021-07-27	27-Jul-21	18.0					
				LC_DCDS_INVRHY-1_2021-09-10	10-Sep-21	18.0	17.0	17.0	16.0	18.0	1.00
				LC_DCDS_INVRHY-2_2021-09-10	10-Sep-21	17.0					
				LC_DCDS_INVRHY-3_2021-09-10	10-Sep-21	16.0					
				LC_DCDS_INVRHY-01_2021-11-30	30-Nov-21	11.0	12.3	13.0	11.0	13.0	1.15
				LC_DCDS_INVRHY-02_2021-11-30	30-Nov-21	13.0					
				LC_DCDS_INVRHY-03_2021-11-30	30-Nov-21	13.0					
Fording River		Composite	LC_FRUS	LC_FRUS_INV-01_2021-03-16	16-Mar-21	6.60	6.20	6.50	5.50	6.60	0.608
				LC_FRUS_INV-02_2021-03-16	16-Mar-21	5.50					
				LC_FRUS_INV-03_2021-03-16	16-Mar-21	6.50					
				LC_FRUS_INV-01_2021-05-07	07-May-21	7.30	7.94	7.30	6.20	9.70	1.61
				LC_FRUS_INV-02_2021-05-07	07-May-21	6.20					
				LC_FRUS_INV-03_2021-05-07	07-May-21	6.90					
				LC_FRUS_INV-04_2021-05-07	07-May-21	9.70					
				LC_FRUS_INV-05_2021-05-07	07-May-21	9.60					
				LC_FRUS_INV-01_20210602	02-Jun-21	5.50	5.87	5.50	4.90	7.20	1.19
				LC_FRUS_INV-02_20210602	02-Jun-21	7.20					
				LC_FRUS_INV-03_20210602	02-Jun-21	4.90					
				LC_FRUS_INV-01_2021-06-25	25-Jun-21	5.50	6.34	6.50	5.50	7.10	0.713
				LC_FRUS_INV-02_2021-06-25	25-Jun-21	7.10					
				LC_FRUS_INV-03_2021-06-25	25-Jun-21	6.90					
				LC_FRUS_INV-04_2021-06-25	25-Jun-21	5.70					
				LC_FRUS_INV-05_2021-06-25	25-Jun-21	6.50					
				LC_FRUS_INV-1_2021-09-12	12-Sep-21	8.90	9.64	8.90	8.60	11.0	1.25
				LC_FRUS_INV-2_2021-09-12	12-Sep-21	11.0					
				LC_FRUS_INV-3_2021-09-12	12-Sep-21	8.60					
				LC_FRUS_INV-4_2021-09-12	12-Sep-21	11.0					
				LC_FRUS_INV-5_2021-09-12	12-Sep-21	8.70					
			LC_FRB	LC_FRB_INV-01_2021-03-15	15-Mar-21	8.40	8.00	8.40	6.90	8.70	0.964
				LC_FRB_INV-02_2021-03-15	15-Mar-21	8.70					
				LC_FRB_INV-03_2021-03-15	15-Mar-21	6.90					
				LC_FRB_INV-01_2021-05-06	06-May-21	6.30	6.72	6.30	5.00	10.0	1.93
				LC_FRB_INV-02_2021-05-06	06-May-21	5.70					
				LC_FRB_INV-03_2021-05-06	06-May-21	6.60					
				LC_FRB_INV-04_2021-05-06	06-May-21	5.00					
				LC_FRB_INV-05_2021-05-06	06-May-21	10.0					
				LC_FRB_INV-01_20210602	02-Jun-21	6.70	5.57	5.00	5.00	6.70	0.981
				LC_FRB_INV-02_20210602	02-Jun-21	5.00					
				LC_FRB_INV-03_20210602	02-Jun-21	5.00					
				LC_FRB_INV-01_2021-06-24	24-Jun-21	5.50	5.96	5.70	5.50	7.00	0.611
				LC_FRB_INV-02_2021-06-24	24-Jun-21	6.00					
				LC_FRB_INV-03_2021-06-24	24-Jun-21	7.00					
				LC_FRB_INV-04_2021-06-24	24-Jun-21	5.70					
				LC_FRB_INV-05_2021-06-24	24-Jun-21	5.60					
				LC_FRB_INV-1_2021-09-12	12-Sep-21	8.00	8.64	8.00	7.70	11.0	1.35
				LC_FRB_INV-2_2021-09-12	12-Sep-21	8.50					
				LC_FRB_INV-3_2021-09-12	12-Sep-21	7.70					
				LC_FRB_INV-4_2021-09-11	12-Sep-21	8.00					
				LC_FRB_INV-5_2021-09-11	12-Sep-21	11.0					

Table F.2: Selenium Concentrations in Benthic Invertebrate Composite-Taxa and Taxon-Specific Samples Collected from Dry Creek, Fording River, and Grace Creek, Dry Creek LAEMP, January to December 2021

Waterbody		Sample Type	Sample Type	Sample Code	Sample Date	Selenium Concentration (mg/kg dw)					
						Sample	Area Mean	Area Median	Area Minimum	Area Maximum	Area Standard Deviation
Dry Creek East Tributary	Reference	Composite	LC_DCEF	LC_DCEF_INV-01_2021-03-08	08-Mar-21	3.70	5.63	6.60	3.70	6.60	1.67
				LC_DCEF_INV-02_2021-03-08	08-Mar-21	6.60					
				LC_DCEF_INV-03_2021-03-08	08-Mar-21	6.60					
				LC_DCEF_INV-01_2021-05-04	04-May-21	6.50	5.58	5.70	4.90	6.50	0.687
				LC_DCEF_INV-02_2021-05-04	04-May-21	5.90					
				LC_DCEF_INV-03_2021-05-04	04-May-21	4.90					
				LC_DCEF_INV-04_2021-05-04	04-May-21	5.70					
				LC_DCEF_INV-05_2021-05-04	04-May-21	4.90					
				LC_DCEF_INV-01_20210531	31-May-21	7.00	6.93	7.00	4.70	9.10	2.20
				LC_DCEF_INV-02_20210531	31-May-21	4.70					
				LC_DCEF_INV-03_20210531	31-May-21	9.10					
				LC_DCEF_INV-01_2021-06-22	22-Jun-21	7.00	6.36	6.20	4.70	8.00	1.23
				LC_DCEF_INV-02_2021-06-22	22-Jun-21	5.90					
				LC_DCEF_INV-03_2021-06-22	22-Jun-21	8.00					
				LC_DCEF_INV-04_2021-06-22	22-Jun-21	4.70					
				LC_DCEF_INV-05_2021-06-22	22-Jun-21	6.20					
				LC_DCEF_INV-1_2021-09-07	07-Sep-21	4.80	5.74	5.60	4.60	7.30	1.13
				LC_DCEF_INV-2_2021-09-07	07-Sep-21	7.30					
				LC_DCEF_INV-3_2021-09-07	07-Sep-21	5.60					
				LC_DCEF_INV-4_2021-09-07	07-Sep-21	4.60					
				LC_DCEF_INV-5_2021-09-07	07-Sep-21	6.40					
				LC_DCEF_INV-01_2021-11-29	29-Nov-21	5.00	5.56	5.30	5.00	6.80	0.716
				LC_DCEF_INV-02_2021-11-29	29-Nov-21	6.80					
				LC_DCEF_INV-03_2021-11-29	29-Nov-21	5.20					
				LC_DCEF_INV-04_2021-11-29	29-Nov-21	5.30					
				LC_DCEF_INV-05_2021-11-29	29-Nov-21	5.50					
Grace Creek			LC_GRCK	LC_GRCK_INV-01_2021-05-07	07-May-21	5.70	6.88	5.70	4.80	10.0	2.29
				LC_GRCK_INV-02_2021-05-07	07-May-21	4.80					
				LC_GRCK_INV-03_2021-05-07	07-May-21	5.30					
				LC_GRCK_INV-04_2021-05-07	07-May-21	10.0					
				LC_GRCK_INV-05_2021-05-07	07-May-21	8.60					
				LC_GRCK_INV-1_2021-09-13	13-Sep-21	5.30	6.56	5.90	5.30	8.30	1.48
				LC_GRCK_INV-2_2021-09-13	13-Sep-21	5.30					
				LC_GRCK_INV-3_2021-09-13	13-Sep-21	5.90					
				LC_GRCK_INV-5_2021-09-13	13-Sep-21	8.30					
				LC_GRCK_INV-4_2021-09-13	13-Sep-21	8.00					

Table F.3: Selenium Species Bioaccumulation Tool[a] Predicted Benthic Invertebrate Tissue Selenium Concentrations Compared to Measured Values, Dry Creek, 2021

Waterbody	Area	B-tool Prediction		Field Measurements	
		Date	Predicted benthic invertebrate tissue selenium concentration	Date	Mean benthic invertebrate tissue selenium concentration
			µg/g dw		µg/g dw
Dry Creek East Tributary (Reference)	LC_DCEF	8-Mar-21	9.76	8-Mar-21	5.63
		4-May-21	12.2	4-May-21	5.58
		1-Jun-21	10.3	31-May-21	6.93
		22-Jun-21	9.91	22-Jun-21	6.36
		13-Sep-21	9.44	7-Sep-21	5.74
		3-Nov-21	9.57	29-Nov-21	5.56
Grace Creek (Reference)	LC_GRCK	7-May-21	5.29	7-May-21	6.88
		13-Sep-21	5.31	13-Sep-21	6.56
Dry Creek (Mine-exposed)	LC_DC3	8-Mar-21	12.0	8-Mar-21	6.37
		4-May-21	9.15	3-May-21	8.96
		25-May-21	11.0	31-May-21	9.44
		8-Jun-21	10.5	10-Jun-21	7.43
		22-Jun-21	9.92	21-Jun-21	7.67
		5-Jul-21	12.3	8-Jul-21	8.87
		27-Jul-21	11.4	27-Jul-21	11.0
		8-Sep-21	12.2	10-Sep-21	9.82
		8-Nov-21	12.1	29-Nov-21	5.46
	LC_DCDS	9-Mar-21	10.6	9-Mar-21	20.0
		4-May-21	9.23	4-May-21	18.2
		1-Jun-21	9.97	1-Jun-21	10.3
		8-Jun-21	10.1	10-Jun-21	5.77
		22-Jun-21	11.4	22-Jun-21	7.78
		5-Jul-21	13.2	8-Jul-21	10.3
		27-Jul-21	15.3	27-Jul-21	11.3
		7-Sep-21	14.1	10-Sep-21	11.9
		9-Nov-21	12.6	30-Nov-21	9.68
	LC_DC4	8-Mar-21	8.33	9-Mar-21	6.90
		4-May-21	8.99	5-May-21	7.44
		1-Jun-21	8.99	1-Jun-21	6.87
		24-Jun-21	8.57	23-Jun-21	6.78
		8-Sep-21	9.55	9-Sep-21	7.34
		8-Nov-21	8.29	1-Dec-21	8.14
	LC_DC2	4-May-21	9.20	6-May-21	14.2
		25-May-21	8.73	31-May-21	13.7
		23-Jun-21	8.99	23-Jun-21	8.68
		8-Sep-21	11.8	9-Sep-21	6.32
		8-Nov-21	10.6	1-Dec-21	7.84
	LC_DC1	9-Mar-21	8.37	10-Mar-21	12.0
		16-Mar-21	8.38	15-Mar-21	9.50
		4-May-21	8.92	5-May-21	13.6
		1-Jun-21	9.31	1-Jun-21	8.20
		22-Jun-21	9.42	24-Jun-21	8.10
		8-Sep-21	8.55	7-Sep-21	10.2
		8-Nov-21	8.19	1-Dec-21	8.44
Fording River (Mine-exposed)	LC_FRUS	7-May-21	5.80	7-May-21	7.94
		2-Jun-21	7.27	2-Jun-21	5.87
		24-Jun-21	6.89	25-Jun-21	6.34
		12-Sep-21	9.65	12-Sep-21	9.64
	LC_FRB	15-Mar-21	7.11	15-Mar-21	8.00
		6-May-21	6.29	6-May-21	6.72
		2-Jun-21	8.49	2-Jun-21	5.57
		24-Jun-21	7.51	24-Jun-21	5.96
		12-Sep-21	9.86	12-Sep-21	8.07

Note: LC_FRUS had no March Se speciation samples and therefore could not be include.

[a] Values derived from deBruyn and Luoma (2021) using selenium speciation data and sulphate concentrations for each area on each date to predict benthic invertebrate tissue selenium concentrations.

Table F.4: Spatial and Temporal Comparisons of Benthic Invertebrate Tissue Selenium Concentration Among Months, Dry Creek Sampling Areas, 2021

ANOVA Model[a]				Area		Month	Do concentrations differ among months for each areas?[b]					Do concentrations differ between reference (LC_DCEF) and exposed areas within months?[c]					
Transformation	Area	Month	Month x Area				March	May	Early June	Late June	September	March	May	Early June	Late June	September	December
log10	<0.001	<0.001	<0.001	Reference	LC-DCEF	May	1.9	nc	nc	nc	nc	nc	nc	nc	nc	nc	nc
						Early June	23	21	nc	nc	nc						
						Late June	15	13	-6.4	nc	nc						
						September	3.9	1.9	-16	-9.7	nc						
						December	1.5	-0.36	-17	-12	-2.3						
				Exposed	LC_DC3	May	41	nc	nc	nc	nc	16	61	32	19	73	-3.2
						Early June	41	-0.58	nc	nc	nc						
						Late June	18	-16	-16	nc	nc						
						September	55	9.9	10	31	nc						
						December	-15	-40	-40	-28	-45						
					LC_DCDS	May	-16	nc	nc	nc	nc	266	203	46	23	108	73
						Early June	-51	-42	nc	nc	nc						
						Late June	-61	-54	-21	nc	nc						
						September	-41	-30	20	52	nc						
						December	-52	-43	-2.2	24	-19						
					LC_DC2	May	-	nc	nc	nc	nc	-	152	104	38	9.0	42
						Early June		-2.4	nc	nc	nc						
						Late June		-38	-37	nc	nc						
						September		-56	-55	-29	nc						
						December		-44	-43	-9.5	27						
					LC_DC4	May	7.2	nc	nc	nc	nc	26	33	0.36	7.0	29	45
						Early June	-2.3	-8.8	nc	nc	nc						
						Late June	-2.5	-9.1	-0.22	nc	nc						
						September	6.3	-0.87	8.7	9.0	nc						
						December	17	8.7	19	20	9.7						
					LC_DC1	May	32	nc	nc	nc	nc	88	145	19	29	78	52
						Early June	-23	-42	nc	nc	nc						
						Late June	-21	-40	1.7	nc	nc						
						September	-1.8	-26	27	25	nc						
						December	-18	-38	6.1	4.3	-16						

▨ *P*-value < 0.05.

🟦 *P*-value for post-hoc pair-wise comparison < 0.05 and MOD > 0.

🟩 *P*-value for post-hoc pair-wise comparison < 0.05 and MOD < 0.

Notes: "nc" = not comparable; "-" = no data for comparison.

[a] *P*-values from Analysis of Variance (ANOVA) including the terms Area, Month and Area x Month.

[b] Magnitude of Difference (MOD) was calculated as $(MCT_{month2} - MCT_{month1})/MCT_{month1}$ *100 using the measure of central tendency (geometric mean due to $\log_{10}$ transformation; MCT) related to the statistics.

[c] Magnitude of Difference (MOD) was calculated as $(MCT_{exp} - MCT_{ref})/MCT_{ref}$ *100 using the measure of central tendency (geometric mean due to log10 transformation) related to statistics.

Table F.5: Spatial and Temporal Comparisons of Benthic Invertebrate Tissue Selenium Concentration Among Months, Fording River Sampling Areas, 2021

ANOVA Model[a]				Month	Do concentrations differ among months for each areas?[b]				Do concentrations differ between reference and exposed areas?[c] LC_FRUS vs LC_FRB					
Transformation	Area	Month	Month x Area		March	May	Early June	Late June	March	May	Early June	Late June	September	December
log10	0.288	<0.001	0.161	May	1.8	nc	nc	nc	-5.3					
				Early June	-19	-21	nc	nc						
				Late June	-13	-14	8.3	nc						
				September	29	27	60	48						

▨ *P*-value < 0.05.

🟦 *P*-value for post-hoc paired-wise comparison < 0.05 and MOD > 0.

🟩 *P*-value for post-hoc paired-wise comparison < 0.05 and MOD < 0.

Notes: "nc" = not comparable; "-" = no data for comparison.

[a] *P*-values from Analysis of Variance (ANOVA) including the terms Station, Month and Station x Month.

[b] Magnitude of Difference (MOD) was calculated as $(MCT_{month2} - MCT_{month1})/MCT_{month1}*100$ using the measure of central tendency (geometric mean due to log_{10} transformation; MCT) related to the statistics.

[c] Magnitude of Difference (MOD) was calculated as $(MCT_{LC\_FRB} - MCT_{LC\_FRUS})/MCT_{LC\_FRUS}*100$ using the measure of central tendency (geometric mean due to log10 transformation) related to statistics.

Table F.6: Asymmetric Two-Way ANOVA Model Results for Benthic Invertebrate Selenium Concentrations at LC_DC3 Relative to the Reference Area (LC_DCEF), Compared Among DCWMS Operational Periods and Before and After the Burnt Ridge North (BRN) Spoil Failure, 2018 to 2021

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	*P*-Value
Period	4	0.17	0.042	4.9	0.001
CI	1	0.42	0.42	50	<0.001
Period×CI	4	0.0069	0.0017	0.21	0.935
Time(Period)	11	0.36	0.032	3.8	<0.001
Time(Period)×CI	11	0.23	0.021	2.5	0.007
Error	128			-	

Among and Within Period Differences (*P*-value and Magnitude of Difference)			
Period 1	**Period 2**	***P*-value**	**MOD[c]**
2018_12 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	0.003	-2.6 SD
2019_2 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2019_5 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2019_6 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2019_9 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	0.002	2.8 SD
	2021_12 (BP: After)	ns	-
2019_12 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2020_5 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2020_6 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2020_9 (DW/BP: Before)	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2020_12 (BP: Before)	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2021_3 (BP: After)	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
2021_5 (BP: After)	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
2021_9 (BP: After)	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
2021_12 (BP: After)	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-

▨	*P*-value for **Period×CI** or **Time(Period)×CI** factors < 0.1.
🟦	Contrast *P*-value < 0.1/14 and in an increasing direction.
🟩	Contrast *P*-value < 0.1/14 and in a decreasing direction.

Notes: "-" = not relevant. Post-hoc tests corrected for the number of Period 1 comparisons. DCMWS = Dry Creek Water Management System; DCWMS Before = DCWMS Operational, Before BRN Spoil Failure; DW/BP: Before = DCWMS Dewatering/Bypass Operational, Before BRN Spoil Failure; BP: Before = DCWMS Bypass Operational, Before BRN Spoil Failure; BP: After = DCWMS Bypass Operational, After BRN Spoil Failure; DCWMS: After = DCWMS Operational, After BRN Spoil Failure; BP: After = DCWMS Bypass Operational, After BRN Spoil Failure. Year_Month by number.

[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 F.7: Asymmetric Two-Way ANOVA Model Results for Benthic Invertebrate Selenium Concentrations at LC_DCDS Relative to the Reference Area (LC_DCEF), Compared Among DCWMS Operational Periods and Before and After the Burnt Ridge North (BRN) Spoil Failure, 2018 to 2021

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	*P*-Value
Period	4	1.2	0.30	26	<0.001
CI	1	13	13	1,139	<0.001
Period×CI	4	1.9	0.47	40	<0.001
Time(Period)	11	1.8	0.17	14	<0.001
Time(Period)×CI	11	1.3	0.11	10	<0.001
Error	126	-			

Among and Within Period Differences (*P*-value and Magnitude of Difference)			
Period 1	**Period 2**	***P*-value**	**MOD[c]**
2018_12 (DCWMS: Before)	2020_9 (DW/BP: Before)	<0.001	-3.2 SD
	2020_12 (BP: Before)	<0.001	-4.7 SD
	2021_3 (BP: After)	<0.001	-4.1 SD
	2021_5 (BP: After)	<0.001	-4.9 SD
	2021_6A (DCWMS: After)	<0.001	-7.8 SD
	2021_6B (DCWMS: After)	<0.001	-8.5 SD
	2021_9 (BP: After)	<0.001	-6.4 SD
	2021_12 (BP: After)	<0.001	-7.1 SD
2019_2 (DCWMS: Before)	2020_9 (DW/BP: Before)	<0.001	-3.0 SD
	2020_12 (BP: Before)	<0.001	-4.5 SD
	2021_3 (BP: After)	<0.001	-4.0 SD
	2021_5 (BP: After)	<0.001	-4.7 SD
	2021_6A (DCWMS: After)	<0.001	-7.7 SD
	2021_6B (DCWMS: After)	<0.001	-8.3 SD
	2021_9 (BP: After)	<0.001	-6.2 SD
	2021_12 (BP: After)	<0.001	-7.0 SD
2019_5 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	<0.001	-5.7 SD
	2021_6B (DCWMS: After)	<0.001	-6.4 SD
	2021_9 (BP: After)	<0.001	-4.3 SD
	2021_12 (BP: After)	<0.001	-5.1 SD
2019_6 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	<0.001	-5.1 SD
	2021_6B (DCWMS: After)	<0.001	-5.8 SD
	2021_9 (BP: After)	<0.001	-3.7 SD
	2021_12 (BP: After)	<0.001	-4.4 SD
2019_9 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	<0.001	-3.9 SD
	2021_6B (DCWMS: After)	<0.001	-4.6 SD
	2021_9 (BP: After)	0.006	-2.5 SD
	2021_12 (BP: After)	<0.001	-3.2 SD
2019_12 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	0.005	-2.6 SD
	2021_6A (DCWMS: After)	<0.001	-5.5 SD
	2021_6B (DCWMS: After)	<0.001	-6.2 SD
	2021_9 (BP: After)	<0.001	-4.1 SD
	2021_12 (BP: After)	<0.001	-4.8 SD
2020_5 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	<0.001	-4.4 SD
	2021_6B (DCWMS: After)	<0.001	-5.1 SD
	2021_9 (BP: After)	0.001	-3.0 SD
	2021_12 (BP: After)	<0.001	-3.7 SD
2020_6 (DCWMS: Before)	2020_9 (DW/BP: Before)	<0.001	3.5 SD
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2020_9 (DW/BP: Before)	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	<0.001	-4.6 SD
	2021_6B (DCWMS: After)	<0.001	-5.3 SD
	2021_9 (BP: After)	<0.001	-3.2 SD
	2021_12 (BP: After)	<0.001	-4.0 SD
2020_12 (BP: Before)	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	0.003	-3.1 SD
	2021_6B (DCWMS: After)	<0.001	-3.8 SD
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2021_3 (BP: After)	2021_6A (DCWMS: After)	0.002	-3.7 SD
	2021_6B (DCWMS: After)	<0.001	-4.4 SD
2021_5 (BP: After)	2021_6A (DCWMS: After)	0.006	-2.9 SD
	2021_6B (DCWMS: After)	<0.001	-3.6 SD
2021_9 (BP: After)	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
2021_12 (BP: After)	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-

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

🟦 Contrast *P*-value < 0.1/14 and in an increasing direction

🟩 Contrast *P*-value < 0.1/14 and in a decreasing direction

Notes: "-" = not relevant. Post-hoc tests corrected for the number of Period 1 comparisons. DCMWS = Dry Creek Water Management System; DCWMS Before = DCWMS Operational, Before BRN Spoil Failure; DW/BP: Before = DCWMS Dewatering/Bypass Operational, Before BRN Spoil Failure; BP: Before = DCWMS Bypass Operational, Before BRN Spoil Failure; BP: After = DCWMS Bypass Operational, After BRN Spoil Failure; DCWMS: After = DCWMS Operational, After BRN Spoil Failure; BP: After = DCWMS Bypass Operational, After BRN Spoil Failure. Year_month by number.

[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 F.8: Asymmetric Two-Way ANOVA Model Results for Benthic Invertebrate Selenium Concentrations at LC_DC2 Relative to the Reference Area (LC_DCEF), Compared Among DCWMS Operational Periods and Before and After the Burnt Ridge North (BRN) Spoil Failure, 2018 to 2021

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	*P*-Value
Period	4	0.079	0.020	3.5	0.010
CI	1	3.1	3.1	556	<0.001
Period×CI	4	0.23	0.056	10	<0.001
Time(Period)	9	0.70	0.078	14	<0.001
Time(Period)×CI	9	0.69	0.076	14	<0.001
Error	102	-			

Among and Within Period Differences (*P*-value and Magnitude of Difference)

Period 1	**Period 2**	***P*-value**	**MOD[c]**
2018_12 (DCWMS: Before)	2020_9 (DW/BP: Before)	<0.001	-5.7 SD
	2020_12 (BP: Before)	<0.001	-6.1 SD
	2021_5 (BP: After)	<0.001	-5.2 SD
	2021_6A (DCWMS: After)	<0.001	-6.4 SD
	2021_6B (DCWMS: After)	<0.001	-8.7 SD
	2021_9 (BP: After)	<0.001	-10.0 SD
	2021_12 (BP: After)	<0.001	-8.5 SD
2019_5 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	0.003	-3.1 SD
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	0.004	-3.4 SD
	2021_6B (DCWMS: After)	<0.001	-5.6 SD
	2021_9 (BP: After)	<0.001	-7.0 SD
	2021_12 (BP: After)	<0.001	-5.5 SD
2019_6 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	<0.001	-3.5 SD
	2021_12 (BP: After)	ns	-
2019_9 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	0.004	-2.7 SD
	2021_12 (BP: After)	ns	-
2019_12 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	<0.001	-3.4 SD
	2021_12 (BP: After)	ns	-
2020_5 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	<0.001	-3.3 SD
	2021_9 (BP: After)	<0.001	-4.7 SD
	2021_12 (BP: After)	<0.001	-3.2 SD
2020_6 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	0.001	-3.0 SD
	2021_12 (BP: After)	ns	-
2020_9 (DW/BP: Before)	2020_12 (BP: Before)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	0.001	-3.0 SD
	2021_9 (BP: After)	<0.001	-4.4 SD
	2021_12 (BP: After)	0.002	-2.8 SD
2020_12 (BP: Before)	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	0.006	-2.5 SD
	2021_9 (BP: After)	<0.001	-3.9 SD
	2021_12 (BP: After)	ns	-
2021_5 (BP: After)	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	<0.001	-3.5 SD
2021_9 (BP: After)	2021_6A (DCWMS: After)	<0.001	3.6 SD
	2021_6B (DCWMS: After)	ns	-
2021_12 (BP: After)	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	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. Post-hoc tests corrected for the number of Period 1 comparisons. DCMWS = Dry Creek Water Management System; DCWMS Before = DCWMS Operational, Before BRN Spoil Failure; DW/BP: Before = DCWMS Dewatering/Bypass Operational, Before BRN Spoil Failure; BP: Before = DCWMS Bypass Operational, Before BRN Spoil Failure; BP: After = DCWMS Bypass Operational, After BRN Spoil Failure; DCWMS: After = DCWMS Operational, After BRN Spoil Failure; BP: After = DCWMS Bypass Operational, After BRN Spoil Failure.

[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 F.9: Asymmetric Two-Way ANOVA Model Results for Benthic Invertebrate Selenium Concentrations at LC_DC4 Relative to the Reference Area (LC_DCEF), Compared Among DCWMS Operational Periods and Before and After the Burnt Ridge North (BRN) Spoil Failure, 2018 to 2021

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	*P*-Value
Period	4	0.12	0.031	5.8	<0.001
CI	1	1.1	1.1	210	<0.001
Period×CI	4	0.20	0.051	9.4	<0.001
Time(Period)	11	0.28	0.025	4.7	<0.001
Time(Period)×CI	11	0.055	0.0050	0.93	0.510
Error	126	-			

Among and Within Period Differences (*P*-value and Magnitude of Difference)			
Period 1	**Period 2**	***P*-value**	**MOD[c]**
DCWMS: Before	DW/BP: Before	ns	-
	BP: Before	0.001	-2.2 SD
	BP: After	0.002	-1.3 SD
	DCWMS: After	<0.001	-2.7 SD
DW/BP: Before	BP: Before	0.006	-2.5 SD
	BP: After	ns	-
	DCWMS: After	<0.001	-3.0 SD
BP: Before	BP: After	ns	-
	DCWMS: Before	ns	-
DCWMS: After	BP: After	0.016	1.5 SD

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

🟦 Contrast P-*v*alue < 0.1/4 and in an increasing direction

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

Notes: "-" = not relevant. Post-hoc tests corrected for the number of Period 1 comparisons. DCMWS = Dry Creek Water Management System; DCWMS Before = DCWMS Operational, Before BRN Spoil Failure; DW/BP: Before = DCWMS Dewatering/Bypass Operational, Before BRN Spoil Failure; BP: Before = DCWMS Bypass Operational, Before BRN Spoil Failure; BP: After = DCWMS Bypass Operational, After BRN Spoil Failure; DCWMS: After = DCWMS Operational, After BRN Spoil Failure; BP: After = DCWMS Bypass Operational, After BRN Spoil Failure.

[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 F.10: Asymmetric Two-Way ANOVA Model Results for Benthic Invertebrate Selenium Concentrations at LC_DC1 Relative to the Reference Area (LC_DCEF), Compared Among DCWMS Operational Periods and Before and After the Burnt Ridge North (BRN) Spoil Failure, 2018 to 2021

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	*P*-Value
Period	4	0.13	0.032	3.6	0.009
CI	1	1.9	1.9	212	<0.001
Period×CI	4	0.10	0.025	2.8	0.029
Time(Period)	10	0.19	0.019	2.2	0.026
Time(Period)×CI	10	0.15	0.015	1.7	0.096
Error	108	-			

Among and Within Period Differences (*P*-value and Magnitude of Difference)			
Period 1	**Period 2**	***P*-value**	**MOD[c]**
2018_12 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2019_5 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2019_6 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2019_9 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	0.002	2.8 SD
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2019_12 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2020_5 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2020_6 (DCWMS: Before)	2020_9 (DW/BP: Before)	ns	-
	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	0.006	2.5 SD
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2020_9 (DW/BP: Before)	2020_12 (BP: Before)	ns	-
	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2020_12 (BP: Before)	2021_3 (BP: After)	ns	-
	2021_5 (BP: After)	ns	-
	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
	2021_9 (BP: After)	ns	-
	2021_12 (BP: After)	ns	-
2021_3 (BP: After)	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
2021_5 (BP: After)	2021_6A (DCWMS: After)	0.002	-3.3 SD
	2021_6B (DCWMS: After)	0.001	-2.9 SD
2021_9 (BP: After)	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-
2021_12 (BP: After)	2021_6A (DCWMS: After)	ns	-
	2021_6B (DCWMS: After)	ns	-

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

🟦 Contrast *P*-value < 0.1/13 and in an increasing direction.

🟩 Contrast *P*-value < 0.1/13 and in a decreasing direction.

Notes: "-" = not relevant. Post-hoc tests corrected for the number of Period 1 comparisons. DCMWS = Dry Creek Water Management System; DCWMS Before = DCWMS Operational, Before BRN Spoil Failure; DW/BP: Before = DCWMS Dewatering/Bypass Operational, Before BRN Spoil Failure; BP: Before = DCWMS Bypass Operational, Before BRN Spoil Failure; BP: After = DCWMS Bypass Operational, After BRN Spoil Failure; DCWMS: After = DCWMS Operational, After BRN Spoil Failure; BP: After = DCWMS Bypass Operational, After BRN Spoil Failure.

[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 F.11: Asymmetric Two-Way ANOVA Model Results for Benthic Invertebrate Selenium Concentrations at LC_FRB Relative to LC_FRUS, Compared Among DCWMS Operational Periods and Before and After the Burnt Ridge North (BRN) Spoil Failure, 2018 to 2021

ANOVA Model					
Term	DF	SS[a]	MS[b]	F-Ratio	*P*-Value
Period	2	0.14	0.072	20	<0.001
CI	1	0.010	0.010	2.8	0.098
Period×CI	2	0.000020	0.000010	0.0027	0.997
Time(Period)	6	0.26	0.043	12	<0.001
Time(Period)×CI	6	0.039	0.0064	1.8	0.117
Error	60	-			

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

Notes: "-" = not relevant. Only data after 2018 were included to match data available in Dry Creek. DCMWS = Dry Creek Water Management System. DCWMS Before = DCWMS Operational, Before BRN Spoil Failure; DW/BP: Before = DCWMS Dewatering/Bypass Operational, Before BRN Spoil Failure; BP: Before = DCWMS Bypass Operational, Before BRN Spoil Failure; BP: After = DCWMS Bypass Operational, After BRN Spoil Failure; DCWMS: After = DCWMS Operational, After BRN Spoil Failure; BP: After = DCWMS Bypass Operational, After BRN Spoil Failure.

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

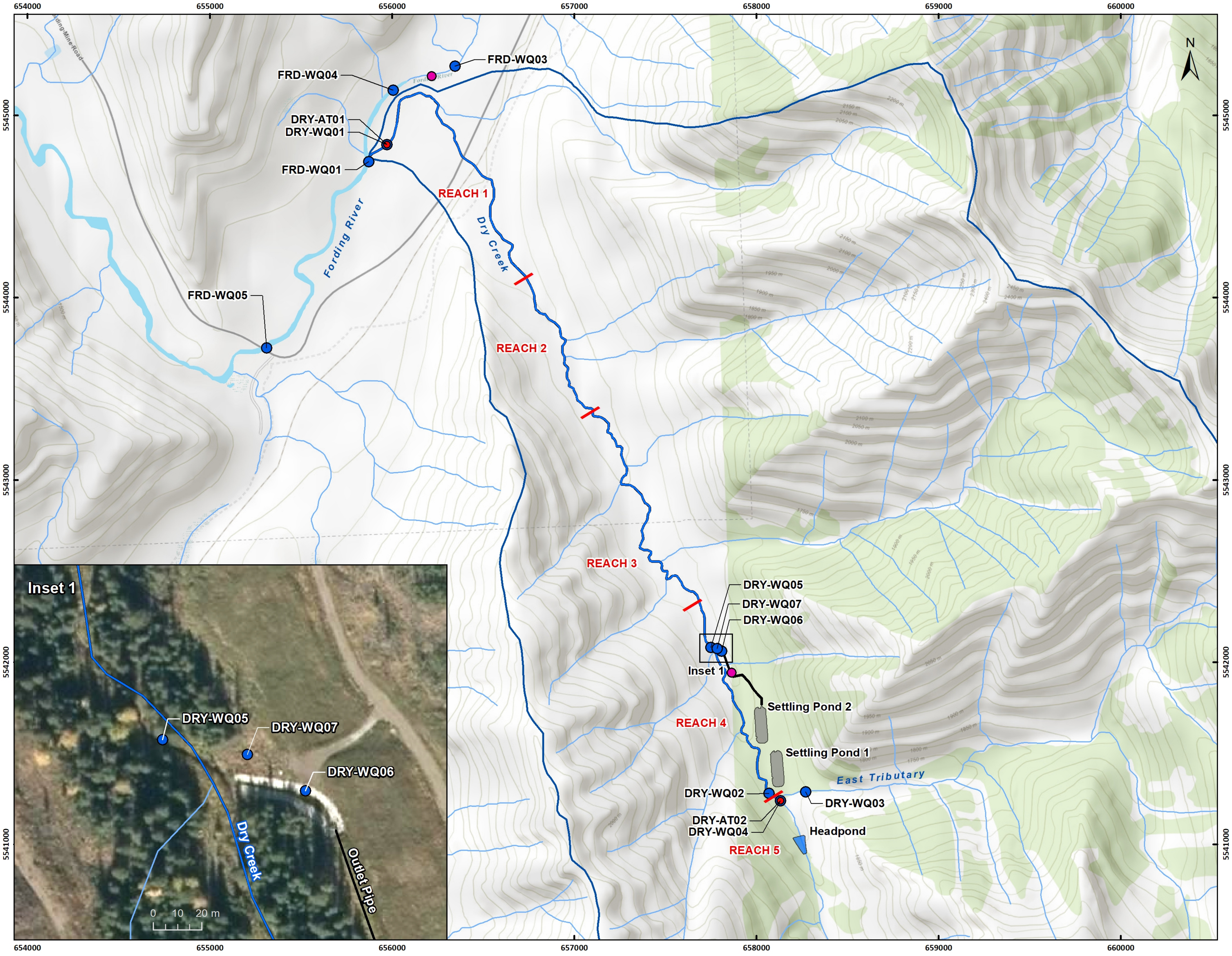
[b] MS = mean sum of squares of ANOVA model.

APPENDIX G

FISH AND FISH HABITAT

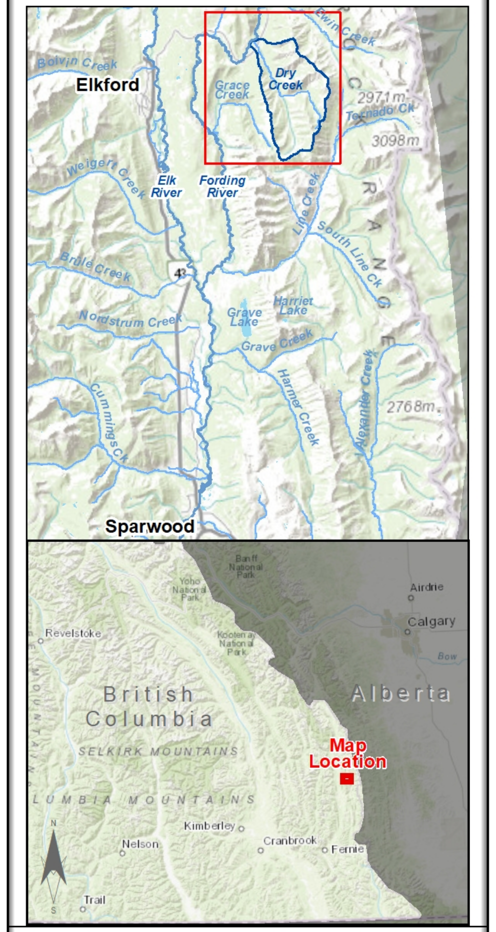
DRY CREEK

Water Temperature Monitoring Sites



Legend

- ● Water Temperature Sites
- ● Air Temperature Site
- Reach Break
- Study
- Headpond
- Settling Ponds
- Dry Creek Watershed
- ● Intake/Outfall
- Outlet Pipe



MAP SHOULD NOT BE USED FOR LEGAL OR NAVIGATIONAL PURPOSES

0 100 200 400 600 800 1,000 Meters

Scale: 1:20,000

NO.	DATE	REVISION	BY
1	2022-01-31	1224_DRY_WaterTemperatureMonitoringSites_4551_20220114	DW
2			
3			
4			
5			

Date Saved: 2022-01-31
Coordinate System: NAD 1983 UTM Zone 11N

ECOFISH RESEARCH

Figure G.1

Path: M:\Projects-Active\1224_DryCreek\MXD\MonitoringSites\1224_DRY_WaterTemperatureMonitoringSites_4551_20220114.mxd

Table G.1: Westslope Cutthroat Trout Mortalities in Dry Creek, 2016 to 2021

Year	Fork Length (mm)	Weight (g)	Age[a]	Comment
2016	238	50	-	Mortality during Fish and Fish Habitat Monitoring Program (FFHMP) survey
2019	200	-	4+	Collected as part of Teck's opportunistic fish tissue sampling program
	250	-	4+	Collected as part of Teck's opportunistic fish tissue sampling program
2020	145	34	3	Collected as part of Teck's opportunistic fish tissue sampling program
	157	44	3	Collected as part of Teck's opportunistic fish tissue sampling program
	124	14	2	Collected as part of Teck's opportunistic fish tissue sampling program
	195	83	4	Collected as part of Teck's opportunistic fish tissue sampling program
	140	32	2	Collected as part of Teck's opportunistic fish tissue sampling program
	110	13	2	Collected as part of Teck's opportunistic fish tissue sampling program
	138	28	2	Collected as part of Teck's opportunistic fish tissue sampling program
	101	12	1	Collected as part of Teck's opportunistic fish tissue sampling program
	86	6	1	Collected as part of Teck's opportunistic fish tissue sampling program
	178	62	4	Collected as part of Teck's opportunistic fish tissue sampling program
	169	48	3	Collected as part of Teck's opportunistic fish tissue sampling program
	151	34	3	Collected as part of Teck's opportunistic fish tissue sampling program
	163	50	3	Collected as part of Teck's opportunistic fish tissue sampling program
	81	5	1	Collected as part of Teck's opportunistic fish tissue sampling program
	169	45	3	Collected as part of Teck's opportunistic fish tissue sampling program
	148	35	3	Collected as part of Teck's opportunistic fish tissue sampling program
	150	37	3	Collected as part of Teck's opportunistic fish tissue sampling program
	256	184	4+	Collected as part of Teck's opportunistic fish tissue sampling program
	80	5	1	Collected as part of Teck's opportunistic fish tissue sampling program
	186	69	4	Collected as part of Teck's opportunistic fish tissue sampling program
	156	42	3	Collected as part of Teck's opportunistic fish tissue sampling program
	125	20	2	Collected as part of Teck's opportunistic fish tissue sampling program
	157	44	3	Collected as part of Teck's opportunistic fish tissue sampling program
	124	20	2	Collected as part of Teck's opportunistic fish tissue sampling program
	130	26	2	Collected as part of Teck's opportunistic fish tissue sampling program
2021	-	-	-	No mortalities reported

Notes: "-" indicates data not collected. Data in 2017 and 2018 were not available for review.

[a] Age assigned based on 2020 age-length key.

Table G.2: Monthly Mean Dissolved Oxygen Concentrations (mg/L) in Dry Creek, 2012 to 2021

Year	Month	LC_DCEF	LC_SPDC	LC_DCDS	LC_DC2	LC_DC4	LC_DC1
2012	January	11.9	-	-	-	-	13.8
	February	-	-	-	-	-	-
	March	12.5	-	-	-	-	-
	April	13.8	-	-	-	-	16.6
	May	11.7	-	-	12.1	-	12.4
	June	11.8	-	-	11.4	-	11.8
	July	10.7	-	-	10.1	-	10.4
	August	10.0	-	-	9.8	-	9.5
	September	10.2	-	-	10.0	-	10.6
	October	10.7	-	-	11.3	-	11.8
	November	9.9	-	-	11.4	-	11.3
	December	10.2	-	-	-	-	12.2
2013	January	11.2	-	-	-	-	11.4
	February	10.6	-	-	-	-	-
	March	11.2	-	-	-	-	-
	April	10.7	-	-	11.8	-	11.8
	May	12.7	-	-	12.8	-	13.3
	June	10.8	-	-	10.6	-	10.9
	July	10.9	-	-	10.1	-	10.2
	August	10.4	-	-	9.8	-	9.9
	September	9.9	-	-	9.5	-	10.3
	October	-	-	-	-	-	-
	November	10.0	-	11.9	11.3	-	11.6
	December	10.8	-	12.0	-	-	12.2
2014	January	9.6	-	11.2	-	-	-
	February	10.5	-	-	-	-	-
	March	8.2	-	12.2	-	-	12.4
	April	8.7	-	11.5	-	-	11.2
	May	12.4	-	12.7	-	-	12.9
	June	11.3	-	10.8	-	-	10.8
	July	9.6	-	10.5	-	-	10.2
	August	10.8	-	10.1	-	-	10.1
	September	11.5	-	12.1	-	-	11.9
	October	10.1	-	10.8	-	-	10.9
	November	9.8	12.6	11.4	-	-	11.5
	December	1.6	7.0	5.9	-	-	-
2015	January	11.3	-	12.1	-	-	-
	February	10.0	11.0	-	-	-	-
	March	9.4	11.8	11.7	-	-	13.2
	April	12.5	12.2	12.3	-	-	12.3
	May	10.7	10.9	10.6	-	-	11.4
	June	11.2	9.9	9.7	-	-	10.3
	July	11.6	8.5	9.0	-	-	10.0
	August	10.1	7.3	8.4	-	-	9.7
	September	10.6	9.9	9.9	-	-	10.7
	October	10.4	9.7	10.4	-	-	10.4
	November	10.5	10.8	11.0	-	-	12.0
	December	10.2	11.7	11.5	-	-	11.6
2016	January	9.9	11.4	11.5	-	-	11.1
	February	10.1	10.7	9.3	-	-	8.2
	March	13.0	12.6	12.9	-	-	12.4
	April	12.3	11.3	11.2	-	-	11.4
	May	11.9	10.8	11.0	-	-	11.3
	June	11.1	9.4	9.6	-	-	10.8
	July	11.1	8.6	9.3	-	-	10.5
	August	10.2	7.5	7.9	-	-	10.1
	September	10.9	8.7	8.7	-	-	10.5
	October	9.5	9.8	10.2	-	-	11.0
	November	10.0	11.2	10.8	-	-	11.0
	December	11.6	10.3	11.9	-	-	13.1

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

Notes: "-" = no data/not recorded. Spawning, incubation, and alevin stages for 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 this species is approximated from COSEWIC (2016), McPhail and Baxter (1996), and McPhail (2007).

Table G.2: Monthly Mean Dissolved Oxygen Concentrations (mg/L) in Dry Creek, 2012 to 2021

Year	Month	LC_DCEF	LC_SPDC	LC_DCDS	LC_DC2	LC_DC4	LC_DC1
2017	January	11.1	12.2	12.3	-	-	12.4
	February	11.1	13.6	12.6	-	-	12.6
	March	11.3	10.4	10.5	-	-	11.5
	April	12.6	12.3	12.4	-	-	11.9
	May	11.6	11.4	11.4	-	-	11.4
	June	10.4	11.4	10.1	-	-	10.3
	July	8.9	8.2	8.1	-	-	9.8
	August	10.5	7.9	8.5	-	-	10.1
	September	10.5	9.1	9.8	-	-	12.0
	October	10.0	10.7	10.8	-	-	11.7
	November	10.1	12.2	12.3	-	-	12.0
	December	10.5	10.9	11.4	-	-	12.2
2018	January	10.1	10.0	9.8	-	-	9.7
	February	10.6	11.5	11.6	-	-	11.8
	March	10.3	11.6	11.6	-	-	11.6
	April	11.4	12.3	12.1	-	-	12.2
	May	11.9	10.2	11.2	-	-	11.4
	June	10.5	9.2	9.5	-	-	10.4
	July	11.6	9.1	9.4	-	-	11.0
	August	10.4	8.6	8.9	-	-	10.6
	September	10.4	9.3	9.3	-	-	10.8
	October	10.9	11.4	11.4	-	-	11.9
	November	10.3	11.3	11.6	11.8	11.0	11.7
	December	10.5	12.1	12.1	-	11.2	12.6
2019	January	10.4	10.5	12.8	7.5	11.4	12.1
	February	11.7	10.9	12.0	8.0	11.4	13.2
	March	14.3	14.3	17.5	16.1	15.5	15.9
	April	11.3	11.7	11.9	11.9	11.7	11.9
	May	10.2	10.5	11.4	10.9	11.1	11.0
	June	11.1	10.1	10.5	10.7	10.8	10.7
	July	10.3	9.4	9.7	10.2	10.2	10.3
	August	10.4	8.9	9.0	9.6	10.5	10.6
	September	10.5	9.3	9.4	10.0	10.4	11.0
	October	10.5	11.2	11.3	11.3	11.3	11.9
	November	10.5	11.8	11.7	11.6	11.3	12.3
	December	10.9	13.1	12.7	13.3	12.4	13.2
2020	January	10.8	11.7	11.8	11.9	11.7	12.1
	February	11.1	11.8	12.2	-	-	12.3
	March	11.1	12.0	12.1	12.1	11.5	12.1
	April	10.7	11.8	11.9	11.7	11.6	11.7
	May	11.9	11.1	10.9	11.8	11.3	11.3
	June	11.1	10.4	10.4	11.0	10.8	10.7
	July	10.7	10.1	10.4	10.5	10.8	10.7
	August	10.5	9.1	9.0	9.2	9.8	10.1
	September	10.1	10.7	10.8	10.3	10.6	11.0
	October	10.6	11.5	11.6	11.6	11.2	11.8
	November	10.5	12.3	11.9	11.9	11.2	11.8
	December	10.9	12.1	12.1	12.0	11.4	12.0
2021	January	10.8	12.0	12.1	11.8	11.5	12.2
	February	10.7	11.9	12.4	12.0	11.5	12.0
	March	11.1	11.3	11.4	11.2	10.6	11.3
	April	10.3	11.3	11.8	11.7	11.6	11.6
	May	10.6	10.7	10.9	11.2	11.0	11.0
	June	10.3	9.8	9.8	9.7	10.0	9.8
	July	10.0	9.2	9.2	9.4	9.9	9.8
	August	10.2	9.8	9.9	10.0	10.1	10.2
	September	10.3	10.6	10.8	10.8	10.6	10.8
	October	10.6	11.2	11.4	11.6	11.1	11.4
	November	10.8	11.7	11.7	11.9	11.3	11.8
	December	10.6	11.5	11.6	11.5	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 for all months except April, see notes for details).

Notes: "-" = no data/not recorded. Spawning, incubation, and alevin stages for 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 this species is approximated from COSEWIC (2016), McPhail and Baxter (1996), and McPhail (2007).

Table G.3: Summary of Data Gaps (presented as percent [%] complete) at the Dry Creek LC_DC1 Gauge from 2011 to 2021

Year	% Complete[1]												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2011	100	100	100	100	100	100	100	100	100	76	7	0	82
2012	0	0	0	0	0	63	0	13	54	100	69	0	25
2013	18	23	20	28	31	19	31	31	32	31	20	0	24
2014	0	0	0	0	0	0	74	100	29	100	49	0	29
2015	0	0	24	26	100	100	100	100	100	100	100	100	71
2016	100	100	100	100	100	100	100	100	100	100	100	100	100
2017	0	0	34	100	85	84	85	100	100	90	70	5	63
2018	63	92	94	86	100	100	100	100	100	100	44	74	88
2019	0	0	0	2	100	100	100	100	100	92	79	75	62
2020	88	86	91	94	100	100	100	100	100	93	92	84	94
2021	88	79	100	100	100	100	100	100	100	100	92	92	96

[1] Based on the total number of days within each month (Jan-Dec) and in each year (Total) that data was available.

APPENDIX H

BIOLOGICAL TRIGGERS

APPENDIX H BIOLOGICAL TRIGGERS

H1. INTRODUCTION

H1.1 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 (Canadian Aquatic Biomonitoring Network (CABIN) protocol.
- 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 eight samples collected per location per sampling event, where each sample is taken 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.

H2. METHODS

H2.1 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. For the 2021 LCO Dry Creek LAEMP, biological trigger analyses only included two of the three measurement endpoints (%EPT and BIT Se).

For the purpose of application of the biological triggers, expectations for the endpoints evaluated (%EPT and BIT 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 were 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, which for this study were mine-exposed areas LC_DCDS and LC_DC1. Although data for other areas studied under the LCO Dry Creek LAEMP (i.e., LC_DCEF, LC_DC3, LC_DC2, LC_DC4, LC_FRUS, LC_FRB, and LC_GRCK) were not evaluated relative to biological triggers, they were assessed as part of the main LCO Dry Creek LAEMP report.

Detailed methods associated with the evaluation of data associated with each of the applicable biological triggers are provided below.

H2.2 Percent EPT

Data for percent EPT were compared to:

- <u>Normal range:</u> The lower limit of the habitat-adjusted normal range (2.5th percentile). Up-to-date limits for normal ranges[1] are provided in the RAEMP and LAEMPs, where they are recalculated when 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, (geographic information system) GIS, and land cover variables (Minnow 2020).
- <u>Expectations:</u> The lower limit of the range of %EPT corresponds to the predicted ADIT score. The predicted ADIT scores correspond to potential effects on benthic invertebrate community (BIC) endpoints, based on relationships between water quality projections (for nitrate, sulphate and cadmium)[2] and invertebrate toxicity

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[1] The normal range will be updated as part of the three-year reporting cycle of the RAEMP (Minnow 2021b).

[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).

endpoints originally developed for the Elk Valley Water Quality Plan (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 effects in 20 to 50% of organisms, 1 corresponds to effects in 10 to 20% of organisms, and 0 corresponds to effects in 10% or fewer organisms. Once %EPT is actually measured, the measured results are converted to an 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; and 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 (replicates were evaluated individually). In summary, this component of the biological trigger for %EPT asks whether the 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 Dry Creek LAEMP were included in the biological trigger analysis.

H2.3 Benthic Invertebrate Tissue Selenium (BIT Se)

Data for BIT Se were compared to:

- Normal range: The upper limit of the 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 when new data become available (Teck 2019).
- Expectations: The upper limit of the 95% prediction interval based on the water to BIT Se 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. Methods for estimating the upper limit of the 95% prediction for BIT Se (given any projected value of aqueous selenium) are discussed further in the Biological Trigger Development for the Elk Valley Adaptive Management Plan (Azimuth 2021 [In Preparation]).

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[3] The normal range will be updated as part of the three-year reporting cycle of the RAEMP (Minnow 2021b).

Benthic invertebrate tissue selenium data from sampling events completed throughout 2021 for the LCO Dry Creek LAEMP (March, May, early-June, mid-June (only LC_DCDS), late-June, July, August, and November/December) were included in the biological trigger analysis although normal range information is based on fall (September) information.

Although EVWQP effects benchmarks are not part of the trigger, they are relevant for interpreting potential significance and responses. Consequently, the level 1, 2 and 3 EVWQP benchmarks for the most sensitive receptor (juvenile fish via dietary exposure) are included in benthic invertebrate tissue plots (11, 18 and 26 mg/kg respectively).

H3. RESULTS

H3.1 Percent EPT

Individual replicates for the %EPT endpoint for both mine-exposed areas (LC_DCDS and LC_DC1) evaluated in the LCO Dry Creek LAEMP were assessed against their respective biological trigger values for the September sampling period (Table H.1 and Figure H.1). None of the three replicates evaluated during this sampling period from each of LC_DCDS and LC_DC1, were below the biological trigger values, (Appendix Table H.1 and Appendix Figure H.1).

H3.2 Benthic Invertebrate Tissue Selenium (BIT Se)

Benthic invertebrate tissue selenium concentrations at LC_DCDS and LC_DC1 were assessed against their respective biological triggers for individual replicates from each of the sampling events (March, May, early-June, mid-June [only LC_DCDS], late-June, July [only LC_DCDS], August, and November/December; Table H.2 and Figure H.2). At least one replicate in each of the eight sampling events for LC_DCDS as well as at least one replicate from March, May, and September from LC_DC1 exceeded the biological trigger for BIT Se. Of the 35 samples evaluated in 2021 at LC_DCDS, 13 exceeded the biological trigger (11.7 mg/kg dw) with BIT Se concentrations ranging from 12 to 26 mg/kg dw Seven out of 26 samples (with Se concentrations ranging from 12 to 15 mg/kg dw) exceeded the biological trigger at LC_DC1 in 2021

H4. SUMMARY

All of the benthic invertebrate community samples from LC_DC1 and LC_DCDS were above the biological trigger values for %EPT. Efforts 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 are underway as Minnow is developing a predictive model for benthic invertebrate community endpoints. Uncertainties are expected to be reduced through these efforts, and additional monitoring or potential management responses will continue to be assessed through the adaptive management process.

At least one replicate in each of the eight sampling events for LC_DCDS and at least one replicate from March, May, and September from LC_DC1 exceeded the biological trigger for benthic invertebrate tissue selenium concentrations. The higher frequency and magnitude of exceedances at LC_DCDS are likely related to its proximity to the DCWMS discharge, while farther downstream at LC_DC1 benthic invertebrate tissue selenium concentrations either did not reach or were only slightly above the biological trigger values. The biological trigger exceedance for benthic invertebrate tissue selenium concentrations at these areas is likely the result of enhanced selenium bioaccumulation due to the generation of more bioavailable organoselenium in the DCWMS sedimentation ponds (see main report). Mitigation steps and additional monitoring efforts were implemented in 2021 to address the elevated benthic invertebrate tissue selenium concentrations observed in the LCO Dry Creek LAEMP. Overall, current biological triggers were sufficient to identify monitoring areas where biological responses are occurring, and no additional triggers are recommended at this time.

H5. REFERENCES

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Teck. 2018. Water Quality Adaptive Management Plan for Teck Coal Operations in the Elk Valley. December 21, 2018.

Teck. 2019. Elk Valley Water Quality Plan 2019 Implementation Plan Adjustment. July 2019.

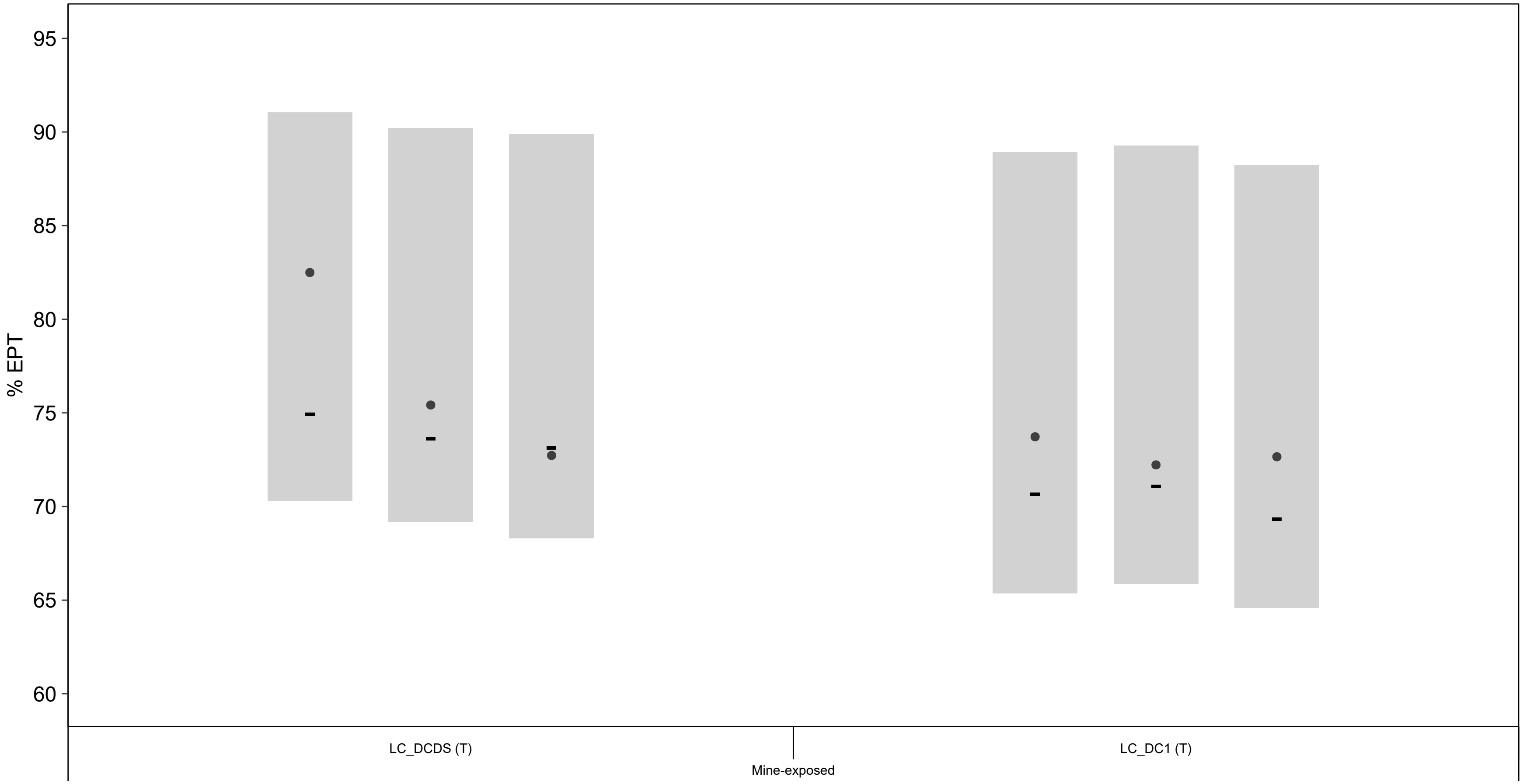

Figure H.1: **% EPT Compared to Predicted Values, Dry Creek LAEMP, September 2021**

Notes: Black bars indicate the lower limit of the predicted ADIT score for the location. Grey shading represents the habitat-adjusted normal range for each replicate. T = Tributary. 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).

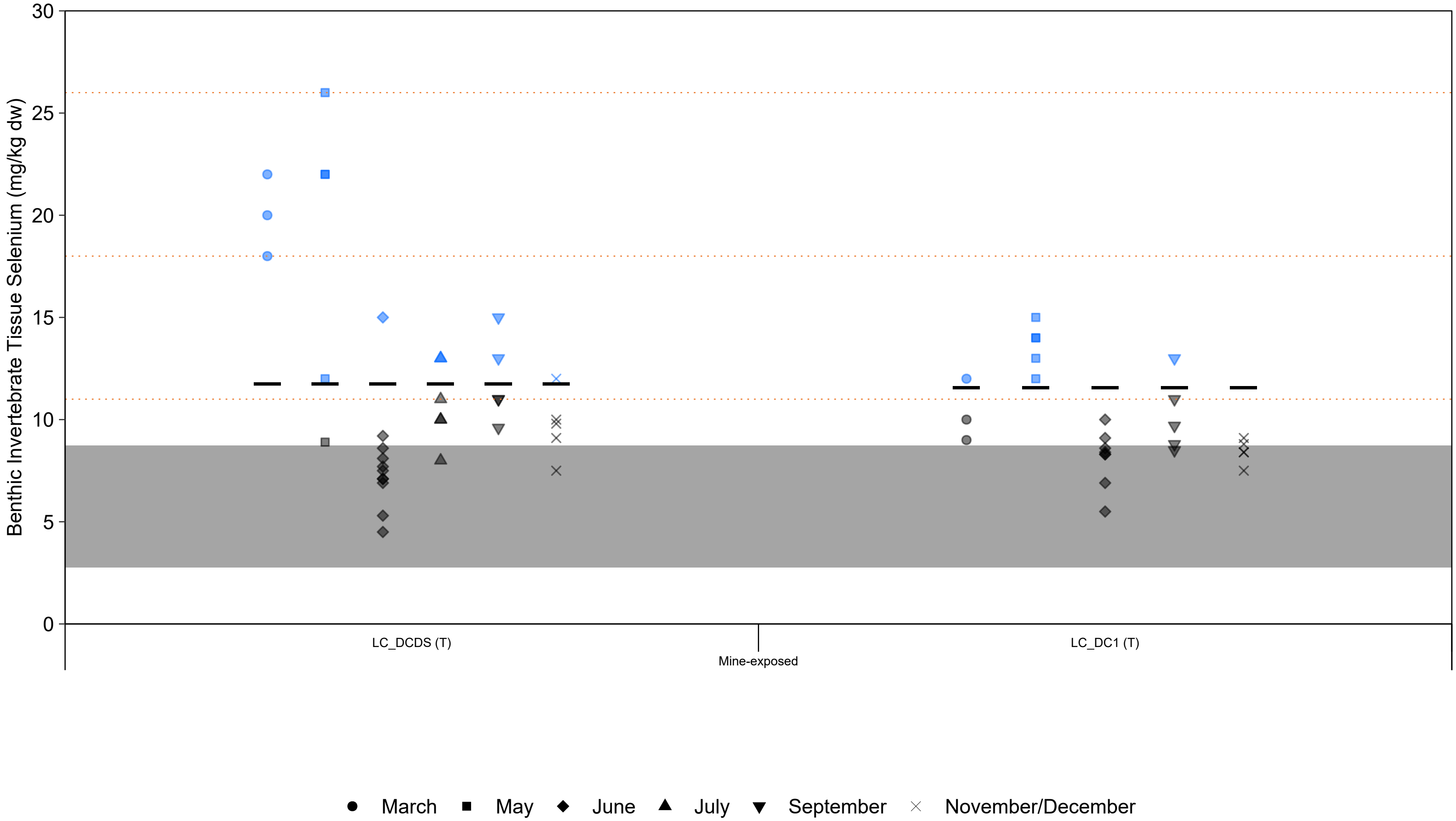

Figure H.2: **Selenium Concentrations in Benthic Invertebrate Composite-Taxa Samples Compared to Predicted Values, Dry Creek LAEMP, 2021**

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 Elk Valley Water Quality Plan (EVWQP) benchmarks (11, 18, and 26 mg/kg respectively) for juvenile fish. Grey 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. T = Tributary.

Table H.1: Biological Trigger Analysis for % EPT in LCO Dry 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
Dry Creek	Mine-exposed	LC_DCDS	T	1	82.5	74.9	70.3
		LC_DCDS	T	2	75.4	73.6	69.2
		LC_DCDS	T	3	72.7	73.1	68.3
		LC_DC1	T	1	73.7	70.6	65.4
		LC_DC1	T	2	72.2	71.1	65.8
		LC_DC1	T	3	72.7	69.3	64.6

Note: T = Tributary.

[a] Information pertaining to the calculation of the ADIT value is shown in Section E3.1. 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 H.2: Biological Trigger Analysis for Selenium Concentrations in Benthic Invertebrate Composite-Taxa Samples in LCO Dry Creek LAEMP, 2021

Waterbody		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)
Dry Creek	Mine-exposed	LC_DCDS	09-Mar-21	4.31	5.82	8.74	22.0
		LC_DCDS	09-Mar-21	4.31	5.82	8.74	18.0
		LC_DCDS	09-Mar-21	4.31	5.82	8.74	20.0
		LC_DCDS	04-May-21	4.31	5.82	8.74	12.0
		LC_DCDS	04-May-21	4.31	5.82	8.74	8.90
		LC_DCDS	04-May-21	4.31	5.82	8.74	22.0
		LC_DCDS	04-May-21	4.31	5.82	8.74	26.0
		LC_DCDS	04-May-21	4.31	5.82	8.74	22.0
		LC_DCDS	01-Jun-21	4.31	5.82	8.74	8.10
		LC_DCDS	01-Jun-21	4.31	5.82	8.74	7.70
		LC_DCDS	01-Jun-21	4.31	5.82	8.74	15.0
		LC_DCDS	10-Jun-21	4.31	5.82	8.74	5.30
		LC_DCDS	10-Jun-21	4.31	5.82	8.74	4.50
		LC_DCDS	10-Jun-21	4.31	5.82	8.74	7.50
		LC_DCDS	22-Jun-21	4.31	5.82	8.74	7.10
		LC_DCDS	22-Jun-21	4.31	5.82	8.74	9.20
		LC_DCDS	22-Jun-21	4.31	5.82	8.74	7.10
		LC_DCDS	22-Jun-21	4.31	5.82	8.74	6.90
		LC_DCDS	22-Jun-21	4.31	5.82	8.74	8.60
		LC_DCDS	08-Jul-21	4.31	5.82	8.74	11.0
		LC_DCDS	08-Jul-21	4.31	5.82	8.74	10.0
		LC_DCDS	08-Jul-21	4.31	5.82	8.74	10.0
		LC_DCDS	27-Jul-21	4.31	5.82	8.74	13.0
		LC_DCDS	27-Jul-21	4.31	5.82	8.74	8.00
		LC_DCDS	27-Jul-21	4.31	5.82	8.74	13.0
		LC_DCDS	10-Sep-21	4.31	5.82	8.74	13.0
		LC_DCDS	10-Sep-21	4.31	5.82	8.74	11.0
		LC_DCDS	10-Sep-21	4.31	5.82	8.74	11.0
		LC_DCDS	10-Sep-21	4.31	5.82	8.74	15.0
		LC_DCDS	10-Sep-21	4.31	5.82	8.74	9.60
		LC_DCDS	30-Nov-21	4.31	5.82	8.74	12.0
		LC_DCDS	30-Nov-21	4.31	5.82	8.74	7.50
		LC_DCDS	30-Nov-21	4.31	5.82	8.74	9.80
		LC_DCDS	30-Nov-21	4.31	5.82	8.74	9.10
		LC_DCDS	30-Nov-21	4.31	5.82	8.74	10.0
		LC_DC1	10-Mar-21	3.52	5.74	8.74	12.0
		LC_DC1	15-Mar-21	3.52	5.74	8.74	9.00
		LC_DC1	15-Mar-21	3.52	5.74	8.74	10.0
		LC_DC1	05-May-21	3.52	5.74	8.74	12.0
		LC_DC1	05-May-21	3.52	5.74	8.74	14.0
		LC_DC1	05-May-21	3.52	5.74	8.74	13.0
		LC_DC1	05-May-21	3.52	5.74	8.74	14.0
		LC_DC1	05-May-21	3.52	5.74	8.74	15.0
		LC_DC1	01-Jun-21	3.52	5.74	8.74	10.0
		LC_DC1	01-Jun-21	3.52	5.74	8.74	9.10
		LC_DC1	01-Jun-21	3.52	5.74	8.74	5.50
		LC_DC1	24-Jun-21	3.52	5.74	8.74	8.40
		LC_DC1	24-Jun-21	3.52	5.74	8.74	6.90
		LC_DC1	24-Jun-21	3.52	5.74	8.74	8.60
		LC_DC1	24-Jun-21	3.52	5.74	8.74	8.30
		LC_DC1	24-Jun-21	3.52	5.74	8.74	8.30
		LC_DC1	07-Sep-21	3.52	5.74	8.74	9.70
		LC_DC1	07-Sep-21	3.52	5.74	8.74	8.80
		LC_DC1	07-Sep-21	3.52	5.74	8.74	11.0
		LC_DC1	07-Sep-21	3.52	5.74	8.74	8.50
		LC_DC1	07-Sep-21	3.52	5.74	8.74	13.0
		LC_DC1	01-Dec-21	3.52	5.74	8.74	9.10
		LC_DC1	01-Dec-21	3.52	5.74	8.74	7.50
		LC_DC1	01-Dec-21	3.52	5.74	8.74	8.80
		LC_DC1	01-Dec-21	3.52	5.74	8.74	8.40
		LC_DC1	01-Dec-21	3.52	5.74	8.74	8.40

▒ Shaded cells signify those individual replicates that were associated with a biological trigger response (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 I

PERIPHYTON REPORT

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April 27, 2022

Teck Coal Limited
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Re: LCO Dry Creek LAEMP Supplemental Sampling Periphyton Community Results Summary

1. Introduction

Teck Coal Limited (Teck) currently operates four steelmaking coal mines in the Elk River watershed in southeastern British Columbia (BC) which are the Line Creek Operation (LCO), Fording River Operation (FRO), Greenhills Operation (GHO), and Elkview Operation (EVO). A local aquatic effects monitoring program (LAEMP) related to LCO Dry Creek has been implemented from 2017 to 2021, and additional aquatic monitoring has been conducted outside of the LCO Dry Creek LAEMP. In 2020 and 2021, supplemental sampling of total periphyton density, biomass, and community composition was conducted at LCO Dry Creek LAEMP sampling areas. As the 2021 sampling was outside of the scope of the 2021 LCO Dry Creek LAEMP study design (Minnow 2021), periphyton results were not linked to the LAEMP study questions or directly reported in the LAEMP. Instead, these periphyton results are summarized and compared with available historical data (2020 and 2015) herein.[1]

2. Methods

2.1 Field Collection

In 2021, periphyton community samples were collected during six field programs (Table I.1). Triplicate samples were collected at each of five areas (LC_DC3, LC_DCDS, LC_DC2, LC_DC4, and LC_DC1; Table I.1). Three samples were collected at each study area by selecting five representative submerged rocks (excluding those that were too small, highly angular, or

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[1] Periphyton sampling was conducted at Dry Creek area LC_SPDC in 2018 in response to a bloom of the invasive diatom *Didymosphenia geminata* in the LC_SPDC discharge channel. The 2018 data collection method used artificial substrates and targeted grabs of the stalked diatom present in the discharge channel for taxonomic identification of that taxon, as opposed to a full community collection. Area LC_SPDC was not sampled for periphyton community in 2021, because the area was replaced by a discharge pipe in 2020 and is no longer a natural receiver. Therefore, periphyton data collected in 2018 at LC_SPDC have not been included herein.

uncharacteristic in surface texture) that were taken to shore for processing as described below. A concerted effort was made to ensure that habitat characteristics (water depth, velocity, and substrate characteristics) were comparable among sampling stations and areas in order to minimize natural influences on the variability of productivity endpoints. Periphyton community samples were collected by firmly placing a thin acetate template with a 2x2 cm (4 cm²) opening in the middle of each selected rock and scraping off the periphyton within this area using a stainless-steel razor blade or scalpel. Each single composite sample represented a 0.002 m² (5 x 4 cm²) surface area per endpoint. Sample material scraped from each of the five rocks was then transferred from the razor blade or scalpel to an opaque 40 mL sample cup, diluted with site water, and preserved with Lugol's iodine solution. Samples were stored at room temperature prior to shipment to the laboratory for taxonomic analysis.

Historical data were collected in 2020 from areas LC_DC3, LC_DCDS, LC_DC4, and LC_DC1 using the same methods as 2021 (Minnow 2021). Historical data were also collected in 2015 at areas LC_DC1 and LC_DCDS (Minnow and Larratt 2016). Periphyton sampling in 2015 was consistent with 2021 protocols for sampling effort at each area, and targeted substrate, depth, and flow characteristics, but differed slightly in collection technique. In 2015, a 19 cm^2 cylinder fitted with a flexible rubber gasket (internal diameter reached by scrub brush = 14.9 cm^2) was held firmly in place on the rock surface, then a scalpel, modified toothbrushes and a squirt bottle filled with river water was used to remove all the periphyton within the sampler diameter into a pre-labelled sample jar, to a total volume of 100 mL (Barbour et al. 1999). This process was repeated for all five rocks in each sample, resulting in a final sample volume of 500 mL per composite sample.

2.2 Laboratory Analysis

Taxonomic identification and enumeration of periphyton community samples in 2015, 2020, and 2021 were completed by Larratt Aquatic Consulting Ltd. in Kelowna, BC. Laboratory analysis methods were identical in all years. Briefly, samples were agitated before a 10 mL subsample was extracted and settled in a Utermohl settling chamber for 24 hours. The samples were quickly previewed at 100x to ensure that large clumps or anomalies were assessed accurately and to make sure that algae concentrations were about 10 to 30 cells per field of view. The original sample was then diluted or concentrated, if necessary, to achieve desirable cell density for further viewing. Viewing continued until 300 cells were counted and cell counts had stabilized (i.e., ratios of taxa identified were not changing and new taxa were not being identified), or 80 to 100 fields had been assessed. Live and dead (no cell contents) diatoms were counted separately. Periphyton were identified to the lowest practicable level (LPL; genus or species wherever possible) and 10% of samples were re-analyzed for quality assurance/quality control (QA/QC) purposes. Notes were kept on the amount (as a %) of other materials (silt, moss, detritus, periphyton stalks, invertebrates, etc.) encountered in each sample. Voucher photography was also taken for each sample. Cell dimensions were collected for representative samples from each area for every sampling effort to aid in taxonomy and to allow biovolume calculations. For colonial algae, each colony was counted as one algal unit per 10 by 10 micrometer area, or in the case of filaments, each 10 µm length was counted as one algal unit for purposes of tallying 300 counting units in a count. Methods used were compatible with United States Environmental Protection Agency (USEPA; Barbour et al 1999), the National Institute of Water and Atmospheric Research (NIWA; Biggs and Kilroy 2000), and Ontario Ministry of Environment (OMOE 2011).

Quality control samples for periphyton community data revealed the potential for inaccuracies, particularly at the species level and for rarer or less abundant taxa. Several taxa were only identified in one sample within a duplicate pair, resulting in several high relative percent difference (RPDs) between duplicate samples. Periphyton community structure data, particularly at the species level, should be treated with a degree of caution. In general, high variability is common in and among periphyton datasets, and can result from sources such as changes in taxonomists and/or field sampling practices, field sampling error, patchy distribution of algal colonies, laboratory analytical variability, and natural variability among communities.

2.3 Data Analysis

Periphyton communities were evaluated using the metrics of organism density, taxonomic richness, biomass (inferred from biovolume estimates), and the relative density of major taxonomic groups (Table I.2). Taxonomic richness was calculated using LPL taxonomy. Relative density was calculated as the density of each respective taxon divided by the total density expressed as a percent. The following major taxonomic groups were evaluated: Diatoms, green algae (Chlorophytes), blue-green algae (Cyanobacteria), golden algae (Chrysophytes), and Dinoflagellates. The 2021 total density, relative densities, and biomass results were plotted as raw values alongside historical data, where available for 2015 (i.e., LC_DC1 and LC_DCDS; Minnow and Larratt 2016) and 2020 (LC_DC1, LC_DC2, LC_DC4, and LC_DCDS; Minnow 2021).

3. Results

3.1 Total Abundance and Biomass

Generally, mean total periphyton density was lower in 2021 than 2020, but higher than 2015 (Figure I.1). Within years, mean total periphyton density varied among areas and among seasons

(Figure I.1). Mean total periphyton density measured in 2021 ranged from 565,693 cells/cm^2 (LC_DC4) to 19,876,406 cells/cm^2 (LC_DC1; Figure I.1). In 2020, mean total periphyton density ranged from 22,076,880 cells/cm^2 (LC_DC2) to 44,504,187 cells/cm^2 (LC_DC4)). In 2015, mean total periphyton density ranged from 1,094,160 cells/cm^2 (LC_DCDS) to 824,568 cells/cm^2 (LC_DC1; Figure I.1). Only areas LC_DC1 and LC_DCDS could be compared across 2015, 2020, and 2021 (Figure I.1). For both areas, mean total periphyton density in 2021 was lower than in 2020 but higher than in 2015 (Figure I.1). Visually, periphyton coverage at LC_DC1 and LC_DCDS was similar across all years (Figure I.2).

Similar to total periphyton density, total biomass measured in 2021 was lower than in 2020 and higher than in 2015 (Figure I.3). Total biomass values for 2021 ranged from 85 µg/cm^2 (LC_DC2) to 2,911 µg/cm^2 (LC_DCDS), in 2020 they ranged from 1,260 µg/cm^2 (LC_DC2) to 3,790 µg/cm^2 (LC_DCDS), and in 2015 they ranged from 416 µg/cm^2 (LC_DCDS) to 827 µg/cm^2 (LC_DC1; Figure I.3). Within years, mean total biomass varied among areas and among seasons (Figure I.3).

3.2 Community Composition

Cyanobacteria and diatoms dominated the periphyton communities in all years (2021, 2020, and 2015; Figure I.4). The periphyton community composition was similar in 2021 and 2020, predominantly composed of diatoms (*Achnanthidium minutissimum* and *Nitzschia palea*) as well as cyanobacteria (*Homeothrix sp.* and *Phormidium autumnale*). This was generally consistent with 2015 periphyton communities, which were also predominantly diatoms except for one replicate collected at LC_DC1 (chrysosphytes were dominant). In general, Dry Creek periphyton communities do not appear to have demonstrated any major changes between 2015 and 2021.

The periphyton community at LC_DC1 in 2021 was more similar to that seen in 2015 than 2020, with the re-emergence of Chrysophytes in June; however, periphyton community composition at area LC_DC1 was relatively consistent across all sampling events in 2015, 2020, and 2021 (Figure I.5). In 2021, periphyton communities from LC_DC1 consisted of Cyanobacteria (mainly *Homeothrix* and *Phormidium*) and the diatom *A. minutissimum* and in 2020 and 2015 periphyton communities were co-dominated by diatoms and Cyanobacteria.

Periphyton community composition at LC_DCDS was dominated by diatoms in all sampling events in 2021, 2020, and 2015 except for May 2021 when the community was dominated by cyanobacteria (Figure I.6). The dominant diatom taxon in 2021 and 2020 was *A. minutissimum,* whereas in 2015 the diatom community was primarily *Nitzschia* (25 to 53%) and *Cyclotella* (17 to 30%; Appendix I). The filamentous cyanobacterium *Homeothrix* was also common at area LC_DCDS through all years and was found in all samples in varying proportions (6 to 20%).

Periphyton communities at areas LC_DC4, LC_DC2, and LC_DC3 were similar to those upstream (LC_DCDS) and downstream (LC_DC1) in 2021, and were generally dominated by diatoms and cyanobacteria, with notable abundances of chrysophytes.

4. Summary

Total periphyton density and biomass measured at Dry Creek study areas in 2021 were higher than in 2015, but lower than in 2020, however the historical comparison was limited by few areas having been sampled in 2015 and 2020. Differences among sampling years were minor and likely not ecologically meaningful. Periphyton community composition was generally similar among areas and study years. High variability in total density, biomass, and community composition endpoints likely reflected natural habitat variability and possibly laboratory analytical procedures.

5. References

Barbour, M.T., J. Gerritsen, B.D. Snyder, and J.B. Stribling. 1999. Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates and Fish, Second Edition. EPA 841-B-99-002. U.S. Environmental Protection Agency; Office of Water; Washington, D.C.

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Minnow. 2021. Line Creek Operation's Local Aquatic Effects Monitoring Program (LAEMP) Report for Dry Creek, 2020. Prepared for Teck Coal Ltd., Sparwood, BC. Project #207202.0024. May 2021

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OMOE (Ontario Ministry of the Environment). 2011. An Algal Bioassessment Protocol for use in Ontario Rivers, Ontario Ministry of the Environment Environmental Monitoring and Reporting Branch Toronto and Region Conservation Authority. Queen's Printer for Ontario, 49 pp.

Sincerely,

Minnow Environmental Inc.

R. Valleau.

Robin Valleau, Ph.D.

Aquatic Scientist

cc: Katharina Batchelar, M.Sc., R.P.Bio. Senior Advisor

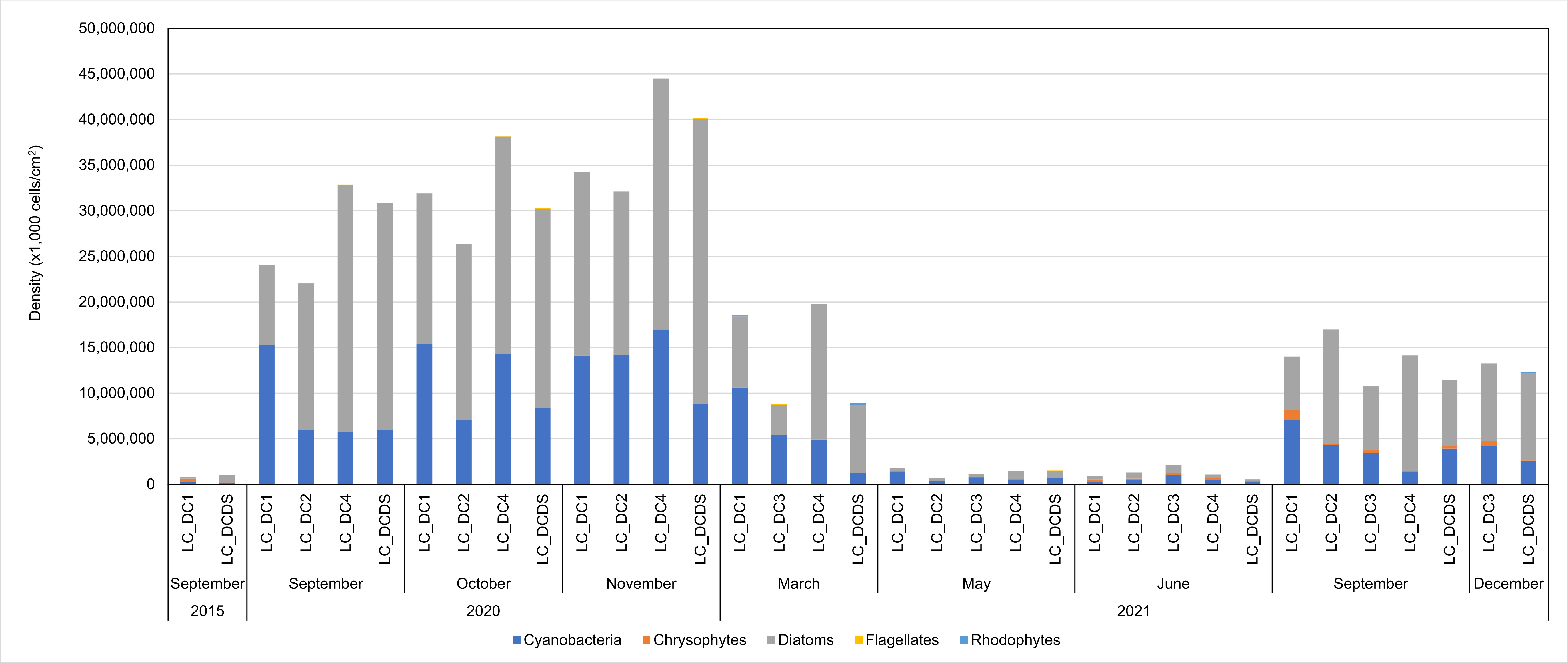

Figure I.1: **Mean Total Periphyton Abundance, LCO Dry Creek LAEMP Areas, 2015, 2020, and 2021**

LC_DC1	LC_DCDS
2015 	2015 
2020 	2020 
2021 	2021 

Figure I.2: **Periphyton Coverage at Areas LC_DC1 and LC_DCDS, 2015, 2020, and 2021**

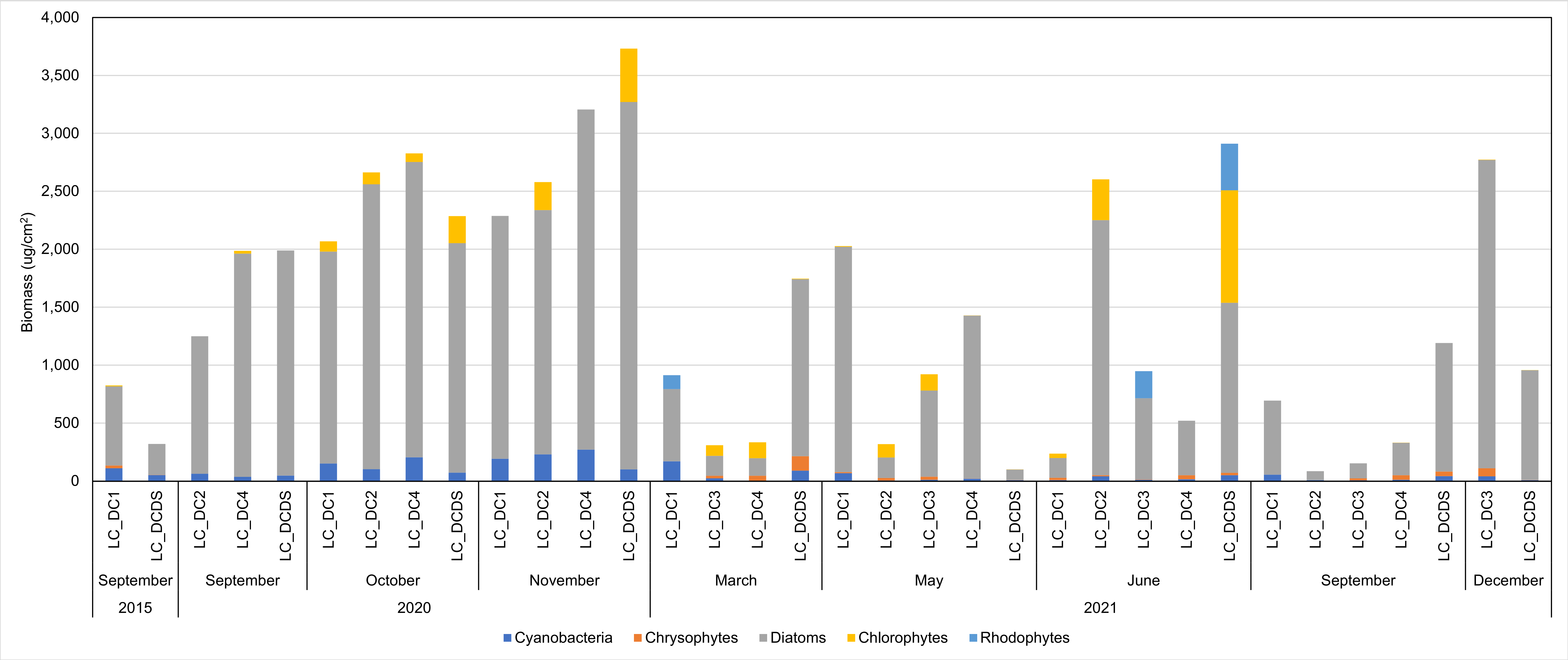

Figure I.3: **Total Periphyton Biomass, LCO Dry Creek LAEMP Areas, 2015, 2020, and 2021**

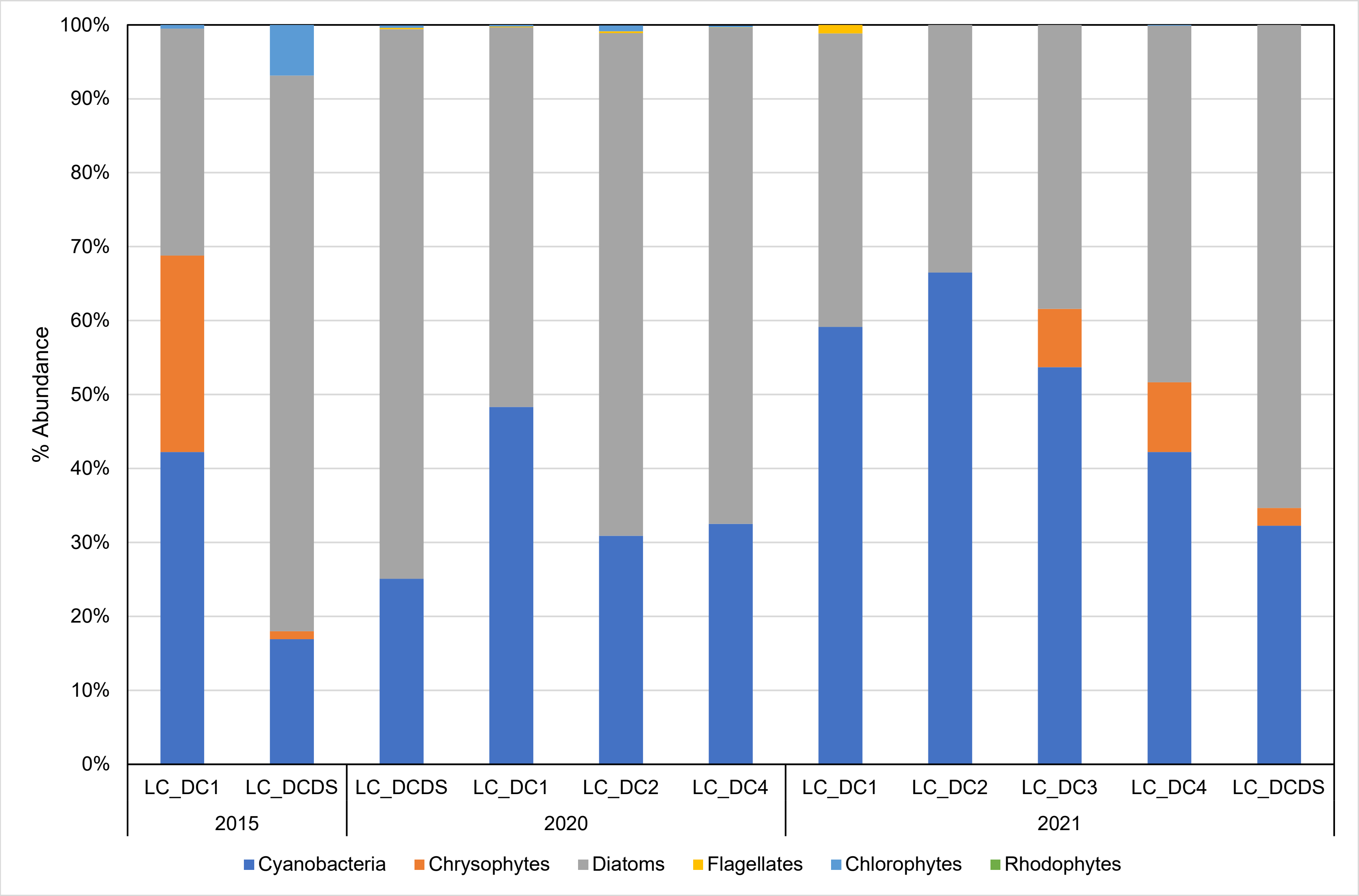

Figure I.4: **Periphyton Mean Proportional Abundance of Major Taxonomic Groups, LCO Dry Creek LAEMP Areas, Fall (September and October) 2015, 2020, and 2021**

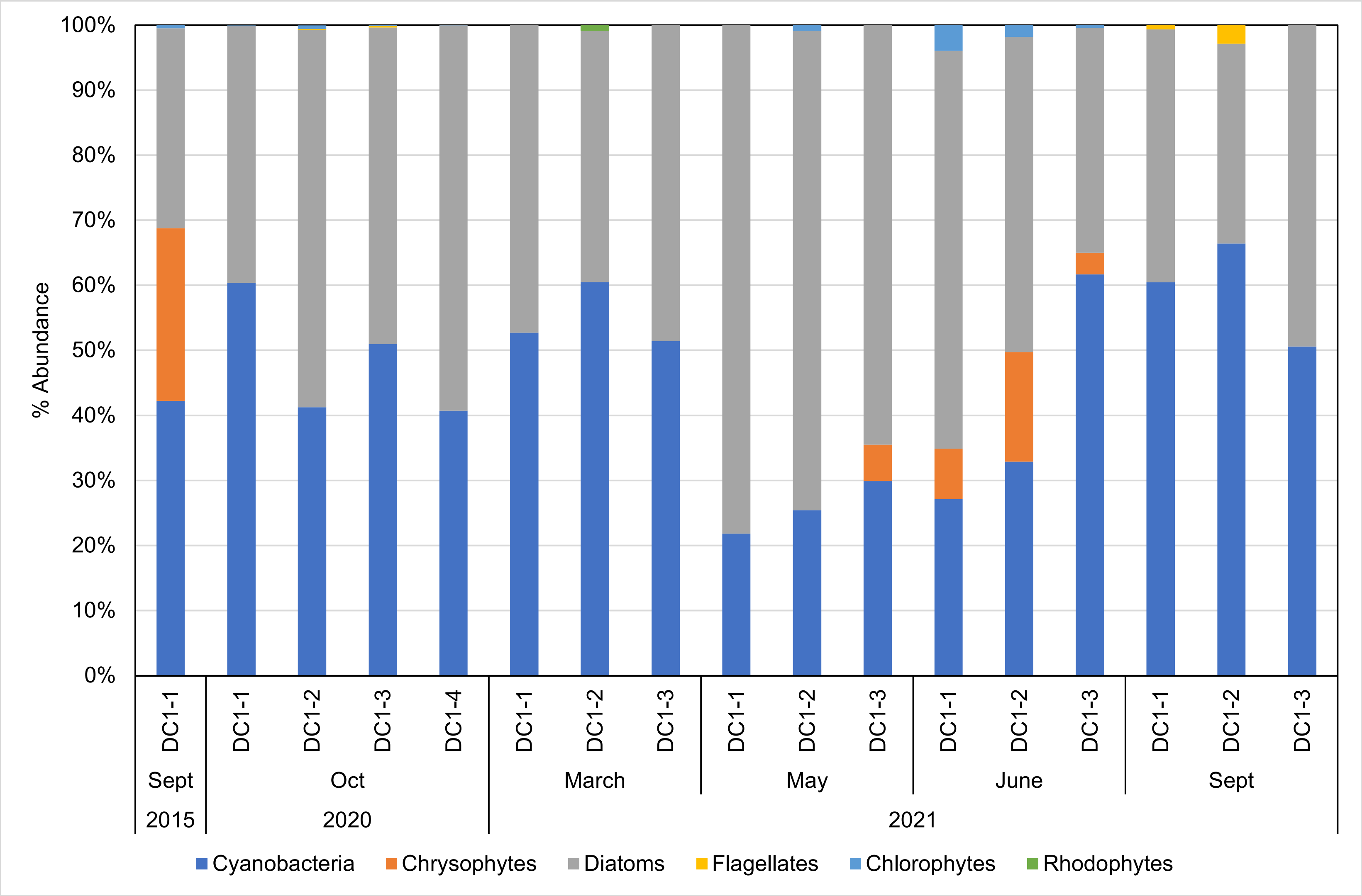

Figure I.5: **Periphyton Proportional Abundance of Major Taxonomic Groups, LCO Dry Creek Area LC_DC1, 2015, 2020, and 2021**

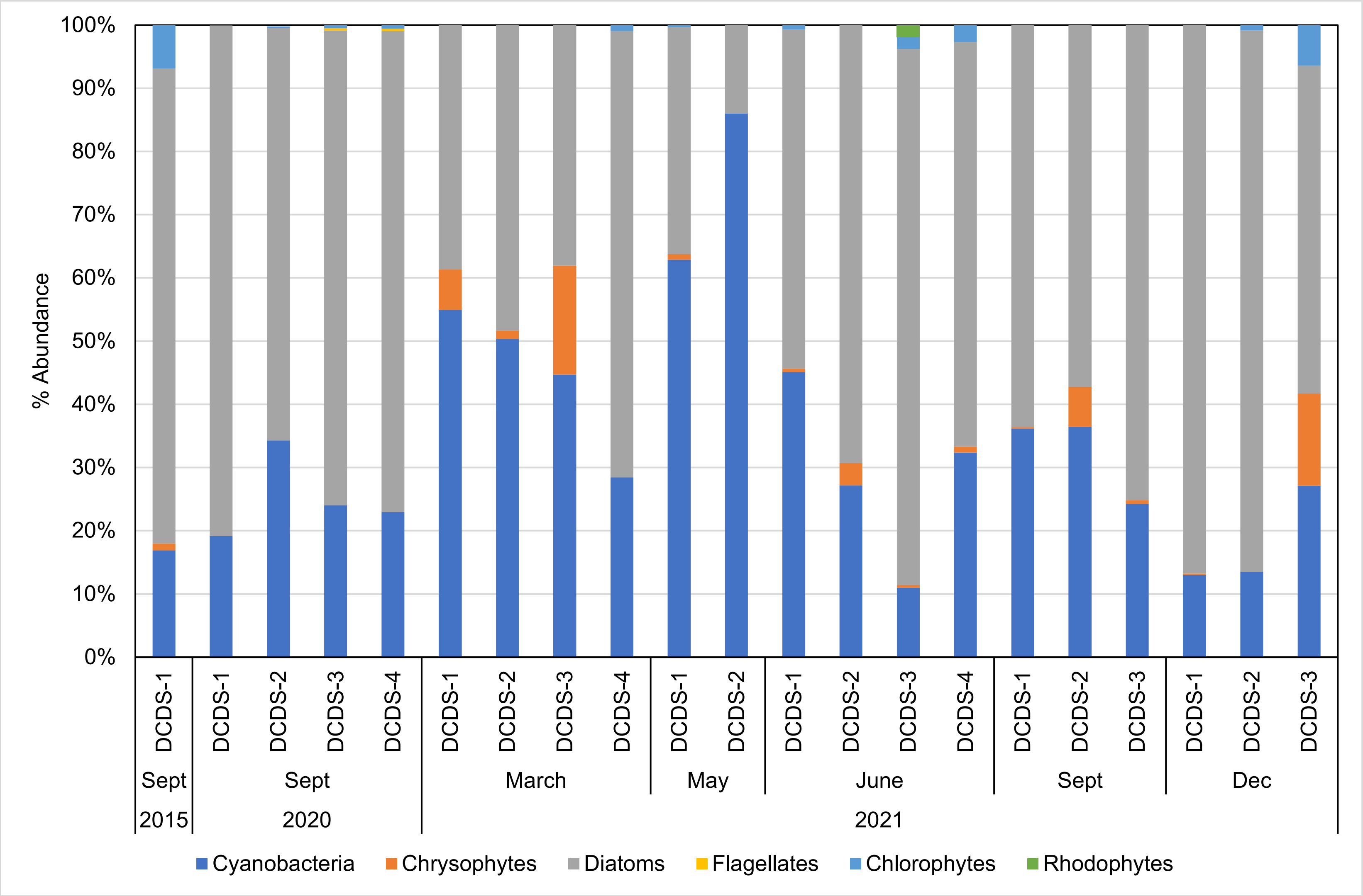

Figure I.6: **Periphyton Proportional Abundance of Major Taxonomic Groups, LCO Dry Creek Area LC_DCDS, 2015, 2020, and 2021**

Table I.1: Supplemental Periphyton Community Sampling at Dry Creek, 2021

Area		08-Mar-21	04-May-21	31-May-21	21-Jun-21	07-Sep-21	01-Dec-21
Mine-exposed	LC_DC3	n=3 (√)	n=3 (√)	n=3 (√)	n=3 (√)	n=3 (√)	n=3 (√)
	LC_DCDS	n=3 (√)	n=3 (√)	n=3 (√)	-	n=3 (√)	n=3 (√)
	LC_DC2	-	n=3 (√)	n=3 (√)	-	n=3 (√)	n=3 (√)
	LC_DC4	n=3 (√)	n=3 (√)	n=3 (√)	-	n=3 (√)	-
	LC_DC1	n=3 (√)	n=3 (√)	n=3 (√)	-	n=3 (√)	-

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

Table I.2: Dry Creek Periphyton Community Data, 2021

Endpoint	LC_DC1											
	March			May-21			Jun-21			Sep-21		
	DC1-1	DC1-2	DC1-3	DC1-1	DC1-2	DC1-3	DC1-1	DC1-2	DC1-3	DC1-1	DC1-2	DC1-3
	10-Mar-21	10-Mar-21	15-Mar-21	5-May-21	5-May-21	5-May-21	1-Jun-21	1-Jun-21	1-Jun-21	7-Sep-21	7-Sep-21	7-Sep-21
Total Density (cells/cm^2)	4,741,064	35,063,280	15,794,966	1,337,357	2,040,816	2,102,658	1,410,015	796,228	682,207	14,865,489	13,868,272	13,288,494
Taxonomic Richness (# of taxa)	12	12	9	21	17	17	19	19	19	18	15	18
Total Chrysophytes (cells/cm^2)	0	0	0	326,608	92,765	34,787	386,518	251,237	241,574	950,835	185,528	2,295,918
Total Cyanobacteria (cells/cm^2)	2,499,366	21,211,120	8,116,499	848,408	1,596,320	1,584,724	389,610	168,135	168,136	8,163,264	6,980,519	5,936,919
Total Diatoms (cells/cm^2)	2,241,698	13,542,960	7,678,467	160,408	351,731	440,630	633,887	347,867	233,845	5,751,390	6,702,225	5,055,657
Total Flagellates (cells/cm^2)	0	0	0	1,933	0	0	0	0	0	0	0	0
Total Chlorophytes (cells/cm^2)	0	0	0	0	0	42,517	0	28,989	38,652	0	0	0
Total Rhodophytes (cells/cm^2)	0	309,200	0	0	0	0	0	0	0	0	0	0
% Chrysophytes	0%	0%	0%	24%	5%	2%	27%	32%	35%	6%	1%	17%
% Cyanobacteria	53%	60%	51%	63%	78%	75%	28%	21%	25%	55%	50%	45%
% Diatoms	47%	39%	49%	12%	17%	21%	45%	44%	34%	39%	48%	38%
% Flagellates	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
% Chlorophytes	0%	0%	0%	0%	0%	2%	0%	4%	6%	0%	0%	0%
% Rhodophytes	0%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total Biomass (mg/cm^2)	0.23	1.79	0.72	0.14	0.25	0.54	0.28	0.35	0.38	1.55	1.89	2.31
Chrysophyte Biomass (mg/cm^2)	0.00	0.00	0.00	0.05	0.01	0.01	0.06	0.04	0.03	0.14	0.03	0.33
Cyanobacteria Biomass (mg/cm^2)	0.04	0.37	0.10	0.01	0.03	0.03	0.01	0.00	0.00	0.12	0.08	0.05
Diatom Biomass (mg/cm^2)	0.19	1.06	0.62	0.08	0.21	0.23	0.22	0.14	0.09	1.30	1.78	1.92
Flagellate Biomass (mg/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chlorophytes Biomass (mg/cm^2)	0.00	0.00	0.00	0.00	0.00	0.27	0.00	0.17	0.25	0.00	0.00	0.00
Rhodophytes Biomass (mg/cm^2)	0.00	0.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table I.2: Dry Creek Periphyton Community Data, 2021

Endpoint	LC_DC4											
	March			May-21			Jun-21			Sep-21		
	DC4-1	DC4-2	DC4-3	DC4-1	DC4-2	DC4-3	DC4-1	DC4-2	DC4-3	DC4-1	DC4-2	DC4-3
	9-Mar-21	9-Mar-21	9-Mar-21	5-May-21	5-May-21	5-May-21	1-Jun-21	1-Jun-21	1-Jun-21	9-Sep-21	9-Sep-21	9-Sep-21
Total Density (cells/cm^2)	16,310,300	25,230,720	18,088,200	3,126,934	639,690	570,757	1,383,738	680,273	1,209,026	14,958,254	14,772,726	12,731,908
Taxonomic Richness (# of taxa)	13	17	18	17	18	23	20	19	16	20	21	16
Total Chrysophytes (cells/cm^2)	0	0	0	173,933	86,967	97,918	264,765	166,202	173,160	231,911	23,191	0
Total Cyanobacteria (cells/cm^2)	4,638,000	5,503,760	4,599,350	935,374	249,304	229,334	585,575	241,574	541,125	927,644	1,692,950	1,553,803
Total Diatoms (cells/cm^2)	11,517,700	19,726,960	13,334,250	2,017,627	258,969	229,333	533,398	249,306	470,004	13,775,508	13,056,585	11,178,105
Total Flagellates (cells/cm^2)	0	0	0	0	1,933	1,288	0	0	0	0	0	0
Total Chlorophytes (cells/cm^2)	154,600	0	154,600	0	42,517	12,884	0	23,191	24,737	23,191	0	0
Total Rhodophytes (cells/cm^2)	0	0	0	0	0	0	0	0	0	0	0	0
% Chrysophytes	0%	0%	0%	6%	14%	17%	19%	24%	14%	2%	0%	0%
% Cyanobacteria	28%	22%	25%	30%	39%	40%	42%	36%	45%	6%	11%	12%
% Diatoms	71%	78%	74%	65%	40%	40%	39%	37%	39%	92%	88%	88%
% Flagellates	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
% Chlorophytes	1%	0%	1%	0%	7%	2%	0%	3%	2%	0%	0%	0%
% Rhodophytes	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total Biomass (mg/cm^2)	1.24	3.56	1.75	0.77	0.52	0.28	0.16	0.24	0.37	2.15	2.67	1.45
Chrysophyte Biomass (mg/cm^2)	0.00	0.00	0.00	0.03	0.01	0.01	0.04	0.02	0.02	0.03	0.00	0.00
Cyanobacteria Biomass (mg/cm^2)	0.11	0.09	0.10	0.02	0.00	0.00	0.01	0.00	0.01	0.02	0.03	0.02
Diatom Biomass (mg/cm^2)	1.11	3.48	1.63	0.73	0.23	0.19	0.11	0.08	0.20	1.95	2.63	1.43
Flagellate Biomass (mg/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chlorophytes Biomass (mg/cm^2)	0.02	0.00	0.02	0.00	0.27	0.07	0.00	0.13	0.14	0.15	0.00	0.00
Rhodophytes Biomass (mg/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table I.2: **Dry Creek Periphyton Community Data, 2021**

Endpoint	LC_DC2									LC_DCDS				
	May-21			Jun-21			Sep-21			March			May 2021	
	DC2-1	DC2-2	DC2-3	DC2-1	DC2-2	DC2-3	DC2-1	DC2-2	DC2-3	DCDS-1	DCDS-2	DCDS-3	DCDS-1	DCDS-2
	6-May-21	6-May-21	6-May-21	31-May-21	31-May-21	31-May-21	9-Sep-21	9-Sep-21	9-Sep-21	9-Mar-21	9-Mar-21	9-Mar-21	4-May-21	4-May-21
Total Density (cells/cm^2)	657,084	1,082,251	265,150	1,481,136	1,672,852	811,689	13,242,113	19,828,383	18,089,052	12,337,080	6,075,780	10,605,560	1,808,905	1,270,871
Taxonomic Richness (# of taxa)	18	17	16	20	23	19	18	20	19	19	24	15	16	14
Total Chrysophytes (cells/cm^2)	9,663	9,663	0	114,409	281,385	27,056	115,955	46,382	23,191	0	0	0	40,198	15,461
Total Cyanobacteria (cells/cm^2)	218,383	680,271	228,045	401,978	550,403	500,540	3,061,224	4,754,174	5,217,997	1,546,000	834,840	1,762,440	958,565	599,877
Total Diatoms (cells/cm^2)	374,925	388,452	37,105	905,998	810,142	280,228	10,064,934	14,888,680	12,801,482	9,585,200	5,194,560	8,843,120	810,142	655,533
Total Flagellates (cells/cm^2)	0	0	0	0	0	0	0	0	0	0	46,380	0	0	0
Total Chlorophytes (cells/cm^2)	54,113	3,865	0	58,751	30,922	3,865	0	139,147	46,382	0	0	0	0	0
Total Rhodophytes (cells/cm^2)	0	0	0	0	0	0	0	0	0	1,205,880	0	0	0	0
% Chrysophytes	1%	1%	0%	8%	17%	3%	1%	0%	0%	0%	0%	0%	2%	1%
% Cyanobacteria	33%	63%	86%	27%	33%	62%	23%	24%	29%	13%	14%	17%	53%	47%
% Diatoms	57%	36%	14%	61%	48%	35%	76%	75%	71%	78%	85%	83%	45%	52%
% Flagellates	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	0%	0%
% Chlorophytes	8%	0%	0%	4%	2%	0%	0%	1%	0%	0%	0%	0%	0%	0%
% Rhodophytes	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	0%	0%	0%	0%
Total Biomass (mg/cm^2)	0.17	0.19	0.01	0.18	0.45	0.09	1.68	3.37	2.76	3.39	0.97	0.89	0.23	0.13
Chrysophyte Biomass (mg/cm^2)	0.00	0.00	0.00	0.02	0.04	0.00	0.02	0.01	0.00	0.00	0.00	0.00	0.01	0.00
Cyanobacteria Biomass (mg/cm^2)	0.00	0.01	0.00	0.01	0.01	0.01	0.03	0.03	0.06	0.01	0.01	0.02	0.02	0.01
Diatom Biomass (mg/cm^2)	0.16	0.17	0.01	0.15	0.29	0.08	1.64	2.53	2.43	1.97	0.96	0.86	0.20	0.12
Flagellate Biomass (mg/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chlorophytes Biomass (mg/cm^2)	0.00	0.00	0.00	0.01	0.11	0.00	0.00	0.79	0.26	0.00	0.00	0.00	0.00	0.00
Rhodophytes Biomass (mg/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.41	0.00	0.00	0.00	0.00

Table I.2: **Dry Creek Periphyton Community Data, 2021**

Endpoint	LC_DCDS								LC_DC3					
	June 2021			September 2021			December 2021		March			May 2021		
	DCDS-1	DCDS-2	DCDS-3	DCDS-1	DCDS-2	DCDS-3	DCDS-1	DCDS-2	DC3-1	DC3-2	DC3-3	DC3-1	DC3-2	DC3-3
	1-Jun-21	1-Jun-21	1-Jun-21	10-Sep-21	10-Sep-21	10-Sep-21	30-Nov-21	30-Nov-21	8-Mar-21	8-Mar-21	8-Mar-21	3-May-21	3-May-21	3-May-21
Total Density (cells/cm^2)	391,671	1,406,924	235,775	11,688,310	12,847,865	9,809,831	10,969,385	15,329,312	13,914,000	8,657,600	3,880,460	854,202	852,915	1,685,221
Taxonomic Richness (# of taxa)	14	15	20	19	16	15	22	20	21	18	15	15	10	12
Total Chrysophytes (cells/cm^2)	112,090	241,187	34,014	440,631	69,573	347,866	46,382	139,147	0	0	0	0	0	0
Total Cyanobacteria (cells/cm^2)	166,203	760,667	64,935	3,293,135	5,797,774	2,666,975	1,205,937	4,962,894	8,410,240	5,751,120	1,963,420	462,533	601,680	1,260,049
Total Diatoms (cells/cm^2)	113,378	405,070	136,826	7,954,544	6,887,754	6,794,990	9,299,626	9,809,831	5,411,000	2,659,120	1,917,040	391,669	251,235	425,172
Total Flagellates (cells/cm^2)	0	0	0	0	0	0	0	0	92,760	247,360	0	0	0	0
Total Chlorophytes (cells/cm^2)	0	0	0	0	92,764	0	208,720	417,440	0	0	0	0	0	0
Total Rhodophytes (cells/cm^2)	0	0	0	0	0	0	208,720	0	0	0	0	0	0	0
% Chrysophytes	29%	17%	14%	4%	1%	4%	0%	1%	0%	0%	0%	0%	0%	0%
% Cyanobacteria	42%	54%	28%	28%	45%	27%	11%	32%	60%	66%	51%	54%	71%	75%
% Diatoms	29%	29%	58%	68%	54%	69%	85%	64%	39%	31%	49%	46%	29%	25%
% Flagellates	0%	0%	0%	0%	0%	0%	0%	0%	1%	3%	0%	0%	0%	0%
% Chlorophytes	0%	0%	0%	0%	1%	0%	2%	3%	0%	0%	0%	0%	0%	0%
% Rhodophytes	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%
Total Biomass (mg/cm^2)	0.10	0.25	0.14	1.17	0.91	1.21	4.72	4.81	1.13	0.67	0.29	0.07	0.07	0.11
Chrysophyte Biomass (mg/cm^2)	0.02	0.03	0.00	0.06	0.01	0.05	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00
Cyanobacteria Biomass (mg/cm^2)	0.00	0.01	0.00	0.04	0.07	0.02	0.01	0.11	0.09	0.07	0.01	0.01	0.01	0.01
Diatom Biomass (mg/cm^2)	0.08	0.21	0.13	1.07	0.82	1.14	1.91	2.00	1.04	0.59	0.28	0.07	0.06	0.10
Flagellate Biomass (mg/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chlorophytes Biomass (mg/cm^2)	0.00	0.00	0.00	0.00	0.01	0.00	1.19	2.69	0.00	0.00	0.00	0.00	0.00	0.00
Rhodophytes Biomass (mg/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	1.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table I.2: Dry Creek Periphyton Community Data, 2021

Endpoint	LC_DC3											
	June 2021			June 2021			September 2021			December 2021		
	DC3-1	DC3-2	DC3-3	DC3-1	DC3-2	DC3-3	DC3-1	DC3-2	DC3-3	DC3-1	DC3-2	DC3-3
	31-May-21	31-May-21	31-May-21	21-Jun-21	21-Jun-21	21-Jun-21	10-Sep-21	10-Sep-21	10-Sep-21	29-Nov-21	29-Nov-21	29-Nov-21
Total Density (cells/cm^2)	1,589,363	1,233,765	1,709,955	3,991,958	2,108,844	2,207,788	9,369,202	11,711,499	11,108,532	11,943,411	11,270,868	16,674,392
Taxonomic Richness (# of taxa)	15	14	16	18	17	19	19	17	15	19	19	21
Total Chrysophytes (cells/cm^2)	126,778	68,027	173,160	454,545	179,345	185,528	23,191	742,115	69,573	0	115,955	1,345,083
Total Cyanobacteria (cells/cm^2)	859,617	553,494	1,063,698	2,520,099	766,852	599,876	3,385,900	4,267,161	2,690,167	1,646,567	4,800,556	6,261,594
Total Diatoms (cells/cm^2)	602,968	612,244	473,097	1,017,314	1,162,647	1,413,108	5,960,111	6,702,223	8,348,792	10,296,844	6,261,593	9,067,715
Total Flagellates (cells/cm^2)	0	0	0	0	0	0	0	0	0	0	0	0
Total Chlorophytes (cells/cm^2)	0	0	0	0	0	9,276	0	0	0	0	92,764	0
Total Rhodophytes (cells/cm^2)	0	0	0	0	0	0	0	0	0	0	0	0
% Chrysophytes	8%	6%	10%	11%	9%	8%	0%	6%	1%	0%	1%	8%
% Cyanobacteria	54%	45%	62%	63%	36%	27%	36%	36%	24%	14%	43%	38%
% Diatoms	38%	50%	28%	25%	55%	64%	64%	57%	75%	86%	56%	54%
% Flagellates	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
% Chlorophytes	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%
% Rhodophytes	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total Biomass (mg/cm^2)	0.16	0.17	0.13	0.31	0.30	0.39	0.97	1.34	1.26	3.00	2.00	3.33
Chrysophyte Biomass (mg/cm^2)	0.02	0.01	0.02	0.07	0.03	0.03	0.00	0.11	0.01	0.00	0.02	0.19
Cyanobacteria Biomass (mg/cm^2)	0.01	0.01	0.01	0.02	0.01	0.01	0.04	0.05	0.04	0.02	0.06	0.04
Diatom Biomass (mg/cm^2)	0.14	0.15	0.10	0.22	0.27	0.35	0.92	1.18	1.22	2.98	1.91	3.09
Flagellate Biomass (mg/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chlorophytes Biomass (mg/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Rhodophytes Biomass (mg/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

APPENDIX J

SUPPORTING INFORMATION

Table J.1: Visual Periphyton Coverage Scores from Dry Creek, Fording River, and Grace Creek, 2021

Area		Biological Area Code	Date	Periphyton Cover
Reference	Dry Creek	LC_DCEF	08-Mar-21	3
			04-May-21	2
			22-Jun-21	3
			07-Sep-21	2
Mine-exposed	Dry Creek	LC_DC3	08-Mar-21	2
			03-May-21	2
			21-Jun-21	3
			10-Sep-21	3
		LC_DCDS	09-Mar-21	2
			04-May-21	2
			22-Jun-21	2
			10-Sep-21	2
			30-Nov-21	3
		LC_DC4	09-Mar-21	2
			05-May-21	2
			23-Jun-21	-
			09-Sep-21	2
		LC_DC2	06-May-21	2
			23-Jun-21	4
			09-Sep-21	3
		LC_DC1	10-Mar-21	2
			05-May-21	2
			24-Jun-21	4
			07-Sep-21	3
			01-Dec-21	2
	Fording River	LC_FRUS	16-Mar-21	2
			07-May-21	2
			25-Jun-21	2
			12-Sep-21	2
		LC_FRB	15-Mar-21	2
			06-May-21	3
			24-Jun-21	-
			11-Sep-21	2
	Grace Creek	LC_GRCK	07-May-21	2
			13-Sep-21	2

Note: "-" indicates data not collected.

Periphyton Coverage Scores (Environment Canada, 2012):
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 J.2: Summary of Benthic Invertebrate Endpoints Collected by 3-Minute Kick and Sweep Sampling from Dry Creek, Fording River, and Grace Creek, 2021

Area		Biological Area Code	Station	Month	Abundance (# org/3-min kick)	LPL Richness (# of taxa)	EPT		Ephemeroptera	
							Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)
Dry Creek	Reference	**LC_DCEF**	DCEF-1	March	16,300	28.0	11,680	0.717	9,040	0.555
			DCEF-2		8,920	37.0	5,880	0.659	3,920	0.439
			DCEF-3		9,860	34.0	5,920	0.600	4,580	0.465
	Mine-Exposed	**LC_DC3**	DC3-1		12,440	28.0	3,300	0.265	0	0
			DC3-2		940	29.0	368	0.391	0	0
			DC3-3		1,587	30.0	639	0.403	0	0
		LC_DCDS	DCDS-1		736	33.0	269	0.366	21.4	0.0291
			DCDS-2		1,240	25.0	832	0.671	0	0
			DCDS-3		1,839	22.0	1,250	0.680	33.3	0.0181
		LC_DC4	DC4-1		9,660	30.0	7,040	0.729	3,060	0.317
			DC4-2		8,760	31.0	6,080	0.694	2,960	0.338
			DC4-3		11,640	37.0	8,600	0.739	4,360	0.375
		LC_DC1	DC1-1		2,260	34.0	1,550	0.686	625	0.277
			DC1-2		5,500	23.0	4,383	0.797	700	0.127
			DC1-3		11,840	31.0	8,440	0.713	2,500	0.211
Fording River	Mine-Exposed	**LC_FRUS**	FRUS-1		6,900	24.0	4,840	0.701	360	0.0522
			FRUS-2		10,500	27.0	8,340	0.794	820	0.0781
			FRUS-3		8,420	28.0	5,860	0.696	520	0.0618
		LC_FRB	FRB-1		9,160	32.0	6,860	0.749	1,580	0.172
			FRB-2		6,250	33.0	3,983	0.637	800	0.128
			FRB-3		8,720	39.0	5,760	0.661	1,140	0.131
Dry Creek	Mine-Exposed	LC_DC1	DC1-1	May	8,040	33.0	5,820	0.724	2,240	0.279
			DC1-2		11,500	33.0	8,920	0.776	2,440	0.212
			DC1-3		8,960	30.0	6,880	0.768	2,460	0.275
		LC_DC2	DC2-1		1,500	32.0	1,255	0.836	0	0
			DC2-2		2,039	29.0	1,600	0.785	11.1	0.00545
			DC2-3		595	38.0	346	0.582	32.0	0.0538
		LC_DC3	DC3-1		2,554	27.0	754	0.295	0	0
			DC3-2		664	41.0	196	0.295	0	0
			DC3-3		900	34.0	175	0.194	0	0
		LC_DC4	DC4-1		14,280	40.0	10,060	0.704	4,140	0.290
			DC4-2		7,620	32.0	5,660	0.743	2,720	0.357
			DC4-3		10,720	37.0	8,920	0.832	4,600	0.429
		LC_DCDS	DCDS-1		17.0	6.00	3.00	0.176	0	0
			DCDS-2		1,430	40.0	796	0.557	3.70	0.00259
			DCDS-3		1,140	32.0	757	0.664	0	0
	Reference	LC_DCEF	DCEF-1		8,240	31.0	4,400	0.534	2,760	0.335
			DCEF-2		6,450	32.0	3,583	0.556	2,483	0.385
			DCEF-3		4,062	28.0	2,562	0.631	1,875	0.462
Fording River	Mine-Exposed	LC_FRB	FRB-1		3,520	39.0	1,500	0.426	400	0.114
			FRB-2		2,630	43.0	1,720	0.654	450	0.171
			FRB-3		3,650	46.0	1,850	0.507	380	0.104
		LC_FRUS	FRUS-1		277	30.0	159	0.574	15.0	0.0542
			FRUS-2		1,620	43.0	985	0.608	95.0	0.0586
			FRUS-3		3,200	43.0	2,150	0.672	170	0.0531
Grace Creek	Reference	LC_GRCK	GRCK-1		1,369	37.0	846	0.618	446	0.326
			GRCK-2		5,171	35.0	3,886	0.751	2,886	0.558
			GRCK-3		7,700	32.0	6,640	0.862	4,840	0.629
Dry Creek	Mine-Exposed	LC_DC1	DC1-1	June	7,880	37.0	6,120	0.777	1,560	0.198
			DC1-2		10,200	37.0	7,940	0.778	2,560	0.251
			DC1-3		10,300	39.0	8,120	0.788	2,220	0.216
		LC_DC2	DC2-1		2,650	37.0	1,725	0.651	775	0.292
			DC2-2		3,567	36.0	2,244	0.629	689	0.193
			DC2-3		3,740	43.0	2,870	0.767	1,240	0.332
		LC_DC3	DC3-1		4,557	35.0	671	0.147	14.3	0.00313
			DC3-2		3,990	25.0	740	0.185	0	0
			DC3-3		2,692	24.0	292	0.108	0	0
		LC_DC4	DC4-1		12,840	37.0	8,840	0.688	2,500	0.195
			DC4-2		5,900	32.0	4,517	0.766	1,767	0.299
			DC4-3		4,062	35.0	2,812	0.692	1,125	0.277
		LC_DCDS	DCDS-1		7,640	33.0	6,560	0.859	5,580	0.730
			DCDS-2		7,480	30.0	6,480	0.866	5,420	0.725
			DCDS-3		2,523	32.0	1,746	0.692	1,446	0.573
Dry Creek	Reference	LC_DCEF	DCEF-1		6,880	37.0	4,100	0.596	2,920	0.424
			DCEF-2		5,550	29.0	3,833	0.691	3,033	0.547
			DCEF-3		5,567	23.0	4,200	0.754	3,417	0.614
Fording River	Mine-Exposed	LC_FRB	FRB-1		4,671	34.0	2,800	0.599	1,543	0.330
		LC_FRUS	FRUS-2		1,772	34.0	1,561	0.881	906	0.511
			FRUS-3		2,750	28.0	2,508	0.912	1,683	0.612
Dry Creek	Reference	LC_DCEF	DCEF-1	September	10,040	31.0	8,280	0.825	6,180	0.616
			DCEF-2		10,580	42.0	8,600	0.813	5,680	0.537
			DCEF-3		6,480	36.0	5,520	0.852	4,060	0.627
Dry Creek	Mine-Exposed	LC_DC3	DC3-1		13,780	40.0	3,420	0.248	40.0	0.00290
			DC3-2		11,340	33.0	1,760	0.155	0	0
			DC3-3		12,080	34.0	1,160	0.0960	40.0	0.00331
		LC_DCDS	DCDS-1		8,340	35.0	6,880	0.825	1,980	0.237
			DCDS-2		9,520	42.0	7,180	0.754	1,620	0.170
			DCDS-3		9,240	40.0	6,720	0.727	1,600	0.173
		LC_DC2	DC2-1		14,540	32.0	13,600	0.935	740	0.0509
			DC2-2		12,540	40.0	11,380	0.907	1,580	0.126
			DC2-3		18,580	39.0	16,160	0.870	2,220	0.119
		LC_DC4	DC4-1		16,740	39.0	13,600	0.812	4,700	0.281
			DC4-2		13,200	35.0	11,280	0.855	4,740	0.359
			DC4-3		13,820	38.0	12,140	0.878	5,280	0.382
		LC_DC1	DC1-1		18,420	43.0	13,580	0.737	7,180	0.390
			DC1-2		16,920	42.0	12,220	0.722	5,580	0.330
			DC1-3		31,160	42.0	22,640	0.727	12,080	0.388
Fording River	Mine-Exposed	LC_FRUS	FRUS-1		4,429	31.0	3,714	0.839	1,771	0.400
			FRUS-2		2,655	42.0	1,980	0.746	915	0.345
			FRUS-3		7,380	39.0	5,500	0.745	2,580	0.350
		LC_FRB	FRB-1		8,600	40.0	6,740	0.784	3,960	0.460
			FRB-2		6,300	35.0	5,120	0.813	3,920	0.622
			FRB-3		5,533	34.0	4,267	0.771	3,083	0.557
Grace Creek	Reference	LC_GRCK	GRCK-1		4,025	44.0	3,588	0.891	1,625	0.404
			GRCK-2		2,808	44.0	2,554	0.910	977	0.348
			GRCK-3		6,760	45.0	5,880	0.870	2,000	0.296
Dry Creek	Mine-Exposed	LC_DCDS	DCDS-1	November-December	6,580	36.0	5,320	0.809	1,680	0.255
			DCDS-2		7,020	26.0	5,100	0.726	760	0.108
			DCDS-3		8,440	34.0	6,440	0.763	420	0.0498
		LC_DC1	DC1-1		14,980	42.0	10,580	0.706	2,620	0.175
			DC1-2		24,720	38.0	15,620	0.632	3,480	0.141
			DC1-3		23,960	41.0	14,620	0.610	4,080	0.170

Table J.2: Summary of Benthic Invertebrate Endpoints Collected by 3-Minute Kick and Sweep Sampling from Dry Creek, Fording River, and Grace Creek, 2021

Area		Biological Area Code	Station	Month	Chironomidae		Diptera		Oligochaeta	
					Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)
Dry Creek	Reference	**LC_DCEF**	DCEF-1	March	4,460	0.274	120	0.00736	0	0
			DCEF-2		2,480	0.278	520	0.0583	0	0
			DCEF-3		3,040	0.308	780	0.0791	0	0
	Mine-Exposed	**LC_DC3**	DC3-1		8,200	0.659	840	0.0675	0	0
			DC3-2		416	0.443	138	0.147	0	0
			DC3-3		761	0.479	165	0.104	0	0
		LC_DCDS	DCDS-1		457	0.621	7.14	0.00971	0	0
			DCDS-2		372	0.300	32.0	0.0258	4.00	0.00323
			DCDS-3		578	0.314	5.56	0.00302	0	0
		LC_DC4	DC4-1		2,540	0.263	60.0	0.00621	0	0
			DC4-2		2,480	0.283	200	0.0228	0	0
			DC4-3		2,700	0.232	320	0.0275	0	0
		LC_DC1	DC1-1		475	0.210	230	0.102	5.00	0.00221
			DC1-2		800	0.145	317	0.0576	0	0
			DC1-3		2,540	0.215	840	0.0709	0	0
Fording River	Mine-Exposed	**LC_FRUS**	FRUS-1		1,880	0.272	100.0	0.0145	0	0
			FRUS-2		1,600	0.152	380	0.0362	0	0
			FRUS-3		2,160	0.257	260	0.0309	0	0
		LC_FRB	FRB-1		1,740	0.190	480	0.0524	0	0
			FRB-2		1,933	0.309	200	0.0320	16.7	0.00267
			FRB-3		2,080	0.239	500	0.0573	60.0	0.00688
Dry Creek	Mine-Exposed	LC_DC1	DC1-1	May	980	0.122	1,200	0.149	40.0	0.00498
			DC1-2		1,520	0.132	1,040	0.0904	0	0
			DC1-3		940	0.105	1,140	0.127	0	0
		LC_DC2	DC2-1		132	0.0879	95.5	0.0636	9.09	0.00606
			DC2-2		311	0.153	88.9	0.0436	22.2	0.0109
			DC2-3		101	0.170	42.6	0.0716	101	0.170
		LC_DC3	DC3-1		1,700	0.666	92.3	0.0361	0	0
			DC3-2		390	0.587	72.0	0.108	0	0
			DC3-3		644	0.716	61.1	0.0679	2.78	0.00309
		LC_DC4	DC4-1		3,820	0.268	400	0.0280	0	0
			DC4-2		1,700	0.223	180	0.0236	20.0	0.00262
			DC4-3		1,640	0.153	160	0.0149	0	0
		LC_DCDS	DCDS-1		6.00	0.353	7.00	0.412	0	0
			DCDS-2		570	0.399	48.1	0.0337	7.41	0.00518
			DCDS-3		277	0.243	96.7	0.0848	0	0
	Reference	LC_DCEF	DCEF-1		3,700	0.449	60.0	0.00728	20.0	0.00243
			DCEF-2		2,600	0.403	167	0.0258	33.3	0.00517
			DCEF-3		1,362	0.335	100	0.0246	37.5	0.00923
Fording River	Mine-Exposed	LC_FRB	FRB-1		1,170	0.332	640	0.182	10.0	0.00284
			FRB-2		375	0.143	445	0.169	15.0	0.00570
			FRB-3		1,170	0.321	350	0.0959	20.0	0.00548
		LC_FRUS	FRUS-1		68.0	0.245	33.0	0.119	0	0
			FRUS-2		363	0.224	212	0.131	5.00	0.00309
			FRUS-3		580	0.181	320	0.100	0	0
Grace Creek	Reference	LC_GRCK	GRCK-1		388	0.284	119	0.0871	0	0
			GRCK-2		771	0.149	471	0.0912	28.6	0.00552
			GRCK-3		840	0.109	200	0.0260	0	0
Dry Creek	Mine-Exposed	LC_DC1	DC1-1	June	1,640	0.208	120	0.0152	0	0
			DC1-2		2,060	0.202	160	0.0157	40.0	0.00392
			DC1-3		2,040	0.198	40.0	0.00388	40.0	0.00388
		LC_DC2	DC2-1		775	0.292	133	0.0503	0	0
			DC2-2		1,056	0.296	156	0.0436	88.9	0.0249
			DC2-3		640	0.171	150	0.0401	60.0	0.0160
		LC_DC3	DC3-1		3,486	0.765	243	0.0533	14.3	0.00313
			DC3-2		2,800	0.702	350	0.0877	10.0	0.00251
			DC3-3		2,083	0.774	308	0.115	0	0
		LC_DC4	DC4-1		3,820	0.298	160	0.0125	0	0
			DC4-2		1,317	0.223	33.3	0.00565	0	0
			DC4-3		1,150	0.283	62.5	0.0154	12.5	0.00308
		LC_DCDS	DCDS-1		960	0.126	80.0	0.0105	0	0
			DCDS-2		740	0.0989	240	0.0321	0	0
			DCDS-3		738	0.293	38.5	0.0152	0	0
Dry Creek	Reference	LC_DCEF	DCEF-1		2,280	0.331	440	0.0640	0	0
			DCEF-2		1,383	0.249	300	0.0541	0	0
			DCEF-3		1,167	0.210	200	0.0359	0	0
Fording River	Mine-Exposed	LC_FRB	FRB-1		1,514	0.324	71.4	0.0153	28.6	0.00612
		LC_FRUS	FRUS-2		156	0.0878	22.2	0.0125	0	0
			FRUS-3		158	0.0576	8.33	0.00303	25.0	0.00909
Dry Creek	Reference	LC_DCEF	DCEF-1	September	1,620	0.161	80.0	0.00797	0	0
			DCEF-2		1,380	0.130	380	0.0359	0	0
			DCEF-3		540	0.0833	240	0.0370	40.0	0.00617
Dry Creek	Mine-Exposed	LC_DC3	DC3-1		7,235	0.525	2,545	0.185	20.0	0.00145
			DC3-2		7,880	0.695	1,380	0.122	0	0
			DC3-3		9,460	0.783	1,200	0.0993	40.0	0.00331
		LC_DCDS	DCDS-1		1,380	0.165	40.0	0.00480	0	0
			DCDS-2		2,140	0.225	140	0.0147	0	0
			DCDS-3		2,260	0.245	100.0	0.0108	0	0
		LC_DC2	DC2-1		572	0.0394	368	0.0253	0	0
			DC2-2		800	0.0638	280	0.0223	60.0	0.00478
			DC2-3		1,760	0.0947	380	0.0205	220	0.0118
		LC_DC4	DC4-1		2,540	0.152	540	0.0323	0	0
			DC4-2		1,580	0.120	340	0.0258	0	0
			DC4-3		1,500	0.109	180	0.0130	0	0
		LC_DC1	DC1-1		3,400	0.185	1,380	0.0749	0	0
			DC1-2		3,595	0.212	1,065	0.0629	40.0	0.00236
			DC1-3		7,460	0.239	960	0.0308	0	0
Fording River	Mine-Exposed	LC_FRUS	FRUS-1		100.0	0.0226	229	0.0516	0	0
			FRUS-2		245	0.0923	160	0.0603	20.0	0.00753
			FRUS-3		220	0.0298	940	0.127	40.0	0.00542
		LC_FRB	FRB-1		600	0.0698	740	0.0860	40.0	0.00465
			FRB-2		260	0.0413	460	0.0730	60.0	0.00952
			FRB-3		250	0.0452	617	0.111	33.3	0.00602
Grace Creek	Reference	LC_GRCK	GRCK-1		175	0.0435	162	0.0404	50.0	0.0124
			GRCK-2		115	0.0411	131	0.0466	0	0
			GRCK-3		574	0.0849	226	0.0334	20.0	0.00296
Dry Creek	Mine-Exposed	LC_DCDS	DCDS-1	November-December	1,000	0.152	220	0.0334	20.0	0.00304
			DCDS-2		1,860	0.265	40.0	0.00570	0	0
			DCDS-3		1,700	0.201	300	0.0355	0	0
		LC_DC1	DC1-1		3,960	0.264	400	0.0267	0	0
			DC1-2		7,240	0.293	1,820	0.0736	0	0
			DC1-3		8,120	0.339	1,180	0.0492	20.0	0.000835

Table J.2: **Summary of Benthic Invertebrate Endpoints Collected by 3-Minute Kick and Sweep Sampling from Dry Creek, Fording River, and Grace Creek, 2021**

Area		Biological Area Code	Station	Month	Trichoptera		Plecoptera	
					Abundance (# org/ 3-min kick)	Relative Abundance (%)	Abundance (# org/ 3-min kick)	Relative Abundance (%)
Dry Creek	Reference	**LC_DCEF**	DCEF-1	March	520	0.0319	2,120	0.130
			DCEF-2		400	0.0448	1,560	0.175
			DCEF-3		260	0.0264	1,080	0.110
	Mine-Exposed	**LC_DC3**	DC3-1		120	0.00965	3,180	0.256
			DC3-2		18.0	0.0191	350	0.372
			DC3-3		26.1	0.0164	613	0.386
		LC_DCDS	DCDS-1		61.9	0.0841	186	0.252
			DCDS-2		232	0.187	600	0.484
			DCDS-3		267	0.145	950	0.517
		LC_DC4	DC4-1		980	0.101	3,000	0.311
			DC4-2		1,020	0.116	2,100	0.240
			DC4-3		880	0.0756	3,360	0.289
		LC_DC1	DC1-1		290	0.128	635	0.281
			DC1-2		1,833	0.333	1,850	0.336
			DC1-3		2,100	0.177	3,840	0.324
Fording River	Mine-Exposed	**LC_FRUS**	FRUS-1		220	0.0319	4,260	0.617
			FRUS-2		500	0.0476	7,020	0.669
			FRUS-3		380	0.0451	4,960	0.589
		LC_FRB	FRB-1		560	0.0611	4,720	0.515
			FRB-2		367	0.0587	2,817	0.451
			FRB-3		300	0.0344	4,320	0.495
Dry Creek	Mine-Exposed	LC_DC1	DC1-1	May	1,140	0.142	2,440	0.303
			DC1-2		1,700	0.148	4,780	0.416
			DC1-3		1,280	0.143	3,140	0.350
		LC_DC2	DC2-1		627	0.418	627	0.418
			DC2-2		911	0.447	678	0.332
			DC2-3		169	0.284	145	0.244
		LC_DC3	DC3-1		238	0.0934	515	0.202
			DC3-2		58.0	0.0873	138	0.208
			DC3-3		80.6	0.0895	94.4	0.105
		LC_DC4	DC4-1		1,680	0.118	4,240	0.297
			DC4-2		1,020	0.134	1,920	0.252
			DC4-3		1,200	0.112	3,120	0.291
		LC_DCDS	DCDS-1		2.00	0.118	1.00	0.0588
			DCDS-2		356	0.249	437	0.306
			DCDS-3		293	0.257	463	0.406
	Reference	LC_DCEF	DCEF-1		440	0.0534	1,200	0.146
			DCEF-2		150	0.0233	950	0.147
			DCEF-3		312	0.0769	375	0.0923
Fording River	Mine-Exposed	LC_FRB	FRB-1		270	0.0767	830	0.236
			FRB-2		135	0.0513	1,135	0.432
			FRB-3		230	0.0630	1,240	0.340
		LC_FRUS	FRUS-1		21.0	0.0758	123	0.444
			FRUS-2		155	0.0957	735	0.454
			FRUS-3		340	0.106	1,640	0.512
Grace Creek	Reference	LC_GRCK	GRCK-1		173	0.126	227	0.166
			GRCK-2		386	0.0746	614	0.119
			GRCK-3		200	0.0260	1,600	0.208
Dry Creek	Mine-Exposed	LC_DC1	DC1-1	June	1,600	0.203	2,960	0.376
			DC1-2		1,400	0.137	3,980	0.390
			DC1-3		1,540	0.150	4,360	0.423
		LC_DC2	DC2-1		325	0.123	625	0.236
			DC2-2		900	0.252	656	0.184
			DC2-3		720	0.193	910	0.243
		LC_DC3	DC3-1		243	0.0533	414	0.0909
			DC3-2		240	0.0602	500	0.125
			DC3-3		133	0.0495	158	0.0588
		LC_DC4	DC4-1		1,720	0.134	4,620	0.360
			DC4-2		567	0.0960	2,183	0.370
			DC4-3		262	0.0646	1,425	0.351
		LC_DCDS	DCDS-1		660	0.0864	320	0.0419
			DCDS-2		320	0.0428	740	0.0989
			DCDS-3		115	0.0457	185	0.0732
Dry Creek	Reference	LC_DCEF	DCEF-1		460	0.0669	720	0.105
			DCEF-2		333	0.0601	467	0.0841
			DCEF-3		233	0.0419	550	0.0988
Fording River	Mine-Exposed	LC_FRB	FRB-1		157	0.0336	1,100	0.235
		LC_FRUS	FRUS-2		72.2	0.0408	583	0.329
			FRUS-3		41.7	0.0152	783	0.285
Dry Creek	Reference	LC_DCEF	DCEF-1	September	260	0.0259	1,840	0.183
			DCEF-2		380	0.0359	2,540	0.240
			DCEF-3		320	0.0494	1,140	0.176
Dry Creek	Mine-Exposed	LC_DC3	DC3-1		1,020	0.0740	2,360	0.171
			DC3-2		400	0.0353	1,360	0.120
			DC3-3		240	0.0199	880	0.0728
		LC_DCDS	DCDS-1		1,860	0.223	3,040	0.365
			DCDS-2		2,020	0.212	3,540	0.372
			DCDS-3		1,940	0.210	3,180	0.344
		LC_DC2	DC2-1		2,000	0.138	10,860	0.747
			DC2-2		1,740	0.139	8,060	0.643
			DC2-3		2,240	0.121	11,700	0.630
		LC_DC4	DC4-1		3,040	0.182	5,860	0.350
			DC4-2		2,140	0.162	4,400	0.333
			DC4-3		2,060	0.149	4,800	0.347
		LC_DC1	DC1-1		2,400	0.130	4,000	0.217
			DC1-2		1,860	0.110	4,780	0.283
			DC1-3		1,160	0.0372	9,400	0.302
Fording River	Mine-Exposed	LC_FRUS	FRUS-1		471	0.106	1,471	0.332
			FRUS-2		130	0.0490	935	0.352
			FRUS-3		680	0.0921	2,240	0.304
		LC_FRB	FRB-1		640	0.0744	2,140	0.249
			FRB-2		320	0.0508	880	0.140
			FRB-3		333	0.0602	850	0.154
Grace Creek	Reference	LC_GRCK	GRCK-1		875	0.217	1,088	0.270
			GRCK-2		438	0.156	1,138	0.405
			GRCK-3		1,600	0.237	2,280	0.337
Dry Creek	Mine-Exposed	LC_DCDS	DCDS-1	November-December	900	0.137	2,740	0.416
			DCDS-2		340	0.0484	4,000	0.570
			DCDS-3		940	0.111	5,080	0.602
		LC_DC1	DC1-1		1,220	0.0814	6,740	0.450
			DC1-2		2,380	0.0963	9,760	0.395
			DC1-3		2,280	0.0952	8,260	0.345

Table J.3: Supporting Measures Associated with 3-Minute Kick and Sweep Benthic Invertebrate Community Sampling, 2021

Replicate	Sampling Event			1	2	3	4	5	Mean
		LC_DCEF							
Reference	March	**1**	Depth (cm)	11	13	10	14.5	8	**11.3**
			Velocity (m/s)	0.275	0.294	0.387	0.488	0.103	**0.3**
			Bankfull Width (m)	3					**-**
			Wetted Width (m)	2.6					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		2	Depth (cm)	14.5	18.5	10	10	11	**12.8**
			Velocity (m/s)	0.426	0.142	0.26	0.529	0.314	**0.3**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	9.5	14	10	13	11.5	**11.6**
			Velocity (m/s)	0.278	0.723	0.442	0.348	0.451	**0.4**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_DC3							
Mine-exposed Dry Creek		**1**	Depth (cm)	12	16	14.5	12.5	11.5	**13.3**
			Velocity (m/s)	0.424	0.326	0.66	0.258	0.217	**0.4**
			Bankfull Width (m)	3.2					**-**
			Wetted Width (m)	2.3					**-**
			Bankfull-Wetted Depth (cm)	20					**-**
		2	Depth (cm)	16.5	15.5	12	10	9	**12.6**
			Velocity (m/s)	0.158	0.04	0.172	0.236	0.202	**0.2**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	10	10.5	10.5	22	19	**14.4**
			Velocity (m/s)	0.599	0.166	0.127	0.043	0.065	**0.2**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_DCDS							
		1	Depth (cm)	16	14.5	13	13	10.5	**13.4**
			Velocity (m/s)	0.203	0.159	0.35	0.236	0.067	**0.2**
			Bankfull Width (m)	3.2					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	14					**-**
		2	Depth (cm)	11.5	11.5	13	11	16.5	**12.7**
			Velocity (m/s)	0.072	0.583	0.373	0.283	0.092	**0.3**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	13.5	12.5	8.5	14	9	**11.5**
			Velocity (m/s)	0.185	0.426	0.07	0.696	0.57	**0.4**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_DC4							
		1	Depth (cm)	18	19	12	13	10	**14.4**
			Velocity (m/s)	0.147	0.22	0.223	0.21	0.167	**0.2**
			Bankfull Width (m)	4.3					**-**
			Wetted Width (m)	3.4					**-**
			Bankfull-Wetted Depth (cm)	108					**-**
		2	Depth (cm)	8.5	11	12	15.5	11.5	**11.7**
			Velocity (m/s)	0.302	0.367	0.4	0.305	0.482	**0.4**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	10	13.5	17	12.5	9.5	**12.5**
			Velocity (m/s)	0.383	0.273	0.307	0.341	0.193	**0.3**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_DC1							
		1	Depth (cm)	12.5	13	8.5	9	11	**10.8**
			Velocity (m/s)	0.232	0.318	0.399	0.351	0.146	**0.3**
			Bankfull Width (m)	2.6					**-**
			Wetted Width (m)	1.2					**-**
			Bankfull-Wetted Depth (cm)	130					**-**
		2	Depth (cm)	12	13.5	12.5	11	9	**11.6**
			Velocity (m/s)	0.559	0.231	0.49	0.226	0.495	**0.4**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	11	13.5	15	11.5	10.5	**12.3**
			Velocity (m/s)	0.329	0.397	0.441	0.177	0.237	**0.3**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**

Table J.3: Supporting Measures Associated with 3-Minute Kick and Sweep Benthic Invertebrate Community Sampling, 2021

Mine-exposed Fording River	March	**LC_FRB**							
		1	Depth (cm)	26	23	43	19.5	25	**27.3**
			Velocity (m/s)	0.695	0.717	0.577	0.454	0.15	**0.5**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	13.4					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		2	Depth (cm)	26	28.5	37	26	19	**27.3**
			Velocity (m/s)	0.156	0.596	0.392	0.721	0.464	**0.5**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	27	32	28	40	19.5	**29.3**
			Velocity (m/s)	0.108	0.323	0.511	0.347	0.39	**0.3**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_FRUS							
		1	Depth (cm)	23	25	38	41	27	**30.8**
			Velocity (m/s)	0.673	0.497	0.824	0.505	0.326	**0.6**
			Bankfull Width (m)	16.5					**-**
			Wetted Width (m)	10.3					**-**
			Bankfull-Wetted Depth (cm)	70					**-**
		2	Depth (cm)	16.5	26	31.5	44	20	**27.6**
			Velocity (m/s)	0.519	0.587	0.49	0.508	0.379	**0.5**
			Bankfull Width (m)	26					**-**
			Wetted Width (m)	23					**-**
			Bankfull-Wetted Depth (cm)	90					**-**
		3	Depth (cm)	23	32.5	33	38.5	26	**30.6**
			Velocity (m/s)	0.227	0.647	0.375	0.826	0.413	**0.5**
			Bankfull Width (m)	32					**-**
			Wetted Width (m)	17					**-**
			Bankfull-Wetted Depth (cm)	90					**-**
Reference	May	**LC_DCEF**							
		1	Depth (cm)	19	19	12	13	23	**17.2**
			Velocity (m/s)	0.34	1.166	0.497	0.591	1.073	**0.7**
			Bankfull Width (m)	3.6					**-**
			Wetted Width (m)	3					**-**
			Bankfull-Wetted Depth (cm)	20					**-**
		2	Depth (cm)	15	19	26	25	23	**21.6**
			Velocity (m/s)	0.447	0.924	0.962	0.794	1.094	**0.8**
			Bankfull Width (m)	3.2					**-**
			Wetted Width (m)	2.4					**-**
			Bankfull-Wetted Depth (cm)	40					**-**
		3	Depth (cm)	19	18	30	22	39	**25.6**
			Velocity (m/s)	0.491	0.788	0.701	0.446	0.349	**0.6**
			Bankfull Width (m)	3.2					**-**
			Wetted Width (m)	2.5					**-**
			Bankfull-Wetted Depth (cm)	60					**-**
Mine-exposed Dry Creek		**LC_DC3**							
		1	Depth (cm)	17	29	18	16	18	**19.6**
			Velocity (m/s)	0.642	0.442	0.646	0.209	0.339	**0.5**
			Bankfull Width (m)	4.2					**-**
			Wetted Width (m)	3.3					**-**
			Bankfull-Wetted Depth (cm)	70					**-**
		2	Depth (cm)	24	23	16	18	16	**19.4**
			Velocity (m/s)	0.718	1.153	0.76	0.279	0.813	**0.7**
			Bankfull Width (m)	4					**-**
			Wetted Width (m)	3.2					**-**
			Bankfull-Wetted Depth (cm)	42					**-**
		3	Depth (cm)	19	23	23	27	9	**20.2**
			Velocity (m/s)	0.561	0.757	0.254	0.117	0.486	**0.4**
			Bankfull Width (m)	7.7					**-**
			Wetted Width (m)	3					**-**
			Bankfull-Wetted Depth (cm)	20					**-**
		LC_DCDS							
		1	Depth (cm)	18	33	34	41	25	**30.2**
			Velocity (m/s)	0.317	0.475	0.183	0.204	0.176	**0.3**
			Bankfull Width (m)	3.8					**-**
			Wetted Width (m)	3.4					**-**
			Bankfull-Wetted Depth (cm)	40					**-**
		2	Depth (cm)	15	22	23	35	27	**24.4**
			Velocity (m/s)	1.109	0.708	1.185	1.798	0.933	**1.1**
			Bankfull Width (m)	4.5					**-**
			Wetted Width (m)	4					**-**
			Bankfull-Wetted Depth (cm)	40					**-**
		3	Depth (cm)	40	28	42	26	21	**31.4**
			Velocity (m/s)	0.262	0.89	0.699	0.469	0.285	**0.5**
			Bankfull Width (m)	3.6					**-**
			Wetted Width (m)	3					**-**
			Bankfull-Wetted Depth (cm)	55					**-**

Table J.3: Supporting Measures Associated with 3-Minute Kick and Sweep Benthic Invertebrate Community Sampling, 2021

Mine-exposed Dry Creek	May	**LC_DC2**							
		1	Depth (cm)	26	34	29	35	25	**29.8**
			Velocity (m/s)	0.326	0.739	0.797	1.172	0.845	**0.8**
			Bankfull Width (m)	3.3					**-**
			Wetted Width (m)	2.8					**-**
			Bankfull-Wetted Depth (cm)	60					**-**
		2	Depth (cm)	23	23	22	21	13	**20.4**
			Velocity (m/s)	0.73	0.894	0.941	0.565	0.593	**0.7**
			Bankfull Width (m)	5.8					**-**
			Wetted Width (m)	5.1					**-**
			Bankfull-Wetted Depth (cm)	60					**-**
		3	Depth (cm)	19	17	11	12	14	**14.6**
			Velocity (m/s)	0.627	0.774	0.395	0.413	0.461	**0.5**
			Bankfull Width (m)	5.4					**-**
			Wetted Width (m)	3					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_DC4							
		1	Depth (cm)	28	26	22	23	28	**25.4**
			Velocity (m/s)	0.604	0.495	0.713	0.669	0.33	**0.6**
			Bankfull Width (m)	4.9					**-**
			Wetted Width (m)	3.5					**-**
			Bankfull-Wetted Depth (cm)	140					**-**
		2	Depth (cm)	17	22	13	19	14	**17.0**
			Velocity (m/s)	0.486	0.508	0.48	0.702	0.675	**0.6**
			Bankfull Width (m)	5.7					**-**
			Wetted Width (m)	3.5					**-**
			Bankfull-Wetted Depth (cm)	70					**-**
		3	Depth (cm)	13	20	22	33	38	**25.2**
			Velocity (m/s)	0.92	0.334	0.914	0.611	0.97	**0.7**
			Bankfull Width (m)	5.8					**-**
			Wetted Width (m)	3.7					**-**
			Bankfull-Wetted Depth (cm)	120					**-**
		LC_DC1							
		1	Depth (cm)	18	20	25	17	13	**18.6**
			Velocity (m/s)	0.632	0.566	0.926	0.781	0.606	**0.7**
			Bankfull Width (m)	5.7					**-**
			Wetted Width (m)	3.9					**-**
			Bankfull-Wetted Depth (cm)	60					**-**
		2	Depth (cm)	15	28	20	18	12	**18.6**
			Velocity (m/s)	0.779	0.418	0.694	0.51	0.669	**0.6**
			Bankfull Width (m)	11.4					**-**
			Wetted Width (m)	5.7					**-**
			Bankfull-Wetted Depth (cm)	40					**-**
		3	Depth (cm)	18	22	16	23	23	**20.4**
			Velocity (m/s)	0.626	0.626	0.952	0.12	0.511	**0.6**
			Bankfull Width (m)	6.7					**-**
			Wetted Width (m)	4.1					**-**
			Bankfull-Wetted Depth (cm)	20					**-**
Mine-exposed Fording River		**LC_FRB**							
		1	Depth (cm)	38	42	33	33	41	**37.4**
			Velocity (m/s)	0.29	0.355	0.767	0.935	0.833	**0.6**
			Bankfull Width (m)	23					**-**
			Wetted Width (m)	20					**-**
			Bankfull-Wetted Depth (cm)	70					**-**
		2	Depth (cm)	15	21	27	39	29	**26.2**
			Velocity (m/s)	0.769	0.577	0.544	0.76	0.183	**0.6**
			Bankfull Width (m)	23					**-**
			Wetted Width (m)	20					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	35	29	35	38	35	**34.4**
			Velocity (m/s)	0.433	0.702	0.468	0.406	0.595	**0.5**
			Bankfull Width (m)	23					**-**
			Wetted Width (m)	20					**-**
			Bankfull-Wetted Depth (cm)	60					**-**
		LC_FRUS							
		1	Depth (cm)	15	14	22	25	27	**20.6**
			Velocity (m/s)	0.461	0.285	0.409	0.354	0.309	**0.4**
			Bankfull Width (m)	22					**-**
			Wetted Width (m)	21					**-**
			Bankfull-Wetted Depth (cm)	48					**-**
		2	Depth (cm)	21	23	22	29	21	**23.2**
			Velocity (m/s)	0.537	0.66	0.568	0.546	0.38	**0.5**
			Bankfull Width (m)	22					**-**
			Wetted Width (m)	21					**-**
			Bankfull-Wetted Depth (cm)	55					**-**
		3	Depth (cm)	62	42	46	56	44	**50.0**
			Velocity (m/s)	0.683	0.196	0.339	0.383	0.602	**0.4**
			Bankfull Width (m)	22					**-**
			Wetted Width (m)	21					**-**
			Bankfull-Wetted Depth (cm)	50					**-**

Table J.3: Supporting Measures Associated with 3-Minute Kick and Sweep Benthic Invertebrate Community Sampling, 2021

Mine-exposed Grace Creek	May	**LC_GRCK**							
		1	Depth (cm)	18	20	22	14	12	**17.2**
			Velocity (m/s)	0.279	1.242	0.758	1.033	0.514	**0.8**
			Bankfull Width (m)	22					**-**
			Wetted Width (m)	21					**-**
			Bankfull-Wetted Depth (cm)	48					**-**
		2	Depth (cm)	15	18	13	13	13	**14.4**
			Velocity (m/s)	0.689	0.554	0.469	0.538	0.503	**0.6**
			Bankfull Width (m)	3.5					**-**
			Wetted Width (m)	2.7					**-**
			Bankfull-Wetted Depth (cm)	70					**-**
		3	Depth (cm)	13	24	25	17	10	**17.8**
			Velocity (m/s)	0.14	0.665	0.739	0.992	0.734	**0.7**
			Bankfull Width (m)	4.3					**-**
			Wetted Width (m)	2.5					**-**
			Bankfull-Wetted Depth (cm)	70					**-**
Reference	May 31 - June 2	**LC_DCEF**							
		1	Depth (cm)	17	23	23	17	10	**18.0**
			Velocity (m/s)	0.93	0.264	0.27	1.325	1.023	**0.8**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
Mine-exposed Dry Creek		**LC_DC3**							
		1	Depth (cm)	31	29	20	14	11	**21.0**
			Velocity (m/s)	0.832	0.285	0.138	0.61	0.583	**0.5**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_DCDS							
		1	Depth (cm)	14	41	27	27	21	**26.0**
			Velocity (m/s)	0.881	0.251	1.027	0.731	0.304	**0.6**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_DC2							
		1	Depth (cm)	33	29	15	14	10	**20.2**
			Velocity (m/s)	0.451	0.557	0.819	0.23	0.621	**0.5**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_DC4							
		1	Depth (cm)	32	38	35	36	17	**31.6**
			Velocity (m/s)	0.91	0.841	1.152	1.213	0.735	**1.0**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_DC1							
		1	Depth (cm)	18	27	17	22	30	**22.8**
			Velocity (m/s)	1.045	0.393	0.696	1.289	0.653	**0.8**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
Mine-exposed Fording River		**LC_FRB**							
		1	Depth (cm)	73	46	22	35	50	**45.2**
			Velocity (m/s)	0.116	0.567	0.642	1.167	0.256	**0.5**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_FRUS							
		1	Depth (cm)	59	41	66	50	49	**53.0**
			Velocity (m/s)	0.158	0.436	0.302	0.549	0.412	**0.4**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
Mine-exposed Dry Creek	June 10	**LC_DC3**							
		1	Depth (cm)	12	16	19	17	11	**15.0**
			Velocity (m/s)	0.451	0.555	0.68	0.502	1.096	**0.7**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_DCDS							
		1	Depth (cm)	22	30	32	24	26	**26.8**
			Velocity (m/s)	0.511	0.849	0.251	0.055	0.613	**0.5**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**

Table J.3: Supporting Measures Associated with 3-Minute Kick and Sweep Benthic Invertebrate Community Sampling, 2021

Reference	June 21-25	**LC_DCEF**							
		1	Depth (cm)	14	16	19	20	23	**18.4**
			Velocity (m/s)	0.425	0.379	0.582	0.473	0.611	**0.5**
			Bankfull Width (m)	3					**-**
			Wetted Width (m)	2.3					**-**
			Bankfull-Wetted Depth (cm)	40					**-**
		2	Depth (cm)	24	26	18	21	15	**20.8**
			Velocity (m/s)	0.205	0.389	0.213	0.381	0.482	**0.3**
			Bankfull Width (m)	3.1					**-**
			Wetted Width (m)	2.5					**-**
			Bankfull-Wetted Depth (cm)	30					**-**
		3	Depth (cm)	12	15	18	20	18	**16.6**
			Velocity (m/s)	0.773	0.45	0.507	0.547	0.679	**0.6**
			Bankfull Width (m)	4					**-**
			Wetted Width (m)	3.5					**-**
			Bankfull-Wetted Depth (cm)	40					**-**
Mine-exposed Dry Creek		**LC_DC3**							
		1	Depth (cm)	24	18	28	27	10	**21.4**
			Velocity (m/s)	0.042	0.362	0.369	0.192	0.78	**0.3**
			Bankfull Width (m)	4.8					**-**
			Wetted Width (m)	3.4					**-**
			Bankfull-Wetted Depth (cm)	90					**-**
		2	Depth (cm)	24	18	28	27	10	**21.4**
			Velocity (m/s)	0.042	0.362	0.369	0.192	0.78	**0.3**
			Bankfull Width (m)	5.4					**-**
			Wetted Width (m)	3					**-**
			Bankfull-Wetted Depth (cm)	100					**-**
		3	Depth (cm)	24	18	28	27	10	**21.4**
			Velocity (m/s)	0.042	0.362	0.369	0.192	0.78	**0.3**
			Bankfull Width (m)	7.1					**-**
			Wetted Width (m)	2.9					**-**
			Bankfull-Wetted Depth (cm)	100					**-**
		LC_DCDS							
		1	Depth (cm)	24	26	18	21	15	**20.8**
			Velocity (m/s)	0.205	0.389	0.213	0.381	0.482	**0.3**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_DC2							
		1	Depth (cm)	18	20	27	20	14	**19.8**
			Velocity (m/s)	0.56	0.866	0.378	0.2	0.596	**0.5**
			Bankfull Width (m)	4.2					**-**
			Wetted Width (m)	3.1					**-**
			Bankfull-Wetted Depth (cm)	60					**-**
		LC_DC4							
		1	Depth (cm)	12	15	18	20	18	**16.6**
			Velocity (m/s)	0.773	0.45	0.507	0.547	0.679	**0.6**
			Bankfull Width (m)	4					**-**
			Wetted Width (m)	3.5					**-**
			Bankfull-Wetted Depth (cm)	40					**-**
		LC_DC1							
		1	Depth (cm)	17	26	23	22	23	**22.2**
			Velocity (m/s)	0.246	0.531	0.699	0.629	0.385	**0.5**
			Bankfull Width (m)	5					**-**
			Wetted Width (m)	3.9					**-**
			Bankfull-Wetted Depth (cm)	50					**-**
Mine-exposed Fording River		**LC_FRB**							
		1	Depth (cm)	21	18	23	16	21	**19.8**
			Velocity (m/s)	0.66	0.759	0.341	0.699	0.365	**0.6**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_FRUS							
		1	Depth (cm)	21	26	16	20	28	**22.2**
			Velocity (m/s)	0.574	0.308	0.955	0.356	0.434	**0.5**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
Mine-exposed Dry Creek	July 8	**LC_DC3**							
		1	Depth (cm)	21	22	16	18	21	**19.6**
			Velocity (m/s)	0.12	0.432	0.737	0.337	0.497	**0.4**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_DCDS							
		1	Depth (cm)	20	16	18	16	13	**16.6**
		-	Velocity (m/s)	0.085	0.563	0.347	0.384	0.268	**0.3**
		-	Bankfull Width (m)	-					**-**
		-	Wetted Width (m)	-					**-**
		-	Bankfull-Wetted Depth (cm)	-					**-**
	July 27	**LC_DC3**							
		1	Depth (cm)	11	18	16	19	15	**15.8**
			Velocity (m/s)	0.301	0.575	0.669	0.568	0.023	**0.4**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**

Table J.3: Supporting Measures Associated with 3-Minute Kick and Sweep Benthic Invertebrate Community Sampling, 2021

Mine-exposed Dry Creek	July 27	**LC_DCDS**							
		1	Depth (cm)	11	21	15	18	14	**15.8**
			Velocity (m/s)	0.239	0.405	0.454	0.249	0.376	**0.3**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
Reference	September	**LC_DCEF**							
		1	Depth (cm)	14	11	11	8	7	**10.2**
			Velocity (m/s)	0.098	0.194	0.313	0.156	0.192	**0.2**
			Bankfull Width (m)	2.6					**-**
			Wetted Width (m)	2.3					**-**
			Bankfull-Wetted Depth (cm)	19					**-**
		2	Depth (cm)	8	11	7	-	-	**8.7**
			Velocity (m/s)	0.199	0.649	0.134	-	-	**0.3**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	12	10	15	-	-	**12.3**
			Velocity (m/s)	0.442	0.199	0.137	-	-	**0.3**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
Mine-exposed Dry Creek		**LC_DC3**							
		1	Depth (cm)	13	18	13	12	11	**13.4**
			Velocity (m/s)	0.165	0.131	0.334	0.066	0.234	**0.2**
			Bankfull Width (m)	3					**-**
			Wetted Width (m)	2.7					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		2	Depth (cm)	6	13	6	21	11	**11.4**
			Velocity (m/s)	0.459	0.322	0.898	0.221	0.228	**0.4**
			Bankfull Width (m)	2.6					**-**
			Wetted Width (m)	2.3					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	7	9	13	12	10	**10.2**
			Velocity (m/s)	0.344	0.293	0.155	0.404	0.497	**0.3**
			Bankfull Width (m)	3.1					**-**
			Wetted Width (m)	3					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		LC_DCDS							
		1	Depth (cm)	9	14	12	13	13	**12.2**
			Velocity (m/s)	0.12	0.208	0.461	0.311	0.116	**0.2**
			Bankfull Width (m)	3.2					**-**
			Wetted Width (m)	3					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		2	Depth (cm)	11	16	11	7	5	**10.0**
			Velocity (m/s)	0.231	0.641	0.273	0.223	0.188	**0.3**
			Bankfull Width (m)	3.4					**-**
			Wetted Width (m)	2.9					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	7	6	17	16	15	**12.2**
			Velocity (m/s)	0.206	0.514	0.527	0.547	0.719	**0.5**
			Bankfull Width (m)	3.7					**-**
			Wetted Width (m)	3.1					**-**
			Bankfull-Wetted Depth (cm)	26					**-**
		LC_DC2							
		1	Depth (cm)	11	14	10	18	10	**12.6**
			Velocity (m/s)	0.266	0.139	0.292	0.161	0.451	**0.3**
			Bankfull Width (m)	3.4					**-**
			Wetted Width (m)	2.9					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		2	Depth (cm)	10	10	17	10	12	**11.8**
			Velocity (m/s)	0.571	0.773	0.332	0.274	0.21	**0.4**
			Bankfull Width (m)	2.6					**-**
			Wetted Width (m)	1.9					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	7	-	6	6	13	**8.0**
			Velocity (m/s)	0.272	-	0.438	0.302	0.385	**0.3**
			Bankfull Width (m)	4.6					**-**
			Wetted Width (m)	3.9					**-**
			Bankfull-Wetted Depth (cm)	12					**-**
		LC_DC4							
		1	Depth (cm)	15	18	16	7	13	**13.8**
			Velocity (m/s)	0.338	0.341	0.356	0.274	0.384	**0.3**
			Bankfull Width (m)	4.8					**-**
			Wetted Width (m)	4.2					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		2	Depth (cm)	5	12	15	14	16	**12.4**
			Velocity (m/s)	0.338	0.546	0.395	0.425	0.254	**0.4**
			Bankfull Width (m)	3.7					**-**
			Wetted Width (m)	3.4					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	14	10	12	9	10	**11.0**
			Velocity (m/s)	0.541	0.504	0.51	0.148	0.226	**0.4**
			Bankfull Width (m)	4.2					**-**
			Wetted Width (m)	4.1					**-**
			Bankfull-Wetted Depth (cm)	16					**-**

Table J.3: Supporting Measures Associated with 3-Minute Kick and Sweep Benthic Invertebrate Community Sampling, 2021

Mine-exposed Dry Creek	September	**LC_DC1**							
		1	Depth (cm)	14	13	14	12	15	**13.6**
			Velocity (m/s)	0.408	0.505	0.331	0.444	0.593	**0.5**
			Bankfull Width (m)	4					**-**
			Wetted Width (m)	3.7					**-**
			Bankfull-Wetted Depth (cm)	18					**-**
		2	Depth (cm)	14	17	18	12	16	**15.4**
			Velocity (m/s)	0.326	0.717	0.186	0.405	0.17	**0.4**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	15	9	11	13	12	**12.0**
			Velocity (m/s)	0.341	0.734	0.91	0.223	0.431	**0.5**
			Bankfull Width (m)	-					**-**
			Wetted Width (m)	-					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
Mine-exposed Fording River		**LC_FRB**							
		1	Depth (cm)	41	31	45	48	34	**39.8**
			Velocity (m/s)	0.353	0.751	0.752	0.592	0.351	**0.6**
			Bankfull Width (m)	24.9					**-**
			Wetted Width (m)	21.7					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		2	Depth (cm)	37	43	43	48	27	**39.6**
			Velocity (m/s)	0.485	0.556	0.62	0.694	0.379	**0.5**
			Bankfull Width (m)	21.4					**-**
			Wetted Width (m)	19.1					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	22	37	53	46	21	**35.8**
			Velocity (m/s)	0.682	0.744	0.726	0.31	0.336	**0.6**
			Bankfull Width (m)	21.5					**-**
			Wetted Width (m)	18.5					**-**
			Bankfull-Wetted Depth (cm)	26					**-**
		LC_FRUS							
		1	Depth (cm)	68	76	36	28	32	**48.0**
			Velocity (m/s)	0.194	0.274	0.496	0.412	0.247	**0.3**
			Bankfull Width (m)	19.9					**-**
			Wetted Width (m)	19.2					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		2	Depth (cm)	49	23	26	26	37	**32.2**
			Velocity (m/s)	0.351	0.237	0.39	0.705	0.599	**0.5**
			Bankfull Width (m)	22					**-**
			Wetted Width (m)	21					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	39	40	51	49	20	**39.8**
			Velocity (m/s)	0.663	0.637	0.547	0.368	0.353	**0.5**
			Bankfull Width (m)	19.8					**-**
			Wetted Width (m)	17.5					**-**
			Bankfull-Wetted Depth (cm)	15					**-**
Mine-exposed Grace Creek		**LC_GRCK**							
		1	Depth (cm)	12	15	12	21	29	**17.8**
			Velocity (m/s)	0.343	0.013	0.86	0.041	0.16	**0.3**
			Bankfull Width (m)	2.2					**-**
			Wetted Width (m)	1.8					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		2	Depth (cm)	8	8	15	11	20	**12.4**
			Velocity (m/s)	0.133	0.306	0.361	0.791	0.135	**0.3**
			Bankfull Width (m)	2.8					**-**
			Wetted Width (m)	2.5					**-**
			Bankfull-Wetted Depth (cm)	-					**-**
		3	Depth (cm)	9	10	17	-	-	**12.0**
			Velocity (m/s)	0.141	0.526	0.284	-	-	**0.3**
			Bankfull Width (m)	3.2					**-**
			Wetted Width (m)	2.3					**-**
			Bankfull-Wetted Depth (cm)	13					**-**
Mine-exposed Dry Creek	November 30 - December 1	**LC_DCDS**							
		1	Depth (cm)	10.5	14.5	15	17	21	**15.6**
			Velocity (m/s)	0.482	0.474	0.346	0.424	0.321	**0.4**
			Bankfull Width (m)	3.7					**-**
			Wetted Width (m)	3.2					**-**
			Bankfull-Wetted Depth (cm)	0.5					**-**
		LC_DC1							
		1	Depth (cm)	16	11	13.5	19	13.5	**14.6**
			Velocity (m/s)	0.305	0.713	0.378	0.488	0.438	**0.5**
			Bankfull Width (m)	5.2					**-**
			Wetted Width (m)	4.7					**-**
			Bankfull-Wetted Depth (cm)	0.6					**-**

Table J.4: *In Situ* Water Quality from Dry Creek, Fording River, and Grace Creek, 2021

Sampling Event	Station	Field Parameters	Reference	Mine-exposed Dry Creek					Mine-exposed Fording River		Mine-exposed Grace Creek
			LC_DCEF	LC_DC3	LC_DCDS	LC_DC4	LC_DC2	LC_DC1	LC_FRB	LC_FRUS	LC_GRCK
March 8-16	Station 1	Date	8-Mar-21	8-Mar-21	9-Mar-21	9-Mar-21	-	10-Mar-21	15-Mar-21	16-Mar-21	-
		Temperature (°C)	2.10	0.2	0.3	0.5	-	0.1	1.40	1.20	-
		Dissolved Oxygen (mg/L)	11.2	12.2	12.2	11.7	-	12.3	11.6	11.6	-
		Dissolved Oxygen (%)	81.7	84.2	84.3	81.3	-	84.2	83.1	82.5	-
		Conductivity (µS/cm)	141.4	421.8	424.1	289.6	-	265.9	810.0	853.0	-
		Specific Conductivity (µS/cm)	250.6	802.0	804.0	545.0	-	508.0	1,472	1,561	-
		pH	7.88	8.07	8.16	7.86	-	8.05	8.19	8.10	-
	Station 2	Date	8-Mar-21	8-Mar-21	9-Mar-21	9-Mar-21	-	10-Mar-21	15-Mar-21	16-Mar-21	-
		Temperature (°C)	2.10	0.1	0.2	0.4	-	0.8	1.50	1.30	-
		Dissolved Oxygen (mg/L)	11.4	12.2	12.2	11.9	-	12.4	11.7	11.5	-
		Dissolved Oxygen (%)	82.4	83.7	84.4	82.5	-	86.9	83.4	81.6	-
		Conductivity (µS/cm)	140.9	420.5	420.0	289.2	-	484.6	810.0	827.0	-
		Specific Conductivity (µS/cm)	250.4	801.0	797.0	545.0	-	902.0	1,470	1,512	-
		pH	7.92	7.99	8.16	7.88	-	8.10	8.19	8.19	-
	Station 3	Date	8-Mar-21	8-Mar-21	9-Mar-21	9-Mar-21	-	10-Mar-21	15-Mar-21	16-Mar-21	-
		Temperature (°C)	2.10	0.1	0.2	0.4	-	0.8	1.40	1.30	-
		Dissolved Oxygen (mg/L)	11.3	12.1	12.2	11.9	-	12.4	11.7	11.5	-
		Dissolved Oxygen (%)	82.3	83.0	84.2	82.6	-	85.3	83.4	82.3	-
		Conductivity (µS/cm)	140.8	421.0	419.4	288.4	-	485.1	808.0	852.0	-
		Specific Conductivity (µS/cm)	250.3	803.0	797.0	544.0	-	901.0	1,470	1,556	-
		pH	7.93	7.92	8.16	7.91	-	8.09	8.19	8.14	-
May 4-7	Station 1	Date	4-May-21	3-May-21	4-May-21	5-May-21	6-May-21	5-May-21	6-May-21	7-May-21	7-May-21
		Temperature (°C)	2.40	1.80	2.10	2.00	2.70	4.70	5.90	4.10	2.70
		Dissolved Oxygen (mg/L)	11.5	11.6	11.7	11.7	11.5	11.2	11.3	11.1	11.7
		Dissolved Oxygen (%)	84.2	83.3	85.0	84.7	85.3	87.4	90.9	84.8	86.2
		Conductivity (µS/cm)	112.9	242.9	228.3	203.9	202.1	214.0	416.8	384.2	173.5
		Specific Conductivity (µS/cm)	198.9	435.9	405.5	363.9	351.3	349.4	656.0	640.0	302.1
		pH	8.57	8.54	8.59	8.56	8.66	8.74	8.72	8.60	8.73
	Station 2	Date	4-May-21	3-May-21	4-May-21	5-May-21	6-May-21	5-May-21	6-May-21	7-May-21	7-May-21
		Temperature (°C)	2.30	1.70	2.10	1.50	2.30	4.30	5.60	4.10	2.70
		Dissolved Oxygen (mg/L)	11.6	11.6	11.8	11.9	11.7	11.4	11.4	11.0	11.7
		Dissolved Oxygen (%)	84.4	83.0	85.5	84.7	85.2	88.0	91.0	84.3	86.1
		Conductivity (µS/cm)	112.5	241.4	160.4	200.1	199.0	212.4	413.9	384.9	173.9
		Specific Conductivity (µS/cm)	198.7	434.7	284.5	363.5	351.2	351.0	658.0	641.0	302.9
		pH	8.59	8.50	8.65	8.52	8.64	8.74	8.71	8.58	8.73
	Station 3	Date	4-May-21	3-May-21	4-May-21	5-May-21	6-May-21	5-May-21	6-May-21	7-May-21	7-May-21
		Temperature (°C)	2.20	1.70	1.80	1.30	2.00	3.90	6.00	4.10	2.60
		Dissolved Oxygen (mg/L)	11.7	11.5	11.0	11.7	11.7	11.5	11.5	11.0	11.7
		Dissolved Oxygen (%)	84.8	82.6	81.2	83.4	84.6	87.7	92.5	84.2	86.0
		Conductivity (µS/cm)	112.1	242.5	173.0	199.2	191.1	215.3	417.0	385.7	172.3
		Specific Conductivity (µS/cm)	198.8	437.1	310.4	364.2	341.3	360.3	656.0	642.0	302.0
		pH	8.59	8.40	8.64	8.45	8.59	8.72	8.72	8.58	8.69
May 31 - June 2	Station 1	Date	31-May-21	31-May-21	1-Jun-21	1-Jun-21	31-May-21	1-Jun-21	2-Jun-21	2-Jun-21	-
		Temperature (°C)	4.40	2.70	5.50	4.50	5.50	4.30	6.80	7.30	-
		Dissolved Oxygen (mg/L)	10.9	11.3	10.6	10.7	10.7	11.0	10.1	9.99	-
		Dissolved Oxygen (%)	84.2	83.0	84.2	82.8	84.7	84.6	82.5	83.1	-
		Conductivity (µS/cm)	141.7	305.1	317.9	225.9	235.9	222.6	336.7	351.1	-
		Specific Conductivity (µS/cm)	233.6	557.0	505.0	373.2	376.1	368.4	517.0	530.0	-
		pH	8.24	7.97	8.21	8.28	8.31	8.25	8.29	2021-06-02	-

Table J.4: ***In Situ*** **Water Quality from Dry Creek, Fording River, and Grace Creek, 2021**

Sampling Event	Station	Field Parameters	Reference	Mine-exposed Dry Creek					Mine-exposed Fording River		Mine-exposed Grace Creek
			LC_DCEF	LC_DC3	LC_DCDS	LC_DC4	LC_DC2	LC_DC1	LC_FRB	LC_FRUS	LC_GRCK
May 31 - June 2	Station 2	Date	31-May-21	31-May-21	1-Jun-21	1-Jun-21	31-May-21	1-Jun-21	2-Jun-21	2-Jun-21	-
		Temperature (°C)	4.30	3.00	5.60	4.40	5.60	4.20	6.90	7.10	-
		Dissolved Oxygen (mg/L)	10.9	11.1	10.7	10.8	10.7	11.1	10.3	10.0	-
		Dissolved Oxygen (%)	84.0	82.7	84.8	83.5	84.7	85.1	84.3	83.1	-
		Conductivity (µS/cm)	222.8	292.7	177.6	227.0	235.0	222.6	341.6	345.6	-
		Specific Conductivity (µS/cm)	133.5	551.0	278.4	374.3	373.1	370.1	524.0	529.0	-
		pH	8.22	8.03	8.36	8.21	8.32	8.22	8.18	8.23	-
	Station 3	Date	31-May-21	31-May-21	1-Jun-21	1-Jun-21	31-May-21	1-Jun-21	2-Jun-21	2-Jun-21	-
		Temperature (°C)	4.50	3.90	5.00	4.20	6.00	4.20	6.90	7.30	-
		Dissolved Oxygen (mg/L)	10.6	11.1	10.9	10.9	10.3	11.0	10.3	9.88	-
		Dissolved Oxygen (%)	82.5	84.7	85.1	83.5	83.1	84.4	84.4	82.1	-
		Conductivity (µS/cm)	141.9	362.7	396.6	224.7	238.8	222.7	342.6	347.0	-
		Specific Conductivity (µS/cm)	233.2	581.0	245.0	374.0	375.4	369.9	524.0	528.0	-
		pH	8.27	8.13	8.29	8.16	8.36	7.95	8.17	8.19	-
June 10	Station 1	Date	-	10-Jun-21	10-Jun-21	-	-	-	-	-	-
		Temperature (°C)	-	2.90	4.30	-	-	-	-	-	-
		Dissolved Oxygen (mg/L)	-	11.4	11.3	-	-	-	-	-	-
		Dissolved Oxygen (%)	-	84.6	86.9	-	-	-	-	-	-
		Conductivity (µS/cm)	-	365.3	280.5	-	-	-	-	-	-
		Specific Conductivity (µS/cm)	-	635.0	461.1	-	-	-	-	-	-
		pH	-	8.34	8.47	-	-	-	-	-	-
June 21 - 25	Station 1	Date	22-Jun-21	21-Jun-21	22-Jun-21	23-Jun-21	23-Jun-21	24-Jun-21	24-Jun-21	25-Jun-21	-
		Temperature (°C)	4.40	5.50	3.90	7.90	7.70	6.50	7.30	7.50	-
		Dissolved Oxygen (mg/L)	10.7	10.7	10.9	10.1	10.2	10.5	10.8	10.6	-
		Dissolved Oxygen (%)	82.7	85.5	82.9	85.2	85.6	85.8	89.6	88.4	-
		Conductivity (µS/cm)	129.7	421.2	129.3	273.1	311.8	276.2	334.4	327.6	-
		Specific Conductivity (µS/cm)	213.8	670.0	216.5	405.5	470.2	427.8	504.0	503.0	-
		pH	8.34	8.31	8.56	8.32	8.43	8.35	8.24	8.25	-
	Station 2	Date	22-Jun-21	21-Jun-21	22-Jun-21	23-Jun-21	23-Jun-21	24-Jun-21	-	25-Jun-21	-
		Temperature (°C)	3.90	5.50	8.50	8.00	7.50	6.50	-	6.30	-
		Dissolved Oxygen (mg/L)	10.9	10.8	10.1	10.1	10.2	10.5	-	10.3	-
		Dissolved Oxygen (%)	82.9	85.9	85.9	85.5	85.5	85.5	-	83.8	-
		Conductivity (µS/cm)	129.3	422.7	278.8	297.1	310.9	268.0	-	328.9	-
		Specific Conductivity (µS/cm)	216.5	676.0	406.5	440.1	467.2	414.0	-	512.0	-
		pH	8.56	8.50	8.38	8.23	8.39	8.41	-	8.19	-
	Station 3	Date	22-Jun-21	21-Jun-21	22-Jun-21	23-Jun-21	23-Jun-21	24-Jun-21	-	-	-
		Temperature (°C)	4.00	3.90	7.60	7.90	6.90	6.20	-	-	-
		Dissolved Oxygen (mg/L)	10.8	11.2	10.4	10.3	10.3	10.6	-	-	-
		Dissolved Oxygen (%)	82.7	85.3	87.3	87.0	84.5	85.9	-	-	-
		Conductivity (µS/cm)	128.6	400.9	309.1	294.7	307.8	272.9	-	-	-
		Specific Conductivity (µS/cm)	214.4	669.0	465.7	438.0	467.8	426.8	-	-	-
		pH	8.56	8.30	-	8.25	8.44	8.55	-	-	-
July 8	Station 1	Date	-	8-Jul-21	8-Jul-21	-	-	-	-	-	-
		Temperature (°C)	-	4.19	10.9	-	-	-	-	-	-
		Dissolved Oxygen (mg/L)	-	11.1	9.57	-	-	-	-	-	-
		Dissolved Oxygen (%)	-	87.1	86.7	-	-	-	-	-	-
		Conductivity (µS/cm)	-	464.7	493.3	-	-	-	-	-	-
		Specific Conductivity (µS/cm)	-	745.0	675.0	-	-	-	-	-	-
		pH	-	7.86	-	-	-	-	-	-	-

Table J.4: *In Situ* Water Quality from Dry Creek, Fording River, and Grace Creek, 2021

Sampling Event	Station	Field Parameters	Reference	Mine-exposed Dry Creek					Mine-exposed Fording River		Mine-exposed Grace Creek
			LC_DCEF	LC_DC3	LC_DCDS	LC_DC4	LC_DC2	LC_DC1	LC_FRB	LC_FRUS	LC_GRCK
July 27	Station 1	Date	-	27-Jul-21	27-Jul-21	-	-	-	-	-	-
		Temperature (°C)	-	4.70	12.6	-	-	-	-	-	-
		Dissolved Oxygen (mg/L)	-	10.0	8.60	-	-	-	-	-	-
		Dissolved Oxygen (%)	-	78.0	81.0	-	-	-	-	-	-
		Conductivity (µS/cm)	-	834.0	962.0	-	-	-	-	-	-
		Specific Conductivity (µS/cm)	-	1,354	1,264	-	-	-	-	-	-
		pH	-	8.17	8.37	-	-	-	-	-	-
September 7-13	Station 1	Date	7-Sep-21	10-Sep-21	10-Sep-21	9-Sep-21	9-Sep-21	7-Sep-21	11-Sep-21	12-Sep-21	13-Sep-21
		Temperature (°C)	4.31	5.50	5.70	6.00	7.60	6.80	7.50	8.10	5.30
		Dissolved Oxygen (mg/L)	10.3	11.4	11.5	11.3	10.7	10.6	10.3	10.5	11.2
		Dissolved Oxygen (%)	79.2	111.4	111.8	109.9	109.7	86.9	103.2	106.3	105.6
		Conductivity (µS/cm)	179.4	729.0	690.0	483.4	675.0	511.0	577.0	594.0	257.1
		Specific Conductivity (µS/cm)	296.6	1,160	1,090	760.0	1,010	782.0	870.0	880.0	412.0
		pH	7.86	7.97	7.87	7.59	7.83	8.42	7.52	7.65	7.59
	Station 2	Date	7-Sep-21	10-Sep-21	10-Sep-21	9-Sep-21	9-Sep-21	7-Sep-21	11-Sep-21	12-Sep-21	13-Sep-21
		Temperature (°C)	4.40	5.30	5.60	5.50	7.60	5.80	7.40	7.90	5.20
		Dissolved Oxygen (mg/L)	10.3	11.6	11.1	11.4	11.0	10.9	10.5	11.0	11.7
		Dissolved Oxygen (%)	79.6	112.1	107.8	109.5	111.8	87.0	104.9	111.0	109.5
		Conductivity (µS/cm)	179.6	724.0	657.0	478.0	676.0	497.9	580.0	592.0	256.6
		Specific Conductivity (µS/cm)	296.2	1,160	1,040	762.0	1,010	786.0	870.0	880.0	412.0
		pH	7.90	7.90	7.87	7.60	7.86	8.37	7.75	7.55	7.61
	Station 3	Date	7-Sep-21	10-Sep-21	10-Sep-21	9-Sep-21	9-Sep-21	7-Sep-21	11-Sep-21	12-Sep-21	13-Sep-21
		Temperature (°C)	4.46	4.70	5.60	4.90	7.50	4.60	9.60	7.70	5.20
		Dissolved Oxygen (mg/L)	10.4	11.7	11.2	11.4	11.2	10.8	10.6	10.4	11.5
		Dissolved Oxygen (%)	80.0	112.0	108.7	107.7	113.7	83.6	111.8	104.6	107.7
		Conductivity (µS/cm)	179.9	710.0	664.0	470.6	675.0	477.0	600.0	586.0	256.5
		Specific Conductivity (µS/cm)	296.0	1,160	1,060	763.0	1,010	791.0	850.0	880.0	413.0
		pH	7.92	7.95	7.82	7.55	7.93	8.25	7.78	7.51	7.52
November 29 - December 1	Station 1	Date	29-Nov-21	29-Nov-21	30-Nov-21	1-Dec-21	1-Dec-21	1-Dec-21	-	-	-
		Temperature (°C)	3.40	1.60	1.50	2.60	1.90	2.60	-	-	-
		Dissolved Oxygen (mg/L)	10.9	11.6	11.5	11.0	11.4	11.4	-	-	-
		Dissolved Oxygen (%)	81.7	83.4	82.5	81.3	82.2	83.8	-	-	-
		Conductivity (µS/cm)	233.0	815.0	777.0	594.0	670.0	574.0	-	-	-
		Specific Conductivity (µS/cm)	396.3	1,472	1,409	1,040	1,198	1,003	-	-	-
		pH	8.11	8.23	8.16	8.22	8.35	8.52	-	-	-
	Station 2	Date	29-Nov-21	29-Nov-21	30-Nov-21	1-Dec-21	1-Dec-21	-	-	-	-
		Temperature (°C)	3.40	1.70	1.60	2.60	1.90	2.60	-	-	-
		Dissolved Oxygen (mg/L)	10.9	11.6	11.4	11.0	11.2	11.4	-	-	-
		Dissolved Oxygen (%)	82.3	83.6	82.1	81.2	81.1	83.8	-	-	-
		Conductivity (µS/cm)	234.0	817.0	712.0	593.0	666.0	574.0	-	-	-
		Specific Conductivity (µS/cm)	398.7	1,473	1,288	1,041	1,194	1,003	-	-	-
		pH	8.15	8.29	7.98	8.29	8.32	8.54	-	-	-
	Station 3	Date	29-Nov-21	29-Nov-21	30-Nov-21	1-Dec-21	1-Dec-21	1-Dec-21	-	-	-
		Temperature (°C)	3.40	1.70	1.60	2.60	1.90	2.60	-	-	-
		Dissolved Oxygen (mg/L)	10.9	11.6	11.5	11.0	11.2	11.4	-	-	-
		Dissolved Oxygen (%)	82.0	83.4	82.7	81.3	81.1	84.1	-	-	-
		Conductivity (µS/cm)	232.9	816.0	721.0	594.0	666.0	573.0	-	-	-
		Specific Conductivity (µS/cm)	396.3	1,472	1,308	1,038	1,194	1,001	-	-	-
		pH	8.07	8.22	7.91	8.24	8.32	8.53	-	-	-

Note: "-" indicates data not collected.

Table J.5: Pebble Counts and Calcite Measurements (September Only) at Benthic Invertebrate Sampling Locations in Dry Creek, Fording River, and Grace Creek, 2021

LC_GRCK-1						LC_GRCK-2					
13-Sep-21						13-Sep-21					
Pebble	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**	**Pebble**	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**
1	0	0	0	9.2	-	**1**	0	0	0	4.6	-
2	0	0	0	4.3	-	**2**	0	0	0	6.8	-
3	0	0	0	17.2	-	**3**	0	0	0	7.0	-
4	0	0	0	6.3	-	**4**	0	0	0	8.2	-
5	0	0	0	3.2	-	**5**	0	0	0	5.2	-
6	0	0	0	6.5	-	**6**	0	0	0	4.6	-
7	0	0	0	6.8	-	**7**	0	0	0	6.7	-
8	0	0	0	6.1	-	**8**	0	0	0	6.1	-
9	0	0	0	14.3	-	**9**	0	0	0	18.4	-
10	0	0	0	4.8	0	**10**	0	0	0	12.1	0.25
11	0	0	0	16.2	-	**11**	0	0	0	13.6	-
12	0	0	0	12.1	-	**12**	0	0	0	10.2	-
13	0	0	0	4.7	-	**13**	0	0	0	13.5	-
14	0	0	0	5.1	-	**14**	0	0	0	9.1	-
15	0	0	0	5.2	-	**15**	0	0	0	4.6	-
16	0	0	0	4.1	-	**16**	0	0	0	4.2	-
17	0	0	0	4.6	-	**17**	0	0	0	5.3	-
18	0	0	0	14.9	-	**18**	0	0	0	5.8	-
19	0	0	0	7.4	-	**19**	0	0	0	9.7	-
20	0	0	0	7.2	0.5	**20**	0	0	0	8.2	0
21	0	0	0	6.4	-	**21**	0	0	0	3.8	-
22	0	0	0	10.9	-	**22**	0	0	0	1.7	-
23	0	0	0	4.0	-	**23**	0	0	0	2.0	-
24	0	0	0	10.8	-	**24**	0	0	0	12.8	-
25	0	0	0	3.1	-	**25**	0	0	0	6.1	-
26	0	0	0	3.0	-	**26**	0	0	0	5.2	-
27	0	0	0	7.5	-	**27**	0	0	0	6.6	-
28	0	0	0	6.8	-	**28**	0	0	0	3.7	-
29	0	0	0	7.2	-	**29**	0	0	0	9.4	-
30	0	0	0	18.5	0.75	**30**	0	0	0	15.4	0.25
31	0	0	0	2.5	-	**31**	0	0	0	4.0	-
32	0	0	0	5.0	-	**32**	0	0	0	9.1	-
33	0	0	0	8.3	-	**33**	0	0	0	5.0	-
34	0	0	0	4.1	-	**34**	0	0	0	5.2	-
35	0	0	0	4.6	-	**35**	0	0	0	2.6	-
36	0	0	0	9.0	-	**36**	0	0	0	4.7	-
37	0	0	0	12.4	-	**37**	0	0	0	6.8	-
38	0	0	0	6.7	-	**38**	0	0	0	6.3	-
39	0	0	0	11.1	-	**39**	0	0	0	3.5	-
40	0	0	0	6.2	0.25	**40**	0	0	0	7.5	0.5
41	0	0	0	5.2	-	**41**	0	0	0	2.6	-
42	0	0	0	1.9	-	**42**	0	0	0	11.7	-
43	0	0	0	3.2	-	**43**	0	0	0	2.8	-
44	0	0	0	6.5	-	**44**	0	0	0	3.2	-
45	0	0	0	17.1	-	**45**	0	0	0	3.0	-
46	0	0	0	11.6	-	**46**	0	0	0	2.4	-
47	0	0	0	5.8	-	**47**	0	0	0	2.3	-
48	0	0	0	6.2	-	**48**	0	0	0	6.3	-
49	0	0	0	8.1	-	**49**	0	0	0	6.8	-
50	0	0	0	5.3	0	**50**	0	0	0	6.2	0.25
51	0	0	0	5.9	-	**51**	0	0	0	8.4	-
52	0	0	0	10.3	-	**52**	0	0	0	1.8	-
53	0	0	0	5.6	-	**53**	0	0	0	1.7	-
54	0	0	0	3.3	-	**54**	0	0	0	14.7	-
55	0	0	0	2.8	-	**55**	0	0	0	14.7	-
56	0	0	0	14.9	-	**56**	0	0	0	10.2	-
57	0	0	0	4.8	-	**57**	0	0	0	8.2	-
58	0	0	0	4.5	-	**58**	0	0	0	5.0	-
59	0	0	0	7.5	-	**59**	0	0	0	5.7	-
60	0	0	0	5.5	0.25	**60**	0	0	0	3.7	0
61	0	0	0	6.9	-	**61**	0	0	0	4.4	-
62	0	0	0	5.2	-	**62**	0	0	0	5.5	-
63	0	0	0	7.3	-	**63**	0	0	0	5.2	-
64	0	0	0	8.2	-	**64**	0	0	0	3.8	-
65	0	0	0	12.3	-	**65**	0	0	0	2.5	-
66	0	0	0	6.0	-	**66**	0	0	0	2.3	-
67	0	0	0	3.6	-	**67**	0	0	0	9.9	-
68	0	0	0	3.3	-	**68**	0	0	0	4.1	-
69	0	0	0	2.0	-	**69**	0	0	0	1.4	-
70	0	0	0	1.9	0.75	**70**	0	0	0	12.3	0.75
71	0	0	0	3.0	-	**71**	0	0	0	1.6	-
72	0	0	0	15.3	-	**72**	0	0	0	5.7	-
73	0	0	0	7.2	-	**73**	0	0	0	5.3	-
74	0	0	0	4.6	-	**74**	0	0	0	6.2	-
75	0	0	0	8.7	-	**75**	0	0	0	3.5	-
76	0	0	0	6.6	-	**76**	0	0	0	2.3	-
77	0	0	0	3.1	-	**77**	0	0	0	5.8	-
78	0	0	0	2.9	-	**78**	0	0	0	3.3	-
79	0	0	0	8.7	-	**79**	0	0	0	7.2	-
80	0	0	0	1.6	0	**80**	0	0	0	8.7	0.25
81	0	0	0	6.8	-	**81**	0	0	0	4.7	-
82	0	0	0	4.2	-	**82**	0	0	0	2.2	-
83	0	0	0	7.3	-	**83**	0	0	0	2.8	-
84	0	0	0	6.0	-	**84**	0	0	0	6.3	-
85	0	0	0	3.2	-	**85**	0	0	0	6.2	-
86	0	0	0	4.1	-	**86**	0	0	0	16.2	-
87	0	0	0	8.7	-	**87**	0	0	0	13.3	-
88	0	0	0	2.7	-	**88**	0	0	0	13.0	-
89	0	0	0	1.8	-	**89**	0	0	0	7.7	-
90	0	0	0	5.0	0.75	**90**	0	0	0	6.4	0.5
91	0	0	0	4.3	-	**91**	0	0	0	6.2	-
92	0	0	0	6.2	-	**92**	0	0	0	5.6	-
93	0	0	0	9.1	-	**93**	0	0	0	4.1	-
94	0	0	0	7.7	-	**94**	0	0	0	2.2	-
95	0	0	0	13.7	-	**95**	0	0	0	2.7	-
96	0	0	0	5.4	-	**96**	0	0	0	2.5	-
97	0	0	0	6.2	-	**97**	0	0	0	2.0	-
98	0	0	0	6.6	-	**98**	0	0	0	1.7	-
99	0	0	0	5.5	-	**99**	0	0	0	5.8	-
100	-	-	-	-	-	**100**	0	0	0	15.7	0.5
Average =	**0.00**	**0.00**	**0.00**	**6.8**	**0.36**	**Average =**	**0.00**	**0.00**	**0.00**	**6.4**	**0.33**
	Old Calcite Index (CI) =	**0.00**					**Old Calcite Index (CI) =**	**0.00**			
	New Calcite Index (CI') =	**0.00**					**New Calcite Index (CI') =**	**0.00**			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Calcite proportion was not recorded prior to Sept. 9, 2021.

Table J.5: Pebble Counts and Calcite Measurements (September Only) at Benthic Invertebrate Sampling Locations in Dry Creek, Fording River, and Grace Creek, 2021

LC_GRCK-3						LC_FRUS-1					
13-Sep-21						12-Sep-21					
Pebble	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**	**Pebble**	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**
1	0	0	0	5.7	-	**1**	0	0.9	1	8.3	-
2	0	0	0	11.7	-	**2**	0	0.9	1	11.4	-
3	0	0	0	11.9	-	**3**	0	0.8	1	14.3	-
4	0	0	0	5.5	-	**4**	0	1	1	8.2	-
5	0	0	0	10.1	-	**5**	0	0.7	1	6.1	-
6	0	0	0	11.6	-	**6**	0	0.8	1	6.2	-
7	0	0	0	1.4	-	**7**	0	0.2	1	7.3	-
8	0	0	0	6.7	-	**8**	0	0.8	1	11.2	-
9	0	0	0	4.8	-	**9**	0	0.9	1	6.3	-
10	0	0	0	5.4	0	**10**	0	1	1	11.7	0.5
11	0	0	0	2.1	-	**11**	0	0.8	1	12.1	-
12	0	0	0	5.3	-	**12**	0	0.6	1	12.2	-
13	0	0	0	6.2	-	**13**	0	0.7	1	7.6	-
14	0	0	0	4.2	-	**14**	0	0.4	1	10.0	-
15	0	0	0	2.8	-	**15**	0	0.7	1	9.2	-
16	0	0	0	7.3	-	**16**	0	0.9	1	10.7	-
17	0	0	0	15.6	-	**17**	0	0.7	1	6.9	-
18	0	0	0	5.4	-	**18**	0	0.2	1	5.8	-
19	0	0	0	4.6	-	**19**	0	0.7	1	5.3	-
20	0	0	0	2.3	0	**20**	0	0.3	1	5.4	0.5
21	0	0	0	12.7	-	**21**	0	0.3	1	7.9	-
22	0	0	0	3.2	-	**22**	0	0.1	1	4.4	-
23	0	0	0	8.8	-	**23**	0	0.8	1	9.0	-
24	0	0	0	5.3	-	**24**	0	0	0	2.6	-
25	0	0	0	14.8	-	**25**	0	0.9	1	9.2	-
26	0	0	0	4.8	-	**26**	0	-	-	7.1	-
27	0	0	0	15.5	-	**27**	0	0.5	1	4.4	-
28	0	0	0	3.8	-	**28**	0	0.8	1	5.8	-
29	0	0	0	6.4	-	**29**	0	0.5	1	9.9	-
30	0	0	0	3.7	0.25	**30**	0	0.8	1	7.5	0.75
31	0	0	0	3.8	-	**31**	0	0.2	1	7.2	-
32	0	0	0	6.3	-	**32**	0	0.6	1	7.2	-
33	0	0	0	3.0	-	**33**	0	0.8	1	6.3	-
34	0	0	0	6.3	-	**34**	0	0.8	1	11.8	-
35	0	0	0	6.1	-	**35**	0	0.9	1	15.2	-
36	0	0	0	4.1	-	**36**	0	0.3	1	7.6	-
37	0	0	0	4.7	-	**37**	0	0.7	1	14.9	-
38	0	0	0	5.2	-	**38**	0	0.8	1	9.2	-
39	0	0	0	5.3	-	**39**	0	0.6	1	19.8	-
40	0	0	0	19.2	0	**40**	0	1	1	13.8	0.5
41	0	0	0	3.4	-	**41**	0	0.6	1	14.8	-
42	0	0	0	7.2	-	**42**	0	0.8	1	8.2	-
43	0	0	0	5.7	-	**43**	0	0.9	1	7.5	-
44	0	0	0	12.6	-	**44**	0	0.8	1	13.9	-
45	0	0	0	5.5	-	**45**	0	0.6	1	11.8	-
46	0	0	0	3.3	-	**46**	0	0	0	4.3	-
47	0	0	0	1.8	-	**47**	0	0.3	1	8.2	-
48	0	0	0	4.7	-	**48**	0	0.8	1	11.3	-
49	0	0	0	13.6	-	**49**	0	0.8	1	13.8	-
50	0	0	0	4.1	0.5	**50**	0	0.3	1	8.0	0
51	0	0	0	8.4	-	**51**	0	0.4	1	6.4	-
52	0	0	0	2.6	-	**52**	0	0.9	1	11.0	-
53	0	0	0	4.6	-	**53**	0	0.3	1	10.0	-
54	0	0	0	3.2	-	**54**	0	-	-	7.0	-
55	0	0	0	5.5	-	**55**	0	0.4	1	11.0	-
56	0	0	0	6.0	-	**56**	0	0.5	1	9.1	-
57	0	0	0	3.5	-	**57**	0	0.6	1	13.0	-
58	0	0	0	5.6	-	**58**	0	1	1	13.2	-
59	0	0	0	4.8	-	**59**	0	1	1	13.1	-
60	0	0	0	5.1	0.25	**60**	0	1	1	12.3	0
61	0	0	0	16.9	-	**61**	0	0.6	1	8.4	-
62	0	0	0	7.4	-	**62**	0	0.8	1	6.0	-
63	0	0	0	3.4	-	**63**	0	0.3	1	5.2	-
64	0	0	0	4.8	-	**64**	0	1	1	9.5	-
65	0	0	0	6.2	-	**65**	0	0.7	1	11.2	-
66	0	0	0	2.8	-	**66**	0	1	1	8.2	-
67	0	0	0	5.1	-	**67**	0	0.8	1	13.5	-
68	0	0	0	2.6	-	**68**	0	1	1	10.6	-
69	0	0	0	5.5	-	**69**	0	0.8	1	15.3	-
70	0	0	0	3.0	0.5	**70**	0	0.6	1	9.2	0
71	0	0	0	1.9	-	**71**	0	0.8	1	10.0	-
72	0	0	0	2.7	-	**72**	0	0.6	1	10.8	-
73	0	0	0	5.4	-	**73**	0	0.6	1	9.9	-
74	0	0	0	6.2	-	**74**	0	0.6	1	10.2	-
75	0	0	0	7.2	-	**75**	0	0.8	1	8.5	-
76	0	0	0	5.1	-	**76**	0	0.8	1	8.3	-
77	0	0	0	9.8	-	**77**	0	0.6	1	9.2	-
78	0	0	0	18.2	-	**78**	0	0.5	1	6.4	-
79	0	0	0	10.1	-	**79**	0	0.5	1	11.5	-
80	0	0	0	3.4	0	**80**	0	0.5	1	9.5	0.75
81	0	0	0	4.3	-	**81**	0	1	1	10.0	-
82	0	0	0	4.0	-	**82**	0	0.7	1	10.3	-
83	0	0	0	5.0	-	**83**	0	0.5	1	6.5	-
84	0	0	0	4.4	-	**84**	0	0.8	1	11.7	-
85	0	0	0	2.1	-	**85**	0	0.4	1	6.7	-
86	0	0	0	6.2	-	**86**	0	0.4	1	5.5	-
87	0	0	0	7.6	-	**87**	0	0.5	1	7.3	-
88	0	0	0	4.8	-	**88**	0	0.1	1	7.2	-
89	0	0	0	5.5	-	**89**	0	0	0	5.2	-
90	0	0	0	5.4	0.75	**90**	0	1	1	9.1	0
91	0	0	0	6.2	-	**91**	0	0.8	1	7.8	-
92	0	0	0	4.8	-	**92**	0	0.6	1	5.9	-
93	0	0	0	2.1	-	**93**	0	0.7	1	6.9	-
94	0	0	0	3.2	-	**94**	0	0.3	1	6.4	-
95	0	0	0	6.4	-	**95**	0	0.5	1	8.4	-
96	0	0	0	5.1	-	**96**	0	0.5	1	10.7	-
97	0	0	0	2.3	-	**97**	0	0	0	5.3	-
98	0	0	0	2.1	-	**98**	0	0.6	1	8.3	-
99	0	0	0	8.2	-	**99**	0	0.4	1	8.2	-
100	0	0	0	3.9	0.5	**100**	0	0.4	1	11.0	0.25
Average =	**0.00**	**0.00**	**0.00**	**6.1**	**0.28**	**Average =**	**0.00**	**0.63**	**0.96**	**9.1**	**0.33**
	Old Calcite Index (CI) =	**0.00**					**Old Calcite Index (CI) =**	**0.96**			
	New Calcite Index (CI') =	**0.00**					**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. Calcite proportion was not recorded prior to Sept. 9, 2021.

Table J.5: Pebble Counts and Calcite Measurements (September Only) at Benthic Invertebrate Sampling Locations in Dry Creek, Fording River, and Grace Creek, 2021

LC_FRUS-2						LC_FRUS-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	0.7	1	6.3	-	**1**	0	0.5	1	12.5	-
2	0	0.4	1	6.1	-	**2**	0	0.5	1	7.3	-
3	0	0.7	1	10.9	-	**3**	0	0.8	1	6.8	-
4	0	0.6	1	8.6	-	**4**	0	0	0	5.8	-
5	0	0.6	1	7.3	-	**5**	0	0.6	1	9.6	-
6	0	0.6	1	13.5	-	**6**	0	0.8	1	6.2	-
7	0	0.5	1	8.2	-	**7**	0	0.3	1	5.3	-
8	0	0.2	1	7.3	-	**8**	0	0.2	1	9.3	-
9	0	0.5	1	12.4	-	**9**	0	0.6	1	8.4	-
10	0	1	1	10.5	0	**10**	0	1	1	12.3	0
11	0	0.6	1	13.0	-	**11**	0	0.3	1	10.8	-
12	0	0.6	1	8.2	-	**12**	0	0.2	1	7.8	-
13	0	0.9	1	20.2	-	**13**	0	0.4	1	7.9	-
14	0	0.1	1	4.3	-	**14**	0	0.3	1	12.6	-
15	0	0.5	1	7.3	-	**15**	0	0.8	1	10.4	-
16	0	0.2	1	8.2	-	**16**	0	0.6	1	8.4	-
17	0	0.6	1	9.8	-	**17**	0	0.8	1	11.4	-
18	0	0.4	1	7.6	-	**18**	0	0.6	1	11.8	-
19	0	0.9	1	12.1	-	**19**	0	0.4	1	11.3	-
20	0	0.9	1	18.2	0.25	**20**	0	0.7	1	10.7	0.25
21	0	0.1	1	3.7	-	**21**	0	0.6	1	10.3	-
22	0	0.2	1	3.6	-	**22**	0	1	1	9.0	-
23	0	0.1	1	3.2	-	**23**	0	0.9	1	9.3	-
24	0	0.6	1	16.6	-	**24**	0	0.7	1	12.7	-
25	0	0.2	1	9.7	-	**25**	0	0.8	1	12.2	-
26	0	0.7	1	8.3	-	**26**	0	1	1	10.8	-
27	0	0.7	1	8.7	-	**27**	0	1	1	9.3	-
28	0	0.6	1	11.3	-	**28**	0	1	1	11.4	-
29	0	0.8	1	10.4	-	**29**	0	1	1	10.7	-
30	0	0.5	1	9.2	0	**30**	0	0.8	1	6.3	0.25
31	0	0.5	1	3.6	-	**31**	0	0.8	1	9.0	-
32	0	0.2	1	1.7	-	**32**	0	1	1	10.9	-
33	0	0.7	1	10.8	-	**33**	0	0.8	1	9.3	-
34	0	0.6	1	9.3	-	**34**	0	1	1	12.1	-
35	0	0.7	1	8.4	-	**35**	0	1	1	14.2	-
36	0	0.4	1	4.3	-	**36**	0	0.8	1	12.3	-
37	0	0.1	1	3.8	-	**37**	0	0.7	1	10.8	-
38	0	0.7	1	10.5	-	**38**	0	0.3	1	9.6	-
39	0	0.3	1	3.8	-	**39**	0	0.7	1	12.2	-
40	0	0.4	1	6.2	0.5	**40**	0	0.3	1	12.4	0.5
41	0	0.6	1	7.8	-	**41**	0	0.9	1	8.9	-
42	0	0.4	1	6.3	-	**42**	0	0.8	1	10.3	-
43	0	0.9	1	4.6	-	**43**	0	0.2	1	9.9	-
44	0	0.6	1	11.2	-	**44**	0	0.1	1	7.1	-
45	0	0.9	1	13.4	-	**45**	0	0.5	1	6.6	-
46	0	0.6	1	9.2	-	**46**	0	0.6	1	9.3	-
47	0	0.5	1	8.7	-	**47**	0	0.3	1	9.6	-
48	0	1	1	12.9	-	**48**	0	0.4	1	12.3	-
49	0	0.1	1	5.5	-	**49**	0	0.4	1	9.2	-
50	0	0.4	1	4.6	0.5	**50**	0	0.8	1	11.2	0
51	0	0.9	1	6.2	-	**51**	0	0.7	1	13.8	-
52	0	0.1	1	6.3	-	**52**	0	0.8	1	9.6	-
53	0	0.6	1	4.8	-	**53**	0	0.7	1	8.1	-
54	0	0.3	1	9.6	-	**54**	0	0.4	1	5.2	-
55	0	0.5	1	9.1	-	**55**	0	0.6	1	10.0	-
56	0	0.1	1	2.1	-	**56**	0	0.7	1	8.9	-
57	0	0.2	1	6.2	-	**57**	0	0.7	1	14.0	-
58	0	0.3	1	2.8	-	**58**	0	0.6	1	10.2	-
59	0	0.5	1	9.9	-	**59**	0	0.6	1	8.0	-
60	0	0.7	1	11.8	0.25	**60**	0	0.3	1	8.2	0.25
61	0	0.6	1	7.3	-	**61**	0	0.3	1	11.0	-
62	0	0.7	1	8.2	-	**62**	0	0.8	1	9.3	-
63	0	0.5	1	6.9	-	**63**	0	0.7	1	7.8	-
64	0	0.4	1	11.3	-	**64**	0	1	1	10.0	-
65	0	0.7	1	8.2	-	**65**	0	0.7	1	11.6	-
66	0	1	1	15.1	-	**66**	0	1	1	6.0	-
67	0	0.7	1	11.3	-	**67**	0	0.7	1	7.6	-
68	0	0.8	1	13.1	-	**68**	0	0.3	1	9.0	-
69	0	0.7	1	8.7	-	**69**	0	0.7	1	10.0	-
70	0	0.6	1	9.7	0	**70**	0	0.8	1	11.2	0.25
71	0	0.6	1	11.1	-	**71**	0	0.6	1	8.0	-
72	0	0.8	1	9.7	-	**72**	0	0.4	1	12.2	-
73	0	1	1	7.3	-	**73**	0	0.4	1	7.9	-
74	0	0.5	1	8.6	-	**74**	0	0.8	1	7.8	-
75	0	0.5	1	7.2	-	**75**	0	0.3	1	10.2	-
76	0	0.9	1	9.3	-	**76**	0	0.5	1	7.6	-
77	0	0.7	1	9.9	-	**77**	0	0.6	1	7.4	-
78	0	0.5	1	4.9	-	**78**	0	0.6	1	18.2	-
79	0	0.4	1	7.5	-	**79**	0	0.6	1	9.2	-
80	0	0.8	1	11.3	0	**80**	0	0.8	1	5.9	0.25
81	0	0.2	1	7.3	-	**81**	0	0.8	1	10.1	-
82	0	0.6	1	6.6	-	**82**	0	1	1	10.9	-
83	0	0.8	1	5.2	-	**83**	0	0.8	1	6.8	-
84	0	0.8	1	12.7	-	**84**	0	0.4	1	9.0	-
85	0	1	1	9.9	-	**85**	0	0.6	1	11.5	-
86	0	0.9	1	5.7	-	**86**	0	0.6	1	9.1	-
87	0	0.4	1	6.2	-	**87**	0	0.7	1	10.4	-
88	0	0.1	1	4.3	-	**88**	0	0.2	1	5.4	-
89	0	0	0	3.7	-	**89**	0	0.6	1	12.4	-
90	0	0.5	1	5.3	0.25	**90**	0	0.7	1	10.7	0.25
91	0	0.1	1	3.2	-	**91**	0	0.6	1	12.6	-
92	0	0.3	1	7.7	-	**92**	0	0.4	1	6.6	-
93	0	0.8	1	7.8	-	**93**	0	0.3	1	7.9	-
94	0	0.7	1	6.2	-	**94**	0	0.6	1	11.2	-
95	0	0.7	1	6.6	-	**95**	0	0.6	1	11.0	-
96	0	0.9	1	5.2	-	**96**	0	0.7	1	11.3	-
97	0	0.8	1	8.2	-	**97**	0	0.6	1	9.5	-
98	0	0.6	1	12.3	-	**98**	0	0.7	1	8.3	-
99	0	0.7	1	6.9	-	**99**	0	0.6	1	9.0	-
100	0	0.9	1	5.9	0.25	**100**	0	0.9	1	7.9	0.25
Average =	**0.00**	**0.56**	**0.99**	**8.2**	**0.20**	**Average =**	**0.00**	**0.63**	**0.99**	**9.7**	**0.23**
	Old Calcite Index (CI) =	**0.99**					**Old Calcite Index (CI) =**	**0.99**			
	New Calcite Index (CI') =	**0.56**					**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. Calcite proportion was not recorded prior to Sept. 9, 2021.

Table J.5: **Pebble Counts and Calcite Measurements (September Only) at Benthic Invertebrate Sampling Locations in Dry Creek, Fording River, and Grace Creek, 2021**

LC_FRB-1						LC_FRB-2					
11-Sep-21						11-Sep-21					
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embedded-ness (%)	Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embedded-ness (%)
1	0	0.8	1	12.2	-	**1**	0	0.4	1	7.5	-
2	0	0.6	1	6.7	-	**2**	0	0.3	1	13.8	-
3	0	0.8	1	13.8	-	**3**	0	0.6	1	18.5	-
4	0	0.9	1	13.3	-	**4**	0	0.7	1	13.0	-
5	0	0.4	1	6.6	-	**5**	0	0.5	1	8.5	-
6	0	0.4	1	4.3	-	**6**	0	0.2	1	5.5	-
7	0	0.7	1	7.2	-	**7**	0	0.6	1	10.8	-
8	0	0.9	1	9.8	-	**8**	0	0.4	1	12.9	-
9	0	0.9	1	4.3	-	**9**	0	0.5	1	6.7	-
10	0	0.7	1	9.8	0.5	**10**	0	0.5	1	4.6	0.5
11	0	0	0	3.3	-	**11**	0	0.4	1	10.1	-
12	0	0.3	1	6.3	-	**12**	0	0.4	1	7.5	-
13	0	0.5	1	4.2	-	**13**	0	0.5	1	20.9	-
14	0	0.2	1	7.4	-	**14**	0	0.6	1	10.5	-
15	0	0.8	1	9.7	-	**15**	0	0.1	1	5.3	-
16	0	0.3	1	7.7	-	**16**	0	0.3	1	4.7	-
17	0	0.6	1	8.2	-	**17**	0	0.2	1	8.2	-
18	0	0.6	1	6.4	-	**18**	0	0.5	1	11.1	-
19	0	0.1	1	3.9	-	**19**	0	0.3	1	6.1	-
20	0	0.5	1	5.7	0.5	**20**	0	0.5	1	8.8	0.5
21	0	0.5	1	8.3	-	**21**	0	0.3	1	11.1	-
22	0	0.3	1	7.2	-	**22**	0	0.3	1	14.3	-
23	0	0.5	1	11.2	-	**23**	0	0.1	1	5.3	-
24	0	0.3	1	6.8	-	**24**	0	0.4	1	12.3	-
25	0	0.8	1	10.4	-	**25**	0	0.5	1	21.9	-
26	0	0.5	1	7.6	-	**26**	0	0.4	1	14.5	-
27	0	0.8	1	8.3	-	**27**	0	0.4	1	8.6	-
28	0	0.5	1	6.6	-	**28**	0	0.1	1	3.0	-
29	0	0.4	1	7.8	-	**29**	0	0.1	1	8.5	-
30	0	0.6	1	5.6	0	**30**	0	0	0	5.4	0.75
31	0	0.8	1	9.5	-	**31**	0	0.2	1	8.7	-
32	0	0.6	1	7.3	-	**32**	0	0	0	22.8	-
33	0	0.3	1	10.3	-	**33**	0	0	0	6.5	-
34	0	0.8	1	8.9	-	**34**	0	0.4	1	11.4	-
35	0	0.1	1	3.3	-	**35**	0	0.2	1	10.2	-
36	0	0.4	1	7.6	-	**36**	0	0	0	5.6	-
37	0	0.5	1	8.2	-	**37**	0	0.2	1	8.9	-
38	0	0.1	1	6.2	-	**38**	0	0.4	1	17.7	-
39	0	0.1	1	13.3	-	**39**	0	0.7	1	8.3	-
40	0	0.6	1	7.4	0.5	**40**	0	0	0	4.6	0
41	0	0.8	1	10.3	-	**41**	0	0.6	1	13.4	-
42	0	0.2	1	4.2	-	**42**	0	0.4	1	11.2	-
43	0	0.2	1	4.3	-	**43**	0	0.6	1	4.6	-
44	0	0.7	1	11.1	-	**44**	0	0.5	1	8.4	-
45	0	0.7	1	13.4	-	**45**	0	0.4	1	8.4	-
46	0	0.1	1	7.8	-	**46**	0	0.2	1	9.2	-
47	0	0.1	1	7.2	-	**47**	0	0.4	1	10.3	-
48	0	0.7	1	13.3	-	**48**	0	0.4	1	16.2	-
49	0	0.6	1	8.5	-	**49**	0	0	0	4.1	-
50	0	0.6	1	6.2	0.25	**50**	0	0	0	3.2	0.75
51	0	0	0	2.4	-	**51**	0	0.6	1	20.5	-
52	0	0	0	2.3	-	**52**	0	0.4	1	16.2	-
53	0	0.5	1	15.2	-	**53**	0	0.6	1	8.2	-
54	0	0.6	1	4.8	-	**54**	0	0	0	2.8	-
55	0	0	0	3.2	-	**55**	0	0.3	1	12.2	-
56	0	0.1	1	3.1	-	**56**	0	0.3	1	14.8	-
57	0	0.6	1	9.8	-	**57**	0	0	0	4.6	-
58	0	0	0	2.2	-	**58**	0	0.5	1	10.2	-
59	0	0	0	3.0	-	**59**	0	0.2	1	10.2	-
60	0	0.4	1	7.1	0	**60**	0	0	0	5.6	0.5
61	0	0.4	1	6.2	-	**61**	0	0.4	1	15.5	-
62	0	0.6	1	8.3	-	**62**	0	0.3	1	8.0	-
63	0	0.7	1	15.7	-	**63**	0	0.4	1	10.3	-
64	0	0.5	1	7.8	-	**64**	0	0.4	1	13.6	-
65	0	0.6	1	8.2	-	**65**	0	0.6	1	22.8	-
66	0	0.8	1	8.6	-	**66**	0	0.6	1	23.0	-
67	0	0.4	1	6.3	-	**67**	0	0.5	1	20.7	-
68	0	0.2	1	8.5	-	**68**	0	0.5	1	18.5	-
69	0	0.3	1	8.8	-	**69**	0	0.6	1	17.5	-
70	0	0.4	1	3.2	0	**70**	0	0.5	1	13.8	0.5
71	0	0.5	1	7.3	-	**71**	0	0.1	1	4.4	-
72	0	0.6	1	9.1	-	**72**	0	0	0	5.6	-
73	0	-	-	3.7	-	**73**	0	0	0	4.7	-
74	0	0.2	1	9.4	-	**74**	0	0.8	1	14.3	-
75	0	0.3	1	11.2	-	**75**	0	0.7	1	10.3	-
76	0	0.1	1	6.3	-	**76**	0	0.6	1	12.7	-
77	0	0.6	1	8.5	-	**77**	0	0.7	1	7.4	-
78	0	0.7	1	5.3	-	**78**	0	0.5	1	10.0	-
79	0	-	-	3.5	-	**79**	0	0.5	1	12.8	-
80	0	0.5	1	12.2	0.25	**80**	0	0.2	1	8.5	0.75
81	0	0.7	1	8.2	-	**81**	0	0.4	1	16.0	-
82	0	0.4	1	6.5	-	**82**	0	0.8	1	14.3	-
83	0	0.4	1	4.4	-	**83**	0	0.3	1	11.4	-
84	0	0.7	1	8.1	-	**84**	0	0.7	1	11.7	-
85	0	0.6	1	5.9	-	**85**	0	0.7	1	23.4	-
86	0	0.4	1	14.1	-	**86**	0	0.4	1	11.4	-
87	0	0.3	1	11.4	-	**87**	0	0.2	1	6.2	-
88	0	0.2	1	8.9	-	**88**	0	0.2	1	8.3	-
89	0	0	0	5.3	-	**89**	0	0.8	1	11.2	-
90	0	0.2	1	11.2	0.25	**90**	0	0.1	1	7.5	0
91	0	0.8	1	5.7	-	**91**	0	0.1	1	8.4	-
92	0	0.7	1	8.3	-	**92**	0	0.3	1	8.3	-
93	0	0	0	7.3	-	**93**	0	0.9	1	10.4	-
94	0	0.5	1	11.7	-	**94**	0	0.5	1	16.8	-
95	0	0.8	1	10.2	-	**95**	0	0	0	4.8	-
96	0	0.2	1	7.6	-	**96**	0	0.8	1	20.5	-
97	0	0.1	1	2.1	-	**97**	0	0.5	1	8.8	-
98	0	0.7	1	9.2	-	**98**	0	0.6	1	16.3	-
99	0	0.8	1	8.4	-	**99**	0	0.4	1	10.9	-
100	0	0.9	1	8.5	0	**100**	0	0.4	1	9.5	0.5
Average =	**0.00**	**0.46**	**0.92**	**7.7**	**0.23**	**Average =**	**0.00**	**0.38**	**0.87**	**10.9**	**0.48**
	Old Calcite Index (CI) =	**0.92**					**Old Calcite Index (CI) =**	**0.87**			
	New Calcite Index (CI') =	**0.46**					**New Calcite Index (CI') =**	**0.38**			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Calcite proportion was not recorded prior to Sept. 9, 2021.

Table J.5: **Pebble Counts and Calcite Measurements (September Only) at Benthic Invertebrate Sampling Locations in Dry Creek, Fording River, and Grace Creek, 2021**

LC_FRB-3						LC_DCDS-1					
11-Sep-21						10-Sep-21					
Pebble	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**	**Pebble**	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**
1	0	0.4	1	9.4	-	**1**	0	0	0	6.4	-
2	0	0.2	1	7.1	-	**2**	0	0	0	16.2	-
3	0	0	0	3.5	-	**3**	0	0	0	5.0	-
4	0	0.2	1	6.6	-	**4**	0	0	0	4.8	-
5	0	0.3	1	9.2	-	**5**	0	0	0	12.2	-
6	0	0	0	3.9	-	**6**	0	0	0	9.4	-
7	0	0.2	1	7.1	-	**7**	0	0	0	3.9	-
8	0	0	0	4.7	-	**8**	0	0	0	4.4	-
9	0	0.6	1	14.2	-	**9**	0	0	0	19.5	-
10	0	0.1	1	4.9	0.25	**10**	0	0	0	11.6	0.25
11	0	0.3	1	17.3	-	**11**	0	0	0	8.4	-
12	0	0	0	4.1	-	**12**	0	0	0	19.8	-
13	0	0.2	1	11.7	-	**13**	0	0	0	6.1	-
14	0	0.2	1	11.1	-	**14**	0	0	0	8.2	-
15	0	0	0	5.9	-	**15**	0	0	0	6.4	-
16	0	0	0	6.4	-	**16**	0	0	0	14.6	-
17	0	0.3	1	4.9	-	**17**	0	0	0	13.2	-
18	0	0.4	1	13.6	-	**18**	0	0	0	13.0	-
19	0	0.3	1	5.3	-	**19**	0	0	0	11.4	-
20	0	0.2	1	6.7	0.5	**20**	0	0	0	8.9	0
21	0	0.1	1	5.3	-	**21**	0	0	0	7.4	-
22	0	0.1	1	5.4	-	**22**	0	0	0	11.5	-
23	0	0.6	1	23.7	-	**23**	0	0	0	4.3	-
24	0	0	0	4.2	-	**24**	0	0	0	9.9	-
25	0	0.2	1	5.5	-	**25**	0	0	0	8.0	-
26	0	0.4	1	12.8	-	**26**	0	0	0	7.5	-
27	0	0.1	1	8.9	-	**27**	0	0	0	13.4	-
28	0	0	0	5.7	-	**28**	0	0	0	9.8	-
29	0	0	0	8.2	-	**29**	0	0	0	5.2	-
30	0	0.6	1	12.4	0.25	**30**	0	0	0	8.4	0
31	0	0.1	1	6.4	-	**31**	0	0	0	6.5	-
32	0	0	0	7.9	-	**32**	0	0	0	17.2	-
33	0	0	0	3.8	-	**33**	0	0	0	6.3	-
34	0	0.8	1	15.4	-	**34**	0	0	0	6.5	-
35	0	0.4	1	11.6	-	**35**	0	0	0	9.9	-
36	0	0.4	1	9.4	-	**36**	0	0	0	6.9	-
37	0	0.3	1	13.1	-	**37**	0	0	0	8.1	-
38	0	0.1	1	4.2	-	**38**	0	0	0	2.0	-
39	0	0.1	1	4.8	-	**39**	0	0	0	11.2	-
40	0	0.6	1	21.6	-	**40**	0	0	0	5.5	0
41	0	0.6	1	12.4	-	**41**	0	0	0	12.6	-
42	0	0.2	1	7.1	-	**42**	0	0	0	6.2	-
43	0	0	0	6.3	-	**43**	0	0	0	11.4	-
44	0	0	0	3.2	-	**44**	0	0	0	24.4	-
45	0	0.2	1	9.3	-	**45**	0	0	0	13.2	-
46	0	0	0	5.6	-	**46**	0	0	0	8.9	-
47	0	0.5	1	19.2	-	**47**	0	0	0	11.6	-
48	0	0	0	5.2	-	**48**	0	0	0	9.9	-
49	0	0	0	5.7	-	**49**	0	0	0	6.0	-
50	0	0.7	1	10.5	0	**50**	0	0	0	14.5	0
51	0	0.1	1	10.2	-	**51**	0	0	0	2.4	-
52	0	0.6	1	6.4	-	**52**	0	0	0	6.3	-
53	0	0.3	1	7.3	-	**53**	0	0	0	22.2	-
54	0	0	0	7.2	-	**54**	0	0	0	12.1	-
55	0	0.6	1	14.3	-	**55**	0	0	0	4.5	-
56	0	0.1	1	10.1	-	**56**	0	0	0	22.9	-
57	0	0	0	9.4	-	**57**	0	0	0	5.8	-
58	0	0	0	3.3	-	**58**	0	0	0	10.6	-
59	0	0.1	1	9.9	-	**59**	0	0	0	6.8	-
60	0	0.1	1	5.9	0.5	**60**	0	0	0	5.5	0
61	0	0	0	6.3	-	**61**	0	0	0	10.8	-
62	0	0.2	1	8.2	-	**62**	0	0	0	3.2	-
63	0	0.2	1	6.4	-	**63**	0	0	0	11.4	-
64	0	0	0	7.9	-	**64**	0	0	0	18.3	-
65	0	0.6	1	13.3	-	**65**	0	0	0	19.5	-
66	0	0.5	1	8.3	-	**66**	0	0	0	2.0	-
67	0	0	0	5.1	-	**67**	0	0	0	1.4	-
68	0	0	0	6.1	-	**68**	0	0	0	1.0	-
69	0	0.5	1	11.3	-	**69**	0	0	0	10.9	-
70	0	0.7	1	13.4	0.25	**70**	0	0	0	7.1	0
71	0	0	0	7.2	-	**71**	0	0	0	8.3	-
72	0	0.6	1	9.3	-	**72**	0	0	0	8.4	-
73	0	0.2	1	11.0	-	**73**	0	0	0	15.8	-
74	0	0	0	2.5	-	**74**	0	0	0	17.3	-
75	0	0.1	1	5.2	-	**75**	0	0	0	8.9	-
76	0	0	0	4.6	-	**76**	0	0	0	11.0	-
77	0	0.6	1	8.9	-	**77**	0	0	0	8.3	-
78	0	0.6	1	3.3	-	**78**	0	0	0	7.6	-
79	0	0.2	1	4.2	-	**79**	0	0	0	9.5	-
80	0	0.1	1	5.4	0.75	**80**	0	0	0	3.3	0
81	0	0.2	1	6.2	-	**81**	0	0	0	15.1	-
82	0	0.5	1	4.1	-	**82**	0	0	0	13.8	-
83	0	0.1	1	7.6	-	**83**	0	0	0	9.4	-
84	0	0.4	1	5.1	-	**84**	0	0	0	6.3	-
85	0	0	0	6.3	-	**85**	0	0	0	6.1	-
86	0	0.5	1	4.1	-	**86**	0	0	0	8.2	-
87	0	0	0	9.3	-	**87**	0	0	0	2.2	-
88	0	0	0	4.9	-	**88**	0	0	0	2.4	-
89	0	0	0	3.4	-	**89**	0	0	0	4.8	-
90	0	0.2	1	4.5	0	**90**	0	0	0	5.2	0
91	0	0.2	1	5.5	-	**91**	0	0	0	4.5	-
92	0	0.4	1	14.3	-	**92**	0	0	0	7.1	-
93	0	0	0	2.1	-	**93**	0	0	0	9.5	-
94	0	0	0	3.2	-	**94**	0	0	0	8.8	-
95	0	0	0	7.9	-	**95**	0	0	0	6.2	-
96	0	0.1	1	7.5	-	**96**	0	0	0	10.5	-
97	0	0.1	1	3.1	-	**97**	0	0	0	11.7	-
98	0	0	0	4.2	-	**98**	0	0	0	4.0	-
99	0	0.6	1	16.3	-	**99**	0	0	0	5.4	-
100	0	0.6	1	12.3	0.75	**100**	0	0	0	7.3	0.25
Average =	**0.00**	**0.22**	**0.66**	**8.0**	**0.36**	**Average =**	**0.00**	**0.00**	**0.00**	**9.2**	**0.05**
	Old Calcite Index (CI) =	**0.66**					**Old Calcite Index (CI) =**	**0.00**			
	New Calcite Index (CI') =	**0.22**					**New Calcite Index (CI') =**	**0.00**			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Calcite proportion was not recorded prior to Sept. 9, 2021.

Table J.5: Pebble Counts and Calcite Measurements (September Only) at Benthic Invertebrate Sampling Locations in Dry Creek, Fording River, and Grace Creek, 2021

LC_DCDS-2						LC_DCDS-3					
10-Sep-21						10-Sep-21					
Pebble	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**	**Pebble**	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**
1	0	0	0	14.9	-	**1**	0	0	0	4.4	-
2	0	0	0	5.5	-	**2**	0	0	0	11.5	-
3	0	0	0	4.2	-	**3**	0	0	0	6.7	-
4	0	0	0	6.9	-	**4**	0	0	0	5.5	-
5	0	0	0	4.6	-	**5**	0	0	0	13.8	-
6	0	0	0	8.9	-	**6**	0	0	0	1.8	-
7	0	0	0	18.7	-	**7**	0	0	0	13.5	-
8	0	0	0	14.6	-	**8**	0	0	0	14.4	-
9	0	0	0	3.3	-	**9**	0	0	0	3.7	-
10	0	0	0	6.6	0	**10**	0	0	0	9.0	0.25
11	0	0	0	15.6	-	**11**	0	0	0	7.6	-
12	0	0	0	9.2	-	**12**	0	0	0	9.5	-
13	0	0	0	18.8	-	**13**	0	0	0	9.2	-
14	0	0	0	11.7	-	**14**	0	0	0	8.1	-
15	0	0	0	12.4	-	**15**	0	0	0	13.9	-
16	0	0	0	10.8	-	**16**	0	0	0	8.9	-
17	0	0	0	4.8	-	**17**	0	0	0	14.5	-
18	0	0	0	8.3	-	**18**	0	0	0	9.9	-
19	0	0	0	8.0	-	**19**	0	0	0	4.6	-
20	0	0	0	4.7	0	**20**	0	0	0	6.2	0
21	0	0	0	11.4	-	**21**	0	0	0	5.7	-
22	0	0	0	5.6	-	**22**	0	0	0	5.0	-
23	0	0	0	5.1	-	**23**	0	0	0	3.9	-
24	0	0	0	4.1	-	**24**	0	0	0	18.2	-
25	0	0	0	6.5	-	**25**	0	0	0	8.6	-
26	0	0	0	7.8	-	**26**	0	0	0	3.3	-
27	0	0	0	7.4	-	**27**	0	0	0	6.3	-
28	0	0	0	8.4	-	**28**	0	0	0	7.7	-
29	0	0	0	24.3	-	**29**	0	0	0	4.1	-
30	0	0	0	7.4	0.5	**30**	0	0	0	4.4	0.25
31	0	0	0	11.4	-	**31**	0	0	0	11.9	-
32	0	0	0	8.1	-	**32**	0	0	0	16.2	-
33	0	0	0	10.2	-	**33**	0	0	0	18.0	-
34	0	0	0	6.6	-	**34**	0	0	0	9.4	-
35	0	0	0	9.7	-	**35**	0	0	0	9.6	-
36	0	0	0	17.1	-	**36**	0	0	0	5.1	-
37	0	0	0	8.4	-	**37**	0	0	0	4.1	-
38	0	0	0	9.7	-	**38**	0	0	0	13.3	-
39	0	0	0	5.3	-	**39**	0	0	0	6.2	-
40	0	0	0	13.7	0	**40**	0	0	0	23.4	0
41	0	0	0	8.1	-	**41**	0	0	0	18.4	-
42	0	0	0	6.3	-	**42**	0	0	0	6.2	-
43	0	0	0	9.9	-	**43**	0	0	0	4.9	-
44	0	0	0	5.1	-	**44**	0	0	0	9.8	-
45	0	0	0	4.9	-	**45**	0	0	0	8.5	-
46	0	0	0	16.1	-	**46**	0	0	0	8.6	-
47	0	0	0	8.4	-	**47**	0	0	0	4.7	-
48	0	0	0	17.4	-	**48**	0	0	0	7.5	-
49	0	0	0	10.6	-	**49**	0	0	0	7.0	-
50	0	0	0	12.2	0.25	**50**	0	0	0	2.5	0
51	0	0	0	10.1	-	**51**	0	0	0	5.8	-
52	0	0	0	13.9	-	**52**	0	0	0	13.2	-
53	0	0	0	10.4	-	**53**	0	0	0	13.4	-
54	0	0	0	9.3	-	**54**	0	0	0	4.6	-
55	0	0	0	19.8	-	**55**	0	0	0	2.4	-
56	0	0	0	4.8	-	**56**	0	0	0	14.8	-
57	0	0	0	7.2	-	**57**	0	0	0	7.3	-
58	0	0	0	7.7	-	**58**	0	0	0	4.9	-
59	0	0	0	10.9	-	**59**	0	0	0	6.9	-
60	0	0	0	7.5	0	**60**	0	0	0	2.5	0
61	0	0	0	9.6	-	**61**	0	0	0	3.7	-
62	0	0	0	8.7	-	**62**	0	0	0	5.2	-
63	0	0	0	3.6	-	**63**	0	0	0	6.3	-
64	0	0	0	7.4	-	**64**	0	0	0	7.5	-
65	0	0	0	10.3	-	**65**	0	0	0	27.5	-
66	0	0	0	8.6	-	**66**	0	0	0	10.2	-
67	0	0	0	4.7	-	**67**	0	0	0	13.4	-
68	0	0	0	10.8	-	**68**	0	0	0	8.1	-
69	0	0	0	14.4	-	**69**	0	0	0	6.1	-
70	0	0	0	7.6	0.25	**70**	0	0	0	8.5	0
71	0	0	0	7.3	-	**71**	0	0	0	3.6	-
72	0	0	0	5.8	-	**72**	0	0	0	22.9	-
73	0	0	0	12.6	-	**73**	0	0	0	5.8	-
74	0	0	0	2.7	-	**74**	0	0	0	8.9	-
75	0	0	0	20.2	-	**75**	0	0	0	6.5	-
76	0	0	0	9.6	-	**76**	0	0	0	10.1	-
77	0	0	0	2.4	-	**77**	0	0	0	24.5	-
78	0	0	0	7.8	-	**78**	0	0	0	9.9	-
79	0	0	0	3.7	-	**79**	0	0	0	18.8	-
80	0	0	0	4.8	0	**80**	0	0	0	11.5	0
81	0	0	0	24.4	-	**81**	0	0	0	6.7	-
82	0	0	0	5.2	-	**82**	0	0	0	3.5	-
83	0	0	0	15.3	-	**83**	0	0	0	10.1	-
84	0	0	0	11.4	-	**84**	0	0	0	7.8	-
85	0	0	0	9.5	-	**85**	0	0	0	4.1	-
86	0	0	0	6.8	-	**86**	0	0	0	9.4	-
87	0	0	0	7.4	-	**87**	0	0	0	8.6	-
88	0	0	0	7.3	-	**88**	0	0	0	10.2	-
89	0	0	0	16.7	-	**89**	0	0	0	6.4	-
90	0	0	0	6.2	0	**90**	0	0	0	10.1	0
91	0	0	0	4.1	-	**91**	0	0	0	11.0	-
92	0	0	0	5.2	-	**92**	0	0	0	10.5	-
93	0	0	0	6.4	-	**93**	0	0	0	5.2	-
94	0	0	0	7.0	-	**94**	0	0	0	8.6	-
95	0	0	0	7.7	-	**95**	0	0	0	6.4	-
96	0	0	0	26.1	-	**96**	0	0	0	9.4	-
97	0	0	0	2.3	-	**97**	0	0	0	10.2	-
98	0	0	0	6.4	-	**98**	0	0	0	11.7	-
99	0	0	0	7.1	-	**99**	0	0	0	25.6	-
100	0	0	0	19.4	0.5	**100**	0	0	0	8.7	0.25
Average =	**0.00**	**0.00**	**0.00**	**9.5**	**0.15**	**Average =**	**0.00**	**0.00**	**0.00**	**9.2**	**0.08**
	Old Calcite Index (CI) =	**0.00**					**Old Calcite Index (CI) =**	**0.00**			
	New Calcite Index (CI') =	**0.00**					**New Calcite Index (CI') =**	**0.00**			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Calcite proportion was not recorded prior to Sept. 9, 2021.

Table J.5: Pebble Counts and Calcite Measurements (September Only) at Benthic Invertebrate Sampling Locations in Dry Creek, Fording River, and Grace Creek, 2021

LC_DC3-1						**LC_DC3-2**					
10-Sep-21						**10-Sep-21**					
Pebble	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**	**Pebble**	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**
1	0	0	0	6.4	-	**1**	0	0.6	1	20.4	-
2	0	0	0	6.1	-	**2**	0	0	0	6.9	-
3	0	0	0	8.2	-	**3**	0	0	0	3.3	-
4	0	0.3	1	8.1	-	**4**	0	0	0	11.4	-
5	0	0.4	1	18.6	-	**5**	0	0	0	7.6	-
6	0	0.1	1	5.9	-	**6**	0	0	0	7.3	-
7	0	0	0	17.4	-	**7**	0	0	0	9.5	-
8	0	0	0	3.7	-	**8**	0	0	0	14.2	-
9	0	0.2	1	9.3	-	**9**	0	0.1	1	5.6	-
10	0	0.2	1	7.9	0	**10**	0	0.2	1	15.0	0.25
11	0	0.2	1	10.9	-	**11**	0	0	0	20.5	-
12	0	0.1	1	6.6	-	**12**	0	0	0	8.2	-
13	0	0	0	21.6	-	**13**	0	0	0	5.4	-
14	0	0	0	21.5	-	**14**	0	0	0	9.4	-
15	0	0	0	7.9	-	**15**	0	0.4	1	14.8	-
16	0	0.2	1	8.1	-	**16**	0	0	0	1.2	-
17	0	0	0	6.8	-	**17**	0	0	0	6.6	-
18	0	0	0	3.3	-	**18**	0	0	0	6.2	-
19	0	0	0	12.4	-	**19**	0	0	0	4.4	-
20	0	0.1	1	7.6	0	**20**	0	0.1	1	7.7	0
21	0	0	0	10.3	-	**21**	0	0	0	2.5	-
22	0	0	0	7.9	-	**22**	0	0	0	4.3	-
23	0	0	0	3.9	-	**23**	0	0	0	6.0	-
24	0	0	0	4.4	-	**24**	0	0.1	1	9.8	-
25	0	0	0	17.5	-	**25**	0	0	0	17.6	-
26	0	0	0	5.1	-	**26**	0	0	0	8.8	-
27	0	0	0	10.2	-	**27**	0	0	0	9.7	-
28	0	0	0	4.8	-	**28**	0	0	0	8.4	-
29	0	0	0	3.6	-	**29**	0	0.1	1	19.3	-
30	0	0	0	13.2	0	**30**	0	0.3	1	19.0	0
31	0	0	0	7.0	-	**31**	0	0	0	9.0	-
32	0	0	0	3.2	-	**32**	0	0	0	6.4	-
33	0	0	0	9.9	-	**33**	0	0	0	6.4	-
34	0	0	0	7.4	-	**34**	0	0	0	5.7	-
35	0	0	0	4.6	-	**35**	0	0	0	5.1	-
36	0	0	0	2.9	-	**36**	0	0	0	2.9	-
37	0	0	0	5.4	-	**37**	0	0.1	1	7.2	-
38	0	0	0	15.3	-	**38**	0	0	0	2.9	-
39	0	0	0	7.6	-	**39**	0	0	0	4.9	-
40	0	0	0	12.3	0.25	**40**	0	0	0	2.6	0
41	0	0	0	6.8	-	**41**	0	0	0	10.2	-
42	0	0	0	2.3	-	**42**	0	0.4	1	7.5	-
43	0	0	0	2.6	-	**43**	0	0.4	1	11.8	-
44	0	0	0	13.7	-	**44**	0	0.4	1	7.4	-
45	0	0	0	10.4	-	**45**	0	0.4	1	6.1	-
46	0	0	0	7.4	-	**46**	0	0.2	1	6.8	-
47	0	0	0	5.8	-	**47**	0	0.2	1	6.9	-
48	0	0	0	4.2	-	**48**	0	0.4	1	16.4	-
49	0	0	0	5.9	-	**49**	0	0	0	7.5	-
50	0	0	0	7.0	0	**50**	0	0.1	1	8.4	0.25
51	0	0	0	5.8	-	**51**	0	0.3	1	11.4	-
52	0	0	0	8.1	-	**52**	0	0.1	1	7.3	-
53	0	0	0	3.1	-	**53**	0	0.4	1	10.7	-
54	0	0	0	3.8	-	**54**	0	0.4	1	19.5	-
55	0	0	0	17.7	-	**55**	0	0.4	1	11.6	-
56	0	0	0	15.9	-	**56**	0	0	0	1.7	-
57	0	0	0	9.9	-	**57**	0	0.1	1	13.4	-
58	0	0	0	5.6	-	**58**	0	0	0	2.8	-
59	0	0	0	4.1	-	**59**	0	0	0	3.7	-
60	0	0	0	3.9	0	**60**	0	0.8	1	18.4	0
61	0	0	0	7.3	-	**61**	0	0.2	1	7.3	-
62	0	0	0	3.5	-	**62**	0	0.3	1	4.4	-
63	0	0	0	5.6	-	**63**	0	0	0	5.4	-
64	0	0	0	6.8	-	**64**	0	0.1	1	6.9	-
65	0	0	0	6.5	-	**65**	0	0	0	4.0	-
66	0	0	0	8.4	-	**66**	0	0.4	1	9.2	-
67	0	0	0	15.5	-	**67**	0	0.4	1	16.7	-
68	0	0	0	22.1	-	**68**	0	0	0	4.6	-
69	0	0	0	2.2	-	**69**	0	0	0	12.2	-
70	0	0	0	6.8	0	**70**	0	0	0	4.5	0
71	0	0.1	1	16.9	-	**71**	0	0	0	6.0	-
72	0	0	0	3.6	-	**72**	0	0	0	5.5	-
73	0	0	0	8.0	-	**73**	0	0.1	1	9.7	-
74	0	0	0	10.4	-	**74**	0	0.1	1	4.9	-
75	0	0	0	7.9	-	**75**	0	0.3	1	13.5	-
76	0	0	0	7.6	-	**76**	0	0	0	2.5	-
77	0	0	0	3.7	-	**77**	0	0	0	5.7	-
78	0	0	0	5.8	-	**78**	0	0	0	3.0	-
79	0	0	0	18.9	-	**79**	0	0	0	7.1	-
80	0	0	0	6.5	0	**80**	0	0.2	1	7.1	-
81	0	0	0	5.2	-	**81**	0	0	0	7.3	-
82	0	0	0	3.7	-	**82**	0	0	0	3.2	-
83	0	0	0	2.4	-	**83**	0	0	0	1.1	-
84	0	0	0	17.4	-	**84**	0	0	0	8.8	-
85	0	0	0	3.1	-	**85**	0	0.1	1	7.3	-
86	0	0	0	13.0	-	**86**	0	0	0	6.2	-
87	0	0	0	8.1	-	**87**	0	0	0	9.4	-
88	0	0	0	4.4	-	**88**	0	0	0	8.7	-
89	0	0	0	5.4	-	**89**	0	0	0	9.4	-
90	0	0	0	4.7	-	**90**	0	0	0	5.0	0
91	0	0	0	4.8	-	**91**	0	0	0	2.8	-
92	0	0	0	9.9	-	**92**	0	0	0	4.3	-
93	0	0	0	19.5	-	**93**	0	0	0	15.2	-
94	0	0	0	7.7	-	**94**	0	0	0	2.3	-
95	0	0	0	9.8	-	**95**	0	0	0	1.0	-
96	0	0	0	5.8	-	**96**	0	0	0	5.4	-
97	0	0	0	18.4	-	**97**	0	0	0	1.4	-
98	0	0	0	9.3	-	**98**	0	0	0	10.5	-
99	0	0	0	5.2	-	**99**	0	0	0	4.5	-
100	0	0	0	9.2	0.25	**100**	0	0	0	4.6	0
Average =	**0.00**	**0.02**	**0.10**	**8.4**	**0.06**	**Average =**	**0.00**	**0.09**	**0.34**	**7.9**	**0.06**
	Old Calcite Index (CI) =	**0.10**					**Old Calcite Index (CI) =**	**0.34**			
	New Calcite Index (CI') =	**0.02**					**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. Calcite proportion was not recorded prior to Sept. 9, 2021.

Table J.5: Pebble Counts and Calcite Measurements (September Only) at Benthic Invertebrate Sampling Locations in Dry Creek, Fording River, and Grace Creek, 2021

LC_DC3-3						LC_DC2-1					
10-Sep-21						9-Sep-21					
Pebble	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**	**Pebble**	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**
1	0	0.2	1	18.4	-	**1**	0	0	0	7.1	-
2	0	0.4	1	19.9	-	**2**	0	0	0	8.0	-
3	0	0	0	3.2	-	**3**	0	0	0	3.6	-
4	0	0.6	1	14.4	-	**4**	0	0	0	3.8	-
5	0	0.5	1	16.2	-	**5**	0	0	0	3.9	-
6	0	0	0	3.3	-	**6**	0	0	0	7.2	-
7	0	0	0	3.6	-	**7**	0	0	0	3.9	-
8	0	0	0	6.4	-	**8**	0	0	0	10.7	-
9	0	0.4	1	6.5	-	**9**	0	0.3	1	23.7	-
10	0	0.1	1	5.2	0.25	**10**	0	0	0	7.0	0
11	0	0	0	4.0	-	**11**	0	0	0	3.3	-
12	0	0.3	1	7.1	-	**12**	0	0.2	1	17.2	-
13	0	0.1	1	8.4	-	**13**	0	0	0	7.2	-
14	0	0	0	5.3	-	**14**	0	0	0	19.3	-
15	0	0	0	3.6	-	**15**	0	0	0	8.8	-
16	0	0	0	2.1	-	**16**	0	0	0	5.2	-
17	0	0.8	1	10.9	-	**17**	0	0	0	4.7	-
18	0	0.6	1	16.9	-	**18**	0	0	0	5.0	-
19	0	0.6	1	15.8	-	**19**	0	0	0	7.1	-
20	0	0	0	3.1	0	**20**	0	0	0	10.9	0
21	0	0	0	13.4	-	**21**	0	0.3	1	11.0	-
22	0	0.2	1	11.9	-	**22**	0	0	0	3.3	-
23	0	0	0	6.4	-	**23**	0	0	0	7.5	-
24	0	0.4	1	10.1	-	**24**	0	0	0	7.8	-
25	0	0.2	1	8.2	-	**25**	0	0	0	9.0	-
26	0	0	0	6.2	-	**26**	0	0	0	3.6	-
27	0	0	0	12.2	-	**27**	0	0	0	3.7	-
28	0	0	0	12.4	-	**28**	0	0	0	17.8	-
29	0	0	0	3.1	-	**29**	0	0	0	5.2	-
30	0	0.4	1	14.3	0.5	**30**	0	0	0	3.9	0
31	0	0.4	1	15.3	-	**31**	0	0	0	16.1	-
32	0	0.1	1	4.9	-	**32**	0	0	0	6.4	-
33	0	0.2	1	7.4	-	**33**	0	0	0	6.9	-
34	0	0.4	1	10.3	-	**34**	0	0	0	11.2	-
35	0	0.4	1	7.1	-	**35**	0	0	0	9.3	-
36	0	0.4	1	13.2	-	**36**	0	0	0	5.6	-
37	0	0.3	1	6.8	-	**37**	0	0	0	2.7	-
38	0	0	0	3.1	-	**38**	0	0	0	9.8	-
39	0	0	0	2.2	-	**39**	0	0	0	10.6	-
40	0	0.3	1	5.1	0.5	**40**	0	0	0	8.1	0.5
41	0	0.7	1	16.6	-	**41**	0	0	0	6.4	-
42	0	0.4	1	3.1	-	**42**	0	0	0	6.1	-
43	0	0.5	1	5.0	-	**43**	0	0	0	8.8	-
44	0	0.6	1	12.2	-	**44**	0	0	0	6.9	-
45	0	0.5	1	19.1	-	**45**	0	0	0	5.8	-
46	0	0.3	1	6.6	-	**46**	0	0	0	10.3	-
47	0	0.5	1	11.2	-	**47**	0	0	0	7.7	-
48	0	0.1	1	3.8	-	**48**	0	0	0	11.4	-
49	0	0	0	2.3	-	**49**	0	0	0	6.8	-
50	0	0.1	1	3.3	0	**50**	0	0	0	6.5	0
51	0	0.6	1	12.2	-	**51**	0	0	0	12.2	-
52	0	0	0	4.2	-	**52**	0	0	0	6.1	-
53	0	0.5	1	15.1	-	**53**	0	0	0	9.3	-
54	0	0.6	1	20.2	-	**54**	0	0	0	11.8	-
55	0	0.7	1	20.9	-	**55**	0	0	0	4.2	-
56	0	0.7	1	7.6	-	**56**	0	0	0	7.1	-
57	0	0.7	1	13.9	-	**57**	0	0	0	8.2	-
58	0	0.6	1	7.1	-	**58**	0	0	0	8.5	-
59	0	0.7	1	13.4	-	**59**	0	0	0	5.1	-
60	0	0.6	1	11.3	0	**60**	0	0	0	7.4	-
61	0	0.6	1	5.4	-	**61**	0	0	0	11.6	-
62	0	0.6	1	7.6	-	**62**	0	0	0	9.1	-
63	0	0.5	1	8.4	-	**63**	0	0	0	7.3	-
64	0	0.6	1	10.6	-	**64**	0	0	0	5.2	-
65	0	0.5	1	3.6	-	**65**	0	0	0	8.8	-
66	0	0.1	1	10.2	-	**66**	0	0	0	9.3	-
67	0	0.1	1	5.3	-	**67**	0	0	0	4.4	-
68	0	0.6	1	18.6	-	**68**	0	0	0	7.0	-
69	0	0.5	1	8.2	-	**69**	0	0	0	8.9	-
70	0	0.5	1	14.7	-	**70**	0	0	0	8.3	0
71	0	0.6	1	11.3	-	**71**	0	0	0	4.9	-
72	0	0	0	4.5	-	**72**	0	0	0	10.2	-
73	0	0.3	1	7.6	-	**73**	0	0	0	9.0	-
74	0	0.1	1	7.1	-	**74**	0	0	0	5.2	-
75	0	0.4	1	11.3	-	**75**	0	0	0	8.2	-
76	0	0.2	1	5.6	-	**76**	0	0	0	8.9	-
77	0	0.1	1	9.2	-	**77**	0	0	0	22.0	-
78	0	0.4	1	9.0	-	**78**	0	0	0	4.1	-
79	0	0.4	1	9.2	-	**79**	0	0	0	4.6	-
80	0	0.5	1	7.6	0.5	**80**	0	0.3	1	7.0	0
81	0	0	0	4.3	-	**81**	0	0	0	3.3	-
82	0	0.3	1	3.9	-	**82**	0	0	0	20.3	-
83	0	0.7	1	26.8	-	**83**	0	0	0	24.0	-
84	0	0	0	2.6	-	**84**	0	0	0	7.5	-
85	0	0.3	1	17.7	-	**85**	0	0	0	9.4	-
86	0	0.6	1	12.9	-	**86**	0	0	0	4.9	-
87	0	0.5	1	10.7	-	**87**	0	0	0	8.1	-
88	0	0.2	1	5.6	-	**88**	0	0	0	7.2	-
89	0	0.5	1	13.2	-	**89**	0	0	0	4.7	-
90	0	0.9	1	11.3	0	**90**	0	0	0	5.0	0
91	0	0.4	1	14.9	-	**91**	0	0	0	7.2	-
92	0	0.5	1	17.1	-	**92**	0	0	0	9.6	-
93	0	0.3	1	6.8	-	**93**	0	0	0	11.7	-
94	0	0.2	1	3.7	-	**94**	0	0	0	9.5	-
95	0	0.1	1	9.3	-	**95**	0	0	0	8.1	-
96	0	0.4	1	9.2	-	**96**	0	0	0	8.6	-
97	0	0.4	1	15.6	-	**97**	0	0	0	7.6	-
98	0	0.1	1	9.6	-	**98**	0	0	0	4.7	-
99	0	0.4	1	9.5	-	**99**	0	0	0	15.1	-
100	0	0.5	1	11.7	0.25	**100**	0	0	0	11.8	0
Average =	**0.00**	**0.33**	**0.78**	**9.5**	**0.22**	**Average =**	**0.00**	**0.01**	**0.04**	**8.4**	**0.06**
	Old Calcite Index (CI) =	**0.78**					**Old Calcite Index (CI) =**	**0.04**			
	New Calcite Index (CI') =	**0.33**					**New Calcite Index (CI') =**	**0.01**			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Calcite proportion was not recorded prior to Sept. 9, 2021.

Table J.5: Pebble Counts and Calcite Measurements (September Only) at Benthic Invertebrate Sampling Locations in Dry Creek, Fording River, and Grace Creek, 2021

LC_DC2-2						**LC_DC2-3**					
9-Sep-21						**9-Sep-21**					
Pebble	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**	**Pebble**	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**
1	0	0	0	9.3	-	**1**	0	0	0	9.6	-
2	0	0	0	6.1	-	**2**	0	0	0	10.5	-
3	0	0	0	18.0	-	**3**	0	0.3	1	8.5	-
4	0	0	0	25.8	-	**4**	0	0	0	4.0	-
5	0	0	0	12.6	-	**5**	0	0	0	5.5	-
6	0	0	0	3.9	-	**6**	0	0	0	7.6	-
7	0	0	0	7.2	-	**7**	0	0	0	8.7	-
8	0	0	0	4.0	-	**8**	0	0	0	6.3	-
9	0	0	0	8.0	-	**9**	0	0	0	5.3	-
10	0	0	0	11.3	0	**10**	0	0	0	4.9	0
11	0	0	0	2.8	-	**11**	0	0	0	11.3	-
12	0	0	0	5.9	-	**12**	0	0	0	4.1	-
13	0	0	0	6.1	-	**13**	0	0	0	1.2	-
14	0	0	0	9.9	-	**14**	0	0.1	1	9.6	-
15	0	0	0	3.9	-	**15**	0	0	0	7.9	-
16	0	0	0	8.1	-	**16**	0	0	0	4.7	-
17	0	0	0	4.6	-	**17**	0	0	0	3.5	-
18	0	0	0	7.7	-	**18**	0	0	0	5.9	-
19	0	0	0	4.9	-	**19**	0	0	0	9.8	-
20	0	0	0	5.7	0	**20**	0	0	0	18.3	0
21	0	0	0	6.5	-	**21**	0	0	0	8.0	-
22	0	0	0	6.2	-	**22**	0	0	0	7.0	-
23	0	0	0	7.8	-	**23**	0	0	0	11.4	-
24	0	0	0	7.3	-	**24**	0	0	0	6.8	-
25	0	0	0	12.5	-	**25**	0	0	0	5.4	-
26	0	0	0	7.0	-	**26**	0	0	0	5.9	-
27	0	0	0	10.1	-	**27**	0	0	0	17.5	-
28	0	0	0	6.4	-	**28**	0	0	0	17.8	-
29	0	0	0	5.7	-	**29**	0	0	0	14.7	-
30	0	0	0	5.7	0	**30**	0	0	0	6.7	0.5
31	0	0	0	8.8	-	**31**	0	0	0	3.4	-
32	0	0	0	10.4	-	**32**	0	0	0	4.4	-
33	0	0	0	7.0	-	**33**	0	0	0	4.9	-
34	0	0	0	13.6	-	**34**	0	0	0	5.3	-
35	0	0	0	4.4	-	**35**	0	0	0	7.4	-
36	0	0	0	6.7	-	**36**	0	0.1	1	10.8	-
37	0	0	0	5.6	-	**37**	0	0	0	8.7	-
38	0	0	0	4.9	-	**38**	0	0	0	9.4	-
39	0	0	0	6.3	-	**39**	0	0	0	5.9	-
40	0	0	0	17.2	0.5	**40**	0	0	0	12.3	0.5
41	0	0	0	5.8	-	**41**	0	0	0	17.8	-
42	0	0	0	5.8	-	**42**	0	0	0	4.1	-
43	0	0	0	6.9	-	**43**	0	0	0	11.8	-
44	0	0	0	3.0	-	**44**	0	0.5	1	8.2	-
45	0	0	0	5.5	-	**45**	0	0	0	6.2	-
46	0	0	0	4.8	-	**46**	0	0	0	4.6	-
47	0	0	0	4.5	-	**47**	0	0	0	9.9	-
48	0	0	0	10.7	-	**48**	0	0	0	8.7	-
49	0	0	0	12.2	-	**49**	0	0	0	9.4	-
50	0	0	0	6.2	0	**50**	0	0	0	2.9	0
51	0	0	0	3.4	-	**51**	0	0	0	7.5	-
52	0	0	0	5.7	-	**52**	0	0	0	5.5	-
53	0	0.1	1	9.9	-	**53**	0	0	0	10.6	-
54	0	0	0	8.7	-	**54**	0	0	0	12.8	-
55	0	0	0	13.7	-	**55**	0	0.3	1	11.5	-
56	0	0	0	6.8	-	**56**	0	0	0	4.0	-
57	0	0	0	7.9	-	**57**	0	0	0	6.7	-
58	0	0	0	9.5	-	**58**	0	0.1	1	9.0	-
59	0	0	0	15.5	-	**59**	0	0	0	7.8	-
60	0	0	0	3.1	0	**60**	0	0	0	8.7	0
61	0	0	0	6.1	-	**61**	0	0	0	6.2	-
62	0	0	0	7.2	-	**62**	0	0	0	1.5	-
63	0	0	0	8.7	-	**63**	0	0	0	10.0	-
64	0	0	0	3.0	-	**64**	0	0	0	5.7	-
65	0	0	0	7.1	-	**65**	0	0	0	6.9	-
66	0	0	0	7.3	-	**66**	0	0	0	8.4	-
67	0	0	0	16.3	-	**67**	0	0	0	8.8	-
68	0	0	0	12.0	-	**68**	0	0	0	4.1	-
69	0	0	0	4.1	-	**69**	0	0	0	4.5	-
70	0	0	0	3.6	0	**70**	0	0	0	14.6	0.25
71	0	0	0	10.0	-	**71**	0	0	0	4.3	-
72	0	0	0	15.7	-	**72**	0	0.3	1	6.3	-
73	0	0	0	4.1	-	**73**	0	0	0	7.3	-
74	0	0	0	6.5	-	**74**	0	0	0	2.8	-
75	0	0	0	3.8	-	**75**	0	0	0	6.5	-
76	0	0	0	7.3	-	**76**	0	0	0	5.9	-
77	0	0	0	12.0	-	**77**	0	0	0	4.2	-
78	0	0	0	3.8	-	**78**	0	0	0	8.7	-
79	0	0	0	3.4	-	**79**	0	0	0	9.3	-
80	0	0	0	6.0	0	**80**	0	0	0	13.2	0.25
81	0	0	0	13.5	-	**81**	0	0	0	1.0	-
82	0	0	0	6.2	-	**82**	0	0.1	1	8.8	-
83	0	0	0	4.1	-	**83**	0	0	0	12.4	-
84	0	0	0	6.1	-	**84**	0	0	0	8.5	-
85	0	0	0	12.2	-	**85**	0	0	0	5.5	-
86	0	0	0	9.7	-	**86**	0	0	0	6.4	-
87	0	0	0	8.5	-	**87**	0	0	0	7.6	-
88	0	0	0	8.4	-	**88**	0	0	0	4.4	-
89	0	0	0	23.4	-	**89**	0	0	0	5.7	-
90	0	0	0	12.5	0.5	**90**	0	0	0	3.2	0
91	0	0	0	1.5	-	**91**	0	0	0	16.7	-
92	0	0	0	4.5	-	**92**	0	0	0	7.6	-
93	0	0	0	5.2	-	**93**	0	0.2	1	13.4	-
94	0	0	0	7.9	-	**94**	0	0	0	9.5	-
95	0	0	0	7.9	-	**95**	0	0	0	3.8	-
96	0	0	0	5.5	-	**96**	0	0	0	13.2	-
97	0	0	0	5.6	-	**97**	0	0	0	12.6	-
98	0	0	0	8.4	-	**98**	0	0	0	6.5	-
99	0	0	0	7.0	-	**99**	0	0	0	7.9	-
100	0	0	0	7.9	0	**100**	0	0	0	14.5	0.75
Average =	**0.00**	**0.00**	**0.01**	**7.9**	**0.10**	**Average =**	**0.00**	**0.02**	**0.09**	**8.0**	**0.23**
	Old Calcite Index (CI) =	**0.01**					**Old Calcite Index (CI) =**	**0.09**			
	New Calcite Index (CI') =	**0.00**					**New Calcite Index (CI') =**	**0.02**			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Calcite proportion was not recorded prior to Sept. 9, 2021.

Table J.5: **Pebble Counts and Calcite Measurements (September Only) at Benthic Invertebrate Sampling Locations in Dry Creek, Fording River, and Grace Creek, 2021**

LC_DC4-1						LC_DC4-2					
9-Sep-21						9-Sep-21					
Pebble	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**	**Pebble**	**Concreted Status**	**Calcite Proportion**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**
1	0	0	0	6.4	-	**1**	0	0	0	6.0	-
2	0	0.2	1	14.8	-	**2**	0	0	0	8.0	-
3	0	0	0	9.8	-	**3**	0	0	0	4.2	-
4	0	0.3	1	8.9	-	**4**	0	0	0	2.3	-
5	0	0	0	3.9	-	**5**	0	0	0	10.9	-
6	0	0	0	5.0	-	**6**	0	0.3	1	14.0	-
7	0	0	0	6.7	-	**7**	0	0	0	7.4	-
8	0	0	0	8.4	-	**8**	0	0	0	7.4	-
9	0	0	0	4.2	-	**9**	0	0	0	10.8	-
10	0	0.4	1	8.8	0.25	**10**	0	0.5	1	13.5	0
11	0	0	0	4.5	-	**11**	0	0	0	7.9	-
12	0	0.5	1	6.8	-	**12**	0	0	0	10.0	-
13	0	0.1	1	3.5	-	**13**	0	0	0	4.6	-
14	0	0.3	1	5.0	-	**14**	0	0	0	5.9	-
15	0	0	0	3.4	-	**15**	0	0	0	3.0	-
16	0	0.5	1	12.5	-	**16**	0	0	0	2.1	-
17	0	0.3	1	9.2	-	**17**	0	0	0	8.6	-
18	0	0.5	1	13.5	-	**18**	0	0	0	5.9	-
19	0	0.5	1	25.5	-	**19**	0	0	0	8.7	-
20	0	0	0	6.4	0	**20**	0	0	0	12.0	0
21	0	0	0	3.8	-	**21**	0	0	0	3.1	-
22	0	0.6	1	12.2	-	**22**	0	0	0	3.4	-
23	0	0	0	5.1	-	**23**	0	0	0	3.8	-
24	0	0	0	1.9	-	**24**	0	0	0	12.7	-
25	0	0	0	9.2	-	**25**	0	0	0	7.1	-
26	0	0.5	1	4.7	-	**26**	0	0	0	6.6	-
27	0	0.1	1	3.8	-	**27**	0	0	0	1.8	-
28	0	0.8	1	14.5	-	**28**	0	0	0	5.9	-
29	0	0.5	1	13.4	-	**29**	0	0	0	7.2	-
30	0	0.2	1	10.2	0	**30**	0	0.3	1	4.6	0
31	0	0.2	1	12.4	-	**31**	0	0	0	4.3	-
32	0	0	0	3.5	-	**32**	0	0	0	0.9	-
33	0	0	0	4.4	-	**33**	0	0	0	4.1	-
34	0	0	0	3.4	-	**34**	0	0	0	9.3	-
35	0	0.4	1	7.7	-	**35**	0	0	0	7.2	-
36	0	0.4	1	6.8	-	**36**	0	0	0	7.6	-
37	0	0.3	1	11.7	-	**37**	0	0	0	6.4	-
38	0	0.4	1	6.8	-	**38**	0	0	0	11.5	-
39	0	0	0	3.5	-	**39**	0	0	0	13.1	-
40	0	0	0	3.8	0	**40**	0	0	0	6.2	0.25
41	0	0.1	1	6.2	-	**41**	0	0	0	6.3	-
42	0	0.5	1	7.5	-	**42**	0	0	0	2.4	-
43	0	0.5	1	10.0	-	**43**	0	0.5	1	12.0	-
44	0	0.2	1	6.5	-	**44**	0	0	0	4.1	-
45	0	0	0	8.5	-	**45**	0	0	0	4.9	-
46	0	0	0	3.4	-	**46**	0	0	0	17.1	-
47	0	0.1	1	17.8	-	**47**	0	0	0	6.9	-
48	0	0.3	1	7.0	-	**48**	0	0	0	7.1	-
49	0	0	0	10.5	-	**49**	0	0	0	4.5	-
50	0	0.4	1	10.2	0.25	**50**	0	0	0	4.1	0
51	0	0	0	1.4	-	**51**	0	0	0	6.5	-
52	0	0	0	6.5	-	**52**	0	0	0	6.1	-
53	0	0.2	1	6.9	-	**53**	0	0	0	6.2	-
54	0	0.5	1	9.4	-	**54**	0	0	0	3.4	-
55	0	0.3	1	10.8	-	**55**	0	0	0	3.5	-
56	0	0.3	1	8.8	-	**56**	0	0	0	2.1	-
57	0	0.5	1	6.8	-	**57**	0	0	0	4.4	-
58	0	0.1	1	4.3	-	**58**	0	0.1	1	14.5	-
59	0	0	0	10.9	-	**59**	0	0	0	13.2	-
60	0	0	0	4.6	0.5	**60**	0	0	0	5.1	0
61	0	0	0	6.7	-	**61**	0	0	0	4.1	-
62	0	0	0	5.0	-	**62**	0	0	0	4.1	-
63	0	0.3	1	13.3	-	**63**	0	0	0	8.4	-
64	0	0.4	1	7.9	-	**64**	0	0	0	3.9	-
65	0	0	0	5.4	-	**65**	0	0	0	2.8	-
66	0	0.5	1	8.6	-	**66**	0	0	0	4.4	-
67	0	0	0	3.9	-	**67**	0	0.1	1	12.7	-
68	0	0.4	1	10.9	-	**68**	0	0	0	2.1	-
69	0	0.4	1	4.1	-	**69**	0	0	0	4.4	-
70	0	0	0	8.7	0.25	**70**	0	0	0	3.4	0.5
71	0	0	0	10.5	-	**71**	0	0	0	6.5	-
72	0	0	0	5.1	-	**72**	0	0	0	11.6	-
73	0	0	0	4.2	-	**73**	0	0	0	7.9	-
74	0	0	0	5.5	-	**74**	0	0	0	6.7	-
75	0	0	0	14.5	-	**75**	0	0	0	3.3	-
76	0	0.4	1	6.7	-	**76**	0	0	0	7.4	-
77	0	0	0	12.7	-	**77**	0	0	0	5.4	-
78	0	0.1	1	4.0	-	**78**	0	0	0	4.6	-
79	0	0	0	2.9	-	**79**	0	0	0	6.3	-
80	0	0	0	2.7	0	**80**	0	0	0	7.3	0
81	0	0	0	3.5	-	**81**	0	0	0	8.0	-
82	0	0.1	1	6.9	-	**82**	0	0	0	6.6	-
83	0	0	0	14.3	-	**83**	0	0	0	13.1	-
84	0	0.1	1	12.8	-	**84**	0	0	0	22.4	-
85	0	0	0	9.2	-	**85**	0	0	0	1.6	-
86	0	0	0	0.9	-	**86**	0	0	0	8.5	-
87	0	0	0	17.8	-	**87**	0	0	0	3.0	-
88	0	0	0	4.4	-	**88**	0	0	0	9.2	-
89	0	0	0	3.2	-	**89**	0	0	0	6.6	-
90	0	0	0	18.8	0.5	**90**	0	0	0	7.2	0
91	0	0.5	1	8.5	-	**91**	0	0	0	3.4	-
92	0	0	0	9.6	-	**92**	0	0	0	19.3	-
93	0	0	0	3.0	-	**93**	0	0	0	3.4	-
94	0	0	0	9.7	-	**94**	0	0	0	2.8	-
95	0	0	0	1.5	-	**95**	0	0	0	3.2	-
96	0	0	0	11.5	-	**96**	0	0	0	3.6	-
97	0	0.1	1	25.8	-	**97**	0	0	0	14.4	-
98	0	0	0	5.9	-	**98**	0	0	0	3.2	-
99	0	0	0	3.8	-	**99**	0	0	0	10.4	-
100	0	0	0	2.0	0	**100**	0	0	0	12.6	0.25
Average =	**0.00**	**0.15**	**0.45**	**7.8**	**0.18**	**Average =**	**0.00**	**0.02**	**0.00**	**6.9**	**0.10**
	Old Calcite Index (CI) =	**0.45**					**Old Calcite Index (CI) =**	**0.06**			
	New Calcite Index (CI') =	**0.15**					**New Calcite Index (CI') =**	**0.02**			

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Calcite proportion was not recorded prior to Sept. 9, 2021.

Table J.5: **Pebble Counts and Calcite Measurements (September Only) at Benthic Invertebrate Sampling Locations in Dry Creek, Fording River, and Grace Creek, 2021**

LC_DC4-3						LC_DC1-1				
9-Sep-21						7-Sep-21				
Pebble	Concreted Status	Calcite Proportion	Calcite Presence	Intermediate Axis (cm)	Embedded-ness (%)	Pebble	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embedded-ness (%)
1	0	0	0	2.9	-	**1**	0	0	15.8	-
2	0	0	0	3.9	-	**2**	0	1	22.0	-
3	0	0	0	7.9	-	**3**	0	0	11.2	-
4	0	0	0	6.7	-	**4**	0	1	7.2	-
5	0	0.3	1	9.7	-	**5**	0	0	2.4	-
6	0	0	0	5.1	-	**6**	0	0	9.0	-
7	0	0	0	4.7	-	**7**	0	0	5.3	-
8	0	0	0	7.3	-	**8**	0	0	0.6	-
9	0	0	0	3.2	-	**9**	0	0	9.0	-
10	0	0.1	1	8.0	0	**10**	0	1	6.2	0.25
11	0	0.1	1	8.5	-	**11**	0	0	14.8	-
12	0	0	0	8.0	-	**12**	0	1	8.4	-
13	0	0.1	1	10.8	-	**13**	0	0	7.4	-
14	0	0	0	3.1	-	**14**	0	1	6.0	-
15	0	0	0	14.6	-	**15**	0	1	15.3	-
16	0	0.2	1	9.3	-	**16**	0	1	10.9	-
17	0	0	0	11.7	-	**17**	0	1	7.9	-
18	0	0	0	6.7	-	**18**	0	1	4.2	-
19	0	0	0	4.4	-	**19**	0	1	11.1	-
20	0	0	0	14.6	0	**20**	0	1	5.8	0.25
21	0	0	0	6.6	-	**21**	0	0	3.9	-
22	0	0	0	7.5	-	**22**	0	1	9.2	-
23	0	0	0	9.9	-	**23**	0	0	3.0	-
24	0	0	0	6.7	-	**24**	0	0	7.2	-
25	0	0	0	7.2	-	**25**	0	1	7.5	-
26	0	0	0	4.1	-	**26**	0	1	9.2	-
27	0	0	0	10.0	-	**27**	0	1	6.8	-
28	0	0	0	20.0	-	**28**	0	0	13.4	-
29	0	0	0	5.7	-	**29**	0	0	0.2	-
30	0	0	0	7.8	0	**30**	0	1	5.5	0.5
31	0	0	0	4.3	-	**31**	0	0	3.4	-
32	0	0	0	8.2	-	**32**	0	0	5.8	-
33	0	0	0	9.1	-	**33**	0	0	3.5	-
34	0	0.1	1	7.2	-	**34**	0	0	6.2	-
35	0	0	0	11.3	-	**35**	0	0	5.8	-
36	0	0	0	3.7	-	**36**	0	0	8.2	-
37	0	0	0	15.9	-	**37**	0	1	11.0	-
38	0	0	0	2.8	-	**38**	0	0	7.4	-
39	0	0	0	6.7	-	**39**	0	1	16.0	-
40	0	0	0	11.3	0	**40**	0	1	9.0	0.25
41	0	0	0	7.2	-	**41**	0	0	12.3	-
42	0	0	0	7.1	-	**42**	0	1	4.6	-
43	0	0	0	12.1	-	**43**	0	0	13.9	-
44	0	0	0	7.3	-	**44**	0	1	4.8	-
45	0	0	0	9.8	-	**45**	0	0	6.8	-
46	0	0	0	9.2	-	**46**	0	0	8.5	-
47	0	0	0	22.5	-	**47**	0	0	6.5	-
48	0	0	0	12.8	-	**48**	0	0	2.0	-
49	0	0	0	5.7	-	**49**	0	1	3.0	-
50	0	0	0	5.7	0.5	**50**	0	0	9.3	0.25
51	0	0	0	7.0	-	**51**	0	0	9.1	-
52	0	0	0	10.7	-	**52**	0	1	10.5	-
53	0	0	0	11.3	-	**53**	0	0	4.5	-
54	0	0	0	5.4	-	**54**	0	1	7.3	-
55	0	0	0	11.6	-	**55**	0	1	4.9	-
56	0	0	0	7.0	-	**56**	0	1	10.2	-
57	0	0	0	7.3	-	**57**	0	1	12.2	-
58	0	0	0	7.1	-	**58**	0	1	8.1	-
59	0	0	0	1.8	-	**59**	0	0	9.4	-
60	0	0	0	11.7	0	**60**	0	0	10.8	0.25
61	0	0	0	3.2	-	**61**	0	0	7.7	-
62	0	0	0	4.6	-	**62**	0	0	3.6	-
63	0	0	0	6.7	-	**63**	0	0	13.8	-
64	0	0	0	3.7	-	**64**	0	0	15.5	-
65	0	0	0	5.8	-	**65**	0	1	10.8	-
66	0	0	0	8.5	-	**66**	0	1	8.2	-
67	0	0	0	1.3	-	**67**	0	1	0.0	-
68	0	0	0	5.1	-	**68**	0	1	3.0	-
69	0	0.4	1	3.6	-	**69**	0	1	0.0	-
70	0	0	0	5.0	0.25	**70**	0	1	4.5	-
71	0	0	0	5.6	-	**71**	0	1	7.9	-
72	0	0	0	5.6	-	**72**	0	0	1.5	-
73	0	0	0	11.6	-	**73**	0	1	5.6	-
74	0	0	0	15.0	-	**74**	0	1	9.7	-
75	0	0	0	13.1	-	**75**	0	0	11.0	-
76	0	0	0	12.2	-	**76**	0	1	5.7	-
77	0	0	0	9.6	-	**77**	0	0	9.2	-
78	0	0	0	5.2	-	**78**	0	0	2.6	-
79	0	0	0	21.5	-	**79**	0	0	2.9	-
80	0	0	0	2.6	0	**80**	0	1	7.2	0.25
81	0	0	0	11.9	-	**81**	0	1	2.5	-
82	0	0.5	1	6.3	-	**82**	0	1	6.3	-
83	0	0.3	1	7.3	-	**83**	0	0	1.7	-
84	0	0	0	7.6	-	**84**	0	1	15.9	-
85	0	0	0	7.1	-	**85**	0	0	6.5	-
86	0	0	0	5.9	-	**86**	0	0	11.3	-
87	0	0	0	3.8	-	**87**	0	0	4.2	-
88	0	0	0	4.1	-	**88**	0	0	4.6	-
89	0	0	0	21.2	-	**89**	0	0	7.2	-
90	0	0.1	1	12.6	0	**90**	0	0	3.9	0.25
91	0	0	0	6.2	-	**91**	0	0	5.7	-
92	0	0	0	6.3	-	**92**	0	0	2.5	-
93	0	0	0	11.0	-	**93**	0	0	2.0	-
94	0	0	0	15.3	-	**94**	0	1	7.7	-
95	0	0	0	4.1	-	**95**	0	1	12.6	-
96	0	0	0	6.7	-	**96**	0	0	1.7	-
97	0	0.1	1	6.8	-	**97**	0	-	0.2	-
98	0	0	0	3.3	-	**98**	0	1	6.9	-
99	0	0	0	4.2	-	**99**	0	0	2.9	-
100	0	0	0	8.6	0	**100**	0	0	9.1	0.25
Average =	**0.00**	**0.00**	**0.11**	**8.1**	**0.08**	**Average =**	**0.00**	**0.45**	**7.3**	**0.28**
	Old Calcite Index (CI) =	**0.00**					**Old Calcite Index (CI) =**	**0.45**		
	New Calcite Index (CI') =	**0.00**					**New Calcite Index (CI') =**	**-**		

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Calcite proportion was not recorded prior to Sept. 9, 2021.

Table J.5: Pebble Counts and Calcite Measurements (September Only) at Benthic Invertebrate Sampling Locations in Dry Creek, Fording River, and Grace Creek, 2021

LC_DC1-2					LC_DC1-3				
7-Sep-21					7-Sep-21				
Pebble	**Concreted Status**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**	**Pebble**	**Concreted Status**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embedded-ness (%)**
1	0	0	1.8	-	**1**	0	1	4.1	-
2	0	0	4.2	-	**2**	0	0	9.3	-
3	0	0	4.4	-	**3**	0	1	17.5	-
4	0	1	5.4	-	**4**	0	1	12.7	-
5	0	1	6.5	-	**5**	0	0	0.2	-
6	0	0	10.3	-	**6**	0	0	5.7	-
7	0	1	11.7	-	**7**	0	1	11.3	-
8	0	1	7.2	-	**8**	0	1	11.7	-
9	0	0	2.6	-	**9**	0	0	2.9	-
10	0	0	6.7	0.25	**10**	0	1	3.8	0.25
11	0	1	12.4	-	**11**	0	1	15.1	-
12	0	0	10.2	-	**12**	0	1	12.2	-
13	0	1	12.6	-	**13**	0	1	13.1	-
14	0	1	6.8	-	**14**	0	0	2.6	-
15	0	1	11.8	-	**15**	0	0	4.1	-
16	0	1	8.8	-	**16**	0	1	6.8	-
17	0	1	11.3	-	**17**	0	1	10.9	-
18	0	0	5.8	-	**18**	0	1	5.8	-
19	0	0	5.2	-	**19**	0	0	3.7	-
20	0	0	10.9	0.5	**20**	0	1	10.2	0.5
21	0	1	10.5	-	**21**	0	0	1.4	-
22	0	1	6.9	-	**22**	0	0	6.1	-
23	0	1	6.2	-	**23**	0	0	4.8	-
24	0	1	5.8	-	**24**	0	0	11.1	-
25	0	0	5.6	-	**25**	0	1	12.5	-
26	0	1	9.0	-	**26**	0	0	0.2	-
27	0	1	9.9	-	**27**	0	0	5.7	-
28	0	0	5.0	-	**28**	0	1	5.5	-
29	0	1	6.2	-	**29**	0	1	9.5	-
30	0	1	11.7	0.25	**30**	0	1	8.5	0
31	0	0	7.0	-	**31**	0	0	0.9	-
32	0	1	10.2	-	**32**	0	0	2.7	-
33	0	1	8.9	-	**33**	0	1	11.1	-
34	0	0	6.5	-	**34**	0	0	8.5	-
35	0	0	3.4	-	**35**	0	0	5.4	-
36	0	0	4.2	-	**36**	0	0	4.8	-
37	0	1	11.5	-	**37**	0	0	3.2	-
38	0	1	8.6	-	**38**	0	1	4.5	-
39	0	1	8.9	-	**39**	0	1	8.5	-
40	0	0	5.5	0.5	**40**	0	1	13.0	0.25
41	0	1	7.7	-	**41**	0	1	22.0	-
42	0	1	8.0	-	**42**	0	1	11.0	-
43	0	1	7.4	-	**43**	0	0	5.2	-
44	0	1	8.7	-	**44**	0	0	5.5	-
45	0	0	7.2	-	**45**	0	1	10.6	-
46	0	1	9.6	-	**46**	0	1	6.2	-
47	0	1	4.8	-	**47**	0	0	4.1	-
48	0	1	5.6	-	**48**	0	1	5.2	-
49	0	1	3.5	-	**49**	0	1	13.5	-
50	0	0	5.3	0	**50**	0	0	2.9	0.5
51	0	0	3.2	-	**51**	0	0	7.9	-
52	0	0	2.6	-	**52**	0	0	2.2	-
53	0	0	3.9	-	**53**	0	0	6.0	-
54	0	1	11.8	-	**54**	0	0	4.4	-
55	0	1	11.7	-	**55**	0	0	15.7	-
56	0	0	3.5	-	**56**	0	1	7.7	-
57	0	1	11.6	-	**57**	0	0	8.3	-
58	0	1	13.8	-	**58**	0	1	21.0	-
59	0	1	5.5	-	**59**	0	0	9.1	-
60	0	0	7.1	0.75	**60**	0	0	2.7	0
61	0	1	5.6	-	**61**	0	1	6.3	-
62	0	1	5.5	-	**62**	0	0	2.0	-
63	0	0	6.6	-	**63**	0	0	1.5	-
64	0	1	12.2	-	**64**	0	1	8.1	-
65	0	0	15.2	-	**65**	0	1	6.1	-
66	0	1	13.8	-	**66**	0	0	6.9	-
67	0	1	6.1	-	**67**	0	0	6.2	-
68	0	1	5.9	-	**68**	0	0	7.1	-
69	0	1	5.4	-	**69**	0	1	6.0	-
70	0	1	3.9	0.5	**70**	0	1	1.6	-
71	0	1	6.2	-	**71**	0	0	10.5	-
72	0	0	5.1	-	**72**	0	1	12.5	-
73	0	0	4.2	-	**73**	0	0	8.0	-
74	0	1	17.1	-	**74**	0	1	9.1	-
75	0	1	6.2	-	**75**	0	0	8.9	-
76	0	1	1.4	-	**76**	0	0	9.0	-
77	0	1	6.7	-	**77**	0	0	18.8	-
78	0	0	5.1	-	**78**	0	1	6.7	-
79	0	1	7.1	-	**79**	0	0	4.4	-
80	0	1	11.1	0.75	**80**	0	0	6.3	0.75
81	0	1	4.7	-	**81**	0	0	9.3	-
82	0	0	4.1	-	**82**	0	0	8.4	-
83	0	1	7.1	-	**83**	0	0	7.0	-
84	0	0	4.5	-	**84**	0	0	7.3	-
85	0	0	8.0	-	**85**	0	0	8.2	-
86	0	0	9.2	-	**86**	0	0	2.2	-
87	0	0	4.2	-	**87**	0	1	7.5	-
88	0	0	1.1	-	**88**	0	0	2.5	-
89	0	1	9.5	-	**89**	0	0	9.1	-
90	0	1	5.2	0.5	**90**	0	0	14.4	0.5
91	0	1	5.8	-	**91**	0	1	26.2	-
92	0	0	3.1	-	**92**	0	0	3.6	-
93	0	0	3.8	-	**93**	0	0	10.0	-
94	0	1	7.9	-	**94**	0	0	10.8	-
95	0	0	5.2	-	**95**	0	0	4.4	-
96	0	1	8.7	-	**96**	0	1	14.0	-
97	0	0	3.7	-	**97**	0	1	11.5	-
98	0	0	6.7	-	**98**	0	1	15.4	-
99	0	0	8.4	-	**99**	0	0	8.3	-
100	0	1	6.3	0.5	**100**	0	1	8.5	0.25
Average =	**0.00**	**0.59**	**7.2**	**0.45**	**Average =**	**0.00**	**0.43**	**8.0**	**0.33**
	Old Calcite Index (CI) =	**0.59**				**Old Calcite Index (CI) =**	**0.43**		
	New Calcite Index (CI') =	**-**				**New Calcite Index (CI') =**	**-**		

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Calcite proportion was not recorded prior to Sept. 9, 2021.

Table J.5: Pebble Counts and Calcite Measurements (September Only) at Benthic Invertebrate Sampling Locations in Dry Creek, Fording River, and Grace Creek, 2021

LC_DCEF-1					LC_DCEF-2				
7-Sep-21					7-Sep-21				
Pebble	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embedded-ness (%)	Pebble	Concreted Status	Calcite Presence	Intermediate Axis (cm)	Embedded-ness (%)
1	0	0	4.5	-	1	0	0	1.6	-
2	0	0	3.6	-	2	0	0	2.1	-
3	0	0	5.4	-	3	0	0	29.8	-
4	0	0	6.8	-	4	0	0	3.5	-
5	0	0	5.5	-	5	0	0	4.4	-
6	0	0	2.9	-	6	0	0	6.3	-
7	0	0	3.9	-	7	0	0	13.6	-
8	0	0	8.6	-	8	0	0	5.0	-
9	0	0	7.8	-	9	0	0	14.1	-
10	0	0	4.3	0	10	0	0	3.5	0.5
11	0	0	6.6	-	11	0	0	9.8	-
12	0	0	1.5	-	12	0	0	25.0	-
13	0	0	12.5	-	13	0	0	10.2	-
14	0	0	15.8	-	14	0	0	1.1	-
15	0	0	6.8	-	15	0	0	1.9	-
16	0	0	16.5	-	16	0	0	6.5	-
17	0	0	10.3	-	17	0	0	3.7	-
18	0	0	8.0	-	18	0	0	2.7	-
19	0	0	5.3	-	19	0	0	16.2	-
20	0	0	7.5	0.5	20	0	0	5.2	0
21	0	0	6.9	-	21	0	0	14.1	-
22	0	0	5.5	-	22	0	0	9.0	-
23	0	0	4.5	-	23	0	0	1.8	-
24	0	0	4.4	-	24	0	0	3.5	-
25	0	0	4.5	-	25	0	0	5.1	-
26	0	0	14.0	-	26	0	0	6.5	-
27	0	0	6.5	-	27	0	0	15.7	-
28	0	0	3.4	-	28	0	0	10.2	-
29	0	0	11.5	-	29	0	0	8.5	-
30	0	0	8.5	0.25	30	0	0	5.1	0.25
31	0	0	4.5	-	31	0	0	2.2	-
32	0	0	6.5	-	32	0	0	2.2	-
33	0	0	7.5	-	33	0	0	1.1	-
34	0	0	7.4	-	34	0	0	8.2	-
35	0	0	9.0	-	35	0	0	2.2	-
36	0	0	7.6	-	36	0	0	8.5	-
37	0	0	5.9	-	37	0	0	2.4	-
38	0	0	10.0	-	38	0	0	13.3	-
39	0	0	5.0	-	39	0	0	2.7	-
40	0	0	15.2	0.75	40	0	0	8.2	0.25
41	0	0	9.2	-	41	0	0	10.2	-
42	0	0	9.5	-	42	0	0	11.0	-
43	0	0	9.5	-	43	0	0	5.7	-
44	0	0	5.9	-	44	0	0	10.2	-
45	0	0	16.5	-	45	0	0	3.6	-
46	0	0	10.9	-	46	0	0	5.7	-
47	0	0	2.2	-	47	0	0	7.6	-
48	0	0	2.3	-	48	0	0	19.5	-
49	0	0	14.5	-	49	0	0	7.0	-
50	0	0	13.4	0.25	50	0	0	2.0	0.5
51	0	0	9.9	-	51	0	0	6.3	-
52	0	0	20.3	-	52	0	0	11.4	-
53	0	0	3.9	-	53	0	0	9.4	-
54	0	0	1.9	-	54	0	0	5.6	-
55	0	0	29.6	-	55	0	0	10.9	-
56	0	0	20.6	-	56	0	0	15.9	-
57	0	0	16.0	-	57	0	0	10.2	-
58	0	0	13.5	-	58	0	0	6.8	-
59	0	0	6.2	-	59	0	0	4.4	-
60	0	0	2.7	0	60	0	0	8.9	0.25
61	0	0	32.3	-	61	0	0	6.9	-
62	0	0	12.9	-	62	0	0	13.6	-
63	0	0	7.6	-	63	0	0	6.9	-
64	0	0	8.7	-	64	0	0	5.4	-
65	0	0	4.7	-	65	0	0	5.8	-
66	0	0	11.8	-	66	0	0	4.4	-
67	0	0	17.9	-	67	0	0	12.0	-
68	0	0	3.7	-	68	0	0	6.1	-
69	0	0	5.8	-	69	0	0	3.2	-
70	0	0	8.8	0.5	70	0	0	6.6	0.5
71	0	0	15.3	-	71	0	0	7.5	-
72	0	0	10.7	-	72	0	0	9.6	-
73	0	0	4.4	-	73	0	0	12.0	-
74	0	0	3.9	-	74	0	0	12.9	-
75	0	0	10.9	-	75	0	0	7.4	-
76	0	0	3.7	-	76	0	0	4.4	-
77	0	0	21.4	-	77	0	0	19.9	-
78	0	0	3.2	-	78	0	0	7.8	-
79	0	0	14.3	-	79	0	0	11.2	-
80	0	0	6.9	0.25	80	0	0	4.9	0.25
81	0	0	1.7	-	81	0	0	1.9	-
82	0	0	3.2	-	82	0	0	5.6	-
83	0	0	19.3	-	83	0	0	13.9	-
84	0	0	13.2	-	84	0	0	2.8	-
85	0	0	14.3	-	85	0	0	14.8	-
86	0	0	9.9	-	86	0	0	10.7	-
87	0	0	12.2	-	87	0	0	11.0	-
88	0	0	11.8	-	88	0	0	5.6	-
89	0	0	6.7	-	89	0	0	3.0	-
90	0	0	13.8	0.25	90	0	0	5.8	0.5
91	0	0	18.1	-	91	0	0	6.8	-
92	0	0	10.9	-	92	0	0	8.8	-
93	0	0	5.9	-	93	0	0	9.6	-
94	0	0	5.0	-	94	0	0	10.7	-
95	0	0	5.5	-	95	0	0	12.4	-
96	0	0	3.7	-	96	0	0	7.8	-
97	0	0	16.0	-	97	0	0	5.9	-
98	0	0	8.9	-	98	0	0	17.2	-
99	0	0	9.0	-	99	0	0	5.4	-
100	0	0	7.2	0.25	100	0	0	6.2	0.75
Average =	**0.00**	**0.00**	**9.2**	**0.30**	**Average =**	**0.00**	**0.00**	**8.0**	**0.38**
	Old Calcite Index (CI) =	**0.00**				**Old Calcite Index (CI) =**	**0.00**		
	New Calcite Index (CI') =	-				**New Calcite Index (CI') =**	-		

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Calcite proportion was not recorded prior to Sept. 9, 2021.

Table J.5: **Pebble Counts and Calcite Measurements (September Only) at Benthic Invertebrate Sampling Locations in Dry Creek, Fording River, and Grace Creek, 2021**

LC_DCEF-3				
7-Sep-21				
Pebble	**Concreted Status**	**Calcite Presence**	**Intermediate Axis (cm)**	**Embeddedness (%)**
1	0	0	9.3	-
2	0	0	6.4	-
3	0	0	11.5	-
4	0	0	2.6	-
5	0	0	1.9	-
6	0	0	11.9	-
7	0	0	0.2	-
8	0	0	4.1	-
9	0	0	3.0	-
10	0	0	9.6	0.25
11	0	0	15.5	-
12	0	0	3.7	-
13	0	0	6.0	-
14	0	0	11.2	-
15	0	0	18.8	-
16	0	0	5.9	-
17	0	0	2.7	-
18	0	0	9.3	-
19	0	0	5.0	-
20	0	0	18.0	0
21	0	0	5.7	-
22	0	0	2.9	-
23	0	0	24.5	-
24	0	0	3.3	-
25	0	0	13.1	-
26	0	0	3.9	-
27	0	0	2.1	-
28	0	0	1.7	-
29	0	0	9.4	-
30	0	0	6.6	0.5
31	0	0	2.5	-
32	0	0	11.3	-
33	0	0	4.4	-
34	0	0	7.3	-
35	0	0	4.9	-
36	0	0	6.8	-
37	0	0	11.0	-
38	0	0	1.7	-
39	0	0	6.5	-
40	0	0	14.0	0.25
41	0	0	9.1	-
42	0	0	6.4	-
43	0	0	5.7	-
44	0	0	25.0	-
45	0	0	13.1	-
46	0	0	0.2	-
47	0	0	2.2	-
48	0	0	8.1	-
49	0	0	12.3	-
50	0	0	3.1	0.5
51	0	0	12.0	-
52	0	0	7.0	-
53	0	0	4.6	-
54	0	0	7.5	-
55	0	0	18.3	-
56	0	0	9.2	-
57	0	0	3.9	-
58	0	0	21.3	-
59	0	0	4.1	-
60	0	0	12.8	0.75
61	0	0	3.5	-
62	0	0	14.4	-
63	0	0	15.6	-
64	0	0	7.1	-
65	0	0	2.8	-
66	0	0	23.8	-
67	0	0	4.3	-
68	0	0	9.6	-
69	0	0	1.6	-
70	0	0	4.2	0.75
71	0	0	3.4	-
72	0	0	6.7	-
73	0	0	3.0	-
74	0	0	57.7	-
75	0	0	1.3	-
76	0	0	8.8	-
77	0	0	16.1	-
78	0	0	7.5	-
79	0	0	4.4	-
80	0	0	5.3	0.25
81	0	0	6.0	-
82	0	0	1.4	-
83	0	0	3.3	-
84	0	0	14.2	-
85	0	0	11.5	-
86	0	0	13.1	-
87	0	0	25.3	-
88	0	0	5.1	-
89	0	0	2.7	-
90	0	0	4.2	0.25
91	0	0	27.1	-
92	0	0	7.6	-
93	0	0	0.2	-
94	0	0	26.7	-
95	0	0	3.8	-
96	0	0	5.0	-
97	0	0	9.5	-
98	0	0	14.1	-
99	0	0	9.0	-
100	0	0	8.2	0.25
Average =	**0.00**	**0.00**	**8.9**	**0.38**
	Old Calcite Index (CI) =	**0.00**		
	New Calcite Index (CI') =	**-**		

Notes: nm = not measurable, "-" indicates no data. Intermediate axis is the measurement across the intermediate access of the pebble and presented in cm. Calcite proportion was not recorded prior to Sept. 9, 2021.

APPENDIX K

LABORATORY REPORTS

WATER CHEMISTRY

ALS Laboratory Report CG2106159

CERTIFICATE OF ANALYSIS

Work Order	: **CG2106159**	Page	: 1 of 6
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Mike Pope	Account Manager	: Lyudmyla Shvets
Address	: Line Creek Operations PO BOX 2003 15km North Hwy 43 Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary AB Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: LINE CREEK OPERATIONS	Date Samples Received	: 30-Nov-2021 08:40
PO	: VPO00748510	Date Analysis Commenced	: 30-Nov-2021
C-O-C number	: DRY CREEK LAEMP	Issue Date	: 09-Dec-2021 17:40
Sampler	: MS		
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*
Angelo Salandanan	Lab Assistant	Metals, Burnaby, British Columbia
Caleb Deroche	Lab Analyst	Metals, Burnaby, British Columbia
Dwayne Bennett	Supervisor - Inorganic	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
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
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
Woochan Song	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*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_DCEF_WS_ 2021-11-29_NP**	----	----	----	----
				Client sampling date / time	29-Nov-2021 13:00	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2106159-001**	--------	--------	--------	--------
					Result	----	----	----	----
Physical Tests									
acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	----	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	128	----	----	----	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	156	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	----	----	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	<1.0	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	----	----	----	----
alkalinity, hydroxide (as OH)	14280-30-9	E290	1.0	mg/L	<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	156	----	----	----	----
conductivity	----	E100	2.0	µS/cm	270	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	135	----	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV	431	----	----	----	----
pH	----	E108	0.10	pH units	7.95	----	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	130	----	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L	1.1	----	----	----	----
turbidity	----	E121	0.10	NTU	0.12	----	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0092	----	----	----	----
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	0.126	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.107	----	----	----	----
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	0.0148	----	----	----	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0130 DLM	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	6.40	----	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.52	----	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.33	----	----	----	----
Ion Balance									

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_DCEF_WS_ 2021-11-29_NP**	----	----	----	----
				Client sampling date / time	29-Nov-2021 13:00	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2106159-001**	--------	--------	--------	--------
					Result	----	----	----	----
Ion Balance									
anion sum	----	EC101	0.10	meq/L	3.27	----	----	----	----
cation sum	----	EC101	0.10	meq/L	2.84	----	----	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%	86.8	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%	7.04	----	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0290	----	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00016	----	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00023	----	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.265	----	----	----	----
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	0.013	----	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.112	----	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	33.8	----	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00013	----	----	----	----
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	0.077	----	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	0.000060	----	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0188	----	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	13.4	----	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00352	----	----	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L	<0.00050	----	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00103	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00052	----	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	1.06	----	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L	1.44	----	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L	3.19	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	----	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L	2.54	----	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L	0.0508	----	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_DCEF_WS_ 2021-11-29_NP**	----	----	----	----
				Client sampling date / time	29-Nov-2021 13:00	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2106159-001**	--------	--------	--------	--------
					Result	----	----	----	----
Total Metals									
sulfur, total	7704-34-9	E420	0.50	mg/L	2.45	----	----	----	----
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	0.00035	----	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.000365	----	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00117	----	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	----	----	----	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	<0.0010	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00012	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00016	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.250	----	----	----	----
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	0.0335	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L	31.5	----	----	----	----
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	0.0183	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	13.8	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	<0.00010	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00109	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.988	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.050	µg/L	1.33	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.04	----	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_DCEF_WS_ 2021-11-29_NP**	**----**	**----**	**----**	**----**
				Client sampling date / time	29-Nov-2021 13:00	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2106159-001**	**--------**	**--------**	**--------**	**--------**
					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	2.54	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0492	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	2.40	----	----	----	----
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	0.000347	----	----	----	----
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 : **CG2106159**

Client : **Teck Coal Limited**
Contact : Mike Pope
Address : Line Creek Operations PO BOX 2003 15km North Hwy 43
Sparwood BC Canada V0B 2G0
Telephone : ----
Project : LINE CREEK OPERATIONS
PO : VPO00748510
C-O-C number : DRY CREEK LAEMP
Sampler : MS
Site : ----
Quote number : Teck Coal Master Quote
No. of samples received : 1
No. of samples analysed : 1

Page : 1 of 12
Laboratory : Calgary - Environmental
Account Manager : Lyudmyla Shvets
Address : 2559 29th Street NE
Calgary, Alberta Canada T1Y 7B5
Telephone : +1 403 407 1800
Date Samples Received : 30-Nov-2021 08:40
Issue Date : 09-Dec-2021 17:40

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

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

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	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*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) LC_DCEF_WS_2021-11-29_NP	E298	29-Nov-2021	01-Dec-2021	----	----		01-Dec-2021	28 days	2 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE LC_DCEF_WS_2021-11-29_NP	E235.Br-L	29-Nov-2021	----	----	----		30-Nov-2021	28 days	1 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE LC_DCEF_WS_2021-11-29_NP	E235.Cl-L	29-Nov-2021	----	----	----		30-Nov-2021	28 days	1 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE LC_DCEF_WS_2021-11-29_NP	E378-U	29-Nov-2021	----	----	----		30-Nov-2021	3 days	1 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE LC_DCEF_WS_2021-11-29_NP	E235.F	29-Nov-2021	----	----	----		30-Nov-2021	28 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LC_DCEF_WS_2021-11-29_NP	E235.NO3-L	29-Nov-2021	----	----	----		30-Nov-2021	3 days	1 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LC_DCEF_WS_2021-11-29_NP	E235.NO2-L	29-Nov-2021	----	----	----		30-Nov-2021	3 days	1 days	✓

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Anions and Nutrients : Sulfate in Water by IC										
HDPE LC_DCEF_WS_2021-11-29_NP	E235.SO4	29-Nov-2021	----	----	----		30-Nov-2021	28 days	1 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) LC_DCEF_WS_2021-11-29_NP	E318	29-Nov-2021	03-Dec-2021	----	----		06-Dec-2021	28 days	7 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) LC_DCEF_WS_2021-11-29_NP	E372-U	29-Nov-2021	02-Dec-2021	----	----		02-Dec-2021	28 days	3 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LC_DCEF_WS_2021-11-29_NP	E421.Cr-L	29-Nov-2021	03-Dec-2021	----	----		03-Dec-2021	180 days	4 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) LC_DCEF_WS_2021-11-29_NP	E509	29-Nov-2021	05-Dec-2021	----	----		05-Dec-2021	28 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LC_DCEF_WS_2021-11-29_NP	E421	29-Nov-2021	03-Dec-2021	----	----		03-Dec-2021	180 days	4 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) LC_DCEF_WS_2021-11-29_NP	E358-L	29-Nov-2021	30-Nov-2021	----	----		02-Dec-2021	28 days	3 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) LC_DCEF_WS_2021-11-29_NP	E355-L	29-Nov-2021	30-Nov-2021	----	----		02-Dec-2021	28 days	3 days	✓
Physical Tests : Acidity by Titration										
HDPE LC_DCEF_WS_2021-11-29_NP	E283	29-Nov-2021	----	----	----		01-Dec-2021	14 days	2 days	✓

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Physical Tests : Alkalinity Species by Titration										
HDPE LC_DCEF_WS_2021-11-29_NP	E290	29-Nov-2021	----	----	----		01-Dec-2021	14 days	2 days	✓
Physical Tests : Conductivity in Water										
HDPE LC_DCEF_WS_2021-11-29_NP	E100	29-Nov-2021	----	----	----		01-Dec-2021	28 days	2 days	✓
Physical Tests : ORP by Electrode										
HDPE LC_DCEF_WS_2021-11-29_NP	E125	29-Nov-2021	----	----	----		07-Dec-2021	0.25 hrs	191 hrs	✘ EHTR-FM
Physical Tests : pH by Meter										
HDPE LC_DCEF_WS_2021-11-29_NP	E108	29-Nov-2021	----	----	----		01-Dec-2021	0.25 hrs	45 hrs	✘ EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE LC_DCEF_WS_2021-11-29_NP	E162	29-Nov-2021	----	----	----		02-Dec-2021	7 days	3 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] LC_DCEF_WS_2021-11-29_NP	E160-L	29-Nov-2021	----	----	----		01-Dec-2021	7 days	2 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE LC_DCEF_WS_2021-11-29_NP	E121	29-Nov-2021	----	----	----		01-Dec-2021	3 days	2 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) LC_DCEF_WS_2021-11-29_NP	E420.Cr-L	29-Nov-2021	----	----	----		02-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) LC_DCEF_WS_2021-11-29_NP	E508-L	29-Nov-2021	----	----	----		03-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*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) LC_DCEF_WS_2021-11-29_NP	E420	29-Nov-2021	----	----	----		02-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	356758	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	356781	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	357026	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	356188	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	356189	1	20	5.0	5.0	✓
Conductivity in Water	E100	356779	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	358422	1	1	100.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	359954	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	358423	1	9	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	356114	1	7	14.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	356277	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	356186	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	356190	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	356191	1	20	5.0	5.0	✓
ORP by Electrode	E125	360257	1	20	5.0	5.0	✓
pH by Meter	E108	356778	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	356187	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	357080	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	357480	1	10	10.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	359133	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	358817	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	357481	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	356119	1	7	14.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	356026	1	5	20.0	5.0	✓
Turbidity by Nephelometry	E121	356814	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	356758	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	356781	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	357026	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	356188	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	356189	1	20	5.0	5.0	✓
Conductivity in Water	E100	356779	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	358422	1	1	100.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	359954	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	358423	1	9	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	356114	1	7	14.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	356277	1	20	5.0	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type *Analytical Methods*	*Method*	*QC Lot #*	*Count* *QC*	 *Regular*	*Frequency (%)* *Actual*	 *Expected*	 *Evaluation*
Laboratory Control Samples (LCS) - Continued							
Fluoride in Water by IC	E235.F	356186	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	356190	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	356191	1	20	5.0	5.0	✓
ORP by Electrode	E125	360257	1	20	5.0	5.0	✓
pH by Meter	E108	356778	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	356187	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	357080	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	357480	1	10	10.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	359133	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	358817	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	357481	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	356119	1	7	14.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	356026	1	5	20.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	357083	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	356814	1	20	5.0	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	356758	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	356781	1	17	5.8	5.0	✓
Ammonia by Fluorescence	E298	357026	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	356188	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	356189	1	20	5.0	5.0	✓
Conductivity in Water	E100	356779	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	358422	1	1	100.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	359954	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	358423	1	9	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	356114	1	7	14.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	356277	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	356186	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	356190	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	356191	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	356187	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	357080	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	357480	1	10	10.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	359133	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	358817	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	357481	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	356119	1	7	14.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	356026	1	5	20.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	357083	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	356814	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	357026	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	356188	1	20	5.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	356189	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	358422	0	1	0.0	5.0	✗
Dissolved Mercury in Water by CVAAS	E509	359954	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	358423	1	9	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	356114	1	7	14.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	356277	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	356186	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	356190	1	20	5.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	356191	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	356187	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	357480	1	10	10.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	359133	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	358817	1	20	5.0	5.0	✓
Total Metals in Water by CRC ICPMS	E420	357481	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	356119	1	7	14.2	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	356026	1	5	20.0	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 CO2. 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.

QUALITY CONTROL REPORT

Work Order	:**CG2106159**	Page	: 1 of 17
Client	: Teck Coal Limited	Laboratory	: Calgary - Environmental
Contact	: Mike Pope	Account Manager	: Lyudmyla Shvets
Address	: Line Creek Operations PO BOX 2003 15km North Hwy 43 Sparwood BC Canada V0B 2G0	Address	: 2559 29th Street NE Calgary, Alberta Canada T1Y 7B5
Telephone	: ----	Telephone	: +1 403 407 1800
Project	: LINE CREEK OPERATIONS	Date Samples Received	: 30-Nov-2021 08:40
PO	: VPO00748510	Date Analysis Commenced	: 30-Nov-2021
C-O-C number	: DRY CREEK LAEMP	Issue Date	: 09-Dec-2021 17:40
Sampler	: MS		
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.

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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: 356758)											
CG2106128-011	Anonymous	acidity (as CaCO3)	----	E283	10.0	mg/L	10.9	<10.0	0.9	Diff <2x LOR	----
Physical Tests (QC Lot: 356778)											
CG2106118-001	Anonymous	pH	----	E108	0.10	pH units	7.35	7.19	2.20%	4%	----
Physical Tests (QC Lot: 356779)											
CG2106118-001	Anonymous	conductivity	----	E100	2.0	µS/cm	3870	3890	0.515%	10%	----
Physical Tests (QC Lot: 356781)											
CG2106153-008	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	199	210	5.65%	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	242	256	5.65%	20%	----
Physical Tests (QC Lot: 356814)											
CG2106159-001	LC_DCEF_WS_2021-11-29_NP	turbidity	----	E121	0.10	NTU	0.12	0.12	0.004	Diff <2x LOR	----
Physical Tests (QC Lot: 357080)											
CG2106118-001	Anonymous	solids, total dissolved [TDS]	----	E162	40	mg/L	3110	3190	2.32%	20%	----
Physical Tests (QC Lot: 360257)											
CG2106118-001	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	435	436	0.115%	15%	----
Anions and Nutrients (QC Lot: 356026)											
CG2106152-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.200	mg/L	2.60	2.50	3.92%	20%	----
Anions and Nutrients (QC Lot: 356186)											
CG2106152-001	Anonymous	fluoride	16984-48-8	E235.F	0.100	mg/L	0.108	0.106	0.002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 356187)											
CG2106152-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1.50	mg/L	1480	1500	0.906%	20%	----
Anions and Nutrients (QC Lot: 356188)											
CG2106152-001	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: 356189)											
CG2106152-001	Anonymous	chloride	16887-00-6	E235.Cl-L	0.50	mg/L	11.9	12.0	0.730%	20%	----
Anions and Nutrients (QC Lot: 356190)											
CG2106152-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	27.0	27.3	1.06%	20%	----
Anions and Nutrients (QC Lot: 356191)											
CG2106152-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0050	mg/L	1.03	1.04	1.66%	20%	----
Anions and Nutrients (QC Lot: 356277)											

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: 356277) - continued											
CG2106117-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	0.0012	0.0002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 357026)											
CG2106153-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0500	mg/L	0.301	0.300	0.0009	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 359133)											
CG2106153-009	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.115	0.116	0.001	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 356114)											
CG2106153-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	36.8	39.1	5.96%	20%	----
Organic / Inorganic Carbon (QC Lot: 356119)											
CG2106153-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	42.9	43.0	0.0605%	20%	----
Total Metals (QC Lot: 357480)											
CG2106165-008	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: 357481)											
CG2106165-008	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0037	0.0037	0.00003	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00053	0.00053	0.000003	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00051	0.00056	0.00005	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0115	0.0115	0.0930%	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	0.037	0.038	0.001	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	0.412 µg/L	0.000412	0.0177%	20%	----
		calcium, total	7440-70-2	E420	0.050	mg/L	248	246	0.839%	20%	----
		cobalt, total	7440-48-4	E420	0.10	mg/L	14.5 µg/L	0.0146	0.214%	20%	----
		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	0.285	0.280	1.65%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000091	0.000088	0.000003	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0569	0.0563	1.10%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	154	157	1.59%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.350	0.354	1.33%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.0169	0.0169	0.110%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.0521	0.0531	1.86%	20%	----
		potassium, total	7440-09-7	E420	0.050	mg/L	4.76	4.86	2.09%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	6.11 µg/L	0.00648	5.84%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	3.31	3.23	2.30%	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	6.74	6.90	2.35%	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: 357481) - continued											
CG2106165-008	Anonymous	strontium, total	7440-24-6	E420	0.00020	mg/L	0.364	0.363	0.316%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	290	285	1.73%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	0.000086	0.000084	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	0.0118	0.0115	2.24%	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	0.0212	0.0213	0.0001	Diff <2x LOR	----
Total Metals (QC Lot: 358817)											
CG2106091-001	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: 358422)											
CG2106159-001	LC_DCEF_WS_2021-11-29_NP	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 358423)											
CG2106159-001	LC_DCEF_WS_2021-11-29_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	0.00012	0.00012	0.000001	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00016	0.00016	0.000005	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.250	0.259	3.45%	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	0.0002	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0050	mg/L	0.0335 µg/L	0.0000350	0.0000015	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	31.5	33.6	6.48%	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	0.0183	0.0189	3.08%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	13.8	13.8	0.177%	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	0.00109	0.00111	2.38%	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	0.988	1.01	2.62%	20%	----
		selenium, dissolved	7782-49-2	E421	0.050	mg/L	1.33 µg/L	0.00124	6.86%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	3.04	2.82	7.55%	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: 358423) - continued											
CG2106159-001	LC_DCEF_WS_2021-11-29_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	2.54	2.56	0.623%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0492	0.0511	3.87%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	2.40	2.18	0.21	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	0.000347	0.000349	0.429%	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: 359954)											
CG2106159-001	LC_DCEF_WS_2021-11-29_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: 356758)						
acidity (as CaCO3)	----	E283	2	mg/L	2.1	----
Physical Tests (QCLot: 356779)						
conductivity	----	E100	1	µS/cm	1.3	----
Physical Tests (QCLot: 356781)						
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: 356814)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 357080)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 357083)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Anions and Nutrients (QCLot: 356026)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 356186)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 356187)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 356188)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 356189)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 356190)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 356191)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 356277)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 357026)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 359133)						

Sub-Matrix: **Water**

Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	*Result*	*Qualifier*
Anions and Nutrients (QCLot: 359133) - continued						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Organic / Inorganic Carbon (QCLot: 356114)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 356119)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 357480)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 357481)						
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: 357481) - 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: 358817)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 358422)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 358423)						
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: 358423) - 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: 359954)						
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: 356758)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	106	85.0	115	----
Physical Tests (QCLot: 356778)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 356779)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.4	90.0	110	----
Physical Tests (QCLot: 356781)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	108	85.0	115	----
Physical Tests (QCLot: 356814)									
turbidity	----	E121	0.1	NTU	200 NTU	102	85.0	115	----
Physical Tests (QCLot: 357080)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	91.4	85.0	115	----
Physical Tests (QCLot: 357083)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	93.8	85.0	115	----
Physical Tests (QCLot: 360257)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	101	95.4	104	----
Anions and Nutrients (QCLot: 356026)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.02 mg/L	90.4	80.0	120	----
Anions and Nutrients (QCLot: 356186)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 356187)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 356188)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	96.5	85.0	115	----
Anions and Nutrients (QCLot: 356189)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 356190)									
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: 356191)									
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: 356277)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.02 mg/L	96.5	80.0	120	----
Anions and Nutrients (QCLot: 357026)									

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: 357026) - continued									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	86.8	85.0	115	----
Anions and Nutrients (QCLot: 359133)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	105	75.0	125	----
Organic / Inorganic Carbon (QCLot: 356114)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	111	80.0	120	----
Organic / Inorganic Carbon (QCLot: 356119)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	115	80.0	120	----
Total Metals (QCLot: 357480)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	98.1	80.0	120	----
Total Metals (QCLot: 357481)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	100	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	109	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	102	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	98.2	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	93.1	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	93.7	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	92.9	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	97.2	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	98.0	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	97.7	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	95.8	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	97.8	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	101	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	98.8	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	104	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	98.6	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	----
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	93.3	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	99.1	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	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: 357481) - continued									
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	93.5	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	96.5	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	98.4	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	97.9	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	100	80.0	120	----
Total Metals (QCLot: 358817)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	114	80.0	120	----
Dissolved Metals (QCLot: 358422)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	99.7	80.0	120	----
Dissolved Metals (QCLot: 358423)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	100	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	98.5	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	104	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	98.5	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	90.7	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	88.2	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	96.6	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	98.7	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	98.4	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	97.0	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	98.5	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	96.6	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	104	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	99.9	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	98.5	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	99.0	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	101	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	97.1	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	92.0	80.0	120	----
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	99.8	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	93.1	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: 358423) - continued									
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	99.4	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	97.9	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	95.2	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	96.0	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	103	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	95.9	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: 356026)										
CG2106153-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0567 mg/L	0.0676 mg/L	83.9	70.0	130	----
Anions and Nutrients (QCLot: 356186)										
CG2106153-001	Anonymous	fluoride	16984-48-8	E235.F	1.01 mg/L	1 mg/L	101	75.0	125	----
Anions and Nutrients (QCLot: 356187)										
CG2106153-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	100 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 356188)										
CG2106153-001	Anonymous	bromide	24959-67-9	E235.Br-L	0.531 mg/L	0.5 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 356189)										
CG2106153-001	Anonymous	chloride	16887-00-6	E235.Cl-L	110 mg/L	100 mg/L	110	75.0	125	----
Anions and Nutrients (QCLot: 356190)										
CG2106153-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	ND mg/L	2.5 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 356191)										
CG2106153-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.543 mg/L	0.5 mg/L	108	75.0	125	----
Anions and Nutrients (QCLot: 356277)										
CG2106117-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0525 mg/L	0.05 mg/L	105	70.0	130	----
Anions and Nutrients (QCLot: 357026)										
CG2106153-009	Anonymous	ammonia, total (as N)	7664-41-7	E298	ND mg/L	0.1 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 359133)										
CG2106153-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.28 mg/L	2.5 mg/L	91.2	70.0	130	----
Organic / Inorganic Carbon (QCLot: 356114)										
CG2106153-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	23.9 mg/L	ND	70.0	130	----
Organic / Inorganic Carbon (QCLot: 356119)										
CG2106153-001	Anonymous	carbon, total organic [TOC]	----	E355-L	ND mg/L	23.9 mg/L	ND	70.0	130	----
Total Metals (QCLot: 357480)										
CG2106165-010	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0388 mg/L	0.04 mg/L	97.0	70.0	130	----
Total Metals (QCLot: 357481)										
CG2106165-010	Anonymous	aluminum, total	7429-90-5	E420	0.196 mg/L	0.2 mg/L	97.8	70.0	130	----
		antimony, total	7440-36-0	E420	0.0205 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*
Total Metals (QCLot: 357481) - continued										
CG2106165-010	Anonymous	arsenic, total	7440-38-2	E420	0.0199 mg/L	0.02 mg/L	99.4	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	0.0362 mg/L	0.04 mg/L	90.6	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00854 mg/L	0.01 mg/L	85.4	70.0	130	----
		boron, total	7440-42-8	E420	0.097 mg/L	0.1 mg/L	97.2	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00374 mg/L	0.004 mg/L	93.5	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	0.0178 mg/L	0.02 mg/L	88.8	70.0	130	----
		iron, total	7439-89-6	E420	1.90 mg/L	2 mg/L	94.8	70.0	130	----
		lead, total	7439-92-1	E420	0.0175 mg/L	0.02 mg/L	87.6	70.0	130	----
		lithium, total	7439-93-2	E420	0.0856 mg/L	0.1 mg/L	85.6	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	0.0192 mg/L	0.02 mg/L	95.9	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0206 mg/L	0.02 mg/L	103	70.0	130	----
		nickel, total	7440-02-0	E420	0.0358 mg/L	0.04 mg/L	89.5	70.0	130	----
		potassium, total	7440-09-7	E420	3.67 mg/L	4 mg/L	91.8	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	8.58 mg/L	10 mg/L	85.8	70.0	130	----
		silver, total	7440-22-4	E420	0.00370 mg/L	0.004 mg/L	92.6	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	89.9	70.0	130	----
		tin, total	7440-31-5	E420	0.0197 mg/L	0.02 mg/L	98.7	70.0	130	----
		titanium, total	7440-32-6	E420	0.0397 mg/L	0.04 mg/L	99.3	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	0.0979 mg/L	0.1 mg/L	97.9	70.0	130	----
		zinc, total	7440-66-6	E420	0.361 mg/L	0.4 mg/L	90.3	70.0	130	----
Total Metals (QCLot: 358817)										
CG2106091-002	Anonymous	mercury, total	7439-97-6	E508-L	4.87 ng/L	5 ng/L	97.3	70.0	130	----
Dissolved Metals (QCLot: 358423)										
KS2103934-002	Anonymous	aluminum, dissolved	7429-90-5	E421	0.191 mg/L	0.2 mg/L	95.7	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0195 mg/L	0.02 mg/L	97.4	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0197 mg/L	0.02 mg/L	98.7	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0192 mg/L	0.02 mg/L	96.2	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: 358423) - continued										
KS2103934-002	Anonymous	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	0.0102 mg/L	0.01 mg/L	102	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.089 mg/L	0.1 mg/L	89.4	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00405 mg/L	0.004 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	0.0194 mg/L	0.02 mg/L	96.9	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0189 mg/L	0.02 mg/L	94.6	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.92 mg/L	2 mg/L	96.2	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0193 mg/L	0.02 mg/L	96.5	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0936 mg/L	0.1 mg/L	93.6	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	0.0192 mg/L	0.02 mg/L	95.8	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0192 mg/L	0.02 mg/L	96.2	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0381 mg/L	0.04 mg/L	95.3	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.65 mg/L	4 mg/L	91.2	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0389 mg/L	0.04 mg/L	97.2	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.08 mg/L	10 mg/L	90.8	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00380 mg/L	0.004 mg/L	95.1	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	19.6 mg/L	20 mg/L	98.3	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	0.0378 mg/L	0.04 mg/L	94.5	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00386 mg/L	0.004 mg/L	96.4	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	0.389 mg/L	0.4 mg/L	97.3	70.0	130	----
Dissolved Metals (QCLot: 359954)										
CG2106165-008	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000991 mg/L	0.0001 mg/L	99.1	70.0	130	----

Teck

Page 1 of 1

COC ID:	Dry Creek LAEMP	**TURNAROUND TIME:**	

PROJECT/CLIENT INFO

Facility Name	REP		
Project Manager	Mike Pope		
Email	mike.pope@teck.com		
Address	421 Pine Avenue		
City	Sparwood	Province	BC
Postal Code	V0B 2G0	Country	Canada
Phone Number	343-333-3905		

LABORATORY

Lab Name	ALS Calgary		
Lab Contact	Lyudmyla Shvets		
Email	lyudmyla.shvets@alsglobal.com		
Address	2559 29 Street NE		
City	Calgary	Province	AB
Postal Code	T1Y 7B5	Country	Canada
Phone Number	1 403 407 1794		

	Excel	PDF	EDD
[illegible]	x	x	x
teckcoal@equisonline.com			x
[illegible]	x	x	x
[illegible]	x	x	x
[illegible]		x	

PO 748510

SAMPLE DETAILS / **ANALYSIS REQUESTED** — Filtered - F: Field, L: Lab, FL: Field & Lab, N: None

								FILT.	N	F	N	N	F	N	F
								PRESERV.		H2SO4	H2SO4		HCL	HNO3	HNO3
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	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
LC_DCEF_WS_2021-11-29_NP	LC_DCEF	WS	No	29/11/2021	13:00	G	7		1	1	1	1	1	1	1

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

PO 748510

RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	
			6.5°C
		NOV.30,2021	8:40pm

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	Maddy Stokes	**Mobile #**	647-522-0672
Sampler's Signature	MS	**Date/Time**	November 29, 2021

Environmental Division
Calgary
Work Order Reference
CG2106159

Telephone : +1 403 407 1800

WATER CHEMISTRY

ALS Laboratory Report CG2101807

CERTIFICATE OF ANALYSIS

Work Order	: **CG2101807**	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	: 04-Jun-2021 08:50
PO	: VPO00748510	Date Analysis Commenced	: 04-Jun-2021
C-O-C number	: DRY CREEK 2021	Issue Date	: 15-Jun-2021 13:58
Sampler	: AM		
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*
Annabelle Prasad	Analyst	Metals, Burnaby, British Columbia
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, 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
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
Naeun Kim	Analyst	Inorganics, Calgary, Alberta
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
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*
DTMF	*Dissolved concentration exceeds total for field-filtered metals sample. Metallic contaminants may have been introduced to dissolved sample during field filtration.*

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_FRUS_WS_2021-06-02_16:00**	----	----	----	----
				Client sampling date / time	01-Jun-2021 16:00	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2101807-001**	--------	--------	--------	--------
					Result	----	----	----	----
Physical Tests									
acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	----	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	150	----	----	----	----
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	150	----	----	----	----
conductivity	----	E100	2.0	µS/cm	463	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	245	----	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV	461	----	----	----	----
pH	----	E108	0.10	pH units	7.96	----	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	302	----	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L	262	----	----	----	----
turbidity	----	E121	0.10	NTU	32.3	----	----	----	----
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0135	----	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L	1.01	----	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	0.180	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	1.58	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	6.06	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0035	----	----	----	----
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	0.0402	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	83.4	----	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.81	----	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	3.96	----	----	----	----
Ion Balance									
anion sum	----	EC101	0.10	meq/L	5.20	----	----	----	----
cation sum	----	EC101	0.10	meq/L	4.98	----	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_FRUS_WS_ 2021-06-02_16: 00**	**----**	**----**	**----**	**----**
				Client sampling date / time	01-Jun-2021 16:00	----	----	----	----
Analyte	CAS Number	Method	LOR	Unit	**CG2101807-001**	**--------**	**--------**	**--------**	**--------**
					Result	----	----	----	----
Ion Balance									
ion balance (cations/anions ratio)	----	EC101	0.010	%	95.8	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%	2.16	----	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.207	----	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00014	----	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00036	----	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0614	----	----	----	----
beryllium, total	7440-41-7	E420	0.020	µg/L	0.031	----	----	----	----
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	0.143	----	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	67.6	----	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00070	----	----	----	----
cobalt, total	7440-48-4	E420	0.10	µg/L	0.38	----	----	----	----
copper, total	7440-50-8	E420	0.00050	mg/L	0.00097	----	----	----	----
iron, total	7439-89-6	E420	0.010	mg/L	0.392	----	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	0.000598	----	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0134	----	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	25.3	----	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	0.0419	----	----	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L	0.00403	----	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000628	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00276	----	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	0.922	----	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L	25.2	----	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L	2.08	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	----	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L	1.35	----	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L	0.107	----	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	31.7	----	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_FRUS_WS_2021-06-02_16:00**	----	----	----	----
				Client sampling date / time	01-Jun-2021 16:00	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2101807-001**	--------	--------	--------	--------
					Result	----	----	----	----
Total Metals									
thallium, total	7440-28-0	E420	0.000010	mg/L	0.000013	----	----	----	----
tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	----	----	----	----
titanium, total	7440-32-6	E420	0.00030	mg/L	0.00237	----	----	----	----
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00148	----	----	----	----
vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00121	----	----	----	----
zinc, total	7440-66-6	E420	0.0030	mg/L	0.0070	----	----	----	----
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0055	----	----	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00012	----	----	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00014	----	----	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0520	----	----	----	----
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	0.0174	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L	59.1	----	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00011	----	----	----	----
cobalt, dissolved	7440-48-4	E421	0.10	µg/L	<0.10	----	----	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00035	----	----	----	----
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	0.0137	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	23.7	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00530	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.000874 DTMF	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00106	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	0.928	----	----	----	----
selenium, dissolved	7782-49-2	E421	0.050	µg/L	24.6	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L	1.91	----	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_FRUS_WS_2021-06-02_16:00**	**----**	**----**	**----**	**----**
				Client sampling date / time	01-Jun-2021 16:00	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2101807-001**	**--------**	**--------**	**--------**	**--------**
					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	1.40	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.0924	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	30.6	----	----	----	----
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	0.00130	----	----	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	----	----	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0014	----	----	----	----
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.

ALS Environmental

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2101807**	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	Telephone	: +1 403 407 1800
Project	: Regional Effects Program	Date Samples Received	: 04-Jun-2021 08:50
PO	: VPO00748510	Issue Date	: 15-Jun-2021 13:58
C-O-C number	: DRY CREEK 2021		
Sampler	: AM		
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

- Quality Control Sample Frequency Outliers occur - please see following pages for full details.

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	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) LC_FRUS_WS_2021-06-02_16:00	E298	01-Jun-2021	12-Jun-2021	----	11 days	✓	12-Jun-2021	28 days	1 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE LC_FRUS_WS_2021-06-02_16:00	E235.Br-L	01-Jun-2021	----	----	----		04-Jun-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE LC_FRUS_WS_2021-06-02_16:00	E235.Cl-L	01-Jun-2021	----	----	----		04-Jun-2021	28 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE LC_FRUS_WS_2021-06-02_16:00	E378-U	01-Jun-2021	----	----	----		04-Jun-2021	3 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE LC_FRUS_WS_2021-06-02_16:00	E235.F	01-Jun-2021	----	----	----		04-Jun-2021	28 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LC_FRUS_WS_2021-06-02_16:00	E235.NO3-L	01-Jun-2021	----	----	----		04-Jun-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LC_FRUS_WS_2021-06-02_16:00	E235.NO2-L	01-Jun-2021	----	----	----		04-Jun-2021	3 days	3 days	✓

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*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 LC_FRUS_WS_2021-06-02_16:00	E235.SO4	01-Jun-2021	----	----	----		04-Jun-2021	28 days	3 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) LC_FRUS_WS_2021-06-02_16:00	E318	01-Jun-2021	08-Jun-2021	----	8 days	✓	08-Jun-2021	28 days	1 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) LC_FRUS_WS_2021-06-02_16:00	E372-U	01-Jun-2021	11-Jun-2021	----	10 days	✓	11-Jun-2021	28 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LC_FRUS_WS_2021-06-02_16:00	E421.Cr-L	01-Jun-2021	07-Jun-2021	----	7 days	✓	08-Jun-2021	180 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) LC_FRUS_WS_2021-06-02_16:00	E509	01-Jun-2021	09-Jun-2021	----	9 days	✓	09-Jun-2021	28 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LC_FRUS_WS_2021-06-02_16:00	E421	01-Jun-2021	07-Jun-2021	----	7 days	✓	08-Jun-2021	180 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) LC_FRUS_WS_2021-06-02_16:00	E358-L	01-Jun-2021	10-Jun-2021	----	9 days	✓	10-Jun-2021	28 days	1 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) LC_FRUS_WS_2021-06-02_16:00	E355-L	01-Jun-2021	10-Jun-2021	----	9 days	✓	10-Jun-2021	28 days	1 days	✓
Physical Tests : Acidity by Titration										
HDPE LC_FRUS_WS_2021-06-02_16:00	E283	01-Jun-2021	----	----	----		10-Jun-2021	14 days	10 days	✓

Matrix: **Water**

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

Analyte Group Container / Client Sample ID(s)	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
			Preparation Date	*Holding Times Rec*	*Holding Times Actual*	*Eval*	*Analysis Date*	*Holding Times Rec*	*Holding Times Actual*	*Eval*
Physical Tests : Alkalinity Species by Titration										
HDPE LC_FRUS_WS_2021-06-02_16:00	E290	01-Jun-2021	----	----	----		09-Jun-2021	14 days	9 days	✓
Physical Tests : Conductivity in Water										
HDPE LC_FRUS_WS_2021-06-02_16:00	E100	01-Jun-2021	----	----	----		09-Jun-2021	28 days	9 days	✓
Physical Tests : ORP by Electrode										
HDPE LC_FRUS_WS_2021-06-02_16:00	E125	01-Jun-2021	----	----	----		10-Jun-2021	0.34 hrs	217 hrs	✗ EHTR-FM
Physical Tests : pH by Meter										
HDPE LC_FRUS_WS_2021-06-02_16:00	E108	01-Jun-2021	----	----	----		09-Jun-2021	0.25 hrs	192 hrs	✗ EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE LC_FRUS_WS_2021-06-02_16:00	E162	01-Jun-2021	----	----	----		07-Jun-2021	7 days	6 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] LC_FRUS_WS_2021-06-02_16:00	E160-L	01-Jun-2021	----	----	----		05-Jun-2021	7 days	4 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE LC_FRUS_WS_2021-06-02_16:00	E121	01-Jun-2021	----	----	----		04-Jun-2021	3 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) LC_FRUS_WS_2021-06-02_16:00	E420.Cr-L	01-Jun-2021	----	----	----		07-Jun-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) LC_FRUS_WS_2021-06-02_16:00	E508-L	01-Jun-2021	----	----	----		09-Jun-2021	28 days	9 days	✓

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) LC_FRUS_WS_2021-06-02_16:00	E420	01-Jun-2021	----	----	----		07-Jun-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	218386	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	217228	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	219506	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	213300	1	10	10.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	213301	1	10	10.0	5.0	✓
Conductivity in Water	E100	217227	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	215362	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	217199	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	215363	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	217620	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	213457	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	213304	1	10	10.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	213302	1	10	10.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	213303	1	10	10.0	5.0	✓
ORP by Electrode	E125	217890	1	20	5.0	5.0	✓
pH by Meter	E108	217226	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	213299	1	10	10.0	5.0	✓
TDS by Gravimetry	E162	214170	1	15	6.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	214554	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	216028	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	217269	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	214555	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	217621	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	216805	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	213120	1	1	100.0	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	218386	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	217228	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	219506	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	213300	1	10	10.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	213301	1	10	10.0	5.0	✓
Conductivity in Water	E100	217227	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	215362	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	217199	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	215363	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	217620	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	213457	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	213304	1	10	10.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	213302	1	10	10.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	213303	1	10	10.0	5.0	✓
ORP by Electrode	E125	217890	1	20	5.0	5.0	✓
pH by Meter	E108	217226	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	213299	1	10	10.0	5.0	✓
TDS by Gravimetry	E162	214170	1	15	6.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	214554	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	216028	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	217269	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	214555	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	217621	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	216805	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	214164	1	2	50.0	5.0	✓
Turbidity by Nephelometry	E121	213120	1	1	100.0	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	218386	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	217228	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	219506	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	213300	1	10	10.0	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	213301	1	10	10.0	5.0	✓
Conductivity in Water	E100	217227	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	215362	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	217199	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	215363	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	217620	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	213457	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	213304	1	10	10.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	213302	1	10	10.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	213303	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	213299	1	10	10.0	5.0	✓
TDS by Gravimetry	E162	214170	1	15	6.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	214554	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	216028	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	217269	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	214555	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	217621	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	216805	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	214164	1	2	50.0	5.0	✓
Turbidity by Nephelometry	E121	213120	1	1	100.0	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	219506	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	213300	0	10	0.0	5.0	✗
Chloride in Water by IC (Low Level)	E235.Cl-L	213301	0	10	0.0	5.0	✗
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	215362	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	217199	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	215363	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	217620	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	213457	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	213304	0	10	0.0	5.0	✗
Nitrate in Water by IC (Low Level)	E235.NO3-L	213302	0	10	0.0	5.0	✗
Nitrite in Water by IC (Low Level)	E235.NO2-L	213303	0	10	0.0	5.0	✗
Sulfate in Water by IC	E235.SO4	213299	0	10	0.0	5.0	✗
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	214554	0	20	0.0	5.0	✗
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	216028	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	217269	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	214555	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	217621	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	216805	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 Vancouver - 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 CO2. 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 Vancouver - 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 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 Vancouver - Environmental	Water		Preparation for Total Organic Carbon by Combustion
Preparation for Dissolved Organic Carbon for Combustion	EP358 Vancouver - 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.

QUALITY CONTROL REPORT

Work Order	: **CG2101807**	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	Telephone	: +1 403 407 1800
Project	: Regional Effects Program	Date Samples Received	: 04-Jun-2021 08:50
PO	: VPO00748510	Date Analysis Commenced	: 04-Jun-2021
C-O-C number	: DRY CREEK 2021	Issue Date	: 15-Jun-2021 13:58
Sampler	: AM		
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*
Annabelle Prasad	Analyst	Metals, Burnaby, British Columbia
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, 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
Lindsay Gung	Supervisor - Water Chemistry	Inorganics, Burnaby, British Columbia
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Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Sara Niroomand		Inorganics, Calgary, Alberta
Sristika Chand	Lab 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: 213120)											
CG2101807-001	LC_FRUS_WS_2021-06-02_16:00	turbidity	----	E121	0.10	NTU	32.3	34.0	5.13%	15%	----
Physical Tests (QC Lot: 214170)											
CG2101773-008	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	146	144	2	Diff <2x LOR	----
Physical Tests (QC Lot: 217226)											
CG2101806-001	Anonymous	pH	----	E108	0.10	pH units	8.08	8.11	0.370%	4%	----
Physical Tests (QC Lot: 217227)											
CG2101806-001	Anonymous	conductivity	----	E100	2.0	µS/cm	973	950	2.39%	10%	----
Physical Tests (QC Lot: 217228)											
CG2101806-001	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	257	261	1.35%	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	257	261	1.35%	20%	----
Physical Tests (QC Lot: 217890)											
CG2101806-001	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	475	468	1.36%	15%	----
Physical Tests (QC Lot: 218386)											
CG2101806-001	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 213299)											
CG2101807-001	LC_FRUS_WS_2021-06-02_16:00	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	83.4	83.6	0.147%	20%	----
Anions and Nutrients (QC Lot: 213300)											
CG2101807-001	LC_FRUS_WS_2021-06-02_16:00	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 213301)											
CG2101807-001	LC_FRUS_WS_2021-06-02_16:00	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	1.01	1.00	1.78%	20%	----
Anions and Nutrients (QC Lot: 213302)											
CG2101807-001	LC_FRUS_WS_2021-06-02_16:00	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	6.06	6.05	0.144%	20%	----
Anions and Nutrients (QC Lot: 213303)											
CG2101807-001	LC_FRUS_WS_2021-06-02_16:00	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0035	0.0034	0.0001	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 213304)											
CG2101807-001	LC_FRUS_WS_2021-06-02_16:00	fluoride	16984-48-8	E235.F	0.020	mg/L	0.180	0.178	0.002	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: 213457)											
CG2101806-001	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: 216028)											
CG2101804-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.100	mg/L	7.86	7.23	8.38%	20%	----
Anions and Nutrients (QC Lot: 216805)											
CG2101806-001	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: 219506)											
CG2101795-007	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	0.0055	0.0005	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 217620)											
CG2101806-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	0.82	0.83	0.01	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 217621)											
CG2101806-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.83	0.74	0.09	Diff <2x LOR	----
Total Metals (QC Lot: 214554)											
CG2101806-001	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: 214555)											
CG2101806-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0046	0.0042	0.0004	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00010	0.00010	0.000006	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00030	0.00033	0.00003	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0385	0.0376	2.13%	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	0.021	0.0002	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0050	mg/L	1.09 µg/L	0.00114	4.36%	20%	----
		calcium, total	7440-70-2	E420	0.050	mg/L	128	131	2.16%	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	0.332	0.355	6.87%	20%	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.644	0.630	2.13%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.00527	0.00511	3.08%	20%	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0131	0.0130	1.05%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	60.8	61.4	0.992%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0244	0.0253	3.62%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00153	0.00149	2.34%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00143	0.00146	0.00004	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	1.65	1.70	3.08%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	7.87 µg/L	0.00786	0.227%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	4.80	4.78	0.514%	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: 214555) - continued											
CG2101806-001	Anonymous	silver, total	7440-22-4	E420	0.000010	mg/L	0.000022	0.000020	0.000002	Diff <2x LOR	----
		sodium, total	17341-25-2	E420	0.050	mg/L	9.69	9.73	0.415%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.403	0.396	1.73%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	109	110	0.531%	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	0.00051	0.00053	0.00001	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	0.00184	0.00178	2.86%	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	0.0572	0.0567	0.919%	20%	----
Total Metals (QC Lot: 217269)											
CG2101807-001	LC_FRUS_WS_2021-06-02_16:00	mercury, total	7439-97-6	E508-L	0.00050	ng/L	0.00403 µg/L	3.95	0.08	Diff <2x LOR	----
Dissolved Metals (QC Lot: 215362)											
CG2101806-001	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: 215363)											
CG2101806-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0024	0.0023	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	0.00011	0.00011	0.0000003	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0366	0.0363	0.839%	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	0.021	0.020	0.0010	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0050	mg/L	0.548 µg/L	0.000535	2.51%	20%	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	122	119	2.86%	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	0.194	0.192	0.878%	20%	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.035	0.036	0.0005	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	0.000373	0.000373	0.0000002	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	0.0135	0.0132	2.76%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	59.6	59.2	0.762%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0106	0.0105	1.05%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00191	0.00192	0.457%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00120	0.00121	0.00001	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.77	1.76	0.476%	20%	----
		selenium, dissolved	7782-49-2	E421	0.050	mg/L	8.65 µg/L	0.00845	2.36%	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: 215363) - continued											
CG2101806-001	Anonymous	silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.58	4.53	1.09%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	0.000014	0.000014	0.0000002	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.050	mg/L	8.88	8.82	0.659%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.354	0.350	1.10%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	103	101	2.10%	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	0.00216	0.00215	0.474%	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	0.0344	0.0348	1.11%	20%	----
Dissolved Metals (QC Lot: 217199)											
CG2101807-001	LC_FRUS_WS_2021-06-02_16:00	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: 213120)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 214164)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 214170)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 217227)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 217228)						
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: 218386)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Anions and Nutrients (QCLot: 213299)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 213300)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 213301)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 213302)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 213303)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 213304)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 213457)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 216028)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 216805)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 219506)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 219506) - continued						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 217620)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 217621)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 214554)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 214555)						
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: 214555) - 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: 217269)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 215362)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 215363)						
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: 215363) - 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: 217199)						
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: 213120)									
turbidity	----	E121	0.1	NTU	200 NTU	100.0	85.0	115	----
Physical Tests (QCLot: 214164)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	91.0	85.0	115	----
Physical Tests (QCLot: 214170)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	101	85.0	115	----
Physical Tests (QCLot: 217226)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 217227)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	102	90.0	110	----
Physical Tests (QCLot: 217228)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	102	85.0	115	----
Physical Tests (QCLot: 217890)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	101	95.4	104	----
Physical Tests (QCLot: 218386)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	104	85.0	115	----
Anions and Nutrients (QCLot: 213299)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	99.6	90.0	110	----
Anions and Nutrients (QCLot: 213300)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	101	85.0	115	----
Anions and Nutrients (QCLot: 213301)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 213302)									
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: 213303)									
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: 213304)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 213457)									
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: 216028)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	82.4	75.0	125	----
Anions and Nutrients (QCLot: 216805)									

Sub-Matrix: **Water**

Laboratory Control Sample (LCS) Report

Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	*Spike Concentration*	*Recovery (%) LCS*	*Recovery Limits (%) Low*	*High*	*Qualifier*
Anions and Nutrients (QCLot: 216805) - continued									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	100	80.0	120	----
Anions and Nutrients (QCLot: 219506)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	99.0	85.0	115	----
Organic / Inorganic Carbon (QCLot: 217620)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	102	80.0	120	----
Organic / Inorganic Carbon (QCLot: 217621)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	96.2	80.0	120	----
Total Metals (QCLot: 214554)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	109	80.0	120	----
Total Metals (QCLot: 214555)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	105	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	116	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	104	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	104	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	118	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	105	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	108	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	107	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	106	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	114	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	106	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	107	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	113	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	106	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	107	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	112	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	112	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	116	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	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: 214555) - 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	104	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	109	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	116	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	110	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	104	80.0	120	----
Total Metals (QCLot: 217269)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	98.2	80.0	120	----
Dissolved Metals (QCLot: 215362)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	105	80.0	120	----
Dissolved Metals (QCLot: 215363)									
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	106	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	106	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	107	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	89.0	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	96.8	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	105	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	105	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	108	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	98.8	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	107	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	104	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	104	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	107	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	113	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	103	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	105	80.0	120	----
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	102	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	94.2	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
Dissolved Metals (QCLot: 215363) - continued									
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	102	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	99.7	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	106	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	110	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	90.4	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: 213457)										
CG2101806-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0487 mg/L	0.05 mg/L	97.4	70.0	130	----
Anions and Nutrients (QCLot: 216028)										
CG2101806-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	3.20 mg/L	2.5 mg/L	128	70.0	130	----
Anions and Nutrients (QCLot: 216805)										
CG2101806-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0582 mg/L	0.0676 mg/L	86.1	70.0	130	----
Anions and Nutrients (QCLot: 219506)										
CG2101809-008	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.109 mg/L	0.1 mg/L	109	75.0	125	----
Organic / Inorganic Carbon (QCLot: 217620)										
CG2101806-002	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	10.1 mg/L	10 mg/L	101	70.0	130	----
Organic / Inorganic Carbon (QCLot: 217621)										
CG2101806-002	Anonymous	carbon, total organic [TOC]	----	E355-L	4.45 mg/L	5 mg/L	89.0	70.0	130	----
Total Metals (QCLot: 214555)										
CG2101806-001	Anonymous	aluminum, total	7429-90-5	E420	0.203 mg/L	0.2 mg/L	101	70.0	130	----
		antimony, total	7440-36-0	E420	0.0215 mg/L	0.02 mg/L	108	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0208 mg/L	0.02 mg/L	104	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	0.0365 mg/L	0.04 mg/L	91.2	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	0.094 mg/L	0.1 mg/L	93.9	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00394 mg/L	0.004 mg/L	98.5	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	0.0197 mg/L	0.02 mg/L	98.7	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	1.99 mg/L	2 mg/L	99.7	70.0	130	----
		lead, total	7439-92-1	E420	0.0198 mg/L	0.02 mg/L	99.1	70.0	130	----
		lithium, total	7439-93-2	E420	0.0926 mg/L	0.1 mg/L	92.6	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	0.0215 mg/L	0.02 mg/L	107	70.0	130	----
		nickel, total	7440-02-0	E420	0.0380 mg/L	0.04 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: 214555) - continued										
CG2101806-001	Anonymous	potassium, total	7440-09-7	E420	4.13 mg/L	4 mg/L	103	70.0	130	----
		selenium, total	7782-49-2	E420	0.0425 mg/L	0.04 mg/L	106	70.0	130	----
		silicon, total	7440-21-3	E420	9.15 mg/L	10 mg/L	91.5	70.0	130	----
		silver, total	7440-22-4	E420	0.00410 mg/L	0.004 mg/L	102	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	0.00382 mg/L	0.004 mg/L	95.6	70.0	130	----
		tin, total	7440-31-5	E420	0.0205 mg/L	0.02 mg/L	103	70.0	130	----
		titanium, total	7440-32-6	E420	0.0415 mg/L	0.04 mg/L	104	70.0	130	----
		uranium, total	7440-61-1	E420	0.00416 mg/L	0.004 mg/L	104	70.0	130	----
		vanadium, total	7440-62-2	E420	0.107 mg/L	0.1 mg/L	107	70.0	130	----
		zinc, total	7440-66-6	E420	0.382 mg/L	0.4 mg/L	95.6	70.0	130	----
Total Metals (QCLot: 217269)										
CG2101809-001	Anonymous	mercury, total	7439-97-6	E508-L	4.73 ng/L	5 ng/L	94.6	70.0	130	----
Dissolved Metals (QCLot: 215362)										
CG2101806-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0394 mg/L	0.04 mg/L	98.5	70.0	130	----
Dissolved Metals (QCLot: 215363)										
CG2101806-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.192 mg/L	0.2 mg/L	96.2	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0218 mg/L	0.02 mg/L	109	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0199 mg/L	0.02 mg/L	99.6	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	0.0397 mg/L	0.04 mg/L	99.3	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	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00398 mg/L	0.004 mg/L	99.6	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	0.0188 mg/L	0.02 mg/L	94.0	70.0	130	----
		copper, dissolved	7440-50-8	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.92 mg/L	2 mg/L	95.8	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0182 mg/L	0.02 mg/L	91.3	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0929 mg/L	0.1 mg/L	92.9	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	0.0185 mg/L	0.02 mg/L	92.7	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0220 mg/L	0.02 mg/L	110	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0367 mg/L	0.04 mg/L	91.8	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*Concentration*	*Target*	*MS*	*Low*	*High*	*Qualifier*
Dissolved Metals (QCLot: 215363) - continued										
CG2101806-001	Anonymous	potassium, dissolved	7440-09-7	E421	3.82 mg/L	4 mg/L	95.6	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0414 mg/L	0.04 mg/L	104	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.62 mg/L	10 mg/L	96.2	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00394 mg/L	0.004 mg/L	98.6	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	0.00361 mg/L	0.004 mg/L	90.2	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0217 mg/L	0.02 mg/L	109	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0430 mg/L	0.04 mg/L	108	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00372 mg/L	0.004 mg/L	92.9	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0997 mg/L	0.1 mg/L	99.7	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.374 mg/L	0.4 mg/L	93.5	70.0	130	----
Dissolved Metals (QCLot: 217199)										
CG2101810-001	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000948 mg/L	0.0001 mg/L	94.8	70.0	130	----

Teck

Page 1 of 1

COC ID:	Dry Creek 2021	**TURNAROUND TIME:**	

PROJECT/CLIENT INFO

Facility Name	REP		
Project Manager	Cait Good		
Email	cait.good@teck.com		
Address	421 Pine Avenue		
City	Sparwood	Province	BC
Postal Code	V0B 2G0	Country	Canada
Phone Number	250-425-8202		

LABORATORY

Lab Name	ALS Calgary		
Lab Contact	Lyudmyla Shvets		
Email	lyudmyla.shvets@alsglobal.com		
Address	2559 29 Street NE		
City	Calgary	Province	AB
Postal Code	T1Y 7B5	Country	Canada
Phone Number	1 403 407 1794		

	Excel	PDF	EDD
[illegible]	x	x	x
teckcoal@equisonline.com			x
[illegible]	x	x	x
alex.mcclymont@minnow.ca	x	x	x
[illegible]	x	x	x

PO 748510

SAMPLE DETAILS / **ANALYSIS REQUESTED**

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	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
								N	F	N	N	F	N	F
									H2SO4	H2SO4		HCL	HNO3	HNO3
LC_FRUS_WS_2021-06-02_16:00	LC_FRUS	WS	No	6/1/2021	16:00	G	7	1	1	1	1	1	1	1

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

PO 748510

RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
			04/06 8:50

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	Alex McClymont	Mobile #	780-293-6750
Sampler's Signature	AM	Date/Time	June 3, 2021

20

Environmental Division
Calgary
Work Order Reference
CG2101807

Telephone : +1 403 407 1800

WATER CHEMISTRY

ALS Laboratory Report L2565161

[redacted]

Teck Coal Ltd.
ATTN: Cait Good
421 Pine Avenue
Sparwood BC V0B 2G0

Date Received:	09-MAR-21
Report Date:	18-MAR-21 14:50 (MT)
Version:	FINAL

Client Phone: 250-425-8202

Certificate of Analysis

Lab Work Order #:	L2565161
Project P.O. #:	VPO00689999
Job Reference:	LINE CREEK OPERATIONS
C of C Numbers:	Dry Creek 2021
Legal Site Desc:	

[redacted]

Lyudmyla Shvets, B.Sc.
Account Manager

[redacted]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2565161-1				
	Description	WS				
	Sampled Date	08-MAR-21				
	Sampled Time	12:45				
	Client ID	LC_DCEF_WS_2021-03-08				
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (@ 25C) (uS/cm)	276				
	Hardness (as CaCO3) (mg/L)	154				
	pH (pH)	8.36				
	ORP (mV)	307				
	Total Suspended Solids (mg/L)	<1.0				
	Total Dissolved Solids (mg/L)	165 DLHC				
	Turbidity (NTU)	<0.10				
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	147				
	Alkalinity, Carbonate (as CaCO3) (mg/L)	6.4				
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0				
	Alkalinity, Total (as CaCO3) (mg/L)	153				
	Ammonia as N (mg/L)	0.0985				
	Bromide (Br) (mg/L)	<0.050				
	Chloride (Cl) (mg/L)	0.26				
	Fluoride (F) (mg/L)	0.063				
	Ion Balance (%)	101				
	Nitrate (as N) (mg/L)	0.116				
	Nitrite (as N) (mg/L)	<0.0010				
	Total Kjeldahl Nitrogen (mg/L)	0.201				
	Orthophosphate-Dissolved (as P) (mg/L)	0.0143				
	Phosphorus (P)-Total (mg/L)	0.0149				
	Sulfate (SO4) (mg/L)	5.42				
	Anion Sum (meq/L)	3.19				
	Cation Sum (meq/L)	3.23				
	Cation - Anion Balance (%)	0.5				
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	0.57				
	Total Organic Carbon (mg/L)	0.64				
Total Metals	Aluminum (Al)-Total (mg/L)	<0.0030				
	Antimony (Sb)-Total (mg/L)	0.00013				
	Arsenic (As)-Total (mg/L)	0.00017				
	Barium (Ba)-Total (mg/L)	0.270				
	Beryllium (Be)-Total (ug/L)	<0.020				
	Bismuth (Bi)-Total (mg/L)	<0.000050				
	Boron (B)-Total (mg/L)	<0.010				
	Cadmium (Cd)-Total (ug/L)	0.0363				

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2565161-1
	Description	WS
	Sampled Date	08-MAR-21
	Sampled Time	12:45
	Client ID	LC_DCEF_WS_2021-03-08
Grouping	**Analyte**	
WATER		
Total Metals	Calcium (Ca)-Total (mg/L)	37.9
	Chromium (Cr)-Total (mg/L)	0.00012
	Cobalt (Co)-Total (ug/L)	<0.10
	Copper (Cu)-Total (mg/L)	<0.00050
	Iron (Fe)-Total (mg/L)	<0.010
	Lead (Pb)-Total (mg/L)	<0.000050
	Lithium (Li)-Total (mg/L)	0.0191
	Magnesium (Mg)-Total (mg/L)	14.8
	Manganese (Mn)-Total (mg/L)	<0.00010
	Mercury (Hg)-Total (ug/L)	<0.00050
	Molybdenum (Mo)-Total (mg/L)	0.00121
	Nickel (Ni)-Total (mg/L)	<0.00050
	Potassium (K)-Total (mg/L)	1.03
	Selenium (Se)-Total (ug/L)	1.46
	Silicon (Si)-Total (mg/L)	2.85
	Silver (Ag)-Total (mg/L)	<0.000010
	Sodium (Na)-Total (mg/L)	2.76
	Strontium (Sr)-Total (mg/L)	0.0562
	Sulfur (S)-Total (mg/L)	2.52
	Thallium (Tl)-Total (mg/L)	<0.000010
	Tin (Sn)-Total (mg/L)	<0.00010
	Titanium (Ti)-Total (mg/L)	<0.010
	Uranium (U)-Total (mg/L)	0.000451
	Vanadium (V)-Total (mg/L)	0.00051
	Zinc (Zn)-Total (mg/L)	<0.0030
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD
	Dissolved Metals Filtration Location	FIELD
	Aluminum (Al)-Dissolved (mg/L)	<0.0030
	Antimony (Sb)-Dissolved (mg/L)	0.00012
	Arsenic (As)-Dissolved (mg/L)	0.00015
	Barium (Ba)-Dissolved (mg/L)	0.271
	Beryllium (Be)-Dissolved (ug/L)	<0.020
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050
	Boron (B)-Dissolved (mg/L)	<0.010
	Cadmium (Cd)-Dissolved (ug/L)	0.0367
	Calcium (Ca)-Dissolved (mg/L)	37.2
	Chromium (Cr)-Dissolved (mg/L)	0.00011

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2565161-1				
	Description	WS				
	Sampled Date	08-MAR-21				
	Sampled Time	12:45				
	Client ID	LC_DCEF_WS_2021-03-08				
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (ug/L)	<0.10				
	Copper (Cu)-Dissolved (mg/L)	<0.00020				
	Iron (Fe)-Dissolved (mg/L)	<0.010				
	Lead (Pb)-Dissolved (mg/L)	<0.000050				
	Lithium (Li)-Dissolved (mg/L)	0.0190				
	Magnesium (Mg)-Dissolved (mg/L)	14.8				
	Manganese (Mn)-Dissolved (mg/L)	<0.00010				
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050				
	Molybdenum (Mo)-Dissolved (mg/L)	0.00114				
	Nickel (Ni)-Dissolved (mg/L)	<0.00050				
	Potassium (K)-Dissolved (mg/L)	1.06				
	Selenium (Se)-Dissolved (ug/L)	1.44				
	Silicon (Si)-Dissolved (mg/L)	2.86				
	Silver (Ag)-Dissolved (mg/L)	<0.000010				
	Sodium (Na)-Dissolved (mg/L)	2.65				
	Strontium (Sr)-Dissolved (mg/L)	0.0541				
	Sulfur (S)-Dissolved (mg/L)	2.25				
	Thallium (Tl)-Dissolved (mg/L)	<0.000010				
	Tin (Sn)-Dissolved (mg/L)	<0.00010				
	Titanium (Ti)-Dissolved (mg/L)	<0.010				
	Uranium (U)-Dissolved (mg/L)	0.000452				
	Vanadium (V)-Dissolved (mg/L)	<0.00050				
	Zinc (Zn)-Dissolved (mg/L)	<0.0010				

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)

Qualifiers for Individual Parameters Listed:

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

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALS Test Code	Matrix	Test Description	Method Reference**
ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

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

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

ALS Test Code	Matrix	Test Description	Method Reference**
BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

ALS Test Code	Matrix	Test Description	Method Reference**
BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference**
C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.
TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

ALS Test Code	Matrix	Test Description	Method Reference**
C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.
TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

ALS Test Code	Matrix	Test Description	Method Reference**
CL-L-IC-N-CL	Water	Chloride in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference**
EC-L-PCT-CL	Water	Electrical Conductivity (EC)	APHA 2510B

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 25C.

ALS Test Code	Matrix	Test Description	Method Reference**
F-IC-N-CL	Water	Fluoride in Water by IC	EPA 300.1 (mod)

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

ALS Test Code	Matrix	Test Description	Method Reference**
HARDNESS-CALC-VA	Water	Hardness	APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

ALS Test Code	Matrix	Test Description	Method Reference**
HG-D-CVAA-VA	Water	Diss. Mercury in Water by CVAAS or CVAFS	APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction

Reference Information

with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-U-CVAF-VA Water Total Mercury in Water by CVAFS (Ultra) EPA 1631 REV. E

This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

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

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

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

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

PH-CL Water pH APHA 4500 H-Electrode

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

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

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

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

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Reference Information

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL	Water	Total Kjeldahl Nitrogen	APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL	Water	Total Suspended Solids	APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL	Water	Turbidity	APHA 2130 B-Nephelometer

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

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Dry Creek 2021

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

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Quality Control Report

Workorder: L2565161 Report Date: 18-MAR-21

Client: Teck Coal Ltd.
421 Pine Avenue
Sparwood BC V0B 2G0
Contact: Cait Good

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	**Water**							
Batch R5403085								
WG3504572-11 LCS								
Acidity (as CaCO3)			107.5		%		85-115	17-MAR-21
WG3504572-10 MB								
Acidity (as CaCO3)			1.8		mg/L		2	17-MAR-21
ALK-MAN-CL	**Water**							
Batch R5403062								
WG3504505-14 LCS								
Alkalinity, Total (as CaCO3)			103.7		%		85-115	17-MAR-21
WG3504505-13 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	17-MAR-21
BE-D-L-CCMS-VA	**Water**							
Batch R5400095								
WG3500868-2 LCS								
Beryllium (Be)-Dissolved			98.5		%		80-120	11-MAR-21
WG3500868-1 MB		**NP**						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	11-MAR-21
BE-T-L-CCMS-VA	**Water**							
Batch R5400077								
WG3500877-2 LCS								
Beryllium (Be)-Total			103.0		%		80-120	11-MAR-21
WG3500877-1 MB								
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	11-MAR-21
BR-L-IC-N-CL	**Water**							
Batch R5399989								
WG3500704-2 LCS								
Bromide (Br)			104.1		%		85-115	10-MAR-21
WG3500704-1 MB								
Bromide (Br)			<0.050		mg/L		0.05	10-MAR-21
C-DIS-ORG-LOW-CL	**Water**							
Batch R5402661								
WG3504031-3 DUP		**L2565161-1**						
Dissolved Organic Carbon		0.57	0.61		mg/L	8.0	20	17-MAR-21
WG3504031-2 LCS								
Dissolved Organic Carbon			104.4		%		80-120	17-MAR-21
WG3504031-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	17-MAR-21
WG3504031-4 MS		**L2565161-1**						

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL	**Water**							
Batch R5402661								
WG3504031-4 MS		**L2565161-1**						
Dissolved Organic Carbon			122.0		%		70-130	17-MAR-21
C-TOT-ORG-LOW-CL	**Water**							
Batch R5402661								
WG3504031-3 DUP		**L2565161-1**						
Total Organic Carbon		0.64	0.64		mg/L	1.3	20	17-MAR-21
WG3504031-2 LCS								
Total Organic Carbon			116.9		%		80-120	17-MAR-21
WG3504031-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	17-MAR-21
WG3504031-4 MS		**L2565161-1**						
Total Organic Carbon			109.9		%		70-130	17-MAR-21
CL-L-IC-N-CL	**Water**							
Batch R5399989								
WG3500704-2 LCS								
Chloride (Cl)			107.3		%		85-115	10-MAR-21
WG3500704-1 MB								
Chloride (Cl)			<0.10		mg/L		0.1	10-MAR-21
EC-L-PCT-CL	**Water**							
Batch R5403062								
WG3504505-14 LCS								
Conductivity (@ 25C)			96.7		%		90-110	17-MAR-21
WG3504505-13 MB								
Conductivity (@ 25C)			<2.0		uS/cm		2	17-MAR-21
F-IC-N-CL	**Water**							
Batch R5399989								
WG3500704-2 LCS								
Fluoride (F)			97.2		%		90-110	10-MAR-21
WG3500704-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	10-MAR-21
HG-D-CVAA-VA	**Water**							
Batch R5400206								
WG3501090-3 DUP		**L2565161-1**						
Mercury (Hg)-Dissolved		<0.0000050	<0.000005	RPD-NA	mg/L	N/A	20	12-MAR-21
WG3501090-2 LCS								
Mercury (Hg)-Dissolved			98.9		%		80-120	12-MAR-21

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA	**Water**							
Batch R5400206								
WG3501090-1 MB		**NP**						
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	12-MAR-21
HG-T-U-CVAF-VA	**Water**							
Batch R5400693								
WG3501749-2 LCS								
Mercury (Hg)-Total			97.6		%		80-120	13-MAR-21
WG3501749-1 MB								
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	13-MAR-21
MET-D-CCMS-VA	**Water**							
Batch R5400095								
WG3500868-2 LCS								
Aluminum (Al)-Dissolved			99.6		%		80-120	11-MAR-21
Antimony (Sb)-Dissolved			107.1		%		80-120	11-MAR-21
Arsenic (As)-Dissolved			107.4		%		80-120	11-MAR-21
Barium (Ba)-Dissolved			107.5		%		80-120	11-MAR-21
Bismuth (Bi)-Dissolved			97.6		%		80-120	11-MAR-21
Boron (B)-Dissolved			93.1		%		80-120	11-MAR-21
Cadmium (Cd)-Dissolved			108.6		%		80-120	11-MAR-21
Calcium (Ca)-Dissolved			101.3		%		80-120	11-MAR-21
Chromium (Cr)-Dissolved			102.0		%		80-120	11-MAR-21
Cobalt (Co)-Dissolved			103.2		%		80-120	11-MAR-21
Copper (Cu)-Dissolved			102.8		%		80-120	11-MAR-21
Iron (Fe)-Dissolved			93.1		%		80-120	11-MAR-21
Lead (Pb)-Dissolved			106.6		%		80-120	11-MAR-21
Lithium (Li)-Dissolved			91.6		%		80-120	11-MAR-21
Magnesium (Mg)-Dissolved			102.8		%		80-120	11-MAR-21
Manganese (Mn)-Dissolved			96.4		%		80-120	11-MAR-21
Molybdenum (Mo)-Dissolved			100.2		%		80-120	11-MAR-21
Nickel (Ni)-Dissolved			101.1		%		80-120	11-MAR-21
Potassium (K)-Dissolved			103.5		%		80-120	11-MAR-21
Selenium (Se)-Dissolved			115.8		%		80-120	11-MAR-21
Silicon (Si)-Dissolved			98.1		%		60-140	11-MAR-21
Silver (Ag)-Dissolved			105.2		%		80-120	11-MAR-21
Sodium (Na)-Dissolved			106.4		%		80-120	11-MAR-21
Strontium (Sr)-Dissolved			105.2		%		80-120	11-MAR-21

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R5400095								
WG3500868-2 LCS								
Sulfur (S)-Dissolved			98.2		%		80-120	11-MAR-21
Thallium (Tl)-Dissolved			108.9		%		80-120	11-MAR-21
Tin (Sn)-Dissolved			97.9		%		80-120	11-MAR-21
Titanium (Ti)-Dissolved			99.0		%		80-120	11-MAR-21
Uranium (U)-Dissolved			108.2		%		80-120	11-MAR-21
Vanadium (V)-Dissolved			101.9		%		80-120	11-MAR-21
Zinc (Zn)-Dissolved			107.9		%		80-120	11-MAR-21
WG3500868-1 MB		**NP**						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	11-MAR-21
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	11-MAR-21
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	11-MAR-21
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	11-MAR-21
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	11-MAR-21
Boron (B)-Dissolved			<0.010		mg/L		0.01	11-MAR-21
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	11-MAR-21
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	11-MAR-21
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	11-MAR-21
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	11-MAR-21
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	11-MAR-21
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	11-MAR-21
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	11-MAR-21
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	11-MAR-21
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	11-MAR-21
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	11-MAR-21
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	11-MAR-21
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	11-MAR-21
Potassium (K)-Dissolved			<0.050		mg/L		0.05	11-MAR-21
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	11-MAR-21
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	11-MAR-21
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	11-MAR-21
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	11-MAR-21
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	11-MAR-21
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	11-MAR-21
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	11-MAR-21

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R5400095								
WG3500868-1 MB		**NP**						
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	11-MAR-21
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	11-MAR-21
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	11-MAR-21
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	11-MAR-21
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	11-MAR-21
MET-T-CCMS-VA	**Water**							
Batch R5400077								
WG3500877-2 LCS								
Aluminum (Al)-Total			104.6		%		80-120	11-MAR-21
Antimony (Sb)-Total			110.0		%		80-120	11-MAR-21
Arsenic (As)-Total			102.8		%		80-120	11-MAR-21
Barium (Ba)-Total			104.3		%		80-120	11-MAR-21
Bismuth (Bi)-Total			105.1		%		80-120	11-MAR-21
Boron (B)-Total			98.8		%		80-120	11-MAR-21
Cadmium (Cd)-Total			102.5		%		80-120	11-MAR-21
Calcium (Ca)-Total			107.1		%		80-120	11-MAR-21
Chromium (Cr)-Total			102.5		%		80-120	11-MAR-21
Cobalt (Co)-Total			103.4		%		80-120	11-MAR-21
Copper (Cu)-Total			102.9		%		80-120	11-MAR-21
Iron (Fe)-Total			106.6		%		80-120	11-MAR-21
Lead (Pb)-Total			105.8		%		80-120	11-MAR-21
Lithium (Li)-Total			100.9		%		80-120	11-MAR-21
Magnesium (Mg)-Total			104.9		%		80-120	11-MAR-21
Manganese (Mn)-Total			101.9		%		80-120	11-MAR-21
Molybdenum (Mo)-Total			109.1		%		80-120	11-MAR-21
Nickel (Ni)-Total			103.3		%		80-120	11-MAR-21
Potassium (K)-Total			103.5		%		80-120	11-MAR-21
Selenium (Se)-Total			106.7		%		80-120	11-MAR-21
Silicon (Si)-Total			99.6		%		80-120	11-MAR-21
Silver (Ag)-Total			106.4		%		80-120	11-MAR-21
Sodium (Na)-Total			107.8		%		80-120	11-MAR-21
Strontium (Sr)-Total			106.9		%		80-120	11-MAR-21
Sulfur (S)-Total			108.2		%		80-120	11-MAR-21
Thallium (Tl)-Total			105.0		%		80-120	11-MAR-21

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	**Water**							
Batch R5400077								
WG3500877-2 LCS								
Tin (Sn)-Total			100.8		%		80-120	11-MAR-21
Titanium (Ti)-Total			99.97		%		80-120	11-MAR-21
Uranium (U)-Total			105.1		%		80-120	11-MAR-21
Vanadium (V)-Total			102.9		%		80-120	11-MAR-21
Zinc (Zn)-Total			106.6		%		80-120	11-MAR-21
WG3500877-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	11-MAR-21
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	11-MAR-21
Arsenic (As)-Total			<0.00010		mg/L		0.0001	11-MAR-21
Barium (Ba)-Total			<0.00010		mg/L		0.0001	11-MAR-21
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	11-MAR-21
Boron (B)-Total			<0.010		mg/L		0.01	11-MAR-21
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	11-MAR-21
Calcium (Ca)-Total			<0.050		mg/L		0.05	11-MAR-21
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	11-MAR-21
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	11-MAR-21
Copper (Cu)-Total			<0.00050		mg/L		0.0005	11-MAR-21
Iron (Fe)-Total			<0.010		mg/L		0.01	11-MAR-21
Lead (Pb)-Total			<0.000050		mg/L		0.00005	11-MAR-21
Lithium (Li)-Total			<0.0010		mg/L		0.001	11-MAR-21
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	11-MAR-21
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	11-MAR-21
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	11-MAR-21
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	11-MAR-21
Potassium (K)-Total			<0.050		mg/L		0.05	11-MAR-21
Selenium (Se)-Total			<0.000050		mg/L		0.00005	11-MAR-21
Silicon (Si)-Total			<0.10		mg/L		0.1	11-MAR-21
Silver (Ag)-Total			<0.000010		mg/L		0.00001	11-MAR-21
Sodium (Na)-Total			<0.050		mg/L		0.05	11-MAR-21
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	11-MAR-21
Sulfur (S)-Total			<0.50		mg/L		0.5	11-MAR-21
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	11-MAR-21
Tin (Sn)-Total			<0.00010		mg/L		0.0001	11-MAR-21
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	11-MAR-21

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Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	**Water**							
Batch R5400077								
WG3500877-1 MB								
Uranium (U)-Total			<0.000010		mg/L		0.00001	11-MAR-21
Vanadium (V)-Total			<0.00050		mg/L		0.0005	11-MAR-21
Zinc (Zn)-Total			<0.0030		mg/L		0.003	11-MAR-21
NH3-L-F-CL	**Water**							
Batch R5401658								
WG3502548-2 LCS								
Ammonia as N			101.0		%		85-115	15-MAR-21
WG3502548-1 MB								
Ammonia as N			<0.0050		mg/L		0.005	15-MAR-21
NO2-L-IC-N-CL	**Water**							
Batch R5399989								
WG3500704-2 LCS								
Nitrite (as N)			109.3		%		90-110	10-MAR-21
WG3500704-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	10-MAR-21
NO3-L-IC-N-CL	**Water**							
Batch R5399989								
WG3500704-2 LCS								
Nitrate (as N)			107.9		%		90-110	10-MAR-21
WG3500704-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	10-MAR-21
ORP-CL	**Water**							
Batch R5401689								
WG3502891-1 CRM		**CL-ORP**						
ORP			224		mV		210-230	16-MAR-21
P-T-L-COL-CL	**Water**							
Batch R5400749								
WG3501744-22 LCS								
Phosphorus (P)-Total			103.0		%		80-120	13-MAR-21
WG3501744-21 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	13-MAR-21
PH-CL	**Water**							

[redacted]

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PH-CL	**Water**							
Batch R5403062								
WG3504505-14 LCS								
pH			7.01		pH		6.9-7.1	17-MAR-21
PO4-DO-L-COL-CL	**Water**							
Batch R5398747								
WG3499529-2 LCS								
Orthophosphate-Dissolved (as P)			94.2		%		80-120	09-MAR-21
WG3499529-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	09-MAR-21
SO4-IC-N-CL	**Water**							
Batch R5399989								
WG3500704-2 LCS								
Sulfate (SO4)			107.1		%		90-110	10-MAR-21
WG3500704-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	10-MAR-21
SOLIDS-TDS-CL	**Water**							
Batch R5401342								
WG3502102-2 LCS								
Total Dissolved Solids			87.6		%		85-115	15-MAR-21
WG3502102-1 MB								
Total Dissolved Solids			<10		mg/L		10	15-MAR-21
TKN-L-F-CL	**Water**							
Batch R5400681								
WG3501437-2 LCS								
Total Kjeldahl Nitrogen			91.0		%		75-125	12-MAR-21
WG3501437-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	12-MAR-21
TSS-L-CL	**Water**							
Batch R5401334								
WG3502103-2 LCS								
Total Suspended Solids			106.7		%		85-115	15-MAR-21
WG3502103-1 MB								
Total Suspended Solids			<1.0		mg/L		1	15-MAR-21
TURBIDITY-CL	**Water**							

[redacted]

Quality Control Report

Workorder: L2565161 Report Date: 18-MAR-21

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TURBIDITY-CL	**Water**							
Batch R5399918								
WG3500845-2 LCS								
Turbidity			99.96		%		85-115	11-MAR-21
WG3500845-1 MB								
Turbidity			<0.10		NTU		0.1	11-MAR-21

Quality Control Report

Legend:

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

Sample Parameter Qualifier Definitions:

Qualifier	Description
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.							
	1	08-MAR-21 12:45	16-MAR-21 09:00	0.25	188	hours	EHTR-FM
pH							
	1	08-MAR-21 12:45	17-MAR-21 10:00	0.25	213	hours	EHTR-FM

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2565161 were received on 09-MAR-21 08:30.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

L2565161-COFC

Teck

Page 1 of 1

COC ID:	Dry Creek 2021	TURNAROUND TIME:	

PROJECT/CLIENT INFO

Facility Name	REP		
Project Manager	Cait Good		
Email	cait.good@teck.com		
Address	421 Pine Avenue		
City	Sparwood	Province	BC
Postal Code	V0B 2G0	Country	Canada
Phone Number	250-425-8202		

LABORATORY

Lab Name	ALS Calgary		
Lab Contact	Lyudmyla Shvets		
Email	lyudmyla.shvets@alsglobal.com		
Address	2559 29 Street NE		
City	Calgary	Province	AB
Postal Code	T1Y 7B5	Country	Canada
Phone Number	1 403 407 1794		

	Excel	PDF	EDD
cait.good@teck.com	x		x
teckcoal@equisonline.com			x
[illegible]	x	x	x
carlie.meyer@teck.com	x	x	x
[illegible]	x	x	x

PO number: 689999

SAMPLE DETAILS

L256161

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.	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				
Filtered								N	F	N	N	F	N	F				
Preserved									H2SO4	H2SO4		HCL	HNO3	HNO3				
LC_DCEF_WS_2021-03-08	LC_DCEF	WS	No	3/8/2021	12:45	G	7	1	1	1	1	1	1	1				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	
PO #: 689999				3/9 830

NB OF BOTTLES RETURNED/DESCRIPTION

Regular (default)	x	Sampler's Name	Maddy Stokes	Mobile #	647-522-0672
Priority (2-3 business days) - 50% surcharge		Sampler's Signature	MS	Date/Time	8-Mar-2021 / 16:30
Emergency (1 Business Day) - 100% surcharge					
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

WATER CHEMISTRY

ALS Laboratory Report L2568053

[redacted]

Teck Coal Ltd.
ATTN: Cait Good
421 Pine Avenue
Sparwood BC V0B 2G0

Date Received: 17-MAR-21
Report Date: 29-MAR-21 15:25 (MT)
Version: FINAL

Client Phone: 250-425-8202

Certificate of Analysis

Lab Work Order #: L2568053
Project P.O. #: VPO00689999
Job Reference: LINE CREEK OPERATION
C of C Numbers: Dry Creek 2021
Legal Site Desc:

[redacted]

Lyudmyla Shvets, B.Sc.
Account Manager

[redacted]

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2568053-1	L2568053-2			
	Description	WS	WS			
	Sampled Date	15-MAR-21	16-MAR-21			
	Sampled Time	13:45	11:00			
	Client ID	LC_FRB_WS_2021-03-15	LC_FRUS_WS_2021-03-16			
Grouping	**Analyte**					
WATER						
Physical Tests	Conductivity (@ 25C) (uS/cm)	941	996			
	Hardness (as CaCO3) (mg/L)	590	650			
	pH (pH)	8.20	8.19			
	ORP (mV)	395	417			
	Total Suspended Solids (mg/L)	2.9	2.3			
	Total Dissolved Solids (mg/L)	DLHC 665	DLHC 731			
	Turbidity (NTU)	0.47	0.18			
Anions and Nutrients	Acidity (as CaCO3) (mg/L)	1.0	<1.0			
	Alkalinity, Bicarbonate (as CaCO3) (mg/L)	227	233			
	Alkalinity, Carbonate (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Hydroxide (as CaCO3) (mg/L)	<1.0	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	227	233			
	Ammonia as N (mg/L)	0.0606	0.0093			
	Bromide (Br) (mg/L)	<0.25	<0.25			
	Chloride (Cl) (mg/L)	2.84	3.51			
	Fluoride (F) (mg/L)	<0.10	<0.10			
	Ion Balance (%)	107	104			
	Nitrate (as N) (mg/L)	HTD 17.4	21.2			
	Nitrite (as N) (mg/L)	0.0114	0.0093			
	Total Kjeldahl Nitrogen (mg/L)	TKNI <0.25	TKNI <0.25			
	Orthophosphate-Dissolved (as P) (mg/L)	<0.0010	<0.0010			
	Phosphorus (P)-Total (mg/L)	<0.0020	<0.0020			
	Sulfate (SO4) (mg/L)	255	309			
	Anion Sum (meq/L)	11.2	12.7			
	Cation Sum (meq/L)	11.9	13.1			
	Cation - Anion Balance (%)	3.2	1.8			
Organic / Inorganic Carbon	Dissolved Organic Carbon (mg/L)	0.53	<0.50			
	Total Organic Carbon (mg/L)	<0.50	<0.50			
Total Metals	Aluminum (Al)-Total (mg/L)	0.0178	0.0057			
	Antimony (Sb)-Total (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Total (mg/L)	<0.00010	<0.00010			
	Barium (Ba)-Total (mg/L)	0.137	0.133			
	Beryllium (Be)-Total (ug/L)	<0.020	<0.020			
	Bismuth (Bi)-Total (mg/L)	<0.000050	<0.000050			
	Boron (B)-Total (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Total (ug/L)	0.0296	0.0259			

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

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID	L2568053-1	L2568053-2			
	Description	WS	WS			
	Sampled Date	15-MAR-21	16-MAR-21			
	Sampled Time	13:45	11:00			
	Client ID	LC_FRB_WS_2021-03-15	LC_FRUS_WS_2021-03-16			
Grouping	**Analyte**					
WATER						
Total Metals	Calcium (Ca)-Total (mg/L)	129	134			
	Chromium (Cr)-Total (mg/L)	0.00014	0.00018			
	Cobalt (Co)-Total (ug/L)	<0.10	<0.10			
	Copper (Cu)-Total (mg/L)	<0.00050	<0.00050			
	Iron (Fe)-Total (mg/L)	0.021	0.016			
	Lead (Pb)-Total (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Total (mg/L)	0.0257	0.0287			
	Magnesium (Mg)-Total (mg/L)	59.2	63.3			
	Manganese (Mn)-Total (mg/L)	0.00236	0.00236			
	Mercury (Hg)-Total (ug/L)	0.00057	<0.00050			
	Molybdenum (Mo)-Total (mg/L)	0.000690	0.000701			
	Nickel (Ni)-Total (mg/L)	<0.00050	0.00057			
	Potassium (K)-Total (mg/L)	1.39	1.49			
	Selenium (Se)-Total (ug/L)	80.7	88.1			
	Silicon (Si)-Total (mg/L)	2.36	2.36			
	Silver (Ag)-Total (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Total (mg/L)	2.82	2.93			
	Strontium (Sr)-Total (mg/L)	0.179	0.189			
	Sulfur (S)-Total (mg/L)	103	112			
	Thallium (Tl)-Total (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Total (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Total (mg/L)	<0.010	<0.010			
	Uranium (U)-Total (mg/L)	0.00280	0.00323			
	Vanadium (V)-Total (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Total (mg/L)	<0.0030	<0.0030			
Dissolved Metals	Dissolved Mercury Filtration Location	FIELD	FIELD			
	Dissolved Metals Filtration Location	FIELD	FIELD			
	Aluminum (Al)-Dissolved (mg/L)	<0.0030	<0.0030			
	Antimony (Sb)-Dissolved (mg/L)	<0.00010	<0.00010			
	Arsenic (As)-Dissolved (mg/L)	<0.00010	<0.00010			
	Barium (Ba)-Dissolved (mg/L)	0.124	0.122			
	Beryllium (Be)-Dissolved (ug/L)	<0.020	<0.020			
	Bismuth (Bi)-Dissolved (mg/L)	<0.000050	<0.000050			
	Boron (B)-Dissolved (mg/L)	<0.010	<0.010			
	Cadmium (Cd)-Dissolved (ug/L)	0.0176	0.0226			
	Calcium (Ca)-Dissolved (mg/L)	138	151			
	Chromium (Cr)-Dissolved (mg/L)	0.00014	0.00013			

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L2568053-1 WS 15-MAR-21 13:45 LC_FRB_WS_2021-03-15	L2568053-2 WS 16-MAR-21 11:00 LC_FRUS_WS_2021-03-16			
Grouping	**Analyte**					
WATER						
Dissolved Metals	Cobalt (Co)-Dissolved (ug/L)	<0.10	<0.10			
	Copper (Cu)-Dissolved (mg/L)	<0.00020	<0.00020			
	Iron (Fe)-Dissolved (mg/L)	<0.010	<0.010			
	Lead (Pb)-Dissolved (mg/L)	<0.000050	<0.000050			
	Lithium (Li)-Dissolved (mg/L)	0.0256	0.0288			
	Magnesium (Mg)-Dissolved (mg/L)	59.3	66.5			
	Manganese (Mn)-Dissolved (mg/L)	0.00131	0.00195			
	Mercury (Hg)-Dissolved (mg/L)	<0.0000050	<0.0000050			
	Molybdenum (Mo)-Dissolved (mg/L)	0.000689	0.000689			
	Nickel (Ni)-Dissolved (mg/L)	<0.00050	<0.00050			
	Potassium (K)-Dissolved (mg/L)	1.31	1.47			
	Selenium (Se)-Dissolved (ug/L)	81.9	88.5			
	Silicon (Si)-Dissolved (mg/L)	2.20	2.26			
	Silver (Ag)-Dissolved (mg/L)	<0.000010	<0.000010			
	Sodium (Na)-Dissolved (mg/L)	2.40	2.66			
	Strontium (Sr)-Dissolved (mg/L)	0.191	0.197			
	Sulfur (S)-Dissolved (mg/L)	95.3	106			
	Thallium (Tl)-Dissolved (mg/L)	<0.000010	<0.000010			
	Tin (Sn)-Dissolved (mg/L)	<0.00010	<0.00010			
	Titanium (Ti)-Dissolved (mg/L)	<0.010	<0.010			
	Uranium (U)-Dissolved (mg/L)	0.00275	0.00306			
	Vanadium (V)-Dissolved (mg/L)	<0.00050	<0.00050			
	Zinc (Zn)-Dissolved (mg/L)	0.0053	<0.0010			

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

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Matrix Spike	Barium (Ba)-Dissolved	MS-B	L2568053-1, -2
Matrix Spike	Calcium (Ca)-Dissolved	MS-B	L2568053-1, -2
Matrix Spike	Magnesium (Mg)-Dissolved	MS-B	L2568053-1, -2
Matrix Spike	Strontium (Sr)-Dissolved	MS-B	L2568053-1, -2
Matrix Spike	Sulfur (S)-Dissolved	MS-B	L2568053-1, -2
Matrix Spike	Barium (Ba)-Total	MS-B	L2568053-1, -2
Matrix Spike	Calcium (Ca)-Total	MS-B	L2568053-1, -2
Matrix Spike	Magnesium (Mg)-Total	MS-B	L2568053-1, -2
Matrix Spike	Selenium (Se)-Total	MS-B	L2568053-1, -2
Matrix Spike	Sodium (Na)-Total	MS-B	L2568053-1, -2
Matrix Spike	Strontium (Sr)-Total	MS-B	L2568053-1, -2
Matrix Spike	Sulfur (S)-Total	MS-B	L2568053-1, -2
Matrix Spike	Uranium (U)-Total	MS-B	L2568053-1, -2

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).
HTD	Hold time exceeded for re-analysis or dilution, but initial testing was conducted within hold time.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
TKNI	TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACIDITY-PCT-CL	Water	Acidity by Automatic Titration	APHA 2310 Acidity

This analysis is carried out using procedures adapted from APHA Method 2310 "Acidity". Acidity is determined by potentiometric titration to a specified endpoint.

ALK-MAN-CL	Water	Alkalinity (Species) by Manual Titration	APHA 2320 ALKALINITY

This analysis is carried out using procedures adapted from APHA Method 2320 "Alkalinity". 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.

BE-D-L-CCMS-VA	Water	Diss. Be (low) in Water by CRC ICPMS	APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

BE-T-L-CCMS-VA	Water	Total Be (Low) in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

BR-L-IC-N-CL	Water	Bromide in Water by IC (Low Level)	EPA 300.1 (mod)

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

C-DIS-ORG-LOW-CL	Water	Dissolved Organic Carbon	APHA 5310 B-Instrumental

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.
TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

C-TOT-ORG-LOW-CL	Water	Total Organic Carbon	APHA 5310 TOTAL ORGANIC CARBON (TOC)

This method is applicable to the analysis of ground water, wastewater, and surface water samples. The form detected depends upon sample pretreatment: Unfiltered sample = TC, 0.45um filtered = TDC. Samples are injected into a combustion tube containing an oxidation catalyst. The carrier gas containing the combustion product from the combustion tube flows through an inorganic carbon reactor vessel and is then sent through a halogen scrubber into a sample cell set in a non-dispersive infrared gas analyzer (NDIR) where carbon dioxide is detected. For total inorganic carbon and dissolved inorganic carbon, the sample is injected into an IC reactor vessel where only the IC component is decomposed to become carbon dioxide.

Reference Information

The peak area generated by the NDIR indicates the TC/TDC or TIC/DIC as applicable. The total organic carbon content of the sample is calculated by subtracting the TIC from the TC.
TOC = TC-TIC, DOC = TDC-DIC, Particulate = Total - Dissolved.

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

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

EC-L-PCT-CL Water Electrical Conductivity (EC) APHA 2510B

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 25C.

F-IC-N-CL Water Fluoride in Water by IC EPA 300.1 (mod)

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

HARDNESS-CALC-VA Water Hardness APHA 2340B

Hardness (also known as Total Hardness) is calculated from the sum of Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. Dissolved Calcium and Magnesium concentrations are preferentially used for the hardness calculation.

HG-D-CVAA-VA Water Diss. Mercury in Water by CVAAS or CVAFS APHA 3030B/EPA 1631E (mod)

Water samples are filtered (0.45 um), preserved with hydrochloric acid, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS or CVAFS.

HG-T-U-CVAF-VA Water Total Mercury in Water by CVAFS (Ultra) EPA 1631 REV. E

This analysis is carried out using procedures adapted from Method 1631 Rev. E. by the United States Environmental Protection Agency (EPA). The procedure involves a cold-oxidation of the acidified sample using bromine monochloride prior to a purge and trap concentration step and final reduction of the sample with stannous chloride. Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry.

IONBALANCE-BC-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

MET-D-CCMS-VA Water Dissolved Metals in Water by CRC ICPMS APHA 3030B/6020A (mod)

Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

MET-T-CCMS-VA Water Total Metals in Water by CRC ICPMS EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

NH3-L-F-CL Water Ammonia, Total (as N) J. ENVIRON. MONIT., 2005, 7, 37-42, RSC

This analysis is carried out, on sulfuric acid preserved samples, using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-L-IC-N-CL Water Nitrite in Water by IC (Low Level) EPA 300.1 (mod)

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

NO3-L-IC-N-CL Water Nitrate in Water by IC (Low Level) EPA 300.1 (mod)

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

ORP-CL Water Oxidation redution potential by elect. ASTM D1498

This analysis is carried out in accordance with the procedure described in the "ASTM" method D1498 "Oxidation-Reduction Potential of Water" published by the American Society for Testing and Materials (ASTM). Results are reported as observed oxidation-reduction potential of the platinum metal-reference electrode employed, in mV.

It is recommended that this analysis be conducted in the field.

P-T-L-COL-CL Water Phosphorus (P)-Total APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is determined colourimetrically after persulphate digestion of the sample.

Reference Information

PH-CL Water pH APHA 4500 H-Electrode

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

PO4-DO-L-COL-CL Water Orthophosphate-Dissolved (as P) APHA 4500-P PHOSPHORUS

This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Dissolved Orthophosphate is determined colourimetrically on a sample that has been lab or field filtered through a 0.45 micron membrane filter.

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

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

SOLIDS-TDS-CL Water Total Dissolved Solids APHA 2540 C

A well-mixed sample is filtered through a glass fibre filter paper. The filtrate is then evaporated to dryness in a pre-weighed vial and dried at 180 – 2 °C. The increase in vial weight represents the total dissolved solids (TDS).

TECKCOAL-IONBAL-CL Water Ion Balance Calculation APHA 1030E

Cation Sum, Anion Sum, and Ion Balance (as % difference) are calculated based on guidance from APHA Standard Methods (1030E Checking Correctness of Analysis). Because all aqueous solutions are electrically neutral, the calculated ion balance (% difference of cations minus anions) should be near-zero.

Cation and Anion Sums are the total meq/L concentration of major cations and anions. Dissolved species are used where available. Minor ions are included where data is present. Ion Balance is calculated as:

Ion Balance (%) = [Cation Sum-Anion Sum] / [Cation Sum+Anion Sum]

TKN-L-F-CL Water Total Kjeldahl Nitrogen APHA 4500-NORG (TKN)

This analysis is carried out using procedures adapted from APHA Method 4500-Norg D. "Block Digestion and Flow Injection Analysis". Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection.

TSS-L-CL Water Total Suspended Solids APHA 2540 D-Gravimetric

This analysis is carried out using procedures adapted from APHA Method 2540 "Solids". Solids are determined gravimetrically. Total suspended solids (TSS) are determined by filtering a sample through a glass fibre filter, and by drying the filter at 104 deg. C.

TURBIDITY-CL Water Turbidity APHA 2130 B-Nephelometer

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

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
CL	ALS ENVIRONMENTAL - CALGARY, ALBERTA, CANADA
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Dry Creek 2021

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.
mg/kg - milligrams per kilogram based on dry weight of sample.
mg/kg wwt - milligrams per kilogram based on wet weight of sample.
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.
mg/L - milligrams per litre.
< - Less than.
D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

[redacted]

Quality Control Report

Client: Teck Coal Ltd.
421 Pine Avenue
Sparwood BC V0B 2G0
Contact: Cait Good

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
ACIDITY-PCT-CL	**Water**							
Batch R5413535								
WG3507838-2 LCS								
Acidity (as CaCO3)			100.2		%		85-115	23-MAR-21
WG3507838-1 MB								
Acidity (as CaCO3)			1.2		mg/L		2	23-MAR-21
ALK-MAN-CL	**Water**							
Batch R5415943								
WG3508596-2 LCS								
Alkalinity, Total (as CaCO3)			100.8		%		85-115	26-MAR-21
WG3508596-1 MB								
Alkalinity, Total (as CaCO3)			<1.0		mg/L		1	26-MAR-21
BE-D-L-CCMS-VA	**Water**							
Batch R5405458								
WG3505296-2 LCS								
Beryllium (Be)-Dissolved			99.1		%		80-120	19-MAR-21
WG3505296-1 MB		**NP**						
Beryllium (Be)-Dissolved			<0.000020		mg/L		0.00002	19-MAR-21
BE-T-L-CCMS-VA	**Water**							
Batch R5407097								
WG3505514-2 LCS								
Beryllium (Be)-Total			98.8		%		80-120	19-MAR-21
WG3505514-1 MB								
Beryllium (Be)-Total			<0.000020		mg/L		0.00002	19-MAR-21
BR-L-IC-N-CL	**Water**							
Batch R5404559								
WG3505205-2 LCS								
Bromide (Br)			107.2		%		85-115	18-MAR-21
WG3505205-1 MB								
Bromide (Br)			<0.050		mg/L		0.05	18-MAR-21
C-DIS-ORG-LOW-CL	**Water**							
Batch R5412938								
WG3507692-2 LCS								
Dissolved Organic Carbon			108.6		%		80-120	23-MAR-21
WG3507692-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	23-MAR-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
C-DIS-ORG-LOW-CL	**Water**							
Batch R5415699								
WG3508967-2 LCS								
Dissolved Organic Carbon			103.1		%		80-120	25-MAR-21
WG3508967-1 MB								
Dissolved Organic Carbon			<0.50		mg/L		0.5	25-MAR-21
C-TOT-ORG-LOW-CL	**Water**							
Batch R5412938								
WG3507692-2 LCS								
Total Organic Carbon			107.6		%		80-120	23-MAR-21
WG3507692-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	23-MAR-21
Batch R5415158								
WG3508404-2 LCS								
Total Organic Carbon			104.9		%		80-120	24-MAR-21
WG3508404-1 MB								
Total Organic Carbon			<0.50		mg/L		0.5	24-MAR-21
CL-L-IC-N-CL	**Water**							
Batch R5404559								
WG3505205-2 LCS								
Chloride (Cl)			98.6		%		85-115	18-MAR-21
WG3505205-1 MB								
Chloride (Cl)			<0.10		mg/L		0.1	18-MAR-21
EC-L-PCT-CL	**Water**							
Batch R5415943								
WG3508596-2 LCS								
Conductivity (@ 25C)			98.1		%		90-110	26-MAR-21
WG3508596-1 MB								
Conductivity (@ 25C)			<2.0		uS/cm		2	26-MAR-21
F-IC-N-CL	**Water**							
Batch R5404559								
WG3505205-2 LCS								
Fluoride (F)			106.7		%		90-110	18-MAR-21
WG3505205-1 MB								
Fluoride (F)			<0.020		mg/L		0.02	18-MAR-21
HG-D-CVAA-VA	**Water**							

[redacted]

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-D-CVAA-VA	**Water**							
Batch R5405520								
WG3505442-2 LCS								
Mercury (Hg)-Dissolved			96.9		%		80-120	20-MAR-21
WG3505442-1 MB		**NP**						
Mercury (Hg)-Dissolved			<0.0000050		mg/L		0.000005	20-MAR-21
HG-T-U-CVAF-VA	**Water**							
Batch R5409479								
WG3506598-2 LCS								
Mercury (Hg)-Total			102.8		%		80-120	23-MAR-21
WG3506598-1 MB								
Mercury (Hg)-Total			<0.00050		ug/L		0.0005	23-MAR-21
WG3506598-4 MS		**L2568053-2**						
Mercury (Hg)-Total			79.3		%		70-130	23-MAR-21
MET-D-CCMS-VA	**Water**							
Batch R5405458								
WG3505296-2 LCS								
Aluminum (Al)-Dissolved			99.8		%		80-120	19-MAR-21
Antimony (Sb)-Dissolved			100.3		%		80-120	19-MAR-21
Arsenic (As)-Dissolved			92.0		%		80-120	19-MAR-21
Barium (Ba)-Dissolved			94.0		%		80-120	19-MAR-21
Bismuth (Bi)-Dissolved			104.9		%		80-120	19-MAR-21
Boron (B)-Dissolved			92.4		%		80-120	19-MAR-21
Cadmium (Cd)-Dissolved			93.0		%		80-120	19-MAR-21
Calcium (Ca)-Dissolved			94.2		%		80-120	19-MAR-21
Chromium (Cr)-Dissolved			89.7		%		80-120	19-MAR-21
Cobalt (Co)-Dissolved			96.1		%		80-120	19-MAR-21
Copper (Cu)-Dissolved			91.8		%		80-120	19-MAR-21
Iron (Fe)-Dissolved			82.8		%		80-120	19-MAR-21
Lead (Pb)-Dissolved			101.7		%		80-120	19-MAR-21
Lithium (Li)-Dissolved			99.9		%		80-120	19-MAR-21
Magnesium (Mg)-Dissolved			95.8		%		80-120	19-MAR-21
Manganese (Mn)-Dissolved			92.7		%		80-120	19-MAR-21
Molybdenum (Mo)-Dissolved			98.0		%		80-120	19-MAR-21
Nickel (Ni)-Dissolved			92.2		%		80-120	19-MAR-21
Potassium (K)-Dissolved			92.4		%		80-120	19-MAR-21
Selenium (Se)-Dissolved			99.5		%		80-120	19-MAR-21
Silicon (Si)-Dissolved			96.7		%		60-140	19-MAR-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R5405458								
WG3505296-2 LCS								
Silver (Ag)-Dissolved			96.3		%		80-120	19-MAR-21
Sodium (Na)-Dissolved			93.4		%		80-120	19-MAR-21
Strontium (Sr)-Dissolved			93.0		%		80-120	19-MAR-21
Sulfur (S)-Dissolved			97.1		%		80-120	19-MAR-21
Thallium (Tl)-Dissolved			102.8		%		80-120	19-MAR-21
Tin (Sn)-Dissolved			96.7		%		80-120	19-MAR-21
Titanium (Ti)-Dissolved			93.4		%		80-120	19-MAR-21
Uranium (U)-Dissolved			101.1		%		80-120	19-MAR-21
Vanadium (V)-Dissolved			95.5		%		80-120	19-MAR-21
Zinc (Zn)-Dissolved			88.4		%		80-120	19-MAR-21
WG3505296-1 MB		**NP**						
Aluminum (Al)-Dissolved			<0.0010		mg/L		0.001	19-MAR-21
Antimony (Sb)-Dissolved			<0.00010		mg/L		0.0001	19-MAR-21
Arsenic (As)-Dissolved			<0.00010		mg/L		0.0001	19-MAR-21
Barium (Ba)-Dissolved			<0.00010		mg/L		0.0001	19-MAR-21
Bismuth (Bi)-Dissolved			<0.000050		mg/L		0.00005	19-MAR-21
Boron (B)-Dissolved			<0.010		mg/L		0.01	19-MAR-21
Cadmium (Cd)-Dissolved			<0.0000050		mg/L		0.000005	19-MAR-21
Calcium (Ca)-Dissolved			<0.050		mg/L		0.05	19-MAR-21
Chromium (Cr)-Dissolved			<0.00010		mg/L		0.0001	19-MAR-21
Cobalt (Co)-Dissolved			<0.00010		mg/L		0.0001	19-MAR-21
Copper (Cu)-Dissolved			<0.00020		mg/L		0.0002	19-MAR-21
Iron (Fe)-Dissolved			<0.010		mg/L		0.01	19-MAR-21
Lead (Pb)-Dissolved			<0.000050		mg/L		0.00005	19-MAR-21
Lithium (Li)-Dissolved			<0.0010		mg/L		0.001	19-MAR-21
Magnesium (Mg)-Dissolved			<0.0050		mg/L		0.005	19-MAR-21
Manganese (Mn)-Dissolved			<0.00010		mg/L		0.0001	19-MAR-21
Molybdenum (Mo)-Dissolved			<0.000050		mg/L		0.00005	19-MAR-21
Nickel (Ni)-Dissolved			<0.00050		mg/L		0.0005	19-MAR-21
Potassium (K)-Dissolved			<0.050		mg/L		0.05	19-MAR-21
Selenium (Se)-Dissolved			<0.000050		mg/L		0.00005	19-MAR-21
Silicon (Si)-Dissolved			<0.050		mg/L		0.05	19-MAR-21
Silver (Ag)-Dissolved			<0.000010		mg/L		0.00001	19-MAR-21
Sodium (Na)-Dissolved			<0.050		mg/L		0.05	19-MAR-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-D-CCMS-VA	**Water**							
Batch R5405458								
WG3505296-1 MB		**NP**						
Strontium (Sr)-Dissolved			<0.00020		mg/L		0.0002	19-MAR-21
Sulfur (S)-Dissolved			<0.50		mg/L		0.5	19-MAR-21
Thallium (Tl)-Dissolved			<0.000010		mg/L		0.00001	19-MAR-21
Tin (Sn)-Dissolved			<0.00010		mg/L		0.0001	19-MAR-21
Titanium (Ti)-Dissolved			<0.00030		mg/L		0.0003	19-MAR-21
Uranium (U)-Dissolved			<0.000010		mg/L		0.00001	19-MAR-21
Vanadium (V)-Dissolved			<0.00050		mg/L		0.0005	19-MAR-21
Zinc (Zn)-Dissolved			<0.0010		mg/L		0.001	19-MAR-21
MET-T-CCMS-VA	**Water**							
Batch R5407097								
WG3505514-2 LCS								
Aluminum (Al)-Total			101.8		%		80-120	19-MAR-21
Antimony (Sb)-Total			105.7		%		80-120	19-MAR-21
Arsenic (As)-Total			98.0		%		80-120	19-MAR-21
Barium (Ba)-Total			104.5		%		80-120	19-MAR-21
Bismuth (Bi)-Total			101.1		%		80-120	19-MAR-21
Boron (B)-Total			97.9		%		80-120	19-MAR-21
Cadmium (Cd)-Total			99.2		%		80-120	19-MAR-21
Calcium (Ca)-Total			99.9		%		80-120	19-MAR-21
Chromium (Cr)-Total			98.0		%		80-120	19-MAR-21
Cobalt (Co)-Total			100.7		%		80-120	19-MAR-21
Copper (Cu)-Total			98.1		%		80-120	19-MAR-21
Iron (Fe)-Total			102.3		%		80-120	19-MAR-21
Lead (Pb)-Total			101.3		%		80-120	19-MAR-21
Lithium (Li)-Total			99.7		%		80-120	19-MAR-21
Magnesium (Mg)-Total			105.2		%		80-120	19-MAR-21
Manganese (Mn)-Total			98.9		%		80-120	19-MAR-21
Molybdenum (Mo)-Total			101.1		%		80-120	19-MAR-21
Nickel (Ni)-Total			98.0		%		80-120	19-MAR-21
Potassium (K)-Total			99.8		%		80-120	19-MAR-21
Selenium (Se)-Total			100.1		%		80-120	19-MAR-21
Silicon (Si)-Total			99.9		%		80-120	19-MAR-21
Silver (Ag)-Total			99.9		%		80-120	19-MAR-21
Sodium (Na)-Total			105.1		%		80-120	19-MAR-21

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	**Water**							
Batch R5407097								
WG3505514-2 LCS								
Strontium (Sr)-Total			103.6		%		80-120	19-MAR-21
Sulfur (S)-Total			106.3		%		80-120	19-MAR-21
Thallium (Tl)-Total			102.9		%		80-120	19-MAR-21
Tin (Sn)-Total			96.5		%		80-120	19-MAR-21
Titanium (Ti)-Total			97.4		%		80-120	19-MAR-21
Uranium (U)-Total			103.5		%		80-120	19-MAR-21
Vanadium (V)-Total			99.4		%		80-120	19-MAR-21
Zinc (Zn)-Total			103.9		%		80-120	19-MAR-21
WG3505514-1 MB								
Aluminum (Al)-Total			<0.0030		mg/L		0.003	19-MAR-21
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	19-MAR-21
Arsenic (As)-Total			<0.00010		mg/L		0.0001	19-MAR-21
Barium (Ba)-Total			<0.00010		mg/L		0.0001	19-MAR-21
Bismuth (Bi)-Total			<0.000050		mg/L		0.00005	19-MAR-21
Boron (B)-Total			<0.010		mg/L		0.01	19-MAR-21
Cadmium (Cd)-Total			<0.0000050		mg/L		0.000005	19-MAR-21
Calcium (Ca)-Total			<0.050		mg/L		0.05	19-MAR-21
Chromium (Cr)-Total			<0.00010		mg/L		0.0001	19-MAR-21
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	19-MAR-21
Copper (Cu)-Total			<0.00050		mg/L		0.0005	19-MAR-21
Iron (Fe)-Total			<0.010		mg/L		0.01	19-MAR-21
Lead (Pb)-Total			<0.000050		mg/L		0.00005	19-MAR-21
Lithium (Li)-Total			<0.0010		mg/L		0.001	19-MAR-21
Magnesium (Mg)-Total			<0.0050		mg/L		0.005	19-MAR-21
Manganese (Mn)-Total			<0.00010		mg/L		0.0001	19-MAR-21
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	19-MAR-21
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	19-MAR-21
Potassium (K)-Total			<0.050		mg/L		0.05	19-MAR-21
Selenium (Se)-Total			<0.000050		mg/L		0.00005	19-MAR-21
Silicon (Si)-Total			<0.10		mg/L		0.1	19-MAR-21
Silver (Ag)-Total			<0.000010		mg/L		0.00001	19-MAR-21
Sodium (Na)-Total			<0.050		mg/L		0.05	19-MAR-21
Strontium (Sr)-Total			<0.00020		mg/L		0.0002	19-MAR-21
Sulfur (S)-Total			<0.50		mg/L		0.5	19-MAR-21

[redacted]

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-VA	**Water**							
Batch R5407097								
WG3505514-1 MB								
Thallium (Tl)-Total			<0.000010		mg/L		0.00001	19-MAR-21
Tin (Sn)-Total			<0.00010		mg/L		0.0001	19-MAR-21
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	19-MAR-21
Uranium (U)-Total			<0.000010		mg/L		0.00001	19-MAR-21
Vanadium (V)-Total			<0.00050		mg/L		0.0005	19-MAR-21
Zinc (Zn)-Total			<0.0030		mg/L		0.003	19-MAR-21
NH3-L-F-CL	**Water**							
Batch R5404337								
WG3505192-2 LCS								
Ammonia as N			100.5		%		85-115	19-MAR-21
WG3505192-1 MB								
Ammonia as N			<0.0050		mg/L		0.005	19-MAR-21
NO2-L-IC-N-CL	**Water**							
Batch R5404559								
WG3505205-2 LCS								
Nitrite (as N)			100.2		%		90-110	18-MAR-21
WG3505205-1 MB								
Nitrite (as N)			<0.0010		mg/L		0.001	18-MAR-21
NO3-L-IC-N-CL	**Water**							
Batch R5404559								
WG3505205-2 LCS								
Nitrate (as N)			99.96		%		90-110	18-MAR-21
WG3505205-1 MB								
Nitrate (as N)			<0.0050		mg/L		0.005	18-MAR-21
ORP-CL	**Water**							
Batch R5413358								
WG3507787-1 CRM		**CL-ORP**						
ORP			226		mV		210-230	24-MAR-21
WG3507787-2 DUP		**L2568053-1**						
ORP		395	392	J	mV	2.6	15	24-MAR-21
P-T-L-COL-CL	**Water**							
Batch R5407760								
WG3505880-2 LCS								
Phosphorus (P)-Total			96.8		%		80-120	22-MAR-21
WG3505880-6 LCS								
Phosphorus (P)-Total			96.9		%		80-120	22-MAR-21

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Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
P-T-L-COL-CL	**Water**							
Batch R5407760								
WG3505880-1 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	22-MAR-21
WG3505880-5 MB								
Phosphorus (P)-Total			<0.0020		mg/L		0.002	22-MAR-21
PH-CL	**Water**							
Batch R5415943								
WG3508596-2 LCS								
pH			6.97		pH		6.9-7.1	26-MAR-21
PO4-DO-L-COL-CL	**Water**							
Batch R5403196								
WG3504677-2 LCS								
Orthophosphate-Dissolved (as P)			96.4		%		80-120	18-MAR-21
WG3504677-1 MB								
Orthophosphate-Dissolved (as P)			<0.0010		mg/L		0.001	18-MAR-21
SO4-IC-N-CL	**Water**							
Batch R5404559								
WG3505205-2 LCS								
Sulfate (SO4)			102.0		%		90-110	18-MAR-21
WG3505205-1 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	18-MAR-21
SOLIDS-TDS-CL	**Water**							
Batch R5407137								
WG3505691-5 LCS								
Total Dissolved Solids			92.6		%		85-115	21-MAR-21
WG3505691-4 MB								
Total Dissolved Solids			<10		mg/L		10	21-MAR-21
Batch R5413259								
WG3506504-2 LCS								
Total Dissolved Solids			97.2		%		85-115	23-MAR-21
WG3506504-1 MB								
Total Dissolved Solids			<10		mg/L		10	23-MAR-21
TKN-L-F-CL	**Water**							
Batch R5413217								
WG3507766-2 LCS								
Total Kjeldahl Nitrogen			84.4		%		75-125	24-MAR-21
WG3507766-1 MB								

[redacted]

Quality Control Report

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
TKN-L-F-CL	**Water**							
Batch R5413217								
WG3507766-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	24-MAR-21
TSS-L-CL	**Water**							
Batch R5406979								
WG3505690-4 LCS								
Total Suspended Solids			98.4		%		85-115	21-MAR-21
WG3505690-3 MB								
Total Suspended Solids			<1.0		mg/L		1	21-MAR-21
Batch R5413059								
WG3506502-2 LCS								
Total Suspended Solids			95.9		%		85-115	23-MAR-21
WG3506502-1 MB								
Total Suspended Solids			<1.0		mg/L		1	23-MAR-21
TURBIDITY-CL	**Water**							
Batch R5403407								
WG3504766-2 LCS								
Turbidity			100.5		%		85-115	18-MAR-21
WG3504766-1 MB								
Turbidity			<0.10		NTU		0.1	18-MAR-21

Legend:

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

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.

Quality Control Report

Hold Time Exceedances:

ALS Product Description	Sample ID	Sampling Date	Date Processed	Rec. HT	Actual HT	Units	Qualifier
Physical Tests							
Oxidation redution potential by elect.							
	1	15-MAR-21 13:45	24-MAR-21 07:15	0.25	210	hours	EHTR-FM
	2	16-MAR-21 11:00	24-MAR-21 07:15	0.25	188	hours	EHTR-FM
pH							
	1	15-MAR-21 13:45	26-MAR-21 00:00	0.25	250	hours	EHTR-FM
	2	16-MAR-21 11:00	26-MAR-21 00:00	0.25	229	hours	EHTR-FM
Anions and Nutrients							
Nitrate in Water by IC (Low Level)							
	1	15-MAR-21 13:45	19-MAR-21 10:00	3	4	days	EHTL

Legend & Qualifier Definitions:

EHTR-FM:	Exceeded ALS recommended hold time prior to sample receipt. Field Measurement recommended.
EHTR:	Exceeded ALS recommended hold time prior to sample receipt.
EHTL:	Exceeded ALS recommended hold time prior to analysis. Sample was received less than 24 hours prior to expiry.
EHT:	Exceeded ALS recommended hold time prior to analysis.
Rec. HT:	ALS recommended hold time (see units).

Notes*:
Where actual sampling date is not provided to ALS, the date (& time) of receipt is used for calculation purposes.
Where actual sampling time is not provided to ALS, the earlier of 12 noon on the sampling date or the time (& date) of receipt is used for calculation purposes. Samples for L2568053 were received on 17-MAR-21 17:45.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

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

Teck

Page 1 of 1

COC ID:	**Dry Creek 2021**	**TURNAROUND TIME:**	

PROJECT/CLIENT INFO				**LABORATORY**							
Facility Name	REP			Lab Name	ALS Calgary				Excel	PDF	EDD
Project Manager	Cait Good			Lab Contact	Lyudmyla Shvets			cait.good@teck.com	x	x	x
Email	cait.good@teck.com			Email	lyudmyla.shvets@alsglobal.com			teckcoal@equisonline.com			x
Address	421 Pine Avenue			Address	2559 29 Street NE			dhasek@minnow.ca	x	x	x
								carlie.meyer@teck.com	x	x	x
City	Sparwood	Province	BC	City	Calgary	Province	AB	nnicholes@minnow.ca	x	x	x
Postal Code	V0B 2G0	Country	Canada	Postal Code	T1Y 7B5	Country	Canada				
Phone Number	250-425-8202			Phone Number	1 403 407 1794			PO number: 689999			

SAMPLE DETAILS — **ANALYSIS REQUESTED** — Filtered - F: Field, L: Lab, FL: Field & Lab, N: None

L2568053-COFC

Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	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				
							Filt.	N	F	N	N	F	N	F				
							PRESERV.		H2SO4	H2SO4		HCL	HNO3	HNO3				
LC_FRB_WS_2021-03-15	LC_FRB	WS	No	3/15/2021	13:45	G	7	1	1	1	1	1	1	1				
LC_FRUS_WS_2021-03-16	LC_FRUS	WS	No	3/16/2021	11:00	G	7	1	1	1	1	1	1	1				

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	**RELINQUISHED BY/AFFILIATION**	**DATE/TIME**	**ACCEPTED BY/AFFILIATION**	
PO #: 689999				3/18 8:45am

NB OF BOTTLES RETURNED/DESCRIPTION					
Regular (default)	x	Sampler's Name	Maddy Stokes	Mobile #	647-522-0672
Priority (2-3 business days) - 50% surcharge					
Emergency (1 Business Day) - 100% surcharge		Sampler's Signature	MS	Date/Time	16-Mar-2021 / 16:30
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

10

WATER CHEMISTRY

ALS Laboratory Report CG2101306

CERTIFICATE OF ANALYSIS

Work Order	: **CG2101306**	Page	: 1 of 10
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	: LINE CREEK OPERATIONS	Date Samples Received	: 08-May-2021 09:15
PO	: VPO00748510	Date Analysis Commenced	: 08-May-2021
C-O-C number	: Dry Creek 2021	Issue Date	: 25-May-2021 18:27
Sampler	: Maddy Stokes		
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*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
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
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
Woochan Song	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.*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	LC_FRB_WS_2021-05-06_1430	LC_CC2_WS_2021-05-07_1430	LC_FRUS_WS_2021-05-07_0930	LC_GRCK_WS_2021-05-07_1400	LC_MT2_WS_2021-05-07_0900
				Client sampling date / time	06-May-2021 14:30	06-May-2021 14:30	06-May-2021 09:30	06-May-2021 14:00	06-May-2021 09:00
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2101306-001**	**CG2101306-002**	**CG2101306-003**	**CG2101306-004**	**CG2101306-005**
					Result	Result	Result	Result	Result
Physical Tests									
acidity (as CaCO3)	----	E283	2.0	mg/L	41.8	<2.0	<2.0	<2.0	<2.0
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	178	173	171	151	<1.0
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	7.6	8.2	6.6	4.0	<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	186	181	177	155	<1.0
conductivity	----	E100	2.0	µS/cm	763	763	747	356	<2.0
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	425	429	413	186	<0.50
oxidation-reduction potential [ORP]	----	E125	0.10	mV	488	316	390	465	448
pH	----	E108	0.10	pH units	8.38	8.39	8.39	8.36	5.99
solids, total dissolved [TDS]	----	E162	10	mg/L	549	595	524	243	<10
solids, total suspended [TSS]	----	E160-L	1.0	mg/L	5.0	4.6	7.8	8.7	<1.0
turbidity	----	E121	0.10	NTU	1.47	1.97	3.30	2.53	<0.10
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0086	<0.0050	0.0085	0.0562	<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	1.61	1.66	1.49	0.18	<0.10
fluoride	16984-48-8	E235.F	0.020	mg/L	0.126	0.126	0.148	0.110	<0.020
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.299	<0.050	<0.050	<0.050	<0.050 RRV
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	13.1	13.2	12.2	0.0387	<0.0050
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0090	0.0103	0.0053	<0.0010	<0.0010
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	<0.0010	<0.0010	<0.0010	0.0026	<0.0010
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0116	0.0046	0.0057	0.0099	<0.0020
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	194	194	192	43.3	<0.30
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.42	1.20	0.85	1.21	<0.50
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.20	1.24	0.84	1.52	<0.50
Ion Balance									
anion sum	----	EC101	0.10	meq/L	8.74	8.65	8.46	4.01	<0.10
cation sum	----	EC101	0.10	meq/L	8.62	8.70	8.37	3.87	<0.10

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_FRB_WS_2021-05-06_1430**	**LC_CC2_WS_2021-05-07_1430**	**LC_FRUS_WS_2021-05-07_0930**	**LC_GRCK_WS_2021-05-07_1400**	**LC_MT2_WS_2021-05-07_0900**
				Client sampling date / time	06-May-2021 14:30	06-May-2021 14:30	06-May-2021 09:30	06-May-2021 14:00	06-May-2021 09:00
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2101306-001**	**CG2101306-002**	**CG2101306-003**	**CG2101306-004**	**CG2101306-005**
					Result	Result	Result	Result	Result
Ion Balance									
ion balance (cations/anions ratio)	----	EC101	0.010	%	98.6	100	98.9	96.5	100
ion balance (cation-anion difference)	----	EC101	0.010	%	0.691	0.288	0.535	1.78	<0.010
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0447	0.0342	0.0932	0.0934	0.0058 RRV
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00016	0.00016	0.00014	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00015	0.00013	0.00020	0.00016	<0.00010
barium, total	7440-39-3	E420	0.00010	mg/L	0.0950	0.0986	0.0849	0.0584	0.00069 RRV
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	<0.010	<0.010	0.016	<0.010
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0435	0.0400	0.0472	0.0131	<0.0050
calcium, total	7440-70-2	E420	0.050	mg/L	95.7	98.9	97.4	46.2	<0.050
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00017	0.00017	0.00033	0.00032	0.00012 RRV
cobalt, total	7440-48-4	E420	0.10	µg/L	<0.10	<0.10	0.14	<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	0.074	0.059	0.168	0.159	<0.010
lead, total	7439-92-1	E420	0.000050	mg/L	0.000052	<0.000050	0.000116	0.000110	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0206	0.0221	0.0202	0.0058	<0.0010
magnesium, total	7439-95-4	E420	0.0050	mg/L	44.2	45.6	45.7	17.9	0.0088 RRV
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00558	0.00474	0.00930	0.0102	<0.00010
mercury, total	7439-97-6	E508-L	0.00050	µg/L	0.00073	0.00067	0.00101	0.00086	<0.00050
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00125	0.00125	0.00107	0.00132	<0.000050
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00192	0.00188	0.00205	<0.00050	<0.00050
potassium, total	7440-09-7	E420	0.050	mg/L	1.35	1.37	1.32	0.705	<0.050
selenium, total	7782-49-2	E420	0.050	µg/L	49.9	52.1	47.6	1.77	<0.050
silicon, total	7440-21-3	E420	0.10	mg/L	1.96	1.98	1.97	2.64	0.27 RRV
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	2.01	2.10	2.04	2.75	0.249 RRV
strontium, total	7440-24-6	E420	0.00020	mg/L	0.133	0.136	0.140	0.166	0.00035 RRV
sulfur, total	7704-34-9	E420	0.50	mg/L	71.5	72.3	68.3	15.3	<0.50

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_FRB_WS_2021-05-06_1430**	**LC_CC2_WS_2021-05-07_1430**	**LC_FRUS_WS_2021-05-07_0930**	**LC_GRCK_WS_2021-05-07_1400**	**LC_MT2_WS_2021-05-07_0900**
				Client sampling date / time	06-May-2021 14:30	06-May-2021 14:30	06-May-2021 09:30	06-May-2021 14:00	06-May-2021 09:00
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2101306-001**	**CG2101306-002**	**CG2101306-003**	**CG2101306-004**	**CG2101306-005**
					Result	Result	Result	Result	Result
Total Metals									
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	0.00059	0.00057	0.00104	0.00076	<0.00030
uranium, total	7440-61-1	E420	0.000010	mg/L	0.00224	0.00228	0.00222	0.000907	<0.000010
vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0.00054	<0.00050	<0.00050
zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0.0072	<0.0030	<0.0030
Dissolved Metals									
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0014	0.0014	0.0012	<0.0010	0.0050 RRV
antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00014	0.00014	0.00012	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00010	0.00011	0.00010	<0.00010	<0.00010
barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.108	0.110	0.0920	0.0616	0.00067 RRV
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	<0.010	<0.010	0.016	<0.010
cadmium, dissolved	7440-43-9	E421	0.0050	µg/L	0.0340	0.0325	0.0298	<0.0050	<0.0050
calcium, dissolved	7440-70-2	E421	0.050	mg/L	99.1	101	96.9	46.3	<0.050
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	0.00011	0.00011	0.00014	<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	<0.00020	<0.00020	<0.00020	<0.00020
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	0.0233	0.0248	0.0227	0.0062	<0.0010
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	43.1	42.9	41.5	17.1	0.0096 RRV
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00244	0.00233	0.00270	0.00040	0.00027 DTC, RRV
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	0.00130	0.00128	0.00115	0.00138	<0.000050
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00180	0.00173	0.00161	<0.00050	<0.00050
potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.43	1.45	1.29	0.718	<0.050
selenium, dissolved	7782-49-2	E421	0.050	µg/L	54.1	52.7	51.0	1.78	<0.050
silicon, dissolved	7440-21-3	E421	0.050	mg/L	1.94	1.92	1.87	2.63	0.209 RRV

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_FRB_WS_2021-05-06_1430**	**LC_CC2_WS_2021-05-07_1430**	**LC_FRUS_WS_2021-05-07_0930**	**LC_GRCK_WS_2021-05-07_1400**	**LC_MT2_WS_2021-05-07_0900**
				Client sampling date / time	06-May-2021 14:30	06-May-2021 14:30	06-May-2021 09:30	06-May-2021 14:00	06-May-2021 09:00
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2101306-001**	**CG2101306-002**	**CG2101306-003**	**CG2101306-004**	**CG2101306-005**
					Result	Result	Result	Result	Result
Dissolved Metals									
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	2.14	2.17	2.07	2.97	0.239 RRV
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.142	0.145	0.146	0.175	0.00050 RRV
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	70.2	70.3	67.7	15.6	<0.50
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	0.00217	0.00224	0.00218	0.000866	<0.000010
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	0.0013	0.0011	0.0015	<0.0010	<0.0010
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**)

Client sample ID					**LC_RD2_WS_2021-05-07_0900**	**----**	**----**	**----**	**----**
Client sampling date / time					06-May-2021 09:00	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2101306-006**	--------	--------	--------	--------
					Result	----	----	----	----
Physical Tests									
acidity (as CaCO3)	----	E283	2.0	mg/L	2.0	----	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	<1.0	----	----	----	----
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	<1.0	----	----	----	----
conductivity	----	E100	2.0	µS/cm	<2.0	----	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV	447	----	----	----	----
pH	----	E108	0.10	pH units	5.16	----	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L	<1.0	----	----	----	----
turbidity	----	E121	0.10	NTU	<0.10	----	----	----	----
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	<0.10	----	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	<0.020	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050 RRV	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	----	----	----	----
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	<0.30	----	----	----	----
Organic / Inorganic Carbon									
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	<0.50	----	----	----	----
Ion Balance									
anion sum	----	EC101	0.10	meq/L	<0.10	----	----	----	----
cation sum	----	EC101	0.10	meq/L	<0.10	----	----	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%	100	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%	<0.010	----	----	----	----
Total Metals									

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_RD2_WS_2021-05-07_0900**	**----**	**----**	**----**	**----**
				Client sampling date / time	06-May-2021 09:00	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2101306-006**	**--------**	**--------**	**--------**	**--------**
					Result	----	----	----	----
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	<0.00010	----	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	<0.00010	----	----	----	----
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	<0.0050	----	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	<0.050	----	----	----	----
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	<0.0010	----	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	<0.0050	----	----	----	----
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	<0.000050	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	----	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	<0.050	----	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L	<0.050	----	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L	<0.10	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	----	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L	<0.050	----	----	----	----
strontium, total	7440-24-6	E420	0.00020	mg/L	<0.00020	----	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	<0.50	----	----	----	----
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	----	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water)**

				Client sample ID	**LC_RD2_WS_2021-05-07_0900**	**----**	**----**	**----**	**----**
				Client sampling date / time	06-May-2021 09:00	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2101306-006**	**--------**	**--------**	**--------**	**--------**
					Result	----	----	----	----
Total Metals									
uranium, total	7440-61-1	E420	0.000010	mg/L	<0.000010	----	----	----	----
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									
calcium, dissolved	7440-70-2	E421	0.050	mg/L	<0.050	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	<0.0050	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	<0.050	----	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L	<0.050	----	----	----	----
dissolved metals filtration location	----	EP421	-	-	Laboratory	----	----	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2101306**	Page	: 1 of 27
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	: LINE CREEK OPERATIONS	Date Samples Received	: 08-May-2021 09:15
PO	: VPO00748510	Issue Date	: 25-May-2021 18:28
C-O-C number	: Dry Creek 2021		
Sampler	: Maddy Stokes		
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 Duplicate outliers occur.
- No Laboratory Control Sample (LCS) outliers occur
- No Matrix Spike outliers occur.
- Method Blank value 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
Method Blank (MB) Values								
Physical Tests	QC-199157-001	----	acidity (as CaCO3)	----	E283	2.0 mg/L	2 mg/L	Blank result exceeds permitted value

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*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) LC_CC2_WS_2021-05-07_1430	E298	06-May-2021	18-May-2021	----	12 days	✓	18-May-2021	28 days	1 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) LC_FRB_WS_2021-05-06_1430	E298	06-May-2021	18-May-2021	----	12 days	✓	18-May-2021	28 days	1 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) LC_GRCK_WS_2021-05-07_1400	E298	06-May-2021	18-May-2021	----	12 days	✓	18-May-2021	28 days	1 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) LC_FRUS_WS_2021-05-07_0930	E298	06-May-2021	18-May-2021	----	13 days	✓	18-May-2021	28 days	1 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) LC_MT2_WS_2021-05-07_0900	E298	06-May-2021	18-May-2021	----	13 days	✓	18-May-2021	28 days	1 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) LC_RD2_WS_2021-05-07_0900	E298	06-May-2021	18-May-2021	----	13 days	✓	18-May-2021	28 days	1 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE LC_CC2_WS_2021-05-07_1430	E235.Br-L	06-May-2021	----	----	----		09-May-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*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE LC_FRB_WS_2021-05-06_1430	E235.Br-L	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE LC_FRUS_WS_2021-05-07_0930	E235.Br-L	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE LC_GRCK_WS_2021-05-07_1400	E235.Br-L	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE LC_MT2_WS_2021-05-07_0900	E235.Br-L	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE LC_RD2_WS_2021-05-07_0900	E235.Br-L	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE LC_CC2_WS_2021-05-07_1430	E235.Cl-L	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE LC_FRB_WS_2021-05-06_1430	E235.Cl-L	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE LC_FRUS_WS_2021-05-07_0930	E235.Cl-L	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE LC_GRCK_WS_2021-05-07_1400	E235.Cl-L	06-May-2021	----	----	----		09-May-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*
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE LC_MT2_WS_2021-05-07_0900	E235.Cl-L	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE LC_RD2_WS_2021-05-07_0900	E235.Cl-L	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE LC_CC2_WS_2021-05-07_1430	E378-U	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE LC_FRB_WS_2021-05-06_1430	E378-U	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE LC_FRUS_WS_2021-05-07_0930	E378-U	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE LC_GRCK_WS_2021-05-07_1400	E378-U	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE LC_MT2_WS_2021-05-07_0900	E378-U	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE LC_RD2_WS_2021-05-07_0900	E378-U	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE LC_CC2_WS_2021-05-07_1430	E235.F	06-May-2021	----	----	----		09-May-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
Anions and Nutrients : Fluoride in Water by IC										
HDPE LC_FRB_WS_2021-05-06_1430	E235.F	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE LC_FRUS_WS_2021-05-07_0930	E235.F	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE LC_GRCK_WS_2021-05-07_1400	E235.F	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE LC_MT2_WS_2021-05-07_0900	E235.F	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE LC_RD2_WS_2021-05-07_0900	E235.F	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LC_CC2_WS_2021-05-07_1430	E235.NO3-L	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LC_FRB_WS_2021-05-06_1430	E235.NO3-L	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LC_FRUS_WS_2021-05-07_0930	E235.NO3-L	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LC_GRCK_WS_2021-05-07_1400	E235.NO3-L	06-May-2021	----	----	----		09-May-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* Preparation Date	*Extraction / Preparation* Holding Times Rec	*Extraction / Preparation* Holding Times Actual	*Extraction / Preparation* Eval	*Analysis* Analysis Date	*Analysis* Holding Times Rec	*Analysis* Holding Times Actual	*Analysis* Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LC_MT2_WS_2021-05-07_0900	E235.NO3-L	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LC_RD2_WS_2021-05-07_0900	E235.NO3-L	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LC_CC2_WS_2021-05-07_1430	E235.NO2-L	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LC_FRB_WS_2021-05-06_1430	E235.NO2-L	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LC_FRUS_WS_2021-05-07_0930	E235.NO2-L	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LC_GRCK_WS_2021-05-07_1400	E235.NO2-L	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LC_MT2_WS_2021-05-07_0900	E235.NO2-L	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LC_RD2_WS_2021-05-07_0900	E235.NO2-L	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE LC_CC2_WS_2021-05-07_1430	E235.SO4	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*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 LC_FRB_WS_2021-05-06_1430	E235.SO4	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE LC_FRUS_WS_2021-05-07_0930	E235.SO4	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE LC_GRCK_WS_2021-05-07_1400	E235.SO4	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE LC_MT2_WS_2021-05-07_0900	E235.SO4	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE LC_RD2_WS_2021-05-07_0900	E235.SO4	06-May-2021	----	----	----		09-May-2021	28 days	3 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) LC_CC2_WS_2021-05-07_1430	E318	06-May-2021	17-May-2021	----	11 days	✓	17-May-2021	28 days	0 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) LC_FRB_WS_2021-05-06_1430	E318	06-May-2021	17-May-2021	----	11 days	✓	17-May-2021	28 days	0 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) LC_FRUS_WS_2021-05-07_0930	E318	06-May-2021	17-May-2021	----	11 days	✓	17-May-2021	28 days	0 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) LC_GRCK_WS_2021-05-07_1400	E318	06-May-2021	17-May-2021	----	11 days	✓	17-May-2021	28 days	0 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*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) LC_MT2_WS_2021-05-07_0900	E318	06-May-2021	17-May-2021	----	11 days	✓	17-May-2021	28 days	0 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) LC_RD2_WS_2021-05-07_0900	E318	06-May-2021	17-May-2021	----	11 days	✓	17-May-2021	28 days	0 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) LC_CC2_WS_2021-05-07_1430	E372-U	06-May-2021	16-May-2021	----	10 days	✓	16-May-2021	28 days	1 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) LC_FRB_WS_2021-05-06_1430	E372-U	06-May-2021	16-May-2021	----	10 days	✓	16-May-2021	28 days	1 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) LC_GRCK_WS_2021-05-07_1400	E372-U	06-May-2021	16-May-2021	----	10 days	✓	16-May-2021	28 days	1 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) LC_FRUS_WS_2021-05-07_0930	E372-U	06-May-2021	16-May-2021	----	11 days	✓	16-May-2021	28 days	1 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) LC_MT2_WS_2021-05-07_0900	E372-U	06-May-2021	16-May-2021	----	11 days	✓	16-May-2021	28 days	1 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) LC_RD2_WS_2021-05-07_0900	E372-U	06-May-2021	16-May-2021	----	11 days	✓	16-May-2021	28 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LC_CC2_WS_2021-05-07_1430	E421.Cr-L	06-May-2021	11-May-2021	----	6 days	✓	11-May-2021	180 days	1 days	✓

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LC_FRB_WS_2021-05-06_1430	E421.Cr-L	06-May-2021	11-May-2021	----	6 days	✓	11-May-2021	180 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LC_FRUS_WS_2021-05-07_0930	E421.Cr-L	06-May-2021	11-May-2021	----	6 days	✓	11-May-2021	180 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LC_GRCK_WS_2021-05-07_1400	E421.Cr-L	06-May-2021	11-May-2021	----	6 days	✓	11-May-2021	180 days	1 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LC_MT2_WS_2021-05-07_0900	E421.Cr-L	06-May-2021	11-May-2021	----	6 days	✓	11-May-2021	180 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) LC_CC2_WS_2021-05-07_1430	E509	06-May-2021	13-May-2021	----	7 days	✓	13-May-2021	28 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) LC_FRB_WS_2021-05-06_1430	E509	06-May-2021	13-May-2021	----	7 days	✓	13-May-2021	28 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) LC_GRCK_WS_2021-05-07_1400	E509	06-May-2021	13-May-2021	----	7 days	✓	13-May-2021	28 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) LC_FRUS_WS_2021-05-07_0930	E509	06-May-2021	13-May-2021	----	8 days	✓	13-May-2021	28 days	1 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) LC_MT2_WS_2021-05-07_0900	E509	06-May-2021	13-May-2021	----	8 days	✓	13-May-2021	28 days	1 days	✓

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LC_CC2_WS_2021-05-07_1430	E421	06-May-2021	11-May-2021	----	6 days	✓	11-May-2021	180 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LC_FRB_WS_2021-05-06_1430	E421	06-May-2021	11-May-2021	----	6 days	✓	11-May-2021	180 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LC_FRUS_WS_2021-05-07_0930	E421	06-May-2021	11-May-2021	----	6 days	✓	11-May-2021	180 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LC_GRCK_WS_2021-05-07_1400	E421	06-May-2021	11-May-2021	----	6 days	✓	11-May-2021	180 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LC_MT2_WS_2021-05-07_0900	E421	06-May-2021	11-May-2021	----	6 days	✓	11-May-2021	180 days	1 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LC_RD2_WS_2021-05-07_0900	E421	06-May-2021	12-May-2021	----	7 days	✓	12-May-2021	180 days	1 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) LC_CC2_WS_2021-05-07_1430	E358-L	06-May-2021	17-May-2021	----	12 days	✓	19-May-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) LC_FRB_WS_2021-05-06_1430	E358-L	06-May-2021	17-May-2021	----	12 days	✓	19-May-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) LC_FRUS_WS_2021-05-07_0930	E358-L	06-May-2021	17-May-2021	----	12 days	✓	19-May-2021	28 days	2 days	✓

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) LC_GRCK_WS_2021-05-07_1400	E358-L	06-May-2021	17-May-2021	----	12 days	✓	19-May-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) LC_MT2_WS_2021-05-07_0900	E358-L	06-May-2021	17-May-2021	----	12 days	✓	19-May-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) LC_CC2_WS_2021-05-07_1430	E355-L	06-May-2021	17-May-2021	----	12 days	✓	19-May-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) LC_FRB_WS_2021-05-06_1430	E355-L	06-May-2021	17-May-2021	----	12 days	✓	19-May-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) LC_FRUS_WS_2021-05-07_0930	E355-L	06-May-2021	17-May-2021	----	12 days	✓	19-May-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) LC_GRCK_WS_2021-05-07_1400	E355-L	06-May-2021	17-May-2021	----	12 days	✓	19-May-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) LC_MT2_WS_2021-05-07_0900	E355-L	06-May-2021	17-May-2021	----	12 days	✓	19-May-2021	28 days	2 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) LC_RD2_WS_2021-05-07_0900	E355-L	06-May-2021	17-May-2021	----	12 days	✓	19-May-2021	28 days	2 days	✓
Physical Tests : Acidity by Titration										
HDPE LC_CC2_WS_2021-05-07_1430	E283	06-May-2021	----	----	----		17-May-2021	14 days	11 days	✓

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Physical Tests : Acidity by Titration										
HDPE LC_FRB_WS_2021-05-06_1430	E283	06-May-2021	----	----	----		17-May-2021	14 days	11 days	✓
Physical Tests : Acidity by Titration										
HDPE LC_GRCK_WS_2021-05-07_1400	E283	06-May-2021	----	----	----		17-May-2021	14 days	11 days	✓
Physical Tests : Acidity by Titration										
HDPE LC_FRUS_WS_2021-05-07_0930	E283	06-May-2021	----	----	----		17-May-2021	14 days	12 days	✓
Physical Tests : Acidity by Titration										
HDPE LC_MT2_WS_2021-05-07_0900	E283	06-May-2021	----	----	----		17-May-2021	14 days	12 days	✓
Physical Tests : Acidity by Titration										
HDPE LC_RD2_WS_2021-05-07_0900	E283	06-May-2021	----	----	----		17-May-2021	14 days	12 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE LC_CC2_WS_2021-05-07_1430	E290	06-May-2021	----	----	----		17-May-2021	14 days	11 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE LC_FRB_WS_2021-05-06_1430	E290	06-May-2021	----	----	----		17-May-2021	14 days	11 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE LC_GRCK_WS_2021-05-07_1400	E290	06-May-2021	----	----	----		17-May-2021	14 days	11 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE LC_FRUS_WS_2021-05-07_0930	E290	06-May-2021	----	----	----		17-May-2021	14 days	12 days	✓

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Physical Tests : Alkalinity Species by Titration										
HDPE LC_MT2_WS_2021-05-07_0900	E290	06-May-2021	----	----	----		17-May-2021	14 days	12 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE LC_RD2_WS_2021-05-07_0900	E290	06-May-2021	----	----	----		17-May-2021	14 days	12 days	✓
Physical Tests : Conductivity in Water										
HDPE LC_CC2_WS_2021-05-07_1430	E100	06-May-2021	----	----	----		17-May-2021	28 days	11 days	✓
Physical Tests : Conductivity in Water										
HDPE LC_FRB_WS_2021-05-06_1430	E100	06-May-2021	----	----	----		17-May-2021	28 days	11 days	✓
Physical Tests : Conductivity in Water										
HDPE LC_GRCK_WS_2021-05-07_1400	E100	06-May-2021	----	----	----		17-May-2021	28 days	11 days	✓
Physical Tests : Conductivity in Water										
HDPE LC_FRUS_WS_2021-05-07_0930	E100	06-May-2021	----	----	----		17-May-2021	28 days	12 days	✓
Physical Tests : Conductivity in Water										
HDPE LC_MT2_WS_2021-05-07_0900	E100	06-May-2021	----	----	----		17-May-2021	28 days	12 days	✓
Physical Tests : Conductivity in Water										
HDPE LC_RD2_WS_2021-05-07_0900	E100	06-May-2021	----	----	----		17-May-2021	28 days	12 days	✓
Physical Tests : ORP by Electrode										
HDPE LC_CC2_WS_2021-05-07_1430	E125	06-May-2021	----	----	----		14-May-2021	0.34 hrs	185 hrs	✗ EHTR-FM

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times Rec*	*Holding Times Actual*	*Eval*	*Analysis Date*	*Holding Times Rec*	*Holding Times Actual*	*Eval*
Physical Tests : ORP by Electrode										
HDPE LC_FRB_WS_2021-05-06_1430	E125	06-May-2021	----	----	----		14-May-2021	0.34 hrs	185 hrs	✗ EHTR-FM
Physical Tests : ORP by Electrode										
HDPE LC_GRCK_WS_2021-05-07_1400	E125	06-May-2021	----	----	----		14-May-2021	0.34 hrs	185 hrs	✗ EHTR-FM
Physical Tests : ORP by Electrode										
HDPE LC_FRUS_WS_2021-05-07_0930	E125	06-May-2021	----	----	----		14-May-2021	0.34 hrs	190 hrs	✗ EHTR-FM
Physical Tests : ORP by Electrode										
HDPE LC_MT2_WS_2021-05-07_0900	E125	06-May-2021	----	----	----		14-May-2021	0.34 hrs	190 hrs	✗ EHTR-FM
Physical Tests : ORP by Electrode										
HDPE LC_RD2_WS_2021-05-07_0900	E125	06-May-2021	----	----	----		14-May-2021	0.34 hrs	190 hrs	✗ EHTR-FM
Physical Tests : pH by Meter										
HDPE LC_CC2_WS_2021-05-07_1430	E108	06-May-2021	----	----	----		17-May-2021	0.25 hrs	260 hrs	✗ EHTR-FM
Physical Tests : pH by Meter										
HDPE LC_FRB_WS_2021-05-06_1430	E108	06-May-2021	----	----	----		17-May-2021	0.25 hrs	260 hrs	✗ EHTR-FM
Physical Tests : pH by Meter										
HDPE LC_GRCK_WS_2021-05-07_1400	E108	06-May-2021	----	----	----		17-May-2021	0.25 hrs	260 hrs	✗ EHTR-FM
Physical Tests : pH by Meter										
HDPE LC_FRUS_WS_2021-05-07_0930	E108	06-May-2021	----	----	----		17-May-2021	0.25 hrs	265 hrs	✗ EHTR-FM

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Physical Tests : pH by Meter										
HDPE LC_MT2_WS_2021-05-07_0900	E108	06-May-2021	----	----	----		17-May-2021	0.25 hrs	265 hrs	✘ EHTR-FM
Physical Tests : pH by Meter										
HDPE LC_RD2_WS_2021-05-07_0900	E108	06-May-2021	----	----	----		17-May-2021	0.25 hrs	265 hrs	✘ EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE LC_CC2_WS_2021-05-07_1430	E162	06-May-2021	----	----	----		12-May-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE LC_FRB_WS_2021-05-06_1430	E162	06-May-2021	----	----	----		12-May-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE LC_FRUS_WS_2021-05-07_0930	E162	06-May-2021	----	----	----		12-May-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE LC_GRCK_WS_2021-05-07_1400	E162	06-May-2021	----	----	----		12-May-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE LC_MT2_WS_2021-05-07_0900	E162	06-May-2021	----	----	----		12-May-2021	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE LC_RD2_WS_2021-05-07_0900	E162	06-May-2021	----	----	----		12-May-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] LC_CC2_WS_2021-05-07_1430	E160-L	06-May-2021	----	----	----		12-May-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*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] LC_FRB_WS_2021-05-06_1430	E160-L	06-May-2021	----	----	----		12-May-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] LC_FRUS_WS_2021-05-07_0930	E160-L	06-May-2021	----	----	----		12-May-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] LC_GRCK_WS_2021-05-07_1400	E160-L	06-May-2021	----	----	----		12-May-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] LC_MT2_WS_2021-05-07_0900	E160-L	06-May-2021	----	----	----		12-May-2021	7 days	7 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] LC_RD2_WS_2021-05-07_0900	E160-L	06-May-2021	----	----	----		12-May-2021	7 days	7 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE LC_CC2_WS_2021-05-07_1430	E121	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE LC_FRB_WS_2021-05-06_1430	E121	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE LC_FRUS_WS_2021-05-07_0930	E121	06-May-2021	----	----	----		09-May-2021	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE LC_GRCK_WS_2021-05-07_1400	E121	06-May-2021	----	----	----		09-May-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*
Physical Tests : Turbidity by Nephelometry										
HDPE LC_MT2_WS_2021-05-07_0900	E121	06-May-2021	----	----	----		09-May-2021	3 days	4 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE LC_RD2_WS_2021-05-07_0900	E121	06-May-2021	----	----	----		09-May-2021	3 days	4 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) LC_CC2_WS_2021-05-07_1430	E420.Cr-L	06-May-2021	----	----	----		11-May-2021	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) LC_FRB_WS_2021-05-06_1430	E420.Cr-L	06-May-2021	----	----	----		11-May-2021	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) LC_FRUS_WS_2021-05-07_0930	E420.Cr-L	06-May-2021	----	----	----		11-May-2021	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) LC_GRCK_WS_2021-05-07_1400	E420.Cr-L	06-May-2021	----	----	----		11-May-2021	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) LC_MT2_WS_2021-05-07_0900	E420.Cr-L	06-May-2021	----	----	----		11-May-2021	180 days	6 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) LC_RD2_WS_2021-05-07_0900	E420.Cr-L	06-May-2021	----	----	----		11-May-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) LC_CC2_WS_2021-05-07_1430	E508-L	06-May-2021	----	----	----		16-May-2021	28 days	10 days	✓

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) LC_FRB_WS_2021-05-06_1430	E508-L	06-May-2021	----	----	----		16-May-2021	28 days	10 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) LC_GRCK_WS_2021-05-07_1400	E508-L	06-May-2021	----	----	----		16-May-2021	28 days	10 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) LC_FRUS_WS_2021-05-07_0930	E508-L	06-May-2021	----	----	----		16-May-2021	28 days	11 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) LC_MT2_WS_2021-05-07_0900	E508-L	06-May-2021	----	----	----		16-May-2021	28 days	11 days	✓
Total Metals : Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)										
Pre-cleaned amber glass - total (lab preserved) LC_RD2_WS_2021-05-07_0900	E508-L	06-May-2021	----	----	----		16-May-2021	28 days	11 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) LC_CC2_WS_2021-05-07_1430	E420	06-May-2021	----	----	----		11-May-2021	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) LC_FRB_WS_2021-05-06_1430	E420	06-May-2021	----	----	----		11-May-2021	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) LC_FRUS_WS_2021-05-07_0930	E420	06-May-2021	----	----	----		11-May-2021	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) LC_GRCK_WS_2021-05-07_1400	E420	06-May-2021	----	----	----		11-May-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 Metals in Water by CRC ICPMS										
HDPE total (nitric acid) LC_MT2_WS_2021-05-07_0900	E420	06-May-2021	----	----	----		11-May-2021	180 days	6 days	✓
Total Metals : Total Metals in Water by CRC ICPMS										
HDPE total (nitric acid) LC_RD2_WS_2021-05-07_0900	E420	06-May-2021	----	----	----		11-May-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	199157	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	199113	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	200099	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	193871	2	27	7.4	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	193872	2	27	7.4	5.0	✓
Conductivity in Water	E100	199112	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	195284	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	196750	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	195285	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	199409	1	16	6.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	193900	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	193875	2	27	7.4	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	193873	2	27	7.4	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	193874	2	27	7.4	5.0	✓
ORP by Electrode	E125	197485	1	20	5.0	5.0	✓
pH by Meter	E108	199111	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	193870	2	27	7.4	5.0	✓
TDS by Gravimetry	E162	195704	2	32	6.2	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	195394	1	13	7.6	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	197837	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	198751	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	195393	1	13	7.6	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	199412	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	197765	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	193909	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	199157	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	199113	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	200099	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	193871	2	27	7.4	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	193872	2	27	7.4	5.0	✓
Conductivity in Water	E100	199112	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	195284	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	196750	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	195285	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	199409	1	16	6.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	193900	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	193875	2	27	7.4	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	193873	2	27	7.4	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	193874	2	27	7.4	5.0	✓
ORP by Electrode	E125	197485	1	20	5.0	5.0	✓
pH by Meter	E108	199111	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	193870	2	27	7.4	5.0	✓
TDS by Gravimetry	E162	195704	2	32	6.2	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	195394	1	13	7.6	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	197837	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	198751	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	195393	1	13	7.6	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	199412	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	197765	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	195700	1	13	7.6	5.0	✓
Turbidity by Nephelometry	E121	193909	1	20	5.0	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	199157	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	199113	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	200099	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	193871	2	27	7.4	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	193872	2	27	7.4	5.0	✓
Conductivity in Water	E100	199112	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	195284	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	196750	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	195285	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	199409	1	16	6.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	193900	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	193875	2	27	7.4	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	193873	2	27	7.4	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	193874	2	27	7.4	5.0	✓
Sulfate in Water by IC	E235.SO4	193870	2	27	7.4	5.0	✓
TDS by Gravimetry	E162	195704	2	32	6.2	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	195394	1	13	7.6	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	197837	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	198751	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	195393	1	13	7.6	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	199412	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	197765	1	20	5.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	195700	1	13	7.6	5.0	✓
Turbidity by Nephelometry	E121	193909	1	20	5.0	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type *Analytical Methods*	*Method*	*QC Lot #*	*Count* *QC*	 *Regular*	*Frequency (%)* *Actual*	 *Expected*	 *Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	200099	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	193871	2	27	7.4	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	193872	2	27	7.4	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	195284	1	20	5.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	196750	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	195285	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	199409	1	16	6.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	193900	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	193875	2	27	7.4	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	193873	2	27	7.4	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	193874	2	27	7.4	5.0	✓
Sulfate in Water by IC	E235.SO4	193870	2	27	7.4	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	195394	1	13	7.6	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	197837	1	20	5.0	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	198751	1	18	5.5	5.0	✓
Total Metals in Water by CRC ICPMS	E420	195393	1	13	7.6	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	199412	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	197765	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 CO2. 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 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			

QUALITY CONTROL REPORT

Work Order	: **CG2101306**	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	: LINE CREEK OPERATIONS	Date Samples Received	: 08-May-2021 09:15
PO	: VPO00748510	Date Analysis Commenced	: 08-May-2021
C-O-C number	: Dry Creek 2021	Issue Date	: 25-May-2021 18:28
Sampler	: Maddy Stokes		
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*
Dee Lee	Analyst	Metals, Burnaby, British Columbia
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
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
Woochan Song	Lab 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: 193909)											
CG2101300-001	Anonymous	turbidity	----	E121	0.10	NTU	2.29	2.32	1.30%	15%	----
Physical Tests (QC Lot: 195704)											
CG2101288-004	Anonymous	solids, total dissolved [TDS]	----	E162	40	mg/L	1630	1800	9.61%	20%	----
Physical Tests (QC Lot: 195705)											
CG2101306-003	LC_FRUS_WS_2021-05-07_0930	solids, total dissolved [TDS]	----	E162	20	mg/L	524	568	8.06%	20%	----
Physical Tests (QC Lot: 197485)											
CG2101300-001	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	386	396	2.64%	15%	----
Physical Tests (QC Lot: 199111)											
CG2101300-001	Anonymous	pH	----	E108	0.10	pH units	7.84	7.83	0.128%	4%	----
Physical Tests (QC Lot: 199112)											
CG2101300-001	Anonymous	conductivity	----	E100	2.0	µS/cm	148	143	3.57%	10%	----
Physical Tests (QC Lot: 199113)											
CG2101300-001	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	76.2	73.9	3.06%	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	76.2	73.9	3.06%	20%	----
Physical Tests (QC Lot: 199157)											
CG2101300-001	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 193870)											
CG2101306-005	LC_MT2_WS_2021-05-07_0900	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: 193871)											
CG2101306-005	LC_MT2_WS_2021-05-07_0900	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 193872)											
CG2101306-005	LC_MT2_WS_2021-05-07_0900	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 193873)											
CG2101306-005	LC_MT2_WS_2021-05-07_0900	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: 193874)											
CG2101306-005	LC_MT2_WS_2021-05-07_0900	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: 193875)											

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: 193875) - continued											
CG2101306-005	LC_MT2_WS_2021-05-07_0900	fluoride	16984-48-8	E235.F	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 193876)											
CG2101307-002	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: 193877)											
CG2101307-002	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: 193878)											
CG2101307-002	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: 193879)											
CG2101307-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	<0.0050	0.0080	0.0030	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 193880)											
CG2101307-002	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: 193881)											
CG2101307-002	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	<0.020	<0.020	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 193900)											
CG2101300-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0446	0.0454	1.84%	20%	----
Anions and Nutrients (QC Lot: 197765)											
CG2101300-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0100	mg/L	0.0447	0.0456	0.0009	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 197837)											
CG2101300-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.100	0.114	0.014	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 200099)											
CG2101300-005	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0072	0.0062	0.0010	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 199409)											
CG2101300-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	3.78	3.89	0.10	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 199412)											
CG2101300-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	3.85	3.91	0.06	Diff <2x LOR	----
Total Metals (QC Lot: 195393)											
CG2101293-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0359	0.0361	0.475%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.00016	0.00016	0.000002	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00015	0.00015	0.000001	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0934	0.0937	0.319%	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	0.0376 µg/L	0.0000372	0.0000004	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: 195393) - continued											
CG2101293-001	Anonymous	calcium, total	7440-70-2	E420	0.050	mg/L	98.0	99.5	1.48%	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	0.061	0.057	0.005	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	0.0221	0.0223	0.842%	20%	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	44.7	45.2	1.03%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00425	0.00433	1.89%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00119	0.00117	1.76%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00178	0.00192	0.00014	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	1.35	1.34	0.694%	20%	----
		selenium, total	7782-49-2	E420	0.050	mg/L	52.4 µg/L	0.0517	1.50%	20%	----
		silicon, total	7440-21-3	E420	0.10	mg/L	1.93	1.94	0.309%	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	2.09	2.16	3.35%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.133	0.130	2.53%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	73.4	74.1	0.894%	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	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00231	0.00230	0.0626%	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: 195394)											
CG2101293-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00019	0.00018	0.00001	Diff <2x LOR	----
Total Metals (QC Lot: 198751)											
CG2101306-001	LC_FRB_WS_2021-05-06_1430	mercury, total	7439-97-6	E508-L	0.00050	ng/L	0.00073 µg/L	0.67	0.06	Diff <2x LOR	----
Dissolved Metals (QC Lot: 195284)											
CG2101306-001	LC_FRB_WS_2021-05-06_1430	chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	<0.00010	0.00011	0.00001	Diff <2x LOR	----
Dissolved Metals (QC Lot: 195285)											
CG2101306-001	LC_FRB_WS_2021-05-06_1430	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0014	0.0011	0.0004	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00014	0.00014	0.000004	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00010	<0.00010	0.000002	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.108	0.108	0.476%	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: 195285) - continued											
CG2101306-001	LC_FRB_WS_2021-05-06_ 1430	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	0.0340 µg/L	0.0000312	0.0000028	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	99.1	99.8	0.692%	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	0.0233	0.0246	5.37%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	43.1	42.4	1.48%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00244	0.00247	1.22%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00130	0.00124	4.51%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00180	0.00174	0.00006	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.43	1.43	0.208%	20%	----
		selenium, dissolved	7782-49-2	E421	0.050	mg/L	54.1 µg/L	0.0534	1.27%	20%	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	1.94	1.92	1.29%	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	2.14	2.15	0.404%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.142	0.142	0.665%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	70.2	69.5	1.02%	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	0.00217	0.00214	1.35%	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	0.0013	0.0012	0.00004	Diff <2x LOR	----
Dissolved Metals (QC Lot: 195842)											
CG2101288-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00050	mg/L	0.00095	0.00102	0.00007	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00050	mg/L	0.0138	0.0140	1.41%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.100	mg/L	<0.100 µg/L	<0.000100	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000250	mg/L	<0.000250	<0.000250	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.050	mg/L	<0.050	<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: 195842) - continued											
CG2101288-001	Anonymous	cadmium, dissolved	7440-43-9	E421	0.0250	mg/L	1.13 µg/L	0.00117	3.97%	20%	----
		calcium, dissolved	7440-70-2	E421	0.250	mg/L	290	288	0.640%	20%	----
		cobalt, dissolved	7440-48-4	E421	0.50	mg/L	0.55 µg/L	0.00057	0.00002	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		lead, dissolved	7439-92-1	E421	0.000250	mg/L	<0.000250	<0.000250	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0050	mg/L	0.454	0.468	3.08%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0250	mg/L	151	152	0.419%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		molybdenum, dissolved	7439-98-7	E421	0.000250	mg/L	0.00425	0.00419	1.36%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00250	mg/L	0.0594	0.0594	0.136%	20%	----
		potassium, dissolved	7440-09-7	E421	0.250	mg/L	7.46	7.51	0.603%	20%	----
		selenium, dissolved	7782-49-2	E421	0.250	mg/L	162 µg/L	0.163	0.304%	20%	----
		silicon, dissolved	7440-21-3	E421	0.250	mg/L	1.69	1.65	0.035	Diff <2x LOR	----
		silver, dissolved	7440-22-4	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		sodium, dissolved	17341-25-2	E421	0.250	mg/L	9.42	9.36	0.615%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00100	mg/L	0.436	0.429	1.70%	20%	----
		sulfur, dissolved	7704-34-9	E421	2.50	mg/L	258	259	0.259%	20%	----
		thallium, dissolved	7440-28-0	E421	0.000050	mg/L	0.000054	0.000055	0.000001	Diff <2x LOR	----
		tin, dissolved	7440-31-5	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		titanium, dissolved	7440-32-6	E421	0.00150	mg/L	<0.00150	<0.00150	0	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000050	mg/L	0.0152	0.0155	2.03%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00250	mg/L	<0.00250	<0.00250	0	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0050	mg/L	0.0638	0.0626	1.83%	20%	----
Dissolved Metals (QC Lot: 196750)											
CG2101306-001	LC_FRB_WS_2021-05-06_1430	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: 193909)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 195700)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 195704)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 195705)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 199112)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 199113)						
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: 199157)						
acidity (as CaCO3)	----	E283	2	mg/L	# 2.0	----
Anions and Nutrients (QCLot: 193870)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 193871)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 193872)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 193873)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 193874)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 193875)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 193876)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 193877)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 193878)						

Sub-Matrix: **Water**

Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	*Result*	*Qualifier*
Anions and Nutrients (QCLot: 193878) - continued						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 193879)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 193880)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 193881)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 193900)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 197765)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 197837)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 200099)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 199409)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 199412)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 195393)						
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	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 195393) - continued						
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	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 195394)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 198751)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 195284)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 195285)						
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	----

Sub-Matrix: **Water**

Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	*Result*	*Qualifier*
Dissolved Metals (QCLot: 195285) - continued						
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: 195842)						
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	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 195842) - continued						
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: 196750)						
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: 193909)									
turbidity	----	E121	0.1	NTU	200 NTU	100	85.0	115	----
Physical Tests (QCLot: 195700)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	92.1	85.0	115	----
Physical Tests (QCLot: 195704)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	93.7	85.0	115	----
Physical Tests (QCLot: 195705)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	109	85.0	115	----
Physical Tests (QCLot: 197485)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	102	95.4	104	----
Physical Tests (QCLot: 199111)									
pH	----	E108	----	pH units	7 pH units	101	98.6	101	----
Physical Tests (QCLot: 199112)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	103	90.0	110	----
Physical Tests (QCLot: 199113)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	106	85.0	115	----
Physical Tests (QCLot: 199157)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	106	85.0	115	----
Anions and Nutrients (QCLot: 193870)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 193871)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	100	85.0	115	----
Anions and Nutrients (QCLot: 193872)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 193873)									
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: 193874)									
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: 193875)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	99.6	90.0	110	----
Anions and Nutrients (QCLot: 193876)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	102	90.0	110	----
Anions and Nutrients (QCLot: 193877)									

Sub-Matrix: **Water**

Laboratory Control Sample (LCS) Report

Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	*Spike*	*Recovery (%)*	*Recovery Limits (%)*		*Qualifier*
					Concentration	*LCS*	*Low*	*High*	
Anions and Nutrients (QCLot: 193877) - continued									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	98.2	85.0	115	----
Anions and Nutrients (QCLot: 193878)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 193879)									
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: 193880)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	101	90.0	110	----
Anions and Nutrients (QCLot: 193881)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	98.8	90.0	110	----
Anions and Nutrients (QCLot: 193900)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.1 mg/L	99.6	80.0	120	----
Anions and Nutrients (QCLot: 197765)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	101	80.0	120	----
Anions and Nutrients (QCLot: 197837)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	79.4	75.0	125	----
Anions and Nutrients (QCLot: 200099)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.1 mg/L	93.5	85.0	115	----
Organic / Inorganic Carbon (QCLot: 199409)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	89.3	80.0	120	----
Organic / Inorganic Carbon (QCLot: 199412)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	89.5	80.0	120	----
Total Metals (QCLot: 195393)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	97.7	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	109	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	96.5	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	93.8	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	88.7	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	92.2	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	94.2	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	93.3	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	96.9	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	94.0	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	94.4	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	97.4	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: 195393) - continued									
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	84.8	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	97.5	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	93.6	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	104	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	94.1	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	97.2	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	97.6	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	93.7	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	99.4	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	95.2	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	99.3	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	94.4	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	95.5	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	95.7	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	99.4	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	98.3	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	94.8	80.0	120	----
Total Metals (QCLot: 195394)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	93.9	80.0	120	----
Total Metals (QCLot: 198751)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	98.8	80.0	120	----
Dissolved Metals (QCLot: 195284)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	103	80.0	120	----
Dissolved Metals (QCLot: 195285)									
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	103	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	106	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	103	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	98.0	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	101	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	105	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	101	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	----

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: 195285) - continued									
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	97.3	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	97.9	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	98.0	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	107	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	103	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	104	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	88.5	80.0	120	----
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	106	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	111	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	99.1	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	98.3	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	98.6	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	99.6	80.0	120	----
Dissolved Metals (QCLot: 195842)									
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	97.8	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	98.3	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	107	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	98.0	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	105	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	101	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	98.5	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	97.6	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	88.6	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	98.0	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	98.8	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	101	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	100.0	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	High	Qualifier
Dissolved Metals (QCLot: 195842) - continued									
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	96.6	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	99.6	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	93.2	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	97.1	60.0	140	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	96.7	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	96.5	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	101	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	97.5	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	89.9	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	92.7	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	99.8	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	97.0	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	96.4	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: 193870)										
CG2101306-005	LC_MT2_WS_2021-05-07_0900	sulfate (as SO4)	14808-79-8	E235.SO4	110 mg/L	100 mg/L	110	75.0	125	----
Anions and Nutrients (QCLot: 193871)										
CG2101306-005	LC_MT2_WS_2021-05-07_0900	bromide	24959-67-9	E235.Br-L	0.564 mg/L	0.5 mg/L	113	75.0	125	----
Anions and Nutrients (QCLot: 193872)										
CG2101306-005	LC_MT2_WS_2021-05-07_0900	chloride	16887-00-6	E235.Cl-L	111 mg/L	100 mg/L	111	75.0	125	----
Anions and Nutrients (QCLot: 193873)										
CG2101306-005	LC_MT2_WS_2021-05-07_0900	nitrate (as N)	14797-55-8	E235.NO3-L	2.78 mg/L	2.5 mg/L	111	75.0	125	----
Anions and Nutrients (QCLot: 193874)										
CG2101306-005	LC_MT2_WS_2021-05-07_0900	nitrite (as N)	14797-65-0	E235.NO2-L	0.566 mg/L	0.5 mg/L	113	75.0	125	----
Anions and Nutrients (QCLot: 193875)										
CG2101306-005	LC_MT2_WS_2021-05-07_0900	fluoride	16984-48-8	E235.F	1.07 mg/L	1 mg/L	107	75.0	125	----
Anions and Nutrients (QCLot: 193876)										
CG2101307-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	111 mg/L	100 mg/L	111	75.0	125	----
Anions and Nutrients (QCLot: 193877)										
CG2101307-002	Anonymous	bromide	24959-67-9	E235.Br-L	0.570 mg/L	0.5 mg/L	114	75.0	125	----
Anions and Nutrients (QCLot: 193878)										
CG2101307-002	Anonymous	chloride	16887-00-6	E235.Cl-L	112 mg/L	100 mg/L	112	75.0	125	----
Anions and Nutrients (QCLot: 193879)										
CG2101307-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.79 mg/L	2.5 mg/L	112	75.0	125	----
Anions and Nutrients (QCLot: 193880)										
CG2101307-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.568 mg/L	0.5 mg/L	114	75.0	125	----
Anions and Nutrients (QCLot: 193881)										
CG2101307-002	Anonymous	fluoride	16984-48-8	E235.F	1.06 mg/L	1 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 193900)										
CG2101300-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0496 mg/L	0.05 mg/L	99.2	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
Anions and Nutrients (QCLot: 197765)										
CG2101300-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0515 mg/L	0.0676 mg/L	76.2	70.0	130	----
Anions and Nutrients (QCLot: 197837)										
CG2101300-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.00 mg/L	2.5 mg/L	80.2	70.0	130	----
Anions and Nutrients (QCLot: 200099)										
CG2101306-005	LC_MT2_WS_2021-05-07_0900	ammonia, total (as N)	7664-41-7	E298	0.102 mg/L	0.1 mg/L	102	75.0	125	----
Organic / Inorganic Carbon (QCLot: 199409)										
CG2101300-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	19.8 mg/L	23.9 mg/L	82.7	70.0	130	----
Organic / Inorganic Carbon (QCLot: 199412)										
CG2101300-001	Anonymous	carbon, total organic [TOC]	----	E355-L	20.1 mg/L	23.9 mg/L	84.0	70.0	130	----
Total Metals (QCLot: 195393)										
CG2101293-001	Anonymous	aluminum, total	7429-90-5	E420	0.186 mg/L	0.2 mg/L	92.8	70.0	130	----
		antimony, total	7440-36-0	E420	0.0204 mg/L	0.02 mg/L	102	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0195 mg/L	0.02 mg/L	97.3	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	0.0372 mg/L	0.04 mg/L	92.9	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	0.094 mg/L	0.1 mg/L	94.1	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00376 mg/L	0.004 mg/L	93.9	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	0.0184 mg/L	0.02 mg/L	92.1	70.0	130	----
		copper, total	7440-50-8	E420	0.0180 mg/L	0.02 mg/L	90.2	70.0	130	----
		iron, total	7439-89-6	E420	1.79 mg/L	2 mg/L	89.5	70.0	130	----
		lead, total	7439-92-1	E420	0.0188 mg/L	0.02 mg/L	93.8	70.0	130	----
		lithium, total	7439-93-2	E420	0.0887 mg/L	0.1 mg/L	88.7	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	0.0178 mg/L	0.02 mg/L	89.2	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0197 mg/L	0.02 mg/L	98.5	70.0	130	----
		nickel, total	7440-02-0	E420	0.0363 mg/L	0.04 mg/L	90.8	70.0	130	----
		potassium, total	7440-09-7	E420	3.77 mg/L	4 mg/L	94.3	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	9.10 mg/L	10 mg/L	91.0	70.0	130	----
		silver, total	7440-22-4	E420	0.00386 mg/L	0.004 mg/L	96.4	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	----

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: 195393) - continued										
CG2101293-001	Anonymous	sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	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	0.0191 mg/L	0.02 mg/L	95.7	70.0	130	----
		titanium, total	7440-32-6	E420	0.0391 mg/L	0.04 mg/L	97.7	70.0	130	----
		uranium, total	7440-61-1	E420	0.00394 mg/L	0.004 mg/L	98.4	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	0.368 mg/L	0.4 mg/L	92.0	70.0	130	----
Total Metals (QCLot: 195394)										
CG2101293-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0380 mg/L	0.04 mg/L	94.9	70.0	130	----
Total Metals (QCLot: 198751)										
CG2101306-002	LC_CC2_WS_2021-05-07_1430	mercury, total	7439-97-6	E508-L	4.63 ng/L	5 ng/L	92.6	70.0	130	----
Dissolved Metals (QCLot: 195284)										
CG2101306-001	LC_FRB_WS_2021-05-06_1430	chromium, dissolved	7440-47-3	E421.Cr-L	0.0408 mg/L	0.04 mg/L	102	70.0	130	----
Dissolved Metals (QCLot: 195285)										
CG2101306-001	LC_FRB_WS_2021-05-06_1430	aluminum, dissolved	7429-90-5	E421	0.201 mg/L	0.2 mg/L	100	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0198 mg/L	0.02 mg/L	99.2	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0209 mg/L	0.02 mg/L	104	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	0.0405 mg/L	0.04 mg/L	101	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00810 mg/L	0.01 mg/L	81.0	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.104 mg/L	0.1 mg/L	104	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	0.0193 mg/L	0.02 mg/L	96.7	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0196 mg/L	0.02 mg/L	98.2	70.0	130	----
		iron, dissolved	7439-89-6	E421	2.02 mg/L	2 mg/L	101	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0184 mg/L	0.02 mg/L	91.9	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.102 mg/L	0.1 mg/L	102	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	0.0202 mg/L	0.02 mg/L	101	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0208 mg/L	0.02 mg/L	104	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0390 mg/L	0.04 mg/L	97.5	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.89 mg/L	4 mg/L	97.3	70.0	130	----
		selenium, dissolved	7782-49-2	E421	ND mg/L	0.04 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: 195285) - continued										
CG2101306-001	LC_FRB_WS_2021-05-06_1430	silicon, dissolved	7440-21-3	E421	9.32 mg/L	10 mg/L	93.2	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00375 mg/L	0.004 mg/L	93.7	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	0.00374 mg/L	0.004 mg/L	93.5	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0199 mg/L	0.02 mg/L	99.3	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0386 mg/L	0.04 mg/L	96.4	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00384 mg/L	0.004 mg/L	96.0	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.104 mg/L	0.1 mg/L	104	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.386 mg/L	0.4 mg/L	96.5	70.0	130	----
Dissolved Metals (QCLot: 195842)										
CG2101288-001	Anonymous	aluminum, dissolved	7429-90-5	E421	1.96 mg/L	2 mg/L	98.2	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.199 mg/L	0.2 mg/L	99.4	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.198 mg/L	0.2 mg/L	99.0	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.197 mg/L	0.2 mg/L	98.6	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.404 mg/L	0.4 mg/L	101	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.0914 mg/L	0.1 mg/L	91.4	70.0	130	----
		boron, dissolved	7440-42-8	E421	1.00 mg/L	1 mg/L	100	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.0393 mg/L	0.04 mg/L	98.2	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	40 mg/L	ND	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.196 mg/L	0.2 mg/L	98.0	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.193 mg/L	0.2 mg/L	96.7	70.0	130	----
		iron, dissolved	7439-89-6	E421	19.0 mg/L	20 mg/L	94.9	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.189 mg/L	0.2 mg/L	94.6	70.0	130	----
		lithium, dissolved	7439-93-2	E421	1.03 mg/L	1 mg/L	103	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	10 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.196 mg/L	0.2 mg/L	98.0	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.207 mg/L	0.2 mg/L	104	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.380 mg/L	0.4 mg/L	94.9	70.0	130	----
		potassium, dissolved	7440-09-7	E421	38.6 mg/L	40 mg/L	96.6	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.399 mg/L	0.4 mg/L	99.8	70.0	130	----
		silicon, dissolved	7440-21-3	E421	92.9 mg/L	100 mg/L	92.9	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.0393 mg/L	0.04 mg/L	98.2	70.0	130	----
		sodium, dissolved	17341-25-2	E421	19.0 mg/L	20 mg/L	95.1	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.2 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: 195842) - continued										
CG2101288-001	Anonymous	sulfur, dissolved	7704-34-9	E421	ND mg/L	200 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.0373 mg/L	0.04 mg/L	93.4	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.196 mg/L	0.2 mg/L	97.9	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.385 mg/L	0.4 mg/L	96.2	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.0385 mg/L	0.04 mg/L	96.3	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.997 mg/L	1 mg/L	99.7	70.0	130	----
		zinc, dissolved	7440-66-6	E421	3.91 mg/L	4 mg/L	97.8	70.0	130	----
Dissolved Metals (QCLot: 196750)										
CG2101306-002	LC_CC2_WS_2021-05-07_1430	mercury, dissolved	7439-97-6	E509	0.0000995 mg/L	0.0001 mg/L	99.5	70.0	130	----

Teck

Page 1 of 1

COC ID:	Dry Creek 2021	**TURNAROUND TIME:**	

PROJECT/CLIENT INFO

Facility Name	REP		
Project Manager	Cait Good		
Email	[illegible]		
Address	421 Pine Avenue		
City	Sparwood	Province	BC
Postal Code	V0B 2G0	Country	Canada
Phone Number	250-425-8202		

LABORATORY

Lab Name	ALS Calgary		
Lab Contact	Lyudmyla Shvets		
Email	lyudmyla.shvets@alsglobal.com		
Address	2559 29 Street NE		
City	Calgary	Province	AB
Postal Code	T1Y 7B5	Country	Canada
Phone Number	1 403 407 1794		

	Excel	PDF	EDD
[illegible]			
[illegible]			
[illegible]			
cailie.meyer@teck.com			
[illegible]			

PO 748510

SAMPLE DETAILS / **ANALYSIS REQUESTED**

								N	F	N	N	F	N	F
									H2SO4	H2SO4		HCL	HNO3	HNO3
Sample ID	**Sample Location**	**Field Matrix**	**Hazardous Material (Yes/No)**	**Date**	**Time (24hr)**	**G=Grab C=Comp**	**# Of Cont.**	**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**
LC_FRB_WS_2021-05-06_1430	LC_FRB	WS	No	5/6/2021	14:30	G	7	1	1	1	1	1	1	1
LC_CC2_WS_2021-05-07_1430	LC_RIVER	WS	No	5/6/2021	14:30	G	7	1	1	1	1	1	1	1
LC_FRUS_WS_2021-05-07_0930	LC_FRUS	WS	No	5/7/2021	9:30	G	7	1	1	1	1	1	1	1
LC_GRCK_WS_2021-05-07_1400	LC_GRCK	WS	No	5/7/2021	14:00	G	7	1	1	1	1	1	1	1
LC_MT2_WS_2021-05-07_0900	LC_MT2	WS	No	5/7/2021	9:00	G	7	1	1	1	1	1	1	1
LC_RD2_WS_2021-05-07_0900	LC_RD2	WS	No	5/7/2021	9:00	G	4	1		1	1		1	

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

PO 748510

RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
		Dk	5/8

NB OF BOTTLES RETURNED/DESCRIPTION

Regular (default) x
Priority (2-3 business days) - 50% surcharge
Emergency (1 Business Day) - 100% surcharge
gency <1 Day, ASAP or Weekend - Contact ALS

Sampler's Name	**Maddy Stokes**	**Mobile #**	**647-522-0672**
Sampler's Signature	**MS**	**Date/Time**	**07-May-2021 / 17:30**

Environmental Division
Calgary
Work Order Reference
CG2101306

Telephone : +1 403 407 1800

4°c 0915

WATER CHEMISTRY

ALS Laboratory Report CG2104066

CERTIFICATE OF ANALYSIS

Work Order	: **CG2104066**	Page	: 1 of 7
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Mike Pope	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	: LINE CREEK OPERATIONS	Date Samples Received	: 14-Sep-2021 10:30
PO	: VPO00748510	Date Analysis Commenced	: 15-Sep-2021
C-O-C number	: September Dry Creek LAEMP 2021	Issue Date	: 29-Sep-2021 17:28
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
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
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
Robin Weeks	Team Leader - Metals	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Shaneel Dayal	Analyst	Metals, Burnaby, British Columbia
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*
TKNI	*TKN result may be biased low due to Nitrate interference. Nitrate-N is > 10x TKN.*

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water)**

				Client sample ID	**LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP**	----	----	----	----
				Client sampling date / time	12-Sep-2021 13:30	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2104066-001**	--------	--------	--------	--------
					Result	----	----	----	----
Physical Tests									
acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	----	----	----	----
alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	205	----	----	----	----
alkalinity, carbonate (as CaCO3)	----	E290	1.0	mg/L	7.0	----	----	----	----
alkalinity, hydroxide (as CaCO3)	----	E290	1.0	mg/L	<1.0	----	----	----	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	212	----	----	----	----
conductivity	----	E100	2.0	µS/cm	828	----	----	----	----
hardness (as CaCO3), dissolved	----	EC100	0.50	mg/L	435	----	----	----	----
oxidation-reduction potential [ORP]	----	E125	0.10	mV	473	----	----	----	----
pH	----	E108	0.10	pH units	8.32	----	----	----	----
solids, total dissolved [TDS]	----	E162	10	mg/L	572	----	----	----	----
solids, total suspended [TSS]	----	E160-L	1.0	mg/L	1.1	----	----	----	----
turbidity	----	E121	0.10	NTU	0.20	----	----	----	----
alkalinity, bicarbonate (as HCO3)	71-52-3	E290	1.0	mg/L	250	----	----	----	----
alkalinity, carbonate (as CO3)	3812-32-6	E290	1.0	mg/L	4.2	----	----	----	----
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	0.0096	----	----	----	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	----	----	----	----
chloride	16887-00-6	E235.Cl-L	0.10	mg/L	1.46	----	----	----	----
fluoride	16984-48-8	E235.F	0.020	mg/L	0.167	----	----	----	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.113 TKNI	----	----	----	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	14.4	----	----	----	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0051	----	----	----	----
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	0.0036	----	----	----	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	218	----	----	----	----
Organic / Inorganic Carbon									
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.13	----	----	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.45	----	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP**	----	----	----	----
				Client sampling date / time	12-Sep-2021 13:30	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2104066-001**	--------	--------	--------	--------
					Result	----	----	----	----
Ion Balance									
anion sum	----	EC101	0.10	meq/L	9.85	----	----	----	----
cation sum	----	EC101	0.10	meq/L	8.83	----	----	----	----
ion balance (cations/anions ratio)	----	EC101	0.010	%	89.6	----	----	----	----
ion balance (cation-anion difference)	----	EC101	0.010	%	5.46	----	----	----	----
Total Metals									
aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0078	----	----	----	----
antimony, total	7440-36-0	E420	0.00010	mg/L	0.00012	----	----	----	----
arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00012	----	----	----	----
barium, total	7440-39-3	E420	0.00010	mg/L	0.0957	----	----	----	----
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	0.011	----	----	----	----
cadmium, total	7440-43-9	E420	0.0050	µg/L	0.0223	----	----	----	----
calcium, total	7440-70-2	E420	0.050	mg/L	100	----	----	----	----
chromium, total	7440-47-3	E420.Cr-L	0.00010	mg/L	0.00015	----	----	----	----
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	0.014	----	----	----	----
lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	----	----	----	----
lithium, total	7439-93-2	E420	0.0010	mg/L	0.0298	----	----	----	----
magnesium, total	7439-95-4	E420	0.0050	mg/L	44.8	----	----	----	----
manganese, total	7439-96-5	E420	0.00010	mg/L	0.00170	----	----	----	----
mercury, total	7439-97-6	E508-L	0.00050	µg/L	<0.00050	----	----	----	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00108	----	----	----	----
nickel, total	7440-02-0	E420	0.00050	mg/L	0.00083	----	----	----	----
potassium, total	7440-09-7	E420	0.050	mg/L	1.47	----	----	----	----
selenium, total	7782-49-2	E420	0.050	µg/L	53.3	----	----	----	----
silicon, total	7440-21-3	E420	0.10	mg/L	2.07	----	----	----	----
silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	----	----	----	----
sodium, total	17341-25-2	E420	0.050	mg/L	2.29	----	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP**	----	----	----	----
				Client sampling date / time	12-Sep-2021 13:30	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2104066-001**	--------	--------	--------	--------
					Result	----	----	----	----
Total Metals									
strontium, total	7440-24-6	E420	0.00020	mg/L	0.156	----	----	----	----
sulfur, total	7704-34-9	E420	0.50	mg/L	72.3	----	----	----	----
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	0.00260	----	----	----	----
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	<0.0010	----	----	----	----
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	0.0940	----	----	----	----
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	0.0201	----	----	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L	99.1	----	----	----	----
chromium, dissolved	7440-47-3	E421.Cr-L	0.00010	mg/L	0.00011	----	----	----	----
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	0.0281	----	----	----	----
magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	45.6	----	----	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.00117	----	----	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	----	----	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00101	----	----	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00093	----	----	----	----
potassium, dissolved	7440-09-7	E421	0.050	mg/L	1.41	----	----	----	----

Analytical Results

Sub-Matrix: **Water**

(Matrix: **Water**)

				Client sample ID	**LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP**	----	----	----	----
				Client sampling date / time	12-Sep-2021 13:30	----	----	----	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	**CG2104066-001**	--------	--------	--------	--------
					Result	----	----	----	----
Dissolved Metals									
selenium, dissolved	7782-49-2	E421	0.050	µg/L	59.7	----	----	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L	2.03	----	----	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	----	----	----	----
sodium, dissolved	17341-25-2	E421	0.050	mg/L	2.22	----	----	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.152	----	----	----	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	74.7	----	----	----	----
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.

ALS Environmental

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **CG2104066**	Page	: 1 of 12
Client	: **Teck Coal Limited**	Laboratory	: Calgary - Environmental
Contact	: Mike Pope	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	: LINE CREEK OPERATIONS	Date Samples Received	: 14-Sep-2021 10:30
PO	: VPO00748510	Issue Date	: 29-Sep-2021 17:29
C-O-C number	: September Dry Creek 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	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E298	12-Sep-2021	24-Sep-2021	----	----		24-Sep-2021	28 days	12 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E235.Br-L	12-Sep-2021	----	----	----		15-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC (Low Level)										
HDPE LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E235.Cl-L	12-Sep-2021	----	----	----		15-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)										
HDPE LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E378-U	12-Sep-2021	----	----	----		15-Sep-2021	3 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E235.F	12-Sep-2021	----	----	----		15-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E235.NO3-L	12-Sep-2021	----	----	----		15-Sep-2021	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E235.NO2-L	12-Sep-2021	----	----	----		15-Sep-2021	3 days	3 days	✓

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Anions and Nutrients : Sulfate in Water by IC										
HDPE LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E235.SO4	12-Sep-2021	----	----	----		15-Sep-2021	28 days	3 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E318	12-Sep-2021	20-Sep-2021	----	----		21-Sep-2021	28 days	9 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (Ultra Trace)										
Amber glass total (sulfuric acid) LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E372-U	12-Sep-2021	16-Sep-2021	----	----		16-Sep-2021	28 days	4 days	✓
Dissolved Metals : Dissolved Chromium in Water by CRC ICPMS (Low Level)										
HDPE dissolved (nitric acid) LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E421.Cr-L	12-Sep-2021	20-Sep-2021	----	----		20-Sep-2021	180 days	8 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial dissolved (hydrochloric acid) LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E509	12-Sep-2021	21-Sep-2021	----	----		21-Sep-2021	28 days	9 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE dissolved (nitric acid) LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E421	12-Sep-2021	20-Sep-2021	----	----		20-Sep-2021	180 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E358-L	12-Sep-2021	21-Sep-2021	----	----		24-Sep-2021	28 days	12 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E355-L	12-Sep-2021	21-Sep-2021	----	----		24-Sep-2021	28 days	12 days	✓
Physical Tests : Acidity by Titration										
HDPE LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E283	12-Sep-2021	----	----	----		21-Sep-2021	14 days	9 days	✓

Matrix: **Water**

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

Analyte Group	*Method*	*Sampling Date*	*Extraction / Preparation*				*Analysis*			
Container / Client Sample ID(s)			*Preparation Date*	*Holding Times*		*Eval*	*Analysis Date*	*Holding Times*		*Eval*
				Rec	*Actual*			*Rec*	*Actual*	
Physical Tests : Alkalinity Species by Titration										
HDPE LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E290	12-Sep-2021	----	----	----		22-Sep-2021	14 days	10 days	✓
Physical Tests : Conductivity in Water										
HDPE LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E100	12-Sep-2021	----	----	----		22-Sep-2021	28 days	10 days	✓
Physical Tests : ORP by Electrode										
HDPE LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E125	12-Sep-2021	----	----	----		21-Sep-2021	0.34 hrs	218 hrs	✘ EHTR-FM
Physical Tests : pH by Meter										
HDPE LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E108	12-Sep-2021	----	----	----		22-Sep-2021	0.25 hrs	238 hrs	✘ EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E162	12-Sep-2021	----	----	----		17-Sep-2021	7 days	5 days	✓
Physical Tests : TSS by Gravimetry (Low Level)										
HDPE [TSS-WB] LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E160-L	12-Sep-2021	----	----	----		19-Sep-2021	7 days	7 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E121	12-Sep-2021	----	----	----		15-Sep-2021	3 days	3 days	✓
Total Metals : Total Chromium in Water by CRC ICPMS (Low Level)										
HDPE total (nitric acid) LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E420.Cr-L	12-Sep-2021	----	----	----		18-Sep-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) LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E508-L	12-Sep-2021	----	----	----		21-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) LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	E420	12-Sep-2021	----	----	----		18-Sep-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	298053	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	299358	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	301690	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	292755	1	8	12.5	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	292756	1	7	14.2	5.0	✓
Conductivity in Water	E100	299356	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	297296	1	9	11.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	297697	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	297295	1	9	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	298734	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	292598	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	292753	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	292757	1	8	12.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	292758	1	8	12.5	5.0	✓
ORP by Electrode	E125	297941	1	15	6.6	5.0	✓
pH by Meter	E108	299357	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	292754	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	295516	1	6	16.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	295736	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	296970	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	298052	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	295735	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	298741	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	292429	1	11	9.0	5.0	✓
Turbidity by Nephelometry	E121	292521	1	9	11.1	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	298053	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	299358	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	301690	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	292755	1	8	12.5	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	292756	1	7	14.2	5.0	✓
Conductivity in Water	E100	299356	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	297296	1	9	11.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	297697	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	297295	1	9	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	298734	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	292598	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	292753	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	292757	1	8	12.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	292758	1	8	12.5	5.0	✓
ORP by Electrode	E125	297941	1	15	6.6	5.0	✓
pH by Meter	E108	299357	1	20	5.0	5.0	✓
Sulfate in Water by IC	E235.SO4	292754	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	295516	1	6	16.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	295736	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	296970	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	298052	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	295735	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	298741	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	292429	1	11	9.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	295514	1	6	16.6	5.0	✓
Turbidity by Nephelometry	E121	292521	1	9	11.1	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	298053	1	20	5.0	5.0	✓
Alkalinity Species by Titration	E290	299358	1	20	5.0	5.0	✓
Ammonia by Fluorescence	E298	301690	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	292755	1	8	12.5	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	292756	1	7	14.2	5.0	✓
Conductivity in Water	E100	299356	1	20	5.0	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	297296	1	9	11.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	297697	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	297295	1	9	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	298734	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	292598	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	292753	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	292757	1	8	12.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	292758	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	292754	1	20	5.0	5.0	✓
TDS by Gravimetry	E162	295516	1	6	16.6	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	295736	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	296970	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	298052	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	295735	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	298741	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	292429	1	11	9.0	5.0	✓
TSS by Gravimetry (Low Level)	E160-L	295514	1	6	16.6	5.0	✓
Turbidity by Nephelometry	E121	292521	1	9	11.1	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type *Analytical Methods*	*Method*	*QC Lot #*	*Count* *QC*	 *Regular*	*Frequency (%)* *Actual*	 *Expected*	 *Evaluation*
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	301690	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	292755	1	8	12.5	5.0	✓
Chloride in Water by IC (Low Level)	E235.Cl-L	292756	1	7	14.2	5.0	✓
Dissolved Chromium in Water by CRC ICPMS (Low Level)	E421.Cr-L	297296	1	9	11.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	297697	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	297295	1	9	11.1	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	298734	1	17	5.8	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level)	E378-U	292598	1	20	5.0	5.0	✓
Fluoride in Water by IC	E235.F	292753	1	20	5.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	292757	1	8	12.5	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	292758	1	8	12.5	5.0	✓
Sulfate in Water by IC	E235.SO4	292754	1	20	5.0	5.0	✓
Total Chromium in Water by CRC ICPMS (Low Level)	E420.Cr-L	295736	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	296970	1	17	5.8	5.0	✓
Total Mercury in Water by CVAFS (Low Level, LOR = 0.5 ppt)	E508-L	298052	1	19	5.2	5.0	✓
Total Metals in Water by CRC ICPMS	E420	295735	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	298741	1	20	5.0	5.0	✓
Total Phosphorus by Colourimetry (Ultra Trace)	E372-U	292429	1	11	9.0	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.

QUALITY CONTROL REPORT

Work Order	:**CG2104066**	Page	: 1 of 18
Client	:Teck Coal Limited	Laboratory	:Calgary - Environmental
Contact	:Mike Pope	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	:LINE CREEK OPERATIONS	Date Samples Received	:14-Sep-2021 10:30
PO	:VPO00748510	Date Analysis Commenced	:15-Sep-2021
C-O-C number	:September Dry Creek LAEMP 2021	Issue Date	:29-Sep-2021 17:28
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*
Anthony Calero	Team Leader - Inorganics	Inorganics, Calgary, Alberta
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Hannah Phung	Lab Assistant	Inorganics, Calgary, Alberta
Harpreet Chawla	Team Leader - Inorganics	Inorganics, Calgary, Alberta
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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: 292521)											
CG2104066-001	LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	turbidity	----	E121	0.10	NTU	0.20	0.20	0.002	Diff <2x LOR	----
Physical Tests (QC Lot: 295516)											
CG2104060-001	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	240	250	4.29%	20%	----
Physical Tests (QC Lot: 297941)											
CG2104065-002	Anonymous	oxidation-reduction potential [ORP]	----	E125	0.10	mV	451	442	1.88%	15%	----
Physical Tests (QC Lot: 298053)											
CG2104062-001	Anonymous	acidity (as CaCO3)	----	E283	10.0	mg/L	18.1	16.0	2.1	Diff <2x LOR	----
Physical Tests (QC Lot: 299356)											
CG2104065-001	Anonymous	conductivity	----	E100	2.0	µS/cm	280	281	0.356%	10%	----
Physical Tests (QC Lot: 299357)											
CG2104065-001	Anonymous	pH	----	E108	0.10	pH units	8.17	8.20	0.366%	4%	----
Physical Tests (QC Lot: 299358)											
CG2104065-001	Anonymous	alkalinity, bicarbonate (as CaCO3)	----	E290	1.0	mg/L	143	133	7.83%	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	143	133	7.83%	20%	----
Anions and Nutrients (QC Lot: 292429)											
CG2104063-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0083	0.0079	0.0004	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 292598)											
CG2104065-001	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: 292753)											
CG2104066-001	LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	fluoride	16984-48-8	E235.F	0.020	mg/L	0.167	0.166	0.001	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 292754)											
CG2104066-001	LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	218	217	0.287%	20%	----
Anions and Nutrients (QC Lot: 292755)											
CG2104066-001	LC_FRUS_WS_LAEMP_DRY_2021-09-12_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: 292756)											
CG2104066-001	LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	chloride	16887-00-6	E235.Cl-L	0.10	mg/L	1.46	1.44	1.35%	20%	----
Anions and Nutrients (QC Lot: 292757)											

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: 292757) - continued											
CG2104066-001	LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	14.4	14.4	0.303%	20%	----
Anions and Nutrients (QC Lot: 292758)											
CG2104066-001	LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	0.0051	0.0058	0.0007	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 296970)											
CG2104048-009	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.292	0.270	0.022	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 301690)											
CG2104066-001	LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0096	0.0097	0.0001	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 298734)											
CG2104064-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.45	1.72	0.27	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 298741)											
CG2104062-002	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	0.74	0.80	0.06	Diff <2x LOR	----
Total Metals (QC Lot: 295735)											
CG2104062-001	Anonymous	aluminum, total	7429-90-5	E420	0.0060	mg/L	0.0114	0.0114	0.00002	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00020	mg/L	0.00148	0.00148	0.00001	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00020	mg/L	0.0152	0.0148	2.34%	20%	----
		beryllium, total	7440-41-7	E420	0.040	mg/L	<0.040 µg/L	<0.000040	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E420	0.000100	mg/L	<0.000100	<0.000100	0	Diff <2x LOR	----
		boron, total	7440-42-8	E420	0.020	mg/L	0.107	0.108	0.0006	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.0100	mg/L	1.68 µg/L	0.00164	2.31%	20%	----
		calcium, total	7440-70-2	E420	0.100	mg/L	510	515	0.936%	20%	----
		cobalt, total	7440-48-4	E420	0.20	mg/L	30.9 µg/L	0.0303	1.80%	20%	----
		copper, total	7440-50-8	E420	0.00100	mg/L	<0.00100	0.00101	0.00001	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.020	mg/L	0.115	0.134	0.018	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000100	mg/L	0.000111	0.000107	0.000004	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0020	mg/L	0.738	0.720	2.45%	20%	----
		magnesium, total	7439-95-4	E420	0.0100	mg/L	217	214	1.23%	20%	----
		manganese, total	7439-96-5	E420	0.00020	mg/L	0.726	0.719	1.02%	20%	----
		molybdenum, total	7439-98-7	E420	0.000100	mg/L	0.00250	0.00251	0.428%	20%	----
		nickel, total	7440-02-0	E420	0.00100	mg/L	0.228	0.226	0.477%	20%	----
		potassium, total	7440-09-7	E420	0.100	mg/L	8.39	8.43	0.511%	20%	----
		selenium, total	7782-49-2	E420	0.100	mg/L	4.36 µg/L	0.00448	2.58%	20%	----
		silicon, total	7440-21-3	E420	0.20	mg/L	3.01	2.98	0.956%	20%	----
		silver, total	7440-22-4	E420	0.000020	mg/L	<0.000020	<0.000020	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: 295735) - continued											
CG2104062-001	Anonymous	sodium, total	17341-25-2	E420	0.100	mg/L	14.6	14.5	0.723%	20%	----
		strontium, total	7440-24-6	E420	0.00040	mg/L	0.420	0.414	1.44%	20%	----
		sulfur, total	7704-34-9	E420	1.00	mg/L	424	427	0.600%	20%	----
		thallium, total	7440-28-0	E420	0.000020	mg/L	0.000161	0.000150	0.000011	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00060	mg/L	<0.00060	<0.00060	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000020	mg/L	0.0392	0.0377	3.94%	20%	----
		vanadium, total	7440-62-2	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0060	mg/L	0.109	0.107	1.37%	20%	----
Total Metals (QC Lot: 295736)											
CG2104062-001	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.00020	mg/L	0.00039	0.00031	0.00008	Diff <2x LOR	----
Total Metals (QC Lot: 298052)											
CG2104048-008	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: 297295)											
CG2104062-008	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	----

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: 297295) - continued											
CG2104062-008	Anonymous	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	<0.0010	<0.0010	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 297296)											
CG2104062-008	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: 297697)											
CG2104060-001	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: 292521)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 295514)						
solids, total suspended [TSS]	----	E160-L	1	mg/L	<1.0	----
Physical Tests (QCLot: 295516)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 298053)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Physical Tests (QCLot: 299356)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 299358)						
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: 292429)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 292598)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 292753)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 292754)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 292755)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 292756)						
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	<0.10	----
Anions and Nutrients (QCLot: 292757)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 292758)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 296970)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 301690)						

Sub-Matrix: **Water**

Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	*Result*	*Qualifier*
Anions and Nutrients (QCLot: 301690) - continued						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Organic / Inorganic Carbon (QCLot: 298734)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 298741)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 295735)						
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: 295735) - continued						
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 295736)						
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	<0.00010	----
Total Metals (QCLot: 298052)						
mercury, total	7439-97-6	E508-L	0.5	ng/L	<0.50	----
Dissolved Metals (QCLot: 297295)						
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: 297295) - continued						
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 297296)						
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	<0.00010	----
Dissolved Metals (QCLot: 297697)						
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: 292521)									
turbidity	----	E121	0.1	NTU	200 NTU	97.8	85.0	115	----
Physical Tests (QCLot: 295514)									
solids, total suspended [TSS]	----	E160-L	1	mg/L	150 mg/L	94.1	85.0	115	----
Physical Tests (QCLot: 295516)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	99.9	85.0	115	----
Physical Tests (QCLot: 297941)									
oxidation-reduction potential [ORP]	----	E125	----	mV	220 mV	100	95.4	104	----
Physical Tests (QCLot: 298053)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	111	85.0	115	----
Physical Tests (QCLot: 299356)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	99.5	90.0	110	----
Physical Tests (QCLot: 299357)									
pH	----	E108	----	pH units	7 pH units	100	98.6	101	----
Physical Tests (QCLot: 299358)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	101	85.0	115	----
Anions and Nutrients (QCLot: 292429)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	8.32 mg/L	101	80.0	120	----
Anions and Nutrients (QCLot: 292598)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.02 mg/L	97.3	80.0	120	----
Anions and Nutrients (QCLot: 292753)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	97.2	90.0	110	----
Anions and Nutrients (QCLot: 292754)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 292755)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	102	85.0	115	----
Anions and Nutrients (QCLot: 292756)									
chloride	16887-00-6	E235.Cl-L	0.1	mg/L	100 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 292757)									
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: 292758)									
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	0.5 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 296970)									

Sub-Matrix: **Water**

Laboratory Control Sample (LCS) Report

Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	*Spike Concentration*	*Recovery (%) LCS*	*Recovery Limits (%) Low*	*Recovery Limits (%) High*	*Qualifier*
Anions and Nutrients (QCLot: 296970) - continued									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	94.7	75.0	125	----
Anions and Nutrients (QCLot: 301690)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	101	85.0	115	----
Organic / Inorganic Carbon (QCLot: 298734)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	10 mg/L	99.6	80.0	120	----
Organic / Inorganic Carbon (QCLot: 298741)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	10 mg/L	105	80.0	120	----
Total Metals (QCLot: 295735)									
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	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	101	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	98.6	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	102	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	99.4	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	100	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	99.1	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	99.9	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	99.8	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	97.2	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	99.5	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	112	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	102	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	99.4	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	105	80.0	120	----
sodium, total	17341-25-2	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	107	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	98.6	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	----

Sub-Matrix: **Water**

Analyte	*CAS Number*	*Method*	*LOR*	*Unit*	*Laboratory Control Sample (LCS) Report* Spike Concentration	Recovery (%) LCS	Recovery Limits (%) Low	High	*Qualifier*
Total Metals (QCLot: 295735) - continued									
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	103	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	103	80.0	120	----
Total Metals (QCLot: 295736)									
chromium, total	7440-47-3	E420.Cr-L	0.0001	mg/L	0.25 mg/L	104	80.0	120	----
Total Metals (QCLot: 298052)									
mercury, total	7439-97-6	E508-L	0.5	ng/L	5 ng/L	94.4	80.0	120	----
Dissolved Metals (QCLot: 297295)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	99.9	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	97.3	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	97.6	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	102	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	89.8	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	88.2	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	92.9	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	96.3	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	94.5	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	99.7	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	94.4	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	98.9	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	97.8	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	93.4	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	100	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	98.0	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	96.7	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	93.5	80.0	120	----
sodium, dissolved	17341-25-2	E421	0.05	mg/L	50 mg/L	103	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	98.6	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	88.6	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: 297295) - continued									
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	93.5	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	94.4	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	96.3	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	94.8	80.0	120	----
Dissolved Metals (QCLot: 297296)									
chromium, dissolved	7440-47-3	E421.Cr-L	0.0001	mg/L	0.25 mg/L	95.5	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	94.4	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: 292429)										
CG2104063-002	Anonymous	phosphorus, total	7723-14-0	E372-U	ND mg/L	0.0676 mg/L	ND	70.0	130	----
Anions and Nutrients (QCLot: 292598)										
CG2104065-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0573 mg/L	0.05 mg/L	115	70.0	130	----
Anions and Nutrients (QCLot: 292753)										
CG2104066-001	LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	fluoride	16984-48-8	E235.F	0.911 mg/L	1 mg/L	91.1	75.0	125	----
Anions and Nutrients (QCLot: 292754)										
CG2104066-001	LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	sulfate (as SO4)	14808-79-8	E235.SO4	ND mg/L	100 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 292755)										
CG2104066-001	LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	bromide	24959-67-9	E235.Br-L	0.446 mg/L	0.5 mg/L	89.2	75.0	125	----
Anions and Nutrients (QCLot: 292756)										
CG2104080-003	Anonymous	chloride	16887-00-6	E235.Cl-L	106 mg/L	100 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 292757)										
CG2104066-001	LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	nitrate (as N)	14797-55-8	E235.NO3-L	ND mg/L	2.5 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 292758)										
CG2104066-001	LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	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: 296970)										
CG2104048-011	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.51 mg/L	2.5 mg/L	100	70.0	130	----
Anions and Nutrients (QCLot: 301690)										
CG2104067-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0988 mg/L	0.1 mg/L	98.8	75.0	125	----
Organic / Inorganic Carbon (QCLot: 298734)										
CG2104064-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	24.8 mg/L	23.9 mg/L	104	70.0	130	----
Organic / Inorganic Carbon (QCLot: 298741)										
CG2104062-002	Anonymous	carbon, total organic [TOC]	----	E355-L	22.3 mg/L	23.9 mg/L	93.3	70.0	130	----
Total Metals (QCLot: 295735)										
CG2104062-002	Anonymous	aluminum, total	7429-90-5	E420	0.384 mg/L	0.4 mg/L	95.9	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: 295735) - continued										
CG2104062-002	Anonymous	antimony, total	7440-36-0	E420	0.0404 mg/L	0.04 mg/L	101	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0399 mg/L	0.04 mg/L	99.8	70.0	130	----
		barium, total	7440-39-3	E420	0.0375 mg/L	0.04 mg/L	93.7	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0756 mg/L	0.08 mg/L	94.6	70.0	130	----
		bismuth, total	7440-69-9	E420	0.0179 mg/L	0.02 mg/L	89.6	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	0.00746 mg/L	0.008 mg/L	93.2	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	ND mg/L	0.02 mg/L	ND	70.0	130	----
		copper, total	7440-50-8	E420	0.0349 mg/L	0.04 mg/L	87.3	70.0	130	----
		iron, total	7439-89-6	E420	3.70 mg/L	4 mg/L	92.6	70.0	130	----
		lead, total	7439-92-1	E420	0.0357 mg/L	0.04 mg/L	89.2	70.0	130	----
		lithium, total	7439-93-2	E420	ND mg/L	0.1 mg/L	ND	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	0.0420 mg/L	0.04 mg/L	105	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	0.0833 mg/L	0.08 mg/L	104	70.0	130	----
		silicon, total	7440-21-3	E420	18.8 mg/L	20 mg/L	94.0	70.0	130	----
		silver, total	7440-22-4	E420	0.00771 mg/L	0.008 mg/L	96.4	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	0.00725 mg/L	0.008 mg/L	90.6	70.0	130	----
		tin, total	7440-31-5	E420	0.0397 mg/L	0.04 mg/L	99.3	70.0	130	----
		titanium, total	7440-32-6	E420	0.0789 mg/L	0.08 mg/L	98.6	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	0.199 mg/L	0.2 mg/L	99.7	70.0	130	----
		zinc, total	7440-66-6	E420	0.710 mg/L	0.8 mg/L	88.8	70.0	130	----
Total Metals (QCLot: 295736)										
CG2104062-002	Anonymous	chromium, total	7440-47-3	E420.Cr-L	0.0781 mg/L	0.08 mg/L	97.6	70.0	130	----
Total Metals (QCLot: 298052)										
CG2104048-009	Anonymous	mercury, total	7439-97-6	E508-L	4.29 ng/L	5 ng/L	85.8	70.0	130	----
Dissolved Metals (QCLot: 297295)										
CG2104065-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.197 mg/L	0.2 mg/L	98.4	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: 297295) - continued										
CG2104065-001	Anonymous	antimony, dissolved	7440-36-0	E421	0.0195 mg/L	0.02 mg/L	97.5	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0196 mg/L	0.02 mg/L	97.9	70.0	130	----
		barium, dissolved	7440-39-3	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0380 mg/L	0.04 mg/L	95.0	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00911 mg/L	0.01 mg/L	91.1	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.099 mg/L	0.1 mg/L	99.3	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00383 mg/L	0.004 mg/L	95.8	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	0.0188 mg/L	0.02 mg/L	94.1	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0186 mg/L	0.02 mg/L	93.0	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.87 mg/L	2 mg/L	93.6	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0194 mg/L	0.02 mg/L	97.2	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0956 mg/L	0.1 mg/L	95.6	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	0.0193 mg/L	0.02 mg/L	96.4	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0196 mg/L	0.02 mg/L	98.2	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0372 mg/L	0.04 mg/L	93.1	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.88 mg/L	4 mg/L	96.9	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0407 mg/L	0.04 mg/L	102	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.25 mg/L	10 mg/L	92.5	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00364 mg/L	0.004 mg/L	91.0	70.0	130	----
		sodium, dissolved	17341-25-2	E421	2.05 mg/L	2 mg/L	102	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	20.7 mg/L	20 mg/L	103	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00374 mg/L	0.004 mg/L	93.5	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0187 mg/L	0.02 mg/L	93.4	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0381 mg/L	0.04 mg/L	95.3	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00381 mg/L	0.004 mg/L	95.3	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	0.386 mg/L	0.4 mg/L	96.6	70.0	130	----
Dissolved Metals (QCLot: 297296)										
CG2104065-001	Anonymous	chromium, dissolved	7440-47-3	E421.Cr-L	0.0381 mg/L	0.04 mg/L	95.3	70.0	130	----
Dissolved Metals (QCLot: 297697)										
CG2104060-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000959 mg/L	0.0001 mg/L	95.9	70.0	130	----

Teck

Page 1 of 1

COC ID: **September Dry Creek LAEMP 2021** **TURNAROUND TIME:**

PROJECT/CLIENT INFO

Facility Name / Job#	LCO
Project Manager	Mike Pope
Email	[illegible]
Address	421 Pine Avenue
City	Sparwood
Province	BC
Postal Code	V0B 2G0
Country	Canada
Phone Number	250-425-8202

LABORATORY

Lab Name	ALS Calgary
Lab Contact	Lyudmyla Shvets
Email	lyudmyla.shvets@alsglobal.com
Address	2559 29 Street NE
City	Calgary
Province	AB
Postal Code	T1Y 7B5
Country	Canada
Phone Number	1 403 407 1794

	Excel	PDF	EDD
[illegible]	x	x	x
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[illegible]	x	x	
[illegible]	x	x	

SAMPLE DETAILS / **ANALYSIS REQUESTED**

								N	F	N	N	F	N	F
									H2SO4	H2SO4		HCL	HNO3	HNO3
Sample ID	Sample Location	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.	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
LC_FRUS_WS_LAEMP_DRY_2021-09-12_NP	LC_FRUS	WS	No	9/12/2021	1330	G	7	X	X	X	X	X	X	X

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

ALS PO 748510

RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	
Jennifer Ings/Minnow	################		9/13 1030

 # 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	Jennifer Ings	**Date/Time**	**September 13, 2021**

Environmental Division
Calgary
Work Order Reference
CG2104066

Telephone : +1 403 407 1800

SELENIUM SPECIATION

Brooks Report 2112094

BROOKS APPLIED LABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

December 28, 2021

Teck Resources Limited - Vancouver
Mike Pope
421 Pine Avenue
Sparwood, B.C. CANADA V0B2G0
mike.pope@teck.com

Re: LCO

Dear Mike Pope,

On December 9, 2021, Brooks Applied Labs (BAL) received two (2) 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 Se and dissolved Se had also been preserved by the client prior to receipt. All samples were stored according to BAL SOPs.

Total Recoverable Se and Dissolved Se

Each aqueous sample fraction for 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.

Selenium Speciation

Each aqueous sample was analyzed for selenium 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 [$SeSO_3$], 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 selenium species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting selenium 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 where 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 relative percent difference (RPD) of the MS/MSD set was not calculated (**N/C**).

In cases when either the native sample concentration was non-detectable (reported as less than or equal to the MDL) and/or the corresponding DUP result was also non-detectable, the RPD between the two values 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 meet 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
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	**MS**	matrix spike
BAL	Brooks Applied Labs	**MSD**	matrix spike duplicate
BLK	method blank	**ND**	non-detect
BS	blank spike	**NR**	non-reportable
CAL	calibration standard	**N/C**	not calculated
CCB	continuing calibration blank	**PS**	post preparation spike
CCV	continuing calibration verification	**REC**	percent recovery
COC	chain of custody record	**RPD**	relative percent difference
D	dissolved fraction	**SCV**	secondary calibration verification
DUP	duplicate	**SOP**	standard operating procedure
IBL	instrument blank	**SRM**	reference material
ICV	initial calibration verification	**T**	total fraction
MDL	method detection limit	**TR**	total recoverable fraction
MRL	method reporting limit		

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 BAL-5000	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
	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
LC_DCEF_WS_2021-11-29_N	2112094-01	WS	Sample	11/29/2021	12/09/2021
LC_DCEF_WS_2021-11-29_N_NAL	2112094-02	WS	Sample	11/29/2021	12/09/2021
LC_DCEF_WS_2021-11-29_N_NAL	2112094-03	WS	Sample	11/29/2021	12/09/2021

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	12/09/2021	12/09/2021	B213406	S211390
MeSe(IV)	Water	SOP BAL-4201	12/09/2021	12/09/2021	B213406	S211390
MeSe(VI)	Water	SOP BAL-4201	12/09/2021	12/09/2021	B213406	S211390
Se	Water	EPA 1638 Mod	12/10/2021	12/15/2021	B213468	S211433
Se(IV)	Water	SOP BAL-4201	12/09/2021	12/09/2021	B213406	S211390
Se(VI)	Water	SOP BAL-4201	12/09/2021	12/09/2021	B213406	S211390
SeCN	Water	SOP BAL-4201	12/09/2021	12/09/2021	B213406	S211390
SeMet	Water	SOP BAL-4201	12/09/2021	12/09/2021	B213406	S211390
SeSO3	Water	SOP BAL-4201	12/09/2021	12/09/2021	B213406	S211390
Unk Se Sp	Water	SOP BAL-4201	12/09/2021	12/09/2021	B213406	S211390

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_DCEF_WS_2021-11-29_N										
2112094-01	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112094-01	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112094-01	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112094-01	Se(IV)	WS	D	0.019	J	0.010	0.075	µg/L	B213406	S211390
2112094-01	Se(VI)	WS	D	1.21		0.010	0.055	µg/L	B213406	S211390
2112094-01	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B213406	S211390
2112094-01	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B213406	S211390
2112094-01	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B213406	S211390
2112094-01	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B213406	S211390
LC_DCEF_WS_2021-11-29_N_NAL										
2112094-02	Se	WS	TR	1.18		0.165	0.528	µg/L	B213468	S211433
LC_DCEF_WS_2021-11-29_N_NAL										
2112094-03	Se	WS	D	1.24		0.165	0.528	µg/L	B213468	S211433

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-DUP2	**Duplicate, (2112094-01)**								
	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)	0.019		0.013	µg/L			*38%*	25
	Se(VI)	1.209		1.184	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-MS2	**Matrix Spike, (2112094-01)**								
	Se(IV)	0.019	4.900	5.016	µg/L	102%	75-125		
	Se(VI)	1.209	5.100	6.342	µg/L	101%	75-125		
	SeCN	ND	1.962	1.836	µg/L	94%	75-125		
	SeMet	ND	1.977	1.977	µg/L	100%	75-125		
B213406-MSD2	**Matrix Spike Duplicate, (2112094-01)**								
	Se(IV)	0.019	4.900	4.690	µg/L	95%	75-125	7%	25
	Se(VI)	1.209	5.100	5.809	µg/L	90%	75-125	9%	25
	SeCN	ND	1.962	1.689	µg/L	86%	75-125	8%	25
	SeMet	ND	1.977	1.824	µg/L	92%	75-125	8%	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

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 **MDL:** 0.002
Limit: 0.005 **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 **MDL:** 0.002
Limit: 0.005 **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 **MDL:** 0.002
Limit: 0.005 **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: 2112094-01
Sample: LC_DCEF_WS_2021-11-29_N
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 - 2112094
B	XTRA_VOL	15 mL	na	none	na	na	Cooler #2 - 2112094
C	XTRA_VOL	125mL	na	none	na	na	Cooler #2 - 2112094

Lab ID: 2112094-02
Sample: LC_DCEF_WS_2021-11-29_N_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	40ml mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112094

Lab ID: 2112094-03
Sample: LC_DCEF_WS_2021-11-29_N_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	125 mL	na	10% HNO3 (BAL)	2127026	<2	Cooler #2 - 2112094

Shipping Containers

Cooler #2 - 2112094

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

Page 1 of 1

COC ID:	**LCO LAEMP**	**TURNAROUND TIME:**	Regular

PROJECT/CLIENT INFO			
Facility Name / Job#	LCO		
Project Manager			
Email			
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:		X	X	X
Email 2:	jings@minnow.ca			X
Email 3:	teckcoal@equisonline.com	X	X	X
Email 4:	lisa.bowron@minnow.ca	X	X	X
Email 5:	Dhasek@minnow.ca	X	X	X
Email 5:		X	X	X
PO number				

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**	**Selenium Speciation**
FILTERED										
PRESERVED									F	F
LC_DCEF_WS_2021-11-29_N	**LC_DCEF**	**WS**	**No**	29-Nov-21	**13:00**	**G**	**1**			**1**
LC_DCEF_WS_2021-11-29_N_NAL	**LC_DCEF**	**WS**	**No**	29-Nov-21	**13:00**	**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.	**Dave Hasek, Minnow Env.**	**December 7, 2021**	Cole Van Haaften	12/9/21 8:38

SERVICE REQUEST (rush - subject to availability)

Regular (default)	X	**Sampler's Name**	**Dave Hasek**	**Mobile #**	**416-970-7535**
Priority (2-3 business days) - 50% surcharge					
Emergency (1 Business Day) - 100% surcharge		**Sampler's Signature**		**Date/Time**	**December 7, 2021**
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

STRAIGHT BILL OF LADING
NOT NEGOTIABLE

RW HOT SHOT SERVICE INC.
250-425-7447
24 Hour Hot Shot Service

No. 88606

Sparwood, BC	**Vancouver, BC**	**Prince George, BC**	**Elkford, BC**	**Tumbler Ridge, BC**
Terrace, BC	**Calgary, AB**	**Edmonton, AB**	**Ft. McMurray, AB**	**Hinton, AB**
Red Deer, AB	**Montreal, QC**	**Spokane, WA**	**Shelby, MT**	**Gillette, WY**

INVOICE TO
DATE Dec. 8/21
BILL OF LADING #
PURCHASE ORDER NUMBER
SHIPPER (FROM) Teck Coal West Line Creek
STREET c/o Water Treatment Facility
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

PACKAGES	DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)
3	Coolers Water Samples	55 lbs

COPY

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

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, thereof 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, oin 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
SHIPPER SIGN
CONSIGNEE PRINT Travis Castillano
CONSIGNEE SIGN
DATE 12-9-21
TIME 8:41
NUMBER OF PIECES RECEIVED ③

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROAD: Shipper GST # 864540398RT0001

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

2112094

Effective 7/29/20 vision 004

SELENIUM SPECIATION

Brooks Report 2104128

BROOKS APPLIED LABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

April 26, 2021

Teck Resources Limited - Vancouver
Cait Good
421 Pine Avenue
Sparwood, B.C. CANADA V0B2G0
Cait.Good@teck.com

Re: REP

Dear Cait Good,

On April 15, 2021, Brooks Applied Labs (BAL) received six (6) 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.

Chromatographic interference, as indicated by an elevated baseline or co-eluting peak, was observed for selenosulfate in samples 2104128-04 and 2104128-07. Due to potential bias in the obtained results, the affected data have been qualified as estimated (**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 limits for selenomethionine [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 noted above, and 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	**MS**	matrix spike
BAL	Brooks Applied Labs	**MSD**	matrix spike duplicate
BLK	method blank	**ND**	non-detect
BS	blank spike	**NR**	non-reportable
CAL	calibration standard	**N/C**	not calculated
CCB	continuing calibration blank	**PS**	post preparation spike
CCV	continuing calibration verification	**REC**	percent recovery
COC	chain of custody record	**RPD**	relative percent difference
D	dissolved fraction	**SCV**	secondary calibration verification
DUP	duplicate	**SOP**	standard operating procedure
IBL	instrument blank	**SRM**	reference material
ICV	initial calibration verification	**T**	total fraction
MDL	method detection limit	**TR**	total recoverable fraction
MRL	method reporting limit		

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 BAL-5000	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
	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
LC_DCEF_WS_2021-03-08_N	2104128-01	WS	Sample	03/08/2021	04/15/2021
LC_DCEF_WS_2021-03-08_N_NAL	2104128-02	WS	Sample	03/08/2021	04/15/2021
LC_DCEF_WS_2021-03-08_N_NAL	2104128-03	WS	Sample	03/08/2021	04/15/2021
LC_FRB_WS_2021-03-15_N	2104128-04	WS	Sample	03/15/2021	04/15/2021
LC_FRB_WS_2021-03-15_N_NAL	2104128-05	WS	Sample	03/15/2021	04/15/2021
LC_FRB_WS_2021-03-15_N_NAL	2104128-06	WS	Sample	03/15/2021	04/15/2021
LC_FRUS_WS_2021-03-16_N	2104128-07	WS	Sample	03/16/2021	04/15/2021
LC_FRUS_WS_2021-03-16_N_NAL	2104128-08	WS	Sample	03/16/2021	04/15/2021
LC_FRUS_WS_2021-03-16_N_NAL	2104128-09	WS	Sample	03/16/2021	04/15/2021

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	04/15/2021	04/16/2021	B210996	S210420
MeSe(IV)	Water	SOP BAL-4201	04/15/2021	04/16/2021	B210996	S210420
MeSe(VI)	Water	SOP BAL-4201	04/15/2021	04/16/2021	B210996	S210420
Se	Water	EPA 1638 Mod	04/15/2021	04/17/2021	B211007	S210429
Se(IV)	Water	SOP BAL-4201	04/15/2021	04/16/2021	B210996	S210420
Se(VI)	Water	SOP BAL-4201	04/15/2021	04/16/2021	B210996	S210420
SeCN	Water	SOP BAL-4201	04/15/2021	04/16/2021	B210996	S210420
SeMet	Water	SOP BAL-4201	04/15/2021	04/16/2021	B210996	S210420
SeSO3	Water	SOP BAL-4201	04/15/2021	04/16/2021	B210996	S210420
Unk Se Sp	Water	SOP BAL-4201	04/15/2021	04/16/2021	B210996	S210420

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_DCEF_WS_2021-03-08_N										
2104128-01	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B210996	S210420
2104128-01	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B210996	S210420
2104128-01	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B210996	S210420
2104128-01	Se(IV)	WS	D	0.013	J	0.010	0.075	µg/L	B210996	S210420
2104128-01	Se(VI)	WS	D	1.18		0.010	0.055	µg/L	B210996	S210420
2104128-01	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B210996	S210420
2104128-01	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B210996	S210420
2104128-01	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B210996	S210420
2104128-01	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B210996	S210420
LC_DCEF_WS_2021-03-08_N_NAL										
2104128-02	Se	WS	TR	1.45		0.203	0.528	µg/L	B211007	S210429
LC_DCEF_WS_2021-03-08_N_NAL										
2104128-03	Se	WS	D	1.61		0.203	0.528	µg/L	B211007	S210429
LC_FRB_WS_2021-03-15_N										
2104128-04	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B210996	S210420
2104128-04	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B210996	S210420
2104128-04	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B210996	S210420
2104128-04	Se(IV)	WS	D	0.193		0.010	0.075	µg/L	B210996	S210420
2104128-04	Se(VI)	WS	D	63.6		0.010	0.055	µg/L	B210996	S210420
2104128-04	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B210996	S210420
2104128-04	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B210996	S210420
2104128-04	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	µg/L	B210996	S210420
2104128-04	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B210996	S210420
LC_FRB_WS_2021-03-15_N_NAL										
2104128-05	Se	WS	TR	72.9		0.203	0.528	µg/L	B211007	S210429
LC_FRB_WS_2021-03-15_N_NAL										
2104128-06	Se	WS	D	67.5		0.203	0.528	µg/L	B211007	S210429

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_FRUS_WS_2021-03-16_N										
2104128-07	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B210996	S210420
2104128-07	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B210996	S210420
2104128-07	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B210996	S210420
2104128-07	Se(IV)	WS	D	0.134		0.010	0.075	µg/L	B210996	S210420
2104128-07	Se(VI)	WS	D	53.8		0.010	0.055	µg/L	B210996	S210420
2104128-07	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B210996	S210420
2104128-07	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B210996	S210420
2104128-07	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	µg/L	B210996	S210420
2104128-07	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B210996	S210420
LC_FRUS_WS_2021-03-16_N_NAL										
2104128-08	Se	WS	TR	62.5		0.203	0.528	µg/L	B211007	S210429
LC_FRUS_WS_2021-03-16_N_NAL										
2104128-09	Se	WS	D	76.1		0.203	0.528	µg/L	B211007	S210429

Accuracy & Precision Summary

Batch: B210996
Lab Matrix: Water
Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits		RPD & Limits	
B210996-BS1	**Blank Spike, (1923027)**								
	MeSe(IV)		5.095	5.437	µg/L	107%	75-125		
	Se(IV)		5.000	5.110	µg/L	102%	75-125		
	Se(VI)		5.000	4.915	µg/L	98%	75-125		
	SeCN		5.015	4.922	µg/L	98%	75-125		
	SeMet		4.932	4.722	µg/L	96%	75-125		
B210996-DUP8	**Duplicate, (2104128-07)**								
	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)	0.134		0.141	µg/L			5%	25
	Se(VI)	53.79		52.44	µg/L			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
B210996-MS8	**Matrix Spike, (2104128-07)**								
	Se(IV)	0.134	4.900	4.979	µg/L	99%	75-125		
	Se(VI)	53.79	5.100	54.86	µg/L	NR	75-125		
	SeCN	ND	1.962	1.889	µg/L	96%	75-125		
	SeMet	ND	1.977	1.923	µg/L	97%	75-125		
B210996-MSD8	**Matrix Spike Duplicate, (2104128-07)**								
	Se(IV)	0.134	4.900	5.036	µg/L	100%	75-125	1%	25
	Se(VI)	53.79	5.100	56.21	µg/L	NR	75-125	N/C	25
	SeCN	ND	1.962	2.105	µg/L	107%	75-125	11%	25
	SeMet	ND	1.977	1.963	µg/L	99%	75-125	2%	25

Accuracy & Precision Summary

Batch: B211007
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B211007-BS1	**Blank Spike, (2035012)**						
	Se		200.0	194.9	μg/L	97% 75-125	
B211007-BS2	**Blank Spike, (2035012)**						
	Se		200.0	191.3	μg/L	96% 75-125	
B211007-BS3	**Blank Spike, (2035012)**						
	Se		200.0	194.2	μg/L	97% 75-125	
B211007-BS4	**Blank Spike, (2035012)**						
	Se		200.0	191.1	μg/L	96% 75-125	
B211007-BS5	**Blank Spike, (2035012)**						
	Se		200.0	192.0	μg/L	96% 75-125	
B211007-SRM1	**Reference Material (2041020, TMDA 51.5 Reference Standard - Bottle 7 - SRM)**						
	Se		14.30	13.60	μg/L	95% 75-125	
B211007-SRM2	**Reference Material (2041020, TMDA 51.5 Reference Standard - Bottle 7 - SRM)**						
	Se		14.30	13.55	μg/L	95% 75-125	
B211007-SRM3	**Reference Material (2041020, TMDA 51.5 Reference Standard - Bottle 7 - SRM)**						
	Se		14.30	14.36	μg/L	100% 75-125	
B211007-SRM4	**Reference Material (2041020, TMDA 51.5 Reference Standard - Bottle 7 - SRM)**						
	Se		14.30	13.08	μg/L	91% 75-125	
B211007-SRM5	**Reference Material (2041020, TMDA 51.5 Reference Standard - Bottle 7 - SRM)**						
	Se		14.30	13.83	μg/L	97% 75-125	
B211007-DUP5	**Duplicate, (2104128-02)**						
	Se	1.448		1.377	μg/L		5% 20

Accuracy & Precision Summary

Batch: B211007
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits		RPD & Limits	
B211007-MS5	**Matrix Spike, (2104128-02)**								
	Se	1.448	220.0	215.8	µg/L	97%	75-125		
B211007-MSD5	**Matrix Spike Duplicate, (2104128-02)**								
	Se	1.448	220.0	215.1	µg/L	97%	75-125	0.3%	20
B211007-DUP6	**Duplicate, (2104128-08)**								
	Se	62.45		64.91	µg/L			4%	20
B211007-MS6	**Matrix Spike, (2104128-08)**								
	Se	62.45	220.0	277.2	µg/L	98%	75-125		
B211007-MSD6	**Matrix Spike Duplicate, (2104128-08)**								
	Se	62.45	220.0	287.8	µg/L	102%	75-125	4%	20

Method Blanks & Reporting Limits

Batch: B210996
Matrix: Water
Method: SOP BAL-4201
Analyte: DMSeO

Sample	Result	Units
B210996-BLK1	0.00	µg/L
B210996-BLK2	0.00	µg/L
B210996-BLK3	0.00	µg/L
B210996-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B210996-BLK1	0.00	µg/L
B210996-BLK2	0.00	µg/L
B210996-BLK3	0.00	µg/L
B210996-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(VI)

Sample	Result	Units
B210996-BLK1	0.00	µg/L
B210996-BLK2	0.00	µg/L
B210996-BLK3	0.00	µg/L
B210996-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
B210996-BLK1	0.00	µg/L
B210996-BLK2	0.00	µg/L
B210996-BLK3	0.00	µg/L
B210996-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Analyte: Se(VI)

Sample	Result	Units
B210996-BLK1	0.00	µg/L
B210996-BLK2	0.00	µg/L
B210996-BLK3	0.00	µg/L
B210996-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: SeCN

Sample	Result	Units
B210996-BLK1	0.00	µg/L
B210996-BLK2	0.00	µg/L
B210996-BLK3	0.00	µg/L
B210996-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.010

MDL: 0.002
MRL: 0.010

Analyte: SeMet

Sample	Result	Units
B210996-BLK1	0.00	µg/L
B210996-BLK2	0.00	µg/L
B210996-BLK3	0.00	µg/L
B210996-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
B210996-BLK1	0.00	µg/L
B210996-BLK2	0.00	µg/L
B210996-BLK3	0.00	µg/L
B210996-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: Unk Se Sp

Sample	Result	Units
B210996-BLK1	0.00	µg/L
B210996-BLK2	0.00	µg/L
B210996-BLK3	0.00	µg/L
B210996-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Method Blanks & Reporting Limits

Batch: B211007
Matrix: Water
Method: EPA 1638 Mod
Analyte: Se

Sample	Result	Units
B211007-BLK1	-0.087	µg/L
B211007-BLK2	0.017	µg/L
B211007-BLK3	0.012	µg/L
B211007-BLK4	-0.045	µg/L
B211007-BLK5	0.064	µg/L

Average: -0.008
Limit: 0.480

MDL: 0.185
MRL: 0.480

Sample Containers

Lab ID: 2104128-01
Sample: LC_DCEF_WS_2021-03-08_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 03/08/2021
Received: 04/15/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #2 - 2104128
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #2 - 2104128
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #2 - 2104128

Lab ID: 2104128-02
Sample: LC_DCEF_WS_2021-03-08_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 03/08/2021
Received: 04/15/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	120 mL	na	10% HNO3 (BAL)	2037003	<2	Styrofoam Cooler #1 - 2104128

Lab ID: 2104128-03
Sample: LC_DCEF_WS_2021-03-08_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 03/08/2021
Received: 04/15/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	120 mL	na	10% HNO3 (BAL)	2037003	<2	Styrofoam Cooler #1 - 2104128

Lab ID: 2104128-04
Sample: LC_FRB_WS_2021-03-15_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 03/15/2021
Received: 04/15/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #2 - 2104128
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #2 - 2104128
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #2 - 2104128

Sample Containers

Lab ID: 2104128-05
Sample: LC_FRB_WS_2021-03-15_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 03/15/2021
Received: 04/15/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037003	<2	Styrofoam Cooler #1 - 2104128

Lab ID: 2104128-06
Sample: LC_FRB_WS_2021-03-15_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 03/15/2021
Received: 04/15/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2037003	<2	Styrofoam Cooler #1 - 2104128

Lab ID: 2104128-07
Sample: LC_FRUS_WS_2021-03-16_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 03/16/2021
Received: 04/15/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15 mL	na	none	na	na	Styrofoam Cooler #2 - 2104128
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #2 - 2104128
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #2 - 2104128

Lab ID: 2104128-08
Sample: LC_FRUS_WS_2021-03-16_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 03/16/2021
Received: 04/15/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	120 mL	na	10% HNO3 (BAL)	2037003	<2	Styrofoam Cooler #1 - 2104128

Lab ID: 2104128-09
Sample: LC_FRUS_WS_2021-03-16_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 03/16/2021
Received: 04/15/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	120 mL	na	10% HNO3 (BAL)	2037003	<2	Styrofoam Cooler #1 - 2104128

Shipping Containers

Styrofoam Cooler #1 - 2104128

Received: April 15, 2021 7:00	**Description:** Styrofoam Cooler #1	**Custody seals present?** No
Tracking No: 81005 via Courier	**Damaged in transit?** No	**Custody seals intact?** No
Coolant Type: Ice	**Returned to client?** No	**COC present?** Yes
Temperature: 1.4 °C	**Comments:** IR #30	

Styrofoam Cooler #2 - 2104128

Received: April 15, 2021 7:00	**Description:** Styrofoam Cooler #2	**Custody seals present?** No
Tracking No: 81005 via Courier	**Damaged in transit?** No	**Custody seals intact?** No
Coolant Type: Ice	**Returned to client?** No	**COC present?** Yes
Temperature: 0.6 °C	**Comments:** IR #30	

Teck

Page 1 of 1

COC ID:	**Dry Creek March 2021**	**TURNAROUND TIME:**	Regular

PROJECT/CLIENT INFO

Facility Name / Job#	REP		
Project Manager	Cait Good		
Email	cait.good@teck.com		
Address	421 Pine Avenue		
City	Sparwood	Province	BC
Postal Code	V0B 2G0	Country	Canada
Phone Number	250.425.8257		

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:	carlie.meyer@teck.com	X	X	X
Email 2:	teckcoal@equisonline.com			X
Email 3:	cait.good@teck.com	X	X	X
Email 4:	dhasek@minnow.ca	X	X	X
Email 5:	kbatchelar@minnow.ca	X	X	X
Email 5:	mstokes@minnow.ca	X	X	X
PO number	625683			

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	Selenium Speciation
PRESERVATIVE								HNO3	HNO3	
FILTERED								P	F/P	F
LC_DCEF_WS_2021-03-08_N	LC_DCEF	WS	No	08-Mar-21	12:45	G	1			1
LC_DCEF_WS_2021-03-08_N_NAL	LC_DCEF	WS	No	08-Mar-21	12:45	G	2	1	1	
LC_FRB_WS_2021-03-15_N	LC_FRB	WS	No	15-Mar-21	13:45	G	1			1
LC_FRB_WS_2021-03-15_N_NAL	LC_FRB	WS	No	15-Mar-21	13:45	G	2	1	1	
LC_FRUS_WS_2021-03-16_N	RG_RIVER	WS	No	16-Mar-21	11:00	G	1			1
LC_FRUS_WS_2021-03-16_N_NAL	RG_RIVER	WS	No	16-Mar-21	11:00	G	2	1	1	

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

Samples for total selenium have been preserved in the field. Dissolve selenium have been filtered and preserved. Speciation samples have been filtered and frozen.

RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Maddy Stokes	**March 23, 2021**	[illegible] / BAL	4/15/21 6:50

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	**Maddy Stokes**	**Mobile #**	**647-522-0672**
Sampler's Signature		**Date/Time**	**March 23 2021**

Teck

COC ID:	**Dry Creek March 2021**	**TURNAROUND TIME:**	Regular

PROJECT/CLIENT INFO			
Facility Name / Job#	REP		
Project Manager	Cait Good		
Email	cait.good@teck.com		
Address	421 Pine Avenue		
City	Sparwood	Province	BC
Postal Code	V0B 2G0	Country	Canada
Phone Number	250.425.8257		

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:	carlic.meyer@teck.com	X	X	X
Email 2:	teckcoal@equisonline.com			X
Email 3:	cait.good@teck.com	X	X	X
Email 4:	dhasak@minnow.ca	X	X	X
Email 5:	kbatchelar@minnow.ca	X	X	X
Email 5:	mstokes@minnow.ca	X	X	X
PO number	625683			

SAMPLE DETAILS / **ANALYSIS REQUESTED** (Filtered - F: Field, L: Lab, FL: Field & Lab, N: None)

								Total Selenium	Dissolved Selenium	Selenium Speciation
							FIL.	HNO3	HNO3	
							PRESERV.	P	F/P	F
Sample ID	Sample Location (sys_loc_code)	Field Matrix	Hazardous Material (Yes/No)	Date	Time (24hr)	G=Grab C=Comp	# Of Cont.			
LC_DCEF_WS_2021-03-08_N	LC_DCEF	WS	No	08-Mar-21	12:45	G	1			1
LC_DCEF_WS_2021-03-08_N_NAL	LC_DCEF	WS	No	08-Mar-21	12:45	G	2	1	1	
LC_FRB_WS_2021-03-15_N	LC_FRB	WS	No	15-Mar-21	13:45	G	1			1
LC_FRB_WS_2021-03-15_N_NAL	LC_FRB	WS	No	15-Mar-21	13:45	G	2	1	1	
LC_FRUS_WS_2021-03-16_N	RG_RIVER	WS	No	16-Mar-21	11:00	G	1			1
LC_FRUS_WS_2021-03-16_N_NAL	RG_RIVER	WS	No	16-Mar-21	11:00	G	2	1	1	

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Samples for total selenium have been preserved in the field. Dissolve selenium have been filtered and preserved. Speciation samples have been filtered and frozen.	**Maddy Stokes**	**March 23, 2021**		4/15/21 6:50

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	**Maddy Stokes**	**Mobile #**	**647-522-0672**
Sampler's Signature	**MS**	**Date/Time**	**March 23 2021**

STRAIGHT BILL OF LADING
NOT NEGOTIABLE

RW HOT SHOT SERVICE INC.
250-425-7447
24 Hour Hot Shot Service

No. 84005

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 April 14 '21

INVOICE TO

BILL OF LADING #

PURCHASE ORDER NUMBER

CONSIGNEE (TO) Applied Labs

STREET

POSTAL CODE

CITY/PROVINCE WA

POSTAL CODE

DESCRIPTION OF ARTICLES AND SPECIAL MARKS

WEIGHT (Subject to Correction) 120 lbs

WHV84005

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

DECLARED VALUATION: Maximum liability of carrier $2.00 per lb. ($4.41 per kilogram) unless declared valuation states otherwise. $

PICK UP TIME

DRIVER'S SIGNATURE - DELIVERY BY

FINISH TIME

[illegible]

CONSIGNEE PRINT

CONSIGNEE SIGN

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROD: Shipper

GST # 864540398RT0001

COPY

ID: Styrofoam Cooler #1 COC (Y/N) Temperature: 1.4 30

Type: [✓] Blue Ice Ambient

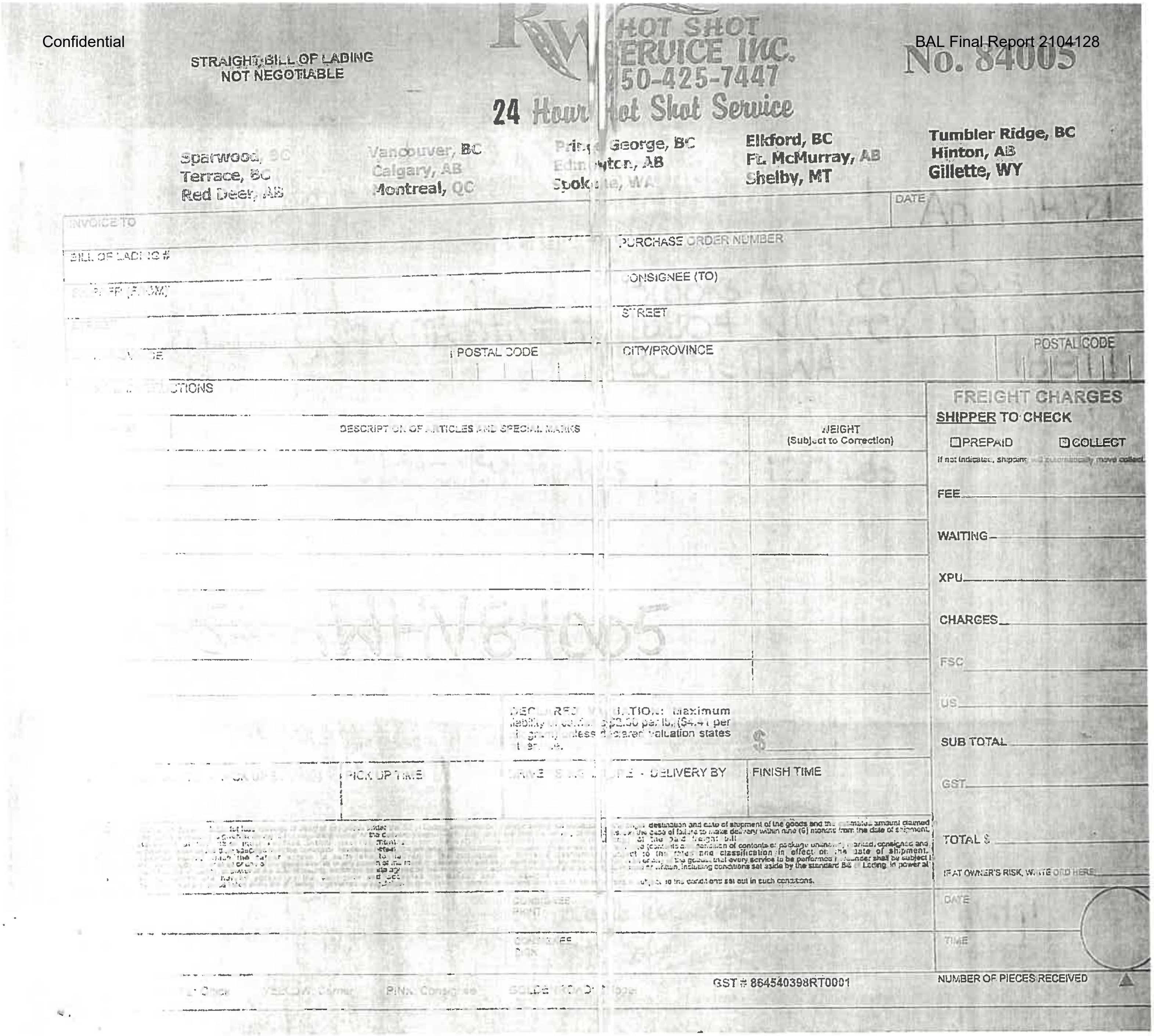
Locations:	CC 20-24		WL		FK 4-07					
Types:	T/D	SP	T/D	SP	T/D	SP	T/D	SP	T/D	SP
Container Types:	120		40		40					

By: PJK Date: 4/15/21

2104128

Effective 7/29/20

Revision 004



STRAIGHT BILL OF LADING
NOT NEGOTIABLE

RW HOT SHOT SERVICE INC.
50-425-7447
24 Hour Hot Shot Service

No. 84005

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

INVOICE TO

BILL OF LADING #

PURCHASE ORDER NUMBER

SHIPPER (FROM)

CONSIGNEE (TO)

STREET

CITY/PROVINCE

POSTAL CODE

POSTAL CODE

SPECIAL INSTRUCTIONS

DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)

FREIGHT CHARGES
SHIPPER TO CHECK
☐ PREPAID ☒ COLLECT

FEE

WAITING

XPU

CHARGES

FSC

US

SUB TOTAL

GST

TOTAL $

IF AT OWNER'S RISK, WRITE OR HERE

DECLARED VALUATION: Maximum liability ... $2.00 per lb. ($4.41 per kg) unless declared valuation states otherwise.

$

PICK UP TIME

DRIVER ... DELIVERY BY

FINISH TIME

CONSIGNEE PRINT

CONSIGNEE SIGN

DATE

TIME

GST # 864540398RT0001

NUMBER OF PIECES RECEIVED

PINK: Consignee

Styrofoam Cooler #2

COC (Y/N)

Temperature: 0.6

COPY

IR: 30

Blue Ice Ambient

Sampling Locations:

FR 4-06		CC 4-12		RG		WL		FR-4-07	
T/D	SP	T/D	SP	T/D	SP	T/D	SP	T/D	SP
	120		120		120		120		120

Sample Types:

Container Types:

Date: 4/15/21

SELENIUM SPECIATION

Brooks Report 2105320

BROOKS APPLIED LABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

June 10, 2021

Teck Resources Limited - Vancouver
Cait Good
421 Pine Avenue
Sparwood, B.C. CANADA V0B2G0
Cait.Good@teck.com

Re: REP

Dear Cait Good,

On May 27, 2021, Brooks Applied Labs (BAL) received six (6) aqueous samples. The samples were received in a cooler at a temperature of 6.7°C. Brooks Applied Labs strongly recommends that all samples submitted for selenium speciation quantitation remain at a temperature of ≤6°C to maintain sample integrity prior to analysis. All selenium speciation results were qualified (**Z**) as a result of the cooler temperature outlier.

The **Sample ID** on the COC form did not match the **Sample IDs** on the corresponding container labels for samples 2105320-02 and 2105320-03. The discrepancies are noted in the table below.

Laboratory ID	**Sample ID (on COC form)**	**Sample ID (on COC container label)**	**Analytical Parameter**
2105320-02	LC_DCEF_WS_2021-05-07_1400_N_NAL	LC_GRCK_WS_2021-05-07_1400_N_NAL	Total Recoverable Se
2105320-03	LC_DCEF_WS_2021-05-07_1400_N_NAL	LC_GRCK_WS_2021-05-07_1400_N_NAL	Dissolved Se

The **Sample Location (sys_loc_code)** described on the COC form matches the **Sample IDs** on the corresponding container labels. Per client request, 2105320-02 and 2105320-03 were logged in using *LC_GRCK_WS_2021-05-07_1400_N_NAL* as the field ID; there was a transcription error on the COC form for these two items.

The COC form indicates that sample fractions for total recoverable Se and dissolved Se were preserved in the field prior to receipt at BAL. Samples 2105320-06 (*LC_FRB_WS_2021-05-06_1430_N_NAL* dissolved Se fraction) and 2105320-08 (*LC_FRUS_WS_2021-05-07_0920_N_NAL* total recoverable Se fraction) each yielded a pH of 6 when received at BAL. The samples were subsequently preserved to (pH < 2) by BAL staff. 2105320-06 and 2105320-08 were preserved to (pH < 2) within the 14-calendar day preservation holding time.

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.

All selenium speciation results were qualified (**Z**) as a result of the cooler temperature outlier.

Poor mass balance was observed in client samples when Se speciation results were compared to corresponding dissolved Se results. Container labels were checked and there was no indication of samples miss-labeled. Re-analyses confirmed the results, suggesting sampling heterogeneity. Consequently, no additional corrective actions are necessary. The reported results are deemed representative of the submitted containers.

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 noted above, and 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 BAL-5000	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
	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
LC_GRCK_WS_2021-05-07_1400_N	2105320-01	WS	Sample	05/07/2021	05/27/2021
LC_GRCK_WS_2021-05-07_1400_N_NAL	2105320-02	WS	Sample	05/07/2021	05/27/2021
LC_GRCK_WS_2021-05-07_1400_N_NAL	2105320-03	WS	Sample	05/07/2021	05/27/2021
LC_FRB_WS_2021-05-06_1430_N	2105320-04	WS	Sample	05/06/2021	05/27/2021
LC_FRB_WS_2021-05-06_1430_N_NAL	2105320-05	WS	Sample	05/06/2021	05/27/2021
LC_FRB_WS_2021-05-06_1430_N_NAL	2105320-06	WS	Sample	05/06/2021	05/27/2021
LC_FRUS_WS_2021-05-07_0920_N	2105320-07	WS	Sample	05/07/2021	05/27/2021
LC_FRUS_WS_2021-05-07_0920_N_NAL	2105320-08	WS	Sample	05/07/2021	05/27/2021
LC_FRUS_WS_2021-05-07_0920_N_NAL	2105320-09	WS	Sample	05/07/2021	05/27/2021

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	05/26/2021	05/29/2021	B211417	S210603
MeSe(IV)	Water	SOP BAL-4201	05/26/2021	05/29/2021	B211417	S210603
MeSe(VI)	Water	SOP BAL-4201	05/26/2021	05/29/2021	B211417	S210603
Se	Water	EPA 1638 Mod	06/02/2021	06/03/2021	B211437	S210632
Se(IV)	Water	SOP BAL-4201	05/26/2021	05/29/2021	B211417	S210603
Se(VI)	Water	SOP BAL-4201	05/26/2021	05/29/2021	B211417	S210603
SeCN	Water	SOP BAL-4201	05/26/2021	05/29/2021	B211417	S210603
SeMet	Water	SOP BAL-4201	05/26/2021	05/29/2021	B211417	S210603
SeSO3	Water	SOP BAL-4201	05/26/2021	05/29/2021	B211417	S210603
Unk Se Sp	Water	SOP BAL-4201	05/26/2021	05/29/2021	B211417	S210603

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_GRCK_WS_2021-05-07_1400_N										
2105320-01	DMSeO	WS	D	≤ 0.010	Z U	0.010	0.025	µg/L	B211417	S210603
2105320-01	MeSe(IV)	WS	D	≤ 0.010	Z U	0.010	0.025	µg/L	B211417	S210603
2105320-01	MeSe(VI)	WS	D	≤ 0.010	Z U	0.010	0.025	µg/L	B211417	S210603
2105320-01	Se(IV)	WS	D	0.031	Z J	0.010	0.075	µg/L	B211417	S210603
2105320-01	Se(VI)	WS	D	1.38	Z	0.010	0.055	µg/L	B211417	S210603
2105320-01	SeCN	WS	D	≤ 0.010	Z U	0.010	0.050	µg/L	B211417	S210603
2105320-01	SeMet	WS	D	≤ 0.010	Z U	0.010	0.025	µg/L	B211417	S210603
2105320-01	SeSO3	WS	D	≤ 0.010	Z U	0.010	0.055	µg/L	B211417	S210603
2105320-01	Unk Se Sp	WS	D	≤ 0.010	Z U	0.010	0.075	µg/L	B211417	S210603
LC_GRCK_WS_2021-05-07_1400_N_NAL										
2105320-02	Se	WS	TR	2.03		0.165	0.528	µg/L	B211437	S210632
LC_GRCK_WS_2021-05-07_1400_N_NAL										
2105320-03	Se	WS	D	2.03		0.165	0.528	µg/L	B211437	S210632
LC_FRB_WS_2021-05-06_1430_N										
2105320-04	DMSeO	WS	D	≤ 0.010	Z U	0.010	0.025	µg/L	B211417	S210603
2105320-04	MeSe(IV)	WS	D	≤ 0.010	Z U	0.010	0.025	µg/L	B211417	S210603
2105320-04	MeSe(VI)	WS	D	≤ 0.010	Z U	0.010	0.025	µg/L	B211417	S210603
2105320-04	Se(IV)	WS	D	0.123	Z	0.010	0.075	µg/L	B211417	S210603
2105320-04	Se(VI)	WS	D	25.5	Z	0.010	0.055	µg/L	B211417	S210603
2105320-04	SeCN	WS	D	≤ 0.010	Z U	0.010	0.050	µg/L	B211417	S210603
2105320-04	SeMet	WS	D	≤ 0.010	Z U	0.010	0.025	µg/L	B211417	S210603
2105320-04	SeSO3	WS	D	≤ 0.010	Z U	0.010	0.055	µg/L	B211417	S210603
2105320-04	Unk Se Sp	WS	D	≤ 0.010	Z U	0.010	0.075	µg/L	B211417	S210603
LC_FRB_WS_2021-05-06_1430_N_NAL										
2105320-05	Se	WS	TR	54.6		0.165	0.528	µg/L	B211437	S210632
LC_FRB_WS_2021-05-06_1430_N_NAL										
2105320-06	Se	WS	D	49.1		0.165	0.528	µg/L	B211437	S210632

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_FRUS_WS_2021-05-07_0920_N										
2105320-07	DMSeO	WS	D	≤ 0.010	Z U	0.010	0.025	µg/L	B211417	S210603
2105320-07	MeSe(IV)	WS	D	≤ 0.010	Z U	0.010	0.025	µg/L	B211417	S210603
2105320-07	MeSe(VI)	WS	D	≤ 0.010	Z U	0.010	0.025	µg/L	B211417	S210603
2105320-07	Se(IV)	WS	D	0.069	Z J	0.010	0.075	µg/L	B211417	S210603
2105320-07	Se(VI)	WS	D	18.9	Z	0.010	0.055	µg/L	B211417	S210603
2105320-07	SeCN	WS	D	≤ 0.010	Z U	0.010	0.050	µg/L	B211417	S210603
2105320-07	SeMet	WS	D	≤ 0.010	Z U	0.010	0.025	µg/L	B211417	S210603
2105320-07	SeSO3	WS	D	≤ 0.010	Z U	0.010	0.055	µg/L	B211417	S210603
2105320-07	Unk Se Sp	WS	D	≤ 0.010	Z U	0.010	0.075	µg/L	B211417	S210603
LC_FRUS_WS_2021-05-07_0920_N_NAL										
2105320-08	Se	WS	TR	46.2		0.165	0.528	µg/L	B211437	S210632
LC_FRUS_WS_2021-05-07_0920_N_NAL										
2105320-09	Se	WS	D	50.7		0.165	0.528	µg/L	B211437	S210632

Accuracy & Precision Summary

Batch: B211417
Lab Matrix: Water
Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits		RPD & Limits	
B211417-BS1	**Blank Spike, (1923027)**								
	MeSe(IV)		5.095	5.296	µg/L	104%	75-125		
	Se(IV)		5.000	5.238	µg/L	105%	75-125		
	Se(VI)		5.000	5.006	µg/L	100%	75-125		
	SeCN		5.015	4.753	µg/L	95%	75-125		
	SeMet		4.932	4.692	µg/L	95%	75-125		
B211417-DUP5	**Duplicate, (2105320-07)**								
	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)	0.069		0.074	µg/L			7%	25
	Se(VI)	18.90		18.86	µg/L			0.2%	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
B211417-MS5	**Matrix Spike, (2105320-07)**								
	Se(IV)	0.069	4.900	5.070	µg/L	102%	75-125		
	Se(VI)	18.90	5.100	24.55	µg/L	111%	75-125		
	SeCN	ND	1.962	1.912	µg/L	97%	75-125		
	SeMet	ND	1.977	1.714	µg/L	87%	75-125		
B211417-MSD5	**Matrix Spike Duplicate, (2105320-07)**								
	Se(IV)	0.069	4.900	5.026	µg/L	101%	75-125	0.9%	25
	Se(VI)	18.90	5.100	24.34	µg/L	107%	75-125	0.9%	25
	SeCN	ND	1.962	1.921	µg/L	98%	75-125	0.5%	25
	SeMet	ND	1.977	1.912	µg/L	97%	75-125	11%	25

Accuracy & Precision Summary

Batch: B211437
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits		RPD & Limits	
B211437-BS1	**Blank Spike, (2104074)**								
	Se		200.0	191.6	µg/L	96%	75-125		
B211437-BS2	**Blank Spike, (2104074)**								
	Se		200.0	185.1	µg/L	93%	75-125		
B211437-BS3	**Blank Spike, (2104074)**								
	Se		200.0	192.6	µg/L	96%	75-125		
B211437-SRM1	**Reference Material (2110004, TMDA 51.5 Reference Standard - Bottle 4 - SRM)**								
	Se		14.30	13.64	µg/L	95%	75-125		
B211437-SRM2	**Reference Material (2110004, TMDA 51.5 Reference Standard - Bottle 4 - SRM)**								
	Se		14.30	12.50	µg/L	87%	75-125		
B211437-SRM3	**Reference Material (2110004, TMDA 51.5 Reference Standard - Bottle 4 - SRM)**								
	Se		14.30	13.15	µg/L	92%	75-125		
B211437-DUP6	**Duplicate, (2105320-02)**								
	Se	2.027		1.839	µg/L			10%	20
B211437-MS6	**Matrix Spike, (2105320-02)**								
	Se	2.027	220.0	213.3	µg/L	96%	75-125		
B211437-MSD6	**Matrix Spike Duplicate, (2105320-02)**								
	Se	2.027	220.0	211.3	µg/L	95%	75-125	1%	20

Method Blanks & Reporting Limits

Batch: B211417
Matrix: Water
Method: SOP BAL-4201
Analyte: DMSeO

Sample	Result	Units
B211417-BLK1	0.00	µg/L
B211417-BLK2	0.00	µg/L
B211417-BLK3	0.00	µg/L
B211417-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B211417-BLK1	0.00	µg/L
B211417-BLK2	0.00	µg/L
B211417-BLK3	0.00	µg/L
B211417-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(VI)

Sample	Result	Units
B211417-BLK1	0.00	µg/L
B211417-BLK2	0.00	µg/L
B211417-BLK3	0.00	µg/L
B211417-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
B211417-BLK1	0.002	µg/L
B211417-BLK2	0.00	µg/L
B211417-BLK3	0.00	µg/L
B211417-BLK4	0.00	µg/L

Average: 0.001
Limit: 0.015

MDL: 0.002
MRL: 0.015

Analyte: Se(VI)

Sample	Result	Units
B211417-BLK1	0.005	µg/L
B211417-BLK2	0.00	µg/L
B211417-BLK3	0.00	µg/L
B211417-BLK4	0.00	µg/L

Average: 0.001
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: SeCN

Sample	Result	Units
B211417-BLK1	0.00	µg/L
B211417-BLK2	0.00	µg/L
B211417-BLK3	0.00	µg/L
B211417-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.010

MDL: 0.002
MRL: 0.010

Analyte: SeMet

Sample	Result	Units
B211417-BLK1	0.00	µg/L
B211417-BLK2	0.00	µg/L
B211417-BLK3	0.00	µg/L
B211417-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
B211417-BLK1	0.00	µg/L
B211417-BLK2	0.00	µg/L
B211417-BLK3	0.00	µg/L
B211417-BLK4	0.00	µg/L

Average: 0.000 **MDL:** 0.002
Limit: 0.011 **MRL:** 0.011

Analyte: Unk Se Sp

Sample	Result	Units
B211417-BLK1	0.00	µg/L
B211417-BLK2	0.00	µg/L
B211417-BLK3	0.00	µg/L
B211417-BLK4	0.00	µg/L

Average: 0.000 **MDL:** 0.002
Limit: 0.015 **MRL:** 0.015

Method Blanks & Reporting Limits

Batch: B211437
Matrix: Water
Method: EPA 1638 Mod
Analyte: Se

Sample	Result	Units
B211437-BLK1	0.113	µg/L
B211437-BLK2	0.062	µg/L
B211437-BLK3	0.097	µg/L
B211437-BLK4	0.076	µg/L

Average: 0.087
Limit: 0.480

MDL: 0.150
MRL: 0.480

Sample Containers

Lab ID: 2105320-01
Sample: LC_GRCK_WS_2021-05-07_1400_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/07/2021
Received: 05/27/2021

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 - 2105320
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105320
C	XTRA_VOL	120 mL	na	none	na	na	Styrofoam Cooler #1 - 2105320

Lab ID: 2105320-02
Sample: LC_GRCK_WS_2021-05-07_1400_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/07/2021
Received: 05/27/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided	120 mL	na	10% HN03 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105320

Lab ID: 2105320-03
Sample: LC_GRCK_WS_2021-05-07_1400_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/07/2021
Received: 05/27/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided	120 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105320

Lab ID: 2105320-04
Sample: LC_FRB_WS_2021-05-06_1430_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/06/2021
Received: 05/27/2021

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 - 2105320
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105320
C	XTRA_VOL	120 mL	na	none	na	na	Styrofoam Cooler #1 - 2105320

Sample Containers

Lab ID: 2105320-05
Sample: LC_FRB_WS_2021-05-06_1430_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/06/2021
Received: 05/27/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided	120 mL	na	10% HN03 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105320

Lab ID: 2105320-06
Sample: LC_FRB_WS_2021-05-06_1430_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/06/2021
Received: 05/27/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided	120 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105320

Lab ID: 2105320-07
Sample: LC_FRUS_WS_2021-05-07_0920_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/07/2021
Received: 05/27/2021

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 - 2105320
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2105320
C	XTRA_VOL	120 mL	na	none	na	na	Styrofoam Cooler #1 - 2105320

Lab ID: 2105320-08
Sample: LC_FRUS_WS_2021-05-07_0920_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/07/2021
Received: 05/27/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided	120 mL	na	10% HN03 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105320

Lab ID: 2105320-09
Sample: LC_FRUS_WS_2021-05-07_0920_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/07/2021
Received: 05/27/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided	120 mL	na	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2105320

Shipping Containers

Styrofoam Cooler #1 - 2105320

Received: May 27, 2021 7:25
Tracking No: 1 via Courier
Coolant Type: Blue Ice
Temperature: 6.7 °C

Description: Styrofoam Cooler #1
Damaged in transit? No
Returned to client? No
Comments: IR# 30 Blue Ice + Ice

Custody seals present? No
Custody seals intact? No
COC present? No

Teck

Page 1 of 1

COC ID:	**Dry Creek March 2021**	**TURNAROUND TIME:**	Regular

PROJECT/CLIENT INFO

Facility Name / Job#	REP		
Project Manager	Cait Good		
Email	cait.good@teck.com		
Address	421 Pine Avenue		
City	Sparwood	Province	BC
Postal Code	V0B 2G0	Country	Canada
Phone Number	250.425.8257		

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:	carlie.meyer@teck.com	X	X	X
Email 2:	teckcoal@equisonline.com			X
Email 3:	cait.good@teck.com	X	X	X
Email 4:	[illegible]	X	X	X
Email 5:	[illegible]	X	X	X
Email 5:	[illegible]	X	X	X
PO number	625683			

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**	**Selenium Speciation**
FIL.								N	F	F
PRESERV.								HNO3	HNO3	N
LC_GRCK_WS_2021-05-07_1400_N	LC_GRCK	WS	No	07-May-21	14:00	G	1			1
LC_DCEF_WS_2021-05-07_1400_N_NAL	LC_GRCK	WS	No	07-May-21	14:00	G	2	1	1	
LC_FRB_WS_2021-05-06_1430_N	LC_FRB	WS	No	06-May-21	14:30	G	1			1
LC_FRB_WS_2021-05-06_1430_N_NAL	LC_FRB	WS	No	06-May-21	14:30	G	2	1	1	
LC_FRUS_WS_2021-05-07_0920_N	LC_FRUS	WS	No	07-May-21	9:20	G	1			1
LC_FRUS_WS_2021-05-07_0920_N_NAL	LC_FRUS	WS	No	07-May-21	9:20	G	2	1	1	

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

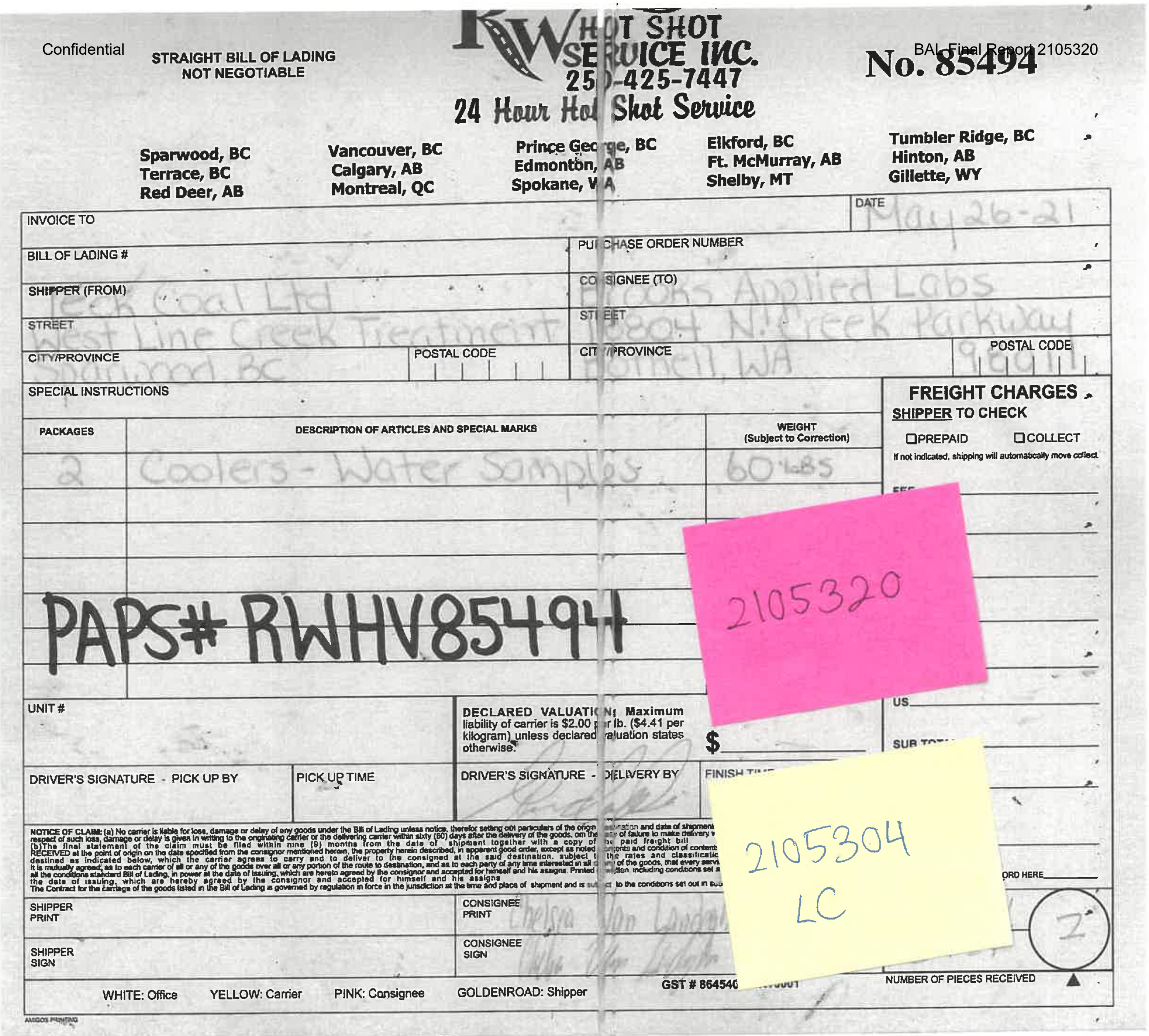
Samples for total selenium have been preserved in the field. Dissolved selenium have been filtered and preserved. Speciation samples have been filtered and frozen.

RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Maddy Stokes	**May 20, 2021**	Sheila Priscilla	5/27/21 7:25

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	**Maddy Stokes**	**Mobile #**	**647-522-0672**
Sampler's Signature	Maddy Stokes	**Date/Time**	**May 20 2021**



STRAIGHT BILL OF LADING
NOT NEGOTIABLE

RW HOT SHOT SERVICE INC.
250-425-7447
24 Hour Hot Shot Service

No. 85494

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 May 26-21

BILL OF LADING #

PURCHASE ORDER NUMBER

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)
2	Coolers - Water Samples	60 LBS
	PAPS# RWHV85494	

FREIGHT CHARGES
SHIPPER TO CHECK
☐ PREPAID ☐ COLLECT
If not indicated, shipping will automatically move collect

2105320

US

SUB TOT

2105304
LC

ORD HERE

2

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 TI

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 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, om the ate of 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 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 content 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 classificatio 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 servi 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 condition including conditions set 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 su

SHIPPER PRINT

CONSIGNEE PRINT Chelsea Van Landingham

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GST # 864540

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROAD: Shipper

AMIGOS PRINTING

Cooler ID: Styrofoam Cooler #1 **COC** (Y/[✓ N]) **Temperature:** 6.7 **IR:** 30

Coolant Type: [✓ Ice] [✓ Blue Ice] Ambient

Notes:

Sampling Locations:	LC		WL							
Sample Types:	T/D	SP	T/D	SP	T/D	SP	T/D	SP	T/D	SP
Container Types:	120mL 40mL	120mL		125mL						

Opened By: SP **Date:** 5/27/21

2105320

SELENIUM SPECIATION

Brooks Report 2023042

BROOKS APPLIED LABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

June 23, 2020

Teck Resources Limited - Vancouver
Cait Good
421 Pine Avenue
Sparwood, B.C. CANADA V0B2G0
Cait.Good@Teck.com

Re: LCO

Ms. Good,

On June 4, 2020, Brooks Applied Labs (BAL) received twelve (12) aqueous samples.

Discrepancies were observed between the sample collection times indicated on the chain-of-custody (COC) form and the collection times listed on the corresponding client container labels. Please see the following table for information on the field ID/collection time issues.

Lab ID	**Sample ID from COC**	**Collection Date/Time from COC**	**Sample ID from Container Label**	**Collection Date/Time from Container Label**
2023042-16	LC_GRCK_WS_2020-05-05_930_N	5/05/2020 09:30	LC_GRCK_WS_2020-05-11_930_N	5/11/2020 09:30
2023042-17	LC_GRCK_WS_2020-05-05_930_N_ NAL	5/05/2020 09:30	LC_GRCK_WS_2020-05-11_930_N_ NAL	5/11/2020 09:30
2023042-18	LC_GRCK_WS_2020-05-05_930_N_ NAL	5/05/2020 09:30	LC_GRCK_WS_2020-05-11_930_N_ NAL	5/11/2020 09:30

Samples 2023042-16, 2023042-17, and 2023042-18 were logged-in and reported using the field IDs/collection date/times listed on the client container labels (the last two columns in the above table). Please note that since the collection date/time values are embedded in the field IDs, it was necessary to use the field IDs described on the container labels. Consequently, the field IDs reported differ from the sample IDs listed on the COC form for samples 2023042-16, 2023042-17, and 2023042-18.

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.

Selenium Speciation

Each aqueous sample was analyzed for selenium 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)*], selenomethionine [*SeMet*], selenosulfate [*$SeSO_3$*], and dimethylselenoxide [*DMSeO*]. An unknown selenium species eluting between MeSe(IV) and SeMet is also reported [*Se Unk A*]. Research at BAL has indicated that [*Se Unk A*] is a product of the oxidation of volatile selenium species present in some client samples. The total concentration of any remaining unidentified selenium-containing species detected in each sample has also been reported 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 selenium species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting selenium species.

A significant discrepancy was observed between the dissolved Se and Se speciation results for sample *LC_FRUS_WS_2020-05-08_0830_N*. Container labels were inspected and there was no evidence of samples mislabeled. Subsequent re-analyses confirmed that the Se concentration of the speciation bottles was greater than the result yielded by the associated dissolved Se fraction, suggesting sampling heterogeneity. The reported results are therefore deemed representative of the submitted containers.

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 where 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) values 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 relative percent difference (RPD) of the MS/MSD set was not calculated (N/C).

All data were reported without qualification (aside from concentration qualifiers). 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 meet 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
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	**MS**	matrix spike
BAL	Brooks Applied Labs	**MSD**	matrix spike duplicate
BLK	method blank	**ND**	non-detect
BS	blank spike	**NR**	non-reportable
CAL	calibration standard	**N/C**	not calculated
CCB	continuing calibration blank	**PS**	post preparation spike
CCV	continuing calibration verification	**REC**	percent recovery
COC	chain of custody record	**RPD**	relative percent difference
D	dissolved fraction	**SCV**	secondary calibration verification
DUP	duplicate	**SOP**	standard operating procedure
IBL	instrument blank	**SRM**	reference material
ICV	initial calibration verification	**T**	total fraction
MDL	method detection limit	**TR**	total recoverable fraction
MRL	method reporting limit		

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, 2019; Valid to: June 30, 2020
Certificate Number: E87982-33

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
EPA 1632A	Non-Potable Waters	Inorganic Arsenic, As(III)
	Biological	Inorganic Arsenic
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: January 10, 2020; Valid to: March 30, 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 BAL-5000	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
	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	Ag, As, Cd, Cr, Cu, Pb, Ni, Se, Zn
EPA 1640 Mod	Non-Potable Waters	Ag, As, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Tl, V, Zn	Not Accredited
EPA 1631E Mod BAL-3100 (waters) BAL-3101 (solids)	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 Solids/Chemicals	Inorganic Arsenic, As(III)	Inorganic Arsenic. As(III) for waters only.
	Biological/Food	Inorganic Arsenic	Inorganic Arsenic (excluding Food)
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	Not Accredited
BAL-4101	Food by BAL-4116	Inorganic Arsenic, DMAs, MMAs	Not Accredited
BAL-4200	Non-Potable Waters	Se(IV), Se(VI), SeCN	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)	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
LC_DC3_WS_2020-05-07_1030_N	2023042-01	WS	Sample	05/07/2020	06/04/2020
LC_DC3_WS_2020-05-07_1030_N_NAL	2023042-02	WS	Sample	05/07/2020	06/04/2020
LC_DC3_WS_2020-05-07_1030_N_NAL	2023042-03	WS	Sample	05/07/2020	06/04/2020
LC_DC2_WS_2020-05-06_1530_N	2023042-04	WS	Sample	05/06/2020	06/04/2020
LC_DC2_WS_2020-05-06_1530_N_NAL	2023042-05	WS	Sample	05/06/2020	06/04/2020
LC_DC2_WS_2020-05-06_1530_N_NAL	2023042-06	WS	Sample	05/06/2020	06/04/2020
LC_FRB_WS_2020-05-08_1230_N	2023042-07	WS	Sample	05/08/2020	06/04/2020
LC_FRB_WS_2020-05-08_1230_N_NAL	2023042-08	WS	Sample	05/08/2020	06/04/2020
LC_FRB_WS_2020-05-08_1230_N_NAL	2023042-09	WS	Sample	05/08/2020	06/04/2020
LC_FRUS_WS_2020-05-08_0830_N	2023042-10	WS	Sample	05/08/2020	06/04/2020
LC_FRUS_WS_2020-05-08_0830_N_NAL	2023042-11	WS	Sample	05/08/2020	06/04/2020
LC_FRUS_WS_2020-05-08_0830_N_NAL	2023042-12	WS	Sample	05/08/2020	06/04/2020
LC_SPDC_WS_2020-05-05_0930_N	2023042-13	WS	Sample	05/05/2020	06/04/2020
LC_SPDC_WS_2020-05-05_0930_N_NAL	2023042-14	WS	Sample	05/05/2020	06/04/2020
LC_SPDC_WS_2020-05-05_0930_N_NAL	2023042-15	WS	Sample	05/05/2020	06/04/2020
LC_GRCK_WS_2020-05-11_930_N	2023042-16	WS	Sample	05/11/2020	06/04/2020
LC_GRCK_WS_2020-05-11_930_N_NAL	2023042-17	WS	Sample	05/11/2020	06/04/2020
LC_GRCK_WS_2020-05-11_930_N_NAL	2023042-18	WS	Sample	05/11/2020	06/04/2020

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	06/04/2020	06/05/2020	B201571	2000716
MeSe(IV)	Water	SOP BAL-4201	06/04/2020	06/05/2020	B201571	2000716
Se	Water	EPA 1638 Mod	06/05/2020	06/10/2020	B201580	2000736
Se Unk A	Water	SOP BAL-4201	06/04/2020	06/05/2020	B201571	2000716
Se(IV)	Water	SOP BAL-4201	06/04/2020	06/05/2020	B201571	2000716
Se(VI)	Water	SOP BAL-4201	06/04/2020	06/05/2020	B201571	2000716
SeCN	Water	SOP BAL-4201	06/04/2020	06/05/2020	B201571	2000716
SeMet	Water	SOP BAL-4201	06/04/2020	06/05/2020	B201571	2000716
SeSO3	Water	SOP BAL-4201	06/04/2020	06/05/2020	B201571	2000716
Unk Se Sp	Water	SOP BAL-4201	06/04/2020	06/05/2020	B201571	2000716

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_DC3_WS_2020-05-07_1030_N										
2023042-01	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-01	MeSe(IV)	WS	D	0.018	J	0.010	0.025	µg/L	B201571	2000716
2023042-01	Se Unk A	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-01	Se(IV)	WS	D	0.390		0.050	0.125	µg/L	B201571	2000716
2023042-01	Se(VI)	WS	D	17.4		0.060	0.125	µg/L	B201571	2000716
2023042-01	SeCN	WS	D	≤ 0.040	U	0.040	0.125	µg/L	B201571	2000716
2023042-01	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-01	SeSO3	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B201571	2000716
2023042-01	Unk Se Sp	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B201571	2000716
LC_DC3_WS_2020-05-07_1030_N_NAL										
2023042-02	Se	WS	TR	29.6		0.181	0.528	µg/L	B201580	2000736
LC_DC3_WS_2020-05-07_1030_N_NAL										
2023042-03	Se	WS	D	29.9		0.181	0.528	µg/L	B201580	2000736
LC_DC2_WS_2020-05-06_1530_N										
2023042-04	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-04	MeSe(IV)	WS	D	0.013	J	0.010	0.025	µg/L	B201571	2000716
2023042-04	Se Unk A	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-04	Se(IV)	WS	D	0.294		0.050	0.125	µg/L	B201571	2000716
2023042-04	Se(VI)	WS	D	12.5		0.060	0.125	µg/L	B201571	2000716
2023042-04	SeCN	WS	D	≤ 0.040	U	0.040	0.125	µg/L	B201571	2000716
2023042-04	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-04	SeSO3	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B201571	2000716
2023042-04	Unk Se Sp	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B201571	2000716
LC_DC2_WS_2020-05-06_1530_N_NAL										
2023042-05	Se	WS	TR	15.0		0.181	0.528	µg/L	B201580	2000736
LC_DC2_WS_2020-05-06_1530_N_NAL										
2023042-06	Se	WS	D	14.4		0.181	0.528	µg/L	B201580	2000736

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_FRB_WS_2020-05-08_1230_N										
2023042-07	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-07	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-07	Se Unk A	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-07	Se(IV)	WS	D	0.173		0.050	0.125	µg/L	B201571	2000716
2023042-07	Se(VI)	WS	D	41.8		0.060	0.125	µg/L	B201571	2000716
2023042-07	SeCN	WS	D	≤ 0.040	U	0.040	0.125	µg/L	B201571	2000716
2023042-07	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-07	SeSO3	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B201571	2000716
2023042-07	Unk Se Sp	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B201571	2000716
LC_FRB_WS_2020-05-08_1230_N_NAL										
2023042-08	Se	WS	TR	47.4		0.181	0.528	µg/L	B201580	2000736
LC_FRB_WS_2020-05-08_1230_N_NAL										
2023042-09	Se	WS	D	46.7		0.181	0.528	µg/L	B201580	2000736
LC_FRUS_WS_2020-05-08_0830_N										
2023042-10	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-10	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-10	Se Unk A	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-10	Se(IV)	WS	D	0.133		0.050	0.125	µg/L	B201571	2000716
2023042-10	Se(VI)	WS	D	25.7		0.060	0.125	µg/L	B201571	2000716
2023042-10	SeCN	WS	D	≤ 0.040	U	0.040	0.125	µg/L	B201571	2000716
2023042-10	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-10	SeSO3	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B201571	2000716
2023042-10	Unk Se Sp	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B201571	2000716
LC_FRUS_WS_2020-05-08_0830_N_NAL										
2023042-11	Se	WS	TR	44.1		0.181	0.528	µg/L	B201580	2000736
LC_FRUS_WS_2020-05-08_0830_N_NAL										
2023042-12	Se	WS	D	44.3		0.181	0.528	µg/L	B201580	2000736

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_SPDC_WS_2020-05-05_0930_N										
2023042-13	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-13	MeSe(IV)	WS	D	0.022	J	0.010	0.025	µg/L	B201571	2000716
2023042-13	Se Unk A	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-13	Se(IV)	WS	D	0.555		0.050	0.125	µg/L	B201571	2000716
2023042-13	Se(VI)	WS	D	20.0		0.060	0.125	µg/L	B201571	2000716
2023042-13	SeCN	WS	D	≤ 0.040	U	0.040	0.125	µg/L	B201571	2000716
2023042-13	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-13	SeSO3	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B201571	2000716
2023042-13	Unk Se Sp	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B201571	2000716
LC_SPDC_WS_2020-05-05_0930_N_NAL										
2023042-14	Se	WS	TR	26.0		0.181	0.528	µg/L	B201580	2000736
LC_SPDC_WS_2020-05-05_0930_N_NAL										
2023042-15	Se	WS	D	25.8		0.181	0.528	µg/L	B201580	2000736
LC_GRCK_WS_2020-05-11_930_N										
2023042-16	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-16	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-16	Se Unk A	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-16	Se(IV)	WS	D	≤ 0.050	U	0.050	0.125	µg/L	B201571	2000716
2023042-16	Se(VI)	WS	D	1.20		0.060	0.125	µg/L	B201571	2000716
2023042-16	SeCN	WS	D	≤ 0.040	U	0.040	0.125	µg/L	B201571	2000716
2023042-16	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B201571	2000716
2023042-16	SeSO3	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B201571	2000716
2023042-16	Unk Se Sp	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B201571	2000716
LC_GRCK_WS_2020-05-11_930_N_NAL										
2023042-17	Se	WS	TR	1.93		0.181	0.528	µg/L	B201580	2000736
LC_GRCK_WS_2020-05-11_930_N_NAL										
2023042-18	Se	WS	D	1.92		0.181	0.528	µg/L	B201580	2000736

Accuracy & Precision Summary

Batch: B201571
Lab Matrix: Water
Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B201571-BS1	**Blank Spike, (1923027)**						
	MeSe(IV)		5.095	5.388	µg/L	106% 75-125	
	Se(IV)		5.000	5.078	µg/L	102% 75-125	
	Se(VI)		5.000	5.022	µg/L	100% 75-125	
	SeCN		5.015	4.919	µg/L	98% 75-125	
	SeMet		4.932	4.840	µg/L	98% 75-125	
B201571-DUP3	**Duplicate, (2023042-13)**						
	DMSeO	ND		ND	µg/L		N/C 25
	MeSe(IV)	0.022		0.021	µg/L		6% 25
	Se Unk A	ND		ND	µg/L		N/C 25
	Se(IV)	0.555		0.575	µg/L		3% 25
	Se(VI)	20.02		20.31	µg/L		1% 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
B201571-MS3	**Matrix Spike, (2023042-13)**						
	Se(IV)	0.555	4.900	5.489	µg/L	101% 75-125	
	Se(VI)	20.02	5.100	24.76	µg/L	93% 75-125	
	SeCN	ND	4.905	4.632	µg/L	94% 75-125	
	SeMet	ND	0.9885	0.940	µg/L	95% 75-125	
B201571-MSD3	**Matrix Spike Duplicate, (2023042-13)**						
	Se(IV)	0.555	4.900	5.574	µg/L	102% 75-125	2% 25
	Se(VI)	20.02	5.100	24.93	µg/L	96% 75-125	0.7% 25
	SeCN	ND	4.905	4.612	µg/L	94% 75-125	0.4% 25
	SeMet	ND	0.9885	0.959	µg/L	97% 75-125	2% 25

Accuracy & Precision Summary

Batch: B201580
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B201580-BS1	**Blank Spike, (1943020)**						
	Se		200.0	215.5	µg/L	108% 75-125	
B201580-BS2	**Blank Spike, (1943020)**						
	Se		200.0	217.9	µg/L	109% 75-125	
B201580-BS3	**Blank Spike, (1943020)**						
	Se		200.0	210.4	µg/L	105% 75-125	
B201580-SRM1	**Reference Material (1938021, TMDA 51.5 Reference Standard - Bottle 6- SRM)**						
	Se		14.30	15.78	µg/L	110% 75-125	
B201580-SRM2	**Reference Material (1938021, TMDA 51.5 Reference Standard - Bottle 6- SRM)**						
	Se		14.30	15.01	µg/L	105% 75-125	
B201580-SRM3	**Reference Material (1938021, TMDA 51.5 Reference Standard - Bottle 6- SRM)**						
	Se		14.30	15.14	µg/L	106% 75-125	
B201580-DUP4	**Duplicate, (2023042-08)**						
	Se	47.39		46.60	µg/L		2% 20
B201580-MS4	**Matrix Spike, (2023042-08)**						
	Se	47.39	220.0	293.7	µg/L	112% 75-125	
B201580-MSD4	**Matrix Spike Duplicate, (2023042-08)**						
	Se	47.39	220.0	292.8	µg/L	112% 75-125	0.3% 20

Method Blanks & Reporting Limits

Batch: B201571
Matrix: Water
Method: SOP BAL-4201
Analyte: DMSeO

Sample	Result	Units
B201571-BLK1	0.00	µg/L
B201571-BLK2	0.00	µg/L
B201571-BLK3	0.00	µg/L
B201571-BLK4	0.00	µg/L

Average: 0.000 **MDL:** 0.002
Limit: 0.005 **MRL:** 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B201571-BLK1	0.00	µg/L
B201571-BLK2	0.00	µg/L
B201571-BLK3	0.00	µg/L
B201571-BLK4	0.00	µg/L

Average: 0.000 **MDL:** 0.002
Limit: 0.005 **MRL:** 0.005

Analyte: Se Unk A

Sample	Result	Units
B201571-BLK1	0.00	µg/L
B201571-BLK2	0.00	µg/L
B201571-BLK3	0.00	µg/L
B201571-BLK4	0.00	µg/L

Average: 0.000 **MDL:** 0.002
Limit: 0.005 **MRL:** 0.005

Method Blanks & Reporting Limits

Analyte: Se(IV)

Sample	Result	Units
B201571-BLK1	0.00	µg/L
B201571-BLK2	0.00	µg/L
B201571-BLK3	0.00	µg/L
B201571-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.025

MDL: 0.010
MRL: 0.025

Analyte: Se(VI)

Sample	Result	Units
B201571-BLK1	0.00	µg/L
B201571-BLK2	0.00	µg/L
B201571-BLK3	0.00	µg/L
B201571-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.025

MDL: 0.012
MRL: 0.025

Analyte: SeCN

Sample	Result	Units
B201571-BLK1	0.00	µg/L
B201571-BLK2	0.00	µg/L
B201571-BLK3	0.00	µg/L
B201571-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.025

MDL: 0.008
MRL: 0.025

Analyte: SeMet

Sample	Result	Units
B201571-BLK1	0.00	µg/L
B201571-BLK2	0.00	µg/L
B201571-BLK3	0.00	µg/L
B201571-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
B201571-BLK1	0.00	µg/L
B201571-BLK2	0.00	µg/L
B201571-BLK3	0.00	µg/L
B201571-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.025

MDL: 0.012
MRL: 0.025

Analyte: Unk Se Sp

Sample	Result	Units
B201571-BLK1	0.00	µg/L
B201571-BLK2	0.00	µg/L
B201571-BLK3	0.00	µg/L
B201571-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.025

MDL: 0.012
MRL: 0.025

Method Blanks & Reporting Limits

Batch: B201580
Matrix: Water
Method: EPA 1638 Mod
Analyte: Se

Sample	Result	Units
B201580-BLK1	0.122	µg/L
B201580-BLK2	0.072	µg/L
B201580-BLK3	0.071	µg/L
B201580-BLK4	0.060	µg/L
Average:	0.081	
Limit:	0.480	

MDL: 0.165
MRL: 0.480

Sample Containers

Lab ID: 2023042-01
Sample: LC_DC3_WS_2020-05-07_1030_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/07/2020
Received: 06/04/2020

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 - 2023042
B	EXTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2023042
C	EXTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2023042

Lab ID: 2023042-02
Sample: LC_DC3_WS_2020-05-07_1030_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/07/2020
Received: 06/04/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	1950008	<2	Styrofoam Cooler #1 - 2023042

Lab ID: 2023042-03
Sample: LC_DC3_WS_2020-05-07_1030_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/07/2020
Received: 06/04/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	1950008	<2	Styrofoam Cooler #1 - 2023042

Lab ID: 2023042-04
Sample: LC_DC2_WS_2020-05-06_1530_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/06/2020
Received: 06/04/2020

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 - 2023042
B	EXTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2023042
C	EXTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2023042

Sample Containers

Lab ID: 2023042-05
Sample: LC_DC2_WS_2020-05-06_1530_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/06/2020
Received: 06/04/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	1950008	<2	Styrofoam Cooler #1 - 2023042

Lab ID: 2023042-06
Sample: LC_DC2_WS_2020-05-06_1530_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/06/2020
Received: 06/04/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	1950008	<2	Styrofoam Cooler #1 - 2023042

Lab ID: 2023042-07
Sample: LC_FRB_WS_2020-05-08_1230_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/08/2020
Received: 06/04/2020

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 - 2023042
B	EXTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2023042
C	EXTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2023042

Lab ID: 2023042-08
Sample: LC_FRB_WS_2020-05-08_1230_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/08/2020
Received: 06/04/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	1950008	<2	Styrofoam Cooler #1 - 2023042

Lab ID: 2023042-09
Sample: LC_FRB_WS_2020-05-08_1230_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/08/2020
Received: 06/04/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	1950008	<2	Styrofoam Cooler #1 - 2023042

Sample Containers

Lab ID: 2023042-10
Sample: LC_FRUS_WS_2020-05-08_0830_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/08/2020
Received: 06/04/2020

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 - 2023042
B	EXTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2023042
C	EXTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2023042

Lab ID: 2023042-11
Sample: LC_FRUS_WS_2020-05-08_0830_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/08/2020
Received: 06/04/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	1950008	<2	Styrofoam Cooler #1 - 2023042

Lab ID: 2023042-12
Sample: LC_FRUS_WS_2020-05-08_0830_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/08/2020
Received: 06/04/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	1950008	<2	Styrofoam Cooler #1 - 2023042

Lab ID: 2023042-13
Sample: LC_SPDC_WS_2020-05-05_0930_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/05/2020
Received: 06/04/2020

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 - 2023042
B	EXTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2023042
C	EXTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2023042

Sample Containers

Lab ID: 2023042-14
Sample: LC_SPDC_WS_2020-05-05_0930_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/05/2020
Received: 06/04/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	1950008	<2	Styrofoam Cooler #1 - 2023042

Lab ID: 2023042-15
Sample: LC_SPDC_WS_2020-05-05_0930_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/05/2020
Received: 06/04/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	1950008	<2	Styrofoam Cooler #1 - 2023042

Lab ID: 2023042-16
Sample: LC_GRCK_WS_2020-05-11_930_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/11/2020
Received: 06/04/2020

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 - 2023042
B	EXTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2023042
C	EXTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2023042

Lab ID: 2023042-17
Sample: LC_GRCK_WS_2020-05-11_930_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/11/2020
Received: 06/04/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	1950008	<2	Styrofoam Cooler #1 - 2023042

Lab ID: 2023042-18
Sample: LC_GRCK_WS_2020-05-11_930_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 05/11/2020
Received: 06/04/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	1950008	<2	Styrofoam Cooler #1 - 2023042

Shipping Containers

Styrofoam Cooler #1 - 2023042

Received: June 4, 2020 7:00
Tracking No: 79781 via Courier
Coolant Type: Blue Ice
Temperature: 2.4 °C

Description: Styrofoam Cooler #1
Damaged in transit? No
Returned to client? No
Comments: IR #19

Custody seals present? No
Custody seals intact? No
COC present? Yes

Con Teck

Page 1 of 1

2plastic

BAL Final Report 2023042

COC ID:	**Se Speciation Dry Creek**	**TURNAROUND TIME:**	Regular

PROJECT/CLIENT INFO				LABORATORY				OTHER INFO				
Facility Name	LCO			Lab Name	Brooks Applied Labs			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Cait Good			Lab Contact	Ben Wozniak			Email 1:	carlie.meyer@teck.com	X	X	X
Email	cait.good@teck.com			Email	ben@brooksapplied.com			Email 2:	teckcoal@equisonline.com			X
Address	421 Pine Avenue			Address	18804 North Creek Parkway			Email 3:	mariah.arnold@teck.com	X	X	X
								Email 4:	d.hasek@minnow.ca	X	X	X
City	Sparwood	Province	BC	City	Bothell	Province	WA	Email 5:	c.wiramanaden@minnow.ca	X	X	X
Postal Code	V0B 2G0	Country	Canada	Postal Code	98011	Country	USA	Email 5:	cait.good@teck.com	X	X	X
Phone Number	250.425.8257			Phone Number	206-632-6206			PO number	692629			

SAMPLE DETAILS — **ANALYSIS REQUESTED** — Filtered - F: Field, L: Lab, FL: Field & Lab, N: None

								FIL		F	F
								PRESERV.	HNO3	HNO3	
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**
LC_DC3_WS_2020-05-07_1030_N	**LC_DC3**	**WS**	**No**	7-May-20	**10:30**	**G**	**1**				**1**
LC_DC3_WS_2020-05-07_1030_N_NAL	**LC_DC3**	**WS**	**No**	7-May-20	**10:30**	**G**	**2**		**1**	**1**	
LC_DC2_WS_2020-05-06_1530_N	**LC_DC2**	**WS**	**No**	6-May-20	**15:30**	**G**	**1**				**1**
LC_DC2_WS_2020-05-06_1530_N_NAL	**LC_DC2**	**WS**	**No**	6-May-20	**15:30**	**G**	**2**		**1**	**1**	
LC_FRB_WS_2020-05-08_1230_N	**LC_FRB**	**WS**	**No**	8-May-20	**12:30**	**G**	**1**				**1**
LC_FRB_WS_2020-05-05_1230_N_NAL	**LC_FRB**	**WS**	**No**	8-May-20	**12:30**	**G**	**2**		**1**	**1**	
LC_FRUS_WS_2020-05-08_0830_N	**LC_FRUS**	**WS**	**No**	8-May-20	**8:30**	**G**	**1**				**1**
LC_FRUS_WS_2020-05-08_0830_N_NAL	**LC_FRUS**	**WS**	**No**	8-May-20	**8:30**	**G**	**2**		**1**	**1**	
LC_SPDC_WS_2020-05-05_0930_N	**LC_SPDC**	**WS**	**No**	5-May-20	**9:30**	**G**	**1**				**1**
LC_SPDC_WS_2020-05-05_0930_N_NAL	**LC_SPDC**	**WS**	**No**	5-May-20	**9:30**	**G**	**2**		**1**	**1**	
LC_GRCK_WS_2020-05-05_0930_N	**LC_GRCK**	**WS**	**No**	5-May-20	**9:30**	**G**	**1**				**1**
LC_GRCK_WS_2020-05-05_0930_N_NAL	**LC_GRCK**	**WS**	**No**	5-May-20	**9:30**	**G**	**2**		**1**	**1**	

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Samples for total selenium have been preserved in the field. Dissolve selenium have been filtered and preserved. Speciation samples have been filtered and frozen.	**Maddy Stokes/Minnow Environmental**	**May 19 2020**	BAL	6/4/20 7:00

SERVICE REQUEST (rush - subject to availability)					
Regular (default)	X	**Sampler's Name**	**Maddy Stokes**	**Mobile #**	**647-522-0672**
Priority (2-3 business days) - 50% surcharge					
Emergency (1 Business Day) - 100% surcharge		**Sampler's Signature**	MS	**Date/Time**	19-May-20
For Emergency <1 Day, ASAP or Weekend - Contact ALS					

STRAIGHT BILL OF LADING
NOT NEGOTIABLE

RW HOT SHOT SERVICE INC.
250-425-7447
24 Hour Hot Shot Service

No. 79781

Sparwood, BC **Kamloops, BC** **Terrace, BC**
Vancouver, BC **Prince George, BC** **Tumbler Ridge, BC**
Elkford, BC **Calgary, AB** **Edmonton, AB**
Ft. McMurray, AB **Hinton, AB** **Red Deer, AB**
Montreal, QC **Gillette, WY** **Spokane, WA**
Shelby, MT

INVOICE TO

DATE June 3/2020

BILL OF LADING #

PURCHASE ORDER NUMBER

SHIPPER (FROM) Teck Coal

STREET c/o Line Creek

CITY/PROVINCE Sparwood BC

POSTAL CODE

CONSIGNEE (TO) Brooks Applied Labs

STREET 18804 N. Creek Parkway

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

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

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, om 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.

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DATE 6-4-2020

TIME

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NUMBER OF PIECES RECEIVED ▲

GST # 864540398RT0001

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROAD: Shipper

AMIGOS PRINTING

Styrocooler #1

COC ✓

2023043
2023042
2023044
2023057

Blue Ice - 7.4 T/D 125mL

SP 2.4°C 250mL

SELENIUM SPECIATION

Brooks Report 2037035

BROOKS APPLIED LABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

September 30, 2020

Teck Resources Limited - Vancouver
Cait Good
421 Pine Avenue
Sparwood, B.C. CANADA V0B2G0
Cait.Good@Teck.com

Re: REP

Ms. Good,

On September 10, 2020, Brooks Applied Labs (BAL) received three (3) 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.

Selenium Speciation
Each aqueous sample was analyzed for selenium 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)*], selenomethionine [*SeMet*], selenosulfate [$SeSO_3$], and dimethylselenoxide [*DMSeO*]. An unknown selenium species eluting between MeSe(IV) and SeMet is also reported [*Se Unk A*]. Research at BAL has indicated that [*Se Unk A*] is a product of the oxidation of volatile selenium species present in some client samples. The total concentration of any remaining unidentified selenium-containing species detected in each sample has also been reported 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 selenium species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting selenium 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 where 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 relative percent difference (RPD) of the MS/MSD set was not calculated (N/C).

All data were reported without qualification (aside from concentration qualifiers). 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 meet 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
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	**MS**	matrix spike
BAL	Brooks Applied Labs	**MSD**	matrix spike duplicate
BLK	method blank	**ND**	non-detect
BS	blank spike	**NR**	non-reportable
CAL	calibration standard	**N/C**	not calculated
CCB	continuing calibration blank	**PS**	post preparation spike
CCV	continuing calibration verification	**REC**	percent recovery
COC	chain of custody record	**RPD**	relative percent difference
D	dissolved fraction	**SCV**	secondary calibration verification
DUP	duplicate	**SOP**	standard operating procedure
IBL	instrument blank	**SRM**	reference material
ICV	initial calibration verification	**T**	total fraction
MDL	method detection limit	**TR**	total recoverable fraction
MRL	method reporting limit		

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 TN

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: January 10, 2020; Valid to: March 30, 2022

Method	Matrix	ISO and Non-Gov. TNI Accredited Analyte(s)	DoD/ OE Accredited Analytes
EPA 1638 Mod EPA 200.8 Mod EPA 6020 Mod BAL-5000	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
	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	Ag, As, Cd, Cr, Cu, Pb, Ni, Se, Zn
EPA 1640 Mod	Non-Potable Waters	Ag, As, Be, Cd, Cr, Co, Cu, Pb, Ni, Se, Tl, V, Zn	Not Accredited
EPA 1631E Mod BAL-3100 (waters) BAL-3101 (solids)	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 Solids/Chemicals	Inorganic Arsenic, As(III)	Inorganic Arsenic. As(III) for waters only.
	Biological/Food	Inorganic Arsenic	Inorganic Arsenic (excluding Food)
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 BA -4115	Inorganic Arsenic, DMAs, MMAs	Not Accredited
BAL-4101	Food by BAL-4116	Inorganic Arsenic, DMAs, MMAs	Not Accredited
BAL-4200	Non-Potable Waters	Se(IV), Se(VI), SeCN	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)	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 D	Report Matrix	Type	Sampled	Received
LC_FRUS_WS_LAEMP_DRY_2020-08_NAL	2037035-01	WS	Sample	08/28/2020	09/10/2020
LC_FRUS_WS_LAEMP_DRY_2020-08_NAL	2037035-02	WS	Sample	08/28/2020	09/10/2020
LC_FRUS_WS_LAEMP_DRY_2020-08_NAL	2037035-03	WS	Sample	08/28/2020	09/10/2020
LC_FR8_WS_LAEMP_DRY_2020-08_NAL	2037035-04	WS	Sample	08/28/2020	09/10/2020
LC_FR8_WS_LAEMP_DRY_2020-08_NAL	2037035-05	WS	Sample	08/28/2020	09/10/2020
LC_FR8_WS_LAEMP_DRY_2020-08_NAL	2037035-06	WS	Sample	08/28/2020	09/10/2020
LC_GRCK_WS_LAEMP_DRY_2020-08_NAL	2037035-07	WS	Sample	08/29/2020	09/10/2020
LC_GRCK_WS_LAEMP_DRY_2020-08_NAL	2037035-08	WS	Sample	08/29/2020	09/10/2020
LC_GRCK_WS_LAEMP_DRY_2020-08_NAL	2037035-09	WS	Sample	08/29/2020	09/10/2020

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	09/10/2020	09/11/2020	B202473	2001127
MeSe(IV)	Water	SOP BAL-4201	09/10/2020	09/11/2020	B202473	2001127
Se	Water	EPA 1638 Mod	09/18/2020	09/22/2020	B202530	2001158
Se Unk A	Water	SOP BAL-4201	09/10/2020	09/11/2020	B202473	2001127
Se(IV)	Water	SOP BAL-4201	09/10/2020	09/11/2020	B202473	2001127
Se(VI)	Water	SOP BAL-4201	09/10/2020	09/11/2020	B202473	2001127
SeCN	Water	SOP BAL-4201	09/10/2020	09/11/2020	B202473	2001127
SeMet	Water	SOP BAL-4201	09/10/2020	09/11/2020	B202473	2001127
SeSO3	Water	SOP BAL-4201	09/10/2020	09/11/2020	B202473	2001127
Unk Se Sp	Water	SOP BAL-4201	09/10/2020	09/11/2020	B202473	2001127

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_FRUS_WS_LAEMP_DRY_2020-08_NAL										
2037035-01	Se	WS	TR	47.6		0.137	0.528	µg/L	B202530	2001158
LC_FRUS_WS_LAEMP_DRY_2020-08_NAL										
2037035-02	Se	WS	D	48.1		0.137	0.528	µg/L	B202530	2001158
LC_FRUS_WS_LAEMP_DRY_2020-08_NAL										
2037035-03	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B202473	2001127
2037035-03	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B202473	2001127
2037035-03	Se Unk A	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B202473	2001127
2037035-03	Se(IV)	WS	D	0.201		0.050	0.125	µg/L	B202473	2001127
2037035-03	Se(VI)	WS	D	36.0		0.060	0.125	µg/L	B202473	2001127
2037035-03	SeCN	WS	D	≤ 0.040	U	0.040	0.125	µg/L	B202473	2001127
2037035-03	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B202473	2001127
2037035-03	SeSO3	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B202473	2001127
2037035-03	Unk Se Sp	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B202473	2001127
LC_FR8_WS_LAEMP_DRY_2020-08_NAL										
2037035-04	Se	WS	TR	45.5		0.137	0.528	µg/L	B202530	2001158
LC_FR8_WS_LAEMP_DRY_2020-08_NAL										
2037035-05	Se	WS	D	44.3		0.137	0.528	µg/L	B202530	2001158
LC_FR8_WS_LAEMP_DRY_2020-08_NAL										
2037035-06	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B202473	2001127
2037035-06	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B202473	2001127
2037035-06	Se Unk A	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B202473	2001127
2037035-06	Se(IV)	WS	D	0.205		0.050	0.125	µg/L	B202473	2001127
2037035-06	Se(VI)	WS	D	31.7		0.060	0.125	µg/L	B202473	2001127
2037035-06	SeCN	WS	D	≤ 0.040	U	0.040	0.125	µg/L	B202473	2001127
2037035-06	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B202473	2001127
2037035-06	SeSO3	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B202473	2001127
2037035-06	Unk Se Sp	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B202473	2001127
LC_GRCK_WS_LAEMP_DRY_2020-08_NAL										
2037035-07	Se	WS	TR	2.19		0.137	0.528	µg/L	B202530	2001158
LC_GRCK_WS_LAEMP_DRY_2020-08_NAL										
2037035-08	Se	WS	D	2.05		0.137	0.528	µg/L	B202530	2001158

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_GRCK_WS_LAEMP_DRY_2020-08_NAL										
2037035-09	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B202473	2001127
2037035-09	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B202473	2001127
2037035-09	Se Unk A	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B202473	2001127
2037035-09	Se(IV)	WS	D	≤ 0.050	U	0.050	0.125	µg/L	B202473	2001127
2037035-09	Se(VI)	WS	D	1.12		0.060	0.125	µg/L	B202473	2001127
2037035-09	SeCN	WS	D	≤ 0.040	U	0.040	0.125	µg/L	B202473	2001127
2037035-09	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B202473	2001127
2037035-09	SeSO3	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B202473	2001127
2037035-09	Unk Se Sp	WS	D	≤ 0.060	U	0.060	0.125	µg/L	B202473	2001127

Accuracy & Precision Summary

Batch: B202473
Lab Matrix: Water
Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits		RPD & Limits	
B202473-BS1	**Blank Spike, (1923027)**								
	MeSe(IV)		5.095	5.251	µg/L	103%	75-125		
	Se(IV)		5.000	5.062	µg/L	101%	75-125		
	Se(VI)		5.000	4.906	µg/L	98%	75-125		
	SeCN		5.015	4.671	µg/L	93%	75-125		
	SeMet		4.932	4.647	µg/L	94%	75-125		
B202473-DUP3	**Duplicate, (2037033-10)**								
	DMSeO	ND		ND	µg/L			N/C	25
	MeSe(IV)	ND		ND	µg/L			N/C	25
	Se Unk A	ND		ND	µg/L			N/C	25
	Se(IV)	0.108		0.107	µg/L			0.4%	25
	Se(VI)	117.5		116.6	µg/L			0.8%	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
B202473-MS3	**Matrix Spike, (2037033-10)**								
	Se(IV)	0.108	4.900	5.163	µg/L	103%	75-125		
	Se(VI)	117.5	5.100	120.9	µg/L	NR	75-125		
	SeCN	ND	4.905	4.789	µg/L	98%	75-125		
	SeMet	ND	0.9885	0.956	µg/L	97%	75-125		
B202473-MSD3	**Matrix Spike Duplicate, (2037033-10)**								
	Se(IV)	0.108	4.900	5.094	µg/L	102%	75-125	1%	25
	Se(VI)	117.5	5.100	119.6	µg/L	NR	75-125	N/C	25
	SeCN	ND	4.905	4.824	µg/L	98%	75-125	0.7%	25
	SeMet	ND	0.9885	0.945	µg/L	96%	75-125	1%	25

Accuracy & Precision Summary

Batch: B202530
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B202530-BS1	**Blank Spike, (2035012)**						
	Se		200.0	196.4	µg/L	98% 75-125	
B202530-BS2	**Blank Spike, (2035012)**						
	Se		200.0	197.3	µg/L	99% 75-125	
B202530-BS3	**Blank Spike, (2035012)**						
	Se		200.0	198.6	µg/L	99% 75-125	
B202530-BS4	**Blank Spike, (2035012)**						
	Se		200.0	199.6	µg/L	100% 75-125	
B202530-BS5	**Blank Spike, (2035012)**						
	Se		200.0	195.7	µg/L	98% 75-125	
B202530-SRM1	**Reference Materia (1913039, T221)**						
	Se		3.800	3.839	µg/L	101% 75-125	
B202530-SRM2	**Reference Materia (1913039, T221)**						
	Se		3.800	3.655	µg/L	96% 75-125	
B202530-SRM3	**Reference Materia (1913039, T221)**						
	Se		3.800	3.707	µg/L	98% 75-125	
B202530-SRM4	**Reference Materia (1913039, T221)**						
	Se		3.800	3.639	µg/L	96% 75-125	
B202530-SRM5	**Reference Materia (1913039, T221)**						
	Se		3.800	3.684	µg/L	97% 75-125	
B202530-DUP1	**Duplicate, (2037035-01)**						
	Se	47.57		46.75	µg/L		2% 20

Accuracy & Precision Summary

Batch: B202530
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits		RPD & Limits	
B202530-MS1	**Matrix Spike, (2037035-01)**								
	Se	47.57	220.0	268.0	µg/L	100%	75-125		
B202530-MSD1	**Matrix Spike Duplicate, (2037035-01)**								
	Se	47.57	220.0	265.8	µg/L	99%	75-125	0.8%	20

Method Blanks & Reporting Limits

Batch: B202473
Matrix: Water
Method: SOP BAL-4201
Analyte: DMSeO

Sample	Result	Units
B202473-BLK1	0.00	µg/L
B202473-BLK2	0.00	µg/L
B202473-BLK3	0.00	µg/L
B202473-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B202473-BLK1	0.00	µg/L
B202473-BLK2	0.00	µg/L
B202473-BLK3	0.00	µg/L
B202473-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: Se Unk A

Sample	Result	Units
B202473-BLK1	0.00	µg/L
B202473-BLK2	0.00	µg/L
B202473-BLK3	0.00	µg/L
B202473-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
B202473-BLK1	0.00	µg/L
B202473-BLK2	0.00	µg/L
B202473-BLK3	0.00	µg/L
B202473-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.025

MDL: 0.010
MRL: 0.025

Analyte: Se(VI)

Sample	Result	Units
B202473-BLK1	0.00	µg/L
B202473-BLK2	0.00	µg/L
B202473-BLK3	0.00	µg/L
B202473-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.025

MDL: 0.012
MRL: 0.025

Analyte: SeCN

Sample	Result	Units
B202473-BLK1	0.00	µg/L
B202473-BLK2	0.00	µg/L
B202473-BLK3	0.00	µg/L
B202473-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.025

MDL: 0.008
MRL: 0.025

Analyte: SeMet

Sample	Result	Units
B202473-BLK1	0.00	µg/L
B202473-BLK2	0.00	µg/L
B202473-BLK3	0.00	µg/L
B202473-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
B202473-BLK1	0.00	µg/L
B202473-BLK2	0.00	µg/L
B202473-BLK3	0.00	µg/L
B202473-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.025

MDL: 0.012
MRL: 0.025

Analyte: Unk Se Sp

Sample	Result	Units
B202473-BLK1	0.00	µg/L
B202473-BLK2	0.00	µg/L
B202473-BLK3	0.00	µg/L
B202473-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.025

MDL: 0.012
MRL: 0.025

Method Blanks & Reporting Limits

Batch: B202530
Matrix: Water
Method: EPA 1638 Mod
Analyte: Se

Sample	Result	Units
B202530-BLK1	0.044	µg/L
B202530-BLK2	0.036	µg/L
B202530-BLK3	0.074	µg/L
B202530-BLK4	-0.004	µg/L
B202530-BLK5	0.022	µg/L

Average: 0.034
Limit: 0.480

MDL: 0.125
MRL: 0.480

Sample Containers

Lab ID: 2037035-01
Sample: LC_FRUS_WS_LAEMP_DRY_2020-08_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 08/28/2020
Received: 09/10/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	120 mL	na	10% HNO3 (BAL)	2037003	<2	Styrofoam Cooler 1 - 2037035

Lab ID: 2037035-02
Sample: LC_FRUS_WS_LAEMP_DRY_2020-08_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 08/28/2020
Received: 09/10/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	120 mL	na	10% HNO3 (BAL)	2037003	<2	Styrofoam Cooler 1 - 2037035

Lab ID: 2037035-03
Sample: LC_FRUS_WS_LAEMP_DRY_2020-08_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 08/28/2020
Received: 09/10/2020

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 - 2037035
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler 1 - 2037035
C	XTRA_VOL	120 mL	na	none	na	na	Styrofoam Cooler 2 - 2037035

Lab ID: 2037035-04
Sample: LC_FR8_WS_LAEMP_DRY_2020-08_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 08/28/2020
Received: 09/10/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	120 mL	na	10% HNO3 (BAL)	2037003	<2	Styrofoam Cooler 1 - 2037035

Sample Containers

Lab ID: 2037035-05
Sample: LC_FR8_WS_LAEMP_DRY_2020-08_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 08/28/2020
Received: 09/10/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	120 mL	na	10% HNO3 (BAL)	2037003	<2	Styrofoam Cooler 1 - 2037035

Lab ID: 2037035-06
Sample: LC_FR8_WS_LAEMP_DRY_2020-08_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 08/28/2020
Received: 09/10/2020

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 - 2037035
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler 1 - 2037035
C	XTRA_VOL	120 mL	na	none	na	na	Styrofoam Cooler 2 - 2037035

Lab ID: 2037035-07
Sample: LC_GRCK_WS_LAEMP_DRY_2020-08_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 08/29/2020
Received: 09/10/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	120 mL	na	10% HNO3 (BAL)	2037003	<2	Styrofoam Cooler 1 - 2037035

Lab ID: 2037035-08
Sample: LC_GRCK_WS_LAEMP_DRY_2020-08_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 08/29/2020
Received: 09/10/2020

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	120 mL	na	10% HNO3 (BAL)	2037003	<2	Styrofoam Cooler 1 - 2037035

Sample Containers

Lab ID: 2037035-09
Sample: LC_GRCK_WS_LAEMP_DRY_2020-08_NAL

Report Matrix: WS
Sample Type: Sample + Sum

Collected: 08/29/2020
Received: 09/10/2020

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 - 2037035
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler 1 - 2037035
C	XTRA_VOL	120 mL	na	none	na	na	Styrofoam Cooler 2 - 2037035

Shipping Containers

Styrofoam Cooler 1 - 2037035

Received: September 10, 2020 7:00
Tracking No: 76917 via Courier
Coolant Type: Blue Ice
Temperature: 3.9 °C

Description: Styrofoam Cooler 1
Damaged in transit? No
Returned to client? No
Comments: IR# 21

Custody seals present? No
Custody seals intact? No
COC present? No

Styrofoam Cooler 2 - 2037035

Received: September 10, 2020 7:00
Tracking No: 76917 via Courier
Coolant Type: Blue Ice
Temperature: 1.8 °C

Description: Styrofoam Cooler 2
Damaged in transit? No
Returned to client? No
Comments: IR# 21

Custody seals present? No
Custody seals intact? No
COC present? No

COC ID: DRY CREEK ~~ECO~~ LAEMP Aug 2020

TURNAROUND TIME:

PROJECT/CLIENT INFO				**LABORATORY**			
Facility Name	REP			Lab Name	Brooks Applied Labs		
Project Manager	~~Paul Dore~~ Cait Good			Lab Contact	Ben Wozniak		
Email	~~paul.dore@teck.com~~ cait.good@teck.com			Email	ben@brooksapplied.com		
Address	421 Pine Avenue			Address	18804 North Creek Parkway		
City	Sparwood	Province	BC	City	Bothell	Province	WA
Postal Code	V0B 2G0	Country	Canada	Postal Code	98011	Country	USA
Phone Number	250-425-4869			Phone Number	206-632-6206		

	Excel	PDF	EDD
~~paul.dore@teck.com~~	~~x~~	~~x~~	~~x~~
teckcoal@equisonline.com			x
carlie.meyer@teck.com	x	x	x
dhasek@minnow.ca	x	x	x
cait.good@teck.com	x	x	x

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.	Total Selenium	Dissolved Selenium	Selenium Speciation
Filt.									HNO3	HNO3	
PRESERV.									P	F/P	F
✓✓	LC_FRUS_WS_LAEMP_DRY_2020-08_NAL	LC_FRUS	WS	No	28-Aug-20	13:30	G	3	X	X	X
✓✓	LC_FR8_WS_LAEMP_DRY_2020-08_NAL	LC_FR8	WS	No	28-Aug-20	08:45	G	3	X	X	X
✓✓	LC_GRCK_WS_LAEMP_DRY_2020-08_NAL	LC_GRCK	WS	No	29-Aug-20	15:00	G	3	X	X	X
			WS	No			G	3	X	X	X
			WS	No			G	3	X	X	X
			WS	No			G	3	X	X	X
			WS	No			G	3	X	X	X
			WS	No			G	3	X	X	X
			WS	No			G	3	X	X	X
			WS	No			G	3	X	X	X
			WS	No			G	3	X	X	X
			WS	No			G	3	X	X	X
			WS	No			G	3	X	X	X
			WS	No			G	3	X	X	X
			WS	No			G	3	X	X	X

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

Line Creek Aquatic Baseline- VPO00690100.
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	DATE/TIME
Katharina Batchelar/Minnow	02-Sept-20 1400	Spencer Shilaya (BAL)	9/10/20 7:00

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	Katharina Batchelar	Mobile #	778-679-4350
Sampler's Signature	KBatchelar	Date/Time	02-Sept-20 14:00

STRAIGHT BILL OF LADING
NOT NEGOTIABLE

COPY

RW HOT SHOT SERVICE INC.
250-425-7447
24 Hour Hot Shot Service

No. 76917

Sparwood, BC
Kamloops, BC
Terrace, BC

Vancouver, BC
Prince George, BC
Tumbler Ridge, BC

Elkford, BC
Calgary, AB
Edmonton, AB

Ft. McMurray, AB
Hinton, AB
Red Deer, AB

Montreal, QC
Gillette, WY
Spokane, WA

Shelby, MT

INVOICE TO

DATE Sept 9/20

BILL OF LADING #

PURCHASE ORDER NUMBER

SHIPPER (FROM) [illegible]

CONSIGNEE (TO) Brooks Applied Labs

STREET [illegible]

STREET 18804 N Creek Parkway

CITY/PROVINCE [illegible]

POSTAL CODE

CITY/PROVINCE Bothell WA

POSTAL CODE 98011

SPECIAL INSTRUCTIONS

PACKAGES	DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)
	[illegible]	50 LBS
	PAPS# RWHV76917	

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 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

CONSIGNEE PRINT

DATE

SHIPPER SIGN

CONSIGNEE SIGN

TIME

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROD: Shipper

GST # 864540398RT0001

NUMBER OF PIECES RECEIVED

AMIGOS PRINTING

Cooler ID: S.C. 1

COC (Y/[✓ N])

Temperature: 3.9

IR: 21

Coolant Type: Ice [✓ Blue Ice] Ambient

Notes:

Sampling Locations:	2037037		2037036		2037035		2037039		2037040	
	T/D	SP	T/D	SP	T/D	SP	T/D	SP	T/D	SP
Sample Types:	120		120		120			120		120
Container Types:										

Opened By: DJR

Date: 9/10/20

Effective 7/29/20

Revision 004

RW HOT SHOT SERVICE INC.
250-425-7447
24 Hour Hot Shot Service

STRAIGHT BILL OF LADING
NOT NEGOTIABLE

COPY

No. 76917

Sparwood, BC
Kamloops, BC
Terrace, BC

Vancouver, BC
Prince George, BC
Tumbler Ridge, BC

Elkford, BC
Calgary, AB
Edmonton, AB

Ft. McMurray, AB
Hinton, AB
Red Deer, AB

Montreal, QC
Gillette, WY
Spokane, WA

Shelby, MT

INVOICE TO

DATE Sept 9/20

BILL OF LADING #

PURCHASE ORDER NUMBER

SHIPPER (FROM) [illegible]

CONSIGNEE (TO) Brooks Applied Labs

STREET [illegible]

STREET 18804 N. Creek Parkway

CITY/PROVINCE [illegible]

POSTAL CODE

CITY/PROVINCE Bothell WA

POSTAL CODE 98011

SPECIAL INSTRUCTIONS

PACKAGES	DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)
	[illegible]	[illegible] LBS
	PAPS# RWHV76917	

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

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 9

SHIPPER SIGN

CONSIGNEE SIGN

TIME

1

NUMBER OF PIECES RECEIVED ▲

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROAD: Shipper

GST # 864540398RT0001

AMIGOS PRINTING

Cooler ID: 5. 6. 2 **COC (Y/N)** [✓ N] **Temperature:** 1.8 **IR:** 21

Coolant Type: Ice [✓ Blue Ice] Ambient

Notes:

Sampling Locations:	36		35		2037038		33			
Sample Types:	T/D	SP	T/D	SP	T/D	SP	T/D	SP	T/D	SP
Container Types:	MSANPND 120	120		120	125		40			

43
46
5

Opened By: DSK **Date:** 9/10

Effective 7/29/20

Revision 004

SELENIUM SPECIATION

Brooks Report 2106211

BROOKS APPLIED LABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

July 2, 2021

Teck Resources Limited - Vancouver
Cait Good
421 Pine Avenue
Sparwood, B.C. CANADA V0B2G0
Cait.Good@teck.com

Re: REP

Dear Cait Good,

On June 17, 2021, Brooks Applied Labs (BAL) received two (2) 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 selenium species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting selenium 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 where 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) values 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 relative percent difference (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 meet 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
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	**MS**	matrix spike
BAL	Brooks Applied Labs	**MSD**	matrix spike duplicate
BLK	method blank	**ND**	non-detect
BS	blank spike	**NR**	non-reportable
CAL	calibration standard	**N/C**	not calculated
CCB	continuing calibration blank	**PS**	post preparation spike
CCV	continuing calibration verification	**REC**	percent recovery
COC	chain of custody record	**RPD**	relative percent difference
D	dissolved fraction	**SCV**	secondary calibration verification
DUP	duplicate	**SOP**	standard operating procedure
IBL	instrument blank	**SRM**	reference material
ICV	initial calibration verification	**T**	total fraction
MDL	method detection limit	**TR**	total recoverable fraction
MRL	method reporting limit		

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 BAL-5000	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
	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
LC_FRB_WS_2021-06-02_14:30_NAL	2106211-01	WS	Sample	06/02/2021	06/17/2021
LC_FRB_WS_2021-06-02_14:30_NAL	2106211-02	WS	Sample	06/02/2021	06/17/2021
LC_FRB_WS_2021-06-02_14:30_NAL	2106211-03	WS	Sample	06/02/2021	06/17/2021
LC_FRUS_WS_2021-06-02_15:55	2106211-04	WS	Sample	06/02/2021	06/17/2021
LC_FRUS_WS_2021-06-02_15:55	2106211-05	WS	Sample	06/02/2021	06/17/2021
LC_FRUS_WS_2021-06-02_15:55	2106211-06	WS	Sample	06/02/2021	06/17/2021

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	06/16/2021	06/17/2021	B211664	S210695
MeSe(IV)	Water	SOP BAL-4201	06/16/2021	06/17/2021	B211664	S210695
MeSe(VI)	Water	SOP BAL-4201	06/16/2021	06/17/2021	B211664	S210695
Se	Water	EPA 1638 Mod	06/22/2021	06/24/2021	B211700	S210720
Se(IV)	Water	SOP BAL-4201	06/16/2021	06/17/2021	B211664	S210695
Se(VI)	Water	SOP BAL-4201	06/16/2021	06/17/2021	B211664	S210695
SeCN	Water	SOP BAL-4201	06/16/2021	06/17/2021	B211664	S210695
SeMet	Water	SOP BAL-4201	06/16/2021	06/17/2021	B211664	S210695
SeSO3	Water	SOP BAL-4201	06/16/2021	06/17/2021	B211664	S210695
Unk Se Sp	Water	SOP BAL-4201	06/16/2021	06/17/2021	B211664	S210695

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_FRB_WS_2021-06-02_14:30_NAL										
2106211-01	Se	WS	TR	21.9		0.165	0.528	µg/L	B211700	S210720
LC_FRB_WS_2021-06-02_14:30_NAL										
2106211-02	Se	WS	D	21.5		0.165	0.528	µg/L	B211700	S210720
LC_FRB_WS_2021-06-02_14:30_NAL										
2106211-03	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211664	S210695
2106211-03	MeSe(IV)	WS	D	0.012	J	0.010	0.025	µg/L	B211664	S210695
2106211-03	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211664	S210695
2106211-03	Se(IV)	WS	D	0.079		0.010	0.075	µg/L	B211664	S210695
2106211-03	Se(VI)	WS	D	19.7		0.010	0.055	µg/L	B211664	S210695
2106211-03	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211664	S210695
2106211-03	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211664	S210695
2106211-03	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B211664	S210695
2106211-03	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211664	S210695
LC_FRUS_WS_2021-06-02_15:55										
2106211-04	Se	WS	TR	23.5		0.165	0.528	µg/L	B211700	S210720
LC_FRUS_WS_2021-06-02_15:55										
2106211-05	Se	WS	D	21.3		0.165	0.528	µg/L	B211700	S210720
LC_FRUS_WS_2021-06-02_15:55										
2106211-06	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211664	S210695
2106211-06	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211664	S210695
2106211-06	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211664	S210695
2106211-06	Se(IV)	WS	D	0.078		0.010	0.075	µg/L	B211664	S210695
2106211-06	Se(VI)	WS	D	16.0		0.010	0.055	µg/L	B211664	S210695
2106211-06	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211664	S210695
2106211-06	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211664	S210695
2106211-06	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B211664	S210695
2106211-06	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211664	S210695

Accuracy & Precision Summary

Batch: B211664
Lab Matrix: Water
Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits		RPD & Limits	
B211664-BS1	**Blank Spike, (2124033)**								
	MeSe(IV)		5.095	5.562	µg/L	109%	75-125		
	Se(IV)		5.000	4.713	µg/L	94%	75-125		
	Se(VI)		5.000	4.611	µg/L	92%	75-125		
	SeCN		5.015	4.956	µg/L	99%	75-125		
	SeMet		4.932	4.773	µg/L	97%	75-125		
B211664-DUP3	**Duplicate, (2106191-04)**								
	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)	0.014		0.016	µg/L			12%	25
	Se(VI)	0.293		0.295	µg/L			0.7%	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
B211664-MS3	**Matrix Spike, (2106191-04)**								
	Se(IV)	0.014	4.900	4.455	µg/L	91%	75-125		
	Se(VI)	0.293	5.100	4.963	µg/L	92%	75-125		
	SeCN	ND	1.962	1.766	µg/L	90%	75-125		
	SeMet	ND	1.977	1.728	µg/L	87%	75-125		
B211664-MSD3	**Matrix Spike Duplicate, (2106191-04)**								
	Se(IV)	0.014	4.900	4.374	µg/L	89%	75-125	2%	25
	Se(VI)	0.293	5.100	4.754	µg/L	87%	75-125	4%	25
	SeCN	ND	1.962	1.723	µg/L	88%	75-125	2%	25
	SeMet	ND	1.977	1.683	µg/L	85%	75-125	3%	25

Accuracy & Precision Summary

Batch: B211700
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B211700-BS1	**Blank Spike, (2104075)**						
	Se		200.0	191.2	µg/L	96% 75-125	
B211700-BS2	**Blank Spike, (2104075)**						
	Se		200.0	199.1	µg/L	100% 75-125	
B211700-SRM1	**Reference Material (2110003, TMDA 51.5 Reference Standard - Bottle 3 - SRM)**						
	Se		14.30	14.32	µg/L	100% 75-125	
B211700-SRM2	**Reference Material (2110003, TMDA 51.5 Reference Standard - Bottle 3 - SRM)**						
	Se		14.30	14.67	µg/L	103% 75-125	
B211700-DUP3	**Duplicate, (2106211-01)**						
	Se	21.89		21.67	µg/L		1% 20
B211700-MS3	**Matrix Spike, (2106211-01)**						
	Se	21.89	220.0	239.3	µg/L	99% 75-125	
B211700-MSD3	**Matrix Spike Duplicate, (2106211-01)**						
	Se	21.89	220.0	240.9	µg/L	100% 75-125	0.7% 20

Method Blanks & Reporting Limits

Batch: B211664
Matrix: Water
Method: SOP BAL-4201
Analyte: DMSeO

Sample	Result	Units
B211664-BLK1	0.00	µg/L
B211664-BLK2	0.00	µg/L
B211664-BLK3	0.00	µg/L
B211664-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B211664-BLK1	0.00	µg/L
B211664-BLK2	0.00	µg/L
B211664-BLK3	0.00	µg/L
B211664-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(VI)

Sample	Result	Units
B211664-BLK1	0.00	µg/L
B211664-BLK2	0.00	µg/L
B211664-BLK3	0.00	µg/L
B211664-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
B211664-BLK1	0.00	µg/L
B211664-BLK2	0.00	µg/L
B211664-BLK3	0.00	µg/L
B211664-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Analyte: Se(VI)

Sample	Result	Units
B211664-BLK1	0.00	µg/L
B211664-BLK2	0.00	µg/L
B211664-BLK3	0.00	µg/L
B211664-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: SeCN

Sample	Result	Units
B211664-BLK1	0.00	µg/L
B211664-BLK2	0.00	µg/L
B211664-BLK3	0.00	µg/L
B211664-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.010

MDL: 0.002
MRL: 0.010

Analyte: SeMet

Sample	Result	Units
B211664-BLK1	0.00	µg/L
B211664-BLK2	0.00	µg/L
B211664-BLK3	0.00	µg/L
B211664-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
B211664-BLK1	0.00	µg/L
B211664-BLK2	0.00	µg/L
B211664-BLK3	0.00	µg/L
B211664-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: Unk Se Sp

Sample	Result	Units
B211664-BLK1	0.00	µg/L
B211664-BLK2	0.00	µg/L
B211664-BLK3	0.00	µg/L
B211664-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Method Blanks & Reporting Limits

Batch: B211700
Matrix: Water
Method: EPA 1638 Mod
Analyte: Se

Sample	Result	Units
B211700-BLK1	-0.009	µg/L
B211700-BLK2	-0.010	µg/L
B211700-BLK3	0.039	µg/L
B211700-BLK4	0.026	µg/L

Average: 0.011
Limit: 0.480

MDL: 0.150
MRL: 0.480

Sample Containers

Lab ID: 2106211-01
Sample: LC_FRB_WS_2021-06-02_14:30_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/02/2021
Received: 06/17/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40mL	n/a	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2106211

Lab ID: 2106211-02
Sample: LC_FRB_WS_2021-06-02_14:30_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/02/2021
Received: 06/17/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40mL	n/a	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2106211

Lab ID: 2106211-03
Sample: LC_FRB_WS_2021-06-02_14:30_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/02/2021
Received: 06/17/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15mL	n/a	none	n/a	n/a	Styrofoam Cooler #1 - 2106211
B	XTRA_VOL	15mL	n/a	none	n/a	n/a	Styrofoam Cooler #1 - 2106211
C	XTRA_VOL	125mL	n/a	none	n/a	n/a	Styrofoam Cooler #1 - 2106211

Lab ID: 2106211-04
Sample: LC_FRUS_WS_2021-06-02_15:55
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/02/2021
Received: 06/17/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40mL	n/a	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2106211

Lab ID: 2106211-05
Sample: LC_FRUS_WS_2021-06-02_15:55
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/02/2021
Received: 06/17/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	40mL	n/a	10% HNO3 (BAL)	2037019	<2	Styrofoam Cooler #1 - 2106211

Sample Containers

Lab ID: 2106211-06
Sample: LC_FRUS_WS_2021-06-02_15:55

Report Matrix: WS
Sample Type: Sample + Sum

Collected: 06/02/2021
Received: 06/17/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Cent Tube 15mL Se-Sp	15mL	n/a	none	n/a	n/a	Styrofoam Cooler #1 - 2106211
B	XTRA_VOL	15mL	n/a	none	n/a	n/a	Styrofoam Cooler #1 - 2106211
C	XTRA_VOL	125mL	n/a	none	n/a	n/a	Styrofoam Cooler #1 - 2106211

Shipping Containers

Styrofoam Cooler #1 - 2106211

Received: June 17, 2021 7:00
Tracking No: PAPS#RWHV76449 via Courier
Coolant Type: Blue Ice
Temperature: 0.2 °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

Confidential

Teck

Page 1 of 1

COC ID: Dry Creek May 2021

TURNAROUND TIME: Regular

PROJECT/CLIENT INFO	
Facility Name / Job#	REP
Project Manager	Cait Good
Email	cait.good@teck.com
Address	421 Pine Avenue
City	Sparwood
Province	BC
Postal Code	V0B 2G0
Country	Canada
Phone Number	250.425.8257

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:	dhasek@minnow.ca	X	X	X
Email 2:	cait.good@teck.com			X
Email 3:	kbatchelar@minnow.ca	X	X	X
Email 4:	alex.mcclymont@minnow.ca	X	X	X
Email 5:	jings@minnow.ca	X	X	X
Email 5:	mstokes@minnow,ca	X	X	X
PO number	748540			

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	Selenium Speciation
FIL.								N	F	F
PRESERV.								HNO3	HNO3	N
LC_FRB_WS_2021-06-02_14:30_NAL	LC_FRB	WS	No	02-June-2021	14:30	G	3	1	1	1
LC_FRUS_WS_2021-06-02_15:55	LC_FRUS	WS	No	02-June-2021	15:55	G	3	1	1	1

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS

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	DATE/TIME
Alex McClymont	June 15, 2021		6/17/21 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	Alex McClymont	Mobile #	780-293-6750
Sampler's Signature		Date/Time	June 15, 2021

Confidential **STRAIGHT BILL OF LADING**
NOT NEGOTIABLE

KW HOT SHOT SERVICE INC.

250-425-7447

24 Hour Hot Shot Service

BAL Final Report 2106211

No. 71770

Sparwood, BC **Kamloops, BC** **Terrace, BC**	**Vancouver, BC** **Prince George, BC** **Tumbler Ridge, BC**	**Elkford, BC** **Calgary, AB** **Edmonton, AB**	**Ft. McMurray, AB** **Hinton, AB** **Red Deer, AB**	**Montreal, QC** **Gillette, WY** **Spokane, WA**	**Shelby, MT**

INVOICE TO

DATE June 16-21

BILL OF LADING #

PURCHASE ORDER NUMBER

SHIPPER (FROM) Teck Coal Ltd.	CONSIGNEE (TO) Brooks Applied Labs
STREET Fording River - Eagle 4	STREET 18804 N. Creek Parkway
CITY/PROVINCE Elkford, BC — POSTAL CODE	CITY/PROVINCE Bothell, WA — POSTAL CODE 98011

SPECIAL INSTRUCTIONS

PACKAGES	DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)
2	Coolers - Water Samples	36 LBS
	PAPS# RWHV76449	

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 OR STAMP 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
			0655

NOTICE OF CLAIM: (a) No carrier is liable for loss, damage or delay of any goods under the Bill of Lading unless notice, thereof 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. [illegible] 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 [illegible] 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 herein 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 Chelsea Van Landeghem	DATE 6-17-21
SHIPPER SIGN	CONSIGNEE SIGN Chelsea Van [illegible]	TIME 0635

NUMBER OF PIECES RECEIVED 2

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROD: Shipper GST # 864540398RT0001

Cooler ID: Styrofoam Cooler # 1 COC ([✓ Y]/N) **Temperature:** 0.2 **IR:** 31

Coolant Type: Ice [✓ Blue Ice] Ambient

Notes:

Sampling Locations:	LC									
Sample Types:	T/D	SP	T/D	SP	T/D	SP	T/D	SP	T/D	SP
Container Types:	120mL	120mL								

Opened By: CVL **Date:** 6/17/21

COPY

COPY

2106211

Effective 7/29/20 Revision 004

SELENIUM SPECIATION

Brooks Report 2107001

BROOKS APPLIED LABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

July 16, 2021

Teck Resources Limited - Vancouver
Cait Good
421 Pine Avenue
Sparwood, B.C. CANADA V0B2G0
Cait.Good@teck.com

Re: REP

Dear Cait Good,

On June 17, 2021, Brooks Applied Labs (BAL) received eight (8) 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.

At sample receipt, the lab observed cases where the **Time Collected** values listed on the COC form did not match the **Time Collected** terms on the corresponding container labels. The deviations are noted in the table below.

Laboratory ID	**Field ID**	**Date/Time Collected *(From COC Form included with sample shipment)***	**Date/Time Collected *(From container label)***	**Analytical Parameter**
2107001-05	LC_DC2_WS_LAEMP_DRY_2021-06_NP_N_NAL	06/23/2021 09:00	06/23/2021 08:56	Total Recoverable Se
2107001-06	LC_DC2_WS_LAEMP_DRY_2021-06_NP_N_NAL	06/23/2021 09:00	06/23/2021 08:56	Dissolved Se
2107001-09	LC_FRB_WS_LAEMP_DRY_2021-06_NP_N_NAL	06/24/2021 13:30	06/24/2021 13:00	Dissolved Se

Per client request, samples 2107001-05, 2107001-06, and 2107001-09 were logged in using the **Date/Time Collected** values listed on the COC form (column 3 in the above table).

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 selenium species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting selenium species.

Chromatographic interference, as indicated by an elevated baseline or co-eluting peak, was observed for selenosulfate samples 2107001-04, 2107001-07, and 2107001-10. Due to potential bias in the obtained results, the affected data have been qualified as estimated (**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 MDLs, MRLs, and other details.

In instances where 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) values 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 relative percent difference (RPD) of the MS/MSD set was not calculated (N/C).

Except for items noted above, and 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 meet 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
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	**MS**	matrix spike
BAL	Brooks Applied Labs	**MSD**	matrix spike duplicate
BLK	method blank	**ND**	non-detect
BS	blank spike	**NR**	non-reportable
CAL	calibration standard	**N/C**	not calculated
CCB	continuing calibration blank	**PS**	post preparation spike
CCV	continuing calibration verification	**REC**	percent recovery
COC	chain of custody record	**RPD**	relative percent difference
D	dissolved fraction	**SCV**	secondary calibration verification
DUP	duplicate	**SOP**	standard operating procedure
IBL	instrument blank	**SRM**	reference material
ICV	initial calibration verification	**T**	total fraction
MDL	method detection limit	**TR**	total recoverable fraction
MRL	method reporting limit		

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 BAL-5000	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
	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
LC_DCEF_WS_LAEMP_DRY_2021-06_NP_N	2107001-01	WS	Sample	06/22/2021	07/01/2021
LC_DCEF_WS_LAEMP_DRY_2021-06_NP_N_NAL	2107001-02	WS	Sample	06/22/2021	07/01/2021
LC_DCEF_WS_LAEMP_DRY_2021-06_NP_N_NAL	2107001-03	WS	Sample	06/22/2021	07/01/2021
LC_DC2_WS_LAEMP_DRY_2021-06_NP_N	2107001-04	WS	Sample	06/23/2021	07/01/2021
LC_DC2_WS_LAEMP_DRY_2021-06_NP_N_NAL	2107001-05	WS	Sample	06/23/2021	07/01/2021
LC_DC2_WS_LAEMP_DRY_2021-06_NP_N_NAL	2107001-06	WS	Sample	06/23/2021	07/01/2021
LC_FRB_WS_LAEMP_DRY_2021-06_NP_N	2107001-07	WS	Sample	06/24/2021	07/01/2021
LC_FRB_WS_LAEMP_DRY_2021-06_NP_N_NAL	2107001-08	WS	Sample	06/24/2021	07/01/2021
LC_FRB_WS_LAEMP_DRY_2021-06_NP_N_NAL	2107001-09	WS	Sample	06/24/2021	07/01/2021
LC_FRUS_WS_LAEMP_DRY_2021-06_NP_N	2107001-10	WS	Sample	06/24/2021	07/01/2021
LC_FRUS_WS_LAEMP_DRY_2021-06_NP_N_NAL	2107001-11	WS	Sample	06/24/2021	07/01/2021
LC_FRUS_WS_LAEMP_DRY_2021-06_NP_N_NAL	2107001-12	WS	Sample	06/24/2021	07/01/2021

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	07/01/2021	07/02/2021	B211788	S210773
MeSe(IV)	Water	SOP BAL-4201	07/01/2021	07/02/2021	B211788	S210773
MeSe(VI)	Water	SOP BAL-4201	07/01/2021	07/02/2021	B211788	S210773
Se	Water	EPA 1638 Mod	07/01/2021	07/07/2021	B211799	S210762
Se(IV)	Water	SOP BAL-4201	07/01/2021	07/02/2021	B211788	S210773
Se(VI)	Water	SOP BAL-4201	07/01/2021	07/02/2021	B211788	S210773
SeCN	Water	SOP BAL-4201	07/01/2021	07/02/2021	B211788	S210773
SeMet	Water	SOP BAL-4201	07/01/2021	07/02/2021	B211788	S210773
SeSO3	Water	SOP BAL-4201	07/01/2021	07/02/2021	B211788	S210773
Unk Se Sp	Water	SOP BAL-4201	07/01/2021	07/02/2021	B211788	S210773

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_DCEF_WS_LAEMP_DRY_2021-06_NP_N										
2107001-01	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-01	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-01	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-01	Se(IV)	WS	D	0.078		0.010	0.075	µg/L	B211788	S210773
2107001-01	Se(VI)	WS	D	1.62		0.010	0.055	µg/L	B211788	S210773
2107001-01	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211788	S210773
2107001-01	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-01	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B211788	S210773
2107001-01	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211788	S210773
LC_DCEF_WS_LAEMP_DRY_2021-06_NP_N_NAL										
2107001-02	Se	WS	TR	1.47		0.165	0.528	µg/L	B211799	S210762
LC_DCEF_WS_LAEMP_DRY_2021-06_NP_N_NAL										
2107001-03	Se	WS	D	1.36		0.165	0.528	µg/L	B211799	S210762
LC_DC2_WS_LAEMP_DRY_2021-06_NP_N										
2107001-04	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-04	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-04	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-04	Se(IV)	WS	D	0.457		0.010	0.075	µg/L	B211788	S210773
2107001-04	Se(VI)	WS	D	27.6		0.010	0.055	µg/L	B211788	S210773
2107001-04	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211788	S210773
2107001-04	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-04	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	µg/L	B211788	S210773
2107001-04	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211788	S210773
LC_DC2_WS_LAEMP_DRY_2021-06_NP_N_NAL										
2107001-05	Se	WS	TR	23.8		0.165	0.528	µg/L	B211799	S210762
LC_DC2_WS_LAEMP_DRY_2021-06_NP_N_NAL										
2107001-06	Se	WS	D	25.3		0.165	0.528	µg/L	B211799	S210762

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_FRB_WS_LAEMP_DRY_2021-06_NP_N										
2107001-07	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-07	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-07	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-07	Se(IV)	WS	D	0.128		0.010	0.075	µg/L	B211788	S210773
2107001-07	Se(VI)	WS	D	27.9		0.010	0.055	µg/L	B211788	S210773
2107001-07	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211788	S210773
2107001-07	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-07	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	µg/L	B211788	S210773
2107001-07	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211788	S210773
LC_FRB_WS_LAEMP_DRY_2021-06_NP_N_NAL										
2107001-08	Se	WS	TR	27.2		0.165	0.528	µg/L	B211799	S210762
LC_FRB_WS_LAEMP_DRY_2021-06_NP_N_NAL										
2107001-09	Se	WS	D	25.7		0.165	0.528	µg/L	B211799	S210762
LC_FRUS_WS_LAEMP_DRY_2021-06_NP_N										
2107001-10	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-10	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-10	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-10	Se(IV)	WS	D	0.096		0.010	0.075	µg/L	B211788	S210773
2107001-10	Se(VI)	WS	D	18.7		0.010	0.055	µg/L	B211788	S210773
2107001-10	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B211788	S210773
2107001-10	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B211788	S210773
2107001-10	SeSO3	WS	D	≤ 0.010	J-1 U	0.010	0.055	µg/L	B211788	S210773
2107001-10	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B211788	S210773
LC_FRUS_WS_LAEMP_DRY_2021-06_NP_N_NAL										
2107001-11	Se	WS	TR	25.9		0.165	0.528	µg/L	B211799	S210762
LC_FRUS_WS_LAEMP_DRY_2021-06_NP_N_NAL										
2107001-12	Se	WS	D	26.5		0.165	0.528	µg/L	B211799	S210762

Accuracy & Precision Summary

Batch: B211788
Lab Matrix: Water
Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits		RPD & Limits	
B211788-BS1	**Blank Spike, (2124033)**								
	MeSe(IV)		5.095	6.196	µg/L	122%	75-125		
	Se(IV)		5.000	5.576	µg/L	112%	75-125		
	Se(VI)		5.000	5.340	µg/L	107%	75-125		
	SeCN		5.015	5.370	µg/L	107%	75-125		
	SeMet		4.932	5.575	µg/L	113%	75-125		
B211788-DUP3	**Duplicate, (2107001-10)**								
	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)	0.096		0.083	µg/L			16%	25
	Se(VI)	18.73		18.44	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
B211788-MS3	**Matrix Spike, (2107001-10)**								
	Se(IV)	0.096	4.900	5.109	µg/L	102%	75-125		
	Se(VI)	18.73	5.100	23.91	µg/L	102%	75-125		
	SeCN	ND	1.962	1.830	µg/L	93%	75-125		
	SeMet	ND	1.977	1.868	µg/L	94%	75-125		
B211788-MSD3	**Matrix Spike Duplicate, (2107001-10)**								
	Se(IV)	0.096	4.900	5.062	µg/L	101%	75-125	0.9%	25
	Se(VI)	18.73	5.100	23.49	µg/L	93%	75-125	2%	25
	SeCN	ND	1.962	1.858	µg/L	95%	75-125	1%	25
	SeMet	ND	1.977	1.915	µg/L	97%	75-125	3%	25

Accuracy & Precision Summary

Batch: B211799
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B211799-BS1	**Blank Spike, (2104074)**						
	Se		200.0	175.3	µg/L	88% 75-125	
B211799-BS2	**Blank Spike, (2104074)**						
	Se		200.0	176.8	µg/L	88% 75-125	
B211799-BS3	**Blank Spike, (2104074)**						
	Se		200.0	179.7	µg/L	90% 75-125	
B211799-BS4	**Blank Spike, (2104074)**						
	Se		200.0	176.6	µg/L	88% 75-125	
B211799-BS5	**Blank Spike, (2104074)**						
	Se		200.0	169.6	µg/L	85% 75-125	
B211799-SRM1	**Reference Material (2041021, TMDA 51.5 Reference Standard - Bottle 8 - SRM)**						
	Se		14.30	12.65	µg/L	88% 75-125	
B211799-SRM2	**Reference Material (2041021, TMDA 51.5 Reference Standard - Bottle 8 - SRM)**						
	Se		14.30	12.39	µg/L	87% 75-125	
B211799-SRM3	**Reference Material (2041021, TMDA 51.5 Reference Standard - Bottle 8 - SRM)**						
	Se		14.30	12.07	µg/L	84% 75-125	
B211799-SRM4	**Reference Material (2041021, TMDA 51.5 Reference Standard - Bottle 8 - SRM)**						
	Se		14.30	12.73	µg/L	89% 75-125	
B211799-SRM5	**Reference Material (2041021, TMDA 51.5 Reference Standard - Bottle 8 - SRM)**						
	Se		14.30	12.00	µg/L	84% 75-125	
B211799-DUP5	**Duplicate, (2106337-02)**						
	Se	0.710		0.688	µg/L		3% 20

Accuracy & Precision Summary

Batch: B211799
Lab Matrix: Water
Method: EPA 1638 Mod

Sample	Analyte	Native	Spike	Result	Units	REC & Limits	RPD & Limits
B211799-MS5	**Matrix Spike, (2106337-02)**						
	Se	0.710	220.0	198.7	µg/L	90% 75-125	
B211799-MSD5	**Matrix Spike Duplicate, (2106337-02)**						
	Se	0.710	220.0	203.3	µg/L	92% 75-125	2% 20

Method Blanks & Reporting Limits

Batch: B211788
Matrix: Water
Method: SOP BAL-4201
Analyte: DMSeO

Sample	Result	Units
B211788-BLK1	0.00	µg/L
B211788-BLK2	0.00	µg/L
B211788-BLK3	0.00	µg/L
B211788-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B211788-BLK1	0.00	µg/L
B211788-BLK2	0.00	µg/L
B211788-BLK3	0.00	µg/L
B211788-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(VI)

Sample	Result	Units
B211788-BLK1	0.00	µg/L
B211788-BLK2	0.00	µg/L
B211788-BLK3	0.00	µg/L
B211788-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
B211788-BLK1	0.00	µg/L
B211788-BLK2	0.003	µg/L
B211788-BLK3	0.003	µg/L
B211788-BLK4	0.004	µg/L

Average: 0.003 **MDL:** 0.002
Limit: 0.015 **MRL:** 0.015

Analyte: Se(VI)

Sample	Result	Units
B211788-BLK1	0.00	µg/L
B211788-BLK2	0.00	µg/L
B211788-BLK3	0.00	µg/L
B211788-BLK4	0.00	µg/L

Average: 0.000 **MDL:** 0.002
Limit: 0.011 **MRL:** 0.011

Analyte: SeCN

Sample	Result	Units
B211788-BLK1	0.00	µg/L
B211788-BLK2	0.00	µg/L
B211788-BLK3	0.00	µg/L
B211788-BLK4	0.00	µg/L

Average: 0.000 **MDL:** 0.002
Limit: 0.010 **MRL:** 0.010

Analyte: SeMet

Sample	Result	Units
B211788-BLK1	0.00	µg/L
B211788-BLK2	0.00	µg/L
B211788-BLK3	0.00	µg/L
B211788-BLK4	0.00	µg/L

Average: 0.000 **MDL:** 0.002
Limit: 0.005 **MRL:** 0.005

Method Blanks & Reporting Limits

Analyte: SeSO3

Sample	Result	Units
B211788-BLK1	0.00	µg/L
B211788-BLK2	0.00	µg/L
B211788-BLK3	0.00	µg/L
B211788-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: Unk Se Sp

Sample	Result	Units
B211788-BLK1	0.00	µg/L
B211788-BLK2	0.00	µg/L
B211788-BLK3	0.00	µg/L
B211788-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Method Blanks & Reporting Limits

Batch: B211799
Matrix: Water
Method: EPA 1638 Mod
Analyte: Se

Sample	Result	Units
B211799-BLK1	0.027	µg/L
B211799-BLK2	-0.025	µg/L
B211799-BLK3	0.017	µg/L
B211799-BLK4	0.021	µg/L
B211799-BLK5	-0.022	µg/L

Average: 0.004
Limit: 0.480

MDL: 0.150
MRL: 0.480

Sample Containers

Lab ID: 2107001-01
Sample: LC_DCEF_WS_LAEMP_DRY_2021-06_NP_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/22/2021
Received: 07/01/2021

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 - 2107001
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2107001
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2107001

Lab ID: 2107001-02
Sample: LC_DCEF_WS_LAEMP_DRY_2021-06_NP_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/22/2021
Received: 07/01/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2052022	<2	Styrofoam Cooler #1 - 2107001

Lab ID: 2107001-03
Sample: LC_DCEF_WS_LAEMP_DRY_2021-06_NP_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/22/2021
Received: 07/01/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2052022	<2	Styrofoam Cooler #1 - 2107001

Lab ID: 2107001-04
Sample: LC_DC2_WS_LAEMP_DRY_2021-06_NP_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/23/2021
Received: 07/01/2021

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 - 2107001
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2107001
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2107001

Sample Containers

Lab ID: 2107001-05
Sample: LC_DC2_WS_LAEMP_DRY_2021-06_NP_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/23/2021
Received: 07/01/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2052022	<2	Styrofoam Cooler #1 - 2107001

Lab ID: 2107001-06
Sample: LC_DC2_WS_LAEMP_DRY_2021-06_NP_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/23/2021
Received: 07/01/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2052022	<2	Styrofoam Cooler #1 - 2107001

Lab ID: 2107001-07
Sample: LC_FRB_WS_LAEMP_DRY_2021-06_NP_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/24/2021
Received: 07/01/2021

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 - 2107001
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2107001
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2107001

Lab ID: 2107001-08
Sample: LC_FRB_WS_LAEMP_DRY_2021-06_NP_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/24/2021
Received: 07/01/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2052022	<2	Styrofoam Cooler #1 - 2107001

Sample Containers

Lab ID: 2107001-09
Sample: LC_FRB_WS_LAEMP_DRY_2021-06_NP_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/24/2021
Received: 07/01/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2052022	<2	Styrofoam Cooler #1 - 2107001

Lab ID: 2107001-10
Sample: LC_FRUS_WS_LAEMP_DRY_2021-06_NP_N
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/24/2021
Received: 07/01/2021

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 - 2107001
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #1 - 2107001
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #1 - 2107001

Lab ID: 2107001-11
Sample: LC_FRUS_WS_LAEMP_DRY_2021-06_NP_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/24/2021
Received: 07/01/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2052022	<2	Styrofoam Cooler #1 - 2107001

Lab ID: 2107001-12
Sample: LC_FRUS_WS_LAEMP_DRY_2021-06_NP_N_NAL
Report Matrix: WS
Sample Type: Sample + Sum
Collected: 06/24/2021
Received: 07/01/2021

Des	Container	Size	Lot	Preservation	P-Lot	pH	Ship. Cont.
A	Client-Provided - TM	60 mL	na	10% HNO3 (BAL)	2052022	<2	Styrofoam Cooler #1 - 2107001

Shipping Containers

Styrofoam Cooler #1 - 2107001

Received: July 1, 2021 7:00	**Description:** Styrofoam Cooler #1	**Custody seals present?** No
Tracking No: PAPS#RWHV86456 via Courier	**Damaged in transit?** No	**Custody seals intact?** No
Coolant Type: Blue Ice	**Returned to client?** No	**COC present?** Yes
Temperature: 0.3 °C	**Comments:** IR#31	

Teck

Page 1 of 1

COC ID:	Se Speciation June 21-25th Dry Creek	TURNAROUND TIME:	Regular

PROJECT/CLIENT INFO

Facility Name / Job#	REP		
Project Manager	Cait Good		
Email	Cait.Good@teck.com		
Address	421 Pine Avenue		
City	Sparwood	Province	BC
Postal Code	V0B 2G0	Country	Canada
Phone Number	250-425-8441		

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:	teckcoal@equisonline.com			X
Email 2:	dhasek@minnow.ca	X	X	X
Email 3:	amcclymont@minnow.ca	X	X	X
Email 4:	Cait.Good@teck.com	X	X	X
Email 5:	kbatchelar@minnow.ca	X	X	X

PO number 748540

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	Selenium Speciation
FIL								N	F	F
PRESERV								HNO3	HNO3	N
LC_DCEF_WS_LAEMP_DRY_2021-06_NP_N	LC_DCEF	WS	No	22-Jun-21	9:00	G	1			X
LC_DCEF_WS_LAEMP_DRY_2021-06_NP_N_NAL	LC_DCEF	WS	No	22-Jun-21	9:00	G	2	X	X	
LC_DC2_WS_LAEMP_DRY_2021-06_NP_N	LC_DC2	WS	No	23-Jun-21	9:00	G	1			X
LC_DC2_WS_LAEMP_DRY_2021-06_NP_N_NAL	LC_DC2	WS	No	23-Jun-21	9:00	G	2	X	X	
LC_FRB_WS_LAEMP_DRY_2021-06_NP_N	LC_FRB	WS	No	24-Jun-21	13:30	G	1			X
LC_FRB_WS_LAEMP_DRY_2021-06_NP_N_NAL	LC_FRB	WS	No	24-Jun-21	13:30	G	2	X	X	
LC_FRUS_WS_LAEMP_DRY_2021-06_NP_N	LC_FRUS	WS	No	24-Jun-21	15:30	G	1			X
LC_FRUS_WS_LAEMP_DRY_2021-06_NP_N_NAL	LC_FRUS	WS	No	24-Jun-21	15:30	G	2	X	X	

ADDITIONAL COMMENTS/SPECIAL INSTRUCTIONS	RELINQUISHED BY/AFFILIATION	DATE/TIME	ACCEPTED BY/AFFILIATION	DATE/TIME
Samples for total selenium have been preserved in the field. Dissolved selenium have been filtered and preserved. Speciation samples have been filtered and frozen.				9/1/21 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	**Maddy Stokes**	**Mobile #**	**647-522-0672**
Sampler's Signature		**Date/Time**	**June 25, 2021**

STRAIGHT BILL OF LADING
NOT NEGOTIABLE

RW HOT SHOT SERVICE INC.
250-425-7447
24 Hour Hot Shot Service

No. 86456

Sparwood, BC	Vancouver, BC	Prince George, BC	Elkford, BC	Tumbler Ridge, BC
Terrace, BC	Calgary, AB	Edmonton, AB	Ft. McMurray, AB	Hinton, AB
Red Deer, AB	Montreal, QC	Spokane, WA	Shelby, MT	Gillette, WY

INVOICE TO

DATE June 30-21

BILL OF LADING # N/A N/A

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

PACKAGES	DESCRIPTION OF ARTICLES AND SPECIAL MARKS	WEIGHT (Subject to Correction)
2	Coolers - Water Samples	30 LBS
	PAPS# RWHV86456	

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

UNIT # 1160

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 Barbre

PICK UP TIME

DRIVER'S SIGNATURE - DELIVERY BY Branden W

FINISH TIME 0700

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, oin 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

SHIPPER SIGN

CONSIGNEE PRINT Chelsea Van Landeghem

CONSIGNEE SIGN

DATE 7-1-21

TIME

NUMBER OF PIECES RECEIVED ②

GST # 864540398RT0001

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROAD: Shipper

Cooler ID: Styrofoam Cooler #1 **COC** [✓ Y]/N **Temperature:** 0.3 **IR:** 31

Coolant Type: Ice [✓ Blue Ice] Ambient

Notes:

Sampling Locations:	WL		LC		FB					
Sample Types:	T/D	SP	T/D	SP	T/D	SP	T/D	SP	T/D	SP
Container Types:	40mL	125mL	60mL	60mL		60mL				

Opened By: CVL **Date:** 7/1/21

2107001

Effective 7/29/20

evision 004

SELENIUM SPECIATION

Brooks Report 2109232

BROOKSAPPLIEDLABS
18804 North Creek Parkway, Ste 100, Bothell, WA 98011 • USA • T: 206 632 6206 F: 206 632 6017 • info@brooksapplied.com

October 12, 2021

Teck Resources Limited - Vancouver
Mike Pope
421 Pine Avenue
Sparwood, B.C. CANADA V0B2G0
mike.pope@teck.com

Re: LCO

Dear Mike Pope,

On September 16, 2021, Brooks Applied Labs (BAL) received six (6) 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 Se and dissolved Se had also been preserved by the client prior to receipt. All samples were stored according to BAL SOPs.

Total Recoverable Se and Dissolved Se

Each aqueous sample fraction for 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.

Selenium Speciation

Each aqueous sample was analyzed for selenium 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 [*$SeSO_3$*], 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 selenium species may coelute. Alternate methods can be applied, upon client request, to increase the separation of DMSeO from potentially co-eluting selenium 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 where 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 relative percent difference (RPD) of the MS/MSD set was not calculated (**N/C**).

In cases when either the native sample concentration was non-detectable (reported as less than or equal to the MDL) and/or the corresponding DUP result was also non-detectable, the RPD between the two values 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 meet 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
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	**MS**	matrix spike
BAL	Brooks Applied Labs	**MSD**	matrix spike duplicate
BLK	method blank	**ND**	non-detect
BS	blank spike	**NR**	non-reportable
CAL	calibration standard	**N/C**	not calculated
CCB	continuing calibration blank	**PS**	post preparation spike
CCV	continuing calibration verification	**REC**	percent recovery
COC	chain of custody record	**RPD**	relative percent difference
D	dissolved fraction	**SCV**	secondary calibration verification
DUP	duplicate	**SOP**	standard operating procedure
IBL	instrument blank	**SRM**	reference material
ICV	initial calibration verification	**T**	total fraction
MDL	method detection limit	**TR**	total recoverable fraction
MRL	method reporting limit		

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 BAL-5000	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
	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
LC_FRB_WS_LAEMP_DRY_2021-09-12_N	2109232-01	WS	Sample	09/12/2021	09/16/2021
LC_FRB_WS_LAEMP_DRY_2021-09-12_N_NAL	2109232-02	WS	Sample	09/12/2021	09/16/2021
LC_FRB_WS_LAEMP_DRY_2021-09-12_N_NAL	2109232-03	WS	Sample	09/12/2021	09/16/2021
LC_FRUS_WS_LAEMP_DRY_2021-09-12_N	2109232-04	WS	Sample	09/12/2021	09/16/2021
LC_FRUS_WS_LAEMP_DRY_2021-09-12_N_NAL	2109232-05	WS	Sample	09/12/2021	09/16/2021
LC_FRUS_WS_LAEMP_DRY_2021-09-12_N_NAL	2109232-06	WS	Sample	09/12/2021	09/16/2021
LC_GRCK_WS_LAEMP_DRY_2021-09-13_N	2109232-07	WS	Sample	09/13/2021	09/16/2021
LC_GRCK_WS_LAEMP_DRY_2021-09-13_N_NAL	2109232-08	WS	Sample	09/13/2021	09/16/2021
LC_GRCK_WS_LAEMP_DRY_2021-09-13_N_NAL	2109232-09	WS	Sample	09/13/2021	09/16/2021

Batch Summary

Analyte	Lab Matrix	Method	Prepared	Analyzed	Batch	Sequence
DMSeO	Water	SOP BAL-4201	09/21/2021	09/22/2021	B212646	S211101
MeSe(IV)	Water	SOP BAL-4201	09/21/2021	09/22/2021	B212646	S211101
MeSe(VI)	Water	SOP BAL-4201	09/21/2021	09/22/2021	B212646	S211101
Se	Water	EPA 1638 Mod	09/21/2021	09/22/2021	B212615	S211084
Se(IV)	Water	SOP BAL-4201	09/21/2021	09/22/2021	B212646	S211101
Se(VI)	Water	SOP BAL-4201	09/21/2021	09/22/2021	B212646	S211101
SeCN	Water	SOP BAL-4201	09/21/2021	09/22/2021	B212646	S211101
SeMet	Water	SOP BAL-4201	09/21/2021	09/22/2021	B212646	S211101
SeSO3	Water	SOP BAL-4201	09/21/2021	09/22/2021	B212646	S211101
Unk Se Sp	Water	SOP BAL-4201	09/21/2021	09/22/2021	B212646	S211101

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_FRB_WS_LAEMP_DRY_2021-09-12_N										
2109232-01	DMSeO	WS	D	0.013	J	0.010	0.025	µg/L	B212646	S211101
2109232-01	MeSe(IV)	WS	D	0.016	J	0.010	0.025	µg/L	B212646	S211101
2109232-01	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212646	S211101
2109232-01	Se(IV)	WS	D	0.329		0.010	0.075	µg/L	B212646	S211101
2109232-01	Se(VI)	WS	D	54.4		0.010	0.055	µg/L	B212646	S211101
2109232-01	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212646	S211101
2109232-01	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212646	S211101
2109232-01	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212646	S211101
2109232-01	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212646	S211101
LC_FRB_WS_LAEMP_DRY_2021-09-12_N_NAL										
2109232-02	Se	WS	TR	51.0		0.165	0.528	µg/L	B212615	S211084
LC_FRB_WS_LAEMP_DRY_2021-09-12_N_NAL										
2109232-03	Se	WS	D	52.4		0.165	0.528	µg/L	B212615	S211084
LC_FRUS_WS_LAEMP_DRY_2021-09-12_N										
2109232-04	DMSeO	WS	D	0.014	J	0.010	0.025	µg/L	B212646	S211101
2109232-04	MeSe(IV)	WS	D	0.014	J	0.010	0.025	µg/L	B212646	S211101
2109232-04	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212646	S211101
2109232-04	Se(IV)	WS	D	0.303		0.010	0.075	µg/L	B212646	S211101
2109232-04	Se(VI)	WS	D	54.1		0.010	0.055	µg/L	B212646	S211101
2109232-04	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212646	S211101
2109232-04	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212646	S211101
2109232-04	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212646	S211101
2109232-04	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212646	S211101
LC_FRUS_WS_LAEMP_DRY_2021-09-12_N_NAL										
2109232-05	Se	WS	TR	56.0		0.165	0.528	µg/L	B212615	S211084
LC_FRUS_WS_LAEMP_DRY_2021-09-12_N_NAL										
2109232-06	Se	WS	D	52.8		0.165	0.528	µg/L	B212615	S211084

Sample Results

Sample	Analyte	Report Matrix	Basis	Result	Qualifier	MDL	MRL	Unit	Batch	Sequence
LC_GRCK_WS_LAEMP_DRY_2021-09-13_N										
2109232-07	DMSeO	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212646	S211101
2109232-07	MeSe(IV)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212646	S211101
2109232-07	MeSe(VI)	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212646	S211101
2109232-07	Se(IV)	WS	D	0.039	J	0.010	0.075	µg/L	B212646	S211101
2109232-07	Se(VI)	WS	D	1.74		0.010	0.055	µg/L	B212646	S211101
2109232-07	SeCN	WS	D	≤ 0.010	U	0.010	0.050	µg/L	B212646	S211101
2109232-07	SeMet	WS	D	≤ 0.010	U	0.010	0.025	µg/L	B212646	S211101
2109232-07	SeSO3	WS	D	≤ 0.010	U	0.010	0.055	µg/L	B212646	S211101
2109232-07	Unk Se Sp	WS	D	≤ 0.010	U	0.010	0.075	µg/L	B212646	S211101
LC_GRCK_WS_LAEMP_DRY_2021-09-13_N_NAL										
2109232-08	Se	WS	TR	2.07		0.165	0.528	µg/L	B212615	S211084
LC_GRCK_WS_LAEMP_DRY_2021-09-13_N_NAL										
2109232-09	Se	WS	D	2.08		0.165	0.528	µg/L	B212615	S211084

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-DUP1	**Duplicate, (2109232-02)**								
	Se	50.96		49.23	µg/L			3%	20
B212615-MS1	**Matrix Spike, (2109232-02)**								
	Se	50.96	220.0	270.0	µg/L	100%	75-125		
B212615-MSD1	**Matrix Spike Duplicate, (2109232-02)**								
	Se	50.96	220.0	267.8	µg/L	99%	75-125	0.8%	20

Accuracy & Precision Summary

Batch: B212646
Lab Matrix: Water
Method: SOP BAL-4201

Sample	Analyte	Native	Spike	Result	Units	REC & Limits		RPD & Limits	
B212646-BS1	**Blank Spike, (2124033)**								
	MeSe(IV)		5.095	5.618	µg/L	110%	75-125		
	Se(IV)		5.000	5.126	µg/L	103%	75-125		
	Se(VI)		5.000	4.881	µg/L	98%	75-125		
	SeCN		5.015	5.110	µg/L	102%	75-125		
	SeMet		4.932	5.110	µg/L	104%	75-125		
B212646-DUP5	**Duplicate, (2109232-07)**								
	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)	0.039		0.033	µg/L			16%	25
	Se(VI)	1.741		1.688	µg/L			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
B212646-MS5	**Matrix Spike, (2109232-07)**								
	Se(IV)	0.039	4.900	5.627	µg/L	114%	75-125		
	Se(VI)	1.741	5.100	6.953	µg/L	102%	75-125		
	SeCN	ND	1.962	2.161	µg/L	110%	75-125		
	SeMet	ND	1.977	2.127	µg/L	108%	75-125		
B212646-MSD5	**Matrix Spike Duplicate, (2109232-07)**								
	Se(IV)	0.039	4.900	5.563	µg/L	113%	75-125	1%	25
	Se(VI)	1.741	5.100	7.041	µg/L	104%	75-125	1%	25
	SeCN	ND	1.962	2.175	µg/L	111%	75-125	0.6%	25
	SeMet	ND	1.977	2.107	µg/L	107%	75-125	0.9%	25

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

Method Blanks & Reporting Limits

Batch: B212646
Matrix: Water
Method: SOP BAL-4201
Analyte: DMSeO

Sample	Result	Units
B212646-BLK1	0.00	µg/L
B212646-BLK2	0.00	µg/L
B212646-BLK3	0.00	µg/L
B212646-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(IV)

Sample	Result	Units
B212646-BLK1	0.00	µg/L
B212646-BLK2	0.00	µg/L
B212646-BLK3	0.00	µg/L
B212646-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.005

MDL: 0.002
MRL: 0.005

Analyte: MeSe(VI)

Sample	Result	Units
B212646-BLK1	0.00	µg/L
B212646-BLK2	0.00	µg/L
B212646-BLK3	0.00	µg/L
B212646-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
B212646-BLK1	0.008	µg/L
B212646-BLK2	0.003	µg/L
B212646-BLK3	0.002	µg/L
B212646-BLK4	0.003	µg/L

Average: 0.004
Limit: 0.015

MDL: 0.002
MRL: 0.015

Analyte: Se(VI)

Sample	Result	Units
B212646-BLK1	0.002	µg/L
B212646-BLK2	0.001	µg/L
B212646-BLK3	0.0006	µg/L
B212646-BLK4	0.00	µg/L

Average: 0.001
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: SeCN

Sample	Result	Units
B212646-BLK1	0.00	µg/L
B212646-BLK2	0.00	µg/L
B212646-BLK3	0.00	µg/L
B212646-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.010

MDL: 0.002
MRL: 0.010

Analyte: SeMet

Sample	Result	Units
B212646-BLK1	0.00	µg/L
B212646-BLK2	0.00	µg/L
B212646-BLK3	0.00	µg/L
B212646-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
B212646-BLK1	0.00	µg/L
B212646-BLK2	0.00	µg/L
B212646-BLK3	0.00	µg/L
B212646-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.011

MDL: 0.002
MRL: 0.011

Analyte: Unk Se Sp

Sample	Result	Units
B212646-BLK1	0.00	µg/L
B212646-BLK2	0.00	µg/L
B212646-BLK3	0.00	µg/L
B212646-BLK4	0.00	µg/L

Average: 0.000
Limit: 0.015

MDL: 0.002
MRL: 0.015

Sample Containers

Lab ID: 2109232-01
Sample: LC_FRB_WS_LAEMP_DRY_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 #2 - 2109232
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #2 - 2109232
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #2 - 2109232

Lab ID: 2109232-02
Sample: LC_FRB_WS_LAEMP_DRY_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 #2 - 2109232

Lab ID: 2109232-03
Sample: LC_FRB_WS_LAEMP_DRY_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 #2 - 2109232

Lab ID: 2109232-04
Sample: LC_FRUS_WS_LAEMP_DRY_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 #2 - 2109232
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #2 - 2109232
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #2 - 2109232

Sample Containers

Lab ID: 2109232-05
Sample: LC_FRUS_WS_LAEMP_DRY_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 #2 - 2109232

Lab ID: 2109232-06
Sample: LC_FRUS_WS_LAEMP_DRY_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 #2 - 2109232

Lab ID: 2109232-07
Sample: LC_GRCK_WS_LAEMP_DRY_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 #2 - 2109232
B	XTRA_VOL	15 mL	na	none	na	na	Styrofoam Cooler #2 - 2109232
C	XTRA_VOL	60 mL	na	none	na	na	Styrofoam Cooler #2 - 2109232

Lab ID: 2109232-08
Sample: LC_GRCK_WS_LAEMP_DRY_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 #2 - 2109232

Sample Containers

Lab ID: 2109232-09
Sample: LC_GRCK_WS_LAEMP_DRY_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 #2 - 2109232

Shipping Containers

Styrofoam Cooler #2 - 2109232

Received: September 16, 2021 6:41
Tracking No: PAPS#RWHV87364 via Courier
Coolant Type: Ice
Temperature: 1.1 °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

Confidential Teck

COC ID:	**September Dry Creek LAEMP**	**TURNAROUND TIME:**	Regular

PROJECT/CLIENT INFO				**LABORATORY**				**OTHER INFO**				
Facility Name / Job#	LCO			Lab Name	Brooks Applied Labs			Report Format / Distribution		Excel	PDF	EDD
Project Manager	Mike Pope			Lab Contact	Ben Wozniak			Email 1:	[illegible]	X	X	X
Email	mike.pope@teck.com			Email	ben@brooksapplied.com			Email 2:	teckcoal@equisonline.com			X
Address	421 Pine Avenue			Address	18804 North Creek Parkway			Email 3:	jessica ritz@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** — 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)
LC_FRB_WS_LAEMP_DRY_2021-09-12_N	LC_FRB	WS	No	09/12/2021	0915	G	1			1
LC_FRB_WS_LAEMP_DRY_2021-09-12_N_NAL	LC_FRB	WS	No	09/12/2021	0915	G	2	1	1	
LC_FRUS_WS_LAEMP_DRY_2021-09-12_N	LC_FRUS	WS	No	09/12/2021	1330	G	1			1
LC_FRUS_WS_LAEMP_DRY_2021-09-12_N_NAL	LC_FRUS	WS	No	09/12/2021	1330	G	2	1	1	
LC_GRCK_WS_LAEMP_DRY_2021-09-13_N	LC_GRCK	WS	No	09/13/2021	1030	G	1			1
LC_GRCK_WS_LAEMP_DRY_2021-09-13_N_NAL	LC_GRCK	WS	No	09/13/2021	1030	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		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		**Date/Time**	**September 14, 2021**

RW HOT SHOT SERVICE INC.
250-425-7447
24 Hour Hot Shot Service

No. 87364

STRAIGHT BILL OF LADING
NOT NEGOTIABLE

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

SHIPPER (FROM) Teck Coal Ltd

STREET 18804 N. Creek Parkway

STREET West Line Creek Treatment

POSTAL CODE 98011

POSTAL CODE

CITY/PROVINCE Bothell WA

CITY/PROVINCE Sparwood, BC

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 col.

FEE

WAITING

XPU

CHARGES

FSC

US

SUB TOTAL

GST

TOTAL $

IF AT OWNER'S RISK, WRITE ORD HERE

DATE

TIME 9/16/21

NUMBER OF PIECES RECEIVED 5

7:4

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 Jason Zmurik

CONSIGNEE PRINT Zach (BAL)

CONSIGNEE SIGN

SHIPPER SIGN

GST # 864540398RT0001

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROD: Shipper

AMIGOS PRINTING

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		
Sample Types:	T/D	SP	T/D	SP	T/D
Container Types:	40mL		40mL	60mL	

Opened By: SP **Date:** 9/16/21

2109232

COPY

RW HOT SHOT SERVICE INC.
250-425-7447
24 Hour Hot Shot Service

STRAIGHT BILL OF LADING
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

SHIPPER (FROM) Teck Coal Ltd

STREET 18804 N. Creek Parkway

POSTAL CODE 98011

STREET West Line Creek Treatment

POSTAL CODE

CITY/PROVINCE Bothell WA

CITY/PROVINCE Sparwood, BC

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 col. cd.

FEE

WAITING

XPU

CHARGES

FSC

US

SUB TOTAL

GST

TOTAL $

IF AT OWNER'S RISK, WRITE OR HERE

DATE

TIME 9/16/21

NUMBER OF PIECES RECEIVED 5

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 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 Thwrth

CONSIGNEE PRINT Sean Zisch (BAL)

CONSIGNEE SIGN

SHIPPER SIGN

GST # 864540398RT0001

WHITE: Office YELLOW: Carrier PINK: Consignee GOLDENROD: Shipper

AMSCOS 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

BENTHIC COMMUNITY DENSITY

Cordillera 21-35 #3 Raw Data

Project: Dry Creek Spoil (21-35)#3
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-01_2021-11-30	LC_DCDS_BIC-02_2021-11-30	LC_DCDS_BIC-03_2021-11-30	LC_DC1_BIC-01_2021-12-01	LC_DC1_BIC-02_2021-12-01	LC_DC1_BIC-03_2021-12-01
Sample Collection Date:	30-Nov-21	30-Nov-21	30-Nov-21	01-Dec-21	01-Dec-21	01-Dec-21
CC#:	CC222815	CC222816	CC222817	CC222818	CC222819	CC222820
Phylum: Arthropoda	0	0	0	0	0	0
| Order: Collembola	0	0	0	40	0	0
Subphylum: Hexapoda	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0
| Family: Baetidae	120	40	60	80	80	100
Baetis	1200	680	300	1300	1500	1640
| Family: Ephemerellidae	240	20	40	440	620	940
Drunella	0	0	0	0	60	0
Drunella doddsii	20	0	0	100	180	260
| Family: Heptageniidae	100	20	20	680	1040	1140
Epeorus	0	0	0	20	0	0
| Order: Plecoptera	40	0	0	100	20	280
| Family: Capniidae	40	40	40	20	0	20
| Family: Chloroperlidae	60	20	140	0	60	60
Sweltsa	220	80	80	140	160	280
| Family: Leuctridae	0	0	0	0	20	0
Paraleuctra	0	0	0	20	0	20
| Family: Nemouridae	260	80	0	0	320	580
Nemoura	0	0	0	20	0	0
Visoka cataractae	0	0	0	0	0	20
Zapada	1560	3060	3100	1940	4740	800
Zapada oregonensis group	60	80	320	640	500	520
Zapada cinctipes	60	40	380	2060	2840	3520
Zapada columbiana	180	160	600	820	440	500
| Family: Peltoperlidae	20	0	0	0	0	0
| Family: Perlodidae	100	240	200	80	0	80
Kogotus	20	80	20	100	440	200
Megarcys	20	20	0	80	20	140
| Family: Taeniopterygidae	100	80	200	680	200	940
Doddsia occidentalis	0	20	0	40	0	300

Site:	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-01_2021-11-30	LC_DCDS_BIC-02_2021-11-30	LC_DCDS_BIC-03_2021-11-30	LC_DC1_BIC-01_2021-12-01	LC_DC1_BIC-02_2021-12-01	LC_DC1_BIC-03_2021-12-01
Sample Collection Date:	30-Nov-21	30-Nov-21	30-Nov-21	01-Dec-21	01-Dec-21	01-Dec-21
CC#:	CC222815	CC222816	CC222817	CC222818	CC222819	CC222820
| Order: Trichoptera	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	20	20	40	140
Anagapetus	20	0	0	80	20	160
| Family: Hydropsychidae	60	0	140	100	40	40
Parapsyche	140	260	360	480	360	140
Parapsyche elsis	0	0	0	40	40	40
| Family: Limnephilidae	0	0	20	20	0	20
Chyranda centralis	0	0	0	0	0	60
Clostoeca disjuncta	0	0	20	0	20	0
Ecclisomyia	160	0	20	40	40	80
| Family: Rhyacophilidae	0	0	0	0	0	0
Rhyacophila	0	20	40	40	100	0
Rhyacophila betteni group	0	0	20	40	0	20
Rhyacophila brunnea/vemna group	20	0	20	60	40	20
Rhyacophila vofixa group	20	0	20	0	0	0
Rhyacophila narvae	20	20	20	0	40	40
| Family: Thremmatidae	0	0	0	0	0	0
Oligophlebodes	460	40	240	300	1640	1520
| Order: Diptera	0	0	0	0	0	0
| Family: Chironomidae	20	40	0	0	40	40
| Subfamily: Chironominae	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0
Micropsectra	60	120	100	60	560	340
| Subfamily: Diamesinae	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0
Diamesa	20	0	0	40	80	280
Pagastia	120	100	120	260	340	200
Pseudodiamesa	260	40	60	20	140	200
| Subfamily: Orthocladiinae	0	0	0	0	0	0
Brillia	0	80	20	100	60	0
Cricotopus (Nostococladius)	0	0	0	140	0	20
Eukiefferiella	80	60	160	260	420	620
Limnophyes	0	0	0	20	20	0
Orthocladius complex	120	160	180	20	120	20
Rheocricotopus	20	0	0	20	0	100
Tvetenia	300	1260	1060	3000	5460	6300
| Subfamily: Tanypodinae	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0
Thienemannimyia group	0	0	0	20	0	0
| Family: Dixidae	0	0	0	20	0	0
| Family: Empididae	0	0	0	0	0	0
Neoplasta	20	0	20	0	40	20
Oreogeton	0	0	0	0	20	0
| Family: Limoniidae	0	0	0	0	0	0
Eloeophila	0	0	0	0	20	0

Site:	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-01_2021-11-30	LC_DCDS_BIC-02_2021-11-30	LC_DCDS_BIC-03_2021-11-30	LC_DC1_BIC-01_2021-12-01	LC_DC1_BIC-02_2021-12-01	LC_DC1_BIC-03_2021-12-01
Sample Collection Date:	30-Nov-21	30-Nov-21	30-Nov-21	01-Dec-21	01-Dec-21	01-Dec-21
CC#:	CC222815	CC222816	CC222817	CC222818	CC222819	CC222820
| Family: Psychodidae	0	0	0	0	0	0
Pericoma/Telmatoscopus	140	20	140	280	1640	1020
| Family: Simuliidae	0	0	0	0	0	0
Prosimulium/Helodon	0	20	100	20	20	80
Simulium	20	0	0	0	0	20
| Family: Tipulidae	0	0	0	0	0	0
Dicranota	40	0	40	80	100	40
Subphylum: Chelicerata	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0
Lebertia	0	20	0	0	0	20
| Family: Sperchontidae	0	0	0	0	0	0
Sperchon	0	0	0	0	20	0
| Order: Sarcoptiformes	0	0	0	0	0	0
| Family: Hydrozetidae	20	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0
| Family: Lumbriculidae	20	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	20
Totals:	**6580**	**7020**	**8440**	**14980**	**24720**	**23960**

Taxa present but not included:

Phylum: Arthropoda	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0
| Class: Ostracoda	20	20	20	0	20	20
Phylum: Nemata	0	0	20	0	20	0
Phylum: Platyhelminthes	0	0	0	0	0	0
| Class: Turbellaria	20	20	20	20	20	20
Totals:	**40**	**40**	**60**	**20**	**60**	**40**

ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

BENTHIC COMMUNITY DENSITY

Cordillera June 2021 Raw Data

Project: Dry Creek Spoil Monitoring(21-79)
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC3_BIC-01_2021-06-21	LC_DC3_BIC-02_2021-06-21	LC_DC3_BIC-03_2021-06-21	LC_DCEF_BIC-01_2021-06-22	LC_DCEF_BIC-02_2021-06-22	LC_DCEF_BIC-03_2021-06-22	LC_DCDS_BIC-01_2021-06-22
Sample Collection Date:	21-Jun-21	21-Jun-21	21-Jun-21	22-Jun-21	22-Jun-21	22-Jun-21	22-Jun-21
CC#:	CC220139	CC220140	CC220141	CC220142	CC220143	CC220144	CC220145
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	14	0	8	0	33	0	0
| Family: Sminthuridae	0	0	0	0	0	0	20
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	0	20	17	0	80
| Family: Baetidae	0	0	0	40	133	33	20
Baetis	0	0	0	220	300	200	2080
Baetis rhodani group	0	0	0	600	650	700	440
Baetis bicaudatus	0	0	0	560	650	983	1480
| Family: Ephemerellidae	0	0	0	0	0	0	0
Drunella	0	0	0	40	17	33	20
Drunella coloradensis	0	0	0	400	167	183	500
Drunella doddsii	0	0	0	0	0	0	20
Drunella spinifera	0	0	0	0	0	0	0
| Family: Heptageniidae	14	0	0	860	867	967	520
Cinygmula	0	0	0	140	217	317	420
Epeorus	0	0	0	20	17	0	0
Rhithrogena	0	0	0	20	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0
| Family: Capniidae	0	0	0	0	0	0	0
| Family: Chloroperlidae	0	40	17	60	100	0	0
Haploperla	0	0	0	0	0	0	0
Plumiperla	0	30	8	120	0	0	0
Suwallia	0	0	0	80	0	0	0
Sweltsa	29	30	0	0	133	67	40
| Family: Leuctridae	29	0	8	0	0	0	0
Paraleuctra	29	10	17	0	0	0	0
| Family: Nemouridae	0	20	0	20	0	0	0
Nemoura	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	40	0	0	0
Zapada	0	0	25	20	17	0	0
Zapada oregonensis group	14	0	0	0	0	0	40
Zapada cinctipes	0	0	0	0	17	0	0
Zapada columbiana	286	340	75	60	67	33	160
| Family: Peltoperlidae	14	0	0	0	0	17	0
Yoraperla	0	0	0	0	0	17	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC3_BIC-01_2021-06-21	LC_DC3_BIC-02_2021-06-21	LC_DC3_BIC-03_2021-06-21	LC_DCEF_BIC-01_2021-06-22	LC_DCEF_BIC-02_2021-06-22	LC_DCEF_BIC-03_2021-06-22	LC_DCDS_BIC-01_2021-06-22
Sample Collection Date:	21-Jun-21	21-Jun-21	21-Jun-21	22-Jun-21	22-Jun-21	22-Jun-21	22-Jun-21
CC#:	CC220139	CC220140	CC220141	CC220142	CC220143	CC220144	CC220145
| Family: Perlidae	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	0	20	0	280	100	367	80
Isoperla	0	0	0	0	0	0	0
Kogotus	0	0	0	0	0	0	0
Megarcys	14	10	8	40	33	50	0
| Order: Trichoptera	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0	0	0	20
Parapsyche	0	0	0	0	0	0	100
Parapsyche elsis	0	0	0	0	0	0	0
| Family: Hydroptilidae	0	0	0	20	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| Family: Limnephilidae	14	0	0	20	0	0	0
Chyranda centralis	0	0	0	0	0	0	20
Clostoeca disjuncta	0	0	0	0	0	0	0
Ecclisomyia	0	0	0	0	0	0	40
Onocosmoecus	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	43	90	50	100	83	0	20
Rhyacophila angelita group	0	0	0	0	0	0	0
Rhyacophila betteni group	0	0	0	0	0	0	60
Rhyacophila brunnea/vemna group	14	0	0	20	33	0	0
Rhyacophila hyalinata group	43	20	0	40	0	0	0
Rhyacophila vetina complex	0	0	0	0	17	33	0
Rhyacophila vofixa group	0	0	0	20	0	0	0
Rhyacophila alberta group	71	90	50	100	133	167	260
Rhyacophila narvae	0	0	0	0	0	0	0
Rhyacophila verrula group	57	40	33	120	67	33	120
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	20	0	0	20
| Family: Uenoidae	0	0	0	0	0	0	0
Neothremma	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	8	0	0	0	0
Mallochohelea	0	0	8	0	0	0	0
| Family: Chironomidae	29	10	33	140	33	100	40
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0
Micropsectra	0	0	0	0	0	0	40
Stempellinella	0	0	0	0	0	0	0
Tanytarsus	800	720	258	700	233	233	280
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	457	400	333	520	583	350	140
Pagastia	143	110	50	20	17	0	0
Pseudodiamesa	14	10	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC3_BIC-01_2021-06-21	LC_DC3_BIC-02_2021-06-21	LC_DC3_BIC-03_2021-06-21	LC_DCEF_BIC-01_2021-06-22	LC_DCEF_BIC-02_2021-06-22	LC_DCEF_BIC-03_2021-06-22	LC_DCDS_BIC-01_2021-06-22
Sample Collection Date:	21-Jun-21	21-Jun-21	21-Jun-21	22-Jun-21	22-Jun-21	22-Jun-21	22-Jun-21
CC#:	CC220139	CC220140	CC220141	CC220142	CC220143	CC220144	CC220145
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	20	0	20	33	33	20
Cardiocladius	0	0	0	0	0	0	0
Corynoneura	0	0	0	40	0	0	0
Cricotopus	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Eukiefferiella	971	440	517	80	33	17	0
Hydrosmittia	0	0	0	0	0	0	0
Limnophyes	43	120	17	0	0	0	0
Orthocladius complex	971	940	850	480	283	267	120
Parametriocnemus	14	0	0	20	0	0	0
Rheocricotopus	14	0	17	180	100	133	140
Tvetenia	29	30	8	80	67	33	140
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
Ablabesmyia	0	0	0	0	0	0	0
Zavrelimyia	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Pentaneura	0	0	0	0	0	0	40
| Family: Empididae	0	0	0	0	0	0	0
Clinocera	0	10	0	20	0	0	0
Neoplasta	0	0	0	0	0	0	20
Oreogeton	0	0	8	0	0	17	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	0	0	0	0	0	0	0
| Family: Simuliidae	0	60	33	60	33	0	0
Prosimulium	0	0	0	0	0	0	40
Prosimulium/Helodon	200	250	167	360	233	100	0
Simulium	14	10	58	0	0	0	20
Twinnia	14	20	0	0	17	33	0
| Family: Thaumaleidae	0	0	8	0	0	0	0
| Family: Tipulidae	0	0	17	0	0	17	0
Dicranota	14	0	0	0	17	33	0
Molophilus	0	0	0	0	0	0	0
Rhabdomastix	0	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0
| Order: Thysanoptera	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	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Albertathyas	14	50	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Atractides	43	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	14	40	0	40	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	29	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC3_BIC-01_2021-06-21	LC_DC3_BIC-02_2021-06-21	LC_DC3_BIC-03_2021-06-21	LC_DCEF_BIC-01_2021-06-22	LC_DCEF_BIC-02_2021-06-22	LC_DCEF_BIC-03_2021-06-22	LC_DCDS_BIC-01_2021-06-22
Sample Collection Date:	21-Jun-21	21-Jun-21	21-Jun-21	22-Jun-21	22-Jun-21	22-Jun-21	22-Jun-21
CC#:	CC220139	CC220140	CC220141	CC220142	CC220143	CC220144	CC220145
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0
| Family: Hydrozetidae	29	0	0	20	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0
| Order: Hypsogastropoda	0	0	0	0	0	0	0
| Family: Hydrobiidae	0	0	0	0	0	0	20
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	0	0	0	0	0	0	0
Rhynchelmis	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	14	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair cha	0	10	0	0	0	0	0
Totals:	**4555**	**3990**	**2689**	**6880**	**5550**	**5566**	**7640**

Taxa present but not included:

Phylum: Arthropoda	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: Diptera	0	0	0	0	0	0	0
| Family: Cecidomyiidae	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0
| Class: Ostracoda	14	10	8	20	17	17	20
Phylum: Nemata	0	0	0	0	0	0	0
Phylum: Platyhelminthes	0	0	0	0	0	0	0
| Class: Turbellaria	14	10	0	20	0	17	20
Totals:	**28**	**20**	**8**	**40**	**17**	**34**	**40**

ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Project: Dry Creek Spoil Monitoring(21-79]
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-02_2021-06-22	LC_DCDS_BIC-03_2021-06-22	LC_DC4_BIC-01_2021-06-23	LC_DC4_BIC-02_2021-06-23	LC_DC4_BIC-03_2021-06-23	LC_DC2_BIC-01_2021-06-23	LC_DC2_BIC-02_2021-06-23
Sample Collection Date:	22-Jun-21	22-Jun-21	23-Jun-21	23-Jun-21	23-Jun-21	23-Jun-21	23-Jun-21
CC#:	CC220146	CC220147	CC220148	CC220149	CC220150	CC220151	CC220152
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	0	0	0	0
| Family: Sminthuridae	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	80	108	20	0	12	0	11
| Family: Baetidae	40	8	0	0	38	0	0
Baetis	1740	323	0	100	0	50	111
Baetis rhodani group	440	115	180	133	75	125	78
Baetis bicaudatus	1500	77	380	83	112	100	133
| Family: Ephemerellidae	0	0	0	0	0	0	0
Drunella	40	0	40	0	12	8	11
Drunella coloradensis	620	238	380	117	50	67	44
Drunella doddsii	100	31	160	0	12	8	0
Drunella spinifera	0	0	0	0	0	0	0
| Family: Heptageniidae	420	215	920	817	488	350	256
Cinygmula	400	300	420	517	325	67	44
Epeorus	40	23	0	0	0	0	0
Rhithrogena	0	8	0	0	0	0	0
| Order: Plecoptera	0	0	20	33	0	8	0
| Family: Capniidae	0	0	0	0	0	0	0
| Family: Chloroperlidae	20	15	80	33	100	0	11
Haploperla	0	0	20	0	0	0	0
Plumiperla	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	20	54	1220	517	425	33	33
| Family: Leuctridae	0	0	0	0	0	0	0
Paraleuctra	0	0	20	0	12	0	0
| Family: Nemouridae	0	8	20	0	0	0	0
Nemoura	0	0	20	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0
Zapada	40	0	240	33	25	17	33
Zapada oregonensis group	0	15	560	150	112	92	22
Zapada cinctipes	0	0	0	17	12	0	0
Zapada columbiana	500	69	1340	850	500	192	356
| Family: Peltoperlidae	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-02_2021-06-22	LC_DCDS_BIC-03_2021-06-22	LC_DC4_BIC-01_2021-06-23	LC_DC4_BIC-02_2021-06-23	LC_DC4_BIC-03_2021-06-23	LC_DC2_BIC-01_2021-06-23	LC_DC2_BIC-02_2021-06-23
Sample Collection Date:	22-Jun-21	22-Jun-21	23-Jun-21	23-Jun-21	23-Jun-21	23-Jun-21	23-Jun-21
CC#:	CC220146	CC220147	CC220148	CC220149	CC220150	CC220151	CC220152
| Family: Perlidae	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	160	23	780	450	175	275	189
Isoperla	0	0	0	17	0	0	0
Kogotus	0	0	80	33	0	0	11
Megarcys	0	0	220	50	62	8	0
| Order: Trichoptera	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0
| Family: Hydropsychidae	20	8	20	0	0	0	0
Parapsyche	40	23	400	100	12	8	22
Parapsyche elsis	0	38	240	67	38	8	0
| Family: Hydroptilidae	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	12	0	0
| Family: Limnephilidae	0	8	0	17	12	8	11
Chyranda centralis	0	0	0	0	0	0	0
Clostoeca disjuncta	0	0	0	17	12	0	0
Ecclisomyia	0	0	0	0	12	0	0
Onocosmoecus	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	0	8	120	50	25	50	67
Rhyacophila angelita group	0	0	20	0	0	8	11
Rhyacophila betteni group	20	0	0	0	0	8	0
Rhyacophila brunnea/vemna group	0	0	60	17	0	0	0
Rhyacophila hyalinata group	0	0	20	0	12	8	11
Rhyacophila vetina complex	0	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	8	0
Rhyacophila alberta group	120	23	120	67	25	33	167
Rhyacophila narvae	0	0	0	33	50	0	0
Rhyacophila verrula group	100	0	380	83	12	175	611
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	20	8	340	117	38	8	0
| Family: Uenoidae	0	0	0	0	0	0	0
Neothremma	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0
Mallochohelea	0	0	0	0	0	8	0
| Family: Chironomidae	40	46	60	17	0	33	22
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0
Micropsectra	60	8	60	0	0	17	33
Stempellinella	0	0	0	0	0	0	0
Tanytarsus	240	169	2260	750	625	350	411
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	120	200	0	0	0	125	122
Pagastia	0	23	40	50	0	0	33
Pseudodiamesa	0	169	0	0	12	17	22

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-02_2021-06-22	LC_DCDS_BIC-03_2021-06-22	LC_DC4_BIC-01_2021-06-23	LC_DC4_BIC-02_2021-06-23	LC_DC4_BIC-03_2021-06-23	LC_DC2_BIC-01_2021-06-23	LC_DC2_BIC-02_2021-06-23
Sample Collection Date:	22-Jun-21	22-Jun-21	23-Jun-21	23-Jun-21	23-Jun-21	23-Jun-21	23-Jun-21
CC#:	CC220146	CC220147	CC220148	CC220149	CC220150	CC220151	CC220152
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	20	8	0	0	0	8	22
Cardiocladius	20	0	0	0	0	0	0
Corynoneura	20	0	0	0	0	0	0
Cricotopus	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	33
Eukiefferiella	0	0	480	0	112	8	0
Hydrosmittia	0	0	0	0	0	0	0
Limnophyes	0	0	0	0	0	0	0
Orthocladius complex	20	31	200	33	0	17	111
Parametriocnemus	0	8	0	33	0	8	11
Rheocricotopus	80	38	320	150	125	150	122
Tvetenia	120	38	360	283	275	42	111
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
Ablabesmyia	0	0	0	0	0	0	0
Zavrelimyia	0	0	40	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Pentaneura	0	0	0	0	0	0	0
| Family: Empididae	0	0	0	0	0	8	0
Clinocera	0	0	0	17	0	8	0
Neoplasta	60	23	40	0	12	42	56
Oreogeton	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	60	0	38	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	0	8	20	17	0	0	0
| Family: Simuliidae	0	8	0	0	0	0	0
Prosimulium	80	0	40	0	0	17	0
Prosimulium/Helodon	100	0	0	0	0	33	67
Simulium	0	0	0	0	0	0	0
Twinnia	0	0	0	0	0	0	0
| Family: Thaumaleidae	0	0	0	0	0	0	0
| Family: Tipulidae	0	0	0	0	0	8	0
Dicranota	0	0	0	0	0	8	22
Molophilus	0	0	0	0	0	0	11
Rhabdomastix	0	0	0	0	0	0	0
Tipula	0	0	0	0	12	0	0
| Order: Hemiptera	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	11
| Order: Lepidoptera	0	0	0	0	0	0	0
| Order: Thysanoptera	0	0	0	0	12	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	12	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Albertathyas	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	20	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	0	0	17	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-02_2021-06-22	LC_DCDS_BIC-03_2021-06-22	LC_DC4_BIC-01_2021-06-23	LC_DC4_BIC-02_2021-06-23	LC_DC4_BIC-03_2021-06-23	LC_DC2_BIC-01_2021-06-23	LC_DC2_BIC-02_2021-06-23
Sample Collection Date:	22-Jun-21	22-Jun-21	23-Jun-21	23-Jun-21	23-Jun-21	23-Jun-21	23-Jun-21
CC#:	CC220146	CC220147	CC220148	CC220149	CC220150	CC220151	CC220152
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	20	0	0	8	0
| Family: Hydrozetidae	0	0	0	17	12	8	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	11
| Order: Hypsogastropoda	0	0	0	0	0	0	0
| Family: Hydrobiidae	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	0	0	0	0	0	0	0
Rhynchelmis	0	0	0	0	12	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	89
Enchytraeus	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0
| Subfamily: Tubificinae without hair cha	0	0	0	0	0	0	0
Totals:	**7480**	**2523**	**12840**	**5902**	**4066**	**2645**	**3563**

Taxa present but not included:

Phylum: Arthropoda	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: Diptera	0	0	0	0	0	0	0
| Family: Cecidomyiidae	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0
| Class: Ostracoda	20	8	20	17	12	8	11
Phylum: Nemata	0	0	0	17	0	0	0
Phylum: Platyhelminthes	0	0	0	0	0	0	0
| Class: Turbellaria	20	8	20	17	12	8	11
Totals:	**40**	**16**	**40**	**51**	**24**	**16**	**22**

ND designation of a taxa represents a non

Project: Dry Creek Spoil Monitoring(21-79)
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC2_BIC-03_2021-06-23	LC_DC1_BIC-01_2021-06-24	LC_DC1_BIC-02_2021-06-24	LC_DC1_BIC-03_2021-06-24	LC_FRB_BIC-01_2021-06-24	LC_FRUS_BIC-02_2021-06-25	LC_FRUS_BIC-03_2021-06-25
Sample Collection Date:	23-Jun-21	24-Jun-21	24-Jun-21	24-Jun-21	24-Jun-21	25-Jun-21	25-Jun-21
CC#:	CC220153	CC220154	CC220155	CC220156	CC220157	CC220158	CC220159
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	0	0	0	0
| Family: Sminthuridae	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	10	20	0	0	14	39	58
| Family: Baetidae	30	0	20	0	0	11	0
Baetis	380	220	620	780	0	61	158
Baetis rhodani group	100	160	240	60	14	89	17
Baetis bicaudatus	100	280	500	480	186	144	250
| Family: Ephemerellidae	0	20	0	20	57	189	267
Drunella	30	0	20	0	14	6	0
Drunella coloradensis	30	220	160	180	100	44	83
Drunella doddsii	20	80	60	140	14	0	0
Drunella spinifera	0	0	0	0	0	0	25
| Family: Heptageniidae	460	460	720	400	814	144	550
Cinygmula	70	100	220	140	114	100	117
Epeorus	10	0	0	20	214	78	158
Rhithrogena	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	14	0	0
| Family: Capniidae	0	0	0	0	0	6	0
| Family: Chloroperlidae	0	40	60	0	0	28	0
Haploperla	0	0	0	0	0	0	0
Plumiperla	0	0	20	20	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	30	260	380	360	57	6	0
| Family: Leuctridae	0	0	20	0	0	6	0
Paraleuctra	0	0	20	0	0	0	0
| Family: Nemouridae	60	0	0	0	0	0	0
Nemoura	0	0	0	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0
Zapada	50	260	80	400	29	6	67
Zapada oregonensis group	10	360	900	1360	300	122	200
Zapada cinctipes	0	0	0	0	0	0	0
Zapada columbiana	270	1760	2340	2020	486	328	417
| Family: Peltoperlidae	0	0	0	0	0	0	8
Yoraperla	0	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC2_BIC-03_2021-06-23	LC_DC1_BIC-01_2021-06-24	LC_DC1_BIC-02_2021-06-24	LC_DC1_BIC-03_2021-06-24	LC_FRB_BIC-01_2021-06-24	LC_FRUS_BIC-02_2021-06-25	LC_FRUS_BIC-03_2021-06-25
Sample Collection Date:	23-Jun-21	24-Jun-21	24-Jun-21	24-Jun-21	24-Jun-21	25-Jun-21	25-Jun-21
CC#:	CC220153	CC220154	CC220155	CC220156	CC220157	CC220158	CC220159
| Family: Perlidae	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	17	8
| Family: Perlodidae	470	60	80	100	57	50	67
Isoperla	0	20	0	20	57	0	0
Kogotus	10	120	80	0	100	17	17
Megarcys	10	80	0	80	0	0	0
| Order: Trichoptera	0	0	0	0	0	0	0
| Family: Glossosomatidae	20	0	0	0	0	0	0
| Family: Hydropsychidae	0	40	20	40	0	0	0
Parapsyche	30	100	20	40	0	0	0
Parapsyche elsis	10	140	200	280	0	0	0
| Family: Hydroptilidae	0	0	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	0	0	0	0	0	0
Chyranda centralis	0	0	0	0	0	0	0
Clostoeca disjuncta	0	0	0	40	0	6	0
Ecclisomyia	0	0	0	0	0	0	0
Onocosmoecus	0	0	0	0	0	0	8
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	70	120	60	100	0	11	8
Rhyacophila angelita group	0	0	0	0	14	0	0
Rhyacophila betteni group	10	0	0	0	0	0	0
Rhyacophila brunnea/vemna group	0	0	20	0	71	17	8
Rhyacophila hyalinata group	10	20	0	0	0	0	0
Rhyacophila vetina complex	0	40	0	20	0	0	0
Rhyacophila vofixa group	10	0	0	0	0	0	0
Rhyacophila alberta group	110	180	80	200	43	11	17
Rhyacophila narvae	10	20	40	0	0	0	0
Rhyacophila verrula group	420	0	60	60	29	28	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	10	940	900	760	0	0	0
| Family: Uenoidae	0	0	0	0	0	0	0
Neothremma	10	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	20	0	0	0
| Family: Elmidae	10	0	0	0	0	0	0
Heterlimnius	0	0	0	20	0	0	0
| Order: Diptera	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	0	0	80	0	14	6	0
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0
Micropsectra	10	20	20	0	0	6	0
Stempellinella	0	0	0	0	14	0	0
Tanytarsus	170	940	1380	1180	100	39	83
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	140	40	40	180	14	6	0
Pagastia	0	0	60	20	271	11	25
Pseudodiamesa	10	20	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC2_BIC-03_2021-06-23	LC_DC1_BIC-01_2021-06-24	LC_DC1_BIC-02_2021-06-24	LC_DC1_BIC-03_2021-06-24	LC_FRB_BIC-01_2021-06-24	LC_FRUS_BIC-02_2021-06-25	LC_FRUS_BIC-03_2021-06-25
Sample Collection Date:	23-Jun-21	24-Jun-21	24-Jun-21	24-Jun-21	24-Jun-21	25-Jun-21	25-Jun-21
CC#:	CC220153	CC220154	CC220155	CC220156	CC220157	CC220158	CC220159
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	20	20	60	40	0	0	0
Cardiocladius	0	0	0	0	0	0	0
Corynoneura	0	20	0	0	0	0	0
Cricotopus	0	80	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	20	40	0	0	0
Eukiefferiella	50	40	200	80	29	6	0
Hydrosmittia	0	0	0	0	0	6	0
Limnophyes	0	0	0	0	0	0	0
Orthocladius complex	60	60	0	260	986	72	33
Parametriocnemus	10	0	20	20	71	6	17
Rheocricotopus	60	260	60	100	0	0	0
Tvetenia	100	140	120	120	14	0	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
Ablabesmyia	10	0	0	0	0	0	0
Zavrelimyia	0	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Pentaneura	0	0	0	0	0	0	0
| Family: Empididae	0	0	0	0	0	0	0
Clinocera	0	0	0	0	0	6	0
Neoplasta	30	20	80	20	0	0	0
Oreogeton	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	80	20	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	0	20	0	0	0	0	0
| Family: Simuliidae	0	0	0	0	0	0	0
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	90	0	0	20	29	0	0
Simulium	0	0	20	0	29	11	8
Twinnia	0	0	0	0	0	0	0
| Family: Thaumaleidae	0	0	0	0	0	0	0
| Family: Tipulidae	0	0	0	0	0	0	0
Dicranota	20	0	40	0	0	6	0
Molophilus	0	0	0	0	14	0	0
Rhabdomastix	10	0	0	0	0	0	0
Tipula	0	0	0	0	0	0	0
| Order: Hemiptera	0	0	0	0	0	0	0
| Family: Corixidae	0	0	0	0	0	0	0
| Order: Lepidoptera	10	0	0	0	0	0	0
| Order: Thysanoptera	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	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Albertathyas	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	0	0	0	0	214	28	42
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	0	0	0	14	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC2_BIC-03_2021-06-23	LC_DC1_BIC-01_2021-06-24	LC_DC1_BIC-02_2021-06-24	LC_DC1_BIC-03_2021-06-24	LC_FRB_BIC-01_2021-06-24	LC_FRUS_BIC-02_2021-06-25	LC_FRUS_BIC-03_2021-06-25
Sample Collection Date:	23-Jun-21	24-Jun-21	24-Jun-21	24-Jun-21	24-Jun-21	25-Jun-21	25-Jun-21
CC#:	CC220153	CC220154	CC220155	CC220156	CC220157	CC220158	CC220159
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	14	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	10	0	0	20	14	0	0
| Family: Hydrozetidae	0	0	0	0	0	6	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	8
| Class: Gastropoda	0	0	0	0	0	0	0
| Order: Hypsogastropoda	0	0	0	0	0	0	0
| Family: Hydrobiidae	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	0	0	0	0	0	0	0
Rhynchelmis	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	60	0	40	40	0	0	8
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	0	29	0	17
| Subfamily: Tubificinae without hair cha	0	0	0	0	0	0	0
Totals:	**3750**	**7880**	**10200**	**10300**	**4668**	**1779**	**2749**

Taxa present but not included:

Phylum: Arthropoda	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: Diptera	0	0	0	0	0	0	0
| Family: Cecidomyiidae	0	0	0	0	0	0	8
Subphylum: Crustacea	0	0	0	0	0	0	0
| Class: Ostracoda	10	20	20	20	14	6	8
Phylum: Nemata	0	0	20	0	0	0	8
Phylum: Platyhelminthes	0	0	0	0	0	0	0
| Class: Turbellaria	10	20	20	20	14	0	0
Totals:	**20**	**40**	**60**	**40**	**28**	**6**	**24**

ND designation of a taxa represents a non

BENTHIC COMMUNITY DENSITY

Cordillera 20-24 #5 Raw Data

Project: Teck Dry Creek LAEMP (20-24)#5
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC3_BIC-01_2021-03-08	LC_DC3_BIC-02_2021-03-08	LC_DC3_BIC-03_2021-03-08	LC_DCEF_BIC-01_2021-03-08	LC_DCEF_BIC-02_2021-03-08	LC_DCEF_BIC-03_2021-03-08	LC_DCDS_BIC-01_2021-03-09
Sample Collection Date:	08-Mar-21	08-Mar-21	08-Mar-21	08-Mar-21	08-Mar-21	08-Mar-21	09-Mar-21
CC#:	CC211942	CC211943	CC211944	CC211945	CC211946	CC211947	CC211948
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	2	0	20	20	80	2
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	0	120	100	160	2
| Family: Baetidae	0	0	0	0	120	120	2
Baetis	0	0	0	3380	1680	2460	14
| Family: Ephemerellidae	0	0	0	20	80	60	0
Drunella	0	0	0	260	120	20	0
Drunella doddsii	0	0	0	20	40	0	0
| Family: Heptageniidae	0	0	0	5180	1760	1600	2
Cinygmula	0	0	0	0	0	120	0
Rhithrogena	0	0	0	60	20	40	0
| Order: Plecoptera	20	2	0	0	0	0	0
| Family: Capniidae	0	6	0	0	0	0	0
| Family: Chloroperlidae	40	24	22	180	300	100	12
Suwallia	0	0	0	0	0	0	0
Sweltsa	40	12	4	1100	220	180	21
| Family: Leuctridae	0	6	9	0	20	20	0
Paraleuctra	0	0	4	0	0	0	0
Perlomyia	0	0	0	0	0	0	0
| Family: Nemouridae	60	6	26	0	0	300	2
Prostoia	0	0	0	0	0	0	0
Visoka cataractae	20	0	0	0	20	60	2
Zapada	2580	254	461	240	620	180	112
Zapada oregonensis group	120	0	0	0	0	0	10
Zapada cinctipes	60	0	13	0	20	0	0
Zapada columbiana	100	20	61	360	80	140	17
| Family: Peltoperlidae	20	4	0	40	0	0	0
Yoraperla	0	4	0	40	20	0	0
| Family: Perlidae	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	100	4	9	120	160	40	5
Isoperla	0	0	0	0	0	0	0
Kogotus	0	0	0	0	0	0	0
Megarcys	0	2	0	40	100	60	5

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC3_BIC-01_2021-03-08	LC_DC3_BIC-02_2021-03-08	LC_DC3_BIC-03_2021-03-08	LC_DCEF_BIC-01_2021-03-08	LC_DCEF_BIC-02_2021-03-08	LC_DCEF_BIC-03_2021-03-08	LC_DCDS_BIC-01_2021-03-09
Sample Collection Date:	08-Mar-21	08-Mar-21	08-Mar-21	08-Mar-21	08-Mar-21	08-Mar-21	09-Mar-21
CC#:	CC211942	CC211943	CC211944	CC211945	CC211946	CC211947	CC211948
| Family: Taeniopterygidae	0	0	0	0	0	0	0
Doddsia occidentalis	20	6	4	0	0	0	0
| Order: Trichoptera	0	0	0	0	20	20	0
| Family: Brachycentridae	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0
Glossosoma	0	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0	0	0	2
Parapsyche	0	0	0	0	0	0	14
Parapsyche elsis	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	20	0	0	0
| Family: Limnephilidae	20	2	4	0	20	0	0
Chyranda centralis	0	0	0	0	100	120	0
Ecclisomyia	0	0	4	0	20	0	2
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	20	8	17	60	140	0	19
Rhyacophila angelita group	0	0	0	0	0	0	0
Rhyacophila betteni group	0	0	0	0	0	0	2
Rhyacophila brunnea/vemna group	40	2	0	0	20	40	0
Rhyacophila hyalinata group	20	0	0	0	0	0	0
Rhyacophila vofixa group	20	2	0	0	20	0	5
Rhyacophila narvae	0	2	0	0	0	0	10
Rhyacophila verrula group	0	0	0	400	40	60	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	2	0	40	0	20	7
| Family: Uenoidae	0	0	0	0	0	0	0
Neothremma	0	0	0	0	20	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0	0
| Order: Diptera	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	0	0	0	20	0	0	0
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	280	20	43	260	160	40	12
Micropsectra	740	52	61	1960	1240	2020	21
Rheotanytarsus	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	0	0	0	0	20	0	0
Pagastia	600	54	113	380	180	140	5
Pseudodiamesa	80	22	61	0	0	0	21

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC3_BIC-01_2021-03-08	LC_DC3_BIC-02_2021-03-08	LC_DC3_BIC-03_2021-03-08	LC_DCEF_BIC-01_2021-03-08	LC_DCEF_BIC-02_2021-03-08	LC_DCEF_BIC-03_2021-03-08	LC_DCDS_BIC-01_2021-03-09
Sample Collection Date:	08-Mar-21	08-Mar-21	08-Mar-21	08-Mar-21	08-Mar-21	08-Mar-21	09-Mar-21
CC#:	CC211942	CC211943	CC211944	CC211945	CC211946	CC211947	CC211948
| Subfamily: Orthocladiinae	40	0	0	0	0	20	0
Brillia	20	4	4	220	220	180	5
Cricotopus (Nostococladius)	0	0	4	0	0	0	2
Diplocladius cultriger	0	0	0	0	0	0	2
Eukiefferiella	5220	194	235	520	140	180	233
Heterotrissocladius	0	0	0	0	0	0	0
Hydrobaenus	0	0	13	0	0	0	0
Krenosmittia	0	0	0	0	0	20	0
Limnophyes	120	6	52	0	20	20	0
Orthocladius complex	360	20	43	280	60	40	33
Parametriocnemus	0	0	0	0	0	0	2
Parorthocladius	420	32	30	380	40	20	57
Rheocricotopus	0	2	4	0	0	0	0
Tvetenia	320	10	96	440	400	360	60
| Subfamily: Tanypodinae	0	0	0	0	0	0	2
| Family: Dixidae	0	0	0	0	0	40	0
| Family: Empididae	0	0	0	20	0	0	0
Clinocera	0	0	4	0	0	0	0
Neoplasta	0	0	0	0	0	0	0
Oreogeton	0	0	0	0	20	0	0
| Family: Muscidae	0	0	0	0	0	0	0
Limnophora	0	0	13	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	580	116	83	20	40	80	2
| Family: Simuliidae	0	0	17	20	0	20	0
Prosimulium/Helodon	0	0	0	0	0	0	0
Simulium	100	0	0	20	340	580	2
| Family: Thaumaleidae	0	0	0	0	0	20	0
| Family: Tipulidae	0	6	26	20	40	0	0
Antocha	0	0	0	0	0	0	0
Dicranota	160	16	22	0	80	40	2
Pedicia	0	0	0	20	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	20	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	80	12	17	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	20	4	4	20	20	20	0
Sperchonopsis	0	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

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC3_BIC-01_2021-03-08	LC_DC3_BIC-02_2021-03-08	LC_DC3_BIC-03_2021-03-08	LC_DCEF_BIC-01_2021-03-08	LC_DCEF_BIC-02_2021-03-08	LC_DCEF_BIC-03_2021-03-08	LC_DCDS_BIC-01_2021-03-09
Sample Collection Date:	08-Mar-21	08-Mar-21	08-Mar-21	08-Mar-21	08-Mar-21	08-Mar-21	09-Mar-21
CC#:	CC211942	CC211943	CC211944	CC211945	CC211946	CC211947	CC211948
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	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: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0
Totals:	**12440**	**940**	**1583**	**16300**	**8920**	**9860**	**730**

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	2	4	20	20	20	2
Phylum: Nemata	20	0	0	20	20	0	0
Phylum: Platyhelminthes	0	0	0	0	0	0	0
| Class: Turbellaria	20	2	0	0	0	0	2
Totals:	**60**	**4**	**4**	**40**	**40**	**20**	**4**

ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Project: Teck Dry Creek LAEMP (20-24)#5
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-02_2021-03-09	LC_DCDS_BIC-03_2021-03-09	LC_DC4_BIC-01_2021-03-09	LC_DC4_BIC-02_2021-03-09	LC_DC4_BIC-03_2021-03-09	LC_DC1_BIC-01_2021-03-10	LC_DC1_BIC-02_2021-03-10
Sample Collection Date:	09-Mar-21	09-Mar-21	09-Mar-21	09-Mar-21	09-Mar-21	10-Mar-21	15-Mar-21
CC#:	CC211949	CC211950	CC211951	CC211952	CC211953	CC211954	CC211955
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	0	0	40	0	0
| Family: Baetidae	0	11	100	60	160	5	0
Baetis	0	22	420	200	420	15	0
| Family: Ephemerellidae	0	0	220	500	260	80	183
Drunella	0	0	20	0	140	0	17
Drunella doddsii	0	0	60	60	40	20	167
| Family: Heptageniidae	0	0	1860	2140	2920	415	333
Cinygmula	0	0	380	0	380	90	0
Rhithrogena	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	20	0	0	0
| Family: Capniidae	0	0	0	0	0	0	0
| Family: Chloroperlidae	0	0	600	660	1180	95	100
Suwallia	0	0	0	0	0	0	0
Sweltsa	4	11	380	420	200	80	50
| Family: Leuctridae	0	0	20	0	20	10	17
Paraleuctra	0	0	20	0	40	10	17
Perlomyia	0	0	0	0	0	0	0
| Family: Nemouridae	8	44	740	300	380	25	50
Prostoia	0	0	40	0	0	0	0
Visoka cataractae	0	0	0	0	0	0	0
Zapada	480	322	680	340	1220	305	1367
Zapada oregonensis group	12	17	140	160	40	70	33
Zapada cinctipes	0	461	0	20	0	10	0
Zapada columbiana	92	72	120	80	40	0	50
| Family: Peltoperlidae	4	0	20	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	0	6	80	40	100	10	100
Isoperla	0	0	0	0	0	0	0
Kogotus	0	0	0	0	0	10	67
Megarcys	0	17	160	60	80	5	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-02_2021-03-09	LC_DCDS_BIC-03_2021-03-09	LC_DC4_BIC-01_2021-03-09	LC_DC4_BIC-02_2021-03-09	LC_DC4_BIC-03_2021-03-09	LC_DC1_BIC-01_2021-03-10	LC_DC1_BIC-02_2021-03-10
Sample Collection Date:	09-Mar-21	09-Mar-21	09-Mar-21	09-Mar-21	09-Mar-21	10-Mar-21	15-Mar-21
CC#:	CC211949	CC211950	CC211951	CC211952	CC211953	CC211954	CC211955
| Family: Taeniopterygidae	0	0	0	0	60	0	0
Doddsia occidentalis	0	0	0	0	0	5	0
| Order: Trichoptera	0	0	0	0	20	10	0
| Family: Brachycentridae	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0
Glossosoma	0	0	0	0	0	0	17
| Family: Hydropsychidae	44	44	0	0	80	5	17
Parapsyche	48	100	60	20	40	40	233
Parapsyche elsis	16	6	0	0	40	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| Family: Limnephilidae	4	0	0	20	0	0	0
Chyranda centralis	0	0	0	40	0	0	0
Ecclisomyia	0	6	80	440	120	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	8	50	240	20	140	10	33
Rhyacophila angelita group	0	0	0	0	0	5	17
Rhyacophila betteni group	0	0	0	0	0	0	0
Rhyacophila brunnea/vemna group	4	0	0	0	40	5	0
Rhyacophila hyalinata group	8	6	0	0	20	15	0
Rhyacophila vofixa group	4	0	0	0	0	0	0
Rhyacophila narvae	4	0	40	60	100	0	0
Rhyacophila verrula group	0	0	40	80	140	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	92	56	520	340	140	200	1517
| Family: Uenoidae	0	0	0	0	0	0	0
Neothremma	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0	0
Mallochohelea	0	0	0	20	0	0	0
| Family: Chironomidae	4	6	20	0	0	25	33
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	8	33	40	380	240	25	0
Micropsectra	0	6	180	320	400	35	67
Rheotanytarsus	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	0	0	0	0	0	0	0
Pagastia	4	0	480	160	120	20	50
Pseudodiamesa	0	0	0	0	0	5	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-02_2021-03-09	LC_DCDS_BIC-03_2021-03-09	LC_DC4_BIC-01_2021-03-09	LC_DC4_BIC-02_2021-03-09	LC_DC4_BIC-03_2021-03-09	LC_DC1_BIC-01_2021-03-10	LC_DC1_BIC-02_2021-03-10
Sample Collection Date:	09-Mar-21	09-Mar-21	09-Mar-21	09-Mar-21	09-Mar-21	10-Mar-21	15-Mar-21
CC#:	CC211949	CC211950	CC211951	CC211952	CC211953	CC211954	CC211955
| Subfamily: Orthocladiinae	0	0	0	0	20	0	17
Brillia	8	0	0	0	20	5	0
Cricotopus (Nostococladius)	0	0	0	0	0	10	67
Diplocladius cultriger	4	6	0	0	0	0	0
Eukiefferiella	172	328	840	480	800	35	333
Heterotrissocladius	0	0	0	0	0	0	0
Hydrobaenus	0	0	0	20	20	0	0
Krenosmittia	0	0	0	0	0	0	0
Limnophyes	0	0	0	20	20	0	0
Orthocladius complex	12	6	100	300	100	0	0
Parametriocnemus	0	0	0	0	0	0	0
Parorthocladius	4	11	40	520	80	0	0
Rheocricotopus	0	6	20	20	0	0	0
Tvetenia	156	178	820	260	880	315	233
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0
| Family: Empididae	4	0	20	0	20	0	0
Clinocera	0	0	0	0	0	0	0
Neoplasta	24	6	20	20	80	5	0
Oreogeton	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0
Limnophora	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	0	20	5	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	0	0	20	120	120	155	283
| Family: Simuliidae	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	5	0
Simulium	0	0	0	0	0	0	0
| Family: Thaumaleidae	0	0	0	0	0	0	0
| Family: Tipulidae	4	0	0	0	0	5	17
Antocha	0	0	0	0	0	0	0
Dicranota	0	0	0	40	80	55	17
Pedicia	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	0	0	0	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	0	0	0	0	20	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	0	0	0	0	0	0
Sperchonopsis	0	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	20	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	6	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-02_2021-03-09	LC_DCDS_BIC-03_2021-03-09	LC_DC4_BIC-01_2021-03-09	LC_DC4_BIC-02_2021-03-09	LC_DC4_BIC-03_2021-03-09	LC_DC1_BIC-01_2021-03-10	LC_DC1_BIC-02_2021-03-10
Sample Collection Date:	09-Mar-21	09-Mar-21	09-Mar-21	09-Mar-21	09-Mar-21	10-Mar-21	15-Mar-21
CC#:	CC211949	CC211950	CC211951	CC211952	CC211953	CC211954	CC211955
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	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	5	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	4	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0
Totals:	**1240**	**1843**	**9660**	**8760**	**11640**	**2260**	**5502**

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	4	6	20	20	20	5	17
Phylum: Nemata	0	0	0	0	20	0	0
Phylum: Platyhelminthes	0	0	0	0	0	0	0
| Class: Turbellaria	4	6	20	20	20	5	17
Totals:	**8**	**12**	**40**	**40**	**60**	**10**	**34**

ND designation of a taxa represents a non·

Project: Teck Dry Creek LAEMP (20-24)#5
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC1_BIC-03_2021-03-10	LC_FRB_BIC-01_2021-03-15	LC_FRB_BIC-02_2021-03-15	LC_FRB_BIC-03_2021-03-15	LC_FRUS_BIC-01_2021-03-16	LC_FRUS_BIC-02_2021-03-16	LC_FRUS_BIC-03_2021-03-16
Sample Collection Date:	15-Mar-21	15-Mar-21	15-Mar-21	15-Mar-21	16-Mar-21	16-Mar-21	16-Mar-21
CC#:	CC211956	CC211957	CC211958	CC211959	CC211960	CC211961	CC211962
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	17	40	0	0	0
| Family: Baetidae	20	80	0	0	0	0	0
Baetis	20	220	117	120	80	40	60
| Family: Ephemerellidae	460	280	67	80	20	100	60
Drunella	20	0	33	0	0	0	0
Drunella doddsii	160	20	0	0	0	0	0
| Family: Heptageniidae	1620	980	450	800	260	460	280
Cinygmula	200	0	117	100	0	220	120
Rhithrogena	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	0
| Family: Capniidae	0	0	17	60	40	20	20
| Family: Chloroperlidae	260	20	50	40	0	20	20
Suwallia	0	0	0	20	0	0	0
Sweltsa	40	0	67	80	0	0	20
| Family: Leuctridae	40	20	0	0	0	0	0
Paraleuctra	80	40	0	20	0	0	0
Perlomyia	0	0	0	40	0	0	0
| Family: Nemouridae	820	2060	1133	1400	1940	3740	2440
Prostoia	0	380	533	1300	1380	1040	1080
Visoka cataractae	0	0	0	0	0	0	0
Zapada	2060	1520	783	1080	480	1520	820
Zapada oregonensis group	320	80	0	20	20	0	0
Zapada cinctipes	60	200	0	40	20	140	40
Zapada columbiana	60	0	17	0	0	0	0
| Family: Peltoperlidae	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	0	0	0
| Family: Perlidae	0	0	33	0	0	0	0
Hesperoperla	0	0	0	20	0	0	0
| Family: Perlodidae	40	20	150	120	360	460	400
Isoperla	0	80	0	20	0	0	40
Kogotus	60	180	0	20	0	20	20
Megarcys	0	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC1_BIC-03_2021-03-10	LC_FRB_BIC-01_2021-03-15	LC_FRB_BIC-02_2021-03-15	LC_FRB_BIC-03_2021-03-15	LC_FRUS_BIC-01_2021-03-16	LC_FRUS_BIC-02_2021-03-16	LC_FRUS_BIC-03_2021-03-16
Sample Collection Date:	15-Mar-21	15-Mar-21	15-Mar-21	15-Mar-21	16-Mar-21	16-Mar-21	16-Mar-21
CC#:	CC211956	CC211957	CC211958	CC211959	CC211960	CC211961	CC211962
| Family: Taeniopterygidae	0	0	17	20	0	20	0
Doddsia occidentalis	0	120	17	20	20	40	60
| Order: Trichoptera	100	0	0	60	0	20	0
| Family: Brachycentridae	0	40	33	0	0	0	0
Micrasema	0	0	0	0	20	20	40
| Family: Glossosomatidae	0	0	0	0	0	0	0
Glossosoma	0	0	0	0	0	0	0
| Family: Hydropsychidae	80	0	17	0	0	0	20
Parapsyche	300	20	0	0	0	0	0
Parapsyche elsis	120	20	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	0	0	0	0	0	0
Chyranda centralis	20	0	0	0	0	0	0
Ecclisomyia	0	0	0	120	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	20	260	167	40	60	340	220
Rhyacophila angelita group	0	60	33	0	0	20	0
Rhyacophila betteni group	0	0	0	0	0	0	0
Rhyacophila brunnea/vemna group	0	140	117	20	120	80	80
Rhyacophila hyalinata group	0	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0
Rhyacophila narvae	20	0	0	0	0	0	0
Rhyacophila verrula group	0	0	0	0	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	1440	20	0	60	20	20	20
| Family: Uenoidae	0	0	0	0	0	0	0
Neothremma	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Elmidae	0	0	17	0	20	20	0
Heterlimnius	0	0	0	120	0	20	20
| Order: Diptera	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	140	0	0	0	0	0	0
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	80	60	133	240	20	40	0
Micropsectra	20	120	33	240	40	20	40
Rheotanytarsus	0	0	0	0	0	0	20
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	0	0	0	0	0	0	0
Pagastia	100	360	367	260	320	400	360
Pseudodiamesa	0	0	17	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC1_BIC-03_2021-03-10	LC_FRB_BIC-01_2021-03-15	LC_FRB_BIC-02_2021-03-15	LC_FRB_BIC-03_2021-03-15	LC_FRUS_BIC-01_2021-03-16	LC_FRUS_BIC-02_2021-03-16	LC_FRUS_BIC-03_2021-03-16
Sample Collection Date:	15-Mar-21	15-Mar-21	15-Mar-21	15-Mar-21	16-Mar-21	16-Mar-21	16-Mar-21
CC#:	CC211956	CC211957	CC211958	CC211959	CC211960	CC211961	CC211962
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	20	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Diplocladius cultriger	0	0	0	0	0	0	0
Eukiefferiella	340	700	700	660	940	740	1300
Heterotrissocladius	0	0	0	20	0	0	0
Hydrobaenus	0	80	67	60	0	0	0
Krenosmittia	0	0	0	0	0	0	0
Limnophyes	0	0	0	0	0	0	0
Orthocladius complex	20	280	367	340	480	120	240
Parametriocnemus	0	0	0	20	0	0	0
Parorthocladius	20	0	0	0	0	0	0
Rheocricotopus	20	0	33	0	0	0	0
Tvetenia	1780	140	200	240	80	280	200
| Subfamily: Tanypodinae	0	0	17	0	0	0	0
| Family: Dixidae	0	0	0	0	0	0	0
| Family: Empididae	20	20	0	0	20	0	40
Clinocera	0	0	0	20	0	0	0
Neoplasta	0	0	0	0	0	60	100
Oreogeton	0	0	0	0	0	0	0
| Family: Muscidae	0	0	0	0	0	0	0
Limnophora	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	20	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	760	340	117	380	40	80	60
| Family: Simuliidae	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	0	0
Simulium	0	0	0	0	0	0	0
| Family: Thaumaleidae	0	0	0	0	0	0	0
| Family: Tipulidae	20	0	50	20	0	20	0
Antocha	0	100	33	40	40	220	60
Dicranota	40	20	0	20	0	0	0
Pedicia	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	0	0	0	0	40	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	20	60	0	160	20	120	120
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	0	100	40	0	0	0
Sperchonopsis	0	0	0	0	0	20	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

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC1_BIC-03_2021-03-10	LC_FRB_BIC-01_2021-03-15	LC_FRB_BIC-02_2021-03-15	LC_FRB_BIC-03_2021-03-15	LC_FRUS_BIC-01_2021-03-16	LC_FRUS_BIC-02_2021-03-16	LC_FRUS_BIC-03_2021-03-16
Sample Collection Date:	15-Mar-21	15-Mar-21	15-Mar-21	15-Mar-21	16-Mar-21	16-Mar-21	16-Mar-21
CC#:	CC211956	CC211957	CC211958	CC211959	CC211960	CC211961	CC211962
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	20	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: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	20	0	0	0
Nais	0	0	17	40	0	0	0
Totals:	**11840**	**9160**	**6253**	**8720**	**6900**	**10500**	**8420**

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	17	20	0	20	20
Phylum: Nemata	0	20	17	20	20	0	20
Phylum: Platyhelminthes	0	0	0	0	0	0	0
| Class: Turbellaria	20	20	17	20	20	20	20
Totals:	**40**	**60**	**51**	**60**	**40**	**40**	**60**

ND designation of a taxa represents a non

BENTHIC COMMUNITY DENSITY

Cordillera May 2021 Raw Data

Project: Teck Dry Creek LAEMP (21-35)#1
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC3_BIC-01_2021-05-03	LC_DC3_BIC-02_2021-05-03	LC_DC3_BIC-03_2021-05-03	LC_DCEF_BIC-01_2021-05-04	LC_DCEF_BIC-02_2021-05-04	LC_DCEF_BIC-03_2021-05-04	LC_DCDS_BIC-01_2021-05-04
Sample Collection Date:	03-May-21	03-May-21	03-May-21	04-May-21	04-May-21	04-May-21	04-May-21
CC#:	CC220055	CC220056	CC220057	CC220058	CC220059	CC220060	CC220061
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	8	0	3	40	17	0	0
| Family: Hypogastruridae	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	0	60	0	0	0
| Family: Baetidae	0	0	0	0	0	0	0
Baetis	0	0	0	640	783	1000	0
Baetis rhodani group	0	0	0	0	0	0	0
Baetis bicaudatus	0	0	0	0	0	100	0
| Family: Ephemerellidae	0	0	0	0	0	12	0
Drunella	0	0	0	160	33	75	0
Drunella coloradensis	0	0	0	0	117	0	0
Drunella doddsii	0	0	0	20	67	38	0
Drunella grandis	0	0	0	0	0	0	0
Drunella spinifera	0	0	0	0	0	0	0
| Family: Heptageniidae	0	0	0	1720	1333	550	0
Cinygmula	0	0	0	120	100	88	0
Epeorus	0	0	0	20	0	12	0
Rhithrogena	0	0	0	20	50	0	0
| Order: Plecoptera	8	2	0	40	33	12	1
| Family: Capniidae	0	0	0	0	0	0	0
Bolshecapnia	0	0	0	0	0	0	0
Capnia	0	0	0	0	0	0	0
Capnura	0	0	0	0	0	0	0
| Family: Chloroperlidae	0	20	11	180	33	0	0
Haploperla	0	2	0	0	0	0	0
Plumiperla	0	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	46	24	3	80	300	125	0
| Family: Leuctridae	8	8	6	0	17	0	0
Paraleuctra	15	0	3	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC3_BIC-01_2021-05-03	LC_DC3_BIC-02_2021-05-03	LC_DC3_BIC-03_2021-05-03	LC_DCEF_BIC-01_2021-05-04	LC_DCEF_BIC-02_2021-05-04	LC_DCEF_BIC-03_2021-05-04	LC_DCDS_BIC-01_2021-05-04
Sample Collection Date:	03-May-21	03-May-21	03-May-21	04-May-21	04-May-21	04-May-21	04-May-21
CC#:	CC220055	CC220056	CC220057	CC220058	CC220059	CC220060	CC220061
| Family: Nemouridae	8	2	0	60	0	12	0
Nemoura	0	2	0	0	0	0	0
Ostrocerca	0	0	0	0	0	0	0
Prostoia	0	0	0	0	0	0	0
Visoka cataractae	0	2	0	20	17	12	0
Zapada	400	60	64	680	367	188	0
Zapada oregonensis group	0	4	6	0	17	0	0
Zapada cinctipes	0	2	0	0	0	0	0
Zapada columbiana	0	2	0	0	0	12	0
| Family: Peltoperlidae	0	0	0	20	17	0	0
Yoraperla	0	2	0	40	17	0	0
| Family: Perlidae	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	8	2	0	0	83	12	0
Isoperla	0	0	0	0	0	0	0
Kogotus	0	0	0	0	0	0	0
Megarcys	23	2	3	80	50	0	0
Setvena	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	0	0	0	0	0	0
Doddsia occidentalis	0	0	0	0	0	0	0
Taenionema	0	2	0	0	0	0	0
| Order: Trichoptera	15	2	0	0	0	0	1
| Family: Apataniidae	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	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	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	20	0	0	0
Anagapetus	0	0	0	0	0	0	0
Glossosoma	0	2	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0	0	0	0
Parapsyche	0	0	0	0	0	0	0
Parapsyche elsis	0	0	0	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| Family: Leptoceridae	8	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	0
Chyranda centralis	0	2	0	20	0	12	0
Dicosmoecus	0	0	0	0	0	0	0
Ecclisomyia	0	2	0	20	0	0	0
Hydatophylax	0	0	0	0	17	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	123	14	56	120	83	38	1
Rhyacophila angelita group	0	0	0	0	0	0	0
Rhyacophila betteni group	0	0	0	0	0	0	0
Rhyacophila brunnea/vemna group	54	10	8	20	17	12	0
Rhyacophila hyalinata group	8	4	6	0	0	0	0
Rhyacophila vetina complex	0	0	0	0	0	0	0
Rhyacophila vobara subgroup	0	0	0	0	0	0	0
Rhyacophila vofixa group	0	10	3	0	0	0	0
Rhyacophila atrata complex	0	0	0	0	0	0	0
Rhyacophila narvae	0	0	0	0	0	0	0
Rhyacophila verrula group	23	8	6	220	0	225	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC3_BIC-01_2021-05-03	LC_DC3_BIC-02_2021-05-03	LC_DC3_BIC-03_2021-05-03	LC_DCEF_BIC-01_2021-05-04	LC_DCEF_BIC-02_2021-05-04	LC_DCEF_BIC-03_2021-05-04	LC_DCDS_BIC-01_2021-05-04
Sample Collection Date:	03-May-21	03-May-21	03-May-21	04-May-21	04-May-21	04-May-21	04-May-21
CC#:	CC220055	CC220056	CC220057	CC220058	CC220059	CC220060	CC220061
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	8	4	3	20	33	25	0
| Family: Uenoidae	0	0	0	0	0	0	0
Neothremma	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0
| Order: Diptera	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	2	0	0	0	0	0
Mallochohelea	15	4	0	0	0	0	0
| Family: Chironomidae	8	2	3	20	17	0	1
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0
Paracladopelma	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	0	0	0
Stictochironomus	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0
Cladotanytarsus	0	0	0	0	0	0	0
Stempellinella	0	2	0	0	0	0	0
Tanytarsus	777	152	292	2800	1583	750	3
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	0	0	0	20	0	0	0
Pagastia	146	40	19	120	67	38	0
Pseudodiamesa	0	0	0	0	17	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	23	6	3	120	167	100	0
Corynoneura	0	0	0	0	0	0	0
Cricotopus	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Diplocladius cultriger	0	0	0	0	0	0	0
Eukiefferiella	377	80	206	80	100	188	2
Heleniella	69	0	0	0	0	0	0
Hydrobaenus	0	0	0	0	0	0	0
Limnophyes	69	78	64	0	100	38	0
Metriocnemus	8	0	0	0	0	0	0
Nanocladius	0	0	0	0	0	0	0
Orthocladius complex	115	12	50	480	533	225	0
Orthocladius lignicola	0	2	3	0	0	0	0
Parametriocnemus	0	0	0	0	0	0	0
Parorthocladius	8	2	3	0	17	0	0
Rheocricotopus	8	12	3	60	0	0	0
Thienemanniella	0	0	0	0	0	0	0
Tvetenia	92	2	0	0	0	25	0
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
Zavrelimyia	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: Culicidae	0	0	0	0	0	12	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC3_BIC-01_2021-05-03	LC_DC3_BIC-02_2021-05-03	LC_DC3_BIC-03_2021-05-03	LC_DCEF_BIC-01_2021-05-04	LC_DCEF_BIC-02_2021-05-04	LC_DCEF_BIC-03_2021-05-04	LC_DCDS_BIC-01_2021-05-04
Sample Collection Date:	03-May-21	03-May-21	03-May-21	04-May-21	04-May-21	04-May-21	04-May-21
CC#:	CC220055	CC220056	CC220057	CC220058	CC220059	CC220060	CC220061
| Family: Dixidae	0	0	0	0	0	0	0
Dixa	0	0	0	0	0	0	0
| Family: Empididae	0	0	0	0	0	0	0
Chelifera/ Metachela	0	0	0	0	0	0	0
Clinocera	0	2	0	0	0	0	0
Neoplasta	0	0	3	0	0	0	7
Roederiodes	0	2	3	0	0	0	0
Trichoclinocera	0	0	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	46	22	31	0	83	0	0
| Family: Simuliidae	0	2	0	0	0	38	0
Helodon	0	0	0	0	0	0	0
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	0	14	3	40	0	0	0
Simulium	15	2	0	20	0	25	0
Twinnia	0	0	0	0	50	0	0
| Family: Tipulidae	0	4	8	0	0	0	0
Antocha	0	0	6	0	0	0	0
Dicranota	15	18	6	0	33	25	0
| Family: Limoniidae	0	0	0	0	0	0	0
Eloeophila	0	0	0	0	0	0	0
Gonomyodes	0	0	3	0	0	0	0
Hesperoconopa	0	0	0	0	0	0	0
Ulomorpha	0	0	0	0	0	0	0
| Order: Thysanoptera	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0
| Class: Branchiopoda	0	0	0	0	0	0	0
| Order: Cladocera	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	0	0	0	0	17	0	0
| Family: Hygrobatidae	0	0	0	20	0	0	0
Atractides	0	4	3	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	0	0	3	0	17	0	1
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	0	6	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	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
| Order: Oribatida	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	2	3	0	17	0	0
| Class: Maxillipoda	0	0	0	0	0	0	0
| Class: Copepoda	0	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC3_BIC-01_2021-05-03	LC_DC3_BIC-02_2021-05-03	LC_DC3_BIC-03_2021-05-03	LC_DCEF_BIC-01_2021-05-04	LC_DCEF_BIC-02_2021-05-04	LC_DCEF_BIC-03_2021-05-04	LC_DCDS_BIC-01_2021-05-04
Sample Collection Date:	03-May-21	03-May-21	03-May-21	04-May-21	04-May-21	04-May-21	04-May-21
CC#:	CC220055	CC220056	CC220057	CC220058	CC220059	CC220060	CC220061
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0
| Family: Lymnaeidae	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	0	0	0	0	0	0	0
Lumbriculus	0	0	0	0	0	0	0
Rhynchelmis	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	3	0	0	25	0
Enchytraeus	0	0	0	20	33	12	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0
Totals:	**2554**	**664**	**908**	**8240**	**6452**	**4061**	**17**

Taxa present but not included:

Phylum: Arthropoda	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: Diptera	0	0	0	0	0	0	0
| Family: Cecidomyiidae	8	0	0	0	50	12	0
Subphylum: Crustacea	0	0	0	0	0	0	0
| Class: Ostracoda	8	2	3	20	17	12	1
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: Tubificida	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0
Phylum: Nemata	0	2	3	0	17	0	0
Phylum: Platyhelminthes	0	0	0	0	0	0	0
| Class: Turbellaria	8	2	3	0	0	0	0
Totals:	**24**	**6**	**9**	**20**	**84**	**24**	**1**

ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Project: Teck Dry Creek LAEMP (21-35)#1
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-02_2021-05-04	LC_DCDS_BIC-03_2021-05-04	LC_DC4_BIC-01_2021-05-05	LC_DC4_BIC-02_2021-05-05	LC_DC4_BIC-03_2021-05-05	LC_DC1_BIC-01_2021-05-05	LC_DC1_BIC-02_2021-05-05
Sample Collection Date:	04-May-21	04-May-21	05-May-21	05-May-21	05-May-21	05-May-21	05-May-21
CC#:	CC220062	CC220063	CC220064	CC220065	CC220066	CC220067	CC220068
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	20	0	0	0
| Family: Hypogastruridae	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	4	0	20	20	20	0	0
| Family: Baetidae	0	0	0	0	0	0	260
Baetis	0	0	1200	680	1500	260	0
Baetis rhodani group	0	0	0	0	0	0	0
Baetis bicaudatus	0	0	740	260	660	40	60
| Family: Ephemerellidae	0	0	0	0	0	0	200
Drunella	0	0	360	140	420	140	0
Drunella coloradensis	0	0	240	0	0	0	0
Drunella doddsii	0	0	40	40	60	80	0
Drunella grandis	0	0	0	0	0	0	0
Drunella spinifera	0	0	0	0	0	0	0
| Family: Heptageniidae	0	0	1180	1460	1860	1600	1360
Cinygmula	0	0	360	120	80	100	560
Epeorus	0	0	0	0	0	20	0
Rhithrogena	0	0	0	0	0	0	0
| Order: Plecoptera	0	10	40	0	120	60	0
| Family: Capniidae	0	0	0	0	0	0	0
Bolshecapnia	0	0	0	0	0	0	0
Capnia	0	0	0	0	0	0	0
Capnura	0	0	0	0	0	0	0
| Family: Chloroperlidae	11	10	780	540	400	80	0
Haploperla	0	3	0	0	0	0	0
Plumiperla	0	0	0	0	0	0	0
Suwallia	0	0	0	0	40	0	0
Sweltsa	52	10	240	300	720	240	240
| Family: Leuctridae	0	0	20	0	20	0	0
Paraleuctra	0	0	0	0	20	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-02_2021-05-04	LC_DCDS_BIC-03_2021-05-04	LC_DC4_BIC-01_2021-05-05	LC_DC4_BIC-02_2021-05-05	LC_DC4_BIC-03_2021-05-05	LC_DC1_BIC-01_2021-05-05	LC_DC1_BIC-02_2021-05-05
Sample Collection Date:	04-May-21	04-May-21	05-May-21	05-May-21	05-May-21	05-May-21	05-May-21
CC#:	CC220062	CC220063	CC220064	CC220065	CC220066	CC220067	CC220068
| Family: Nemouridae	19	43	160	200	0	60	60
Nemoura	0	3	0	40	60	0	0
Ostrocerca	0	0	40	0	0	0	0
Prostoia	0	0	0	0	0	0	20
Visoka cataractae	0	0	0	0	0	0	0
Zapada	289	10	2380	580	220	1700	1020
Zapada oregonensis group	15	37	120	20	40	20	2780
Zapada cinctipes	11	317	20	140	40	120	100
Zapada columbiana	22	10	60	20	1160	0	260
| Family: Peltoperlidae	0	0	20	0	0	0	0
Yoraperla	0	3	0	0	0	0	0
| Family: Perlidae	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	15	3	60	0	20	60	0
Isoperla	0	0	0	0	0	0	20
Kogotus	0	0	200	0	0	0	120
Megarcys	4	3	40	80	160	0	160
Setvena	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	0	0	0	20	60	0
Doddsia occidentalis	0	0	0	0	0	0	0
Taenionema	0	0	60	0	80	40	0
| Order: Trichoptera	0	3	0	0	0	20	0
| Family: Apataniidae	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	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	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0
Anagapetus	0	0	0	0	0	0	60
Glossosoma	4	3	0	0	0	0	0
| Family: Hydropsychidae	7	13	0	0	0	20	60
Parapsyche	41	23	280	20	100	160	140
Parapsyche elsis	15	10	60	0	20	40	220
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0	20
Chyranda centralis	19	0	40	120	20	0	0
Dicosmoecus	0	3	0	0	0	0	0
Ecclisomyia	52	7	40	200	60	20	0
Hydatophylax	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	167	47	360	580	320	200	80
Rhyacophila angelita group	0	0	0	0	0	20	0
Rhyacophila betteni group	11	3	0	0	0	0	0
Rhyacophila brunnea/vemna group	7	0	0	0	0	0	0
Rhyacophila hyalinata group	4	0	40	0	20	0	0
Rhyacophila vetina complex	0	0	0	0	0	0	0
Rhyacophila vobara subgroup	0	0	0	0	0	0	0
Rhyacophila vofixa group	4	37	20	0	0	0	0
Rhyacophila atrata complex	0	0	0	0	0	0	0
Rhyacophila narvae	4	40	160	0	100	20	0
Rhyacophila verrula group	4	10	400	80	300	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-02_2021-05-04	LC_DCDS_BIC-03_2021-05-04	LC_DC4_BIC-01_2021-05-05	LC_DC4_BIC-02_2021-05-05	LC_DC4_BIC-03_2021-05-05	LC_DC1_BIC-01_2021-05-05	LC_DC1_BIC-02_2021-05-05
Sample Collection Date:	04-May-21	04-May-21	05-May-21	05-May-21	05-May-21	05-May-21	05-May-21
CC#:	CC220062	CC220063	CC220064	CC220065	CC220066	CC220067	CC220068
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	19	93	280	20	260	640	1120
| Family: Uenoidae	0	0	0	0	0	0	0
Neothremma	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	4	10	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	0	0	0
| Order: Diptera	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	19	7	300	100	100	0	40
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0
Paracladopelma	0	0	0	0	0	0	0
Polypedilum	0	0	0	0	0	0	0
Stictochironomus	0	0	0	0	0	0	0
| Tribe: Tanytarsini	193	127	920	340	280	60	340
Cladotanytarsus	0	3	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0
Tanytarsus	44	50	500	160	160	280	100
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	0	0	0	0	20	0	20
Pagastia	0	7	900	100	200	160	80
Pseudodiamesa	7	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	15	27	40	0	40	20	80
Corynoneura	4	0	0	0	0	0	0
Cricotopus	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	30	17	20	0	0	160	140
Diplocladius cultriger	0	0	0	0	0	0	0
Eukiefferiella	0	17	500	260	360	140	120
Heleniella	0	0	0	0	0	0	0
Hydrobaenus	0	0	0	0	0	0	0
Limnophyes	22	0	40	0	0	0	40
Metriocnemus	0	0	0	0	0	0	0
Nanocladius	0	0	0	0	0	0	0
Orthocladius complex	26	7	340	560	280	40	20
Orthocladius lignicola	0	0	0	0	0	0	0
Parametriocnemus	152	0	0	0	0	0	0
Parorthocladius	4	0	0	0	0	0	0
Rheocricotopus	15	10	40	20	40	0	0
Thienemanniella	0	0	0	0	20	0	0
Tvetenia	41	7	220	160	140	120	540
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
Zavrelimyia	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: Culicidae	0	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-02_2021-05-04	LC_DCDS_BIC-03_2021-05-04	LC_DC4_BIC-01_2021-05-05	LC_DC4_BIC-02_2021-05-05	LC_DC4_BIC-03_2021-05-05	LC_DC1_BIC-01_2021-05-05	LC_DC1_BIC-02_2021-05-05
Sample Collection Date:	04-May-21	04-May-21	05-May-21	05-May-21	05-May-21	05-May-21	05-May-21
CC#:	CC220062	CC220063	CC220064	CC220065	CC220066	CC220067	CC220068
| Family: Dixidae	0	0	0	0	0	0	0
Dixa	0	0	0	0	0	0	0
| Family: Empididae	0	7	20	0	0	0	20
Chelifera/ Metachela	0	0	0	0	0	0	0
Clinocera	4	0	0	0	0	0	0
Neoplasta	15	77	0	0	0	0	0
Roederiodes	4	0	0	0	0	0	0
Trichoclinocera	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	20	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	15	13	300	100	60	1080	820
| Family: Simuliidae	7	0	40	20	60	0	0
Helodon	0	0	0	0	20	20	0
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	0	0	0	140
Simulium	0	0	0	0	20	40	0
Twinnia	0	0	0	0	0	0	0
| Family: Tipulidae	0	0	20	0	0	0	0
Antocha	0	0	0	0	0	0	0
Dicranota	4	0	20	60	0	40	60
| Family: Limoniidae	0	0	0	0	0	0	0
Eloeophila	0	0	0	20	0	0	0
Gonomyodes	0	0	0	0	0	0	0
Hesperoconopa	0	0	0	0	0	0	0
Ulomorpha	0	0	0	0	0	0	0
| Order: Thysanoptera	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0
| Class: Branchiopoda	0	0	0	0	0	0	0
| Order: Cladocera	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	0	0	0	0	0	0	20
| Family: Hygrobatidae	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	0	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	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	20	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0
| Family: Hydrozetidae	4	0	0	0	0	0	0
| Class: Maxillipoda	0	0	0	0	0	0	0
| Class: Copepoda	0	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCDS_BIC-02_2021-05-04	LC_DCDS_BIC-03_2021-05-04	LC_DC4_BIC-01_2021-05-05	LC_DC4_BIC-02_2021-05-05	LC_DC4_BIC-03_2021-05-05	LC_DC1_BIC-01_2021-05-05	LC_DC1_BIC-02_2021-05-05
Sample Collection Date:	04-May-21	04-May-21	05-May-21	05-May-21	05-May-21	05-May-21	05-May-21
CC#:	CC220062	CC220063	CC220064	CC220065	CC220066	CC220067	CC220068
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0
| Family: Lymnaeidae	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	0	0	0	0	0	0	0
Lumbriculus	0	0	0	0	0	20	0
Rhynchelmis	0	0	0	0	0	20	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	7	0	0	20	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0
Totals:	**1436**	**1140**	**14280**	**7620**	**10720**	**8040**	**11500**

Taxa present but not included:

Phylum: Arthropoda	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: Diptera	0	0	0	0	0	0	0
| Family: Cecidomyiidae	7	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0
| Class: Ostracoda	4	3	20	20	20	20	20
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: Tubificida	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0
Phylum: Nemata	0	0	0	20	0	0	0
Phylum: Platyhelminthes	0	0	0	0	0	0	0
| Class: Turbellaria	4	3	20	20	20	20	0
Totals:	**15**	**6**	**40**	**60**	**40**	**40**	**20**

ND designation of a taxa represents a non

Project: Teck Dry Creek LAEMP (21-35)#1
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC1_BIC-03_2021-05-05	LC_FRB_BIC-01_2021-05-06	LC_FRB_BIC-02_2021-05-06	LC_FRB_BIC-03_2021-05-06	LC_FRUS_BIC-01_2021-05-07	LC_FRUS_BIC-02_2021-05-07	LC_FRUS_BIC-03_2021-05-07
Sample Collection Date:	05-May-21	06-May-21	06-May-21	06-May-21	07-May-21	07-May-21	07-May-21
CC#:	CC220069	CC220070	CC220071	CC220072	CC220073	CC220074	CC220075
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	0	0	5	0
| Family: Hypogastruridae	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	10	10	0	3	0	0
| Family: Baetidae	420	0	0	10	2	5	0
Baetis	0	10	15	0	3	0	0
Baetis rhodani group	0	10	5	0	0	5	0
Baetis bicaudatus	120	0	0	0	0	5	0
| Family: Ephemerellidae	40	0	0	0	0	0	0
Drunella	260	30	25	50	0	0	10
Drunella coloradensis	0	0	0	0	0	0	0
Drunella doddsii	0	0	0	0	0	0	0
Drunella grandis	0	0	0	10	0	0	10
Drunella spinifera	0	10	5	0	0	0	0
| Family: Heptageniidae	680	200	295	20	7	10	20
Cinygmula	940	80	25	140	0	40	40
Epeorus	0	50	70	150	0	30	90
Rhithrogena	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	5	0	0	0	0
| Family: Capniidae	0	0	0	0	6	30	20
Bolshecapnia	0	0	0	0	0	10	0
Capnia	0	0	0	0	9	0	0
Capnura	0	0	0	0	0	25	0
| Family: Chloroperlidae	0	10	40	0	2	0	0
Haploperla	0	0	0	10	0	0	0
Plumiperla	0	0	0	10	0	5	0
Suwallia	0	0	0	0	0	0	0
Sweltsa	280	20	50	70	0	5	20
| Family: Leuctridae	20	0	10	0	0	0	0
Paraleuctra	40	10	20	0	0	0	10

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC1_BIC-03_2021-05-05	LC_FRB_BIC-01_2021-05-06	LC_FRB_BIC-02_2021-05-06	LC_FRB_BIC-03_2021-05-06	LC_FRUS_BIC-01_2021-05-07	LC_FRUS_BIC-02_2021-05-07	LC_FRUS_BIC-03_2021-05-07
Sample Collection Date:	05-May-21	06-May-21	06-May-21	06-May-21	07-May-21	07-May-21	07-May-21
CC#:	CC220069	CC220070	CC220071	CC220072	CC220073	CC220074	CC220075
| Family: Nemouridae	20	40	70	20	33	70	60
Nemoura	0	0	0	0	0	0	0
Ostrocerca	0	0	230	0	0	0	0
Prostoia	0	140	0	320	36	330	450
Visoka cataractae	0	0	0	0	0	0	0
Zapada	420	380	590	10	17	85	90
Zapada oregonensis group	1680	0	5	650	0	65	630
Zapada cinctipes	100	190	15	50	0	10	90
Zapada columbiana	400	10	0	30	0	0	0
| 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	10
Hesperoperla	0	0	0	0	0	5	0
| Family: Perlodidae	120	0	40	50	8	15	10
Isoperla	0	10	45	10	10	55	230
Kogotus	40	10	0	0	0	5	0
Megarcys	20	10	15	10	2	20	20
Setvena	0	0	0	0	0	0	0
| Family: Taeniopterygidae	0	0	0	0	0	0	0
Doddsia occidentalis	0	0	0	0	0	0	0
Taenionema	0	0	0	0	0	0	0
| Order: Trichoptera	0	0	0	0	0	0	0
| Family: Apataniidae	0	0	0	0	0	0	0
Pedomoecus sierra	0	10	0	10	0	0	0
| Family: Brachycentridae	0	10	5	0	0	0	0
Brachycentrus	0	0	0	0	0	5	0
Brachycentrus americanus	0	0	0	20	0	0	10
Micrasema	0	0	0	10	0	0	70
| Family: Glossosomatidae	0	0	0	0	0	0	0
Anagapetus	0	0	0	0	0	0	0
Glossosoma	20	0	0	0	0	0	0
| Family: Hydropsychidae	20	0	0	0	0	0	0
Parapsyche	100	0	0	0	0	0	0
Parapsyche elsis	80	0	5	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	10	0	0	0
Chyranda centralis	0	0	0	0	0	0	0
Dicosmoecus	0	0	0	0	0	0	0
Ecclisomyia	0	0	0	10	0	5	0
Hydatophylax	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	160	140	35	20	15	110	80
Rhyacophila angelita group	0	0	5	0	0	0	0
Rhyacophila betteni group	0	0	0	20	0	0	10
Rhyacophila brunnea/vemna group	0	20	40	50	0	5	30
Rhyacophila hyalinata group	0	0	0	0	0	0	0
Rhyacophila vetina complex	0	0	0	0	0	0	0
Rhyacophila vobara subgroup	0	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0
Rhyacophila atrata complex	20	0	0	0	0	0	0
Rhyacophila narvae	20	0	5	0	0	0	10
Rhyacophila verrula group	0	70	25	50	6	30	70

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC1_BIC-03_2021-05-05	LC_FRB_BIC-01_2021-05-06	LC_FRB_BIC-02_2021-05-06	LC_FRB_BIC-03_2021-05-06	LC_FRUS_BIC-01_2021-05-07	LC_FRUS_BIC-02_2021-05-07	LC_FRUS_BIC-03_2021-05-07
Sample Collection Date:	05-May-21	06-May-21	06-May-21	06-May-21	07-May-21	07-May-21	07-May-21
CC#:	CC220069	CC220070	CC220071	CC220072	CC220073	CC220074	CC220075
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	860	20	15	30	0	0	60
| Family: Uenoidae	0	0	0	0	0	0	0
Neothremma	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Elmidae	0	20	5	10	1	0	0
Heterlimnius	0	10	10	70	11	10	40
| Family: Staphylinidae	0	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	5	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	5	0	0	0	0
| Family: Chironomidae	20	40	15	50	5	65	30
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0	0
Paracladopelma	0	0	0	0	1	0	0
Polypedilum	20	30	0	10	0	0	20
Stictochironomus	0	0	0	0	0	0	10
| Tribe: Tanytarsini	240	310	140	180	0	25	110
Cladotanytarsus	0	0	0	0	0	0	0
Stempellinella	0	0	0	0	0	0	0
Tanytarsus	20	90	35	250	6	50	80
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	0	0	0	0	0	0	0
Pagastia	160	70	15	240	1	5	40
Pseudodiamesa	0	0	0	0	0	5	0
| Subfamily: Orthocladiinae	0	0	0	0	5	0	0
Brillia	40	0	0	0	1	10	0
Corynoneura	0	0	0	10	0	0	0
Cricotopus	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	100	0	0	0	0	0	0
Diplocladius cultriger	0	0	0	0	1	0	0
Eukiefferiella	100	40	5	0	8	45	50
Heleniella	0	0	0	0	0	0	0
Hydrobaenus	0	0	0	40	0	5	10
Limnophyes	0	0	0	0	1	20	0
Metriocnemus	0	0	0	0	0	0	0
Nanocladius	0	30	0	0	0	0	0
Orthocladius complex	0	530	145	360	23	60	180
Orthocladius lignicola	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	5	0
Parorthocladius	0	0	0	0	0	0	0
Rheocricotopus	0	10	10	0	8	35	0
Thienemanniella	0	0	0	0	4	5	10
Tvetenia	240	0	5	10	3	25	30
| Subfamily: Tanypodinae	0	0	0	0	0	0	0
Zavrelimyia	0	0	5	20	1	0	10
| Tribe: Pentaneurini	0	0	0	0	0	0	0
Thienemannimyia group	0	20	0	0	0	0	0
| Family: Culicidae	0	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC1_BIC-03_2021-05-05	LC_FRB_BIC-01_2021-05-06	LC_FRB_BIC-02_2021-05-06	LC_FRB_BIC-03_2021-05-06	LC_FRUS_BIC-01_2021-05-07	LC_FRUS_BIC-02_2021-05-07	LC_FRUS_BIC-03_2021-05-07
Sample Collection Date:	05-May-21	06-May-21	06-May-21	06-May-21	07-May-21	07-May-21	07-May-21
CC#:	CC220069	CC220070	CC220071	CC220072	CC220073	CC220074	CC220075
| Family: Dixidae	0	0	0	0	0	0	0
Dixa	0	0	0	0	0	0	0
| Family: Empididae	0	0	0	0	0	0	0
Chelifera/ Metachela	0	0	0	10	0	0	0
Clinocera	0	0	0	0	0	0	10
Neoplasta	0	30	0	10	0	5	0
Roederiodes	0	0	0	0	0	0	0
Trichoclinocera	0	0	5	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	5	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	1100	290	275	200	0	10	170
| Family: Simuliidae	0	10	5	0	2	15	10
Helodon	0	0	0	0	0	0	0
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	0	10	30	30	7	70	10
Simulium	0	250	90	10	23	110	100
Twinnia	0	0	0	0	0	0	0
| Family: Tipulidae	0	10	0	0	0	0	0
Antocha	0	40	0	20	0	0	10
Dicranota	40	0	15	10	1	0	10
| Family: Limoniidae	0	0	0	0	0	0	0
Eloeophila	0	0	0	0	0	0	0
Gonomyodes	0	0	0	0	0	0	0
Hesperoconopa	0	0	0	60	0	0	0
Ulomorpha	0	0	15	0	0	0	0
| Order: Thysanoptera	0	0	0	0	1	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0
| Class: Branchiopoda	0	0	0	0	0	0	0
| Order: Cladocera	0	0	5	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	0	0	10	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	0	140	60	110	3	25	80
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	30	0	50	0	5	10
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	10
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
| Order: Oribatida	0	0	0	0	2	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	0
| Class: Maxillipoda	0	0	0	0	0	0	0
| Class: Copepoda	20	0	0	0	1	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC1_BIC-03_2021-05-05	LC_FRB_BIC-01_2021-05-06	LC_FRB_BIC-02_2021-05-06	LC_FRB_BIC-03_2021-05-06	LC_FRUS_BIC-01_2021-05-07	LC_FRUS_BIC-02_2021-05-07	LC_FRUS_BIC-03_2021-05-07
Sample Collection Date:	05-May-21	06-May-21	06-May-21	06-May-21	07-May-21	07-May-21	07-May-21
CC#:	CC220069	CC220070	CC220071	CC220072	CC220073	CC220074	CC220075
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	10	0	0	0
Pisidium	0	0	0	10	0	0	10
| Class: Gastropoda	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0
| Family: Lymnaeidae	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	0	0	0	0	0	0	0
Lumbriculus	0	0	0	0	0	0	0
Rhynchelmis	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0	0
Enchytraeus	0	0	5	20	0	5	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	10	10	0	0	0	0
Totals:	**8980**	**3520**	**2635**	**3650**	**279**	**1620**	**3200**

Taxa present but not included:

Phylum: Arthropoda	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: Diptera	0	0	0	0	0	0	0
| Family: Cecidomyiidae	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0
| Class: Ostracoda	20	10	5	10	1	5	10
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: Tubificida	0	0	0	0	0	0	0
| Family: Lumbricidae	20	0	5	0	0	0	0
Phylum: Nemata	20	0	0	0	0	0	10
Phylum: Platyhelminthes	0	0	0	0	0	0	0
| Class: Turbellaria	20	10	5	10	0	5	10
Totals:	**80**	**20**	**15**	**20**	**1**	**10**	**30**

ND designation of a taxa represents a non

Project: Teck Dry Creek LAEMP (21-35)#1
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021
Sample:	LC_GRCK_BIC-01_2021-05-07	LC_GRCK_BIC-02_2021-05-07	LC_GRCK_BIC-03_2021-05-07	LC_DC2_BIC-01_2021_05-06	LC_DC2_BIC-02_2021_05-06	LC_DC2_BIC-03_2021_05-06
Sample Collection Date:	07-May-21	07-May-21	07-May-21	06-May-21	06-May-21	06-May-21
CC#:	CC220076	CC220077	CC220078	CC220079	CC220080	CC220081
Phylum: Arthropoda	0	0	0	0	0	0
| Order: Collembola	12	0	0	0	0	0
| Family: Hypogastruridae	0	0	0	0	6	0
Subphylum: Hexapoda	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0
Ameletus	4	14	0	0	0	0
| Family: Baetidae	181	1286	1480	0	0	8
Baetis	12	86	180	0	6	2
Baetis rhodani group	31	157	320	0	6	3
Baetis bicaudatus	115	914	1800	0	0	16
| Family: Ephemerellidae	0	0	0	0	0	0
Drunella	0	29	0	0	0	1
Drunella coloradensis	0	0	0	0	0	0
Drunella doddsii	0	0	0	0	0	0
Drunella grandis	0	0	0	0	0	0
Drunella spinifera	0	0	0	0	0	0
| Family: Heptageniidae	46	143	460	0	0	1
Cinygmula	27	157	240	0	0	1
Epeorus	31	86	300	0	0	0
Rhithrogena	0	14	60	0	0	0
| Order: Plecoptera	0	0	0	0	0	0
| Family: Capniidae	0	0	0	0	0	0
Bolshecapnia	0	0	0	0	0	0
Capnia	0	0	0	0	0	0
Capnura	0	0	0	0	0	0
| Family: Chloroperlidae	0	0	0	5	6	0
Haploperla	0	0	0	0	0	0
Plumiperla	0	0	0	0	0	0
Suwallia	0	0	0	0	0	0
Sweltsa	0	29	40	36	22	8
| Family: Leuctridae	0	14	0	0	0	0
Paraleuctra	4	14	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021
Sample:	LC_GRCK_BIC-01_2021-05-07	LC_GRCK_BIC-02_2021-05-07	LC_GRCK_BIC-03_2021-05-07	LC_DC2_BIC-01_2021_05-06	LC_DC2_BIC-02_2021_05-06	LC_DC2_BIC-03_2021_05-06
Sample Collection Date:	07-May-21	07-May-21	07-May-21	06-May-21	06-May-21	06-May-21
CC#:	CC220076	CC220077	CC220078	CC220079	CC220080	CC220081
| Family: Nemouridae	4	0	0	5	11	4
Nemoura	0	0	0	0	0	0
Ostrocerca	0	0	0	0	0	0
Prostoia	0	0	0	32	0	4
Visoka cataractae	35	71	240	0	0	0
Zapada	46	214	580	0	6	1
Zapada oregonensis group	58	143	420	373	461	78
Zapada cinctipes	0	0	0	41	28	8
Zapada columbiana	50	86	160	105	122	23
| Family: Peltoperlidae	0	0	0	0	0	0
Yoraperla	4	0	40	0	0	0
| Family: Perlidae	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0
| Family: Perlodidae	12	14	20	18	17	16
Isoperla	0	0	0	0	0	1
Kogotus	0	0	0	9	6	0
Megarcys	0	0	20	0	0	2
Setvena	12	29	60	0	0	0
| Family: Taeniopterygidae	0	0	20	0	0	0
Doddsia occidentalis	4	0	0	0	0	0
Taenionema	0	0	0	5	0	0
| Order: Trichoptera	0	0	0	36	28	0
| Family: Apataniidae	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0
Brachycentrus americanus	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0
Anagapetus	0	0	20	0	0	0
Glossosoma	0	0	0	0	0	0
| Family: Hydropsychidae	0	0	0	0	0	0
Parapsyche	0	0	20	9	33	4
Parapsyche elsis	4	0	0	0	22	0
| Family: Lepidostomatidae	0	0	0	0	0	0
Lepidostoma	8	0	0	0	0	0
| Family: Leptoceridae	0	0	0	0	0	0
| Family: Limnephilidae	0	0	0	0	0	0
Chyranda centralis	0	0	20	0	0	0
Dicosmoecus	0	0	0	0	0	0
Ecclisomyia	0	0	0	5	0	0
Hydatophylax	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0
Rhyacophila	38	71	0	227	328	108
Rhyacophila angelita group	0	0	0	0	0	0
Rhyacophila betteni group	0	0	0	5	17	3
Rhyacophila brunnea/vemna group	8	14	0	9	0	0
Rhyacophila hyalinata group	0	0	0	0	0	1
Rhyacophila vetina complex	0	0	20	0	0	0
Rhyacophila vobara subgroup	0	29	0	0	0	0
Rhyacophila vofixa group	0	0	0	9	0	1
Rhyacophila atrata complex	0	0	0	5	0	0
Rhyacophila narvae	15	57	100	14	11	0
Rhyacophila verrula group	4	0	0	218	394	39

Site:	2021	2021	2021	2021	2021	2021
Sample:	LC_GRCK_BIC-01_2021-05-07	LC_GRCK_BIC-02_2021-05-07	LC_GRCK_BIC-03_2021-05-07	LC_DC2_BIC-01_2021_05-06	LC_DC2_BIC-02_2021_05-06	LC_DC2_BIC-03_2021_05-06
Sample Collection Date:	07-May-21	07-May-21	07-May-21	06-May-21	06-May-21	06-May-21
CC#:	CC220076	CC220077	CC220078	CC220079	CC220080	CC220081
| Family: Thremmatidae	0	0	0	0	0	0
Oligophlebodes	8	43	0	91	78	13
| Family: Uenoidae	0	0	0	0	0	0
Neothremma	88	171	20	0	0	0
| Order: Coleoptera	0	0	0	0	0	0
| Family: Elmidae	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	0
| Family: Staphylinidae	0	0	0	0	6	1
| Order: Diptera	0	0	0	0	0	2
| Family: Blephariceridae	0	0	0	0	0	0
Philorus	4	0	0	0	0	0
| Family: Ceratopogonidae	0	0	0	0	0	0
Mallochohelea	0	0	0	0	0	0
| Family: Chironomidae	0	0	0	5	0	55
| Subfamily: Chironominae	0	0	0	0	0	0
| Tribe: Chironomini	0	0	0	0	0	0
Paracladopelma	0	0	20	0	0	0
Polypedilum	0	0	0	0	0	0
Stictochironomus	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	1
Cladotanytarsus	0	0	0	0	0	0
Stempellinella	0	0	0	0	0	0
Tanytarsus	192	286	380	9	144	0
| Subfamily: Diamesinae	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0
Diamesa	0	0	0	0	0	0
Pagastia	0	57	0	18	17	3
Pseudodiamesa	0	0	0	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0
Brillia	23	29	60	0	0	2
Corynoneura	0	0	0	0	0	0
Cricotopus	0	0	0	0	22	0
Cricotopus (Nostococladius)	0	0	0	0	0	0
Diplocladius cultriger	0	0	0	0	0	0
Eukiefferiella	23	0	40	14	11	4
Heleniella	0	0	0	0	0	0
Hydrobaenus	0	0	0	5	0	0
Limnophyes	123	229	220	5	0	7
Metriocnemus	0	0	0	0	0	0
Nanocladius	0	0	0	0	0	0
Orthocladius complex	4	43	40	41	89	13
Orthocladius lignicola	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0
Parorthocladius	0	0	0	9	0	0
Rheocricotopus	15	43	80	0	0	0
Thienemanniella	0	0	0	0	0	1
Tvetenia	8	86	0	27	28	14
| Subfamily: Tanypodinae	0	0	0	0	0	0
Zavrelimyia	0	0	0	0	0	0
| Tribe: Pentaneurini	0	0	0	0	0	0
Thienemannimyia group	0	0	0	0	0	0
| Family: Culicidae	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021
Sample:	LC_GRCK_BIC-01_2021-05-07	LC_GRCK_BIC-02_2021-05-07	LC_GRCK_BIC-03_2021-05-07	LC_DC2_BIC-01_2021_05-06	LC_DC2_BIC-02_2021_05-06	LC_DC2_BIC-03_2021_05-06
Sample Collection Date:	07-May-21	07-May-21	07-May-21	06-May-21	06-May-21	06-May-21
CC#:	CC220076	CC220077	CC220078	CC220079	CC220080	CC220081
| Family: Dixidae	0	0	0	0	0	0
Dixa	0	0	0	0	0	1
| Family: Empididae	0	0	0	5	0	0
Chelifera/ Metachela	0	0	0	18	11	2
Clinocera	0	0	0	0	0	0
Neoplasta	15	29	0	18	22	1
Roederiodes	0	0	0	0	0	0
Trichoclinocera	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0
Glutops	15	71	20	0	0	0
| Family: Psychodidae	0	0	0	0	0	0
Pericoma/Telmatoscopus	15	86	60	32	11	18
| Family: Simuliidae	0	14	0	0	0	0
Helodon	0	0	0	0	0	0
Prosimulium	42	114	40	0	0	0
Prosimulium/Helodon	15	157	80	0	0	0
Simulium	0	0	0	0	0	0
Twinnia	0	0	0	23	39	7
| Family: Tipulidae	0	0	0	0	0	0
Antocha	0	0	0	0	0	0
Dicranota	12	0	0	0	6	13
| Family: Limoniidae	0	0	0	0	0	0
Eloeophila	0	0	0	0	0	0
Gonomyodes	0	0	0	0	0	0
Hesperoconopa	0	0	0	0	0	0
Ulomorpha	0	0	0	0	0	0
| Order: Thysanoptera	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0
| Class: Branchiopoda	0	0	0	0	0	0
| Order: Cladocera	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0
| Order: Trombidiformes	0	0	0	5	6	0
| Family: Hygrobatidae	0	0	0	0	0	0
Atractides	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0
Lebertia	0	0	0	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0
Sperchon	0	14	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0
Suborder: Prostigmata	0	0	0	0	0	0
| Family: Stygothrombidiidae	0	0	0	0	0	0
Stygothrombium	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0
| Order: Oribatida	4	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	5	0	2
| Class: Maxillipoda	0	0	0	0	0	0
| Class: Copepoda	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021
Sample:	LC_GRCK_BIC-01_2021-05-07	LC_GRCK_BIC-02_2021-05-07	LC_GRCK_BIC-03_2021-05-07	LC_DC2_BIC-01_2021_05-06	LC_DC2_BIC-02_2021_05-06	LC_DC2_BIC-03_2021_05-06
Sample Collection Date:	07-May-21	07-May-21	07-May-21	06-May-21	06-May-21	06-May-21
CC#:	CC220076	CC220077	CC220078	CC220079	CC220080	CC220081
Phylum: Mollusca	0	0	0	0	0	0
| Class: Bivalvia	0	0	0	0	0	0
| Order: Veneroida	0	0	0	0	0	0
| Family: Pisidiidae	0	0	0	0	0	0
Pisidium	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	1
| Order: Basommatophora	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	20	0	0	0
Phylum: Annelida	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	0	0	0
Lumbriculus	0	0	0	0	0	0
Rhynchelmis	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0
| Family: Enchytraeidae	0	0	0	0	0	0
Enchytraeus	0	29	0	9	22	101
| Family: Naididae	0	0	0	0	0	0
Nais	0	0	0	0	0	0
Totals:	**1371**	**5172**	**7700**	**1505**	**2042**	**595**

Taxa present but not included:

Phylum: Arthropoda	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0
| Order: Diptera	0	0	0	0	0	0
| Family: Cecidomyiidae	0	0	0	5	0	6
Subphylum: Crustacea	0	0	0	0	0	0
| Class: Ostracoda	4	0	20	5	6	1
Phylum: Annelida	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	6	0
Phylum: Nemata	0	0	0	5	6	0
Phylum: Platyhelminthes	0	0	0	0	0	0
| Class: Turbellaria	4	14	20	5	6	1
Totals:	**8**	**14**	**40**	**20**	**24**	**8**

ND designation of a taxa represents a non

BENTHIC COMMUNITY DENSITY

Cordillera 21-35 #2 Raw Data

Project: LCO Dry LAEMP (21-35)#2
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCEF_BIC_1_2021-09-07	LC_DCEF_BIC_2_2021-09-07	LC_DCEF_BIC_3_2021-09-07	LC_DC2_BIC_1_2021-09-09	LC_DC2_BIC_2_2021-09-09	LC_DC2_BIC_3_2021-09-09	LC_DC4_BIC_1_2021-09-09
Sample Collection Date:	07-Sep-21	07-Sep-21	07-Sep-21	09-Sep-21	09-Sep-21	09-Sep-21	09-Sep-21
CC#:	CC221314	CC221315	CC221316	CC221317	CC221318	CC221319	CC221320
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	80	20	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	20	0
| Family: Ameletidae	0	0	0	0	0	0	0
Ameletus	100	20	160	0	0	0	0
| Family: Baetidae	0	0	0	0	20	80	360
Baetis	40	20	0	0	0	0	40
Baetis rhodani group	40	20	0	20	20	60	900
Baetis bicaudatus	20	0	40	0	0	0	0
Diphetor hageni	0	0	0	0	0	0	0
| Family: Ephemerellidae	840	900	720	540	1220	1820	1500
Drunella	0	0	0	0	0	0	0
Drunella grandis group	0	0	0	0	0	0	0
Drunella coloradensis	20	20	0	0	0	0	0
Drunella doddsii	340	140	160	100	100	60	160
Drunella grandis	0	0	0	0	0	0	0
Ephemerella	0	0	0	0	0	0	0
| Family: Heptageniidae	3580	3660	2060	80	200	80	880
Cinygmula	880	680	680	0	20	100	800
Epeorus	180	80	140	0	0	0	60
Rhithrogena	140	140	100	0	0	0	0
| Family: Leptophlebiidae	0	0	0	0	0	0	0
| Order: Plecoptera	0	0	0	0	0	0	120
| Family: Capniidae	0	0	60	20	20	0	0
| Family: Chloroperlidae	280	480	100	60	220	420	200
Haploperla	0	0	0	0	0	0	0
Plumiperla	0	0	20	0	0	0	0
Sweltsa	400	240	220	40	80	40	540
| Family: Leuctridae	20	0	0	0	0	0	0
Paraleuctra	0	20	0	0	0	0	0
| Family: Nemouridae	0	40	0	5040	60	140	120
Malenka	0	0	0	0	0	0	0
Visoka cataractae	0	60	20	0	0	0	0
Zapada	20	20	0	2760	3080	5680	940
Zapada oregonensis group	0	0	0	680	1240	680	960
Zapada cinctipes	0	0	0	1220	2380	2440	100
Zapada columbiana	480	900	240	360	300	560	1680

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCEF_BIC_1_2021-09-07	LC_DCEF_BIC_2_2021-09-07	LC_DCEF_BIC_3_2021-09-07	LC_DC2_BIC_1_2021-09-09	LC_DC2_BIC_2_2021-09-09	LC_DC2_BIC_3_2021-09-09	LC_DC4_BIC_1_2021-09-09
Sample Collection Date:	07-Sep-21	07-Sep-21	07-Sep-21	09-Sep-21	09-Sep-21	09-Sep-21	09-Sep-21
CC#:	CC221314	CC221315	CC221316	CC221317	CC221318	CC221319	CC221320
| Family: Peltoperlidae	0	0	0	0	0	0	0
Yoraperla	360	60	0	0	0	0	20
| Family: Perlidae	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	80	260	180	60	220	220	460
Isoperla	0	0	0	0	0	0	0
Kogotus	0	0	0	140	180	500	200
Megarcys	200	200	120	140	120	480	320
Setvena	0	260	180	0	0	0	0
| Family: Taeniopterygidae	0	0	0	340	160	460	200
Taenionema	0	0	0	0	0	80	0
| Order: Trichoptera	40	120	100	0	100	20	160
| Family: Apataniidae	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0	0
Anagapetus	0	0	0	0	0	0	0
Glossosoma	0	0	0	0	0	0	0
| Family: Hydropsychidae	20	0	0	1320	900	1180	1660
Parapsyche	0	0	0	0	0	0	0
Parapsyche elsis	0	0	0	20	40	140	160
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| Family: Limnephilidae	40	0	40	20	60	20	100
Ecclisomyia	0	0	0	0	0	0	0
Homophylax	0	80	20	0	0	0	0
Pycnopsyche	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	140	120	40	220	40	80	40
Rhyacophila betteni group	0	0	0	240	240	460	60
Rhyacophila brunnea/vemna group	0	20	40	60	80	40	140
Rhyacophila hyalinata group	20	20	0	20	0	20	20
Rhyacophila vetina complex	0	20	60	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	20	60	0
Rhyacophila atrata complex	0	0	0	0	20	0	0
Rhyacophila narvae	0	0	0	0	20	20	680
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	0	0	0	100	220	200	20
| Family: Uenoidae	0	0	0	0	0	0	0
Neothremma	0	0	20	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	40
| Family: Curculionidae	0	0	0	0	0	20	0
| Family: Elmidae	0	0	0	0	0	0	0
Heterlimnius	0	0	0	0	0	20	0
| Family: Staphylinidae	0	20	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCEF_BIC_1_2021-09-07	LC_DCEF_BIC_2_2021-09-07	LC_DCEF_BIC_3_2021-09-07	LC_DC2_BIC_1_2021-09-09	LC_DC2_BIC_2_2021-09-09	LC_DC2_BIC_3_2021-09-09	LC_DC4_BIC_1_2021-09-09
Sample Collection Date:	07-Sep-21	07-Sep-21	07-Sep-21	09-Sep-21	09-Sep-21	09-Sep-21	09-Sep-21
CC#:	CC221314	CC221315	CC221316	CC221317	CC221318	CC221319	CC221320
| Order: Diptera	0	0	0	20	0	0	0
| Family: Chironomidae	180	220	100	100	180	380	320
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0	0
Micropsectra	0	20	0	0	0	0	0
Stempellina	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	180	80	0	0	20	20	20
Pagastia	120	60	0	20	0	20	560
Pseudodiamesa	20	0	20	40	20	20	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	60	0	80	80	100	0
Cardiocladius	0	0	0	0	0	0	0
Corynoneura	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Eukiefferiella	220	80	20	120	100	240	460
Heleniella	0	0	0	0	0	0	0
Hydrobaenus	0	0	20	0	0	20	20
Limnophyes	0	0	0	0	20	0	0
Metriocnemus	0	0	20	0	0	0	0
Orthocladius complex	580	160	100	100	220	500	720
Orthocladius lignicola	0	0	0	0	40	40	0
Parametriocnemus	0	20	0	0	0	0	0
Parorthocladius	80	20	80	20	20	40	0
Psectrocladius	0	0	0	0	0	0	0
Rheocricotopus	20	0	40	0	0	0	80
Synorthocladius	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	20	0	0
Tvetenia	220	660	140	80	80	380	360
| Family: Dixidae	0	0	0	0	0	0	0
Dixa	0	20	0	0	0	0	0
| Family: Empididae	0	0	0	0	0	0	20
Chelifera/ Metachela	0	0	0	120	20	20	20
Clinocera	0	0	20	0	0	0	0
Clinocerinae Unknown Genus A	0	0	0	0	0	0	20
Neoplasta	0	0	0	0	0	0	40
Oreogeton	20	40	0	0	0	0	0
Trichoclinocera	0	0	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	60	240	220	160	180	360	380
| Family: Simuliidae	0	0	0	0	0	0	0
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	0	60	60	0	0
Simulium	0	0	0	0	0	0	60
| Family: Tipulidae	0	0	0	0	0	0	0
Antocha	0	0	0	0	0	0	0
Dicranota	0	60	0	20	20	0	0
| Family: Limoniidae	0	0	0	0	0	0	0
Eloeophila	0	0	0	0	0	0	0
Pedicia	0	20	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCEF_BIC_1_2021-09-07	LC_DCEF_BIC_2_2021-09-07	LC_DCEF_BIC_3_2021-09-07	LC_DC2_BIC_1_2021-09-09	LC_DC2_BIC_2_2021-09-09	LC_DC2_BIC_3_2021-09-09	LC_DC4_BIC_1_2021-09-09
Sample Collection Date:	07-Sep-21	07-Sep-21	07-Sep-21	09-Sep-21	09-Sep-21	09-Sep-21	09-Sep-21
CC#:	CC221314	CC221315	CC221316	CC221317	CC221318	CC221319	CC221320
| Order: Hemiptera	0	0	0	0	0	20	0
| Order: Lepidoptera	0	0	0	20	0	0	0
| Order: Hymenoptera	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	0	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	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Albertathyas	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Atractides	0	20	60	0	0	0	0
Hygrobates	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	60	80	20	0	20	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	20	0	0	0	0	20
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	20	0	0	0	0
| Family: Hydrozetidae	0	0	20	0	0	0	0
| Class: Maxillipoda	0	0	0	0	0	0	0
| Class: Copepoda	0	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0
Fossaria	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	0	0	40	0	60	220	0
Rhynchelmis	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	0	0	0	0
Totals:	**10040**	**10580**	**6480**	**14560**	**12540**	**18580**	**16740**

Taxa present but not included:

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DCEF_BIC_1_2021-09-07	LC_DCEF_BIC_2_2021-09-07	LC_DCEF_BIC_3_2021-09-07	LC_DC2_BIC_1_2021-09-09	LC_DC2_BIC_2_2021-09-09	LC_DC2_BIC_3_2021-09-09	LC_DC4_BIC_1_2021-09-09
Sample Collection Date:	07-Sep-21	07-Sep-21	07-Sep-21	09-Sep-21	09-Sep-21	09-Sep-21	09-Sep-21
CC#:	CC221314	CC221315	CC221316	CC221317	CC221318	CC221319	CC221320
Phylum: Arthropoda	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: Coleoptera	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0
| Subfamily: Scolytinae	0	0	0	20	0	0	0
| Order: Homoptera	0	0	0	0	0	0	0
| Family: Aphididae	0	20	0	40	0	40	0
Subphylum: Crustacea	0	0	0	0	0	0	0
| Class: Ostracoda	20	20	20	20	20	20	20
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: Tubificida	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	80	0
Phylum: Nemata	0	20	0	20	0	20	20
Phylum: Platyhelminthes	0	0	0	0	0	0	0
| Class: Turbellaria	0	20	0	20	20	20	20
Totals:	**20**	**80**	**20**	**120**	**40**	**180**	**60**

ND designation of a taxa represents a non-distinct taxa. This adjusts where the associated taxa fall in the metrics for this sample because the individuals are likely represented by Genus or Species level identifications.

Project: LCO Dry LAEMP (21-35)#2
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC4_BIC_2_2021-09-09	LC_DC4_BIC_3_2021-09-09	LC_DC1_BIC_1_2021-09-07	LC_DC1_BIC_2_2021-09-07	LC_DC1_BIC_3_2021-09-07	LC_FRB_BIC_1_2021-09-12	LC_FRB_BIC_2_2021-09-12
Sample Collection Date:	09-Sep-21	09-Sep-21	07-Sep-21	07-Sep-21	07-Sep-21	12-Sep-21	12-Sep-21
CC#:	CC221321	CC221322	CC221323	CC221324	CC221325	CC221326	CC221327
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	0	20	0	0	0
| Family: Baetidae	220	120	3020	2400	7540	460	320
Baetis	60	60	20	80	40	40	60
Baetis rhodani group	580	700	260	240	420	1000	640
Baetis bicaudatus	0	0	0	0	0	0	0
Diphetor hageni	0	20	0	0	0	0	0
| Family: Ephemerellidae	1880	2420	1480	700	680	260	420
Drunella	0	0	0	0	0	0	0
Drunella grandis group	0	0	0	0	0	0	20
Drunella coloradensis	0	0	0	0	0	0	0
Drunella doddsii	200	280	140	320	360	0	0
Drunella grandis	0	0	0	0	0	0	0
Ephemerella	0	0	0	0	0	0	0
| Family: Heptageniidae	780	480	840	340	580	920	1000
Cinygmula	980	1100	1400	1460	2440	1240	1380
Epeorus	40	80	20	20	20	20	40
Rhithrogena	0	0	0	0	0	20	40
| Family: Leptophlebiidae	0	20	0	0	0	0	0
| Order: Plecoptera	120	60	20	60	20	0	0
| Family: Capniidae	40	0	0	0	0	40	20
| Family: Chloroperlidae	180	540	20	20	120	20	0
Haploperla	0	0	0	0	0	20	0
Plumiperla	0	0	0	0	0	0	0
Sweltsa	780	560	140	220	260	40	60
| Family: Leuctridae	0	0	0	20	40	20	0
Paraleuctra	20	0	0	0	0	20	0
| Family: Nemouridae	80	40	0	120	180	20	0
Malenka	0	0	0	0	0	0	0
Visoka cataractae	0	40	0	0	0	0	0
Zapada	880	860	1540	1640	3160	320	60
Zapada oregonensis group	580	1060	1440	1620	2800	320	200
Zapada cinctipes	140	60	60	80	300	720	100
Zapada columbiana	700	740	380	380	600	20	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC4_BIC_2_2021-09-09	LC_DC4_BIC_3_2021-09-09	LC_DC1_BIC_1_2021-09-07	LC_DC1_BIC_2_2021-09-07	LC_DC1_BIC_3_2021-09-07	LC_FRB_BIC_1_2021-09-12	LC_FRB_BIC_2_2021-09-12
Sample Collection Date:	09-Sep-21	09-Sep-21	07-Sep-21	07-Sep-21	07-Sep-21	12-Sep-21	12-Sep-21
CC#:	CC221321	CC221322	CC221323	CC221324	CC221325	CC221326	CC221327
| Family: Peltoperlidae	0	0	0	0	0	0	0
Yoraperla	20	20	0	0	0	0	0
| Family: Perlidae	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	440	220	60	80	240	220	40
Isoperla	0	0	0	0	0	20	20
Kogotus	180	200	160	200	480	120	120
Megarcys	180	360	40	40	120	0	40
Setvena	0	0	0	0	0	0	0
| Family: Taeniopterygidae	60	40	140	300	1080	220	220
Taenionema	0	0	0	0	0	0	0
| Order: Trichoptera	560	580	540	380	80	0	20
| Family: Apataniidae	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	120	0
Micrasema	0	0	0	0	0	40	0
| Family: Glossosomatidae	0	0	20	20	0	0	0
Anagapetus	0	0	20	0	0	0	0
Glossosoma	0	20	0	0	0	20	0
| Family: Hydropsychidae	960	840	720	540	660	20	0
Parapsyche	40	0	0	20	0	0	0
Parapsyche elsis	40	100	220	200	100	20	20
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0	0
| Family: Limnephilidae	260	140	20	20	60	60	20
Ecclisomyia	0	0	0	0	0	0	0
Homophylax	0	0	0	0	0	0	0
Pycnopsyche	0	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	40	40	0	20	20	60	60
Rhyacophila betteni group	20	0	40	40	20	60	20
Rhyacophila brunnea/vemna group	40	40	80	80	60	180	100
Rhyacophila hyalinata group	0	0	0	0	20	0	0
Rhyacophila vetina complex	0	0	0	0	0	0	0
Rhyacophila vofixa group	0	0	0	0	0	0	0
Rhyacophila atrata complex	0	0	20	0	0	60	20
Rhyacophila narvae	140	260	60	60	20	0	0
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	40	40	660	480	120	0	60
| Family: Uenoidae	0	0	0	0	0	0	0
Neothremma	0	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	20	0	80	0	0
| Family: Elmidae	0	0	0	0	0	60	0
Heterlimnius	0	0	0	0	20	200	120
| Family: Staphylinidae	0	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC4_BIC_2_2021-09-09	LC_DC4_BIC_3_2021-09-09	LC_DC1_BIC_1_2021-09-07	LC_DC1_BIC_2_2021-09-07	LC_DC1_BIC_3_2021-09-07	LC_FRB_BIC_1_2021-09-12	LC_FRB_BIC_2_2021-09-12
Sample Collection Date:	09-Sep-21	09-Sep-21	07-Sep-21	07-Sep-21	07-Sep-21	12-Sep-21	12-Sep-21
CC#:	CC221321	CC221322	CC221323	CC221324	CC221325	CC221326	CC221327
| Order: Diptera	0	0	0	20	0	0	0
| Family: Chironomidae	320	200	680	520	1000	120	60
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	20	0
Micropsectra	60	0	100	0	20	20	0
Stempellina	0	0	20	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0	0
Diamesa	0	0	200	80	640	0	20
Pagastia	260	300	300	260	340	60	40
Pseudodiamesa	0	0	20	20	0	0	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	40	0	0	20	0	0
Cardiocladius	0	0	0	20	40	0	0
Corynoneura	0	0	0	0	0	0	0
Cricotopus (Nostococladius)	0	0	80	40	20	0	0
Eukiefferiella	180	160	460	300	1600	80	0
Heleniella	0	0	0	0	0	0	0
Hydrobaenus	140	100	140	100	20	20	20
Limnophyes	0	0	0	0	0	0	0
Metriocnemus	0	0	0	0	0	0	0
Orthocladius complex	120	320	380	300	660	200	120
Orthocladius lignicola	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0	0
Parorthocladius	0	20	60	20	20	0	0
Psectrocladius	0	0	0	0	0	0	0
Rheocricotopus	260	200	460	1360	2480	0	0
Synorthocladius	0	0	0	0	0	0	0
Thienemanniella	0	0	0	0	0	0	0
Tvetenia	240	160	500	560	600	80	0
| Family: Dixidae	0	0	0	0	0	0	0
Dixa	0	0	0	0	0	0	0
| Family: Empididae	0	0	20	20	0	0	20
Chelifera/ Metachela	0	0	20	20	20	0	0
Clinocera	0	0	0	0	0	0	0
Clinocerinae Unknown Genus A	0	0	0	0	0	0	0
Neoplasta	40	0	60	40	0	0	0
Oreogeton	0	0	0	0	0	0	0
Trichoclinocera	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	20	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	300	120	1160	960	860	740	420
| Family: Simuliidae	0	0	60	0	0	0	0
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	20	0	0	0	0
Simulium	0	0	40	0	80	0	0
| Family: Tipulidae	0	0	0	0	0	0	0
Antocha	0	0	0	0	0	0	20
Dicranota	0	40	0	20	0	0	0
| Family: Limoniidae	0	0	0	0	0	0	0
Eloeophila	0	0	0	0	0	0	0
Pedicia	0	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC4_BIC_2_2021-09-09	LC_DC4_BIC_3_2021-09-09	LC_DC1_BIC_1_2021-09-07	LC_DC1_BIC_2_2021-09-07	LC_DC1_BIC_3_2021-09-07	LC_FRB_BIC_1_2021-09-12	LC_FRB_BIC_2_2021-09-12
Sample Collection Date:	09-Sep-21	09-Sep-21	07-Sep-21	07-Sep-21	07-Sep-21	12-Sep-21	12-Sep-21
CC#:	CC221321	CC221322	CC221323	CC221324	CC221325	CC221326	CC221327
| Order: Hemiptera	0	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0	0
| Order: Hymenoptera	0	0	20	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0	0
| Order: Trombidiformes	0	0	20	0	0	0	0
| Family: Aturidae	0	0	0	0	0	0	0
Aturus	0	0	20	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0	0
Feltria	0	0	0	0	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Albertathyas	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Atractides	0	0	0	0	0	0	0
Hygrobates	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	0	0	0	0	0	200	260
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	0	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	20	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	20
| Family: Hydrozetidae	0	0	0	0	0	0	0
| Class: Maxillipoda	0	0	0	0	0	0	0
| Class: Copepoda	20	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	0
Fossaria	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	0	0	0	40	0	0	0
Rhynchelmis	0	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	0	0	0	0	0	40	60
Totals:	**13220**	**13820**	**18440**	**16920**	**31160**	**8600**	**6300**

Taxa present but not included:

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_DC4_BIC_2_2021-09-09	LC_DC4_BIC_3_2021-09-09	LC_DC1_BIC_1_2021-09-07	LC_DC1_BIC_2_2021-09-07	LC_DC1_BIC_3_2021-09-07	LC_FRB_BIC_1_2021-09-12	LC_FRB_BIC_2_2021-09-12
Sample Collection Date:	09-Sep-21	09-Sep-21	07-Sep-21	07-Sep-21	07-Sep-21	12-Sep-21	12-Sep-21
CC#:	CC221321	CC221322	CC221323	CC221324	CC221325	CC221326	CC221327
Phylum: Arthropoda	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: Coleoptera	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0
| Subfamily: Scolytinae	0	0	0	0	0	0	0
| Order: Homoptera	0	0	0	0	0	0	0
| Family: Aphididae	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0
| Class: Ostracoda	20	20	20	20	20	20	20
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: Tubificida	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	20
Phylum: Nemata	0	20	20	0	20	0	20
Phylum: Platyhelminthes	0	0	0	0	0	0	0
| Class: Turbellaria	20	20	0	0	0	20	20
Totals:	**40**	**60**	**40**	**20**	**40**	**40**	**80**

ND designation of a taxa represents a non-

Project: LCO Dry LAEMP (21-35)#2
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_FRB_BIC_3_2021-09-12	LC_DCDS_BIC_1_2021-09-10	LC_DCDS_BIC_2_2021-09-10	LC_DCDS_BIC_3_2021-09-10	LC_GRCK_BIC_1_2021-09-13	LC_GRCK_BIC_2_2021-09-13	LC_GRCK_BIC_3_2021-09-13
Sample Collection Date:	12-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21	13-Sep-21	13-Sep-21	13-Sep-21
CC#:	CC221328	CC221329	CC221330	CC221331	CC221332	CC221333	CC221334
Phylum: Arthropoda	0	0	0	0	0	0	0
| Order: Collembola	0	0	0	20	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	33	0	0	0	12	0	0
| Family: Baetidae	200	300	120	20	500	300	740
Baetis	50	20	0	0	0	0	80
Baetis rhodani group	617	120	20	60	62	46	60
Baetis bicaudatus	0	0	0	0	12	0	0
Diphetor hageni	0	0	0	0	0	0	0
| Family: Ephemerellidae	350	1440	1400	1520	12	8	40
Drunella	0	0	0	0	0	0	0
Drunella grandis group	17	0	0	0	0	0	0
Drunella coloradensis	0	0	0	0	0	0	0
Drunella doddsii	0	40	80	0	38	54	20
Drunella grandis	0	0	0	0	0	0	0
Ephemerella	0	0	0	0	0	0	0
| Family: Heptageniidae	1017	40	0	0	225	215	120
Cinygmula	750	20	0	0	212	123	360
Epeorus	33	0	0	0	450	115	500
Rhithrogena	17	0	0	0	100	115	80
| Family: Leptophlebiidae	0	0	0	0	0	0	0
| Order: Plecoptera	0	40	20	20	0	0	0
| Family: Capniidae	0	60	40	20	62	46	120
| Family: Chloroperlidae	0	220	140	60	12	15	20
Haploperla	0	0	0	0	0	0	0
Plumiperla	0	0	0	0	0	0	0
Sweltsa	33	100	20	60	62	92	160
| Family: Leuctridae	0	0	0	0	0	31	20
Paraleuctra	0	0	20	0	12	15	20
| Family: Nemouridae	0	100	40	100	50	15	200
Malenka	0	0	0	0	0	0	20
Visoka cataractae	0	0	0	0	200	269	500
Zapada	117	1360	2000	1880	62	38	240
Zapada oregonensis group	250	320	180	140	12	15	20
Zapada cinctipes	67	160	120	80	0	0	0
Zapada columbiana	0	400	400	400	412	438	700

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_FRB_BIC_3_2021-09-12	LC_DCDS_BIC_1_2021-09-10	LC_DCDS_BIC_2_2021-09-10	LC_DCDS_BIC_3_2021-09-10	LC_GRCK_BIC_1_2021-09-13	LC_GRCK_BIC_2_2021-09-13	LC_GRCK_BIC_3_2021-09-13
Sample Collection Date:	12-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21	13-Sep-21	13-Sep-21	13-Sep-21
CC#:	CC221328	CC221329	CC221330	CC221331	CC221332	CC221333	CC221334
| Family: Peltoperlidae	0	0	0	0	0	0	0
Yoraperla	0	0	0	0	38	38	40
| Family: Perlidae	0	0	0	0	0	0	0
Hesperoperla	0	0	0	0	0	0	0
| Family: Perlodidae	50	100	180	240	62	38	80
Isoperla	17	0	0	0	0	0	0
Kogotus	67	80	200	120	0	0	0
Megarcys	0	40	40	20	12	0	0
Setvena	0	0	0	0	50	54	80
| Family: Taeniopterygidae	250	60	140	40	38	31	60
Taenionema	0	0	0	0	0	0	0
| Order: Trichoptera	50	80	220	100	25	0	140
| Family: Apataniidae	0	0	0	0	0	0	0
Pedomoecus sierra	0	0	0	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0	0
Brachycentrus	0	0	0	0	0	0	0
Micrasema	0	0	0	0	0	0	0
| Family: Glossosomatidae	0	0	0	20	0	0	20
Anagapetus	0	0	0	20	25	8	0
Glossosoma	0	0	0	0	0	0	0
| Family: Hydropsychidae	17	840	840	1120	38	77	160
Parapsyche	0	20	0	0	0	0	20
Parapsyche elsis	0	60	60	20	0	0	20
| Family: Lepidostomatidae	0	0	0	0	0	0	0
Lepidostoma	0	0	0	0	12	0	20
| Family: Limnephilidae	0	60	20	40	12	23	0
Ecclisomyia	0	0	0	0	0	0	0
Homophylax	0	0	0	0	12	0	0
Pycnopsyche	0	0	0	0	0	8	0
| Family: Rhyacophilidae	0	0	0	0	0	0	0
Rhyacophila	100	40	80	80	50	69	260
Rhyacophila betteni group	17	40	80	20	0	0	0
Rhyacophila brunnea/vemna group	67	40	20	20	50	38	140
Rhyacophila hyalinata group	0	0	0	0	0	0	0
Rhyacophila vetina complex	0	0	0	0	0	0	0
Rhyacophila vofixa group	0	100	0	0	50	38	100
Rhyacophila atrata complex	50	0	0	0	0	8	0
Rhyacophila narvae	0	80	60	80	38	92	180
| Family: Thremmatidae	0	0	0	0	0	0	0
Oligophlebodes	33	500	640	420	0	8	0
| Family: Uenoidae	0	0	0	0	0	0	0
Neothremma	0	0	0	0	562	69	540
| Order: Coleoptera	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	20	0	0	0
| Family: Elmidae	17	20	0	0	0	0	0
Heterlimnius	100	20	40	20	0	8	0
| Family: Staphylinidae	0	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_FRB_BIC_3_2021-09-12	LC_DCDS_BIC_1_2021-09-10	LC_DCDS_BIC_2_2021-09-10	LC_DCDS_BIC_3_2021-09-10	LC_GRCK_BIC_1_2021-09-13	LC_GRCK_BIC_2_2021-09-13	LC_GRCK_BIC_3_2021-09-13
Sample Collection Date:	12-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21	13-Sep-21	13-Sep-21	13-Sep-21
CC#:	CC221328	CC221329	CC221330	CC221331	CC221332	CC221333	CC221334
| Order: Diptera	0	0	0	0	0	0	20
| Family: Chironomidae	17	300	440	160	38	15	40
| Subfamily: Chironominae	0	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	100	0	0	0
Micropsectra	0	100	80	80	25	8	320
Stempellina	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	17	20	80	120	0	0	0
Pagastia	0	20	140	120	12	0	0
Pseudodiamesa	0	80	40	60	0	8	0
| Subfamily: Orthocladiinae	0	0	0	0	0	0	0
Brillia	0	40	40	0	50	31	60
Cardiocladius	0	0	0	0	0	0	0
Corynoneura	0	0	20	0	0	0	20
Cricotopus (Nostococladius)	0	0	0	0	0	0	0
Eukiefferiella	17	60	160	180	0	0	0
Heleniella	0	0	0	0	0	0	20
Hydrobaenus	0	20	80	80	0	0	0
Limnophyes	0	0	0	0	12	8	20
Metriocnemus	0	0	0	0	0	0	0
Orthocladius complex	150	640	880	1200	0	0	0
Orthocladius lignicola	0	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	15	40
Parorthocladius	0	0	40	20	12	0	0
Psectrocladius	17	0	0	0	0	0	0
Rheocricotopus	0	0	40	20	0	8	20
Synorthocladius	0	0	0	0	0	0	0
Thienemanniella	0	0	40	0	0	0	0
Tvetenia	33	100	60	120	25	23	20
| Family: Dixidae	0	0	0	0	0	0	0
Dixa	0	0	0	0	0	8	0
| Family: Empididae	0	0	0	0	0	0	0
Chelifera/ Metachela	17	0	20	20	12	8	0
Clinocera	0	0	0	0	0	8	0
Clinocerinae Unknown Genus A	0	0	0	0	0	0	0
Neoplasta	0	0	20	0	12	23	20
Oreogeton	0	0	20	0	0	0	20
Trichoclinocera	0	0	0	0	0	0	0
| Family: Pelecorhynchidae	0	0	0	0	0	0	0
Glutops	0	0	0	0	0	15	20
| Family: Psychodidae	0	0	0	0	0	0	0
Pericoma/Telmatoscopus	583	40	40	40	112	46	160
| Family: Simuliidae	0	0	0	0	0	0	0
Prosimulium	0	0	0	0	0	0	0
Prosimulium/Helodon	0	0	20	20	12	0	0
Simulium	0	0	20	0	0	0	0
| Family: Tipulidae	0	0	0	0	0	0	0
Antocha	17	0	0	0	0	0	0
Dicranota	0	0	0	20	12	23	0
| Family: Limoniidae	0	0	0	0	0	0	0
Eloeophila	0	0	0	0	0	0	20
Pedicia	0	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_FRB_BIC_3_2021-09-12	LC_DCDS_BIC_1_2021-09-10	LC_DCDS_BIC_2_2021-09-10	LC_DCDS_BIC_3_2021-09-10	LC_GRCK_BIC_1_2021-09-13	LC_GRCK_BIC_2_2021-09-13	LC_GRCK_BIC_3_2021-09-13
Sample Collection Date:	12-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21	13-Sep-21	13-Sep-21	13-Sep-21
CC#:	CC221328	CC221329	CC221330	CC221331	CC221332	CC221333	CC221334
| Order: Hemiptera	0	0	0	20	0	0	0
| Order: Lepidoptera	0	0	0	20	0	0	0
| Order: Hymenoptera	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	0	0	0	40	12	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	0	0	0	20	0	0	0
| Family: Hydryphantidae	0	0	0	0	0	0	0
Albertathyas	0	0	0	0	0	0	0
| Family: Hygrobatidae	0	0	0	0	0	0	0
Atractides	0	0	0	0	25	0	0
Hygrobates	0	0	0	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0	0
Lebertia	217	0	20	20	0	0	0
| Family: Sperchontidae	0	0	0	0	0	0	0
Sperchon	33	0	0	0	0	0	0
| Family: Torrenticolidae	0	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0	0
| Order: Oribatida	0	0	0	0	0	0	0
| Family: Hydrozetidae	0	0	0	0	0	0	20
| Class: Maxillipoda	0	0	0	0	0	0	0
| Class: Copepoda	0	20	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0	20
Fossaria	0	0	0	0	12	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	0	0	0	0	38	0	20
Rhynchelmis	0	0	0	0	12	0	0
| Order: Tubificida	0	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0	0
Nais	33	0	0	0	0	0	0
Totals:	**5537**	**8360**	**9520**	**9260**	**4014**	**2804**	**6760**

Taxa present but not included:

Site:	2021	2021	2021	2021	2021	2021	2021
Sample:	LC_FRB_BIC_3_2021-09-12	LC_DCDS_BIC_1_2021-09-10	LC_DCDS_BIC_2_2021-09-10	LC_DCDS_BIC_3_2021-09-10	LC_GRCK_BIC_1_2021-09-13	LC_GRCK_BIC_2_2021-09-13	LC_GRCK_BIC_3_2021-09-13
Sample Collection Date:	12-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21	13-Sep-21	13-Sep-21	13-Sep-21
CC#:	CC221328	CC221329	CC221330	CC221331	CC221332	CC221333	CC221334
Phylum: Arthropoda	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: Coleoptera	0	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0	0
| Subfamily: Scolytinae	0	0	0	0	0	0	0
| Order: Homoptera	0	0	0	0	0	0	0
| Family: Aphididae	0	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0	0
| Class: Ostracoda	0	20	20	20	12	8	20
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: Tubificida	0	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0	0
Phylum: Nemata	0	0	20	20	12	8	20
Phylum: Platyhelminthes	0	0	0	0	0	0	0
| Class: Turbellaria	17	20	20	20	12	8	20
Totals:	**17**	**40**	**60**	**60**	**36**	**24**	**60**

ND designation of a taxa represents a non-

Project: LCO Dry LAEMP (21-35)#2
Minnow Environmental (BC)
Taxonomist: Scott Finlayson
scottfinlayson@cordilleraconsulting.ca
250-494-7553

Site:	2021	2021	2021	2021	2021	2021
Sample:	LC_FRUS_BIC_1_2021-09-12	LC_FRUS_BIC_2_2021-09-12	LC_FRUS_BIC_3_2021-09-12	LC_DC3_BIC_1_2021-09-10	LC_DC3_BIC_2_2021-09-10	LC_DC3_BIC_3_2021-09-10
Sample Collection Date:	12-Sep-21	12-Sep-21	12-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21
CC#:	CC221335	CC221336	CC221337	CC221338	CC221339	CC221340
Phylum: Arthropoda	0	0	0	0	0	0
| Order: Collembola	0	0	0	20	0	0
Subphylum: Hexapoda	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0
| Order: Ephemeroptera	0	0	0	0	0	0
| Family: Ameletidae	0	0	0	0	0	0
Ameletus	0	15	20	0	0	0
| Family: Baetidae	57	80	260	0	0	0
Baetis	14	0	20	0	0	0
Baetis rhodani group	114	30	180	0	0	0
Baetis bicaudatus	0	0	0	0	0	0
Diphetor hageni	0	0	0	0	0	0
| Family: Ephemerellidae	214	155	500	0	0	40
Drunella	0	0	0	0	0	0
Drunella grandis group	0	0	0	0	0	0
Drunella coloradensis	0	0	0	0	0	0
Drunella doddsii	0	0	20	0	0	0
Drunella grandis	14	25	0	0	0	0
Ephemerella	0	5	20	0	0	0
| Family: Heptageniidae	943	395	840	0	0	0
Cinygmula	343	200	720	20	0	0
Epeorus	71	5	0	20	0	0
Rhithrogena	0	5	0	0	0	0
| Family: Leptophlebiidae	0	0	0	0	0	0
| Order: Plecoptera	14	0	0	0	0	0
| Family: Capniidae	0	0	20	260	140	180
| Family: Chloroperlidae	0	10	0	200	40	20
Haploperla	0	0	0	0	0	0
Plumiperla	0	0	0	0	40	0
Sweltsa	57	25	120	80	0	40
| Family: Leuctridae	0	0	0	20	0	20
Paraleuctra	0	0	20	60	20	60
| Family: Nemouridae	29	0	0	80	40	0
Malenka	0	0	0	0	0	0
Visoka cataractae	0	0	0	20	0	20
Zapada	271	135	360	60	0	0
Zapada oregonensis group	400	145	800	180	160	160
Zapada cinctipes	214	95	240	0	0	0
Zapada columbiana	0	5	20	1160	720	360

Site:	2021	2021	2021	2021	2021	2021
Sample:	LC_FRUS_BIC_1_2021-09-12	LC_FRUS_BIC_2_2021-09-12	LC_FRUS_BIC_3_2021-09-12	LC_DC3_BIC_1_2021-09-10	LC_DC3_BIC_2_2021-09-10	LC_DC3_BIC_3_2021-09-10
Sample Collection Date:	12-Sep-21	12-Sep-21	12-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21
CC#:	CC221335	CC221336	CC221337	CC221338	CC221339	CC221340
| Family: Peltoperlidae	0	0	0	0	0	0
Yoraperla	0	0	0	20	20	0
| Family: Perlidae	0	10	0	0	0	0
Hesperoperla	14	0	0	0	0	0
| Family: Perlodidae	171	245	80	120	100	0
Isoperla	171	180	280	0	0	0
Kogotus	29	45	80	20	20	0
Megarcys	14	0	0	60	40	0
Setvena	0	0	0	0	0	0
| Family: Taeniopterygidae	86	40	220	20	20	20
Taenionema	0	0	0	0	0	0
| Order: Trichoptera	43	5	20	0	20	0
| Family: Apataniidae	0	0	0	0	0	0
Pedomoecus sierra	0	5	0	0	0	0
| Family: Brachycentridae	0	0	0	0	0	0
Brachycentrus	14	0	0	0	0	0
Micrasema	0	15	0	0	0	0
| Family: Glossosomatidae	0	0	0	0	0	0
Anagapetus	0	0	0	0	0	0
Glossosoma	0	0	0	0	0	0
| Family: Hydropsychidae	14	5	20	0	0	20
Parapsyche	0	5	20	0	0	0
Parapsyche elsis	14	5	0	0	0	0
| Family: Lepidostomatidae	0	0	0	0	0	0
Lepidostoma	0	0	0	0	0	0
| Family: Limnephilidae	0	25	0	0	0	20
Ecclisomyia	0	0	0	20	0	0
Homophylax	0	0	0	0	0	0
Pycnopsyche	0	0	0	0	0	0
| Family: Rhyacophilidae	0	0	0	0	0	0
Rhyacophila	200	25	320	820	160	60
Rhyacophila betteni group	14	0	0	0	0	20
Rhyacophila brunnea/vemna group	86	15	140	140	60	20
Rhyacophila hyalinata group	0	0	0	40	20	60
Rhyacophila vetina complex	0	0	0	0	20	0
Rhyacophila vofixa group	0	0	0	0	120	40
Rhyacophila atrata complex	57	0	100	0	0	0
Rhyacophila narvae	29	15	20	0	0	0
| Family: Thremmatidae	0	0	0	0	0	0
Oligophlebodes	0	10	40	0	0	0
| Family: Uenoidae	0	0	0	0	0	0
Neothremma	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0
| Family: Elmidae	14	5	60	0	0	0
Heterlimnius	257	150	320	0	0	20
| Family: Staphylinidae	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021
Sample:	LC_FRUS_BIC_1_2021-09-12	LC_FRUS_BIC_2_2021-09-12	LC_FRUS_BIC_3_2021-09-12	LC_DC3_BIC_1_2021-09-10	LC_DC3_BIC_2_2021-09-10	LC_DC3_BIC_3_2021-09-10
Sample Collection Date:	12-Sep-21	12-Sep-21	12-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21
CC#:	CC221335	CC221336	CC221337	CC221338	CC221339	CC221340
| Order: Diptera	0	0	0	20	0	0
| Family: Chironomidae	29	40	40	1340	1060	1340
| Subfamily: Chironominae	0	0	0	0	0	0
| Tribe: Tanytarsini	0	0	0	0	0	0
Micropsectra	0	5	0	0	0	20
Stempellina	0	0	0	0	0	0
| Subfamily: Diamesinae	0	0	0	0	0	0
| Tribe: Diamesini	0	0	0	0	0	0
Diamesa	0	0	0	400	220	140
Pagastia	0	25	40	160	500	720
Pseudodiamesa	0	0	0	1120	820	740
| Subfamily: Orthocladiinae	0	0	0	0	0	0
Brillia	0	0	0	60	0	0
Cardiocladius	0	0	0	0	0	0
Corynoneura	0	0	0	40	0	20
Cricotopus (Nostococladius)	0	0	0	0	0	0
Eukiefferiella	14	20	40	700	900	2120
Heleniella	0	0	0	0	0	0
Hydrobaenus	0	10	0	660	480	180
Limnophyes	0	0	0	0	0	0
Metriocnemus	0	0	0	20	0	0
Orthocladius complex	43	140	100	2300	3280	3740
Orthocladius lignicola	0	0	0	0	0	0
Parametriocnemus	0	0	0	0	0	0
Parorthocladius	0	0	0	140	0	200
Psectrocladius	0	0	0	0	0	0
Rheocricotopus	14	0	0	0	40	0
Synorthocladius	0	0	0	0	340	0
Thienemanniella	0	0	0	0	0	0
Tvetenia	0	5	0	280	240	240
| Family: Dixidae	0	0	0	0	0	0
Dixa	0	0	0	0	0	0
| Family: Empididae	0	5	0	60	40	40
Chelifera/ Metachela	0	0	40	0	0	0
Clinocera	0	0	0	0	0	0
Clinocerinae Unknown Genus A	0	0	0	20	0	0
Neoplasta	0	15	60	0	0	20
Oreogeton	0	0	0	0	40	0
Trichoclinocera	0	0	0	40	40	80
| Family: Pelecorhynchidae	0	0	0	0	0	0
Glutops	0	0	0	0	0	0
| Family: Psychodidae	0	0	0	0	0	0
Pericoma/Telmatoscopus	200	125	700	2380	1180	1040
| Family: Simuliidae	0	0	0	0	0	0
Prosimulium	0	0	0	20	0	0
Prosimulium/Helodon	0	0	0	0	0	20
Simulium	0	10	40	0	20	0
| Family: Tipulidae	0	0	0	20	0	0
Antocha	29	5	80	0	0	0
Dicranota	0	0	20	0	60	0
| Family: Limoniidae	0	0	0	0	0	0
Eloeophila	0	0	20	0	0	0
Pedicia	0	0	0	0	0	0

Site:	2021	2021	2021	2021	2021	2021
Sample:	LC_FRUS_BIC_1_2021-09-12	LC_FRUS_BIC_2_2021-09-12	LC_FRUS_BIC_3_2021-09-12	LC_DC3_BIC_1_2021-09-10	LC_DC3_BIC_2_2021-09-10	LC_DC3_BIC_3_2021-09-10
Sample Collection Date:	12-Sep-21	12-Sep-21	12-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21
CC#:	CC221335	CC221336	CC221337	CC221338	CC221339	CC221340
| Order: Hemiptera	0	0	0	0	0	0
| Order: Lepidoptera	0	0	0	0	0	0
| Order: Hymenoptera	0	0	0	0	0	0
Subphylum: Chelicerata	0	0	0	0	0	0
| Class: Arachnida	0	0	0	0	0	0
| Order: Trombidiformes	0	5	0	0	0	20
| Family: Aturidae	0	0	0	0	0	0
Aturus	0	0	0	0	0	0
| Family: Feltriidae	0	0	0	0	0	0
Feltria	0	0	0	0	20	0
| Family: Hydryphantidae	0	0	0	0	0	0
Albertathyas	0	0	0	80	60	0
| Family: Hygrobatidae	0	0	0	0	0	0
Atractides	0	0	0	140	40	40
Hygrobates	0	5	0	0	0	0
| Family: Lebertiidae	0	0	0	0	0	0
Lebertia	114	75	260	200	180	140
| Family: Sperchontidae	0	0	0	0	0	0
Sperchon	0	10	20	40	20	0
| Family: Torrenticolidae	0	0	0	0	0	0
Testudacarus	0	0	0	0	0	0
| Order: Sarcoptiformes	0	0	0	0	0	0
| Order: Oribatida	0	0	0	60	0	0
| Family: Hydrozetidae	0	0	0	20	0	0
| Class: Maxillipoda	0	0	0	0	0	0
| Class: Copepoda	0	0	0	0	0	0
Phylum: Mollusca	0	0	0	0	0	0
| Class: Gastropoda	0	0	0	0	0	0
| Order: Basommatophora	0	0	0	0	0	0
| Family: Lymnaeidae	0	0	0	0	0	0
Fossaria	0	0	0	0	0	0
Phylum: Annelida	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0
| Order: Lumbriculida	0	0	0	0	0	0
| Family: Lumbriculidae	0	0	0	20	0	40
Rhynchelmis	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0
| Family: Naididae	0	0	0	0	0	0
Nais	0	20	40	0	0	0
Totals:	**4425**	**2655**	**7380**	**13780**	**11340**	**12080**

Taxa present but not included:

Site:	2021	2021	2021	2021	2021	2021
Sample:	LC_FRUS_BIC_1_2021-09-12	LC_FRUS_BIC_2_2021-09-12	LC_FRUS_BIC_3_2021-09-12	LC_DC3_BIC_1_2021-09-10	LC_DC3_BIC_2_2021-09-10	LC_DC3_BIC_3_2021-09-10
Sample Collection Date:	12-Sep-21	12-Sep-21	12-Sep-21	10-Sep-21	10-Sep-21	10-Sep-21
CC#:	CC221335	CC221336	CC221337	CC221338	CC221339	CC221340
Phylum: Arthropoda	0	0	0	0	0	0
Subphylum: Hexapoda	0	0	0	0	0	0
| Class: Insecta	0	0	0	0	0	0
| Order: Coleoptera	0	0	0	0	0	0
| Family: Curculionidae	0	0	0	0	0	0
| Subfamily: Scolytinae	0	0	0	0	0	0
| Order: Homoptera	0	0	0	0	0	0
| Family: Aphididae	0	0	0	0	0	0
Subphylum: Crustacea	0	0	0	0	0	0
| Class: Ostracoda	14	5	0	20	20	20
Phylum: Annelida	0	0	0	0	0	0
Subphylum: Clitellata	0	0	0	0	0	0
| Class: Oligochaeta	0	0	0	0	0	0
| Order: Tubificida	0	0	0	0	0	0
| Family: Lumbricidae	0	0	0	0	0	0
Phylum: Nemata	0	5	0	20	20	20
Phylum: Platyhelminthes	0	0	0	0	0	0
| Class: Turbellaria	14	5	20	20	20	20
Totals:	**28**	**15**	**20**	**60**	**60**	**60**

ND designation of a taxa represents a non-

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			Site_Rep	LC_DC1-01	LC_DC1-02	LC_DC1-03	LC_DC4-01	LC_DC4-02	LC_DC4-03	LC_DCDS-02-DUP	LC_DC3-01	LC_DC3-02	LC_DC3-03	LC_DCDS-01	LC_DCDS-02	LC_DCDS-03
Final Code	Bacillariophyte-Diatoms	Categorical Groupings	Total	2021-03-10	2021-03-10	2021-03-15	2021-03-09	2021-03-09	2021-03-09	2021-03-09	2021-03-08	2021-03-08	2021-03-08	2021-03-09	2021-03-09	2021-03-09
T038	Achnanthidium minutissimum	D	66226775	1752133	8966800	5591367	7072950	12677200	8309750	3459175	2906480	1453240	1159500	4638000	3014700	5225480
T024	Phormidium autumnale	BG	30530923	386500	12986400	2834333	4638000	2782800	3401200	270550	1886120	1051280	154600	0	139140	0
T016	Homeothrix sp. (janthina?)	BG	27848613	347850	7111600	3993833	0	2473600	773000	579750	5318240	3339360	1746980	1236800	309200	618400
T241	Achnanthidium cf. rivulare	D	21859151	399383	3092000	1752133	2512250	3092000	3130650	1449375	154600	92760	401960	1886120	1051280	2844640
T039	Achnanthidium minutissimum var linearis	D	4720453	38650	865760	206133	1043550	1236800	425150	347850	61840	0	0	216440	185520	92760
T127	Nitzschia sp. (sm)	D	3076540	0	371040	0	193250	618400	502450	77300	309200	154600	61840	556560	139140	92760
T242	Plectonema cf. tenue	BG	3040466	1133733	618400	1288333	0	0	0	0	0	0	0	0	0	0
T239	Chlorogloea sp.	BG	2813720	502450	494720	0	0	247360	425150	77300	247360	742080	0	0	77300	0
T019	Lyngbya sp.	BG	2633353	128833	0	0	0	0	0	0	896680	309200	0	309200	309200	680240
T107	Meridion circulare	D	1600110	0	0	0	0	247360	77300	38650	618400	278280	30920	154600	123680	30920
T084	Encyonema silesiacum	D	1549865	0	61840	0	38650	123680	38650	19325	309200	154600	30920	618400	30920	123680
T211	Audouinella sp.	R	1515080	0	309200	0	0	0	0	0	0	0	0	1205880	0	0
T076	Diatoma hiemale	D	1495755	0	0	0	309200	371040	425150	19325	92760	123680	0	61840	0	92760
T221	Gomphoneis spp.	D	1258701	12883	0	51533	38650	185520	38650	19325	185520	61840	15460	401960	154600	92760
T101	Gomphonema ovilaceum	D	981710	0	0	0	0	247360	77300	270550	0	0	77300	123680	154600	30920
T100	Gomphonema parvulum	D	618400	0	0	0	0	0	0	0	340120	92760	15460	0	46380	123680
T072	Cymbella sp. sm (parva?)	D	599075	0	0	0	77300	123680	77300	57975	92760	0	15460	123680	30920	0
T104	Hannaea arcus (Ceratoneis arcus)	D	499873	12883	0	0	0	61840	38650	0	123680	30920	15460	185520	30920	0
T151	Synedra ulna	D	486990	0	0	0	38650	247360	77300	0	0	30920	0	61840	30920	0
T066	Cymbella excisiformis (Encyonema excisiformis)	D	470242	0	61840	25767	38650	247360	38650	57975	0	0	0	0	0	0
T023	Oscillatoria spp.	BG	463800	0	0	0	0	0	0	0	0	0	0	0	0	463800
T008	Chroococcus sp.	BG	432880	0	0	0	0	0	0	0	61840	309200	61840	0	0	0
T174	nano and pico-flagellates	FL	386500	0	0	0	0	0	0	0	92760	247360	0	0	46380	0
T195	Gloeocystis sp. (colony)	G	367175	0	0	0	154600	0	154600	57975	0	0	0	0	0	0
T244	Encyonema reichardtii	D	340120	0	0	0	0	0	0	0	61840	123680	77300	61840	15460	0
T079	Diatoma vulgare	D	316930	0	0	0	0	0	38650	0	0	0	0	247360	30920	0
T243	Surirella cf. lacrimula	D	204845	0	0	0	0	0	0	19325	0	0	0	154600	30920	0
T229	Diatoma moniliformis	D	197115	0	61840	0	115950	0	0	19325	0	0	0	0	0	0
T091	Eunotia spp.	D	185520	0	0	0	0	185520	0	0	0	0	0	0	0	0
T131	Rhoicosphenia abbreviata	D	170060	0	0	0	0	0	0	0	30920	0	0	61840	15460	61840
T097	Frustulia sp.	D	139140	12883	0	25767	0	61840	38650	0	0	0	0	0	0	0
T114	Navicula spp.	D	139140	0	0	0	0	0	0	0	30920	61840	15460	0	30920	0
T073	Cymbella sp.	D	106932	0	61840	25767	0	0	0	19325	0	0	0	0	0	0
T138	Staurosira construens v. ventor	D	61840	0	0	0	0	0	0	0	61840	0	0	0	0	0
T140	Staurosirella leptostauron	D	61840	0	0	0	0	0	0	0	0	0	0	0	61840	0
T058	Cocconeis placentula	D	46380	0	0	0	0	0	0	0	0	0	0	0	15460	30920
T113	Navicula radiosa	D	43803	12883	0	0	0	0	0	0	30920	0	0	0	0	0
T106	Meridion anceps	D	38650	0	0	0	38650	0	0	0	0	0	0	0	0	0
T065	Cymbella cistula	D	30920	0	0	0	0	0	0	0	0	0	0	30920	0	0
T232	Flagellates dead?	FL	30920	0	0	0	0	0	0	0	0	0	0	30920	0	0

			Site_Rep	LC_DC1-01	LC_DC1-02	LC_DC1-03	LC_DC4-01	LC_DC4-02	LC_DC4-03	LC_DCDS-02-DUP	LC_DC3-01	LC_DC3-02	LC_DC3-03	LC_DCDS-01	LC_DCDS-02	LC_DCDS-03
Final Code	Bacillariophyte-Diatoms	Categorical Groupings	Total	2021-03-10	2021-03-10	2021-03-15	2021-03-09	2021-03-09	2021-03-09	2021-03-09	2021-03-08	2021-03-08	2021-03-08	2021-03-09	2021-03-09	2021-03-09
T038	Achnanthidium minutissimum	D	3973606500	105127980	538008000	335482020	424377000	760632000	498585000	207550500	174388800	87194400	69570000	278280000	180882000	313528800
T241	Achnanthidium cf. rivulare	D	2273351704	41535832	321568000	182221832	261274000	321568000	325587600	150735000	16078400	9647040	41803840	196156480	109333120	295842560
T151	Synedra ulna	D	2049253920	0	0	0	162639200	1040890880	325278400	0	0	130111360	0	260222720	130111360	0
T211	Audouinella sp.	R	1766583280	0	360527200	0	0	0	0	0	0	0	0	1406056080	0	0
T101	Gomphonema ovilaceum	D	1197686200	0	0	0	0	301779200	94306000	330071000	0	0	94306000	150889600	188612000	37722400
T107	Meridion circulare	D	928063800	0	0	0	0	143468800	44834000	22417000	358672000	161402400	17933600	89668000	71734400	17933600
T221	Gomphoneis spp.	D	818155650	8373950	0	33496450	25122500	120588000	25122500	12561250	120588000	40196000	10049000	261274000	100490000	60294000
T024	Phormidium autumnale	BG	732742152	9276000	311673600	68023992	111312000	66787200	81628800	6493200	45266880	25230720	3710400	0	3339360	0
T084	Encyonema silesiacum	D	613746540	0	24488640	0	15305400	48977280	15305400	7652700	122443200	61221600	12244320	244886400	12244320	48977280
T127	Nitzschia sp. (sm)	D	461481000	0	55656000	0	28987500	92760000	75367500	11595000	46380000	23190000	9276000	83484000	20871000	13914000
T039	Achnanthidium minutissimum var linearis	D	433826152.3	3552070.275	79566374.16	18944344.17	95905897.43	113666248.8	39072773.03	31968632.48	5683312.44	0	0	19891593.54	17049937.32	8524968.66
T104	Hannaea arcus (Ceratoneis arcus)	D	272430785	7021235	0	0	0	33702800	21064250	0	67405600	16851400	8425700	101108400	16851400	0
T076	Diatoma hiemale	D	269235900	0	0	0	55656000	66787200	76527000	3478500	16696800	22262400	0	11131200	0	16696800
T091	Eunotia spp.	D	265293600	0	0	0	0	265293600	0	0	0	0	0	0	0	0
T097	Frustulia sp.	D	208710000	19324500	0	38650500	0	92760000	57975000	0	0	0	0	0	0	0
T016	Homeothrix sp. (janthina?)	BG	139243065	1739250	35558000	19969165	0	12368000	3865000	2898750	26591200	16696800	8734900	6184000	1546000	3092000
T065	Cymbella cistula	D	119042000	0	0	0	0	0	0	0	0	0	0	119042000	0	0
T066	Cymbella excisiformis (Encyonema excisiformis)	D	114739048	0	15088960	6287148	9430600	60355840	9430600	14145900	0	0	0	0	0	0
T079	Diatoma vulgare	D	95079000	0	0	0	0	0	11595000	0	0	0	0	74208000	9276000	0
T239	Chlorogloea sp.	BG	92852760	16580850	16325760	0	0	8162880	14029950	2550900	8162880	24488640	0	0	2550900	0
T100	Gomphonema parvulum	D	92760000	0	0	0	0	0	0	0	51018000	13914000	2319000	0	6957000	18552000
T243	Surirella cf. lacrimula	D	71695750	0	0	0	0	0	0	6763750	0	0	0	54110000	10822000	0
T072	Cymbella sp. sm (parva?)	D	66430337.18	0	0	0	8571656.411	13714650.26	8571656.411	6428742.308	10285987.69	0	1714331.282	13714650.26	3428662.564	0
T140	Staurosirella leptostauron	D	51769147.29	0	0	0	0	0	0	0	0	0	0	0	51769147.29	0
T114	Navicula spp.	D	50090400	0	0	0	0	0	0	0	11131200	22262400	5565600	0	11131200	0
T195	Gloeocystis sp. (colony)	G	44061000	0	0	0	18552000	0	18552000	6957000	0	0	0	0	0	0
T058	Cocconeis placentula	D	32048580	0	0	0	0	0	0	0	0	0	0	0	10682860	21365720
T242	Plectonema cf. tenue	BG	30404660	11337330	6184000	12883330	0	0	0	0	0	0	0	0	0	0
T131	Rhoicosphenia abbreviata	D	29420380	0	0	0	0	0	0	0	5349160	0	0	10698320	2674580	10698320
T229	Diatoma moniliformis	D	28581675	0	8966800	0	16812750	0	0	2802125	0	0	0	0	0	0
T113	Navicula radiosa	D	27814905	8180705	0	0	0	0	0	0	19634200	0	0	0	0	0
T073	Cymbella sp.	D	21386400	0	12368000	5153400	0	0	0	3865000	0	0	0	0	0	0
T244	Encyonema reichardtii	D	17006000	0	0	0	0	0	0	0	3092000	6184000	3865000	3092000	773000	0
T019	Lyngbya sp.	BG	15800118	772998	0	0	0	0	0	0	5380080	1855200	0	1855200	1855200	4081440
T023	Oscillatoria spp.	BG	13914000	0	0	0	0	0	0	0	0	0	0	0	0	13914000
T138	Staurosira construens v. ventor	D	13171920	0	0	0	0	0	0	0	13171920	0	0	0	0	0
T232	Flagellates dead?	FL	9276000	0	0	0	0	0	0	0	0	0	0	9276000	0	0
T106	Meridion anceps	D	5797500	0	0	0	5797500	0	0	0	0	0	0	0	0	0
T174	nano and pico-flagellates	FL	5024500	0	0	0	0	0	0	0	1205880	3215680	0	0	602940	0
T008	Chroococcus sp.	BG	2597280	0	0	0	0	0	0	0	371040	1855200	371040	0	0	0

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Final Code	Report Name	High Level Taxa	Total Abundance	LC_DC1_2021-05-05_1	LC_DC1_2021-05-05_2	LC_DC1_2021-05-05_3	LC_DC1_2021-06-01_1	LC_DC1_2021-06-01_2	LC_DC1_2021-06-01_3	LC_DC2_2021-05-06_1
T031	Homeothrix sp.	Cyanobacteria	10954569	421305	405844	425170	46382	65708	146877	3865
T040	Phormidium autumnale	Cyanobacteria	7337918	363327	985622	1024273	231911	19326	0	75371
T02	Achnanthidium minutissima	Diatom	7141054	52180	127551	189394	200989	56045	81169	34787
T037	Nitzschia cf. liebethruthii	Diatom	4177619	13528	34787	23191	197897	98562	50247	127551
T05	Chlorogloea sp.	Cyanobacteria	2966268	63776	50247	135281	111317	83101	21259	139147
T033	Hydrurus foetidus	Chrysophyta	2515976	114023	38652	15461	210266	143012	199057	0
T032	Hydrurus	Chrysophyta	1886207	212585	54113	19326	176252	108225	42517	9663
T028	Gomphonema sp.	Diatom	848921	1933	3865	0	24737	11596	3865	7730
T017	Encyonema silesiacum	Diatom	688518	3865	11596	19326	21645	38652	23191	30921
T025	Gomphoneis pseudo-okunoi	Diatom	651798	0	15461	38652	3092	5798	3865	9663
T020	Eunotia (parallel	Diatom	632602	3865	15461	11596	27829	11596	5798	19326
T034	Meridion circulare	Diatom	549372	19326	23191	23191	6184	9663	1933	65708
T03	Achnanthidium rivulare	Diatom	395670	21259	30921	46382	34014	17393	25124	1933
T010	Diatoma heimale	Diatom	356239	5798	27056	23191	18553	7730	7730	0
T01	Achnanthidium linearis	Diatom	243375	3865	7730	0	30921	9663	3865	0
T029	Hannaea arcus	Diatom	227270	1933	7730	3865	9276	3865	9663	1933
T09	Cymbella spp.	Diatom	187460	0	0	0	6184	1933	0	9663
T07	Cymbella exisiformis	Diatom	172258	0	0	7730	12369	15461	1933	23191
T030	Homeothrix cf. jantha	Cyanobacteria	154607	0	154607	0	0	0	0	0
T011	Diatoma moniliformis	Diatom	151129	13528	19326	27056	18553	17393	3865	1933
T050	Ulothrix sp.	Green	123686	0	0	42517	0	0	38652	0
T022	Eunotia sp.	Diatom	119560	0	0	3865	0	11595	7731	5798
T021	Eunotia cf. microglossa	Diatom	116471	0	3865	0	0	11596	1933	0
T051	Ulothrix zonata	Green	108354	0	0	0	0	28989	0	0
T035	Meridion sp.	Diatom	103328	0	15461	7730	3092	7730	0	15461
T046	UID colonial chlorophyte	Green	98949	0	0	0	0	0	0	0
T042	Rossithidium sp.	Diatom	89286	0	0	0	0	0	0	0
T048	UID Pennate Diatom	Diatom	79621	1933	0	0	6184	3865	0	0
T039	Nitzschia sp	Diatom	72665	1933	7730	3865	0	1933	0	9663
T015	Encyonema cf. reich	Diatom	67511	1933	0	0	3092	0	0	5798
T014	Dictyosphaerium pulchellum	Green	57978	0	0	0	0	0	0	54113
T044	Surirella cf. lacrimula	Diatom	49475	0	0	0	0	0	0	1933
T019	Eunotia	Diatom	37235	0	0	0	0	0	0	0
T08	Cymbella sp.	Diatom	32210	0	0	0	6184	5798	0	0
T036	Navicula sp.	Diatom	31823	1933	0	0	0	0	0	0
T027	Gomphonema sp	Diatom	28732	1933	0	11596	0	0	0	1933
T043	Staurosira contruens	Diatom	12369	0	0	0	0	0	0	0
T041	Rhoicosphenia abbreviata	Diatom	11209	0	0	0	0	0	0	0
T023	Frustulia cf. soror	Diatom	6958	0	0	0	3092	0	0	0
T013	Diatoma vulgaris	Diatom	5798	3865	0	0	0	0	1933	0
T047	UID flagellate	Other.Flagellates	5154	1933	0	0	0	0	0	0
T049	Ulnaria ulna	Diatom	4510	0	0	0	0	0	0	0
T012	Diatoma tenuis	Diatom	3865	3865	0	0	0	0	0	0
T04	Anathece sp.	Cyanobacteria	3865	0	0	0	0	0	0	0
T026	Gomphoneis sp.	Diatom	3221	0	0	0	0	0	0	0
T06	Cyclotella spp.	Diatom	3221	1933	0	0	0	0	0	0
T016	Encyonema neogracile	Diatom	3092	0	0	0	0	0	0	0
T045	Synedra sp	Diatom	3092	0	0	0	0	0	0	0
T024	Frustulia sp.	Diatom	1933	0	0	0	0	0	0	0
T018	Eucocconeis flexella	Diatom	1288	0	0	0	0	0	0	0
T038	Nitzschia sigma	Diatom	773	0	0	0	0	0	0	0

Final Code	Report Name	High Level Taxa	Total Abundance	LC_DC2_2021-05-06_2	LC_DC2_2021-05-06_3	LC_DC2_2021-05-31_1	LC_DC2_2021-05-31_2	LC_DC2_2021-05-31_3	LC_DC3_2021-05-03_1	LC_DC3_2021-05-03_2
T031	Homeothrix sp.	Cyanobacteria	10954569	83101	51020	179344	34014	141079	248660	322099
T040	Phormidium autumnale	Cyanobacteria	7337918	475417	60297	136054	435993	158472	158472	76015
T02	Achnanthidium minutissima	Diatom	7141054	131416	18553	615337	160792	98562	310503	153319
T037	Nitzschia cf. liebethruthii	Diatom	4177619	54113	773	160792	309215	102427	0	1288
T05	Chlorogloea sp.	Cyanobacteria	2966268	121753	112863	86580	80396	200989	55401	203566
T033	Hydrurus foetidus	Chrysophyta	2515976	5798	0	86580	194805	3865	0	0
T032	Hydrurus	Chrysophyta	1886207	3865	0	27829	86580	23191	0	0
T028	Gomphonema sp.	Diatom	848921	17393	3092	18553	21645	13528	0	0
T017	Encyonema silesiacum	Diatom	688518	17393	1546	24737	86580	21259	0	0
T025	Gomphoneis pseudo-okunoi	Diatom	651798	0	1546	15461	6184	0	50247	70862
T020	Eunotia (parallel	Diatom	632602	9663	0	9276	34014	9663	0	0
T034	Meridion circulare	Diatom	549372	85034	3092	3092	34014	5798	1288	7730
T03	Achnanthidium rivulare	Diatom	395670	5798	773	12369	12369	5798	0	0
T010	Diatoma heimale	Diatom	356239	0	0	3092	6184	1933	0	0
T01	Achnanthidium linearis	Diatom	243375	0	3865	12369	6184	1933	1288	0
T029	Hannaea arcus	Diatom	227270	1933	773	3092	40198	7730	2577	1288
T09	Cymbella spp.	Diatom	187460	9663	1546	0	21645	0	5154	10307
T07	Cymbella exisiformis	Diatom	172258	15461	0	3092	15461	1933	0	1288
T030	Homeothrix cf. jantha	Cyanobacteria	154607	0	0	0	0	0	0	0
T011	Diatoma moniliformis	Diatom	151129	3865	773	6184	6184	1933	0	0
T050	Ulothrix sp.	Green	123686	0	0	0	0	0	0	0
T022	Eunotia sp.	Diatom	119560	5798	773	6184	3092	0	0	0
T021	Eunotia cf. microglossa	Diatom	116471	0	0	0	27829	1933	0	0
T051	Ulothrix zonata	Green	108354	0	0	0	18553	0	0	0
T035	Meridion sp.	Diatom	103328	27056	0	0	3092	0	1288	0
T046	UID colonial chlorophyte	Green	98949	0	0	58751	12369	3865	0	0
T042	Rossithidium sp.	Diatom	89286	0	0	0	0	1933	0	0
T048	UID Pennate Diatom	Diatom	79621	0	0	3092	3092	3865	0	0
T039	Nitzschia sp	Diatom	72665	1933	0	0	0	0	10307	1288
T015	Encyonema cf. reich	Diatom	67511	0	0	3092	0	0	1288	0
T014	Dictyosphaerium pulchellum	Green	57978	3865	0	0	0	0	0	0
T044	Surirella cf. lacrimula	Diatom	49475	0	0	0	3092	0	2577	2577
T019	Eunotia	Diatom	37235	0	0	0	0	0	1288	0
T08	Cymbella sp.	Diatom	32210	0	0	0	3092	0	0	1288
T036	Navicula sp.	Diatom	31823	0	0	0	0	0	1288	0
T027	Gomphonema sp	Diatom	28732	0	0	0	0	0	1288	0
T043	Staurosira contruens	Diatom	12369	0	0	0	0	0	0	0
T041	Rhoicosphenia abbreviata	Diatom	11209	0	0	6184	3092	0	0	0
T023	Frustulia cf. soror	Diatom	6958	0	0	0	0	0	0	0
T013	Diatoma vulgaris	Diatom	5798	0	0	0	0	0	0	0
T047	UID flagellate	Other.Flagellates	5154	0	0	0	0	0	0	0
T049	Ulnaria ulna	Diatom	4510	1933	0	0	0	0	0	0
T012	Diatoma tenuis	Diatom	3865	0	0	0	0	0	0	0
T04	Anathece sp.	Cyanobacteria	3865	0	3865	0	0	0	0	0
T026	Gomphoneis sp.	Diatom	3221	0	0	0	0	0	1288	0
T06	Cyclotella spp.	Diatom	3221	0	0	0	0	0	0	0
T016	Encyonema neogracile	Diatom	3092	0	0	0	3092	0	0	0
T045	Synedra sp	Diatom	3092	0	0	0	0	0	0	0
T024	Frustulia sp.	Diatom	1933	0	0	0	0	0	0	0
T018	Eucocconeis flexella	Diatom	1288	0	0	0	0	0	0	0
T038	Nitzschia sigma	Diatom	773	0	0	0	0	0	0	0

Final Code	Report Name	High Level Taxa	Total Abundance	LC_DC3_2021-05-03_3	LC_DC3_2021-05-31_1	LC_DC3_2021-05-31_2	LC_DC3_2021-05-31_3	LC_DC3_2021-06-21_1	LC_DC3_2021-06-21_2	LC_DC3_2021-06-21_3
T031	Homeothrix sp.	Cyanobacteria	10954569	1130566	695733	463822	1035869	2195424	664811	346320
T040	Phormidium autumnale	Cyanobacteria	7337918	50247	145331	80396	0	216450	68027	108225
T02	Achnanthidium minutissima	Diatom	7141054	291821	250464	269017	256648	262832	296846	306122
T037	Nitzschia cf. liebethruthii	Diatom	4177619	15461	154607	102041	52566	500928	531849	708101
T05	Chlorogloea sp.	Cyanobacteria	2966268	79236	18553	9276	27829	108225	34014	145331
T033	Hydrurus foetidus	Chrysophyta	2515976	0	9276	0	120594	108225	61843	9276
T032	Hydrurus	Chrysophyta	1886207	0	117502	68027	52566	346320	117502	176252
T028	Gomphonema sp.	Diatom	848921	0	89672	123686	80396	74212	98949	114409
T017	Encyonema silesiacum	Diatom	688518	11596	12369	9276	3092	9276	58751	37106
T025	Gomphoneis pseudo-okunoi	Diatom	651798	50247	15461	43290	0	30921	21645	24737
T020	Eunotia (parallel	Diatom	632602	0	21645	30921	0	49474	61843	114409
T034	Meridion circulare	Diatom	549372	9663	18553	0	0	15461	15461	46382
T03	Achnanthidium rivulare	Diatom	395670	0	15461	15461	12369	15461	34014	6184
T010	Diatoma heimale	Diatom	356239	1933	0	0	0	0	0	0
T01	Achnanthidium linearis	Diatom	243375	0	0	0	6184	0	0	3092
T029	Hannaea arcus	Diatom	227270	0	0	0	0	9276	3092	3092
T09	Cymbella spp.	Diatom	187460	15461	6184	6184	0	3092	9276	6184
T07	Cymbella exisiformis	Diatom	172258	9663	0	0	0	0	3092	3092
T030	Homeothrix cf. jantha	Cyanobacteria	154607	0	0	0	0	0	0	0
T011	Diatoma moniliformis	Diatom	151129	0	0	0	0	0	0	0
T050	Ulothrix sp.	Green	123686	0	0	0	0	0	0	0
T022	Eunotia sp.	Diatom	119560	0	6184	3092	9276	6184	0	3092
T021	Eunotia cf. microglossa	Diatom	116471	0	0	0	3092	9276	0	6184
T051	Ulothrix zonata	Green	108354	0	0	0	0	0	0	0
T035	Meridion sp.	Diatom	103328	1933	0	6184	3092	0	0	0
T046	UID colonial chlorophyte	Green	98949	0	0	0	0	0	0	9276
T042	Rossithidium sp.	Diatom	89286	0	0	0	6184	0	0	0
T048	UID Pennate Diatom	Diatom	79621	0	3092	0	12369	6184	3092	6184
T039	Nitzschia sp	Diatom	72665	7730	0	0	0	3092	3092	0
T015	Encyonema cf. reich	Diatom	67511	0	6184	0	6184	9276	15461	12369
T014	Dictyosphaerium pulchellum	Green	57978	0	0	0	0	0	0	0
T044	Surirella cf. lacrimula	Diatom	49475	1933	3092	3092	0	0	3092	12369
T019	Eunotia	Diatom	37235	0	0	0	0	0	0	0
T08	Cymbella sp.	Diatom	32210	1933	0	0	0	0	3092	0
T036	Navicula sp.	Diatom	31823	0	0	0	9276	12369	0	0
T027	Gomphonema sp	Diatom	28732	5798	0	0	0	0	0	0
T043	Staurosira contruens	Diatom	12369	0	0	0	12369	0	0	0
T041	Rhoicosphenia abbreviata	Diatom	11209	0	0	0	0	0	0	0
T023	Frustulia cf. soror	Diatom	6958	0	0	0	0	0	0	0
T013	Diatoma vulgaris	Diatom	5798	0	0	0	0	0	0	0
T047	UID flagellate	Other.Flagellates	5154	0	0	0	0	0	0	0
T049	Ulnaria ulna	Diatom	4510	0	0	0	0	0	0	0
T012	Diatoma tenuis	Diatom	3865	0	0	0	0	0	0	0
T04	Anathece sp.	Cyanobacteria	3865	0	0	0	0	0	0	0
T026	Gomphoneis sp.	Diatom	3221	0	0	0	0	0	0	0
T06	Cyclotella spp.	Diatom	3221	0	0	0	0	0	0	0
T016	Encyonema neogracile	Diatom	3092	0	0	0	0	0	0	0
T045	Synedra sp	Diatom	3092	0	0	0	0	0	0	0
T024	Frustulia sp.	Diatom	1933	0	0	0	0	0	0	0
T018	Eucocconeis flexella	Diatom	1288	0	0	0	0	0	0	0
T038	Nitzschia sigma	Diatom	773	0	0	0	0	0	0	0

Final Code	Report Name	High Level Taxa	Total Abundance	LC_DC4_2021-05-05_1	LC_DC4_2021-05-05_2	LC_DC4_2021-05-05_3	LC_DC4_2021-06-01_1	LC_DC4_2021-06-01_2	LC_DC4_2021-06-01_3
T031	Homeothrix sp.	Cyanobacteria	10954569	173933	38652	14172	195192	144944	61843
T040	Phormidium autumnale	Cyanobacteria	7337918	734385	9663	57978	229978	5798	349412
T02	Achnanthidium minutissima	Diatom	7141054	1414657	34787	25768	303417	90832	18553
T037	Nitzschia cf. liebethruthii	Diatom	4177619	112090	85034	83746	54113	50247	244280
T05	Chlorogloea sp.	Cyanobacteria	2966268	27056	200989	157184	160405	90832	129870
T033	Hydrurus foetidus	Chrysophyta	2515976	173933	86967	97918	162338	158472	154607
T032	Hydrurus	Chrysophyta	1886207	0	0	0	102427	7730	18553
T028	Gomphonema sp.	Diatom	848921	0	0	3865	17393	44450	6184
T017	Encyonema silesiacum	Diatom	688518	23191	7730	9019	11596	7730	64935
T025	Gomphoneis pseudo-okunoi	Diatom	651798	38652	27056	7730	5798	7730	18553
T020	Eunotia (parallel	Diatom	632602	34787	11596	11596	5798	7730	27829
T034	Meridion circulare	Diatom	549372	11596	25124	28345	3865	1933	0
T03	Achnanthidium rivulare	Diatom	395670	0	0	2577	54113	9663	0
T010	Diatoma heimale	Diatom	356239	123686	40584	25768	3865	1933	9276
T01	Achnanthidium linearis	Diatom	243375	88899	0	1288	36719	0	0
T029	Hannaea arcus	Diatom	227270	15461	5798	7730	7730	1933	27829
T09	Cymbella spp.	Diatom	187460	15461	0	0	0	3865	0
T07	Cymbella exisiformis	Diatom	172258	3865	0	2577	3865	3865	6184
T030	Homeothrix cf. jantha	Cyanobacteria	154607	0	0	0	0	0	0
T011	Diatoma moniliformis	Diatom	151129	11596	1933	0	5798	1933	0
T050	Ulothrix sp.	Green	123686	0	42517	0	0	0	0
T022	Eunotia sp.	Diatom	119560	7730	7730	0	5798	1933	9276
T021	Eunotia cf. microglossa	Diatom	116471	15461	1933	0	3865	1933	24737
T051	Ulothrix zonata	Green	108354	0	0	12884	0	23191	24737
T035	Meridion sp.	Diatom	103328	0	0	3865	0	5798	0
T046	UID colonial chlorophyte	Green	98949	0	0	0	0	0	0
T042	Rossithidium sp.	Diatom	89286	81169	0	0	0	0	0
T048	UID Pennate Diatom	Diatom	79621	0	0	1288	1933	3865	9276
T039	Nitzschia sp	Diatom	72665	3865	0	3865	0	0	0
T015	Encyonema cf. reich	Diatom	67511	0	0	1288	0	0	0
T014	Dictyosphaerium pulchellum	Green	57978	0	0	0	0	0	0
T044	Surirella cf. lacrimula	Diatom	49475	0	0	0	0	0	0
T019	Eunotia	Diatom	37235	11596	5798	0	0	0	0
T08	Cymbella sp.	Diatom	32210	3865	0	0	3866	0	0
T036	Navicula sp.	Diatom	31823	0	0	3865	0	0	0
T027	Gomphonema sp	Diatom	28732	0	0	0	0	0	0
T043	Staurosira contruens	Diatom	12369	0	0	0	0	0	0
T041	Rhoicosphenia abbreviata	Diatom	11209	0	0	0	1933	0	0
T023	Frustulia cf. soror	Diatom	6958	0	0	0	1933	1933	0
T013	Diatoma vulgaris	Diatom	5798	0	0	0	0	0	0
T047	UID flagellate	Other.Flagellates	5154	0	1933	1288	0	0	0
T049	Ulnaria ulna	Diatom	4510	0	0	2577	0	0	0
T012	Diatoma tenuis	Diatom	3865	0	0	0	0	0	0
T04	Anathece sp.	Cyanobacteria	3865	0	0	0	0	0	0
T026	Gomphoneis sp.	Diatom	3221	0	1933	0	0	0	0
T06	Cyclotella spp.	Diatom	3221	0	0	1288	0	0	0
T016	Encyonema neogracile	Diatom	3092	0	0	0	0	0	0
T045	Synedra sp	Diatom	3092	0	0	0	0	0	3092
T024	Frustulia sp.	Diatom	1933	0	1933	0	0	0	0
T018	Eucocconeis flexella	Diatom	1288	0	0	1288	0	0	0
T038	Nitzschia sigma	Diatom	773	0	0	0	0	0	0

Final Code	Report Name	High Level Taxa	Total Abundance	LC_DCDS_2021-05-04_1	LC_DCDS_2021-05-04_2	LC_DCDS_2021-06-01_1	LC_DCDS_2021-06-01_2	LC_DCDS_2021-06-01_3	LC_DCDS_2021-06-01_01_Dup
T031	Homeothrix sp.	Cyanobacteria	10954569	401979	309215	63131	432900	5411	6184
T040	Phormidium autumnale	Cyanobacteria	7337918	510204	228819	0	296846	23191	22418
T02	Achnanthidium minutissima	Diatom	7141054	355597	513296	18038	176252	17780	7730
T037	Nitzschia cf. liebethruthii	Diatom	4177619	126778	6184	28345	34014	58751	54113
T05	Chlorogloea sp.	Cyanobacteria	2966268	46382	61843	103072	30921	36333	33241
T033	Hydrurus foetidus	Chrysophyta	2515976	40198	15461	69573	197897	13142	24737
T032	Hydrurus	Chrysophyta	1886207	0	0	42517	43290	20872	8503
T028	Gomphonema sp.	Diatom	848921	0	0	20614	30921	6184	10049
T017	Encyonema silesiacum	Diatom	688518	34014	18553	7730	24737	17007	20099
T025	Gomphoneis pseudo-okunoi	Diatom	651798	74212	61843	0	0	3092	0
T020	Eunotia (parallel	Diatom	632602	80396	3092	2577	9276	773	773
T034	Meridion circulare	Diatom	549372	27829	18553	6442	21645	5411	3865
T03	Achnanthidium rivulare	Diatom	395670	0	0	0	15461	773	0
T010	Diatoma heimale	Diatom	356239	0	0	7730	27829	6957	5411
T01	Achnanthidium linearis	Diatom	243375	3092	9276	0	12369	773	0
T029	Hannaea arcus	Diatom	227270	9276	6184	7730	15461	3092	7730
T09	Cymbella spp.	Diatom	187460	27829	6184	3865	15461	1546	773
T07	Cymbella exisiformis	Diatom	172258	21645	0	2577	9276	3092	1546
T030	Homeothrix cf. jantha	Cyanobacteria	154607	0	0	0	0	0	0
T011	Diatoma moniliformis	Diatom	151129	9276	0	0	0	0	0
T050	Ulothrix sp.	Green	123686	0	0	0	0	0	0
T022	Eunotia sp.	Diatom	119560	0	0	1288	9276	3865	0
T021	Eunotia cf. microglossa	Diatom	116471	0	0	1288	0	773	773
T051	Ulothrix zonata	Green	108354	0	0	0	0	0	0
T035	Meridion sp.	Diatom	103328	0	0	0	0	1546	0
T046	UID colonial chlorophyte	Green	98949	0	0	0	0	0	14688
T042	Rossithidium sp.	Diatom	89286	0	0	0	0	0	0
T048	UID Pennate Diatom	Diatom	79621	0	0	2577	3092	2319	2319
T039	Nitzschia sp	Diatom	72665	12369	0	0	0	0	0
T015	Encyonema cf. reich	Diatom	67511	0	0	0	0	773	773
T014	Dictyosphaerium pulchellum	Green	57978	0	0	0	0	0	0
T044	Surirella cf. lacrimula	Diatom	49475	9276	0	2577	0	1546	2319
T019	Eunotia	Diatom	37235	12369	6184	0	0	0	0
T08	Cymbella sp.	Diatom	32210	3092	0	0	0	0	0
T036	Navicula sp.	Diatom	31823	3092	0	0	0	0	0
T027	Gomphonema sp	Diatom	28732	0	6184	0	0	0	0
T043	Staurosira contruens	Diatom	12369	0	0	0	0	0	0
T041	Rhoicosphenia abbreviata	Diatom	11209	0	0	0	0	0	0
T023	Frustulia cf. soror	Diatom	6958	0	0	0	0	0	0
T013	Diatoma vulgaris	Diatom	5798	0	0	0	0	0	0
T047	UID flagellate	Other.Flagellates	5154	0	0	0	0	0	0
T049	Ulnaria ulna	Diatom	4510	0	0	0	0	0	0
T012	Diatoma tenuis	Diatom	3865	0	0	0	0	0	0
T04	Anathece sp.	Cyanobacteria	3865	0	0	0	0	0	0
T026	Gomphoneis sp.	Diatom	3221	0	0	0	0	0	0
T06	Cyclotella spp.	Diatom	3221	0	0	0	0	0	0
T016	Encyonema neogracile	Diatom	3092	0	0	0	0	0	0
T045	Synedra sp	Diatom	3092	0	0	0	0	0	0
T024	Frustulia sp.	Diatom	1933	0	0	0	0	0	0
T018	Eucocconeis flexella	Diatom	1288	0	0	0	0	0	0
T038	Nitzschia sigma	Diatom	773	0	0	0	0	773	0

Final Code	Report Name	High Level Taxa	Total Biovolume	LC_DC1_2021-05-05_1	LC_DC1_2021-05-05_2	LC_DC1_2021-05-05_3	LC_DC1_2021-06-01_1	LC_DC1_2021-06-01_2	LC_DC1_2021-06-01_3	LC_DC2_2021-05-06_1
T010	Diatoma heimale	Diatom	1396456880	22728160	106059520	90908720	72727760	30301600	30301600	0
T037	Nitzschia cf. liebethruthii	Diatom	852234276	2759712	7096548	4730964	40370988	20106648	10250388	26020404
T050	Ulothrix sp.	Green	796570608	0	0	273820744	0	0	248929120	0
T051	Ulothrix zonata	Green	617833497	0	0	0	0	165295007	0	0
T02	Achnanthidium minutissima	Diatom	555248500	4057226	9917654	14726220	15627783	4357746	6311248	2704843
T017	Encyonema silesiacum	Diatom	401514872	2253906	6762302	11270114	12622458	22540228	13524020	18031833
T028	Gomphonema sp.	Diatom	378257099	861294	1722143	0	11022163	5166876	1722143	3444287
T034	Meridion circulare	Diatom	369235774	12989105	15586792	15586792	4156299	6494552	1299179	44162688
T033	Hydrurus foetidus	Chrysophyta	361780525	16395745	5557899	2223188	30234845	20564169	28623066	0
T029	Hannaea arcus	Diatom	291575569	2479938	9917187	4958594	11900625	4958594	12397126	2479938
T025	Gomphoneis pseudo-okunoi	Diatom	290424221	0	6889019	17222325	1377715	2583438	1722143	4305581
T032	Hydrurus	Chrysophyta	271223955	30568302	7781088	2778950	25343859	15562031	6113660	1389475
T035	Meridion sp.	Diatom	204140899	0	30545665	15271844	6108738	15271844	0	30545665
T040	Phormidium autumnale	Cyanobacteria	184421994	9131403	24771383	25742788	5828559	485715	0	1894280
T044	Surirella cf. lacrimula	Diatom	145482759	0	0	0	0	0	0	5684046
T048	UID Pennate Diatom	Diatom	84421152	2049536	0	0	6556818	4098011	0	0
T020	Eunotia (parallel	Diatom	80313150	490688	1962880	1472191	3533082	1472191	736096	2453568
T027	Gomphonema sp	Diatom	77194994	5193440	0	31155268	0	0	0	5193440
T03	Achnanthidium rivulare	Diatom	74582039	4007227	5828471	8742801	6411488	3278503	4735762	364362
T031	Homeothrix sp.	Cyanobacteria	68829589	2647137	2549993	2671422	291427	412856	922855	24285
T07	Cymbella exisiformis	Diatom	66292647	0	0	2974853	4760149	5950090	743906	8924943
T038	Nitzschia sigma	Diatom	57901372	0	0	0	0	0	0	0
T011	Diatoma moniliformis	Diatom	55615472	4978304	7111968	9956608	6827504	6400624	1422320	711344
T05	Chlorogloea sp.	Cyanobacteria	41934626	901612	710350	1912490	1573707	1174813	300542	1967144
T09	Cymbella spp.	Diatom	30035069	0	0	0	990808	309708	0	1548218
T019	Eunotia	Diatom	27920247	0	0	0	0	0	0	0
T021	Eunotia cf. microglossa	Diatom	24644653	0	817814	0	0	2453652	409013	0
T022	Eunotia sp.	Diatom	19764274	0	0	638917	0	1916751	1277999	958458
T023	Frustulia cf. soror	Diatom	19476548	0	0	0	8655000	0	0	0
T049	Ulnaria ulna	Diatom	18507913	0	0	0	0	0	0	0
T08	Cymbella sp.	Diatom	18442004	0	0	0	3540682	3319675	0	0
T01	Achnanthidium linearis	Diatom	17203166	273201	546402	0	2185677	683037	273201	0
T042	Rossithidium sp.	Diatom	16830015	0	0	0	0	0	0	0
T013	Diatoma vulgaris	Diatom	14495000	9662500	0	0	0	0	4832500	0
T041	Rhoicosphenia abbreviata	Diatom	10915289	0	0	0	0	0	0	0
T046	UID colonial chlorophyte	Green	10361915	0	0	0	0	0	0	0
T036	Navicula sp.	Diatom	9372646	569315	0	0	0	0	0	0
T039	Nitzschia sp	Diatom	7557160	201032	803920	401960	0	201032	0	1004952
T024	Frustulia sp.	Diatom	5410774	0	0	0	0	0	0	0
T015	Encyonema cf. reich	Diatom	4860442	139166	0	0	222608	0	0	417426
T014	Dictyosphaerium pulchellum	Green	3794652	0	0	0	0	0	0	3541688
T043	Staurosira contruens	Diatom	2642368	0	0	0	0	0	0	0
T045	Synedra sp	Diatom	2512250	0	0	0	0	0	0	0
T018	Eucocconeis flexella	Diatom	2212354	0	0	0	0	0	0	0
T030	Homeothrix cf. jantha	Cyanobacteria	1639279	0	1639279	0	0	0	0	0
T026	Gomphoneis sp.	Diatom	1435193	0	0	0	0	0	0	0
T047	UID flagellate	Other.Flagellates	1138484	426987	0	0	0	0	0	0
T016	Encyonema neogracile	Diatom	857041	0	0	0	0	0	0	0
T012	Diatoma tenuis	Diatom	834840	834840	0	0	0	0	0	0
T06	Cyclotella spp.	Diatom	156846	94127	0	0	0	0	0	0
T04	Anathece sp.	Cyanobacteria	4047	0	0	0	0	0	0	0

Final Code	Report Name	High Level Taxa	Total Biovolume	LC_DC2_2021-05-06_2	LC_DC2_2021-05-06_3	LC_DC2_2021-05-31_1	LC_DC2_2021-05-31_2	LC_DC2_2021-05-31_3	LC_DC3_2021-05-03_1	LC_DC3_2021-05-03_2
T010	Diatoma heimale	Diatom	1396456880	0	0	12120640	24241280	7577360	0	0
T037	Nitzschia cf. liebethruthii	Diatom	852234276	11039052	157692	32801568	63079860	20895108	0	262752
T050	Ulothrix sp.	Green	796570608	0	0	0	0	0	0	0
T051	Ulothrix zonata	Green	617833497	0	0	0	105789033	0	0	0
T02	Achnanthidium minutissima	Diatom	555248500	10218175	1442578	47845170	12502288	7663631	24142980	11921230
T017	Encyonema silesiacum	Diatom	401514872	10142869	901562	14425583	50489831	12397359	0	0
T028	Gomphonema sp.	Diatom	378257099	7749868	1377715	8266734	9644449	6027725	0	0
T034	Meridion circulare	Diatom	369235774	57151793	2078149	2078149	22860986	3896866	865671	5195373
T033	Hydrurus foetidus	Chrysophyta	361780525	833714	0	12449625	28011656	555761	0	0
T029	Hannaea arcus	Diatom	291575569	2479938	991719	3966875	51571940	9917187	3306157	1652437
T025	Gomphoneis pseudo-okunoi	Diatom	290424221	0	688857	6889019	2755429	0	22388755	31574263
T032	Hydrurus	Chrysophyta	271223955	555761	0	4001624	12449625	3334711	0	0
T035	Meridion sp.	Diatom	204140899	53453431	0	0	6108738	0	2544649	0
T040	Phormidium autumnale	Cyanobacteria	184421994	11948532	1515429	3419410	10957699	3982836	3982836	1910465
T044	Surirella cf. lacrimula	Diatom	145482759	0	0	0	9092121	0	7577748	7577748
T048	UID Pennate Diatom	Diatom	84421152	0	0	3278409	3278409	4098011	0	0
T020	Eunotia (parallel	Diatom	80313150	1226784	0	1177652	4318310	1226784	0	0
T027	Gomphonema sp	Diatom	77194994	0	0	0	0	0	3460502	0
T03	Achnanthidium rivulare	Diatom	74582039	1092897	145707	2331502	2331502	1092897	0	0
T031	Homeothrix sp.	Cyanobacteria	68829589	522139	320568	1126852	213716	886425	1562377	2023808
T07	Cymbella exisiformis	Diatom	66292647	5950090	0	1189941	5950090	743906	0	495680
T038	Nitzschia sigma	Diatom	57901372	0	0	0	0	0	0	0
T011	Diatoma moniliformis	Diatom	55615472	1422320	284464	2275712	2275712	711344	0	0
T05	Chlorogloea sp.	Cyanobacteria	41934626	1721242	1595563	1223996	1136572	2841415	783213	2877847
T09	Cymbella spp.	Diatom	30035069	1548218	247702	0	3467988	0	825780	1651400
T019	Eunotia	Diatom	27920247	0	0	0	0	0	965792	0
T021	Eunotia cf. microglossa	Diatom	24644653	0	0	0	5888470	409013	0	0
T022	Eunotia sp.	Diatom	19764274	958458	127783	1022267	511134	0	0	0
T023	Frustulia cf. soror	Diatom	19476548	0	0	0	0	0	0	0
T049	Ulnaria ulna	Diatom	18507913	7932549	0	0	0	0	0	0
T08	Cymbella sp.	Diatom	18442004	0	0	0	1770341	0	0	737451
T01	Achnanthidium linearis	Diatom	17203166	0	273201	874313	437121	136636	91043	0
T042	Rossithidium sp.	Diatom	16830015	0	0	0	0	364362	0	0
T013	Diatoma vulgaris	Diatom	14495000	0	0	0	0	0	0	0
T041	Rhoicosphenia abbreviata	Diatom	10915289	0	0	6021960	3010980	0	0	0
T046	UID colonial chlorophyte	Green	10361915	0	0	6152390	1295279	404742	0	0
T036	Navicula sp.	Diatom	9372646	0	0	0	0	0	379347	0
T039	Nitzschia sp	Diatom	7557160	201032	0	0	0	0	1071928	133952
T024	Frustulia sp.	Diatom	5410774	0	0	0	0	0	0	0
T015	Encyonema cf. reich	Diatom	4860442	0	0	222608	0	0	92729	0
T014	Dictyosphaerium pulchellum	Green	3794652	252964	0	0	0	0	0	0
T043	Staurosira contruens	Diatom	2642368	0	0	0	0	0	0	0
T045	Synedra sp	Diatom	2512250	0	0	0	0	0	0	0
T018	Eucocconeis flexella	Diatom	2212354	0	0	0	0	0	0	0
T030	Homeothrix cf. jantha	Cyanobacteria	1639279	0	0	0	0	0	0	0
T026	Gomphoneis sp.	Diatom	1435193	0	0	0	0	0	573899	0
T047	UID flagellate	Other.Flagellates	1138484	0	0	0	0	0	0	0
T016	Encyonema neogracile	Diatom	857041	0	0	0	857041	0	0	0
T012	Diatoma tenuis	Diatom	834840	0	0	0	0	0	0	0
T06	Cyclotella spp.	Diatom	156846	0	0	0	0	0	0	0
T04	Anathece sp.	Cyanobacteria	4047	0	4047	0	0	0	0	0

Final Code	Report Name	High Level Taxa	Total Biovolume	LC_DC3_2021-05-03_3	LC_DC3_2021-05-31_1	LC_DC3_2021-05-31_2	LC_DC3_2021-05-31_3	LC_DC3_2021-06-21_1	LC_DC3_2021-06-21_2	LC_DC3_2021-06-21_3
T010	Diatoma heimale	Diatom	1396456880	7577360	0	0	0	0	0	0
T037	Nitzschia cf. liebethruthii	Diatom	852234276	3154044	31539828	20816364	10723464	102189312	108497196	144452604
T050	Ulothrix sp.	Green	796570608	0	0	0	0	0	0	0
T051	Ulothrix zonata	Green	617833497	0	0	0	0	0	0	0
T02	Achnanthidium minutissima	Diatom	555248500	22690372	19474683	20917260	19955516	20436349	23081088	23802338
T017	Encyonema silesiacum	Diatom	401514872	6762302	7213083	5409375	1803125	5409375	34261124	21638666
T028	Gomphonema sp.	Diatom	378257099	0	39955509	55111262	35822365	33066935	44089099	50977672
T034	Meridion circulare	Diatom	369235774	6494552	12469568	0	0	10391418	10391418	31173583
T033	Hydrurus foetidus	Chrysophyta	361780525	0	1333827	0	17340611	15562031	8892610	1333827
T029	Hannaea arcus	Diatom	291575569	0	0	0	0	11900625	3966875	3966875
T025	Gomphoneis pseudo-okunoi	Diatom	290424221	22388755	6889019	19288897	0	13777593	9644449	11022163
T032	Hydrurus	Chrysophyta	271223955	0	16896002	9781828	7558639	49798500	16896002	25343859
T035	Meridion sp.	Diatom	204140899	3818949	0	12217476	6108738	0	0	0
T040	Phormidium autumnale	Cyanobacteria	184421994	1262845	3652566	2020572	0	5439982	1709705	2719991
T044	Surirella cf. lacrimula	Diatom	145482759	5684046	9092121	9092121	0	0	9092121	36371425
T048	UID Pennate Diatom	Diatom	84421152	0	3278409	0	13114696	6556818	3278409	6556818
T020	Eunotia (parallel	Diatom	80313150	0	2747981	3925632	0	6281062	7851392	14525005
T027	Gomphonema sp	Diatom	77194994	15577634	0	0	0	0	0	0
T03	Achnanthidium rivulare	Diatom	74582039	0	2914330	2914330	2331502	2914330	6411488	1165657
T031	Homeothrix sp.	Cyanobacteria	68829589	7103556	4371419	2914280	6508557	13794256	4177131	2175993
T07	Cymbella exisiformis	Diatom	66292647	3718758	0	0	0	0	1189941	1189941
T038	Nitzschia sigma	Diatom	57901372	0	0	0	0	0	0	0
T011	Diatoma moniliformis	Diatom	55615472	0	0	0	0	0	0	0
T05	Chlorogloea sp.	Cyanobacteria	41934626	1120173	262287	131136	393423	1529995	480862	2054569
T09	Cymbella spp.	Diatom	30035069	2477180	990808	990808	0	495404	1486212	990808
T019	Eunotia	Diatom	27920247	0	0	0	0	0	0	0
T021	Eunotia cf. microglossa	Diatom	24644653	0	0	0	654251	1962753	0	1308502
T022	Eunotia sp.	Diatom	19764274	0	1022267	511134	1533401	1022268	0	511134
T023	Frustulia cf. soror	Diatom	19476548	0	0	0	0	0	0	0
T049	Ulnaria ulna	Diatom	18507913	0	0	0	0	0	0	0
T08	Cymbella sp.	Diatom	18442004	1106749	0	0	0	0	1770341	0
T01	Achnanthidium linearis	Diatom	17203166	0	0	0	437121	0	0	218561
T042	Rossithidium sp.	Diatom	16830015	0	0	0	1165657	0	0	0
T013	Diatoma vulgaris	Diatom	14495000	0	0	0	0	0	0	0
T041	Rhoicosphenia abbreviata	Diatom	10915289	0	0	0	0	0	0	0
T046	UID colonial chlorophyte	Green	10361915	0	0	0	0	0	0	971380
T036	Navicula sp.	Diatom	9372646	0	0	0	2732008	3642971	0	0
T039	Nitzschia sp	Diatom	7557160	803920	0	0	0	321568	321568	0
T024	Frustulia sp.	Diatom	5410774	0	0	0	0	0	0	0
T015	Encyonema cf. reich	Diatom	4860442	0	445216	0	445216	667824	1113112	890504
T014	Dictyosphaerium pulchellum	Green	3794652	0	0	0	0	0	0	0
T043	Staurosira contruens	Diatom	2642368	0	0	0	2642368	0	0	0
T045	Synedra sp	Diatom	2512250	0	0	0	0	0	0	0
T018	Eucocconeis flexella	Diatom	2212354	0	0	0	0	0	0	0
T030	Homeothrix cf. jantha	Cyanobacteria	1639279	0	0	0	0	0	0	0
T026	Gomphoneis sp.	Diatom	1435193	0	0	0	0	0	0	0
T047	UID flagellate	Other.Flagellates	1138484	0	0	0	0	0	0	0
T016	Encyonema neogracile	Diatom	857041	0	0	0	0	0	0	0
T012	Diatoma tenuis	Diatom	834840	0	0	0	0	0	0	0
T06	Cyclotella spp.	Diatom	156846	0	0	0	0	0	0	0
T04	Anathece sp.	Cyanobacteria	4047	0	0	0	0	0	0	0

Final Code	Report Name	High Level Taxa	Total Biovolume	LC_DC4_2021-05-05_1	LC_DC4_2021-05-05_2	LC_DC4_2021-05-05_3	LC_DC4_2021-06-01_1	LC_DC4_2021-06-01_2	LC_DC4_2021-06-01_3	LC_DCDS_2021-05-04_1
T010	Diatoma heimale	Diatom	1396456880	484849120	159089280	101010560	15150800	7577360	36361920	0
T037	Nitzschia cf. liebethruthii	Diatom	852234276	22866360	17346936	17084184	11039052	10250388	49833120	25862712
T050	Ulothrix sp.	Green	796570608	0	273820744	0	0	0	0	0
T051	Ulothrix zonata	Green	617833497	0	0	73464448	0	132234866	141050143	0
T02	Achnanthidium minutissima	Diatom	555248500	109995832	2704843	2003576	23592012	7062589	1442578	27649238
T017	Encyonema silesiacum	Diatom	401514872	13524020	4507812	5259503	6762302	4507812	37867374	19835541
T028	Gomphonema sp.	Diatom	378257099	0	0	1722143	7749868	19805763	2755429	0
T034	Meridion circulare	Diatom	369235774	7793732	16885971	19050822	2597687	1299179	0	18704015
T033	Hydrurus foetidus	Chrysophyta	361780525	25010402	12505273	14079954	23343119	22787214	22231453	5780204
T029	Hannaea arcus	Diatom	291575569	19835657	7438532	9917187	9917187	2479938	35703157	11900625
T025	Gomphoneis pseudo-okunoi	Diatom	290424221	17222325	12055449	3444287	2583438	3444287	8266734	33066935
T032	Hydrurus	Chrysophyta	271223955	0	0	0	14728318	1111522	2667797	0
T035	Meridion sp.	Diatom	204140899	0	0	7635922	0	11454871	0	0
T040	Phormidium autumnale	Cyanobacteria	184421994	18457108	242858	1457146	5779978	145720	8781681	12822825
T044	Surirella cf. lacrimula	Diatom	145482759	0	0	0	0	0	0	27276363
T048	UID Pennate Diatom	Diatom	84421152	0	0	1365650	2049536	4098011	9835227	0
T020	Eunotia (parallel	Diatom	80313150	4416447	1472191	1472191	736096	981376	3533082	10206822
T027	Gomphonema sp	Diatom	77194994	0	0	0	0	0	0	0
T03	Achnanthidium rivulare	Diatom	74582039	0	0	485753	10200060	1821433	0	0
T031	Homeothrix sp.	Cyanobacteria	68829589	1092853	242858	89045	1226428	910710	388571	2525709
T07	Cymbella exisiformis	Diatom	66292647	1487426	0	991746	1487426	1487426	2379882	8329972
T038	Nitzschia sigma	Diatom	57901372	0	0	0	0	0	0	0
T011	Diatoma moniliformis	Diatom	55615472	4267328	711344	0	2133664	711344	0	3413568
T05	Chlorogloea sp.	Cyanobacteria	41934626	382495	2841415	2222136	2267672	1284107	1835994	655710
T09	Cymbella spp.	Diatom	30035069	2477180	0	0	0	619255	0	4458796
T019	Eunotia	Diatom	27920247	8695131	4347565	0	0	0	0	9274756
T021	Eunotia cf. microglossa	Diatom	24644653	3271466	409013	0	817814	409013	5234219	0
T022	Eunotia sp.	Diatom	19764274	1277834	1277834	0	958458	319541	1533401	0
T023	Frustulia cf. soror	Diatom	19476548	0	0	0	5410774	5410774	0	0
T049	Ulnaria ulna	Diatom	18507913	0	0	10575364	0	0	0	0
T08	Cymbella sp.	Diatom	18442004	2212926	0	0	2213498	0	0	1770341
T01	Achnanthidium linearis	Diatom	17203166	6283900	0	91043	2595513	0	0	218561
T042	Rossithidium sp.	Diatom	16830015	15299996	0	0	0	0	0	0
T013	Diatoma vulgaris	Diatom	14495000	0	0	0	0	0	0	0
T041	Rhoicosphenia abbreviata	Diatom	10915289	0	0	0	1882349	0	0	0
T046	UID colonial chlorophyte	Green	10361915	0	0	0	0	0	0	0
T036	Navicula sp.	Diatom	9372646	0	0	1138336	0	0	0	910669
T039	Nitzschia sp	Diatom	7557160	401960	0	401960	0	0	0	1286376
T024	Frustulia sp.	Diatom	5410774	0	5410774	0	0	0	0	0
T015	Encyonema cf. reich	Diatom	4860442	0	0	92729	0	0	0	0
T014	Dictyosphaerium pulchellum	Green	3794652	0	0	0	0	0	0	0
T043	Staurosira contruens	Diatom	2642368	0	0	0	0	0	0	0
T045	Synedra sp	Diatom	2512250	0	0	0	0	0	2512250	0
T018	Eucocconeis flexella	Diatom	2212354	0	0	2212354	0	0	0	0
T030	Homeothrix cf. jantha	Cyanobacteria	1639279	0	0	0	0	0	0	0
T026	Gomphoneis sp.	Diatom	1435193	0	861294	0	0	0	0	0
T047	UID flagellate	Other.Flagellates	1138484	0	426987	284510	0	0	0	0
T016	Encyonema neogracile	Diatom	857041	0	0	0	0	0	0	0
T012	Diatoma tenuis	Diatom	834840	0	0	0	0	0	0	0
T06	Cyclotella spp.	Diatom	156846	0	0	62719	0	0	0	0
T04	Anathece sp.	Cyanobacteria	4047	0	0	0	0	0	0	0

Final Code	Report Name	High Level Taxa	Total Biovolume	LC_DCDS_2021-05-04_2	LC_DCDS_2021-06-01_1	LC_DCDS_2021-06-01_2	LC_DCDS_2021-06-01_3	LC_DCDS_2021-06-01_Dup
T010	Diatoma heimale	Diatom	1396456880	0	30301600	109089680	27271440	21211120
T037	Nitzschia cf. liebethruthii	Diatom	852234276	1261536	5782380	6938856	11985204	11039052
T050	Ulothrix sp.	Green	796570608	0	0	0	0	0
T051	Ulothrix zonata	Green	617833497	0	0	0	0	0
T02	Achnanthidium minutissima	Diatom	555248500	39911032	1402534	13704372	1382474	601042
T017	Encyonema silesiacum	Diatom	401514872	10819333	4507812	14425583	9917770	11720895
T028	Gomphonema sp.	Diatom	378257099	0	9185062	13777593	2755429	4477573
T034	Meridion circulare	Diatom	369235774	12469568	4329702	14547717	3636761	2597687
T033	Hydrurus foetidus	Chrysophyta	361780525	2223188	10004132	28456265	1889732	3557015
T029	Hannaea arcus	Diatom	291575569	7933750	9917187	19835657	3966875	9917187
T025	Gomphoneis pseudo-okunoi	Diatom	290424221	27555631	0	0	1377715	0
T032	Hydrurus	Chrysophyta	271223955	0	6113660	6224813	3001254	1222675
T035	Meridion sp.	Diatom	204140899	0	0	0	3054369	0
T040	Phormidium autumnale	Cyanobacteria	184421994	5750849	0	7460554	582853	563426
T044	Surirella cf. lacrimula	Diatom	145482759	0	7577748	0	4546060	6819091
T048	UID Pennate Diatom	Diatom	84421152	0	2732361	3278409	2458807	2458807
T020	Eunotia (parallel	Diatom	80313150	392551	327168	1177652	98138	98138
T027	Gomphonema sp	Diatom	77194994	16614710	0	0	0	0
T03	Achnanthidium rivulare	Diatom	74582039	0	0	2914330	145707	0
T031	Homeothrix sp.	Cyanobacteria	68829589	1942855	396664	2719991	33998	38855
T07	Cymbella exisiformis	Diatom	66292647	0	991746	3569823	1189941	594971
T038	Nitzschia sigma	Diatom	57901372	0	0	0	57901372	0
T011	Diatoma moniliformis	Diatom	55615472	0	0	0	0	0
T05	Chlorogloea sp.	Cyanobacteria	41934626	874285	1457146	437135	513646	469934
T09	Cymbella spp.	Diatom	30035069	990808	619255	2477180	247702	123851
T019	Eunotia	Diatom	27920247	4637003	0	0	0	0
T021	Eunotia cf. microglossa	Diatom	24644653	0	272534	0	163563	163563
T022	Eunotia sp.	Diatom	19764274	0	212917	1533401	638917	0
T023	Frustulia cf. soror	Diatom	19476548	0	0	0	0	0
T049	Ulnaria ulna	Diatom	18507913	0	0	0	0	0
T08	Cymbella sp.	Diatom	18442004	0	0	0	0	0
T01	Achnanthidium linearis	Diatom	17203166	655682	0	874313	54640	0
T042	Rossithidium sp.	Diatom	16830015	0	0	0	0	0
T013	Diatoma vulgaris	Diatom	14495000	0	0	0	0	0
T041	Rhoicosphenia abbreviata	Diatom	10915289	0	0	0	0	0
T046	UID colonial chlorophyte	Green	10361915	0	0	0	0	1538124
T036	Navicula sp.	Diatom	9372646	0	0	0	0	0
T039	Nitzschia sp	Diatom	7557160	0	0	0	0	0
T024	Frustulia sp.	Diatom	5410774	0	0	0	0	0
T015	Encyonema cf. reich	Diatom	4860442	0	0	0	55652	55652
T014	Dictyosphaerium pulchellum	Green	3794652	0	0	0	0	0
T043	Staurosira contruens	Diatom	2642368	0	0	0	0	0
T045	Synedra sp	Diatom	2512250	0	0	0	0	0
T018	Eucocconeis flexella	Diatom	2212354	0	0	0	0	0
T030	Homeothrix cf. jantha	Cyanobacteria	1639279	0	0	0	0	0
T026	Gomphoneis sp.	Diatom	1435193	0	0	0	0	0
T047	UID flagellate	Other.Flagellates	1138484	0	0	0	0	0
T016	Encyonema neogracile	Diatom	857041	0	0	0	0	0
T012	Diatoma tenuis	Diatom	834840	0	0	0	0	0
T06	Cyclotella spp.	Diatom	156846	0	0	0	0	0
T04	Anathece sp.	Cyanobacteria	4047	0	0	0	0	0

PERIPHYTON COMMUNITY

Larratt Report January 11, 2022

Final Code	Report Name	High Level Taxa	Total Abundance	LC_DC1_2021-09-07_1	LC_DC1_2021-09-07_2	LC_DC1_2021-09-07_3	LC_DC2_2021-09-09_1	LC_DC2_2021-09-09_2	LC_DC2_2021-09-09_3	LC_DC3_2021-09-10_1
T032	Hydrurus	Chrysophyta	1345082	278293	92764	487013	0	46382	23191	0
T033	Hydrurus foetidus	Chrysophyta	5890536	672542	92764	1808905	115955	0	0	23191
T05	Anathece sp.	Cyanobacteria	115955	115955	0	0	0	0	0	0
T07	Chlorogloea sp.	Cyanobacteria	2481443	1089981	0	115955	46382	0	0	115955
T030	Homeothrix cf. jantha	Cyanobacteria	1159554	579777	0	0	0	0	0	0
T031	Homeothrix sp.	Cyanobacteria	55612243	3478664	4986085	4986085	2551020	4522263	3594620	2087199
T041	Phormidium autumnale	Cyanobacteria	20292207	2898887	1994434	834879	463822	231911	1623377	1182746
T043	Pseudophormidium tenue	Cyanobacteria	1066790	0	0	0	0	0	0	0
T01	Achnanthidium linearis	Diatom	3130796	208720	46382	185529	23191	139147	231911	46382
T02	Achnanthidium minutissima	Diatom	115422079	3710575	4081633	2226345	6563080	8766234	4777365	4568646
T03	Achnanthidium rivulare	Diatom	10366419	579777	1043599	672542	1066790	1089981	556586	139147
T04	Amphora.sp	Diatom	417439	0	0	0	0	23191	46382	0
T08	Cocconeis placentula	Diatom	23191	0	0	0	0	0	0	0
T09	Cymbella cf. neocistula	Diatom	162337	23191	0	0	0	0	23191	0
T010	Cymbella exisiformis	Diatom	1298699	0	0	139147	115955	115955	162338	0
T011	Cymbella sp.	Diatom	46382	0	0	0	23191	0	0	0
T012	Cymbella spp.	Diatom	1461035	46382	69573	92764	23191	23191	92764	23191
T013	Diatoma heimale	Diatom	487012	46382	0	0	0	0	0	23191
T014	Diatoma moniliformis	Diatom	1089980	185529	23191	324675	0	0	23191	0
T015	Diatoma tenuis	Diatom	69573	0	0	46382	0	0	0	0
T016	Diatoma vulgaris	Diatom	487013	23191	185529	162338	0	0	0	0
T018	Encyonema cf. reich	Diatom	1646567	0	0	0	69573	23191	23191	278293
T019	Encyonema neogracile	Diatom	278292	46382	0	0	0	0	0	0
T020	Encyonema silesiacum	Diatom	6563080	487013	463822	510204	371058	626160	718924	92764
T021	Eunotia (parallel	Diatom	2087196	23191	92764	23191	139147	69573	487013	0
T022	Eunotia bilunaris	Diatom	92764	0	0	0	0	0	0	0
T023	Eunotia cf. microglossa	Diatom	1043598	0	0	0	162338	0	46382	0
T024	Eunotia sp.	Diatom	997215	0	92764	69573	162338	92764	69573	23191
T025	Frustulia cf. soror	Diatom	185528	23191	23191	23191	0	0	0	0
T026	Gomphoneis pseudo-okunoi	Diatom	626159	0	0	0	0	23191	0	139147
T027	Gomphonema sp	Diatom	208719	0	0	0	0	0	0	0
T028	Gomphonema sp.	Diatom	8279219	0	92764	69573	278293	301484	440631	278293
T029	Hannaea arcus	Diatom	974022	0	0	23191	92764	115955	0	0
T034	Meridion circulare	Diatom	2922076	0	0	0	46382	0	0	23191
T035	Meridion sp.	Diatom	417438	0	0	0	0	92764	0	0
T036	Navicual radiosa	Diatom	23191	0	0	0	0	0	0	0
T037	Navicula cryptocephala	Diatom	92764	0	0	0	46382	0	0	0
T038	Navicula sp.	Diatom	23191	0	0	0	0	0	0	23191
T039	Nitzschia palea	Diatom	26808904	0	417440	347866	695733	3246753	4939703	139147
T040	Nitzschia sp	Diatom	858069	255102	0	23191	69573	0	0	46382
T042	Pinnularia sp.	Diatom	46382	0	0	0	0	0	0	0
T044	Rhoicosphenia abbreviata	Diatom	231910	0	0	0	0	23191	115955	46382
T046	Surirella cf. lacrimula	Diatom	440629	0	0	0	0	23191	0	23191
T047	Synedra sp	Diatom	92764	0	0	0	69573	0	0	0
T048	UID Pennate Diatom	Diatom	788494	69573	23191	23191	46382	69573	23191	46382
T049	Ulnaria ulna	Diatom	231910	23191	46382	92764	0	23191	23191	0
T017	Dictyosphaerium pulchellum	Green	92764	0	0	0	0	0	0	0
T045	Scenedesmus abundans	Green	92764	0	0	0	0	0	0	0
T050	Ulothrix sp.	Green	440631	0	0	0	0	0	0	0
T051	Ulothrix zonata	Green	394249	0	0	0	0	139147	46382	0
T06	Audouinella.hermannii	Rhodophyta	208720	0	0	0	0	0	0	0

Final Code	Report Name	High Level Taxa	Total Abundance	LC_DC3_2021-09-10_2	LC_DC3_2021-09-10_3	LC_DC3_2021-11-29_1	LC_DC3_2021-11-29_2	LC_DC3_2021-11-29_3	LC_DC4_2021-09-09_1	LC_DC4_2021-09-09_2
T032	Hydrurus	Chrysophyta	1345082	185529	23191	0	0	23191	23191	23191
T033	Hydrurus foetidus	Chrysophyta	5890536	556586	46382	0	115955	1321892	208720	0
T05	Anathece sp.	Cyanobacteria	115955	0	0	0	0	0	0	0
T07	Chlorogloea sp.	Cyanobacteria	2481443	115955	301484	69573	0	115955	0	0
T030	Homeothrix cf. jantha	Cyanobacteria	1159554	0	0	0	0	579777	0	0
T031	Homeothrix sp.	Cyanobacteria	55612243	3130798	1507421	997217	3478664	5449907	231911	463822
T041	Phormidium autumnale	Cyanobacteria	20292207	1020408	881262	579777	1321892	115955	695733	1229128
T043	Pseudophormidium tenue	Cyanobacteria	1066790	0	0	0	0	0	0	0
T01	Achnanthidium linearis	Diatom	3130796	69573	46382	69573	0	23191	208720	115955
T02	Achnanthidium minutissima	Diatom	115422079	3919295	6122449	4081633	2690167	2736549	10992579	9021336
T03	Achnanthidium rivulare	Diatom	10366419	92764	92764	69573	46382	23191	626160	649351
T04	Amphora.sp	Diatom	417439	0	0	0	0	0	115955	139147
T08	Cocconeis placentula	Diatom	23191	0	0	0	0	0	0	23191
T09	Cymbella cf. neocistula	Diatom	162337	0	0	46382	23191	23191	0	0
T010	Cymbella exisiformis	Diatom	1298699	0	0	92764	69573	92764	69573	92764
T011	Cymbella sp.	Diatom	46382	0	0	23191	0	0	0	0
T012	Cymbella spp.	Diatom	1461035	92764	0	46382	139147	278293	115955	23191
T013	Diatoma heimale	Diatom	487012	0	0	69573	23191	231911	23191	0
T014	Diatoma moniliformis	Diatom	1089980	0	0	0	0	0	255102	92764
T015	Diatoma tenuis	Diatom	69573	0	0	0	0	0	23191	0
T016	Diatoma vulgaris	Diatom	487013	0	0	0	0	0	46382	23191
T018	Encyonema cf. reich	Diatom	1646567	69573	394249	0	46382	185529	0	23191
T019	Encyonema neogracile	Diatom	278292	0	0	0	0	46382	0	0
T020	Encyonema silesiacum	Diatom	6563080	115955	69573	231911	394249	463822	394249	394249
T021	Eunotia (parallel	Diatom	2087196	92764	0	231911	208720	139147	92764	69573
T022	Eunotia bilunaris	Diatom	92764	0	0	0	0	0	0	0
T023	Eunotia cf. microglossa	Diatom	1043598	0	92764	139147	0	46382	0	46382
T024	Eunotia sp.	Diatom	997215	0	23191	0	69573	0	23191	0
T025	Frustulia cf. soror	Diatom	185528	0	0	0	0	0	23191	69573
T026	Gomphoneis pseudo-okunoi	Diatom	626159	23191	46382	162338	23191	92764	115955	0
T027	Gomphonema sp	Diatom	208719	0	23191	23191	69573	69573	0	0
T028	Gomphonema sp.	Diatom	8279219	811688	788497	1275510	556586	1066790	92764	278293
T029	Hannaea arcus	Diatom	974022	46382	23191	92764	69573	69573	46382	23191
T034	Meridion circulare	Diatom	2922076	115955	0	626160	278293	324675	0	0
T035	Meridion sp.	Diatom	417438	0	0	115955	92764	23191	0	0
T036	Navicual radiosa	Diatom	23191	0	0	0	0	0	0	0
T037	Navicula cryptocephala	Diatom	92764	0	0	0	0	0	0	0
T038	Navicula sp.	Diatom	23191	0	0	0	0	0	0	0
T039	Nitzschia palea	Diatom	26808904	1205937	556586	2620594	1321892	3014842	440631	1739332
T040	Nitzschia sp	Diatom	858069	0	23191	69573	0	23191	46382	162338
T042	Pinnularia sp.	Diatom	46382	0	0	0	0	0	0	46382
T044	Rhoicosphenia abbreviata	Diatom	231910	0	0	23191	23191	0	0	0
T046	Surirella cf. lacrimula	Diatom	440629	23191	23191	69573	46382	23191	0	0
T047	Synedra sp	Diatom	92764	0	0	0	0	0	0	23191
T048	UID Pennate Diatom	Diatom	788494	23191	23191	115955	69573	69573	23191	0
T049	Ulnaria ulna	Diatom	231910	0	0	0	0	0	0	0
T017	Dictyosphaerium pulchellum	Green	92764	0	0	0	0	0	0	0
T045	Scenedesmus abundans	Green	92764	0	0	0	92764	0	0	0
T050	Ulothrix sp.	Green	440631	0	0	0	0	0	23191	0
T051	Ulothrix zonata	Green	394249	0	0	0	0	0	0	0
T06	Audouinella.hermannii	Rhodophyta	208720	0	0	0	0	0	0	0

Final Code	Report Name	High Level Taxa	Total Abundance	LC_DC4_2021-09-09_3	LC_DCDS_2021-09-10_1	LC_DCDS_2021-09-10_2	LC_DCDS_2021-09-10_3	LC_DCDS_2021-11-30_1	LC_DCDS_2021-11-30_2	LC_DCDS_2021-11-30_01_duplicate
T032	Hydrurus	Chrysophyta	1345082	0	23191	0	115955	0	0	0
T033	Hydrurus foetidus	Chrysophyta	5890536	0	417440	69573	231911	46382	139147	23191
T05	Anathece sp.	Cyanobacteria	115955	0	0	0	0	0	0	0
T07	Chlorogloea sp.	Cyanobacteria	2481443	115955	46382	185529	0	46382	0	115955
T030	Homeothrix cf. jantha	Cyanobacteria	1159554	0	0	0	0	0	0	0
T031	Homeothrix sp.	Cyanobacteria	55612243	788497	2435065	4058442	2551020	1159555	1808905	1345083
T041	Phormidium autumnale	Cyanobacteria	20292207	649351	811688	1553803	115955	0	2087199	0
T043	Pseudophormidium tenue	Cyanobacteria	1066790	0	0	0	0	0	1066790	0
T01	Achnanthidium linearis	Diatom	3130796	69573	92764	92764	46382	231911	672542	510204
T02	Achnanthidium minutissima	Diatom	115422079	8812616	6168831	5055659	4661410	5844156	4661410	5960111
T03	Achnanthidium rivulare	Diatom	10366419	463822	371058	718924	371058	463822	695733	533395
T04	Amphora.sp	Diatom	417439	69573	23191	0	0	0	0	0
T08	Cocconeis placentula	Diatom	23191	0	0	0	0	0	0	0
T09	Cymbella cf. neocistula	Diatom	162337	0	0	0	0	0	0	23191
T010	Cymbella exisiformis	Diatom	1298699	69573	23191	23191	0	0	185529	46382
T011	Cymbella sp.	Diatom	46382	0	0	0	0	0	0	0
T012	Cymbella spp.	Diatom	1461035	92764	0	46382	46382	115955	46382	46382
T013	Diatoma heimale	Diatom	487012	0	23191	0	0	23191	23191	0
T014	Diatoma moniliformis	Diatom	1089980	115955	0	0	23191	0	23191	23191
T015	Diatoma tenuis	Diatom	69573	0	0	0	0	0	0	0
T016	Diatoma vulgaris	Diatom	487013	0	0	0	0	46382	0	0
T018	Encyonema cf. reich	Diatom	1646567	23191	0	0	0	92764	371058	46382
T019	Encyonema neogracile	Diatom	278292	0	0	0	0	46382	0	139146
T020	Encyonema silesiacum	Diatom	6563080	278293	46382	69573	139147	231911	347866	115955
T021	Eunotia (parallel	Diatom	2087196	69573	46382	46382	46382	46382	69573	92764
T022	Eunotia bilunaris	Diatom	92764	0	0	0	0	0	0	92764
T023	Eunotia cf. microglossa	Diatom	1043598	0	92764	23191	0	115955	115955	162338
T024	Eunotia sp.	Diatom	997215	46382	0	23191	0	115955	46382	139147
T025	Frustulia cf. soror	Diatom	185528	23191	0	0	0	0	0	0
T026	Gomphoneis pseudo-okunoi	Diatom	626159	0	0	0	0	0	0	0
T027	Gomphonema sp	Diatom	208719	0	0	0	0	23191	0	0
T028	Gomphonema sp.	Diatom	8279219	278293	139147	162338	463822	371058	417440	115955
T029	Hannaea arcus	Diatom	974022	23191	46382	69573	23191	46382	92764	69573
T034	Meridion circulare	Diatom	2922076	0	46382	46382	69573	278293	602968	463822
T035	Meridion sp.	Diatom	417438	0	23191	0	0	0	0	69573
T036	Navicual radiosa	Diatom	23191	0	0	0	23191	0	0	0
T037	Navicula cryptocephala	Diatom	92764	0	23191	0	0	23191	0	0
T038	Navicula sp.	Diatom	23191	0	0	0	0	0	0	0
T039	Nitzschia palea	Diatom	26808904	626160	765306	510204	811688	1066790	1345083	997217
T040	Nitzschia sp	Diatom	858069	115955	0	0	0	23191	0	0
T042	Pinnularia sp.	Diatom	46382	0	0	0	0	0	0	0
T044	Rhoicosphenia abbreviata	Diatom	231910	0	0	0	0	0	0	0
T046	Surirella cf. lacrimula	Diatom	440629	0	23191	0	0	69573	23191	92764
T047	Synedra sp	Diatom	92764	0	0	0	0	0	0	0
T048	UID Pennate Diatom	Diatom	788494	0	0	0	69573	23191	69573	0
T049	Ulnaria ulna	Diatom	231910	0	0	0	0	0	0	23191
T017	Dictyosphaerium pulchellum	Green	92764	0	0	92764	0	0	0	0
T045	Scenedesmus abundans	Green	92764	0	0	0	0	0	0	0
T050	Ulothrix sp.	Green	440631	0	0	0	0	0	417440	0
T051	Ulothrix zonata	Green	394249	0	0	0	0	208720	0	0
T06	Audouinella.hermannii	Rhodophyta	208720	0	0	0	0	208720	0	0

Final Code	Report Name	High Level Taxa	Total Biovolume	LC_DC1_2021-09-07_1	LC_DC1_2021-09-07_2	LC_DC1_2021-09-07_3	LC_DC2_2021-09-09_1	LC_DC2_2021-09-09_2	LC_DC2_2021-09-09_3	LC_DC3_2021-09-10_1
T02	Achnanthidium minutissima	Diatom	8566641297	275399346	302939317	165239607	487112627	650630996	354576634	339085484
T039	Nitzschia palea	Diatom	4611131488	0	71799680	59832952	119666076	558441516	849628916	23933284
T020	Encyonema silesiacum	Diatom	3827313502	284005593	270481573	297529614	216385492	365150299	419246380	54096081
T028	Gomphonema sp.	Diatom	3689004477	0	41333224	30999918	124000117	134333423	196333704	124000117
T050	Ulothrix sp.	Green	2837780381	0	0	0	0	0	0	0
T051	Ulothrix zonata	Green	2248004118	0	0	0	0	793414895	264469731	0
T034	Meridion circulare	Diatom	1963942458	0	0	0	31173583	0	0	15586792
T03	Achnanthidium rivulare	Diatom	1954023946	109285390	196713777	126771180	201085178	205456578	104913989	26228592
T013	Diatoma heimale	Diatom	1686400801	160609270	0	0	0	0	0	80304635
T06	Audouinella.hermannii	Rhodophyta	1606497386	0	0	0	0	0	0	0
T046	Surirella cf. lacrimula	Diatom	1295683112	0	0	0	0	68193848	0	68193848
T016	Diatoma vulgaris	Diatom	1217532500	57977500	463822500	405845000	0	0	0	0
T049	Ulnaria ulna	Diatom	1166561653	116656165	233312331	466624662	0	116656165	116656165	0
T033	Hydrurus foetidus	Chrysophyta	847019690	96707043	13338843	260108444	16673554	0	0	3334711
T048	UID Pennate Diatom	Diatom	836030351	73767384	24589128	24589128	49178256	73767384	24589128	49178256
T024	Eunotia sp.	Diatom	791270379	0	73606399	55204799	128811992	73606399	55204799	18401600
T042	Pinnularia sp.	Diatom	611407524	0	0	0	0	0	0	0
T027	Gomphonema sp	Diatom	560770639	0	0	0	0	0	0	0
T035	Meridion sp.	Diatom	552421246	0	0	0	0	122760277	0	0
T025	Frustulia cf. soror	Diatom	519322383	64915298	64915298	64915298	0	0	0	0
T041	Phormidium autumnale	Cyanobacteria	509998787	72856977	50125594	20982798	11657118	5828559	40799914	29725649
T010	Cymbella exisiformis	Diatom	499797948	0	0	53550041	44624714	44624714	62474984	0
T04	Amphora.sp	Diatom	417032608	0	0	0	0	23168423	46336845	0
T029	Hannaea arcus	Diatom	413097346	0	0	9835651	39342605	49178256	0	0
T014	Diatoma moniliformis	Diatom	401112640	68274672	8534288	119480400	0	0	8534288	0
T031	Homeothrix sp.	Cyanobacteria	349422029	21857091	31328496	31328496	16028531	28414216	22585664	13114258
T026	Gomphoneis pseudo-okunoi	Diatom	279000152	0	0	0	0	10333306	0	62000281
T021	Eunotia (parallel	Diatom	264983801	2944256	11777024	2944256	17665663	8832768	61829629	0
T012	Cymbella spp.	Diatom	247858746	7868521	11802781	15737042	3934260	3934260	15737042	3934260
T01	Achnanthidium linearis	Diatom	221302929	14753547	3278550	13114272	1639275	9835722	16392823	3278550
T023	Eunotia cf. microglossa	Diatom	220819833	0	0	0	34349865	0	9814187	0
T032	Hydrurus	Chrysophyta	193413800	40016673	13338843	70029213	0	6669421	3334711	0
T09	Cymbella cf. neocistula	Diatom	165748934	23678419	0	0	0	0	23678419	0
T036	Navicual radiosa	Diatom	137744652	0	0	0	0	0	0	0
T044	Rhoicosphenia abbreviata	Diatom	123174980	0	0	0	0	12317498	61587490	24634996
T018	Encyonema cf. reich	Diatom	118544312	0	0	0	5008896	1669632	1669632	20035658
T037	Navicula cryptocephala	Diatom	107099312	0	0	0	53549656	0	0	0
T040	Nitzschia sp	Diatom	89239176	26530608	0	2411864	7235592	0	0	4823728
T019	Encyonema neogracile	Diatom	77137006	12856168	0	0	0	0	0	0
T047	Synedra sp	Diatom	75370750	0	0	0	56528062	0	0	0
T043	Pseudophormidium tenue	Cyanobacteria	42416405	0	0	0	0	0	0	0
T08	Cocconeis placentula	Diatom	35517629	0	0	0	0	0	0	0
T07	Chlorogloea sp.	Cyanobacteria	35080572	15409243	0	1639275	655710	0	0	1639275
T011	Cymbella sp.	Diatom	32022026	0	0	0	16011013	0	0	0
T015	Diatoma tenuis	Diatom	15027768	0	0	10018512	0	0	0	0
T045	Scenedesmus abundans	Green	12822775	0	0	0	0	0	0	0
T030	Homeothrix cf. jantha	Cyanobacteria	12294606	6147303	0	0	0	0	0	0
T038	Navicula sp.	Diatom	6830313	0	0	0	0	0	0	6830313
T017	Dictyosphaerium pulchellum	Green	6071390	0	0	0	0	0	0	0
T022	Eunotia bilunaris	Diatom	3189611	0	0	0	0	0	0	0
T05	Anathece sp.	Cyanobacteria	121428	121428	0	0	0	0	0	0

Final Code	Report Name	High Level Taxa	Total Biovolume	LC_DC3_2021-09-10_2	LC_DC3_2021-09-10_3	LC_DC3_2021-11-29_1	LC_DC3_2021-11-29_2	LC_DC3_2021-11-29_3	LC_DC4_2021-09-09_1	LC_DC4_2021-09-09_2
T02	Achnanthidium minutissima	Diatom	8566641297	290890570	454408939	302939317	199664535	203107013	815870603	669564699
T039	Nitzschia palea	Diatom	4611131488	207421164	95732792	450742168	227365424	518552824	75788532	299165104
T020	Encyonema silesiacum	Diatom	3827313502	67620102	40572061	135240787	229909512	270481573	229909512	229909512
T028	Gomphonema sp.	Diatom	3689004477	361667044	351333738	568334054	248000233	475333855	41333224	124000117
T050	Ulothrix sp.	Green	2837780381	0	0	0	0	0	149356184	0
T051	Ulothrix zonata	Green	2248004118	0	0	0	0	0	0	0
T034	Meridion circulare	Diatom	1963942458	77933958	0	420845388	187042171	218215754	0	0
T03	Achnanthidium rivulare	Diatom	1954023946	17485602	17485602	13114202	8742801	4371401	118028379	122399780
T013	Diatoma heimale	Diatom	1686400801	0	0	240913906	80304635	803049815	80304635	0
T06	Audouinella.hermannii	Rhodophyta	1606497386	0	0	0	0	0	0	0
T046	Surirella cf. lacrimula	Diatom	1295683112	68193848	68193848	204581544	136387696	68193848	0	0
T016	Diatoma vulgaris	Diatom	1217532500	0	0	0	0	0	115955000	57977500
T049	Ulnaria ulna	Diatom	1166561653	0	0	0	0	0	0	0
T033	Hydrurus foetidus	Chrysophyta	847019690	80033345	6669421	0	16673554	190079231	30012540	0
T048	UID Pennate Diatom	Diatom	836030351	24589128	24589128	122945639	73767384	73767384	24589128	0
T024	Eunotia sp.	Diatom	791270379	0	18401600	0	55204800	0	18401600	0
T042	Pinnularia sp.	Diatom	611407524	0	0	0	0	0	0	611407524
T027	Gomphonema sp	Diatom	560770639	0	62307849	62307849	186923546	186923546	0	0
T035	Meridion sp.	Diatom	552421246	0	0	153450346	122760277	30690069	0	0
T025	Frustulia cf. soror	Diatom	519322383	0	0	0	0	0	64915298	194745893
T041	Phormidium autumnale	Cyanobacteria	509998787	25645650	22148530	14571385	33222770	2914267	17485677	30891356
T010	Cymbella exisiformis	Diatom	499797948	0	0	35699771	26774828	35699771	26774828	35699771
T04	Amphora.sp	Diatom	417032608	0	0	0	0	0	115842114	139011535
T029	Hannaea arcus	Diatom	413097346	19671302	9835651	39342605	29506953	29506953	19671302	9835651
T014	Diatoma moniliformis	Diatom	401112640	0	0	0	0	0	93877536	34137152
T031	Homeothrix sp.	Cyanobacteria	349422029	19671384	9471405	6265699	21857091	34242776	1457140	2914280
T026	Gomphoneis pseudo-okunoi	Diatom	279000152	10333306	20666612	72333587	10333306	41333224	51666530	0
T021	Eunotia (parallel	Diatom	264983801	11777024	0	29442687	26498431	17665663	11777024	8832768
T012	Cymbella spp.	Diatom	247858746	15737042	0	7868521	23605732	47211295	19671302	3934260
T01	Achnanthidium linearis	Diatom	221302929	4917826	3278550	4917826	0	1639275	14753547	8196376
T023	Eunotia cf. microglossa	Diatom	220819833	0	19628373	29442771	0	9814187	0	9814187
T032	Hydrurus	Chrysophyta	193413800	26677830	3334711	0	0	3334711	3334711	3334711
T09	Cymbella cf. neocistula	Diatom	165748934	0	0	47356839	23678419	23678419	0	0
T036	Navicual radiosa	Diatom	137744652	0	0	0	0	0	0	0
T044	Rhoicosphenia abbreviata	Diatom	123174980	0	0	12317498	12317498	0	0	0
T018	Encyonema cf. reich	Diatom	118544312	5008896	28383890	0	3339264	13357129	0	1669632
T037	Navicula cryptocephala	Diatom	107099312	0	0	0	0	0	0	0
T040	Nitzschia sp	Diatom	89239176	0	2411864	7235592	0	2411864	4823728	16883152
T019	Encyonema neogracile	Diatom	77137006	0	0	0	0	12856168	0	0
T047	Synedra sp	Diatom	75370750	0	0	0	0	0	0	18842688
T043	Pseudophormidium tenue	Cyanobacteria	42416405	0	0	0	0	0	0	0
T08	Cocconeis placentula	Diatom	35517629	0	0	0	0	0	0	35517629
T07	Chlorogloea sp.	Cyanobacteria	35080572	1639275	4262130	983565	0	1639275	0	0
T011	Cymbella sp.	Diatom	32022026	0	0	16011013	0	0	0	0
T015	Diatoma tenuis	Diatom	15027768	0	0	0	0	0	5009256	0
T045	Scenedesmus abundans	Green	12822775	0	0	0	12822775	0	0	0
T030	Homeothrix cf. jantha	Cyanobacteria	12294606	0	0	0	0	6147303	0	0
T038	Navicula sp.	Diatom	6830313	0	0	0	0	0	0	0
T017	Dictyosphaerium pulchellum	Green	6071390	0	0	0	0	0	0	0
T022	Eunotia bilunaris	Diatom	3189611	0	0	0	0	0	0	0
T05	Anathece sp.	Cyanobacteria	121428	0	0	0	0	0	0	0

Final Code	Report Name	High Level Taxa	Total Biovolume	LC_DC4_2021-09-09_3	LC_DCDS_2021-09-10_1	LC_DCDS_2021-09-10_2	LC_DCDS_2021-09-10_3	LC_DCDS_2021-11-30_1	LC_DCDS_2021-11-30_2	LC_DCDS_2021-11-30_duplicate
T02	Achnanthidium minutissima	Diatom	8566641297	654073474	457851417	375231650	345970440	433753997	345970440	442360192
T039	Nitzschia palea	Diatom	4611131488	107699520	131632632	87755088	139610336	183487880	231354276	171521324
T020	Encyonema silesiacum	Diatom	3827313502	162288827	27048041	40572061	81144705	135240787	202860888	67620102
T028	Gomphonema sp.	Diatom	3689004477	124000117	62000281	72333587	206667010	165333786	186000398	51666530
T050	Ulothrix sp.	Green	2837780381	0	0	0	0	0	2688424197	0
T051	Ulothrix zonata	Green	2248004118	0	0	0	0	1190119492	0	0
T034	Meridion circulare	Diatom	1963942458	0	31173583	31173583	46760375	187042171	405257925	311737175
T03	Achnanthidium rivulare	Diatom	1954023946	87428387	69942785	135513981	69942785	87428387	131142581	100542589
T013	Diatoma heimale	Diatom	1686400801	0	80304635	0	0	80304635	80304635	0
T06	Audouinella.hermannii	Rhodophyta	1606497386	0	0	0	0	1606497386	0	0
T046	Surirella cf. lacrimula	Diatom	1295683112	0	68193848	0	0	204581544	68193848	272775392
T016	Diatoma vulgaris	Diatom	1217532500	0	0	0	0	115955000	0	0
T049	Ulnaria ulna	Diatom	1166561653	0	0	0	0	0	0	116656165
T033	Hydrurus foetidus	Chrysophyta	847019690	0	60025081	10004132	33347251	6669421	20008408	3334711
T048	UID Pennate Diatom	Diatom	836030351	0	0	0	73767384	24589128	73767384	0
T024	Eunotia sp.	Diatom	791270379	36803200	0	18401600	0	92007999	36803200	110410392
T042	Pinnularia sp.	Diatom	611407524	0	0	0	0	0	0	0
T027	Gomphonema sp	Diatom	560770639	0	0	0	0	62307849	0	0
T035	Meridion sp.	Diatom	552421246	0	30690069	0	0	0	0	92070208
T025	Frustulia cf. soror	Diatom	519322383	64915298	0	0	0	0	0	0
T041	Phormidium autumnale	Cyanobacteria	509998787	16319971	20399944	39051329	2914267	0	52457032	0
T010	Cymbella exisiformis	Diatom	499797948	26774828	8924943	8924943	0	0	71399927	17849885
T04	Amphora.sp	Diatom	417032608	69505268	23168423	0	0	0	0	0
T029	Hannaea arcus	Diatom	413097346	9835651	19671302	29506953	9835651	19671302	39342605	29506953
T014	Diatoma moniliformis	Diatom	401112640	42671440	0	0	8534288	0	8534288	8534288
T031	Homeothrix sp.	Cyanobacteria	349422029	4954273	15299965	25499943	16028531	7285699	11365685	8451406
T026	Gomphoneis pseudo-okunoi	Diatom	279000152	0	0	0	0	0	0	0
T021	Eunotia (parallel	Diatom	264983801	8832768	5888512	5888512	5888512	5888512	8832768	11777024
T012	Cymbella spp.	Diatom	247858746	15737042	0	7868521	7868521	19671302	7868521	7868521
T01	Achnanthidium linearis	Diatom	221302929	4917826	6557101	6557101	3278550	16392823	47539193	36064196
T023	Eunotia cf. microglossa	Diatom	220819833	0	19628373	4907093	0	24535466	24535466	34349865
T032	Hydrurus	Chrysophyta	193413800	0	3334711	0	16673554	0	0	0
T09	Cymbella cf. neocistula	Diatom	165748934	0	0	0	0	0	0	23678419
T036	Navicual radiosa	Diatom	137744652	0	0	0	137744652	0	0	0
T044	Rhoicosphenia abbreviata	Diatom	123174980	0	0	0	0	0	0	0
T018	Encyonema cf. reich	Diatom	118544312	1669632	0	0	0	6678529	26714258	3339264
T037	Navicula cryptocephala	Diatom	107099312	0	26774828	0	0	26774828	0	0
T040	Nitzschia sp	Diatom	89239176	12059320	0	0	0	2411864	0	0
T019	Encyonema neogracile	Diatom	77137006	0	0	0	0	12856168	0	38568502
T047	Synedra sp	Diatom	75370750	0	0	0	0	0	0	0
T043	Pseudophormidium tenue	Cyanobacteria	42416405	0	0	0	0	0	42416405	0
T08	Cocconeis placentula	Diatom	35517629	0	0	0	0	0	0	0
T07	Chlorogloea sp.	Cyanobacteria	35080572	1639275	655710	2622854	0	655710	0	1639275
T011	Cymbella sp.	Diatom	32022026	0	0	0	0	0	0	0
T015	Diatoma tenuis	Diatom	15027768	0	0	0	0	0	0	0
T045	Scenedesmus abundans	Green	12822775	0	0	0	0	0	0	0
T030	Homeothrix cf. jantha	Cyanobacteria	12294606	0	0	0	0	0	0	0
T038	Navicula sp.	Diatom	6830313	0	0	0	0	0	0	0
T017	Dictyosphaerium pulchellum	Green	6071390	0	0	6071390	0	0	0	0
T022	Eunotia bilunaris	Diatom	3189611	0	0	0	0	0	0	3189611
T05	Anathece sp.	Cyanobacteria	121428	0	0	0	0	0	0	0

BENTHIC TISSUE CHEMISTRY

TrichAnalytics Laboratory Report 2021-280

TrichAnalytics Inc.

Tissue Microchemistry Analysis Report

Client: Dave Hasek
Biologist
Minnow Environmental
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Date Received: 03 Dec 2021
Date of Analysis: 08 Dec 2021
09 Dec 2021
Final Report Date: 17 Dec 2021
Project No.: 2021-280
Method No.: MET-002.05

Client Project: 21-79 BRN Runout Monitoring (PO 748530)

Analytical Request: Freshwater Benthic Invertebrate Tissue Microchemistry (total metals and moisture) - 44 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 102% (ranging from 97-109%).

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

17 Dec 2021
Date

[The analytical report shall not be reproduced except in full under the expressed written consent of TrichAnalytics Inc.]

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CALA
Testing Accreditation No. A4196

Minnow Environmental

Tissue Analysis Results

		Client ID	LC_DC3_INV-01_2021-11-29	LC_DC3_INV-02_2021-11-29	LC_DC3_INV-03_2021-11-29	LC_DC3_INV-04_2021-11-29	LC_DC3_INV-05_2021-11-29
		Lab ID	019	020	021	022	023
		Wet Weight (g)	0.2482	0.1674	0.1858	0.4894	0.1179
		Dry Weight (g)	0.0708	0.0494	0.0532	0.0829	0.0321
		Moisture (%)	71.5	70.5	71.4	83.1	72.8
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.891	1.1	1.1	1.4	1.4
11B	0.091	0.303	1.9	2.4	2.6	2.0	3.4
23Na	1.1	3.7	3,346	3,406	3,825	8,868	4,295
24Mg	0.019	0.063	1,684	1,336	1,850	1,967	1,520
27Al	0.043	0.143	1,834	2,748	2,540	1,592	3,745
31P	42	140	13,132	11,978	16,517	17,041	13,787
39K	4.0	13	11,317	11,592	12,886	14,977	11,083
44Ca	16	53	3,802	3,692	6,133	4,152	6,449
49Ti	0.169	0.563	119	171	187	102	242
51V	0.041	0.137	3.8	5.7	5.6	3.5	9.7
52Cr	0.265	0.883	33	61	67	15	132
55Mn	0.007	0.023	50	51	61	51	73
57Fe	1.4	4.7	1,007	1,543	1,576	765	3,197
59Co	0.009	0.030	2.1	3.5	1.9	2.0	7.2
60Ni	0.042	0.140	64	110	115	45	201
63Cu	0.011	0.037	19	16	23	16	14
66Zn	0.518	1.7	175	151	173	194	152
75As	0.409	1.4	0.499	0.648	0.552	0.637	0.977
77Se	0.325	1.1	6.1	5.0	5.6	7.7	5.0
88Sr	0.001	0.003	6.1	7.5	9.9	6.1	10
95Mo	0.015	0.050	0.414	0.763	1.0	0.452	0.546
107Ag	0.001	0.003	0.117	0.131	0.168	0.147	0.121
111Cd	0.051	0.170	1.6	1.2	1.3	1.5	1.6
118Sn	0.024	0.080	0.596	0.671	0.752	0.485	0.343
121Sb	0.003	0.010	0.099	0.111	0.116	0.110	0.165
137Ba	0.001	0.003	63	78	86	51	112
202Hg	0.031	0.103	0.057	0.036	0.036	0.057	0.050
205Tl	0.001	0.003	0.080	0.090	0.106	0.101	0.106
208Pb	0.001	0.003	0.411	0.565	0.569	0.432	0.847
238U	0.001	0.003	0.115	0.153	0.161	0.137	0.200

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	LC_DC3_INV-06_2021-11-29	LC_DC3_INV-07_2021-11-29	LC_DCEF_INV-01_2021-11-29	LC_DCEF_INV-02_2021-11-29	LC_DCEF_INV-03_2021-11-29
		Lab ID	024	025	026	027	028
		Wet Weight (g)	0.1317	0.2114	0.2584	0.3924	0.1877
		Dry Weight (g)	0.0420	0.0456	0.0691	0.0850	0.0305
		Moisture (%)	68.1	78.4	73.3	78.3	83.8
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.304	1.1	0.268	0.649	0.611
11B	0.091	0.303	1.8	2.4	0.480	0.470	0.608
23Na	1.1	3.7	2,281	3,031	2,771	4,435	5,138
24Mg	0.019	0.063	877	1,178	1,605	1,479	1,398
27Al	0.043	0.143	850	2,364	160	144	124
31P	42	140	9,480	10,183	10,914	13,348	12,471
39K	4.0	13	8,211	9,221	9,386	11,396	10,493
44Ca	16	53	2,081	4,048	3,184	1,925	2,754
49Ti	0.169	0.563	77	176	7.6	8.2	9.4
51V	0.041	0.137	2.2	4.8	0.521	0.769	1.1
52Cr	0.265	0.883	14	38	10	8.7	17
55Mn	0.007	0.023	18	51	15	14	16
57Fe	1.4	4.7	333	1,122	236	259	342
59Co	0.009	0.030	0.824	2.5	0.211	0.401	0.783
60Ni	0.042	0.140	29	74	15	13	26
63Cu	0.011	0.037	10	14	24	25	21
66Zn	0.518	1.7	148	109	215	158	227
75As	0.409	1.4	<0.409	0.467	0.488	0.828	0.476
77Se	0.325	1.1	3.8	5.0	5.0	6.8	5.2
88Sr	0.001	0.003	3.2	8.5	4.6	2.4	2.9
95Mo	0.015	0.050	0.245	0.452	0.301	0.358	0.498
107Ag	0.001	0.003	0.089	0.117	0.075	0.103	0.131
111Cd	0.051	0.170	0.480	1.5	3.7	2.9	5.6
118Sn	0.024	0.080	0.152	0.626	0.271	0.279	1.2
121Sb	0.003	0.010	0.046	0.101	0.038	0.048	0.052
137Ba	0.001	0.003	18	79	95	54	54
202Hg	0.031	0.103	0.036	0.079	0.043	0.050	0.047
205Tl	0.001	0.003	0.063	0.095	0.009	0.010	0.018
208Pb	0.001	0.003	0.109	0.833	0.052	0.072	0.099
238U	0.001	0.003	0.030	0.192	0.035	0.045	0.059

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	LC_DCEF_INV-04_2021-11-29	LC_DCEF_INV-05_2021-11-29	LC_DCDS_INV-01_2021-11-30	LC_DCDS_INV-02_2021-11-30	LC_DCDS_INV-03_2021-11-30
		Lab ID	029	030	031	032	033
		Wet Weight (g)	0.3315	0.2508	0.3874	0.2009	0.3681
		Dry Weight (g)	0.0778	0.0631	0.0978	0.0562	0.0985
		Moisture (%)	76.5	74.8	74.8	72.0	73.2
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.487	0.312	1.2	1.0	0.736
11B	0.091	0.303	0.257	0.725	3.1	2.6	1.8
23Na	1.1	3.7	3,941	3,363	3,211	2,586	3,232
24Mg	0.019	0.063	1,437	1,595	1,263	1,043	1,164
27Al	0.043	0.143	51	165	3,991	2,854	2,043
31P	42	140	13,773	12,678	11,752	8,498	9,339
39K	4.0	13	11,063	9,867	8,929	6,744	8,551
44Ca	16	53	2,850	4,081	2,335	2,336	1,926
49Ti	0.169	0.563	3.7	13	244	201	205
51V	0.041	0.137	0.368	0.977	8.3	6.3	3.4
52Cr	0.265	0.883	5.4	9.6	29	33	25
55Mn	0.007	0.023	14	22	151	61	57
57Fe	1.4	4.7	124	244	1,685	1,364	669
59Co	0.009	0.030	0.223	0.232	2.5	2.2	1.7
60Ni	0.042	0.140	7.0	14	68	61	42
63Cu	0.011	0.037	21	25	16	12	9.7
66Zn	0.518	1.7	198	216	194	121	170
75As	0.409	1.4	<0.409	0.589	0.951	0.566	0.657
77Se	0.325	1.1	5.3	5.5	12	7.5	9.8
88Sr	0.001	0.003	3.0	3.6	6.6	5.9	3.5
95Mo	0.015	0.050	0.260	0.390	0.844	0.714	0.552
107Ag	0.001	0.003	0.106	0.101	0.213	0.091	0.109
111Cd	0.051	0.170	3.2	4.1	2.1	0.930	1.3
118Sn	0.024	0.080	0.253	0.365	0.366	0.416	0.260
121Sb	0.003	0.010	0.019	0.041	0.126	0.096	0.087
137Ba	0.001	0.003	58	94	110	76	61
202Hg	0.031	0.103	0.047	0.047	0.101	0.047	0.054
205Tl	0.001	0.003	0.007	0.010	0.127	0.097	0.081
208Pb	0.001	0.003	0.079	0.089	0.761	0.541	0.638
238U	0.001	0.003	0.031	0.064	0.165	0.122	0.076

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	LC_DCDS_INV-04_2021-11-30	LC_DCDS_INV-05_2021-11-30	LC_DC4_INV-01_2021-12-01	LC_DC4_INV-02_2021-12-01	LC_DC4_INV-03_2021-12-01
		Lab ID	034	035	036	037	038
		Wet Weight (g)	0.3197	0.2665	0.6848	0.4532	0.6798
		Dry Weight (g)	0.0796	0.0625	0.1423	0.0838	0.1520
		Moisture (%)	75.1	76.5	79.2	81.5	77.6
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	1.3	1.1	0.467	0.497	0.622
11B	0.091	0.303	3.0	2.6	1.0	1.5	1.3
23Na	1.1	3.7	4,060	4,580	3,932	3,116	4,068
24Mg	0.019	0.063	1,363	1,331	1,098	1,108	1,166
27Al	0.043	0.143	3,336	2,801	695	769	1,090
31P	42	140	13,087	13,197	10,623	9,566	11,719
39K	4.0	13	11,927	10,528	9,023	7,859	10,202
44Ca	16	53	3,507	3,289	1,752	2,407	1,713
49Ti	0.169	0.563	277	164	56	50	65
51V	0.041	0.137	6.2	4.8	2.3	2.5	2.7
52Cr	0.265	0.883	38	29	10	12	16
55Mn	0.007	0.023	111	96	48	33	44
57Fe	1.4	4.7	1,694	1,107	630	584	725
59Co	0.009	0.030	3.5	1.5	0.841	0.889	1.3
60Ni	0.042	0.140	101	67	29	29	39
63Cu	0.011	0.037	18	15	12	11	15
66Zn	0.518	1.7	179	148	147	162	189
75As	0.409	1.4	1.0	0.997	0.616	0.485	0.758
77Se	0.325	1.1	9.1	10	8.6	5.9	10
88Sr	0.001	0.003	7.7	6.5	2.7	3.2	2.8
95Mo	0.015	0.050	0.866	0.866	0.486	0.405	0.526
107Ag	0.001	0.003	0.197	0.144	0.088	0.076	0.120
111Cd	0.051	0.170	2.5	1.3	1.9	1.4	2.0
118Sn	0.024	0.080	0.339	0.400	0.247	0.343	0.444
121Sb	0.003	0.010	0.135	0.125	0.079	0.075	0.081
137Ba	0.001	0.003	122	81	80	76	81
202Hg	0.031	0.103	0.062	0.070	0.058	0.066	0.041
205Tl	0.001	0.003	0.120	0.095	0.047	0.061	0.055
208Pb	0.001	0.003	0.743	0.585	0.260	0.218	0.315
238U	0.001	0.003	0.175	0.134	0.108	0.099	0.093

Notes:

ppm = parts per million
DL = detection limit
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g = grams
% = percent

Minnow Environmental

Tissue Analysis Results

Client ID			LC_DC4_INV-04_2021-12-01	LC_DC4_INV-05_2021-12-01	LC_DC2_INV-01_2021-12-01	LC_DC2_INV-02_2021-12-01	LC_DC2_INV-03_2021-12-01
Lab ID			039	040	041	042	043
Wet Weight (g)			0.6371	0.5285	0.4092	0.6198	0.5559
Dry Weight (g)			0.1091	0.1065	0.0856	0.1630	0.1265
Moisture (%)			82.9	79.8	79.1	73.7	77.2
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.483	0.399	0.931	0.500	0.502
11B	0.091	0.303	0.878	0.828	2.3	0.953	1.6
23Na	1.1	3.7	3,457	3,749	3,526	2,934	3,377
24Mg	0.019	0.063	1,015	897	1,125	861	1,026
27Al	0.043	0.143	618	426	1,751	809	1,101
31P	42	140	9,303	10,929	9,664	9,420	10,502
39K	4.0	13	8,064	8,428	7,425	8,016	9,326
44Ca	16	53	1,793	1,529	2,171	1,249	1,526
49Ti	0.169	0.563	47	27	108	63	77
51V	0.041	0.137	1.5	1.7	4.3	1.9	2.6
52Cr	0.265	0.883	6.6	6.3	20	7.2	17
55Mn	0.007	0.023	18	33	59	47	60
57Fe	1.4	4.7	467	481	822	355	687
59Co	0.009	0.030	0.544	0.544	1.4	0.661	1.3
60Ni	0.042	0.140	15	23	46	23	48
63Cu	0.011	0.037	8.4	12	11	8.7	9.7
66Zn	0.518	1.7	134	145	123	125	148
75As	0.409	1.4	0.545	0.592	0.651	<0.409	0.568
77Se	0.325	1.1	7.3	8.9	8.1	8.0	7.7
88Sr	0.001	0.003	2.2	1.9	4.1	2.8	3.3
95Mo	0.015	0.050	0.283	0.668	0.526	0.708	0.465
107Ag	0.001	0.003	0.060	0.107	0.101	0.107	0.082
111Cd	0.051	0.170	1.2	1.9	1.5	1.5	1.5
118Sn	0.024	0.080	0.278	0.321	0.412	0.266	0.143
121Sb	0.003	0.010	0.051	0.077	0.103	0.083	0.088
137Ba	0.001	0.003	51	73	60	52	60
202Hg	0.031	0.103	0.041	0.054	0.058	0.070	0.058
205Tl	0.001	0.003	0.045	0.038	0.077	0.058	0.068
208Pb	0.001	0.003	0.204	0.209	0.362	0.245	0.299
238U	0.001	0.003	0.056	0.128	0.094	0.075	0.104

Notes:

ppm = parts per million
DL = detection limit
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% = percent

Minnow Environmental
Tissue Analysis Results

		Client ID	LC_DC2_INV-04_2021-12-01	LC_DC2_INV-05_2021-12-01	LC_DC1_INV-01_2021-12-01	LC_DC1_INV-02_2021-12-01	LC_DC1_INV-03_2021-12-01
		Lab ID	044	045	046	047	048
		Wet Weight (g)	0.5201	0.5042	0.6293	0.6593	0.5824
		Dry Weight (g)	0.1184	0.1159	0.1255	0.1444	0.1504
		Moisture (%)	77.2	77.0	80.1	78.1	74.2
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.729	0.531	0.572	0.567	0.306
11B	0.091	0.303	1.6	0.883	1.6	1.7	0.967
23Na	1.1	3.7	3,280	2,666	3,495	2,960	2,728
24Mg	0.019	0.063	1,077	999	1,237	1,000	731
27Al	0.043	0.143	1,617	619	1,180	1,273	300
31P	42	140	10,686	10,963	11,040	10,538	8,627
39K	4.0	13	8,690	7,324	9,999	8,416	7,791
44Ca	16	53	2,249	1,961	2,525	2,475	1,039
49Ti	0.169	0.563	105	38	67	89	12
51V	0.041	0.137	3.5	1.6	3.0	3.2	1.1
52Cr	0.265	0.883	16	6.3	24	9.2	5.8
55Mn	0.007	0.023	71	62	72	60	38
57Fe	1.4	4.7	678	315	886	761	344
59Co	0.009	0.030	1.6	0.786	1.2	0.437	0.375
60Ni	0.042	0.140	43	21	40	23	19
63Cu	0.011	0.037	14	11	14	9.9	8.6
66Zn	0.518	1.7	142	116	173	151	135
75As	0.409	1.4	0.805	<0.409	0.509	0.443	<0.409
77Se	0.325	1.1	8.3	7.1	9.1	7.5	8.8
88Sr	0.001	0.003	4.1	2.7	3.9	3.9	1.6
95Mo	0.015	0.050	0.526	0.425	0.503	0.464	0.445
107Ag	0.001	0.003	0.151	0.073	0.089	0.062	0.036
111Cd	0.051	0.170	1.7	1.6	2.5	2.5	1.4
118Sn	0.024	0.080	0.310	0.301	0.569	0.332	0.099
121Sb	0.003	0.010	0.096	0.045	0.072	0.092	0.029
137Ba	0.001	0.003	66	39	85	94	80
202Hg	0.031	0.103	0.050	0.038	<0.031	0.038	<0.031
205Tl	0.001	0.003	0.075	0.039	0.037	0.038	0.018
208Pb	0.001	0.003	0.399	0.197	0.272	0.322	0.084
238U	0.001	0.003	0.081	0.063	0.070	0.098	0.044

Notes:

ppm = parts per million
DL = detection limit
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g = grams
% = percent

Minnow Environmental
Tissue Analysis Results

		Client ID	LC_DC1_INV-04_2021-12-01	LC_DC1_INV-05_2021-12-01	LC_DC3_INVPLE-01_2021-11-29	LC_DC3_INVPLE-02_2021-11-29	LC_DC3_INVPLE-03_2021-11-29
		Lab ID	049	050	051	052	053
		Wet Weight (g)	0.4704	0.5397	0.0731	0.0398	0.0311
		Dry Weight (g)	0.0992	0.1217	0.0236	0.0104	0.0104
		Moisture (%)	78.9	77.5	67.7	73.9	66.6
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.650	0.293	1.7	2.6	1.2
11B	0.091	0.303	1.5	0.777	4.4	7.3	2.7
23Na	1.1	3.7	3,744	3,001	2,250	2,277	1,790
24Mg	0.019	0.063	1,514	1,211	1,215	1,422	1,100
27Al	0.043	0.143	1,242	325	5,168	8,139	3,359
31P	42	140	13,030	10,314	8,443	9,544	7,541
39K	4.0	13	10,670	7,834	9,077	9,253	7,044
44Ca	16	53	2,708	1,375	4,336	8,469	3,588
49Ti	0.169	0.563	67	13	325	504	207
51V	0.041	0.137	3.1	1.0	12	20	9.6
52Cr	0.265	0.883	26	4.2	145	345	137
55Mn	0.007	0.023	58	49	91	110	77
57Fe	1.4	4.7	930	669	3,818	5,851	2,848
59Co	0.009	0.030	1.3	0.353	3.5	13	5.3
60Ni	0.042	0.140	48	14	239	467	222
63Cu	0.011	0.037	14	11	23	25	15
66Zn	0.518	1.7	172	112	143	215	193
75As	0.409	1.4	0.597	<0.409	0.841	0.763	0.465
77Se	0.325	1.1	8.4	8.4	4.9	5.8	5.5
88Sr	0.001	0.003	3.9	1.7	10	14	8.6
95Mo	0.015	0.050	0.522	0.425	2.1	2.2	0.619
107Ag	0.001	0.003	0.089	0.042	0.098	0.098	0.156
111Cd	0.051	0.170	2.2	1.7	2.5	3.3	3.1
118Sn	0.024	0.080	0.311	0.291	1.5	1.6	1.3
121Sb	0.003	0.010	0.056	0.033	0.194	0.209	0.105
137Ba	0.001	0.003	97	75	125	168	108
202Hg	0.031	0.103	0.053	<0.031	0.045	0.038	0.053
205Tl	0.001	0.003	0.037	0.017	0.135	0.183	0.120
208Pb	0.001	0.003	0.258	0.088	0.941	1.0	0.736
238U	0.001	0.003	0.068	0.041	0.368	0.377	0.260

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	LC_DC3_INVRHY-01_2021-11-29	LC_DC3_INVRHY-02_2021-11-29	LC_DC3_INVRHY-03_2021-11-29	LC_DCDS_INVPLE-01_2021-11-30	LC_DCDS_INVPLE-02_2021-11-30
		Lab ID	**054**	**055**	**056**	**057**	**058**
		Wet Weight (g)	0.1780	0.0796	0.1129	0.0381	0.0306
		Dry Weight (g)	0.0403	0.0249	0.0273	0.0091	0.0071
		Moisture (%)	77.4	68.7	75.8	76.1	76.8
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.352	0.095	0.228	2.7	1.5
11B	0.091	0.303	0.855	0.247	0.362	7.2	3.7
23Na	1.1	3.7	2,797	2,017	3,840	2,586	2,457
24Mg	0.019	0.063	1,252	1,366	1,238	1,725	1,825
27Al	0.043	0.143	675	55	146	9,073	3,969
31P	42	140	9,036	9,176	10,128	12,195	13,614
39K	4.0	13	7,726	6,860	9,293	11,686	9,624
44Ca	16	53	1,134	818	909	6,848	5,543
49Ti	0.169	0.563	28	3.3	9.6	649	324
51V	0.041	0.137	1.6	0.288	0.535	22	8.0
52Cr	0.265	0.883	18	5.9	8.5	229	136
55Mn	0.007	0.023	58	46	36	149	107
57Fe	1.4	4.7	509	141	189	5,467	2,931
59Co	0.009	0.030	1.1	0.383	0.568	11	4.0
60Ni	0.042	0.140	34	13	19	391	254
63Cu	0.011	0.037	9.8	11	10	34	33
66Zn	0.518	1.7	159	178	171	319	534
75As	0.409	1.4	<0.409	<0.409	<0.409	1.3	0.715
77Se	0.325	1.1	5.4	5.9	7.2	10	10
88Sr	0.001	0.003	3.3	3.1	2.1	18	11
95Mo	0.015	0.050	0.225	0.225	0.168	2.1	1.9
107Ag	0.001	0.003	0.048	0.048	0.048	0.921	0.591
111Cd	0.051	0.170	0.571	0.504	0.571	3.5	3.1
118Sn	0.024	0.080	0.191	0.107	0.105	3.5	2.2
121Sb	0.003	0.010	0.052	0.034	0.036	0.388	0.187
137Ba	0.001	0.003	54	50	36	242	122
202Hg	0.031	0.103	0.037	0.037	0.051	0.107	0.093
205Tl	0.001	0.003	0.036	0.018	0.026	0.204	0.147
208Pb	0.001	0.003	0.216	0.049	0.077	1.8	0.863
238U	0.001	0.003	0.042	0.015	0.028	0.352	0.194

Notes:

ppm = parts per million
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Minnow Environmental
Tissue Analysis Results

		Client ID	LC_DCDS_INVPLE-03_2021-11-30	LC_DCDS_INVRHY-01_2021-11-30	LC_DCDS_INVRHY-02_2021-11-30	LC_DCDS_INVRHY-03_2021-11-30
		Lab ID	059	060	061	062
		Wet Weight (g)	0.0697	0.1726	0.0502	0.1199
		Dry Weight (g)	0.0141	0.0389	0.0103	0.0224
		Moisture (%)	79.8	77.5	79.5	81.3
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	1.2	0.822	1.1	0.858
11B	0.091	0.303	3.5	2.2	2.6	1.8
23Na	1.1	3.7	1,920	2,989	3,829	3,371
24Mg	0.019	0.063	1,261	1,358	1,965	1,460
27Al	0.043	0.143	3,509	1,878	2,519	1,704
31P	42	140	8,940	9,816	15,512	11,015
39K	4.0	13	7,638	8,184	12,626	9,821
44Ca	16	53	3,391	1,767	2,849	2,044
49Ti	0.169	0.563	330	145	200	134
51V	0.041	0.137	14	4.0	5.5	3.4
52Cr	0.265	0.883	102	14	37	9.9
55Mn	0.007	0.023	74	120	143	74
57Fe	1.4	4.7	2,206	923	1,426	653
59Co	0.009	0.030	5.4	1.8	2.9	0.895
60Ni	0.042	0.140	194	39	82	30
63Cu	0.011	0.037	21	12	14	11
66Zn	0.518	1.7	304	272	403	308
75As	0.409	1.4	0.685	0.715	0.849	0.566
77Se	0.325	1.1	6.4	11	13	13
88Sr	0.001	0.003	9.5	5.3	9.1	6.5
95Mo	0.015	0.050	0.702	0.617	1.3	0.870
107Ag	0.001	0.003	0.474	0.172	0.165	0.137
111Cd	0.051	0.170	1.6	2.3	3.3	2.7
118Sn	0.024	0.080	1.7	0.307	0.770	0.372
121Sb	0.003	0.010	0.175	0.146	0.159	0.097
137Ba	0.001	0.003	169	118	178	118
202Hg	0.031	0.103	0.056	0.074	0.056	0.079
205Tl	0.001	0.003	0.111	0.069	0.078	0.066
208Pb	0.001	0.003	0.940	0.552	0.669	0.647
238U	0.001	0.003	0.211	0.143	0.151	0.123

Notes:

ppm = parts per million
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g = grams
% = percent

Minnow Environmental
Tissue QA/QC Relative Percent Difference Results

	Client ID	LC_DC3_INV-01_2021-11-29			LC_DCEF_INV-04_2021-11-29			LC_DCDS_INV-03_2021-11-30		
	Lab ID	019			029			033		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.009	0.891	1.1	21	0.487	0.505	3.6	0.736	0.950	25
11B	0.091	1.9	2.3	19	0.257	0.421	-	1.8	2.2	20
23Na	1.1	3,346	3,892	15	3,941	3,687	6.7	3,232	3,582	10
24Mg	0.019	1,684	2,175	25	1,437	1,329	7.8	1,164	1,221	4.8
27Al	0.043	1,834	2,646	36	51	67	27	2,043	1,973	3.5
31P	42	13,132	17,618	29	13,773	12,092	13	9,339	11,953	25
39K	4.0	11,317	13,707	19	11,063	11,571	4.5	8,551	10,458	20
44Ca	16	3,802	5,545	37	2,850	2,741	3.9	1,926	2,484	25
49Ti	0.169	119	159	29	3.7	5.5	39	205	160	25
51V	0.041	3.8	4.8	23	0.368	0.431	-	3.4	4.2	21
52Cr	0.265	33	24	32	5.4	3.9	32	25	29	15
55Mn	0.007	50	65	26	14	15	6.9	57	84	38
57Fe	1.4	1,007	1,348	29	124	136	9.2	669	1,007	40
59Co	0.009	2.1	2.0	4.9	0.223	0.228	2.2	1.7	2.1	21
60Ni	0.042	64	50	25	7.0	5.1	31	42	62	39
63Cu	0.011	19	15	24	21	21	0.0	9.7	13	29
66Zn	0.518	175	215	21	198	233	16	170	161	5.4
75As	0.409	0.499	0.658	-	<0.409	<0.409	-	0.657	0.997	-
77Se	0.325	6.1	6.2	1.6	5.3	5.5	3.7	9.8	11	12
88Sr	0.001	6.1	10	48	3.0	3.1	3.3	3.5	5.3	41
95Mo	0.015	0.414	0.443	6.8	0.260	0.238	8.8	0.552	0.671	20
107Ag	0.001	0.117	0.126	7.4	0.106	0.098	7.8	0.109	0.156	36
111Cd	0.051	1.6	1.8	12	3.2	3.3	3.1	1.3	1.5	14
118Sn	0.024	0.596	0.506	16	0.253	0.270	6.5	0.260	0.374	36
121Sb	0.003	0.099	0.111	11	0.019	0.042	-	0.087	0.093	6.7
137Ba	0.001	63	67	6.2	58	76	27	61	79	26
202Hg	0.031	0.057	0.043	-	0.047	0.062	-	0.054	0.062	-
205Tl	0.001	0.080	0.108	30	0.007	0.010	-	0.081	0.084	3.6
208Pb	0.001	0.411	0.563	31	0.079	0.077	2.6	0.638	0.534	18
238U	0.001	0.115	0.152	28	0.031	0.041	28	0.076	0.100	27

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	LC_DC2_INV-05_2021-12-01		LC_DC3_INVRHY-01_2021-11-29		
		Lab ID	045		054		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.009	0.531	0.475	11	0.352	0.307	14
11B	0.091	0.883	0.904	-	0.855	0.657	-
23Na	1.1	2,666	3,399	24	2,797	3,474	22
24Mg	0.019	999	983	1.6	1,252	1,341	6.9
27Al	0.043	619	728	16	675	625	7.7
31P	42	10,963	11,283	2.9	9,036	9,900	9.1
39K	4.0	7,324	9,435	25	7,726	9,398	20
44Ca	16	1,961	1,448	30	1,134	1,429	23
49Ti	0.169	38	38	0.0	28	27	3.6
51V	0.041	1.6	1.8	12	1.6	1.4	13
52Cr	0.265	6.3	6.7	6.2	18	18	0.0
55Mn	0.007	62	53	16	58	48	19
57Fe	1.4	315	367	15	509	432	16
59Co	0.009	0.786	0.797	1.4	1.1	1.0	9.5
60Ni	0.042	21	20	4.9	34	32	6.1
63Cu	0.011	11	11	0.0	9.8	11	12
66Zn	0.518	116	147	24	159	171	7.3
75As	0.409	<0.409	0.498	-	<0.409	<0.409	-
77Se	0.325	7.1	8.8	21	5.4	6.3	15
88Sr	0.001	2.7	2.5	7.7	3.3	3.2	3.1
95Mo	0.015	0.425	0.532	22	0.225	0.281	22
107Ag	0.001	0.073	0.098	29	0.048	0.048	0.0
111Cd	0.051	1.6	1.3	21	0.571	0.436	-
118Sn	0.024	0.301	0.169	-	0.191	0.214	-
121Sb	0.003	0.045	0.058	25	0.052	0.054	3.8
137Ba	0.001	39	32	20	54	60	11
202Hg	0.031	0.038	0.038	-	0.037	0.046	-
205Tl	0.001	0.039	0.038	2.6	0.036	0.035	2.8
208Pb	0.001	0.197	0.168	16	0.216	0.150	36
238U	0.001	0.063	0.066	4.7	0.042	0.039	7.4

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	0.009	1.21	1.3	106	7.8	1.2	103	7.5
11B	0.091	4.5	4.7	105	3.9	4.9	110	2.3
23Na	1.1	14,000	14,583	104	6.5	15,193	108	2.5
24Mg	0.019	910	1,006	111	6.2	968	106	7.9
27Al	0.043	197.2	219	111	3.8	209	106	7.6
31P	42	8,000	8,346	104	6.3	8,343	104	1.4
39K	4.0	15,500	16,789	108	5.3	16,146	104	2.7
44Ca	16	2,360	2,492	106	6.1	2,573	109	5.6
49Ti	0.169	12.24	12	99	8.9	14	114	12
51V	0.041	1.57	1.5	94	10	1.9	123	8.8
52Cr	0.265	1.87	2.0	106	6.1	2.2	117	2.8
55Mn	0.007	3.17	3.5	110	5.6	3.4	108	6.0
57Fe	1.4	343	370	108	5.6	381	111	5.0
59Co	0.009	0.25	0.276	110	9.3	0.282	113	2.5
60Ni	0.042	1.34	1.5	110	8.4	1.6	116	3.4
63Cu	0.011	15.7	18	116	7.6	17	111	2.7
66Zn	0.518	51.6	57	111	4.4	58	112	4.3
75As	0.409	6.87	7.3	106	5.6	7.3	107	1.4
77Se	0.325	3.45	3.8	109	3.3	3.7	106	4.5
88Sr	0.001	10.1	11	109	4.4	10	102	5.0
95Mo	0.015	0.29	0.320	110	9.3	0.333	115	5.8
107Ag	0.001	0.0252	0.029	115	9.2	0.027	108	10
111Cd	0.051	0.299	0.329	110	7.7	0.349	117	11
118Sn	0.024	0.061	0.059	96	12	0.067	110	15
121Sb	0.003	0.011	0.011	97	4.5	0.011	97	10
137Ba	0.001	8.6	8.8	102	1.9	9.1	106	3.7
202Hg	0.031	0.412	0.443	108	7.1	0.448	109	5.9
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.347	86	11	0.471	117	14
238U	0.001	0.05	0.047	94	4.7	0.057	114	9.1

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.

Minnow Environmental
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	0.009	1.21	1.2	103	6.6	1.3	104	4.5
11B	0.091	4.5	4.8	107	2.1	4.5	100	2.3
23Na	1.1	14,000	14,883	106	3.6	15,604	112	3.4
24Mg	0.019	910	972	107	4.5	988	109	5.3
27Al	0.043	197.2	209	106	4.8	194	98	4.9
31P	42	8,000	8,524	107	2.5	8,405	105	4.2
39K	4.0	15,500	17,007	110	4.1	16,829	109	7.0
44Ca	16	2,360	2,471	105	4.7	2,562	109	4.9
49Ti	0.169	12.24	13	106	9.2	11	92	8.9
51V	0.041	1.57	1.6	102	6.7	1.8	116	14
52Cr	0.265	1.87	1.9	99	2.9	2.0	109	5.7
55Mn	0.007	3.17	3.4	108	3.4	3.6	114	7.0
57Fe	1.4	343	372	109	2.8	389	113	5.1
59Co	0.009	0.25	0.269	108	4.1	0.283	113	5.5
60Ni	0.042	1.34	1.4	104	1.0	1.6	116	4.6
63Cu	0.011	15.7	16	105	4.2	18	116	5.2
66Zn	0.518	51.6	54	105	4.6	56	109	2.5
75As	0.409	6.87	7.1	104	4.0	7.2	104	2.9
77Se	0.325	3.45	3.6	103	5.1	3.4	97	5.4
88Sr	0.001	10.1	11	110	4.8	11	110	7.5
95Mo	0.015	0.29	0.271	94	4.1	0.302	104	3.5
107Ag	0.001	0.0252	0.032	125	0.0	0.025	99	9.8
111Cd	0.051	0.299	0.312	104	17	0.335	112	5.3
118Sn	0.024	0.061	0.071	116	11	0.061	99	18
121Sb	0.003	0.011	0.014	130	8.1	0.011	99	14
137Ba	0.001	8.6	9.0	104	2.9	7.9	92	2.8
202Hg	0.031	0.412	0.441	107	9.6	0.418	101	3.7
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.408	101	7.3	0.472	117	13
238U	0.001	0.05	0.051	102	6.8	0.055	109	15

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
Tissue QA/QC Accuracy and Precision Results

Sample Group ID: 05

Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.009	1.21	1.2	98	4.6
11B	0.091	4.5	4.6	102	2.9
23Na	1.1	14,000	13,580	97	4.5
24Mg	0.019	910	894	98	4.3
27Al	0.043	197.2	205	104	2.1
31P	42	8,000	7,738	97	5.7
39K	4.0	15,500	14,123	91	6.9
44Ca	16	2,360	2,279	97	6.8
49Ti	0.169	12.24	13	106	12
51V	0.041	1.57	1.4	87	5.7
52Cr	0.265	1.87	1.7	93	4.3
55Mn	0.007	3.17	3.1	99	5.7
57Fe	1.4	343	331	96	3.0
59Co	0.009	0.25	0.253	101	6.7
60Ni	0.042	1.34	1.3	98	10
63Cu	0.011	15.7	16	100	7.3
66Zn	0.518	51.6	50	96	2.9
75As	0.409	6.87	6.7	97	4.2
77Se	0.325	3.45	3.3	97	7.5
88Sr	0.001	10.1	10	99	5.4
95Mo	0.015	0.29	0.295	102	4.8
107Ag	0.001	0.0252	0.022	87	14
111Cd	0.051	0.299	0.294	98	6.2
118Sn	0.024	0.061	0.057	93	20
121Sb	0.003	0.011	0.013	115	20
137Ba	0.001	8.6	8.6	100	2.3
202Hg	0.031	0.412	0.368	89	5.1
205Tl	0.001	0.0013	-	-	-
208Pb	0.001	0.404	0.380	94	8.2
238U	0.001	0.05	0.046	92	5.7

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 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	LC_DC3_INV-01_2021-11-29	019	08 Dec 2021
	LC_DC3_INV-02_2021-11-29	020	
	LC_DC3_INV-03_2021-11-29	021	
	LC_DC3_INV-04_2021-11-29	022	
	LC_DC3_INV-05_2021-11-29	023	
	LC_DC3_INV-06_2021-11-29	024	
	LC_DC3_INV-07_2021-11-29	025	
	LC_DCEF_INV-01_2021-11-29	026	
	LC_DCEF_INV-02_2021-11-29	027	
02	LC_DCEF_INV-03_2021-11-29	028	08 Dec 2021
	LC_DCEF_INV-04_2021-11-29	029	
	LC_DCEF_INV-05_2021-11-29	030	
	LC_DCDS_INV-01_2021-11-30	031	
	LC_DCDS_INV-02_2021-11-30	032	
	LC_DCDS_INV-03_2021-11-30	033	
	LC_DCDS_INV-04_2021-11-30	034	
	LC_DCDS_INV-05_2021-11-30	035	
03	LC_DC4_INV-01_2021-12-01	036	08 Dec 2021
	LC_DC4_INV-02_2021-12-01	037	
	LC_DC4_INV-03_2021-12-01	038	
	LC_DC4_INV-04_2021-12-01	039	
	LC_DC4_INV-05_2021-12-01	040	
	LC_DC2_INV-01_2021-12-01	041	
	LC_DC2_INV-02_2021-12-01	042	
	LC_DC2_INV-03_2021-12-01	043	
	LC_DC2_INV-04_2021-12-01	044	
04	LC_DC2_INV-05_2021-12-01	045	09 Dec 2021
	LC_DC1_INV-01_2021-12-01	046	
	LC_DC1_INV-02_2021-12-01	047	
	LC_DC1_INV-03_2021-12-01	048	
	LC_DC1_INV-04_2021-12-01	049	
	LC_DC1_INV-05_2021-12-01	050	
	LC_DC3_INVPLE-01_2021-11-29	051	
	LC_DC3_INVPLE-02_2021-11-29	052	
	LC_DC3_INVPLE-03_2021-11-29	053	
05	LC_DC3_INVRHY-01_2021-11-29	054	08 Dec 2021
	LC_DC3_INVRHY-02_2021-11-29	055	
	LC_DC3_INVRHY-03_2021-11-29	056	
	LC_DCDS_INVPLE-01_2021-11-30	057	
	LC_DCDS_INVPLE-02_2021-11-30	058	

Minnow Environmental
Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
05	LC_DCDS_INVPLE-03_2021-11-30	059	08 Dec 2021
	LC_DCDS_INVRHY-01_2021-11-30	060	
	LC_DCDS_INVRHY-02_2021-11-30	061	
	LC_DCDS_INVRHY-03_2021-11-30	062	

Proj # 2021-280

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: PO# 748530; 21-79 BRN Runout Monitoring

Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
Address:	PO Box 1777	Address:	204-1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

TRICH ID		Sample Identification:	Sample Type: Species	Sample type
019	1	LC_DC3_INV-01_2021-11-29 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
020	2	LC_DC3_INV-02_2021-11-29 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
021	3	LC_DC3_INV-03_2021-11-29 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
022	4	LC_DC3_INV-04_2021-11-29 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
023	5	LC_DC3_INV-05_2021-11-29 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
024	6	LC_DC3_INV-06_2021-11-29 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
025	7	LC_DC3_INV-07_2021-11-29 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
026	8	LC_DCEF_INV-01_2021-11-29 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
027	9	LC_DCEF_INV-02_2021-11-29 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
028	10	LC_DCEF_INV-03_2021-11-29 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
029	11	LC_DCEF_INV-04_2021-11-29 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
030	12	LC_DCEF_INV-05_2021-11-29 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
031	13	LC_DCDS_INV-01_2021-11-30 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
032	14	LC_DCDS_INV-02_2021-11-30 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
033	15	LC_DCDS_INV-03_2021-11-30 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
034	16	LC_DCDS_INV-04_2021-11-30 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
035	17	LC_DCDS_INV-05_2021-11-30 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
036	18	LC_DC4_INV-01_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
037	19	LC_DC4_INV-02_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
038	20	LC_DC4_INV-03_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis

Sample(s) Release	Maddy Stokes	Sample(s) Received By:	Alex Wade
Signature:		Signature:	
Date Sent:	3-Dec-21	Date Received:	06 Dec 2021 (Project # 2021-280)
Sample(s) Returned to Client By:		Shipping Conditions:	
		Shipping Container:	
Signature:		Date Sent:	

Proj # 2021-280

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: PO# 748530; 21-79 BRN Runout Monitoring

Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
Address:	PO Box 1777	Address:	204-1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

TRICH ID		Sample Identification:	Sample Type: Species	Sample type
039	21	LC_DC4_INV-04_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
040	22	LC_DC4_INV-05_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
041	23	LC_DC2_INV-01_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
042	24	LC_DC2_INV-02_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
043	25	LC_DC2_INV-03_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
044	26	LC_DC2_INV-04_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
045	27	LC_DC2_INV-05_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
046	28	LC_DC1_INV-01_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
047	29	LC_DC1_INV-02_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
048	30	LC_DC1_INV-03_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
049	31	LC_DC1_INV-04_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
050	32	LC_DC1_INV-05_2021-12-01 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
051	33	LC_DC3_INVPLE-01_2021-11-29 ✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
052	34	LC_DC3_INVPLE-02_2021-11-29 ✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
053	35	LC_DC3_INVPLE-03_2021-11-29 ✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
054	36	LC_DC3_INVRHY-01_2021-11-29 ✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
055	37	LC_DC3_INVRHY-02_2021-11-29 ✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
056	38	LC_DC3_INVRHY-03_2021-11-29 ✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
057	39	LC_DCDS_INVPLE-01_2021-11-30 ✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
058	40	LC_DCDS_INVPLE-02_2021-11-30 ✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis

Sample(s) Release	Maddy Stokes	Sample(s) Received By:	Alex Wade
Signature:		Signature:	
Date Sent:	3-Dec-21	Date Received:	06 Dec 2021 (Project # 2021-280)
Sample(s) Returned to Client By:		Shipping Conditions:	
		Shipping Container:	
Signature:		Date Sent:	

Proj # 2021-280

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: PO# 748530; 21-35 Dry Creek LAEMP

Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
Address:	PO Box 1777	Address:	204-1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

TRICH ID		Sample Identification:	Sample Type: Species	Sample type
059	41	LC_DCDS_INVPLE-03_2021-11-30 ✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
060	42	LC_DCDS_INVRHY-01_2021-11-30 ✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
061	43	LC_DCDS_INVRHY-02_2021-11-30 ✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
062	44	LC_DCDS_INVRHY-03_2021-11-30 ✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
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	60			

Sample(s) Release	Maddy Stokes	Sample(s) Received By:	Alex Wade
Signature:		Signature:	
Date Sent:	3-Dec-21	Date Received:	06 Dec 2021 (Project # 2021-280)
Sample(s) Returned to Client By:		Shipping Conditions:	
		Shipping Container:	
Signature:		Date Sent:	

BENTHIC TISSUE CHEMISTRY

TrichAnalytics Laboratory Report 2021-241

TrichAnalytics Inc.

Tissue Microchemistry Analysis Report

Client: Dave Hasek
Aquatic Scientist
Minnow Environmental
Phone: (778) 677-3500
Email: dhasek@minnow.ca

Date Received: 30 Jul 2021
Date of Analysis: 05 Aug 2021
Final Report Date: 06 Aug 2021
Project No.: 2021-241
Method No.: MET-002.05

Client Project: Teck Coal/Minnow Environmental 21-79 (BRN Runout Monitoring)

Analytical Request: Benthic Invertebrate Tissue Microchemistry (total metals and moisture) – 36 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 107%, range 104 - 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

06 Aug 2021
Date

[The analytical report shall not be reproduced except in full under the expressed written consent of TrichAnalytics Inc.]

TrichAnalytics Inc.
207-1753 Sean Heights
Saanichton, BC V8M 0B3
www.trichanalytics.com

CALA
Testing Accreditation No. A4196

Teck Minnow
Tissue Analysis Results

		Client ID	LC_DC3_INV-01_2021-07-27	LC_DC3_INV-02_2021-07-27	LC_DC3_INV-03_2021-07-27	LC_DC3_INVPLE-01_2021-07-27	LC_DC3_INVPLE-02_2021-07-27
		Lab ID	007	008	009	010	011
		Wet Weight (g)	0.3048	0.3872	0.2550	0.0170	0.0306
		Dry Weight (g)	0.0955	0.1012	0.0652	0.0078	0.0134
		Moisture (%)	68.7	73.9	74.4	54.1	56.2
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	5.5	0.924	1.5	4.2	1.3
11B	0.089	0.297	25	2.9	4.1	16	3.2
23Na	0.913	3.0	2,950	3,275	4,920	4,032	3,447
24Mg	0.016	0.053	2,372	2,119	2,253	2,544	1,876
27Al	0.059	0.197	25,548	2,506	4,159	19,010	4,434
31P	33	110	12,906	12,816	13,829	12,334	12,712
39K	5.8	19	21,488	15,418	16,208	14,992	12,109
44Ca	25	83	4,092	3,159	4,027	5,150	3,745
49Ti	0.510	1.7	2,520	207	495	1,490	407
51V	0.041	0.137	54	4.2	9.7	37	7.8
52Cr	0.764	2.5	210	12	51	332	54
55Mn	0.012	0.040	421	207	236	220	82
57Fe	1.7	5.7	10,652	847	1,863	10,003	1,805
59Co	0.006	0.020	14	2.0	4.2	18	2.3
60Ni	0.040	0.133	366	43	101	542	104
63Cu	0.011	0.037	23	17	17	28	26
66Zn	0.695	2.3	400	324	274	378	433
75As	0.448	1.5	5.3	1.9	1.4	2.1	0.665
77Se	0.394	1.3	13	9.1	11	11	14
88Sr	0.001	0.003	25	7.4	11	25	9.2
95Mo	0.008	0.027	2.6	0.977	0.914	0.899	1.0
107Ag	0.001	0.003	0.155	0.094	0.123	0.488	0.448
111Cd	0.101	0.337	2.9	2.4	2.1	1.8	1.6
118Sn	0.037	0.123	1.4	0.395	0.339	1.1	0.469
121Sb	0.007	0.023	0.740	0.108	0.213	0.565	0.140
137Ba	0.001	0.003	423	177	231	435	165
202Hg	0.031	0.103	0.075	0.050	0.050	0.087	0.087
205Tl	0.001	0.003	0.273	0.057	0.076	0.184	0.069
208Pb	0.001	0.003	2.5	0.487	1.0	3.1	0.722
238U	0.001	0.003	0.778	0.176	0.248	0.516	0.187

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Minnow
Tissue Analysis Results

Client ID			LC_DC3_INVPLE-03_2021-07-27	LC_DC3_INVRHY-01_2021-07-27	LC_DC3_INVRHY-02_2021-07-27	LC_DC3_INVRHY-03_2021-07-27	LC_DCDS_INV-01_2021-07-27
Lab ID			012	013	014	015	016
Wet Weight (g)			0.0369	0.2047	0.2040	0.1721	0.6468
Dry Weight (g)			0.0076	0.0557	0.0640	0.0447	0.1816
Moisture (%)			79.4	72.8	68.6	74.0	71.9
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	5.4	0.463	0.545	1.4	1.0
11B	0.089	0.297	13	5.4	4.0	3.9	3.0
23Na	0.913	3.0	4,499	2,737	2,362	2,525	3,960
24Mg	0.016	0.053	2,869	1,510	1,784	2,164	1,892
27Al	0.059	0.197	16,856	916	1,621	4,038	3,468
31P	33	110	16,003	12,695	12,529	13,038	13,938
39K	5.8	19	15,765	15,003	10,897	16,449	11,340
44Ca	25	83	7,793	2,293	1,693	3,341	3,114
49Ti	0.510	1.7	1,615	74	129	371	341
51V	0.041	0.137	28	2.3	3.1	7.4	7.5
52Cr	0.764	2.5	238	9.7	19	48	35
55Mn	0.012	0.040	119	246	117	290	146
57Fe	1.7	5.7	8,071	515	833	1,938	1,804
59Co	0.006	0.020	12	2.1	1.7	2.3	9.3
60Ni	0.040	0.133	397	43	47	119	73
63Cu	0.011	0.037	22	14	17	18	17
66Zn	0.695	2.3	269	308	277	344	472
75As	0.448	1.5	2.0	1.5	1.0	2.0	1.8
77Se	0.394	1.3	7.1	10	11	9.4	13
88Sr	0.001	0.003	22	4.4	4.6	8.4	7.5
95Mo	0.008	0.027	0.883	0.891	0.694	1.3	0.768
107Ag	0.001	0.003	0.236	0.074	0.113	0.110	0.195
111Cd	0.101	0.337	1.6	3.3	1.7	2.7	8.5
118Sn	0.037	0.123	2.1	0.501	0.522	0.628	0.238
121Sb	0.007	0.023	0.293	0.100	0.085	0.188	0.174
137Ba	0.001	0.003	338	109	128	237	166
202Hg	0.031	0.103	0.078	0.056	0.044	0.047	0.084
205Tl	0.001	0.003	0.173	0.040	0.034	0.075	0.106
208Pb	0.001	0.003	2.2	0.260	0.316	0.817	0.817
238U	0.001	0.003	0.421	0.104	0.112	0.201	0.144

Notes:

ppm = parts per million
DL = detection limit
LOQ = limit of quantitation
< = less than detection limit
g = grams
% = percent

Teck Minnow
Tissue Analysis Results

Client ID			LC_DCDS_INV-02_2021-07-27	LC_DCDS_INV-03_2021-07-27	LC_DCDS_INVPLE-01_2021-07-27	LC_DCDS_INVPLE-02_2021-07-27	LC_DCDS_INVPLE-03_2021-07-27
Lab ID			017	018	019	020	021
Wet Weight (g)			0.5147	0.3056	0.0807	0.0506	0.0314
Dry Weight (g)			0.1204	0.0724	0.0131	0.0126	0.0096
Moisture (%)			76.6	76.3	83.8	75.1	69.4
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.735	2.2	3.1	3.2	2.0
11B	0.089	0.297	2.2	8.8	9.4	12	5.2
23Na	0.913	3.0	3,392	4,610	2,500	2,771	3,597
24Mg	0.016	0.053	1,146	2,402	2,101	1,996	2,427
27Al	0.059	0.197	2,192	9,343	12,706	15,061	6,020
31P	33	110	9,885	11,951	9,662	10,973	13,371
39K	5.8	19	9,647	12,858	9,158	12,084	11,854
44Ca	25	83	1,656	5,600	8,505	6,391	5,852
49Ti	0.510	1.7	130	798	1,121	1,103	465
51V	0.041	0.137	3.7	22	26	30	13
52Cr	0.764	2.5	12	78	211	157	78
55Mn	0.012	0.040	65	205	166	145	115
57Fe	1.7	5.7	726	5,178	6,011	4,916	2,757
59Co	0.006	0.020	3.5	15	8.1	5.3	4.8
60Ni	0.040	0.133	32	151	283	243	143
63Cu	0.011	0.037	10	23	22	21	22
66Zn	0.695	2.3	248	567	256	223	310
75As	0.448	1.5	1.2	3.3	1.7	1.8	1.5
77Se	0.394	1.3	8.0	13	9.1	8.7	7.2
88Sr	0.001	0.003	3.3	17	20	21	13
95Mo	0.008	0.027	0.380	1.1	1.0	2.0	1.1
107Ag	0.001	0.003	0.079	0.179	0.248	0.228	0.268
111Cd	0.101	0.337	3.3	12	2.5	2.3	2.2
118Sn	0.037	0.123	0.143	0.561	2.0	1.0	0.612
121Sb	0.007	0.023	0.075	0.330	0.420	0.449	0.243
137Ba	0.001	0.003	64	296	299	317	204
202Hg	0.031	0.103	0.070	0.080	0.091	0.084	0.070
205Tl	0.001	0.003	0.076	0.258	0.190	0.204	0.118
208Pb	0.001	0.003	0.400	2.1	2.3	2.0	1.3
238U	0.001	0.003	0.084	0.368	0.395	0.467	0.277

Notes:

ppm = parts per million
DL = detection limit
LOQ = limit of quantitation
< = less than detection limit
g = grams
% = percent

Teck Minnow
Tissue Analysis Results

		Client ID	LC_DCDS_INVRHY-01_2021-07-27	LC_DCDS_INVRHY-02_2021-07-27	LC_DCDS_INVRHY-03_2021-07-27	LC_DC3_INV-01_2021-07-08	LC_DC3_INV-02_2021-07-08
		Lab ID	022	023	024	025	026
		Wet Weight (g)	0.1820	0.0798	0.1947	0.6672	0.4803
		Dry Weight (g)	0.0414	0.0144	0.0576	0.1921	0.1370
		Moisture (%)	77.3	82.0	70.4	71.2	71.5
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.809	0.575	0.416	0.699	0.390
11B	0.089	0.297	2.5	1.4	1.3	2.0	0.878
23Na	0.913	3.0	3,588	3,423	3,035	3,855	3,798
24Mg	0.016	0.053	2,271	1,871	1,563	2,256	2,257
27Al	0.059	0.197	3,307	1,644	1,398	2,437	697
31P	33	110	13,939	12,088	9,765	16,460	16,945
39K	5.8	19	13,024	10,579	9,465	15,930	10,717
44Ca	25	83	3,881	2,960	1,314	7,165	6,302
49Ti	0.510	1.7	343	134	95	177	49
51V	0.041	0.137	8.9	4.5	3.3	3.8	1.5
52Cr	0.764	2.5	49	41	32	20	12
55Mn	0.012	0.040	91	104	39	138	65
57Fe	1.7	5.7	1,901	1,170	994	784	445
59Co	0.006	0.020	3.2	3.9	1.7	1.8	1.1
60Ni	0.040	0.133	93	86	57	42	25
63Cu	0.011	0.037	17	18	19	15	18
66Zn	0.695	2.3	233	298	188	242	169
75As	0.448	1.5	0.785	<0.448	0.589	1.3	0.490
77Se	0.394	1.3	20	18	18	8.2	7.4
88Sr	0.001	0.003	10	8.1	3.2	11	6.7
95Mo	0.008	0.027	0.794	0.777	0.863	0.561	0.486
107Ag	0.001	0.003	0.171	0.175	0.110	0.105	0.126
111Cd	0.101	0.337	2.6	3.0	1.6	0.866	0.727
118Sn	0.037	0.123	0.361	1.2	0.150	0.196	0.145
121Sb	0.007	0.023	0.151	0.098	0.087	0.121	0.066
137Ba	0.001	0.003	238	205	100	148	85
202Hg	0.031	0.103	0.066	0.063	0.056	<0.031	<0.031
205Tl	0.001	0.003	0.086	0.064	0.043	0.083	0.042
208Pb	0.001	0.003	0.964	0.469	0.241	0.396	0.206
238U	0.001	0.003	0.170	0.100	0.053	0.122	0.045

Notes:

ppm = parts per million
DL = detection limit
LOQ = limit of quantitation
< = less than detection limit
g = grams
% = percent

Teck Minnow
Tissue Analysis Results

Client ID			LC_DC3_INV-03_2021-07-08	LC_DC3_INVPLE-01_2021-07-08	LC_DC3_INVPLE-02_2021-07-08	LC_DC3_INVPLE-03_2021-07-08	LC_DC3_INVRHY-01_2021-07-08
Lab ID			027	028	029	030	031
Wet Weight (g)			0.4745	0.2166	0.0714	0.0748	0.7850
Dry Weight (g)			0.1403	0.0596	0.0279	0.0327	0.2039
Moisture (%)			70.4	72.5	60.9	56.3	74.0
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.627	0.570	1.4	1.5	0.493
11B	0.089	0.297	2.1	1.3	2.6	4.8	1.9
23Na	0.913	3.0	3,282	3,452	4,197	3,552	2,168
24Mg	0.016	0.053	1,994	1,914	3,197	1,808	1,574
27Al	0.059	0.197	1,753	1,482	3,188	5,427	1,015
31P	33	110	13,546	13,075	18,995	13,949	14,234
39K	5.8	19	13,181	11,718	12,200	13,459	13,939
44Ca	25	83	3,441	4,893	7,821	5,358	2,808
49Ti	0.510	1.7	137	112	294	496	78
51V	0.041	0.137	3.7	2.8	6.0	11	2.7
52Cr	0.764	2.5	21	25	40	81	8.7
55Mn	0.012	0.040	132	42	76	58	161
57Fe	1.7	5.7	921	778	1,569	2,840	657
59Co	0.006	0.020	2.0	1.2	2.1	4.8	2.5
60Ni	0.040	0.133	43	50	71	135	44
63Cu	0.011	0.037	15	19	22	26	14
66Zn	0.695	2.3	274	291	359	405	302
75As	0.448	1.5	1.2	0.452	0.782	0.801	2.1
77Se	0.394	1.3	11	10	12	11	8.7
88Sr	0.001	0.003	6.2	5.4	10	11	4.7
95Mo	0.008	0.027	0.636	0.543	1.1	0.898	0.655
107Ag	0.001	0.003	0.086	0.224	0.300	0.404	0.095
111Cd	0.101	0.337	1.2	0.866	0.941	1.5	2.4
118Sn	0.037	0.123	0.212	0.526	0.613	0.687	0.275
121Sb	0.007	0.023	0.077	0.072	0.143	0.187	0.091
137Ba	0.001	0.003	129	62	126	139	127
202Hg	0.031	0.103	<0.031	0.043	0.071	0.057	0.050
205Tl	0.001	0.003	0.081	0.072	0.106	0.157	0.102
208Pb	0.001	0.003	0.412	0.304	0.713	0.984	0.453
238U	0.001	0.003	0.108	0.078	0.161	0.190	0.162

Notes:

ppm = parts per million

DL = detection limit

LOQ = limit of quantitation

< = less than detection limit

g = grams

% = percent

Teck Minnow
Tissue Analysis Results

		Client ID	LC_DC3_INVRHY-02_2021-07-08	LC_DC3_INVRHY-03_2021-07-08	LC_DCDS_INV-01_2021-07-08	LC_DCDS_INV-02_2021-07-08	LC_DCDS_INV-03_2021-07-08
		Lab ID	032	033	034	035	036
		Wet Weight (g)	1.0428	0.5964	0.6187	0.8837	0.8326
		Dry Weight (g)	0.2826	0.1706	0.1197	0.1973	0.1863
		Moisture (%)	72.9	71.4	80.7	77.7	77.6
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.724	0.545	0.867	0.395	0.732
11B	0.089	0.297	2.2	2.6	2.9	1.5	2.0
23Na	0.913	3.0	2,883	2,144	4,637	4,055	4,575
24Mg	0.016	0.053	1,726	1,359	1,679	2,109	1,998
27Al	0.059	0.197	1,992	1,579	2,283	597	1,371
31P	33	110	13,523	8,806	11,812	11,034	13,907
39K	5.8	19	15,234	9,884	11,626	9,678	13,033
44Ca	25	83	2,963	2,190	3,067	2,802	2,825
49Ti	0.510	1.7	171	136	181	44	97
51V	0.041	0.137	4.3	2.9	5.0	1.9	3.1
52Cr	0.764	2.5	17	13	9.2	4.0	12
55Mn	0.012	0.040	176	165	131	177	150
57Fe	1.7	5.7	914	603	1,064	345	718
59Co	0.006	0.020	3.3	1.9	5.8	11	8.4
60Ni	0.040	0.133	64	35	53	50	52
63Cu	0.011	0.037	16	11	16	19	16
66Zn	0.695	2.3	335	238	314	530	402
75As	0.448	1.5	2.3	1.4	2.3	2.1	1.5
77Se	0.394	1.3	11	8.1	11	10	10
88Sr	0.001	0.003	6.4	5.3	5.5	3.5	4.8
95Mo	0.008	0.027	0.879	0.702	0.671	0.549	0.549
107Ag	0.001	0.003	0.128	0.067	0.133	0.107	0.129
111Cd	0.101	0.337	1.9	1.1	8.0	18	11
118Sn	0.037	0.123	0.487	0.236	0.543	0.176	0.914
121Sb	0.007	0.023	0.127	0.080	0.116	0.077	0.080
137Ba	0.001	0.003	217	128	178	88	198
202Hg	0.031	0.103	0.043	0.043	0.086	0.078	0.062
205Tl	0.001	0.003	0.090	0.077	0.187	0.204	0.134
208Pb	0.001	0.003	0.602	0.332	0.639	0.179	0.378
238U	0.001	0.003	0.144	0.093	0.200	0.108	0.130

Notes:

ppm = parts per million
DL = detection limit
LOQ = limit of quantitation
< = less than detection limit
g = grams
% = percent

Teck Minnow
Tissue Analysis Results

		Client ID	LC_DCDS_INVPLE-01_2021-07-08	LC_DCDS_INVPLE-02_2021-07-08	LC_DCDS_INVPLE-03_2021-07-08	LC_DCDS_INVRHY-01_2021-07-08	LC_DCDS_INVRHY-02_2021-07-08
		Lab ID	037	038	039	040	041
		Wet Weight (g)	0.1914	0.1816	0.0814	0.3544	0.6442
		Dry Weight (g)	0.0508	0.0500	0.0235	0.0737	0.1449
		Moisture (%)	73.5	72.5	71.1	79.2	77.5
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.447	0.569	0.679	0.516	0.359
11B	0.089	0.297	0.757	1.4	1.9	1.3	1.3
23Na	0.913	3.0	3,872	3,232	2,792	3,004	3,434
24Mg	0.016	0.053	3,218	2,885	2,685	1,815	1,653
27Al	0.059	0.197	493	1,432	2,080	1,342	746
31P	33	110	15,170	15,015	13,272	11,357	10,163
39K	5.8	19	10,763	9,099	8,224	10,831	12,988
44Ca	25	83	6,613	7,720	7,269	1,907	1,848
49Ti	0.510	1.7	38	150	178	137	51
51V	0.041	0.137	1.3	3.2	5.1	3.2	1.9
52Cr	0.764	2.5	10	16	39	12	10
55Mn	0.012	0.040	24	39	46	95	132
57Fe	1.7	5.7	381	668	1,290	683	431
59Co	0.006	0.020	0.925	1.2	2.1	1.6	1.3
60Ni	0.040	0.133	23	40	78	38	39
63Cu	0.011	0.037	20	19	18	15	18
66Zn	0.695	2.3	235	277	286	226	272
75As	0.448	1.5	<0.448	<0.448	<0.448	0.751	1.1
77Se	0.394	1.3	8.5	7.7	6.5	9.9	12
88Sr	0.001	0.003	6.0	7.0	7.1	3.4	3.6
95Mo	0.008	0.027	0.322	0.511	0.340	0.567	0.700
107Ag	0.001	0.003	0.160	0.173	0.140	0.089	0.102
111Cd	0.101	0.337	2.1	2.8	2.4	3.8	2.6
118Sn	0.037	0.123	0.503	0.255	0.503	0.495	0.303
121Sb	0.007	0.023	0.039	0.072	0.072	0.088	0.066
137Ba	0.001	0.003	81	98	110	173	194
202Hg	0.031	0.103	0.055	0.055	0.055	0.055	0.082
205Tl	0.001	0.003	0.031	0.062	0.059	0.065	0.055
208Pb	0.001	0.003	0.131	0.363	0.442	0.359	0.226
238U	0.001	0.003	0.033	0.077	0.090	0.096	0.092

Notes:

ppm = parts per million
DL = detection limit
LOQ = limit of quantitation
< = less than detection limit
g = grams
% = percent

Teck Minnow

Tissue Analysis Results

Parameter	DL (ppm)	LOQ (ppm)	Client ID: LC_DCDS_INVRHY-03_2021-07-08
		Lab ID	042
		Wet Weight (g)	1.3525
		Dry Weight (g)	0.2877
		Moisture (%)	78.7
Parameter	DL (ppm)	LOQ (ppm)	(ppm)
7Li	0.007	0.023	0.735
11B	0.089	0.297	2.3
23Na	0.913	3.0	2,980
24Mg	0.016	0.053	2,062
27Al	0.059	0.197	1,869
31P	33	110	11,113
39K	5.8	19	14,335
44Ca	25	83	2,841
49Ti	0.510	1.7	182
51V	0.041	0.137	4.9
52Cr	0.764	2.5	23
55Mn	0.012	0.040	261
57Fe	1.7	5.7	998
59Co	0.006	0.020	3.2
60Ni	0.040	0.133	76
63Cu	0.011	0.037	16
66Zn	0.695	2.3	267
75As	0.448	1.5	1.4
77Se	0.394	1.3	9.9
88Sr	0.001	0.003	6.1
95Mo	0.008	0.027	0.813
107Ag	0.001	0.003	0.098
111Cd	0.101	0.337	2.7
118Sn	0.037	0.123	0.331
121Sb	0.007	0.023	0.121
137Ba	0.001	0.003	295
202Hg	0.031	0.103	0.055
205Tl	0.001	0.003	0.101
208Pb	0.001	0.003	0.509
238U	0.001	0.003	0.163

Notes:

ppm = parts per million
DL = detection limit
LOQ = limit of quantitation
< = less than detection limit
g = grams
% = percent

Teck Minnow
Tissue QA/QC Relative Percent Difference Results

Client ID		LC_DC3_INV-01_2021-07-27			LC_DC3_INV-01_2021-07-08			LC_DCDS_INV-01_2021-07-08		
Lab ID		007			025			034		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.007	5.5	4.1	29	0.699	0.889	24	0.867	1.0	14
11B	0.089	25	19	27	2.0	2.8	33	2.9	3.3	13
23Na	0.913	2,950	3,290	11	3,855	4,109	6.4	4,637	5,172	11
24Mg	0.016	2,372	2,280	4.0	2,256	2,437	7.7	1,679	1,794	6.6
27Al	0.059	25,548	19,372	28	2,437	2,976	20	2,283	2,881	23
31P	33	12,906	13,593	5.2	16,460	16,046	2.5	11,812	14,367	20
39K	5.8	21,488	18,978	12	15,930	15,643	1.8	11,626	13,619	16
44Ca	25	4,092	2,981	31	7,165	6,036	17	3,067	3,348	8.8
49Ti	0.510	2,520	1,886	29	177	264	40	181	238	27
51V	0.041	54	39	32	3.8	5.5	37	5.0	6.3	23
52Cr	0.764	210	172	20	20	17	16	9.2	13	34
55Mn	0.012	421	332	24	138	125	9.9	131	168	25
57Fe	1.7	10,652	7,554	34	784	1,101	34	1,064	1,083	1.8
59Co	0.006	14	10	33	1.8	2.0	11	5.8	4.7	21
60Ni	0.040	366	295	22	42	55	27	53	55	3.7
63Cu	0.011	23	21	9.1	15	18	18	16	17	6.1
66Zn	0.695	400	356	12	242	268	10	314	325	3.4
75As	0.448	5.3	3.8	-	1.3	1.3	-	2.3	2.0	-
77Se	0.394	13	11	17	8.2	8.6	4.8	11	12	8.7
88Sr	0.001	25	16	44	11	11	0.0	5.5	6.6	18
95Mo	0.008	2.6	2.5	3.9	0.561	0.720	25	0.671	0.870	26
107Ag	0.001	0.155	0.126	21	0.105	0.138	27	0.133	0.125	6.2
111Cd	0.101	2.9	2.3	23	0.866	1.1	-	8.0	8.3	3.7
118Sn	0.037	1.4	1.1	24	0.196	0.251	-	0.543	0.383	35
121Sb	0.007	0.740	0.540	31	0.121	0.124	2.4	0.116	0.143	21
137Ba	0.001	423	312	30	148	171	14	178	209	16
202Hg	0.031	0.075	0.056	-	<0.031	<0.031	-	0.086	0.078	-
205Tl	0.001	0.273	0.204	29	0.083	0.096	15	0.187	0.148	23
208Pb	0.001	2.5	2.2	13	0.396	0.590	39	0.639	0.711	11
238U	0.001	0.778	0.604	25	0.122	0.155	24	0.200	0.212	5.8

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 Minnow

Tissue QA/QC Relative Percent Difference Results

Client ID LC_DCDS_INVRHY-03_2021-07-08

Lab ID 042

Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.007	0.735	0.701	4.7
11B	0.089	2.3	2.9	23
23Na	0.913	2,980	3,160	5.9
24Mg	0.016	2,062	1,926	6.8
27Al	0.059	1,869	2,121	13
31P	33	11,113	10,823	2.6
39K	5.8	14,335	14,036	2.1
44Ca	25	2,841	3,341	16
49Ti	0.510	182	207	13
51V	0.041	4.9	6.6	30
52Cr	0.764	23	25	8.3
55Mn	0.012	261	301	14
57Fe	1.7	998	1,214	20
59Co	0.006	3.2	3.6	12
60Ni	0.040	76	83	8.8
63Cu	0.011	16	18	12
66Zn	0.695	267	345	26
75As	0.448	1.4	1.5	-
77Se	0.394	9.9	9.9	0.0
88Sr	0.001	6.1	6.7	9.4
95Mo	0.008	0.813	0.880	7.9
107Ag	0.001	0.098	0.107	8.8
111Cd	0.101	2.7	3.3	20
118Sn	0.037	0.331	0.463	-
121Sb	0.007	0.121	0.149	21
137Ba	0.001	295	354	18
202Hg	0.031	0.055	0.062	-
205Tl	0.001	0.101	0.120	17
208Pb	0.001	0.509	0.631	21
238U	0.001	0.163	0.215	28

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 Minnow
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	0.007	1.21	1.4	112	12	1.2	99	11
11B	0.089	4.5	5.2	116	1.1	4.8	107	1.1
23Na	0.913	14,000	16,387	117	7.5	14,906	106	2.5
24Mg	0.016	910	1,079	118	9.7	977	107	5.6
27Al	0.059	197.2	225	114	8.4	206	104	6.9
31P	33	8,000	9,322	116	8.1	8,710	109	2.7
39K	5.8	15,500	18,609	120	6.8	16,990	110	4.7
44Ca	25	2,360	2,660	113	9.5	2,613	111	3.2
49Ti	0.510	12.24	16	131	10	12	99	12
51V	0.041	1.57	1.9	121	5.2	1.8	116	5.9
52Cr	0.764	1.87	2.2	118	3.2	2.2	116	2.8
55Mn	0.012	3.17	3.7	117	8.8	3.5	112	3.6
57Fe	1.7	343	418	122	8.5	378	110	3.0
59Co	0.006	0.25	0.297	119	5.7	0.291	116	3.4
60Ni	0.040	1.34	1.7	124	3.7	1.5	109	4.3
63Cu	0.011	15.7	19	120	7.0	17	109	2.8
66Zn	0.695	51.6	62	120	4.0	56	108	2.6
75As	0.448	6.87	7.9	115	6.4	7.4	108	2.2
77Se	0.394	3.45	3.7	107	8.4	3.8	110	4.7
88Sr	0.001	10.1	12	115	6.9	11	113	2.2
95Mo	0.008	0.29	0.347	120	8.5	0.318	110	4.5
107Ag	0.001	0.0252	0.027	108	11	0.032	126	5.7
111Cd	0.101	0.299	0.348	116	11	0.335	112	7.7
118Sn	0.037	0.061	0.084	138	17	0.076	124	10
121Sb	0.007	0.011	0.014	127	16	0.013	116	20
137Ba	0.001	8.6	10	116	4.5	9.1	105	4.1
202Hg	0.031	0.412	0.428	104	4.9	0.465	113	12
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.465	115	2.7	0.523	129	4.6
238U	0.001	0.05	0.057	114	2.5	0.055	109	3.9

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 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 Minnow

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	0.007	1.21	1.3	107	2.4	1.3	108	6.8
11B	0.089	4.5	4.9	108	2.7	4.7	105	1.1
23Na	0.913	14,000	14,681	105	5.7	15,988	114	4.6
24Mg	0.016	910	954	105	1.9	987	108	8.2
27Al	0.059	197.2	203	103	5.0	199	101	6.9
31P	33	8,000	8,197	102	4.1	8,402	105	6.1
39K	5.8	15,500	16,562	107	5.1	16,131	104	5.6
44Ca	25	2,360	2,507	106	5.2	2,429	103	3.4
49Ti	0.510	12.24	14	112	9.4	13	107	13
51V	0.041	1.57	1.5	96	5.5	1.8	114	18
52Cr	0.764	1.87	1.9	104	5.1	2.0	107	4.0
55Mn	0.012	3.17	3.2	102	4.9	3.5	110	7.8
57Fe	1.7	343	357	104	3.7	368	107	6.7
59Co	0.006	0.25	0.264	106	6.7	0.270	108	7.3
60Ni	0.040	1.34	1.4	107	7.0	1.5	109	5.1
63Cu	0.011	15.7	17	109	4.6	17	108	6.9
66Zn	0.695	51.6	56	109	3.9	56	108	4.0
75As	0.448	6.87	7.2	105	2.5	7.1	104	1.9
77Se	0.394	3.45	3.7	106	6.6	3.6	104	6.3
88Sr	0.001	10.1	10	102	6.2	10	104	6.3
95Mo	0.008	0.29	0.314	108	9.8	0.293	101	7.2
107Ag	0.001	0.0252	0.029	117	7.2	0.024	94	8.4
111Cd	0.101	0.299	0.312	104	7.7	0.315	105	8.4
118Sn	0.037	0.061	0.049	81	10	0.069	112	17
121Sb	0.007	0.011	0.010	95	12	0.011	100	0.0
137Ba	0.001	8.6	9.2	106	3.1	9.3	108	2.8
202Hg	0.031	0.412	0.418	101	3.7	0.452	110	7.5
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.332	82	9.6	0.475	118	17
238U	0.001	0.05	0.047	95	2.9	0.052	105	11

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 Minnow
Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
01	LC_DC3_INV-01_2021-07-27	007	05 Aug 2021
	LC_DC3_INV-02_2021-07-27	008	
	LC_DC3_INV-03_2021-07-27	009	
	LC_DC3_INVPLE-01_2021-07-27	010	
	LC_DC3_INVPLE-02_2021-07-27	011	
	LC_DC3_INVPLE-03_2021-07-27	012	
	LC_DC3_INVRHY-01_2021-07-27	013	
	LC_DC3_INVRHY-02_2021-07-27	014	
	LC_DC3_INVRHY-03_2021-07-27	015	
02	LC_DCDS_INV-01_2021-07-27	016	05 Aug 2021
	LC_DCDS_INV-02_2021-07-27	017	
	LC_DCDS_INV-03_2021-07-27	018	
	LC_DCDS_INVPLE-01_2021-07-27	019	
	LC_DCDS_INVPLE-02_2021-07-27	020	
	LC_DCDS_INVPLE-03_2021-07-27	021	
	LC_DCDS_INVRHY-01_2021-07-27	022	
	LC_DCDS_INVRHY-02_2021-07-27	023	
	LC_DCDS_INVRHY-03_2021-07-27	024	
03	LC_DC3_INV-01_2021-07-08	025	05 Aug 2021
	LC_DC3_INV-02_2021-07-08	026	
	LC_DC3_INV-03_2021-07-08	027	
	LC_DC3_INVPLE-01_2021-07-08	028	
	LC_DC3_INVPLE-02_2021-07-08	029	
	LC_DC3_INVPLE-03_2021-07-08	030	
	LC_DC3_INVRHY-01_2021-07-08	031	
	LC_DC3_INVRHY-02_2021-07-08	032	
	LC_DC3_INVRHY-03_2021-07-08	033	
04	LC_DCDS_INV-01_2021-07-08	034	05 Aug 2021
	LC_DCDS_INV-02_2021-07-08	035	
	LC_DCDS_INV-03_2021-07-08	036	
	LC_DCDS_INVPLE-01_2021-07-08	037	
	LC_DCDS_INVPLE-02_2021-07-08	038	
	LC_DCDS_INVPLE-03_2021-07-08	039	
	LC_DCDS_INVRHY-01_2021-07-08	040	
	LC_DCDS_INVRHY-02_2021-07-08	041	
	LC_DCDS_INVRHY-03_2021-07-08	042	

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: PO# 748530; 21-79 BRN Runout Monitoring

Company Name:	Teck	Company Name:	Minnow Environmental
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Sample Analysis Requested

Trich ID		Sample Identification:	Sample Type:	
			Species	Sample type
007 ✓	1	LC_DC3_INV-01_2021-07-27	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
008 ✓	2	LC_DC3_INV-02_2021-07-27	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
009 ✓	3	LC_DC3_INV-03_2021-07-27	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
010 ✓	4	LC_DC3_INVPLE-01_2021-07-27 *	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
011 ✓	5	LC_DC3_INVPLE-02_2021-07-27 **	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
012 ✓	6	LC_DC3_INVPLE-03_2021-07-27 **	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
013 ✓	7	LC_DC3_INVRHY-01_2021-07-27 ***	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
014 ✓	8	LC_DC3_INVRHY-02_2021-07-27 ****	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
015 ✓	9	LC_DC3_INVRHY-03_2021-07-27 ****	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
016 ✓	10	LC_DCDS_INV-01_2021-07-27	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
017 ✓	11	LC_DCDS_INV-02_2021-07-27	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
018 ✓	12	LC_DCDS_INV-03_2021-07-27	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
019 ✓	13	LC_DCDS_INVPLE-01_2021-07-27 **	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
020 ✓	14	LC_DCDS_INVPLE-02_2021-07-27 **	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
021 ✓	15	LC_DCDS_INVPLE-03_2021-07-27 **	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
022 ✓	16	LC_DCDS_INVRHY-01_2021-07-27 ****	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
023 ✓	17	LC_DCDS_INVRHY-02_2021-07-27 ****	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
024 ✓	18	LC_DCDS_INVRHY-03_2021-07-27 ****	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
	19			
	20			

Sample(s) Release Alex McClymont	Sample(s) Received By: Elliot Howell
Signature:	Signature: (Proj 2021-241)
Date Sent: 30-Jul-21	Date Received: 03 Aug 2021 (In lab 30 Jul 2021)
Sample(s) Returned to Client By:	Shipping Conditions:
	Shipping Container:
Signature:	Date Sent:

*Lid: LC-DC3-PLEC-01-2021-07-27
** Same as * (INVPLE is PLEC on lid)

Page 1 of 2

COM-011.01

*** Lid: LC-DC3-RHYA-01-2021-07-27
**** Same as *** (INVRHY is RHYA on lid)

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: PO# 748530; 21-79 BRN Runout Monitoring

Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
Address:	PO Box 1777	Address:	204-1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

Trich ID		Sample Identification:	Sample Type:	
			Species	Sample type
025	✓1	LC_DC3_INV-01_2021-07-08	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
026	✓2	LC_DC3_INV-02_2021-07-08	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
027	✓3	LC_DC3_INV-03_2021-07-08	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
028	✓4	LC_DC3_INVPLE-01_2021-07-08	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
029	✓5	LC_DC3_INVPLE-02_2021-07-08	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
030	✓6	LC_DC3_INVPLE-03_2021-07-08	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
031	✓7	LC_DC3_INVRHY-01_2021-07-08	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
032	✓8	LC_DC3_INVRHY-02_2021-07-08	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
033	✓9	LC_DC3_INVRHY-03_2021-07-08	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
034	✓10	LC_DCDS_INV-01_2021-07-08	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
035	✓11	LC_DCDS_INV-02_2021-07-08	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
036	✓12	LC_DCDS_INV-03_2021-07-08	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
037	✓13	LC_DCDS_INVPLE-01_2021-07-08	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
038	✓14	LC_DCDS_INVPLE-02_2021-07-08	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
039	✓15	LC_DCDS_INVPLE-03_2021-07-08	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
040	✓16	LC_DCDS_INVRHY-01_2021-07-08	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
041	✓17	LC_DCDS_INVRHY-02_2021-07-08	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
042	✓18	LC_DCDS_INVRHY-03_2021-07-08	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
	19			
	20			

Sample(s) Release	Alex McClymont	Sample(s) Received By:	Elliot Howell
Signature:		Signature:	(Prj 2021-241)
Date Sent:	30-Jul-21	Date Received:	03 Aug 2021 (In lab 30 Jul 2021)
Sample(s) Returned to Client By:		Shipping Conditions:	
		Shipping Container:	
Signature:		Date Sent:	

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COM-011.01

BENTHIC TISSUE CHEMISTRY

TrichAnalytics Laboratory Report 2021-228

TrichAnalytics Inc.

Tissue Microchemistry Analysis Report

Client:	Dave Hasek Aquatic Scientist Minnow Environmental	**Date Received:**	11 Jun 2021
		Date of Analysis:	17 Jun 2021
		Final Report Date:	18 Jun 2021
Phone:	(778) 677-3500	**Project No.:**	2021-228
Email:	dhasek@minnow.ca	**Method No.:**	MET-002.05

Client Project: Teck Coal/Minnow Environmental 21-79 (Teck Dry Creek BRN runout)

Analytical Request: Benthic Invertebrate Tissue Microchemistry (total metals and moisture) – 18 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 108%, range 106 - 109%).

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

18 Jun 2021
Date

[The analytical report shall not be reproduced except in full under the expressed written consent of TrichAnalytics Inc.]

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	LC_DC3_INV-01_20210610	LC_DC3_INV-02_20210610	LC_DC3_INV-03_20210610	LC_DC3_PLEC-01_20210610	LC_DC3_PLEC-02_20210610
		Lab ID	122	123	124	125	126
		Wet Weight (g)	0.4967	0.6104	0.3697	0.0311	0.1233
		Dry Weight (g)	0.1476	0.1880	0.1067	0.0085	0.0216
		Moisture (%)	70.3	69.2	71.1	72.7	82.5
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.001	0.003	0.475	1.1	0.974	1.5	0.668
11B	0.087	0.290	1.7	4.1	3.7	5.0	1.7
23Na	0.919	3.1	3,482	3,176	3,849	2,431	3,376
24Mg	0.018	0.060	2,443	2,267	2,159	2,044	1,879
27Al	0.038	0.127	1,024	4,022	3,559	4,467	1,482
31P	29	97	15,390	14,362	13,236	13,721	14,736
39K	1.9	6.3	12,318	11,540	13,370	13,698	13,415
44Ca	7.8	26	5,438	4,158	3,096	3,394	2,743
49Ti	0.227	0.757	79	394	352	398	129
51V	0.031	0.103	3.3	8.1	11	12	4.0
52Cr	0.178	0.593	11	35	34	53	21
55Mn	0.006	0.020	54	53	48	67	32
57Fe	0.726	2.4	682	1,740	1,641	2,600	941
59Co	0.006	0.020	1.7	1.8	3.6	4.1	2.1
60Ni	0.018	0.060	32	94	78	114	49
63Cu	0.015	0.050	23	27	21	22	23
66Zn	0.326	1.1	248	209	183	357	402
75As	0.401	1.3	1.4	1.3	1.1	1.1	0.746
77Se	0.347	1.2	7.2	6.9	8.2	12	12
88Sr	0.001	0.003	7.7	10	12	11	5.5
95Mo	0.001	0.003	0.398	1.0	0.597	0.981	0.654
107Ag	0.001	0.003	0.189	0.180	0.203	0.396	0.396
111Cd	0.082	0.273	0.634	0.634	0.537	0.781	0.781
118Sn	0.031	0.103	0.211	0.264	0.289	1.2	0.456
121Sb	0.004	0.013	0.138	0.239	0.208	0.314	0.129
137Ba	0.001	0.003	164	159	147	160	79
202Hg	0.033	0.110	<0.033	<0.033	0.055	0.055	0.055
205Tl	0.001	0.003	0.047	0.104	0.098	0.170	0.095
208Pb	0.004	0.013	0.347	0.870	0.735	1.1	0.378
238U	0.001	0.003	0.065	0.163	0.138	0.204	0.108

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	LC_DC3_PLEC-03_20210610	LC_DC3_RHYA-01_20210610	LC_DC3_RHYA-02_20210610	LC_DC3_RHYA-03_20210610	LC_DCDS_INV-01_20210610
		Lab ID	127	128	129	130	131
		Wet Weight (g)	0.0789	0.3107	0.0970	0.2601	0.4941
		Dry Weight (g)	0.0187	0.0728	0.0277	0.0678	0.1266
		Moisture (%)	76.3	76.6	71.4	73.9	74.4
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.001	0.003	1.2	0.179	0.793	0.166	0.495
11B	0.087	0.290	3.1	0.616	3.0	0.715	1.2
23Na	0.919	3.1	3,002	2,225	2,165	2,329	3,657
24Mg	0.018	0.060	2,096	1,278	1,654	1,306	1,633
27Al	0.038	0.127	3,464	509	2,681	467	1,101
31P	29	97	14,693	8,563	11,216	10,620	11,746
39K	1.9	6.3	13,103	7,690	11,586	11,041	11,265
44Ca	7.8	26	3,089	734	1,297	602	2,487
49Ti	0.227	0.757	305	42	263	36	85
51V	0.031	0.103	9.1	1.9	8.2	1.5	2.2
52Cr	0.178	0.593	66	12	43	6.6	7.9
55Mn	0.006	0.020	43	65	92	45	54
57Fe	0.726	2.4	2,140	474	1,629	339	569
59Co	0.006	0.020	4.4	1.3	4.0	0.673	1.5
60Ni	0.018	0.060	125	26	106	13	26
63Cu	0.015	0.050	22	13	15	12	17
66Zn	0.326	1.1	415	276	314	269	208
75As	0.401	1.3	1.1	<0.401	0.746	0.509	1.4
77Se	0.347	1.2	12	14	14	17	5.3
88Sr	0.001	0.003	8.7	2.3	4.4	1.9	5.6
95Mo	0.001	0.003	0.654	0.370	0.739	0.313	0.466
107Ag	0.001	0.003	0.459	0.072	0.117	0.081	0.139
111Cd	0.082	0.273	0.830	0.634	1.2	0.756	4.3
118Sn	0.031	0.103	0.469	0.295	0.398	0.353	0.293
121Sb	0.004	0.013	0.178	0.066	0.171	0.048	0.083
137Ba	0.001	0.003	129	113	151	85	99
202Hg	0.033	0.110	0.042	0.042	0.069	0.042	<0.033
205Tl	0.001	0.003	0.114	0.028	0.105	0.030	0.041
208Pb	0.004	0.013	0.818	0.238	0.662	0.202	0.312
238U	0.001	0.003	0.154	0.035	0.124	0.023	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	LC_DCDS_INV-02_20210610	LC_DCDS_INV-03_20210610	LC_DCDS_PLEC-01_20210610	LC_DCDS_PLEC-02_20210610	LC_DCDS_PLEC-03_20210610
		Lab ID	132	133	134	135	136
		Wet Weight (g)	0.4925	0.3047	0.0819	0.0863	0.0973
		Dry Weight (g)	0.1348	0.0604	0.0194	0.0148	0.0138
		Moisture (%)	72.6	80.2	76.3	82.9	85.8
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.001	0.003	0.367	0.778	0.566	0.495	0.544
11B	0.087	0.290	1.6	2.1	1.6	0.965	1.1
23Na	0.919	3.1	2,692	3,201	2,616	2,390	2,636
24Mg	0.018	0.060	1,985	1,466	1,760	1,693	1,712
27Al	0.038	0.127	757	1,815	1,269	674	817
31P	29	97	12,723	11,731	12,969	12,834	12,874
39K	1.9	6.3	11,019	13,257	10,853	10,785	9,741
44Ca	7.8	26	3,131	2,299	2,317	2,529	3,328
49Ti	0.227	0.757	75	174	109	61	71
51V	0.031	0.103	2.1	4.1	2.8	1.8	1.9
52Cr	0.178	0.593	6.7	10	14	14	17
55Mn	0.006	0.020	83	146	33	29	28
57Fe	0.726	2.4	483	973	684	662	721
59Co	0.006	0.020	1.9	4.6	1.4	1.3	1.2
60Ni	0.018	0.060	21	38	40	34	39
63Cu	0.015	0.050	14	15	17	16	16
66Zn	0.326	1.1	301	342	300	368	316
75As	0.401	1.3	1.3	2.5	0.629	0.564	0.693
77Se	0.347	1.2	4.5	7.5	5.0	4.9	5.0
88Sr	0.001	0.003	5.2	5.6	4.3	3.8	4.6
95Mo	0.001	0.003	0.466	0.746	0.373	0.342	0.466
107Ag	0.001	0.003	0.092	0.092	0.176	0.252	0.202
111Cd	0.082	0.273	4.6	13	0.836	0.836	1.1
118Sn	0.031	0.103	0.486	1.3	0.955	1.3	1.6
121Sb	0.004	0.013	0.078	0.099	0.058	0.047	0.057
137Ba	0.001	0.003	160	235	98	69	76
202Hg	0.033	0.110	<0.033	<0.033	0.041	0.041	0.041
205Tl	0.001	0.003	0.044	0.077	0.039	0.032	0.037
208Pb	0.004	0.013	0.221	0.552	0.296	0.223	0.293
238U	0.001	0.003	0.111	0.103	0.045	0.041	0.045

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	LC_DCDS_RHYA-01_20210610	LC_DCDS_RHYA-02_20210610	LC_DCDS_RHYA-03_20210610
		Lab ID	**137**	**138**	**139**
		Wet Weight (g)	0.1653	0.2199	0.3437
		Dry Weight (g)	0.0376	0.0405	0.0830
		Moisture (%)	77.3	81.6	75.9
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)
7Li	0.001	0.003	0.294	0.294	0.253
11B	0.087	0.290	0.860	1.1	0.469
23Na	0.919	3.1	2,220	2,181	2,564
24Mg	0.018	0.060	1,400	1,431	1,418
27Al	0.038	0.127	705	671	333
31P	29	97	11,076	9,943	12,565
39K	1.9	6.3	11,605	11,533	11,516
44Ca	7.8	26	1,070	1,159	776
49Ti	0.227	0.757	59	56	29
51V	0.031	0.103	1.6	1.7	0.822
52Cr	0.178	0.593	8.0	10	4.6
55Mn	0.006	0.020	90	88	68
57Fe	0.726	2.4	532	602	269
59Co	0.006	0.020	1.5	2.1	0.727
60Ni	0.018	0.060	20	22	10
63Cu	0.015	0.050	10	8.9	11
66Zn	0.326	1.1	220	224	218
75As	0.401	1.3	0.744	0.641	0.924
77Se	0.347	1.2	7.9	9.3	6.5
88Sr	0.001	0.003	2.9	3.4	2.0
95Mo	0.001	0.003	0.590	0.404	0.528
107Ag	0.001	0.003	0.092	0.071	0.067
111Cd	0.082	0.273	1.2	1.2	0.780
118Sn	0.031	0.103	0.299	0.207	0.351
121Sb	0.004	0.013	0.058	0.040	0.035
137Ba	0.001	0.003	151	182	124
202Hg	0.033	0.110	<0.033	<0.033	<0.033
205Tl	0.001	0.003	0.033	0.029	0.020
208Pb	0.004	0.013	0.231	0.258	0.124
238U	0.001	0.003	0.048	0.051	0.022

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		LC_DC3_INV-03_20210610			LC_DCDS_INV-01_20210610		
Lab ID		124			131		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.001	0.974	0.982	0.8	0.495	0.539	8.5
11B	0.087	3.7	4.6	22	1.2	1.4	15
23Na	0.919	3,849	3,889	1.0	3,657	3,739	2.2
24Mg	0.018	2,159	1,979	8.7	1,633	1,848	12
27Al	0.038	3,559	4,333	20	1,101	1,169	6.0
31P	29	13,236	12,213	8.0	11,746	13,035	10
39K	1.9	13,370	11,836	12	11,265	12,358	9.3
44Ca	7.8	3,096	3,212	3.7	2,487	3,129	23
49Ti	0.227	352	419	17	85	96	12
51V	0.031	11	12	8.7	2.2	2.6	17
52Cr	0.178	34	40	16	7.9	9.2	15
55Mn	0.006	48	53	9.9	54	59	8.8
57Fe	0.726	1,641	1,927	16	569	670	16
59Co	0.006	3.6	4.0	11	1.5	1.9	24
60Ni	0.018	78	106	30	26	30	14
63Cu	0.015	21	24	13	17	21	21
66Zn	0.326	183	222	19	208	268	25
75As	0.401	1.1	1.2	-	1.4	2.0	-
77Se	0.347	8.2	8.0	2.5	5.3	6.2	16
88Sr	0.001	12	11	8.7	5.6	6.3	12
95Mo	0.001	0.597	0.654	9.1	0.466	0.544	15
107Ag	0.001	0.203	0.225	10	0.139	0.151	8.3
111Cd	0.082	0.537	0.586	-	4.3	5.6	26
118Sn	0.031	0.289	0.426	-	0.293	0.433	-
121Sb	0.004	0.208	0.239	14	0.083	0.077	7.5
137Ba	0.001	147	159	7.8	99	106	6.8
202Hg	0.033	0.055	0.042	-	<0.033	<0.033	-
205Tl	0.001	0.098	0.114	15	0.041	0.047	14
208Pb	0.004	0.735	0.911	21	0.312	0.318	1.9
238U	0.001	0.138	0.150	8.3	0.069	0.082	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	0.001	1.21	1.2	101	4.5	1.3	111	3.5
11B	0.087	4.5	4.9	109	4.0	4.8	106	2.0
23Na	0.919	14,000	15,823	113	3.1	14,363	103	3.8
24Mg	0.018	910	992	109	0.9	977	107	1.9
27Al	0.038	197.2	200	101	2.7	192	98	4.7
31P	29	8,000	8,846	111	1.9	8,390	105	3.3
39K	1.9	15,500	17,101	110	3.0	16,542	107	4.9
44Ca	7.8	2,360	2,642	112	4.1	2,436	103	2.6
49Ti	0.227	12.24	12	101	3.7	13	108	11
51V	0.031	1.57	1.7	106	7.8	1.4	90	7.1
52Cr	0.178	1.87	2.0	106	2.9	1.9	102	2.7
55Mn	0.006	3.17	3.4	107	2.6	3.4	108	4.3
57Fe	0.726	343	381	111	2.9	369	108	3.5
59Co	0.006	0.25	0.289	116	4.7	0.264	106	3.2
60Ni	0.018	1.34	1.4	107	4.0	1.4	105	3.1
63Cu	0.015	15.7	18	112	5.2	17	106	4.4
66Zn	0.326	51.6	58	112	4.0	54	105	3.3
75As	0.401	6.87	7.6	111	1.4	7.0	102	1.9
77Se	0.347	3.45	3.8	109	5.2	3.6	106	5.6
88Sr	0.001	10.1	11	112	3.8	11	106	5.8
95Mo	0.001	0.29	0.321	111	8.6	0.317	109	8.2
107Ag	0.001	0.0252	0.031	121	16	0.024	93	16
111Cd	0.082	0.299	0.330	110	8.6	0.315	106	7.7
118Sn	0.031	0.061	0.080	132	12	0.055	91	17
121Sb	0.004	0.011	0.011	103	10	0.009	84	8.1
137Ba	0.001	8.6	9.3	108	1.6	9.0	104	2.6
202Hg	0.033	0.412	0.448	109	4.5	0.403	98	5.5
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.004	0.404	0.464	115	16	0.376	93	9.4
238U	0.001	0.05	0.049	98	6.0	0.052	104	5.7

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 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	LC_DC3_INV-01_20210610	122	17 Jun 2021
	LC_DC3_INV-02_20210610	123	
	LC_DC3_INV-03_20210610	124	
	LC_DC3_PLEC-01_20210610	125	
	LC_DC3_PLEC-02_20210610	126	
	LC_DC3_PLEC-03_20210610	127	
	LC_DC3_RHYA-01_20210610	128	
	LC_DC3_RHYA-02_20210610	129	
	LC_DC3_RHYA-03_20210610	130	
02	LC_DCDS_INV-01_20210610	131	17 Jun 2021
	LC_DCDS_INV-02_20210610	132	
	LC_DCDS_INV-03_20210610	133	
	LC_DCDS_PLEC-01_20210610	134	
	LC_DCDS_PLEC-02_20210610	135	
	LC_DCDS_PLEC-03_20210610	136	
	LC_DCDS_RHYA-01_20210610	137	
	LC_DCDS_RHYA-02_20210610	138	
	LC_DCDS_RHYA-03_20210610	139	

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: 21-79 (Teck Dry Creek BRN runout)

Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
Address:	PO Box 1777	Address:	204-1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

Trich Sample ID		Sample Identification:	Sample Type:	
			Species	Sample type
122	1	LC_DC3_INV-01_20210610	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
123	2	LC_DC3_INV-02_20210610	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
124	3	LC_DC3_INV-03_20210610	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
125	4	LC_DC3_PLEC-01_20210610	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
126	5	LC_DC3_PLEC-02_20210610	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
127	6	LC_DC3_PLEC-03_20210610	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
128	7	LC_DC3_RHYA-01_20210610	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
129	8	LC_DC3_RHYA-02_20210610	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
130	9	LC_DC3_RHYA-03_20210610	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
131	10	LC_DCDS_INV-01_20210610	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
132	11	LC_DCDS_INV-02_20210610	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
133	12	LC_DCDS_INV-03_20210610	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
134	13	LC_DCDS_PLEC-01_20210610	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
135	14	LC_DCDS_PLEC-02_20210610	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
136	15	LC_DCDS_PLEC-03_20210610	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
137	16	LC_DCDS_RHYA-01_20210610	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
138	17	LC_DCDS_RHYA 02_20210610	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
139	18	LC_DCDS_RHYA-03_20210610	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
	19			
	20			

Sample(s) Release Alex McClymont	Sample(s) Received By: Geriene LaBine
Signature:	Signature:
Date Sent: 11-Jun-21	Date Received: 11 Jun 2021 (Project # 2021-228)
Sample(s) Returned to Client By:	Shipping Conditions:
	Shipping Container:
Signature:	Date Sent:

COM-011.01

BENTHIC TISSUE CHEMISTRY

TrichAnalytics Laboratory Report 2021-234

TrichAnalytics Inc.

Tissue Microchemistry Analysis Report

Client:	Dave Hasek Aquatic Scientist Minnow Environmental	**Date Received:**	29 Jun 2021
		Date of Analysis:	07 Jul 2021 08 Jul 2021 10 Jul 2021
Phone:	(778) 677-3500		
Email:	dhasek@minnow.ca	**Final Report Date:**	15 Jul 2021
		Project No.:	2021-234
		Method No.:	MET-002.05

Client Project: Teck Coal/Minnow Environmental 21-79 (BRN Runout Monitoring)

Analytical Request: Benthic Invertebrate Tissue Microchemistry (total metals and moisture) – 54 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 101 - 106%).
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.

15 Jul 2021

Reviewed and Approved by Jennie Christensen, PhD, RPBio — Date

[The analytical report shall not be reproduced except in full under the expressed written consent of TrichAnalytics Inc.]

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	LC_DC3_INV-01_2021-06-21	LC_DC3_INV-02_2021-06-21	LC_DC3_INV-03_2021-06-21	LC_DC3_INV-04_2021-06-21	LC_DC3_INV-05_2021-06-21
		Lab ID	001	002	003	004	005
		Wet Weight (g)	0.4616	0.5815	0.6376	1.8360	1.0719
		Dry Weight (g)	0.1028	0.1292	0.1781	0.2814	0.2028
		Moisture (%)	77.7	77.8	72.1	84.7	81.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.441	0.540	0.385	0.441	0.511
11B	0.087	0.290	0.986	1.1	0.734	0.928	0.908
23Na	1.2	4.0	4,206	3,427	3,236	3,036	2,550
24Mg	0.018	0.060	2,216	1,467	2,286	2,196	2,017
27Al	0.233	0.777	889	984	608	655	1,012
31P	22	73	15,100	12,159	15,846	13,459	14,782
39K	13	43	11,814	11,297	11,097	9,356	7,999
44Ca	64	213	5,062	1,614	5,109	5,850	5,456
49Ti	0.455	1.5	63	69	42	44	68
51V	0.068	0.227	2.0	2.4	1.5	1.5	1.9
52Cr	0.966	3.2	7.7	4.3	5.6	4.0	7.1
55Mn	0.021	0.070	56	65	56	61	32
57Fe	3.4	11	445	499	312	324	437
59Co	0.006	0.020	1.1	0.991	0.995	0.998	0.754
60Ni	0.034	0.113	20	13	14	14	17
63Cu	0.010	0.033	21	21	17	20	16
66Zn	0.623	2.1	184	197	181	172	160
75As	0.483	1.6	1.2	0.844	0.920	1.0	1.3
77Se	0.296	0.987	7.9	12	6.6	5.8	6.4
88Sr	0.001	0.003	6.2	3.6	5.5	7.5	6.9
95Mo	0.004	0.013	0.567	0.454	0.527	0.421	0.502
107Ag	0.001	0.003	0.165	0.169	0.118	0.173	0.177
111Cd	0.066	0.220	0.833	1.2	0.779	1.8	0.543
118Sn	0.036	0.120	0.222	0.165	0.099	0.267	0.222
121Sb	0.006	0.020	0.077	0.077	0.086	0.090	0.077
137Ba	0.001	0.003	105	71	85	108	74
202Hg	0.038	0.127	<0.038	0.047	<0.038	0.047	<0.038
205Tl	0.001	0.003	0.044	0.048	0.038	0.042	0.044
208Pb	0.001	0.003	0.304	0.354	0.202	0.228	0.233
238U	0.001	0.003	0.054	0.055	0.028	0.047	0.049

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			LC_DC3_INV-06_2021-06-21	LC_DC3_INV-07_2021-06-21	LC_DCEF_INV-01_2021-06-22	LC_DCEF_INV-02_2021-06-22	LC_DCEF_INV-03_2021-06-22
Lab ID			006	007	008	009	010
Wet Weight (g)			0.7822	1.1006	1.2352	1.4511	1.0579
Dry Weight (g)			0.1798	0.2250	0.2827	0.3248	0.2131
Moisture (%)			77.0	79.6	77.1	77.6	79.9
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.380	0.305	0.312	0.296	0.368
11B	0.087	0.290	0.725	0.686	0.773	0.686	0.743
23Na	1.2	4.0	3,091	2,682	3,321	3,732	3,594
24Mg	0.018	0.060	1,855	1,396	1,619	2,264	1,660
27Al	0.233	0.777	603	550	173	93	110
31P	22	73	14,329	11,505	13,506	15,786	13,267
39K	13	43	9,630	7,974	13,960	12,987	11,975
44Ca	64	213	4,755	3,119	2,590	3,739	1,644
49Ti	0.455	1.5	39	45	9.0	4.8	6.2
51V	0.068	0.227	1.6	1.2	0.784	0.557	0.588
52Cr	0.966	3.2	4.4	3.0	3.3	2.1	2.6
55Mn	0.021	0.070	52	44	40	50	38
57Fe	3.4	11	290	258	286	225	234
59Co	0.006	0.020	0.845	0.484	0.586	0.710	0.739
60Ni	0.034	0.113	12	7.6	5.7	3.9	5.7
63Cu	0.010	0.033	19	20	23	24	26
66Zn	0.623	2.1	193	128	208	284	224
75As	0.483	1.6	0.942	0.588	1.4	1.4	1.4
77Se	0.296	0.987	8.5	6.5	7.0	5.9	8.0
88Sr	0.001	0.003	6.0	3.6	2.7	3.9	2.2
95Mo	0.004	0.013	0.437	0.340	0.551	0.502	0.574
107Ag	0.001	0.003	0.185	0.130	0.085	0.110	0.107
111Cd	0.066	0.220	0.797	0.897	5.9	5.8	7.3
118Sn	0.036	0.120	0.210	0.121	0.286	0.359	0.368
121Sb	0.006	0.020	0.081	0.063	0.024	0.029	0.025
137Ba	0.001	0.003	112	51	112	159	83
202Hg	0.038	0.127	<0.038	<0.038	<0.038	<0.038	<0.038
205Tl	0.001	0.003	0.040	0.033	0.029	0.026	0.022
208Pb	0.001	0.003	0.223	0.153	0.071	0.050	0.050
238U	0.001	0.003	0.041	0.030	0.029	0.029	0.029

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	LC_DCEF_INV-04_2021-06-22	LC_DCEF_INV-05_2021-06-22	LC_DCDS_INV-01_2021-06-22	LC_DCDS_INV-02_2021-06-22	LC_DCDS_INV-03_2021-06-22
		Lab ID	011	012	013	014	015
		Wet Weight (g)	0.8412	0.4209	0.6937	0.9130	1.1849
		Dry Weight (g)	0.2107	0.0882	0.1252	0.1872	0.2612
		Moisture (%)	75.0	79.0	82.0	79.5	78.0
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.266	0.298	0.555	1.3	0.734
11B	0.087	0.290	0.743	1.1	1.2	3.7	2.6
23Na	1.2	4.0	3,372	2,951	3,545	4,211	3,207
24Mg	0.018	0.060	2,220	1,495	1,475	1,946	1,655
27Al	0.233	0.777	175	203	892	3,300	2,032
31P	22	73	15,377	12,986	12,282	14,195	11,102
39K	13	43	12,426	11,606	13,939	14,425	11,603
44Ca	64	213	4,831	2,350	2,419	3,309	2,157
49Ti	0.455	1.5	9.6	8.4	59	262	132
51V	0.068	0.227	0.579	0.797	2.5	9.0	5.4
52Cr	0.966	3.2	2.7	4.4	6.0	26	16
55Mn	0.021	0.070	37	34	148	281	148
57Fe	3.4	11	256	304	446	1,255	930
59Co	0.006	0.020	0.539	0.887	2.9	8.4	5.5
60Ni	0.034	0.113	4.9	12	29	76	49
63Cu	0.010	0.033	21	22	17	19	17
66Zn	0.623	2.1	185	172	303	341	236
75As	0.483	1.6	1.3	1.8	1.7	2.9	1.6
77Se	0.296	0.987	4.7	6.2	7.1	9.2	7.1
88Sr	0.001	0.003	5.2	3.0	3.6	9.0	4.6
95Mo	0.004	0.013	0.522	0.592	0.609	0.975	0.800
107Ag	0.001	0.003	0.080	0.102	0.120	0.142	0.113
111Cd	0.066	0.220	4.2	5.2	8.7	11	8.5
118Sn	0.036	0.120	0.440	0.812	0.534	0.484	0.347
121Sb	0.006	0.020	0.021	0.033	0.050	0.136	0.087
137Ba	0.001	0.003	161	77	123	213	170
202Hg	0.038	0.127	<0.038	0.048	0.041	<0.038	0.041
205Tl	0.001	0.003	0.017	0.021	0.083	0.145	0.073
208Pb	0.001	0.003	0.058	0.058	0.248	0.677	0.477
238U	0.001	0.003	0.029	0.035	0.075	0.190	0.126

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	LC_DCDS_INV-04_2021-06-22	LC_DCDS_INV-05_2021-06-22	LC_DC4_INV-01_2021-06-23	LC_DC4_INV-02_2021-06-23	LC_DC4_INV-03_2021-06-23
		Lab ID	016	017	018	019	020
		Wet Weight (g)	0.7849	0.7067	0.8756	1.0048	0.6387
		Dry Weight (g)	0.1572	0.1486	0.1819	0.1945	0.1375
		Moisture (%)	80.0	79.0	79.2	80.6	78.5
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.501	0.601	0.671	0.594	0.612
11B	0.087	0.290	1.1	1.0	1.4	1.1	1.4
23Na	1.2	4.0	3,386	3,770	3,283	3,899	3,650
24Mg	0.018	0.060	1,417	1,342	1,585	1,500	1,836
27Al	0.233	0.777	803	674	1,093	844	1,247
31P	22	73	11,427	11,246	11,038	12,710	12,440
39K	13	43	11,358	10,913	12,319	13,138	14,854
44Ca	64	213	1,641	1,763	2,091	1,404	2,399
49Ti	0.455	1.5	50	40	66	44	95
51V	0.068	0.227	2.1	1.8	2.5	1.7	2.5
52Cr	0.966	3.2	4.8	3.6	8.5	4.9	16
55Mn	0.021	0.070	138	167	133	115	122
57Fe	3.4	11	390	368	532	415	719
59Co	0.006	0.020	4.8	4.5	4.4	1.9	4.7
60Ni	0.034	0.113	22	23	30	16	35
63Cu	0.010	0.033	16	15	15	12	14
66Zn	0.623	2.1	239	245	248	189	288
75As	0.483	1.6	1.4	1.6	1.9	0.945	2.0
77Se	0.296	0.987	6.9	8.6	7.5	5.8	7.6
88Sr	0.001	0.003	2.7	2.7	3.0	2.1	3.6
95Mo	0.004	0.013	0.418	0.592	0.574	0.555	0.640
107Ag	0.001	0.003	0.089	0.098	0.098	0.078	0.080
111Cd	0.066	0.220	6.0	5.6	5.2	4.0	9.3
118Sn	0.036	0.120	0.249	0.209	0.260	0.333	0.402
121Sb	0.006	0.020	0.052	0.050	0.054	0.047	0.063
137Ba	0.001	0.003	103	111	123	88	114
202Hg	0.038	0.127	<0.038	0.066	0.055	<0.038	<0.038
205Tl	0.001	0.003	0.066	0.071	0.052	0.033	0.053
208Pb	0.001	0.003	0.206	0.206	0.233	0.191	0.264
238U	0.001	0.003	0.064	0.065	0.071	0.038	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	LC_DC4_INV-04_2021-06-23	LC_DC4_INV-05_2021-06-23	LC_DC2_INV-01_2021-06-23	LC_DC2_INV-02_2021-06-23	LC_DC2_INV-03_2021-06-23
		Lab ID	021	022	023	024	025
		Wet Weight (g)	0.6257	1.0208	0.7293	0.5516	0.6458
		Dry Weight (g)	0.1213	0.2056	0.1721	0.1426	0.1293
		Moisture (%)	80.6	79.9	76.4	74.1	80.0
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.603	0.388	1.1	1.6	0.981
11B	0.087	0.290	1.6	0.660	3.0	4.4	2.9
23Na	1.2	4.0	3,183	3,207	3,428	2,233	2,764
24Mg	0.018	0.060	1,716	1,567	2,158	1,877	1,966
27Al	0.233	0.777	1,121	584	2,691	4,521	2,289
31P	22	73	11,581	10,699	13,029	11,528	12,158
39K	13	43	11,443	11,094	16,219	16,768	16,341
44Ca	64	213	2,105	2,024	2,758	3,844	2,677
49Ti	0.455	1.5	73	33	235	357	165
51V	0.068	0.227	2.5	1.2	5.5	9.0	5.1
52Cr	0.966	3.2	13	4.8	26	37	32
55Mn	0.021	0.070	97	70	298	378	319
57Fe	3.4	11	739	335	1,094	1,928	1,242
59Co	0.006	0.020	5.2	2.6	7.5	4.8	4.9
60Ni	0.034	0.113	36	14	57	78	69
63Cu	0.010	0.033	14	13	14	16	13
66Zn	0.623	2.1	278	232	343	303	342
75As	0.483	1.6	1.7	1.3	3.4	3.5	3.5
77Se	0.296	0.987	7.7	5.3	8.3	8.2	8.9
88Sr	0.001	0.003	3.0	2.6	5.3	8.0	5.2
95Mo	0.004	0.013	0.457	0.372	0.797	1.2	0.941
107Ag	0.001	0.003	0.077	0.086	0.097	0.120	0.101
111Cd	0.066	0.220	9.8	5.4	8.3	4.9	5.9
118Sn	0.036	0.120	0.367	0.184	0.556	0.472	0.525
121Sb	0.006	0.020	0.059	0.039	0.106	0.165	0.108
137Ba	0.001	0.003	108	92	180	266	224
202Hg	0.038	0.127	<0.038	<0.038	0.054	0.047	<0.038
205Tl	0.001	0.003	0.064	0.037	0.079	0.092	0.074
208Pb	0.001	0.003	0.262	0.146	0.603	0.877	0.504
238U	0.001	0.003	0.063	0.033	0.137	0.180	0.133

Notes:

ppm = parts per million
DL = detection limit
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% = percent

Teck Coal Limited
Tissue Analysis Results

		Client ID	LC_DC2_INV-04_2021-06-23	LC_DC2_INV-05_2021-06-23	LC_DC1_INV-01_2021-06-24	LC_DC1_INV-02_2021-06-24	LC_DC1_INV-03_2021-06-24
		Lab ID	026	027	028	029	030
		Wet Weight (g)	0.5252	0.7374	0.5402	0.6401	0.6451
		Dry Weight (g)	0.1302	0.1452	0.1044	0.1093	0.1373
		Moisture (%)	75.2	80.3	80.7	82.9	78.7
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.483	0.610	0.474	0.583	0.498
11B	0.087	0.290	1.2	1.9	1.0	0.559	0.681
23Na	1.2	4.0	2,937	3,316	3,324	3,681	3,870
24Mg	0.018	0.060	1,726	1,943	1,556	1,446	1,573
27Al	0.233	0.777	1,247	1,477	1,055	485	756
31P	22	73	11,191	12,396	11,808	11,102	12,601
39K	13	43	12,887	17,420	11,497	10,358	12,967
44Ca	64	213	1,824	2,212	1,806	1,724	1,532
49Ti	0.455	1.5	70	94	53	24	53
51V	0.068	0.227	2.6	3.4	2.3	1.0	1.4
52Cr	0.966	3.2	15	22	11	5.6	6.9
55Mn	0.021	0.070	183	313	94	61	107
57Fe	3.4	11	701	821	609	347	544
59Co	0.006	0.020	4.7	7.4	2.3	1.9	1.8
60Ni	0.034	0.113	33	61	29	16	22
63Cu	0.010	0.033	16	15	16	12	12
66Zn	0.623	2.1	326	383	249	249	223
75As	0.483	1.6	1.6	2.8	0.752	0.723	1.0
77Se	0.296	0.987	10	8.0	8.4	6.9	8.6
88Sr	0.001	0.003	3.1	3.5	2.8	2.2	2.6
95Mo	0.004	0.013	0.568	0.705	0.746	0.451	0.730
107Ag	0.001	0.003	0.111	0.101	0.103	0.062	0.069
111Cd	0.066	0.220	6.7	8.8	5.9	5.0	4.1
118Sn	0.036	0.120	0.136	0.520	0.359	0.239	0.278
121Sb	0.006	0.020	0.057	0.086	0.061	0.033	0.050
137Ba	0.001	0.003	134	256	144	98	164
202Hg	0.038	0.127	<0.038	<0.038	<0.038	0.042	<0.038
205Tl	0.001	0.003	0.047	0.064	0.035	0.043	0.053
208Pb	0.001	0.003	0.272	0.407	0.206	0.107	0.142
238U	0.001	0.003	0.072	0.120	0.042	0.031	0.043

Notes:

ppm = parts per million
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Teck Coal Limited
Tissue Analysis Results

		Client ID	LC_DC1_INV-04_2021-06-24	LC_DC1_INV-05_2021-06-24	LC_FRB_INV-01_2021-06-24	LC_FRB_INV-02_2021-06-24	LC_FRB_INV-03_2021-06-24
		Lab ID	031	032	033	034	035
		Wet Weight (g)	0.9981	0.7054	0.9776	1.0081	0.7439
		Dry Weight (g)	0.2003	0.1748	0.2232	0.2148	0.1810
		Moisture (%)	79.9	75.2	77.2	78.7	75.7
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.354	0.352	1.3	1.1	1.0
11B	0.087	0.290	0.510	0.571	2.4	2.5	1.7
23Na	1.2	4.0	3,289	3,326	4,227	2,929	4,058
24Mg	0.018	0.060	1,507	1,314	1,409	1,628	1,476
27Al	0.233	0.777	396	503	2,109	2,077	1,473
31P	22	73	11,581	11,820	10,563	10,657	10,159
39K	13	43	10,699	11,293	11,460	11,891	11,992
44Ca	64	213	1,883	1,262	2,551	3,002	2,432
49Ti	0.455	1.5	26	24	161	121	95
51V	0.068	0.227	1.0	1.2	3.8	3.7	3.1
52Cr	0.966	3.2	5.6	4.3	20	25	19
55Mn	0.021	0.070	83	115	55	117	66
57Fe	3.4	11	363	373	1,209	1,136	1,029
59Co	0.006	0.020	2.3	1.2	3.5	4.4	3.6
60Ni	0.034	0.113	19	12	40	46	38
63Cu	0.010	0.033	11	13	19	16	22
66Zn	0.623	2.1	242	215	206	276	241
75As	0.483	1.6	1.2	0.664	0.723	1.1	0.791
77Se	0.296	0.987	8.3	8.3	5.5	6.0	7.0
88Sr	0.001	0.003	2.5	1.9	4.1	4.5	3.5
95Mo	0.004	0.013	0.528	0.552	0.513	0.466	0.373
107Ag	0.001	0.003	0.058	0.072	0.100	0.079	0.122
111Cd	0.066	0.220	5.0	4.1	3.0	5.2	3.8
118Sn	0.036	0.120	0.504	0.297	0.436	0.663	0.333
121Sb	0.006	0.020	0.039	0.050	0.055	0.050	0.033
137Ba	0.001	0.003	128	162	45	59	34
202Hg	0.038	0.127	0.042	<0.038	<0.038	<0.038	<0.038
205Tl	0.001	0.003	0.053	0.041	0.051	0.053	0.039
208Pb	0.001	0.003	0.094	0.117	0.450	0.445	0.344
238U	0.001	0.003	0.037	0.028	0.079	0.084	0.048

Notes:

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Teck Coal Limited
Tissue Analysis Results

		Client ID	LC_FRB_INV-04_2021-06-24	LC_FRB_INV-05_2021-06-24	LC_FRUS_INV-01_2021-06-25	LC_FRUS_INV-02_2021-06-25	LC_FRUS_INV-03_2021-06-25
		Lab ID	036	037	038	039	040
		Wet Weight (g)	1.1912	1.0569	0.7949	0.6483	0.9506
		Dry Weight (g)	0.2830	0.2623	0.1729	0.1657	0.2264
		Moisture (%)	76.2	75.2	78.2	74.4	76.2
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	1.2	0.909	1.0	1.2	0.873
11B	0.087	0.290	1.9	1.7	2.2	2.8	1.8
23Na	1.2	4.0	4,135	3,988	3,318	3,167	3,123
24Mg	0.018	0.060	2,051	2,017	1,360	1,679	1,582
27Al	0.233	0.777	1,778	1,644	1,635	2,293	1,365
31P	22	73	12,309	13,490	9,986	10,384	12,288
39K	13	43	12,859	12,776	10,218	11,580	11,468
44Ca	64	213	4,633	4,551	2,201	2,758	4,052
49Ti	0.455	1.5	100	96	133	186	93
51V	0.068	0.227	3.0	2.4	2.3	3.7	2.2
52Cr	0.966	3.2	14	13	10	15	14
55Mn	0.021	0.070	72	89	79	129	93
57Fe	3.4	11	930	801	724	1,068	855
59Co	0.006	0.020	3.2	2.7	2.6	5.7	3.4
60Ni	0.034	0.113	29	24	20	33	25
63Cu	0.010	0.033	17	20	19	19	21
66Zn	0.623	2.1	240	296	246	370	301
75As	0.483	1.6	0.840	0.658	0.897	0.959	0.851
77Se	0.296	0.987	5.7	5.6	5.5	7.1	6.9
88Sr	0.001	0.003	5.4	6.3	3.1	4.9	5.2
95Mo	0.004	0.013	0.373	0.364	0.420	0.504	0.448
107Ag	0.001	0.003	0.082	0.118	0.068	0.078	0.106
111Cd	0.066	0.220	3.0	3.0	3.8	5.6	4.9
118Sn	0.036	0.120	0.407	0.236	0.372	0.360	0.628
121Sb	0.006	0.020	0.050	0.045	0.045	0.065	0.045
137Ba	0.001	0.003	53	50	38	69	46
202Hg	0.038	0.127	<0.038	<0.038	<0.038	<0.038	<0.038
205Tl	0.001	0.003	0.045	0.030	0.027	0.043	0.033
208Pb	0.001	0.003	0.349	0.339	0.344	0.455	0.307
238U	0.001	0.003	0.069	0.049	0.066	0.084	0.050

Notes:

ppm = parts per million

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% = percent

Teck Coal Limited
Tissue Analysis Results

		Client ID	LC_FRUS_INV-04_2021-06-25	LC_FRUS_INV-05_2021-06-25	LC_DC3_INVPLE-01_2021-06-21	LC_DC3_INVPLE-02_2021-06-21	LC_DC3_INVPLE-03_2021-06-21
		Lab ID	041	042	043	044	045
		Wet Weight (g)	1.0112	0.6177	0.1419	0.1397	0.1072
		Dry Weight (g)	0.2068	0.1366	0.0327	0.0279	0.0181
		Moisture (%)	79.5	77.9	77.0	80.0	83.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.881	1.2	0.676	3.8	0.702
11B	0.087	0.290	1.7	2.0	1.5	4.4	1.4
23Na	1.2	4.0	3,333	3,325	2,508	1,804	2,317
24Mg	0.018	0.060	1,455	1,689	2,423	3,907	3,143
27Al	0.233	0.777	1,288	2,178	1,490	9,974	1,445
31P	22	73	8,663	10,176	11,443	15,018	13,550
39K	13	43	9,770	11,660	7,925	7,978	7,977
44Ca	64	213	2,410	2,797	3,640	5,335	5,292
49Ti	0.455	1.5	93	156	107	227	104
51V	0.068	0.227	2.0	3.5	3.1	5.4	3.9
52Cr	0.966	3.2	12	16	28	62	68
55Mn	0.021	0.070	89	167	38	56	48
57Fe	3.4	11	769	1,180	854	1,851	1,526
59Co	0.006	0.020	3.9	4.6	2.0	1.8	3.7
60Ni	0.034	0.113	24	31	44	107	111
63Cu	0.010	0.033	17	18	16	19	18
66Zn	0.623	2.1	375	340	227	197	299
75As	0.483	1.6	0.766	1.0	0.557	0.928	0.588
77Se	0.296	0.987	5.7	6.5	8.6	11	9.1
88Sr	0.001	0.003	3.4	4.2	4.6	276	5.7
95Mo	0.004	0.013	0.490	0.687	0.645	1.5	0.869
107Ag	0.001	0.003	0.079	0.090	0.205	0.156	0.208
111Cd	0.066	0.220	4.9	4.9	0.529	0.597	0.589
118Sn	0.036	0.120	0.628	0.421	0.245	1.4	0.911
121Sb	0.006	0.020	0.053	0.065	0.065	0.290	0.085
137Ba	0.001	0.003	52	75	57	2,267	54
202Hg	0.038	0.127	<0.038	<0.038	0.043	<0.038	<0.038
205Tl	0.001	0.003	0.031	0.044	0.035	0.064	0.042
208Pb	0.001	0.003	0.395	0.487	0.343	5.6	0.291
238U	0.001	0.003	0.066	0.087	0.073	0.349	0.076

Notes:

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Teck Coal Limited
Tissue Analysis Results

		Client ID	LC_DC3_INVRHY-01_2021-06-21	LC_DC3_INVRHY-02_2021-06-21	LC_DC3_INVRHY-03_2021-06-21	LC_DCDS_INVPLE-01_2021-06-22	LC_DCDS_INVPLE-02_2021-06-22
		Lab ID	046	047	048	049	050
		Wet Weight (g)	0.3076	0.3903	0.2677	0.2174	0.1472
		Dry Weight (g)	0.0788	0.0652	0.0609	0.0399	0.0236
		Moisture (%)	74.4	83.3	77.3	81.6	84.0
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.158	0.374	0.181	0.571	0.818
11B	0.087	0.290	0.528	1.1	0.653	0.999	1.8
23Na	1.2	4.0	2,267	1,328	2,918	2,758	3,463
24Mg	0.018	0.060	1,292	1,175	1,785	1,566	1,840
27Al	0.233	0.777	315	732	530	1,065	1,607
31P	22	73	11,064	7,151	8,593	11,116	13,027
39K	13	43	8,778	6,063	8,044	10,097	11,388
44Ca	64	213	1,140	1,621	1,041	3,181	4,036
49Ti	0.455	1.5	18	40	29	76	117
51V	0.068	0.227	0.870	1.7	1.4	2.0	3.5
52Cr	0.966	3.2	5.7	9.4	7.7	14	24
55Mn	0.021	0.070	67	73	72	21	37
57Fe	3.4	11	230	341	281	492	959
59Co	0.006	0.020	0.687	1.0	0.938	0.688	1.9
60Ni	0.034	0.113	13	18	14	25	42
63Cu	0.010	0.033	11	13	11	14	19
66Zn	0.623	2.1	187	171	195	240	309
75As	0.483	1.6	<0.483	0.541	<0.483	0.525	0.565
77Se	0.296	0.987	10	8.7	9.3	4.8	5.2
88Sr	0.001	0.003	1.9	2.6	2.8	7.3	6.2
95Mo	0.004	0.013	0.378	0.351	0.290	0.472	0.378
107Ag	0.001	0.003	0.053	0.044	0.047	0.157	0.240
111Cd	0.066	0.220	0.744	0.577	0.632	1.1	1.7
118Sn	0.036	0.120	0.140	0.172	0.064	0.503	1.0
121Sb	0.006	0.020	0.045	0.050	0.050	0.045	0.080
137Ba	0.001	0.003	55	39	82	88	110
202Hg	0.038	0.127	<0.038	0.042	0.039	<0.038	0.042
205Tl	0.001	0.003	0.024	0.026	0.028	0.034	0.043
208Pb	0.001	0.003	0.115	0.196	0.168	0.260	0.345
238U	0.001	0.003	0.022	0.041	0.031	0.053	0.084

Notes:

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% = percent

Teck Coal Limited
Tissue Analysis Results

Client ID			LC_DCDS_INVPLE-03_2021-06-22	LC_DCDS_INVRHY-01_2021-06-22	LC_DCDS_INVRHY-02_2021-06-22	LC_DCDS_INVRHY-03_2021-06-22
Lab ID			051	052	053	054
Wet Weight (g)			0.1319	0.6408	0.5114	0.5830
Dry Weight (g)			0.0268	0.1537	0.1278	0.0823
Moisture (%)			79.7	76.0	75.0	85.9
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.007	0.023	0.915	0.451	0.513	0.480
11B	0.087	0.290	2.5	1.7	1.9	1.4
23Na	1.2	4.0	3,135	2,017	2,182	2,298
24Mg	0.018	0.060	2,230	2,152	1,776	1,807
27Al	0.233	0.777	2,579	586	1,378	955
31P	22	73	13,376	12,588	11,874	11,259
39K	13	43	12,932	17,834	14,162	11,943
44Ca	64	213	4,286	2,628	1,430	2,302
49Ti	0.455	1.5	201	43	109	83
51V	0.068	0.227	6.7	1.8	4.1	2.7
52Cr	0.966	3.2	32	3.8	14	9.5
55Mn	0.021	0.070	57	547	209	284
57Fe	3.4	11	1,211	328	706	526
59Co	0.006	0.020	2.3	3.7	1.9	1.3
60Ni	0.034	0.113	61	48	38	26
63Cu	0.010	0.033	20	11	12	13
66Zn	0.623	2.1	308	307	220	280
75As	0.483	1.6	0.604	3.6	1.7	1.1
77Se	0.296	0.987	6.5	8.2	7.9	9.2
88Sr	0.001	0.003	6.8	4.0	3.6	4.6
95Mo	0.004	0.013	0.486	0.674	0.742	0.701
107Ag	0.001	0.003	0.282	0.101	0.080	0.098
111Cd	0.066	0.220	1.6	3.3	1.8	2.3
118Sn	0.036	0.120	0.546	0.231	0.231	1.0
121Sb	0.006	0.020	0.109	0.074	0.074	0.066
137Ba	0.001	0.003	132	222	135	188
202Hg	0.038	0.127	0.057	0.064	0.042	0.042
205Tl	0.001	0.003	0.063	0.040	0.049	0.044
208Pb	0.001	0.003	0.562	0.206	0.335	0.283
238U	0.001	0.003	0.129	0.107	0.073	0.099

Notes:

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g = grams
% = percent

Teck Coal Limited
Tissue QA/QC Relative Percent Difference Results

Client ID		LC_DC3_INV-01_2021-06-21			LC_DCEF_INV-03_2021-06-22			LC_DC4_INV-02_2021-06-23		
Lab ID		001			010			019		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.007	0.441	0.375	16	0.368	0.415	12	0.594	0.697	16
11B	0.087	0.986	0.928	6.1	0.743	0.815	-	1.1	0.948	15
23Na	1.2	4,206	3,622	15	3,594	3,835	6.5	3,899	5,288	30
24Mg	0.018	2,216	2,208	0.4	1,660	1,524	8.5	1,500	1,535	2.3
27Al	0.233	889	743	18	110	158	36	844	621	30
31P	22	15,100	13,984	7.7	13,267	12,651	4.8	12,710	13,958	9.4
39K	13	11,814	10,115	16	11,975	12,640	5.4	13,138	17,264	27
44Ca	64	5,062	4,348	15	1,644	1,614	1.8	1,404	1,488	5.8
49Ti	0.455	63	48	27	6.2	7.3	16	44	36	20
51V	0.068	2.0	1.7	16	0.588	0.652	-	1.7	1.5	13
52Cr	0.966	7.7	7.7	-	2.6	2.8	-	4.9	5.0	-
55Mn	0.021	56	57	1.8	38	41	7.6	115	127	9.9
57Fe	3.4	445	386	14	234	282	19	415	402	3.2
59Co	0.006	1.1	0.947	15	0.739	0.707	4.4	1.9	2.3	19
60Ni	0.034	20	18	11	5.7	5.4	5.4	16	18	12
63Cu	0.010	21	20	4.9	26	25	3.9	12	14	15
66Zn	0.623	184	197	6.8	224	234	4.4	189	229	19
75As	0.483	1.2	1.2	-	1.4	1.4	-	0.945	1.3	-
77Se	0.296	7.9	7.4	6.5	8.0	8.9	11	5.8	7.0	19
88Sr	0.001	6.2	6.4	3.2	2.2	2.0	9.5	2.1	2.1	0.0
95Mo	0.004	0.567	0.518	9.0	0.574	0.661	14	0.555	0.614	10
107Ag	0.001	0.165	0.154	6.9	0.107	0.111	3.7	0.078	0.092	17
111Cd	0.066	0.833	0.616	-	7.3	7.2	1.4	4.0	4.1	2.5
118Sn	0.036	0.222	0.178	-	0.368	0.462	23	0.333	0.451	-
121Sb	0.006	0.077	0.077	0.0	0.025	0.029	-	0.047	0.059	-
137Ba	0.001	105	109	3.7	83	86	3.6	88	109	21
202Hg	0.038	<0.038	<0.038	-	<0.038	0.055	-	<0.038	<0.038	-
205Tl	0.001	0.044	0.039	12	0.022	0.024	8.7	0.033	0.031	6.3
208Pb	0.001	0.304	0.244	22	0.050	0.061	20	0.191	0.189	1.1
238U	0.001	0.054	0.046	16	0.029	0.032	9.8	0.038	0.049	25

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		LC_FRB_INV-05_2021-06-24			LC_DCDS_INVRHY-01_2021-06-22			LC_DCDS_INVRHY-03_2021-06-22		
Lab ID		037			052			054		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.007	0.909	0.915	0.7	0.451	0.467	3.5	0.480	0.471	1.9
11B	0.087	1.7	1.6	6.1	1.7	2.0	16	1.4	1.6	13
23Na	1.2	3,988	3,473	14	2,017	2,073	2.7	2,298	2,464	7.0
24Mg	0.018	2,017	2,004	0.6	2,152	1,982	8.2	1,807	1,675	7.6
27Al	0.233	1,644	1,497	9.4	586	744	24	955	1,092	13
31P	22	13,490	12,520	7.5	12,588	12,684	0.8	11,259	10,652	5.5
39K	13	12,776	11,710	8.7	17,834	19,123	7.0	11,943	11,178	6.6
44Ca	64	4,551	3,767	19	2,628	2,225	17	2,302	2,165	6.1
49Ti	0.455	96	83	15	43	55	25	83	80	3.7
51V	0.068	2.4	2.3	4.3	1.8	2.0	11	2.7	2.8	3.6
52Cr	0.966	13	15	14	3.8	4.4	-	9.5	11	-
55Mn	0.021	89	82	8.2	547	539	1.5	284	266	6.5
57Fe	3.4	801	855	6.5	328	372	13	526	598	13
59Co	0.006	2.7	2.9	7.1	3.7	3.2	15	1.3	1.6	21
60Ni	0.034	24	27	12	48	50	4.1	26	29	11
63Cu	0.010	20	17	16	11	11	0.0	13	12	8.0
66Zn	0.623	296	264	11	307	275	11	280	273	2.5
75As	0.483	0.658	0.743	-	3.6	3.6	-	1.1	1.3	-
77Se	0.296	5.6	5.3	5.5	8.2	7.7	6.3	9.2	8.8	4.4
88Sr	0.001	6.3	5.1	21	4.0	3.3	19	4.6	4.6	0.0
95Mo	0.004	0.364	0.329	10	0.674	0.789	16	0.701	0.661	5.9
107Ag	0.001	0.118	0.100	17	0.101	0.089	13	0.098	0.101	3.0
111Cd	0.066	3.0	3.0	0.0	3.3	2.7	20	2.3	2.3	0.0
118Sn	0.036	0.236	0.271	-	0.231	0.373	-	1.0	0.790	24
121Sb	0.006	0.045	0.050	-	0.074	0.078	5.3	0.066	0.050	-
137Ba	0.001	50	41	20	222	174	24	188	184	2.2
202Hg	0.038	<0.038	<0.038	-	0.064	<0.038	-	0.042	<0.038	-
205Tl	0.001	0.030	0.026	14	0.040	0.039	2.5	0.044	0.043	2.3
208Pb	0.001	0.339	0.293	15	0.206	0.181	13	0.283	0.245	14
238U	0.001	0.049	0.043	13	0.107	0.088	20	0.099	0.082	19

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	0.007	1.21	1.2	103	1.7	1.2	99	4.8
11B	0.087	4.5	4.7	104	3.2	4.8	107	0.7
23Na	1.2	14,000	15,344	110	4.4	14,784	106	2.9
24Mg	0.018	910	1,008	111	1.4	945	104	1.9
27Al	0.233	197.2	211	107	1.3	222	113	3.9
31P	22	8,000	8,571	107	4.1	8,293	104	1.9
39K	13	15,500	16,824	108	4.7	16,522	107	3.4
44Ca	64	2,360	2,534	107	3.4	2,515	106	4.0
49Ti	0.455	12.24	14	112	13	12	100	7.7
51V	0.068	1.57	1.8	118	16	1.7	110	4.0
52Cr	0.966	1.87	2.0	105	4.5	2.1	112	4.9
55Mn	0.021	3.17	3.6	113	6.5	3.4	106	2.7
57Fe	3.4	343	384	112	3.7	360	105	1.8
59Co	0.006	0.25	0.279	112	4.3	0.274	109	2.2
60Ni	0.034	1.34	1.5	113	3.5	1.4	107	2.1
63Cu	0.010	15.7	18	115	3.1	17	109	2.6
66Zn	0.623	51.6	56	109	1.9	54	105	3.2
75As	0.483	6.87	7.2	105	2.5	7.1	104	1.6
77Se	0.296	3.45	3.6	104	5.2	3.7	106	2.2
88Sr	0.001	10.1	11	110	2.7	11	109	2.9
95Mo	0.004	0.29	0.321	111	7.5	0.311	107	5.0
107Ag	0.001	0.0252	0.028	109	10	0.028	113	8.6
111Cd	0.066	0.299	0.353	118	9.4	0.312	104	12
118Sn	0.036	0.061	0.069	113	20	0.076	124	20
121Sb	0.006	0.011	0.009	82	20	0.013	115	9.0
137Ba	0.001	8.6	8.9	104	1.7	8.9	104	3.3
202Hg	0.038	0.412	0.430	104	6.9	0.429	104	3.8
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.406	101	13	0.475	118	15
238U	0.001	0.05	0.053	105	12	0.057	113	2.9

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	0.007	1.21	1.2	102	12	1.3	109	4.2
11B	0.087	4.5	4.9	110	2.1	4.7	104	2.4
23Na	1.2	14,000	14,850	106	11	15,848	113	3.5
24Mg	0.018	910	959	105	13	1,017	112	2.9
27Al	0.233	197.2	201	102	8.7	202	102	7.3
31P	22	8,000	8,130	102	9.5	8,575	107	3.4
39K	13	15,500	16,429	106	11	17,011	110	3.3
44Ca	64	2,360	2,427	103	9.4	2,580	109	3.0
49Ti	0.455	12.24	12	95	13	11	91	9.9
51V	0.068	1.57	1.5	98	2.9	1.8	115	10
52Cr	0.966	1.87	2.0	107	9.6	1.9	102	10
55Mn	0.021	3.17	3.3	104	13	3.6	114	1.7
57Fe	3.4	343	357	104	11	394	115	3.2
59Co	0.006	0.25	0.284	114	7.7	0.270	108	4.6
60Ni	0.034	1.34	1.5	109	7.1	1.5	111	2.8
63Cu	0.010	15.7	17	108	6.5	17	111	1.2
66Zn	0.623	51.6	54	105	3.7	55	106	1.5
75As	0.483	6.87	7.0	101	7.8	7.1	104	4.1
77Se	0.296	3.45	3.5	101	10	3.6	104	4.2
88Sr	0.001	10.1	10	103	7.2	11	112	2.3
95Mo	0.004	0.29	0.299	103	8.5	0.325	112	5.5
107Ag	0.001	0.0252	0.026	105	13	0.023	91	6.7
111Cd	0.066	0.299	0.317	106	8.8	0.324	108	9.8
118Sn	0.036	0.061	0.061	100	7.7	0.081	133	20
121Sb	0.006	0.011	0.011	100	16	0.011	100	0.0
137Ba	0.001	8.6	9.0	105	4.4	8.8	102	2.1
202Hg	0.038	0.412	0.430	104	7.5	0.438	106	4.8
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.348	86	11	0.454	112	10
238U	0.001	0.05	0.047	94	7.3	0.059	118	9.1

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	05			06		
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.007	1.21	1.4	113	4.4	1.3	106	3.7
11B	0.087	4.5	5.3	118	4.1	5.1	114	2.2
23Na	1.2	14,000	16,627	119	2.3	15,806	113	5.1
24Mg	0.018	910	1,078	118	2.4	964	106	5.9
27Al	0.233	197.2	229	116	11	226	114	7.2
31P	22	8,000	8,952	112	3.2	8,757	110	2.5
39K	13	15,500	17,753	114	3.6	16,752	108	5.6
44Ca	64	2,360	2,721	115	3.8	2,559	108	3.8
49Ti	0.455	12.24	13	102	11	16	130	14
51V	0.068	1.57	1.9	119	11	1.9	119	5.6
52Cr	0.966	1.87	2.3	122	6.7	2.3	120	4.2
55Mn	0.021	3.17	3.8	119	2.0	3.6	113	3.0
57Fe	3.4	343	417	122	2.6	390	114	3.5
59Co	0.006	0.25	0.317	127	4.0	0.284	114	2.6
60Ni	0.034	1.34	1.6	121	3.0	1.5	114	3.8
63Cu	0.010	15.7	19	122	3.9	17	111	3.4
66Zn	0.623	51.6	59	114	3.9	57	111	4.0
75As	0.483	6.87	7.6	110	2.8	7.3	107	2.6
77Se	0.296	3.45	3.6	105	5.2	3.6	103	3.5
88Sr	0.001	10.1	11	112	4.0	11	109	3.0
95Mo	0.004	0.29	0.318	110	6.5	0.299	103	7.4
107Ag	0.001	0.0252	0.030	120	6.9	0.024	96	5.5
111Cd	0.066	0.299	0.348	116	8.6	0.351	117	7.2
118Sn	0.036	0.061	0.069	114	12	0.067	109	7.7
121Sb	0.006	0.011	0.014	125	18	0.012	109	0.0
137Ba	0.001	8.6	9.3	108	2.6	9.6	112	1.9
202Hg	0.038	0.412	0.448	109	5.5	0.430	104	3.3
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.471	117	7.0	0.515	128	14
238U	0.001	0.05	0.058	116	11	0.062	124	7.6

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
Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
01	LC_DC3_INV-01_2021-06-21	001	10 Jul 2021
	LC_DC3_INV-02_2021-06-21	002	
	LC_DC3_INV-03_2021-06-21	003	
	LC_DC3_INV-04_2021-06-21	004	
	LC_DC3_INV-05_2021-06-21	005	
	LC_DC3_INV-06_2021-06-21	006	
	LC_DC3_INV-07_2021-06-21	007	
	LC_DCEF_INV-01_2021-06-22	008	
	LC_DCEF_INV-02_2021-06-22	009	
02	LC_DCEF_INV-03_2021-06-22	010	10 Jul 2021
	LC_DCEF_INV-04_2021-06-22	011	
	LC_DCEF_INV-05_2021-06-22	012	
	LC_DCDS_INV-01_2021-06-22	013	
	LC_DCDS_INV-02_2021-06-22	014	
	LC_DCDS_INV-03_2021-06-22	015	
	LC_DCDS_INV-04_2021-06-22	016	
	LC_DCDS_INV-05_2021-06-22	017	
	LC_DC4_INV-01_2021-06-23	018	
03	LC_DC4_INV-02_2021-06-23	019	08 Jul 2021
	LC_DC4_INV-03_2021-06-23	020	
	LC_DC4_INV-04_2021-06-23	021	
	LC_DC4_INV-05_2021-06-23	022	
	LC_DC2_INV-01_2021-06-23	023	
	LC_DC2_INV-02_2021-06-23	024	
	LC_DC2_INV-03_2021-06-23	025	
	LC_DC2_INV-04_2021-06-23	026	
	LC_DC2_INV-05_2021-06-23	027	
04	LC_DC1_INV-01_2021-06-24	028	07 Jul 2021
	LC_DC1_INV-02_2021-06-24	029	
	LC_DC1_INV-03_2021-06-24	030	
	LC_DC1_INV-04_2021-06-24	031	
	LC_DC1_INV-05_2021-06-24	032	
	LC_FRB_INV-01_2021-06-24	033	
	LC_FRB_INV-02_2021-06-24	034	
	LC_FRB_INV-03_2021-06-24	035	
	LC_FRB_INV-04_2021-06-24	036	
05	LC_FRB_INV-05_2021-06-24	037	07 Jul 2021
	LC_FRUS_INV-01_2021-06-25	038	
	LC_FRUS_INV-02_2021-06-25	039	
	LC_FRUS_INV-03_2021-06-25	040	

Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
05	LC_FRUS_INV-04_2021-06-25	041	07 Jul 2021
	LC_FRUS_INV-05_2021-06-25	042	
	LC_DC3_INVPLE-01_2021-06-21	043	
	LC_DC3_INVPLE-02_2021-06-21	044	
	LC_DC3_INVPLE-03_2021-06-21	045	
06	LC_DC3_INVRHY-01_2021-06-21	046	08 Jul 2021
	LC_DC3_INVRHY-02_2021-06-21	047	
	LC_DC3_INVRHY-03_2021-06-21	048	
	LC_DCDS_INVPLE-01_2021-06-22	049	
	LC_DCDS_INVPLE-02_2021-06-22	050	
	LC_DCDS_INVPLE-03_2021-06-22	051	
	LC_DCDS_INVRHY-01_2021-06-22	052	
	LC_DCDS_INVRHY-02_2021-06-22	053	
	LC_DCDS_INVRHY-03_2021-06-22	054	

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: PO# 748530; 21-79 BRN Runout Monitoring/[redacted]			
Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
Address:	PO Box 1777	Address:	204-1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

Trich Sample ID:		Sample Identification:		Sample Type: Species	Sample type
001	1	LC_DC3_INV-01_2021-06-21	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
002	2	LC_DC3_INV-02_2021-06-21	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
003	3	LC_DC3_INV-03_2021-06-21	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
004	4	LC_DC3_INV-04_2021-06-21	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
005	5	LC_DC3_INV-05_2021-06-21	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
006	6	LC_DC3_INV-06_2021-06-21	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
007	7	LC_DC3_INV-07_2021-06-21	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
008	8	LC_DCEF_INV-01_2021-06-22	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
009	9	LC_DCEF_INV-02_2021-06-22	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
010	10	LC_DCEF_INV-03_2021-06-22	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
011	11	LC_DCEF_INV-04_2021-06-22	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
012	12	LC_DCEF_INV-05_2021-06-22	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
013	13	LC_DCDS_INV-01_2021-06-22	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
014	14	LC_DCDS_INV-02_2021-06-22	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
015	15	LC_DCDS_INV-03_2021-06-22	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
016	16	LC_DCDS_INV-04_2021-06-22	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
017	17	LC_DCDS_INV-05_2021-06-22	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
018	18	LC_DC4_INV-01_2021-06-23	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
019	19	LC_DC4_INV-02_2021-06-23	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
020	20	LC_DC4_INV-03_2021-06-23	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis

Sample(s) Release	Maddy Stokes	Sample(s) Received By:	GERIENE LABINE
Signature:	MS	Signature:	
Date Sent:	28-Jun-21	Date Received:	05 JUL 2021 (Project #: 2021-234)
Sample(s) Returned to Client By:		Shipping Conditions:	29 Jun 2021 date received in lab. AS
		Shipping Container:	
Signature:		Date Sent:	

COM-011.01

2 BAGS

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: PO# 748530; 21-79 BRN Runout Monitoring/ [redacted]

Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
Address:	PO Box 1777	Address:	204-1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

	Sample Identification:			Sample Type:	
Trich Sample ID:				Species	Sample type
021	21	LC_DC4_INV-04_2021-06-23	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
022	22	LC_DC4_INV-05_2021-06-23	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
023	23	LC_DC2_INV-01_2021-06-23	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
024	24	LC_DC2_INV-02_2021-06-23	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
025	25	LC_DC2_INV-03_2021-06-23	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
026	26	LC_DC2_INV-04_2021-06-23	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
027	27	LC_DC2_INV-05_2021-06-23	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
028	28	LC_DC1_INV-01_2021-06-24	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
029	29	LC_DC1_INV-02_2021-06-24	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
030	30	LC_DC1_INV-03_2021-06-24	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
031	31	LC_DC1_INV-04_2021-06-24	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
032	32	LC_DC1_INV-05_2021-06-24	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
033	33	LC_FRB_INV-01_2021-06-24	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
034	34	LC_FRB_INV-02_2021-06-24	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
035	35	LC_FRB_INV-03_2021-06-24	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
036	36	LC_FRB_INV-04_2021-06-24	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
037	37	LC_FRB_INV-05_2021-06-24	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
038	38	LC_FRUS_INV-01_2021-06-25	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
039	39	LC_FRUS_INV-02_2021-06-25	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
040	40	LC_FRUS_INV-03_2021-06-25	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis

Sample(s) Release	Maddy Stokes	Sample(s) Received By:	GERIENE LABINE
Signature:		Signature:	
Date Sent:	28-Jun-21	Date Received:	05 JUL 2021 (Project # 2021-234)
Sample(s) Returned to Client By:		Shipping Conditions:	29 Jun 2021 date received in lab
		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: PO# 748530; 21-79 BRN Runout Monitoring			
Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
Address:	PO Box 1777	Address:	204-1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

Trich Sample ID:		Sample Identification:		Sample Type:	
				Species	Sample type
041	41	LC_FRUS_INV-04_2021-06-25	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
042	42	LC_FRUS_INV-05_2021-06-25	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
043	43	LC_DC3_INVPLE-01_2021-06-21	✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
044	44	LC_DC3_INVPLE-02_2021-06-21	✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
045	45	LC_DC3_INVPLE-03_2021-06-21	✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
046	46	LC_DC3_INVRHY-01_2021-06-21	✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
047	47	LC_DC3_INVRHY-02_2021-06-21	✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
048	48	LC_DC3_INVRHY-03_2021-06-21	✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
049	49	LC_DCDS_INVPLE-01_2021-06-22	✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
050	50	LC_DCDS_INVPLE-02_2021-06-22	✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
051	51	LC_DCDS_INVPLE-03_2021-06-22	✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
052	52	LC_DCDS_INVRHY-01_2021-06-22	✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
053	53	LC_DCDS_INVRHY-02_2021-06-22	✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
054	54	LC_DCDS_INVRHY-03_2021-06-22	✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
	55				
	56				
	57				
	58				
	59				
	60				

Sample(s) Release	Maddy Stokes	Sample(s) Received By:	Gereine LaBrie
Signature:		Signature:	
Date Sent:	28-Jun-21	Date Received:	05 JUL 2021 (Project #: 2021-234)
Sample(s) Returned to Client By:		Shipping Conditions:	29 JUN 2021 date received in lab DJ
		Shipping Container:	
Signature:		Date Sent:	

Page 3 of 3

BENTHIC TISSUE CHEMISTRY

TrichAnalytics Laboratory Report 2021-192

TrichAnalytics Inc.

Tissue Microchemistry Analysis Report

Client:	Dave Hasek Aquatic Scientist Minnow Environmental	**Date Received:**	18 Mar 2021
		Date of Analysis:	23 Mar 2021
		Final Report Date:	24 Mar 2021
Phone:	(778) 677-3500	**Project No.:**	2021-192
Email:	dhasek@minnow.ca	**Method No.:**	MET-002.05

Client Project: Teck Coal/Minnow Environmental 20-24 (Dry Creek LAEMP)

Analytical Request: Benthic Invertebrate Tissue Microchemistry (total metals and moisture) – 21 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 101 - 109%).
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

24 Mar 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	LC_FRUS_INV-01_2021-03-16	LC_FRUS_INV-02_2021-03-16	LC_FRUS_INV-03_2021-03-16	LC_FRB_INV-01_2021-03-15	LC_FRB_INV-02_2021-03-15
		Lab ID	041	042	043	044	045
		Wet Weight (g)	0.7112	1.1136	1.3977	0.9143	0.9922
		Dry Weight (g)	0.2046	0.2790	0.3486	0.2700	0.2704
		Moisture (%)	71.2	74.9	75.1	70.5	72.7
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.006	0.020	0.381	0.366	0.485	0.467	0.700
11B	0.111	0.370	0.633	0.437	0.645	0.529	1.3
23Na	1.7	5.7	1,917	1,959	2,611	2,113	3,370
24Mg	0.021	0.070	1,014	1,005	1,533	1,177	1,620
27Al	0.031	0.103	251	156	312	196	540
31P	57	190	7,790	8,674	10,168	7,379	12,160
39K	0.873	2.9	5,648	5,838	8,394	6,636	9,875
44Ca	4.1	14	1,316	1,200	1,801	1,193	1,882
49Ti	0.145	0.483	14	9.1	24	15	47
51V	0.049	0.163	0.648	0.407	0.861	0.429	1.3
52Cr	0.147	0.490	3.4	3.1	3.7	2.5	3.5
55Mn	0.011	0.037	48	38	46	47	56
57Fe	0.768	2.6	271	289	324	232	470
59Co	0.002	0.007	0.343	0.390	0.435	0.535	0.763
60Ni	0.001	0.003	5.5	4.5	5.7	3.6	6.1
63Cu	0.006	0.020	13	15	15	13	19
66Zn	0.477	1.6	144	192	178	190	237
75As	0.467	1.6	<0.467	<0.467	<0.467	<0.467	<0.467
77Se	0.287	0.957	6.6	5.5	6.5	8.4	8.7
88Sr	0.001	0.003	2.2	1.8	2.5	2.0	3.3
95Mo	0.001	0.003	0.255	0.191	0.191	0.531	0.413
107Ag	0.001	0.003	0.089	0.082	0.089	0.062	0.137
111Cd	0.074	0.247	0.349	0.489	0.489	0.839	1.2
118Sn	0.027	0.090	0.090	0.087	0.089	0.072	0.183
121Sb	0.005	0.017	0.015	0.023	0.027	0.051	0.043
137Ba	0.001	0.003	29	21	35	33	41
202Hg	0.035	0.117	<0.035	<0.035	<0.035	<0.035	<0.035
205Tl	0.001	0.003	0.009	0.007	0.013	0.010	0.013
208Pb	0.005	0.017	0.097	0.090	0.157	0.097	0.211
238U	0.001	0.003	0.023	0.028	0.042	0.024	0.058

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			LC_FRB_INV-03_2021-03-15	LC_DC3_INV-01_2021-03-08	LC_DC3_INV-02_2021-03-08	LC_DC3_INV-03_2021-03-08	LC_DC4_INV-01_2021-03-09
Lab ID			046	047	048	049	050
Wet Weight (g)			1.5141	0.7204	1.1592	0.5557	0.8607
Dry Weight (g)			0.4408	0.1756	0.3145	0.1310	0.1990
Moisture (%)			70.9	75.6	72.9	76.4	76.9
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.006	0.020	0.605	0.465	0.390	0.885	0.474
11B	0.111	0.370	0.803	1.3	0.827	2.4	1.3
23Na	1.7	5.7	3,578	3,120	2,982	2,289	3,807
24Mg	0.021	0.070	1,445	1,486	1,653	1,526	1,665
27Al	0.031	0.103	392	821	690	1,106	466
31P	57	190	11,473	10,613	11,097	8,093	12,835
39K	0.873	2.9	10,317	9,177	7,847	7,048	11,534
44Ca	4.1	14	1,753	1,989	2,075	2,279	2,540
49Ti	0.145	0.483	32	79	50	110	33
51V	0.049	0.163	0.837	2.7	1.8	5.5	2.7
52Cr	0.147	0.490	2.6	5.1	4.0	14	10
55Mn	0.011	0.037	56	33	32	33	18
57Fe	0.768	2.6	354	473	364	504	1,026
59Co	0.002	0.007	0.549	1.7	1.8	2.1	0.860
60Ni	0.001	0.003	3.5	19	15	35	27
63Cu	0.006	0.020	18	13	14	14	16
66Zn	0.477	1.6	231	210	214	191	251
75As	0.467	1.6	<0.467	<0.467	<0.467	<0.467	0.956
77Se	0.287	0.957	6.9	6.1	5.4	7.6	6.1
88Sr	0.001	0.003	2.5	3.7	4.4	6.3	5.0
95Mo	0.001	0.003	0.315	0.239	0.261	0.740	0.297
107Ag	0.001	0.003	0.089	0.089	0.082	0.107	0.103
111Cd	0.074	0.247	0.764	0.545	0.618	1.0	1.3
118Sn	0.027	0.090	0.314	0.164	0.063	0.398	0.123
121Sb	0.005	0.017	0.034	0.074	0.052	0.114	0.071
137Ba	0.001	0.003	30	68	60	90	154
202Hg	0.035	0.117	<0.035	<0.035	0.041	<0.035	<0.035
205Tl	0.001	0.003	0.011	0.028	0.026	0.046	0.023
208Pb	0.005	0.017	0.155	0.297	0.193	0.213	0.223
238U	0.001	0.003	0.047	0.068	0.055	0.176	0.055

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	LC_DC4_INV-02_2021-03-09	LC_DC4_INV-03_2021-03-09	LC_DCDS_INV-01_2021-03-09	LC_DCDS_INV-02_2021-03-09	LC_DCDS_INV-03_2021-03-09
		Lab ID	051	052	053	054	055
		Wet Weight (g)	1.2579	1.7771	1.5431	1.2786	1.1379
		Dry Weight (g)	0.2390	0.3951	0.3002	0.2612	0.2227
		Moisture (%)	81.0	77.8	80.5	79.6	80.4
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.006	0.020	0.483	0.333	0.823	0.700	0.825
11B	0.111	0.370	0.898	0.599	2.3	1.6	2.2
23Na	1.7	5.7	3,982	2,841	3,109	3,354	3,804
24Mg	0.021	0.070	1,333	1,418	1,063	936	1,167
27Al	0.031	0.103	421	146	1,641	1,143	1,625
31P	57	190	11,737	9,177	9,199	9,767	9,434
39K	0.873	2.9	10,039	7,992	6,548	7,099	8,789
44Ca	4.1	14	1,978	1,678	1,606	1,107	1,585
49Ti	0.145	0.483	35	9.4	155	82	148
51V	0.049	0.163	2.1	0.807	5.4	3.1	4.1
52Cr	0.147	0.490	4.0	2.3	3.6	5.7	6.2
55Mn	0.011	0.037	15	10	117	87	127
57Fe	0.768	2.6	1,033	450	619	600	766
59Co	0.002	0.007	0.439	0.294	6.0	4.7	6.7
60Ni	0.001	0.003	10	5.9	39	35	42
63Cu	0.006	0.020	14	14	12	10	12
66Zn	0.477	1.6	208	178	188	189	206
75As	0.467	1.6	0.737	0.538	0.538	<0.467	0.473
77Se	0.287	0.957	7.6	7.0	22	18	20
88Sr	0.001	0.003	3.0	1.6	3.8	2.7	4.0
95Mo	0.001	0.003	0.340	0.308	0.509	0.326	0.587
107Ag	0.001	0.003	0.100	0.082	0.096	0.076	0.082
111Cd	0.074	0.247	1.0	1.3	1.3	0.800	1.4
118Sn	0.027	0.090	0.118	0.056	0.115	0.078	0.147
121Sb	0.005	0.017	0.048	0.033	0.155	0.087	0.110
137Ba	0.001	0.003	126	75	151	125	144
202Hg	0.035	0.117	<0.035	0.036	0.084	0.059	0.059
205Tl	0.001	0.003	0.015	0.010	0.060	0.036	0.041
208Pb	0.005	0.017	0.188	0.075	0.413	0.338	0.404
238U	0.001	0.003	0.049	0.035	0.128	0.118	0.164

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	LC_DC1_INV-01_2021-03-10	LC_DC1_INV-02_2021-03-15	LC_DC1_INV-03_2021-03-15	LC_DCEF_INV-01_2021-03-08	LC_DCEF_INV-02_2021-03-08
		Lab ID	056	057	058	059	060
		Wet Weight (g)	1.0501	0.8080	1.2300	0.8017	0.7741
		Dry Weight (g)	0.2300	0.1943	0.3066	0.1562	0.1749
		Moisture (%)	78.1	76.0	75.1	80.5	77.4
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.006	0.020	0.295	0.307	0.320	0.403	0.352
11B	0.111	0.370	0.462	0.462	0.558	0.685	0.786
23Na	1.7	5.7	3,255	3,715	3,293	3,455	3,131
24Mg	0.021	0.070	811	1,238	767	1,365	1,661
27Al	0.031	0.103	56	153	172	204	223
31P	57	190	8,921	12,291	10,220	10,915	11,860
39K	0.873	2.9	8,176	9,371	7,675	9,240	9,659
44Ca	4.1	14	646	1,077	704	1,807	1,781
49Ti	0.145	0.483	3.2	6.9	9.2	14	23
51V	0.049	0.163	0.289	0.586	0.679	0.766	0.992
52Cr	0.147	0.490	1.8	2.2	2.0	2.4	2.4
55Mn	0.011	0.037	21	60	58	7.5	10
57Fe	0.768	2.6	144	268	321	146	161
59Co	0.002	0.007	0.198	0.351	0.453	0.158	0.269
60Ni	0.001	0.003	4.7	5.4	5.8	3.1	3.2
63Cu	0.006	0.020	14	11	13	17	20
66Zn	0.477	1.6	182	232	202	160	251
75As	0.467	1.6	<0.467	<0.467	<0.467	0.793	0.934
77Se	0.287	0.957	12	9.0	10	3.7	6.6
88Sr	0.001	0.003	0.782	1.7	1.4	1.9	2.2
95Mo	0.001	0.003	0.348	0.435	0.411	0.290	0.338
107Ag	0.001	0.003	0.076	0.069	0.076	0.055	0.091
111Cd	0.074	0.247	1.5	2.6	1.9	2.1	5.0
118Sn	0.027	0.090	<0.027	0.056	0.131	0.223	0.102
121Sb	0.005	0.017	0.024	0.025	0.030	0.040	0.066
137Ba	0.001	0.003	46	127	106	46	51
202Hg	0.035	0.117	0.047	<0.035	<0.035	<0.035	<0.035
205Tl	0.001	0.003	0.004	0.009	0.010	0.010	0.013
208Pb	0.005	0.017	0.035	0.072	0.079	0.064	0.073
238U	0.001	0.003	0.022	0.034	0.026	0.029	0.058

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	LC_DCEF_INV-03_2021-03-08
		Lab ID	061
		Wet Weight (g)	0.5858
		Dry Weight (g)	0.1180
		Moisture (%)	79.9
Parameter	DL (ppm)	LOQ (ppm)	(ppm)
7Li	0.006	0.020	0.547
11B	0.111	0.370	1.4
23Na	1.7	5.7	3,534
24Mg	0.021	0.070	1,636
27Al	0.031	0.103	552
31P	57	190	12,492
39K	0.873	2.9	10,020
44Ca	4.1	14	2,747
49Ti	0.145	0.483	29
51V	0.049	0.163	2.4
52Cr	0.147	0.490	5.1
55Mn	0.011	0.037	19
57Fe	0.768	2.6	388
59Co	0.002	0.007	0.460
60Ni	0.001	0.003	11
63Cu	0.006	0.020	22
66Zn	0.477	1.6	283
75As	0.467	1.6	1.5
77Se	0.287	0.957	6.6
88Sr	0.001	0.003	4.6
95Mo	0.001	0.003	0.338
107Ag	0.001	0.003	0.113
111Cd	0.074	0.247	5.0
118Sn	0.027	0.090	0.150
121Sb	0.005	0.017	0.099
137Ba	0.001	0.003	124
202Hg	0.035	0.117	0.041
205Tl	0.001	0.003	0.026
208Pb	0.005	0.017	0.158
238U	0.001	0.003	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 QA/QC Relative Percent Difference Results

Client ID		LC_FRB_INV-01_2021-03-15			LC_DC4_INV-03_2021-03-09			LC_DCEF_INV-01_2021-03-08		
Lab ID		044			052			059		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.006	0.467	0.414	12	0.333	0.379	13	0.403	0.421	4.4
11B	0.111	0.529	0.322	-	0.599	0.622	-	0.685	0.609	-
23Na	1.7	2,113	2,927	32	2,841	3,727	27	3,455	3,809	9.7
24Mg	0.021	1,177	1,152	2.1	1,418	1,126	23	1,365	1,521	11
27Al	0.031	196	150	27	146	215	38	204	170	18
31P	57	7,379	8,752	17	9,177	10,435	13	10,915	11,220	2.8
39K	0.873	6,636	9,522	36	7,992	8,264	3.3	9,240	10,514	13
44Ca	4.1	1,193	754	45	1,678	1,377	20	1,807	1,921	6.1
49Ti	0.145	15	13	14	9.4	14	39	14	14	0.0
51V	0.049	0.429	0.283	-	0.807	1.2	39	0.766	0.741	3.3
52Cr	0.147	2.5	2.1	17	2.3	2.0	14	2.4	2.6	8.0
55Mn	0.011	47	34	32	10	13	26	7.5	11	38
57Fe	0.768	232	157	39	450	634	34	146	153	4.7
59Co	0.002	0.535	0.358	40	0.294	0.373	24	0.158	0.214	30
60Ni	0.001	3.6	3.0	18	5.9	4.6	25	3.1	4.1	28
63Cu	0.006	13	13	0.0	14	13	7.4	17	25	38
66Zn	0.477	190	141	30	178	198	11	160	216	30
75As	0.467	<0.467	<0.467	-	0.538	0.607	-	0.793	0.858	-
77Se	0.287	8.4	7.4	13	7.0	7.4	5.6	3.7	4.8	26
88Sr	0.001	2.0	1.1	58	1.6	1.9	17	1.9	2.4	23
95Mo	0.001	0.531	0.371	36	0.308	0.276	11	0.290	0.266	8.6
107Ag	0.001	0.062	0.076	20	0.082	0.055	39	0.055	0.060	8.7
111Cd	0.074	0.839	0.507	-	1.3	1.1	17	2.1	3.7	**55**
118Sn	0.027	0.072	0.036	-	0.056	0.080	-	0.223	0.276	-
121Sb	0.005	0.051	0.044	-	0.033	0.034	-	0.040	0.039	-
137Ba	0.001	33	28	16	75	88	16	46	60	26
202Hg	0.035	<0.035	<0.035	-	0.036	<0.035	-	<0.035	<0.035	-
205Tl	0.001	0.010	0.007	-	0.010	0.012	-	0.010	0.009	-
208Pb	0.005	0.097	0.067	37	0.075	0.098	27	0.064	0.079	21
238U	0.001	0.024	0.016	40	0.035	0.037	5.6	0.029	0.036	22

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

Bold indicates DQO exceedance but result is accepted as it does not impact the reportable results

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	1.4	115	6.0	1.3	110	4.9
11B	0.111	4.5	5.0	111	1.1	4.9	109	2.4
23Na	1.7	14,000	15,332	110	3.8	15,751	112	6.2
24Mg	0.021	910	1,001	110	6.3	1,023	112	2.2
27Al	0.031	197.2	196	99	3.7	196	99	3.0
31P	57	8,000	8,410	105	6.7	8,741	109	3.5
39K	0.873	15,500	16,431	106	6.7	16,813	108	7.0
44Ca	4.1	2,360	2,547	108	5.6	2,550	108	2.6
49Ti	0.145	12.24	13	109	8.5	13	108	14
51V	0.049	1.57	1.7	106	3.8	1.8	118	12
52Cr	0.147	1.87	1.9	104	1.8	2.1	113	7.1
55Mn	0.011	3.17	3.5	109	7.5	3.6	112	3.4
57Fe	0.768	343	387	113	8.0	405	118	5.3
59Co	0.002	0.25	0.280	112	5.8	0.274	110	5.3
60Ni	0.001	1.34	1.5	114	3.4	1.5	115	6.0
63Cu	0.006	15.7	17	111	5.5	18	117	6.2
66Zn	0.477	51.6	57	111	6.2	59	115	4.8
75As	0.467	6.87	7.3	106	5.2	7.3	106	6.2
77Se	0.287	3.45	3.8	109	5.7	3.5	102	4.0
88Sr	0.001	10.1	11	109	7.2	11	112	5.5
95Mo	0.001	0.29	0.280	97	9.9	0.311	107	5.9
107Ag	0.001	0.0252	0.027	109	18	0.026	101	12
111Cd	0.074	0.299	0.376	126	6.5	0.359	120	14
118Sn	0.027	0.061	0.080	132	17	0.060	98	13
121Sb	0.005	0.011	0.015	134	13	0.009	79	9.0
137Ba	0.001	8.6	8.9	104	2.2	9.1	106	9.0
202Hg	0.035	0.412	0.450	109	5.9	0.442	107	10
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.005	0.404	0.455	113	17	0.514	127	16
238U	0.001	0.05	0.056	112	6.7	0.060	120	9.8

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

Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.006	1.21	1.5	120	5.1
11B	0.111	4.5	5.2	116	3.8
23Na	1.7	14,000	15,751	112	3.4
24Mg	0.021	910	1,041	114	5.0
27Al	0.031	197.2	201	102	6.5
31P	57	8,000	8,545	107	4.5
39K	0.873	15,500	16,762	108	7.0
44Ca	4.1	2,360	2,599	110	7.2
49Ti	0.145	12.24	14	112	7.4
51V	0.049	1.57	1.6	104	4.7
52Cr	0.147	1.87	2.0	108	4.7
55Mn	0.011	3.17	3.7	116	7.8
57Fe	0.768	343	388	113	8.6
59Co	0.002	0.25	0.282	113	5.8
60Ni	0.001	1.34	1.6	116	7.7
63Cu	0.006	15.7	17	111	7.9
66Zn	0.477	51.6	57	111	7.5
75As	0.467	6.87	7.1	103	7.4
77Se	0.287	3.45	3.5	101	5.8
88Sr	0.001	10.1	11	112	4.9
95Mo	0.001	0.29	0.329	113	8.4
107Ag	0.001	0.0252	0.026	102	16
111Cd	0.074	0.299	0.304	102	**25**
118Sn	0.027	0.061	0.056	92	19
121Sb	0.005	0.011	0.015	136	18
137Ba	0.001	8.6	9.6	112	3.5
202Hg	0.035	0.412	0.490	119	9.7
205Tl	0.001	0.0013	-	-	-
208Pb	0.005	0.404	0.428	106	11
238U	0.001	0.05	0.054	108	9.7

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 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	LC_FRUS_INV-01_2021-03-16	041	23 Mar 2021
	LC_FRUS_INV-02_2021-03-16	042	
	LC_FRUS_INV-03_2021-03-16	043	
	LC_FRB_INV-01_2021-03-15	044	
	LC_DC4_INV-01_2021-03-09	050	
	LC_DC4_INV-02_2021-03-09	051	
	LC_DC4_INV-03_2021-03-09	052	
	LC_DCDS_INV-01_2021-03-09	053	
02	LC_FRB_INV-02_2021-03-15	045	23 Mar 2021
	LC_FRB_INV-03_2021-03-15	046	
	LC_DC3_INV-01_2021-03-08	047	
	LC_DC3_INV-02_2021-03-08	048	
	LC_DC3_INV-03_2021-03-08	049	
	LC_DCDS_INV-02_2021-03-09	054	
	LC_DCDS_INV-03_2021-03-09	055	
	LC_DC1_INV-01_2021-03-10	056	
	LC_DC1_INV-02_2021-03-15	057	
03	LC_DC1_INV-03_2021-03-15	058	23 Mar 2021
	LC_DCEF_INV-01_2021-03-08	059	
	LC_DCEF_INV-02_2021-03-08	060	
	LC_DCEF_INV-03_2021-03-08	061	

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: 20-24 (Teck Dry Creek LAEMP)

Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
Address:	PO Box 1777	Address:	204-1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

Trich Sample ID:		Sample Identification:	Sample Type:	
			Species	Sample type
041	1	LC_FRUS_INV-01_2021-03-16	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
042	2	LC_FRUS_INV-02_2021-03-16	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
043	3	LC_FRUS_INV-03_2021-03-16	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
044	4	LC_FRB_INV-01_2021-03-15	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
045	5	LC_FRB_INV-02_2021-03-15	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
046	6	LC_FRB_INV-03_2021-03-15	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
047	7	LC_DC3_INV-01_2021-03-08	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
048	8	LC_DC3_INV-02_2021-03-08	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
049	9	LC_DC3_INV-03_2021-03-08	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
050	10	LC_DC4_INV-01_2021-03-09	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
051	11	LC_DC4_INV-02_2021-03-09	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
052	12	LC_DC4_INV-03_2021-03-09	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
053	13	LC_DCDS_INV-01_2021-03-09	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
054	14	LC_DCDS_INV-02_2021-03-09	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
055	15	LC_DCDS_INV-03_2021-03-09	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
056	16	LC_DC1_INV-01_2021-03-10	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
057	17	LC_DC1_INV-02_2021-03-15	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
058	18	LC_DC1_INV-03_2021-03-15	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
059	19	LC_DCEF_INV-01_2021-03-08	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
060	20	LC_DCEF_INV-02_2021-03-08	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis

Sample(s) Release	Maddy Stokes	Sample(s) Received By:	Genene LaBine
Signature:		Signature:	
Date Sent:	17-Mar-21	Date Received:	18 Mar 2021 (Project # 2021-192)
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: 20-24 (Teck Dry Creek)

Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
Address:	PO Box 1777	Address:	204-1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

Trich Sample ID:	Sample Identification:	Sample Type: Species	Sample Type: Sample type
061	1 LC_DCEF_INV-03_2021-03-08	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis

Sample(s) Released By: Maddy Stokes	Sample(s) Received By: Generie LaBine
Signature:	Signature:
Date Sent: 17-MAR-21	Date Received: 18 Mar 2021 (Project #: 2021-192)
Sample(s) Returned to Client By:	Shipping Conditions:
	Shipping Container:
Signature:	Date Sent:

BENTHIC TISSUE CHEMISTRY

TrichAnalytics Laboratory Report 2021-215

TrichAnalytics Inc.

Tissue Microchemistry Analysis Report

Client:	Dave Hasek Aquatic Scientist Minnow Environmental	**Date Received:**	11 May 2021
		Date of Analysis:	13 May 2021 14 May 2021 17 May 2021
Phone:	(778) 677-3500		
Email:	dhasek@minnow.ca	**Final Report Date:**	18 May 2021
		Project No.:	2021-215
		Method No.:	MET-002.05

Client Project: Teck Coal/Minnow Environmental 21-35 (Dry Creek LAEMP)

Analytical Request: Benthic Invertebrate Tissue Microchemistry (total metals and moisture) – 57 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 106%, range 101 - 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

18 May 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	LC_DC4_INV-01_2021-05-05	LC_DC4_INV-02_2021-05-05	LC_DC4_INV-03_2021-05-05	LC_DC4_INV-04_2021-05-05	LC_DC4_INV-05_2021-05-05
		Lab ID	020	021	022	023	024
		Wet Weight (g)	1.3663	1.2284	0.8135	1.1012	0.9088
		Dry Weight (g)	0.2740	0.2694	0.1324	0.2345	0.2043
		Moisture (%)	79.9	78.1	83.7	78.7	77.5
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.005	0.017	0.652	0.950	0.856	0.773	0.660
11B	0.081	0.270	1.3	1.6	1.8	1.7	1.3
23Na	1.7	5.7	2,964	4,438	3,122	2,980	3,033
24Mg	0.027	0.090	1,555	1,885	1,391	1,237	1,493
27Al	0.044	0.147	904	1,194	1,224	1,108	951
31P	56	187	10,034	11,407	10,195	10,102	9,517
39K	2.2	7.3	10,030	12,094	10,680	11,199	10,559
44Ca	12	40	2,385	2,962	2,858	1,805	2,944
49Ti	0.218	0.727	75	87	98	91	69
51V	0.053	0.177	3.6	3.6	5.2	3.9	2.9
52Cr	0.337	1.1	10	17	13	10	15
55Mn	0.010	0.033	52	44	56	55	45
57Fe	1.2	4.0	699	897	1,661	1,110	799
59Co	0.006	0.020	1.2	1.5	1.1	1.5	1.4
60Ni	0.019	0.063	23	42	32	28	35
63Cu	0.018	0.060	16	18	17	17	16
66Zn	0.437	1.5	229	252	193	233	223
75As	0.536	1.8	1.2	1.3	1.7	1.6	1.5
77Se	0.309	1.0	7.3	7.2	7.6	9.2	5.9
88Sr	0.001	0.003	4.4	5.0	5.9	3.9	4.4
95Mo	0.001	0.003	0.480	0.390	0.660	0.720	0.450
107Ag	0.001	0.003	0.101	0.143	0.118	0.118	0.109
111Cd	0.081	0.270	1.2	1.3	1.1	1.3	1.4
118Sn	0.040	0.133	0.371	0.240	0.568	0.295	0.393
121Sb	0.008	0.027	0.077	0.099	0.132	0.110	0.072
137Ba	0.001	0.003	131	128	214	168	106
202Hg	0.044	0.147	<0.044	<0.044	<0.044	<0.044	<0.044
205Tl	0.001	0.003	0.032	0.031	0.031	0.032	0.030
208Pb	0.007	0.023	0.290	0.344	0.468	0.433	0.249
238U	0.001	0.003	0.068	0.077	0.102	0.096	0.056

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	LC_DCEF_INV-01_2021-05-04	LC_DCEF_INV-02_2021-05-04	LC_DCEF_INV-03_2021-05-04	LC_DCEF_INV-04_2021-05-04	LC_DCEF_INV-05_2021-05-04
		Lab ID	025	026	027	028	029
		Wet Weight (g)	0.3015	0.7915	0.5262	0.6108	0.2553
		Dry Weight (g)	0.0632	0.1781	0.1391	0.1192	0.0643
		Moisture (%)	79.0	77.5	73.6	80.5	74.8
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.005	0.017	0.467	0.263	0.376	0.405	0.364
11B	0.081	0.270	1.1	0.628	0.599	0.884	1.2
23Na	1.7	5.7	3,121	2,616	2,735	3,747	2,739
24Mg	0.027	0.090	1,287	1,211	1,514	1,967	1,301
27Al	0.044	0.147	348	161	125	203	518
31P	56	187	9,087	8,686	9,914	12,479	9,636
39K	2.2	7.3	10,135	9,465	9,590	11,928	9,953
44Ca	12	40	1,953	1,479	2,842	3,156	2,223
49Ti	0.218	0.727	25	6.4	5.6	16	38
51V	0.053	0.177	1.6	0.755	0.556	1.0	2.0
52Cr	0.337	1.1	12	6.0	6.6	8.7	15
55Mn	0.010	0.033	21	15	16	18	19
57Fe	1.2	4.0	517	201	242	331	679
59Co	0.006	0.020	0.505	0.398	0.702	0.608	1.1
60Ni	0.019	0.063	24	10	11	16	36
63Cu	0.018	0.060	22	19	24	30	22
66Zn	0.437	1.5	243	291	319	309	274
75As	0.536	1.8	1.4	0.741	0.861	1.4	2.1
77Se	0.309	1.0	6.5	5.9	4.9	5.7	4.9
88Sr	0.001	0.003	2.5	2.0	3.7	4.0	3.4
95Mo	0.001	0.003	0.570	0.210	0.330	0.360	0.589
107Ag	0.001	0.003	0.101	0.076	0.101	0.126	0.076
111Cd	0.081	0.270	6.0	5.7	5.3	5.5	6.8
118Sn	0.040	0.133	0.251	0.459	0.153	0.546	0.326
121Sb	0.008	0.027	0.055	0.033	0.033	0.044	0.055
137Ba	0.001	0.003	138	85	88	105	85
202Hg	0.044	0.147	<0.044	0.062	<0.044	<0.044	<0.044
205Tl	0.001	0.003	0.016	0.008	0.005	0.012	0.020
208Pb	0.007	0.023	0.104	0.048	0.037	0.052	0.132
238U	0.001	0.003	0.057	0.023	0.016	0.028	0.039

Notes:

ppm = parts per million
DL = detection limit
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g = grams
% = percent

Teck Coal Limited
Tissue Analysis Results

Client ID			LC_DCDS_INV-01_2021-05-04	LC_DCDS_INV-02_2021-05-04	LC_DCDS_INV-03_2021-05-04	LC_DCDS_INV-04_2021-05-04	LC_DCDS_INV-05_2021-05-04
Lab ID			030	031	032	033	034
Wet Weight (g)			0.8029	0.6421	0.8438	0.1970	0.6402
Dry Weight (g)			0.1677	0.1321	0.1849	0.0396	0.1721
Moisture (%)			79.1	79.4	78.1	79.9	73.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.005	0.017	2.4	1.0	1.7	2.3	3.2
11B	0.081	0.270	5.4	2.1	5.1	5.4	7.7
23Na	1.7	5.7	3,497	3,733	3,759	4,958	2,511
24Mg	0.027	0.090	1,918	1,820	1,178	1,409	1,291
27Al	0.044	0.147	5,922	2,049	3,843	4,830	7,827
31P	56	187	10,542	12,015	10,590	12,517	8,524
39K	2.2	7.3	12,092	10,995	11,353	12,415	9,651
44Ca	12	40	4,186	3,782	2,197	2,869	2,694
49Ti	0.218	0.727	567	188	372	392	779
51V	0.053	0.177	16	5.0	12	12	22
52Cr	0.337	1.1	42	18	20	43	132
55Mn	0.010	0.033	368	100	500	647	616
57Fe	1.2	4.0	3,281	1,159	2,140	2,553	4,341
59Co	0.006	0.020	12.4	5.4	14	21	24
60Ni	0.019	0.063	115	56	80	139	289
63Cu	0.018	0.060	16	20	15	16	16
66Zn	0.437	1.5	219	220	218	241	274
75As	0.536	1.8	2.4	1.3	1.8	1.0	2.2
77Se	0.309	1.0	12	8.9	22	26	22
88Sr	0.001	0.003	13.4	7.1	9.7	10	13
95Mo	0.001	0.003	0.910	0.428	1.0	1.5	1.2
107Ag	0.001	0.003	0.158	0.151	0.141	0.131	0.151
111Cd	0.081	0.270	1.3	0.748	1.4	1.4	2.6
118Sn	0.040	0.133	0.326	0.283	0.218	0.272	0.207
121Sb	0.008	0.027	0.473	0.187	0.363	0.462	0.539
137Ba	0.001	0.003	421	171	321	435	434
202Hg	0.044	0.147	0.057	<0.044	0.068	0.091	0.068
205Tl	0.001	0.003	0.137	0.068	0.112	0.131	0.183
208Pb	0.007	0.023	1.7	0.528	1.5	1.4	2.3
238U	0.001	0.003	0.297	0.133	0.282	0.288	0.314

Notes:

ppm = parts per million

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g = grams

% = percent

Tissue Analysis Results

		Client ID	LC_GRCK_INV-01_2021-05-07	LC_GRCK_INV-02_2021-05-07	LC_GRCK_INV-03_2021-05-07	LC_GRCK_INV-04_2021-05-07	LC_GRCK_INV-05_2021-05-07
		Lab ID	**035**	**036**	**037**	**038**	**039**
		Wet Weight (g)	0.5804	0.5274	0.8139	0.2054	0.2518
		Dry Weight (g)	0.1366	0.1259	0.2120	0.0457	0.0528
		Moisture (%)	76.5	76.1	74.0	77.8	79.0
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.005	0.017	0.691	0.375	0.549	1.5	1.2
11B	0.081	0.270	2.8	2.0	3.1	7.6	4.8
23Na	1.7	5.7	3,311	2,920	3,256	3,578	3,903
24Mg	0.027	0.090	2,030	1,808	2,202	2,311	2,155
27Al	0.044	0.147	1,477	799	1,215	3,638	2,842
31P	56	187	12,494	10,918	12,785	12,948	13,473
39K	2.2	7.3	11,716	10,531	12,091	13,410	14,397
44Ca	12	40	3,056	3,229	3,706	3,120	2,822
49Ti	0.218	0.727	103	49	98	274	197
51V	0.053	0.177	3.0	1.9	2.5	8.9	6.3
52Cr	0.337	1.1	15	13	8.3	54	39
55Mn	0.010	0.033	52	44	86	158	111
57Fe	1.2	4.0	1,071	702	735	2,534	2,269
59Co	0.006	0.020	1.5	1.1	0.676	3.5	3.1
60Ni	0.019	0.063	33	30	18	103	81
63Cu	0.018	0.060	27	22	27	23	21
66Zn	0.437	1.5	352	327	352	355	316
75As	0.536	1.8	0.649	0.586	<0.536	2.0	1.4
77Se	0.309	1.0	5.7	4.8	5.3	10	8.6
88Sr	0.001	0.003	12	11	15	19	15
95Mo	0.001	0.003	0.504	0.479	0.694	1.1	1.0
107Ag	0.001	0.003	0.136	0.129	0.151	0.098	0.129
111Cd	0.081	0.270	1.8	1.4	1.9	4.4	3.0
118Sn	0.040	0.133	0.313	0.199	0.209	0.358	0.621
121Sb	0.008	0.027	0.033	0.020	0.040	0.046	0.053
137Ba	0.001	0.003	54	43	71	183	187
202Hg	0.044	0.147	0.046	0.058	<0.044	0.069	0.058
205Tl	0.001	0.003	0.047	0.030	0.035	0.084	0.071
208Pb	0.007	0.023	0.337	0.200	0.303	0.849	0.649
238U	0.001	0.003	0.072	0.051	0.159	0.176	0.141

Notes:

ppm = parts per million

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Teck Coal Limited
Tissue Analysis Results

		Client ID	LC_FRB_INV-01_2021-05-06	LC_FRB_INV-02_2021-05-06	LC_FRB_INV-03_2021-05-06	LC_FRB_INV-04_2021-05-06	LC_FRB_INV-05_2021-05-06
		Lab ID	040	041	042	043	044
		Wet Weight (g)	0.4519	0.7623	0.6370	0.6988	0.5348
		Dry Weight (g)	0.1208	0.2008	0.1670	0.1797	0.1310
		Moisture (%)	73.3	73.7	73.8	74.3	75.5
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.005	0.017	1.2	0.857	0.731	0.888	1.2
11B	0.081	0.270	2.5	1.9	1.5	1.8	2.3
23Na	1.7	5.7	2,463	2,758	2,778	2,976	3,453
24Mg	0.027	0.090	2,324	1,709	1,686	2,197	2,366
27Al	0.044	0.147	2,060	1,356	1,022	1,381	1,896
31P	56	187	12,829	9,322	9,938	11,217	14,697
39K	2.2	7.3	10,250	9,414	9,783	10,444	12,884
44Ca	12	40	4,580	2,954	2,652	4,161	2,889
49Ti	0.218	0.727	160	94	83	105	176
51V	0.053	0.177	5.3	3.4	3.6	3.7	4.3
52Cr	0.337	1.1	33	28	32	38	18
55Mn	0.010	0.033	38	38	39	31	39
57Fe	1.2	4.0	1,650	1,329	1,185	1,373	1,353
59Co	0.006	0.020	2.3	0.970	2.3	2.5	1.0
60Ni	0.019	0.063	72	65	68	80	47
63Cu	0.018	0.060	22	20	19	24	27
66Zn	0.437	1.5	284	261	263	262	305
75As	0.536	1.8	0.669	0.648	<0.536	<0.536	0.592
77Se	0.309	1.0	6.3	5.7	6.6	5.0	10
88Sr	0.001	0.003	8.7	5.5	5.4	6.6	5.9
95Mo	0.001	0.003	0.429	0.706	0.303	0.328	0.665
107Ag	0.001	0.003	0.197	0.166	0.129	0.178	0.209
111Cd	0.081	0.270	1.7	1.5	2.2	0.844	1.9
118Sn	0.040	0.133	0.308	0.139	0.179	0.273	0.366
121Sb	0.008	0.027	0.053	0.046	0.026	0.040	0.074
137Ba	0.001	0.003	72	53	51	52	61
202Hg	0.044	0.147	<0.044	<0.044	<0.044	<0.044	0.045
205Tl	0.001	0.003	0.040	0.028	0.027	0.027	0.053
208Pb	0.007	0.023	0.483	0.339	0.257	0.323	0.468
238U	0.001	0.003	0.089	0.053	0.044	0.053	0.087

Notes:

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Teck Coal Limited
Tissue Analysis Results

		Client ID	LC_FRUS_INV-01_2021-05-07	LC_FRUS_INV-02_2021-05-07	LC_FRUS_INV-03_2021-05-07	LC_FRUS_INV-04_2021-05-07	LC_FRUS_INV-05_2021-05-07
		Lab ID	045	046	047	048	049
		Wet Weight (g)	0.4590	0.4599	0.4632	0.4651	0.2729
		Dry Weight (g)	0.1013	0.1347	0.1177	0.1288	0.0622
		Moisture (%)	77.9	70.7	74.6	72.3	77.2
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.005	0.017	1.6	2.0	1.4	2.3	0.900
11B	0.081	0.270	4.1	4.2	2.1	5.4	1.7
23Na	1.7	5.7	3,783	2,955	4,068	3,981	3,309
24Mg	0.027	0.090	1,697	1,998	1,536	2,950	2,052
27Al	0.044	0.147	2,402	3,542	1,844	4,405	1,125
31P	56	187	10,728	10,942	12,002	17,590	13,300
39K	2.2	7.3	12,125	11,107	12,699	15,201	11,850
44Ca	12	40	2,663	4,768	3,039	6,035	2,795
49Ti	0.218	0.727	212	321	151	357	87
51V	0.053	0.177	6.2	8.1	4.6	9.3	3.9
52Cr	0.337	1.1	43	64	33	68	51
55Mn	0.010	0.033	41	56	40	90	52
57Fe	1.2	4.0	1,954	2,620	1,707	2,880	1,645
59Co	0.006	0.020	2.6	4.6	1.9	3.7	2.9
60Ni	0.019	0.063	97	146	78	151	114
63Cu	0.018	0.060	34	25	31	37	28
66Zn	0.437	1.5	270	319	294	510	436
75As	0.536	1.8	0.665	0.873	0.582	1.1	0.540
77Se	0.309	1.0	7.3	6.2	6.9	9.7	9.6
88Sr	0.001	0.003	5.9	9.5	5.8	13	6.7
95Mo	0.001	0.003	0.640	0.435	0.512	1.4	0.409
107Ag	0.001	0.003	0.227	0.187	0.223	0.266	0.223
111Cd	0.081	0.270	0.845	1.2	0.585	1.9	2.3
118Sn	0.040	0.133	0.366	0.215	0.189	0.435	0.454
121Sb	0.008	0.027	0.091	0.099	0.066	0.132	0.041
137Ba	0.001	0.003	64	97	50	132	63
202Hg	0.044	0.147	<0.044	<0.044	<0.044	0.045	<0.044
205Tl	0.001	0.003	0.059	0.076	0.047	0.098	0.044
208Pb	0.007	0.023	0.612	0.872	0.456	1.0	0.352
238U	0.001	0.003	0.089	0.123	0.082	0.180	0.063

Notes:

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Teck Coal Limited
Tissue Analysis Results

		Client ID	LC_DCDS_RHYA-01_2021-05-04	LC_DCDS_RHYA-02_2021-05-04	LC_DCDS_RHYA-03_2021-05-04	LC_DCDS_PLEC-01_2021-05-04	LC_DCDS_PLEC-02_2021-05-04
		Lab ID	050	051	052	053	054
		Wet Weight (g)	0.1553	0.0984	0.1502	0.1838	0.0875
		Dry Weight (g)	0.0439	0.0308	0.0466	0.0397	0.0191
		Moisture (%)	71.7	68.7	69.0	78.4	78.2
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.005	0.017	0.620	0.516	0.777	2.6	4.3
11B	0.081	0.270	1.2	1.1	2.0	5.4	9.3
23Na	1.7	5.7	3,757	2,891	2,493	4,115	3,084
24Mg	0.027	0.090	1,539	1,760	1,690	1,579	1,495
27Al	0.044	0.147	1,271	1,205	1,761	6,235	10,398
31P	56	187	13,052	11,326	12,400	11,644	8,897
39K	2.2	7.3	12,289	9,421	9,883	12,784	10,494
44Ca	12	40	1,187	1,783	2,213	3,550	3,395
49Ti	0.218	0.727	127	95	177	556	890
51V	0.053	0.177	3.5	3.9	5.7	15	28
52Cr	0.337	1.1	21	40	52	69	208
55Mn	0.010	0.033	110	191	262	267	300
57Fe	1.2	4.0	966	1,275	1,809	3,518	6,268
59Co	0.006	0.020	3.2	6.7	7.7	6.8	16
60Ni	0.019	0.063	55	94	113	154	356
63Cu	0.018	0.060	20	20	19	30	30
66Zn	0.437	1.5	341	486	457	218	154
75As	0.536	1.8	<0.536	<0.536	0.627	1.1	1.4
77Se	0.309	1.0	18	22	20	9.9	9.3
88Sr	0.001	0.003	4.7	7.1	7.8	12	17
95Mo	0.001	0.003	0.669	1.1	1.0	1.6	2.1
107Ag	0.001	0.003	0.158	0.158	0.189	0.197	0.173
111Cd	0.081	0.270	1.5	3.0	2.7	6.6	5.8
118Sn	0.040	0.133	0.333	0.130	0.130	0.391	0.626
121Sb	0.008	0.027	0.055	0.049	0.083	0.176	0.303
137Ba	0.001	0.003	183	224	268	283	387
202Hg	0.044	0.147	0.090	0.084	0.064	0.052	0.052
205Tl	0.001	0.003	0.080	0.044	0.091	0.215	0.268
208Pb	0.007	0.023	0.514	0.517	0.722	1.8	2.7
238U	0.001	0.003	0.071	0.070	0.111	0.320	0.430

Notes:

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Teck Coal Limited
Tissue Analysis Results

		Client ID	LC_DCDS_PLEC-03_2021-05-04	LC_DC3_RHYA-01_2021-05-03	LC_DC3_RHYA-02_2021-05-03	LC_DC3_RHYA-03_2021-05-03	LC_DC3_PLEC-01_2021-05-03
		Lab ID	055	056	057	058	059
		Wet Weight (g)	0.1047	0.4152	0.2912	0.4830	0.0535
		Dry Weight (g)	0.0243	0.0735	0.0487	0.0824	0.0077
		Moisture (%)	76.8	82.3	83.3	82.9	85.6
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.005	0.017	4.3	0.193	0.313	0.240	0.492
11B	0.081	0.270	9.1	0.331	0.849	0.435	0.734
23Na	1.7	5.7	4,824	4,125	4,287	1,935	1,890
24Mg	0.027	0.090	1,893	1,804	2,024	1,205	1,721
27Al	0.044	0.147	9,544	113	574	242	621
31P	56	187	13,074	11,266	12,728	8,291	10,755
39K	2.2	7.3	15,085	9,117	11,375	6,553	6,109
44Ca	12	40	3,803	1,110	1,817	957	2,774
49Ti	0.218	0.727	928	6.7	40	17	54
51V	0.053	0.177	27	0.565	1.8	0.719	2.4
52Cr	0.337	1.1	158	4.9	17	6.7	43
55Mn	0.010	0.033	352	46	51	33	30
57Fe	1.2	4.0	5,629	192	806	259	1214
59Co	0.006	0.020	15	1.7	1.9	0.941	3.1
60Ni	0.019	0.063	311	10	40	11	97
63Cu	0.018	0.060	30	18	20	11	24
66Zn	0.437	1.5	246	320	323	199	462
75As	0.536	1.8	1.6	<0.536	<0.536	<0.536	<0.536
77Se	0.309	1.0	11	9.6	11	7.7	7.7
88Sr	0.001	0.003	17	2.5	4.2	2.1	5.7
95Mo	0.001	0.003	1.3	0.223	0.558	0.220	0.739
107Ag	0.001	0.003	0.244	0.102	0.165	0.054	0.605
111Cd	0.081	0.270	6.7	1.0	1.3	0.597	0.672
118Sn	0.040	0.133	0.535	0.052	0.320	0.413	3.3
121Sb	0.008	0.027	0.259	0.041	0.039	0.028	0.066
137Ba	0.001	0.003	395	44	100	42	60
202Hg	0.044	0.147	0.103	0.052	0.064	<0.044	0.077
205Tl	0.001	0.003	0.338	0.024	0.040	0.024	0.064
208Pb	0.007	0.023	2.9	0.155	0.319	0.136	0.194
238U	0.001	0.003	0.415	0.029	0.090	0.022	0.081

Notes:

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% = percent

		Client ID	LC_DC3_PLEC-02_2021-05-03	LC_DC3_PLEC-03_2021-05-03	LC_DC1_INV-01_2021-05-05	LC_DC1_INV-02_2021-05-05	LC_DC1_INV-03_2021-05-05
		Lab ID	060	061	062	063	064
		Wet Weight (g)	0.0467	0.0551	0.5290	0.3876	0.7560
		Dry Weight (g)	0.0123	0.0148	0.1212	0.0710	0.1677
		Moisture (%)	73.7	73.1	77.1	81.7	77.8
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.005	0.017	0.766	0.802	0.444	1.1	0.860
11B	0.081	0.270	1.5	1.4	0.572	1.8	1.5
23Na	1.7	5.7	2,016	3,942	3,748	4,861	4,351
24Mg	0.027	0.090	1,544	1,836	1,163	1,553	1,138
27Al	0.044	0.147	1,894	1,602	611	1,841	1,261
31P	56	187	12,453	15,596	9,211	15,467	12,705
39K	2.2	7.3	8,335	12,480	9,211	15,853	12,797
44Ca	12	40	2,906	3,772	1,667	2,436	1,472
49Ti	0.218	0.727	139	101	45	151	98
51V	0.053	0.177	5.6	3.7	1.9	5.1	4.0
52Cr	0.337	1.1	70	40	14	19	15
55Mn	0.010	0.033	42	46	44	134	124
57Fe	1.2	4.0	2,266	1,529	587	1,537	1,128
59Co	0.006	0.020	5.7	2.8	1.5	2.1	2.1
60Ni	0.019	0.063	137	85	36	48	41
63Cu	0.018	0.060	20	21	17	19	17
66Zn	0.437	1.5	395	334	217	261	195
75As	0.536	1.8	<0.536	<0.536	0.639	1.2	1.2
77Se	0.309	1.0	9.2	9.9	12	14	13
88Sr	0.001	0.003	7.2	6.8	3.2	5.1	3.6
95Mo	0.001	0.003	0.417	1.0	0.252	0.788	0.567
107Ag	0.001	0.003	0.474	0.330	0.126	0.117	0.117
111Cd	0.081	0.270	0.810	1.0	6.5	6.0	2.6
118Sn	0.040	0.133	0.348	0.370	0.204	0.693	0.353
121Sb	0.008	0.027	0.057	0.061	0.044	0.121	0.110
137Ba	0.001	0.003	93	73	53	218	158
202Hg	0.044	0.147	0.079	0.064	<0.044	<0.044	<0.044
205Tl	0.001	0.003	0.098	0.125	0.021	0.065	0.045
208Pb	0.007	0.023	0.476	0.373	0.164	0.618	0.486
238U	0.001	0.003	0.148	0.108	0.026	0.102	0.084

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	LC_DC1_INV-04_2021-05-05	LC_DC1_INV-05_2021-05-05	LC_DC2_INV-01_2021-05-06	LC_DC2_INV-02_2021-05-06	LC_DC2_INV-03_2021-05-06
		Lab ID	**065**	**066**	**067**	**068**	**069**
		Wet Weight (g)	0.7049	0.3709	0.5072	1.1057	0.9519
		Dry Weight (g)	0.1739	0.0998	0.1058	0.2863	0.2195
		Moisture (%)	75.3	73.1	79.1	74.1	76.9
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.005	0.017	0.826	1.2	1.7	2.0	1.7
11B	0.081	0.270	1.1	2.2	3.4	4.8	3.4
23Na	1.7	5.7	4,405	4,358	5,487	5,253	4,309
24Mg	0.027	0.090	1,358	1,497	1,629	1,544	1,339
27Al	0.044	0.147	817	1,797	3,379	4,642	3,618
31P	56	187	14,067	14,015	14,598	15,950	11,800
39K	2.2	7.3	12,894	14,995	15,325	16,670	14,286
44Ca	12	40	1,793	2,455	1,898	2,183	1,964
49Ti	0.218	0.727	78	169	290	436	350
51V	0.053	0.177	2.7	5.5	11	12	9.4
52Cr	0.337	1.1	12	20	32	29	37
55Mn	0.010	0.033	107	144	174	341	212
57Fe	1.2	4.0	818	1,505	1,799	2,146	2,128
59Co	0.006	0.020	1.7	2.3	7.1	10	6.1
60Ni	0.019	0.063	28	51	89	90	105
63Cu	0.018	0.060	17	19	21	23	17
66Zn	0.437	1.5	247	251	283	238	200
75As	0.536	1.8	1.1	1.1	1.2	2.4	1.7
77Se	0.309	1.0	14	15	17	17	11
88Sr	0.001	0.003	3.2	6.1	6.6	9.9	7.8
95Mo	0.001	0.003	0.599	0.536	1.1	1.1	1.2
107Ag	0.001	0.003	0.126	0.126	0.180	0.230	0.144
111Cd	0.081	0.270	2.1	4.8	2.4	2.1	1.8
118Sn	0.040	0.133	0.136	0.245	0.462	0.279	0.387
121Sb	0.008	0.027	0.088	0.132	0.209	0.297	0.242
137Ba	0.001	0.003	151	200	262	288	261
202Hg	0.044	0.147	0.070	0.056	0.070	0.084	0.056
205Tl	0.001	0.003	0.038	0.067	0.107	0.138	0.097
208Pb	0.007	0.023	0.369	0.674	1.0	1.4	1.2
238U	0.001	0.003	0.067	0.104	0.222	0.237	0.217

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	LC_DC2_INV-04_2021-05-06	LC_DC2_INV-05_2021-05-06	LC_DC3_INV-01_2021-05-03	LC_DC3_INV-02_2021-05-03	LC_DC3_INV-03_2021-05-03
		Lab ID	070	071	072	073	074
		Wet Weight (g)	0.4499	0.5272	0.5103	0.9595	0.5594
		Dry Weight (g)	0.1144	0.1278	0.1018	0.1938	0.1283
		Moisture (%)	74.6	75.8	80.1	79.8	77.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.005	0.017	1.0	0.629	0.786	1.8	1.1
11B	0.081	0.270	2.4	1.6	1.6	3.6	1.5
23Na	1.7	5.7	3,368	4,472	4,627	4,771	4,923
24Mg	0.027	0.090	1,008	1,243	1,704	1,676	1,858
27Al	0.044	0.147	2,127	1,248	1,431	3,600	1,582
31P	56	187	10,031	12,796	14,353	13,886	14,643
39K	2.2	7.3	10,176	12,360	10,489	12,324	11,785
44Ca	12	40	1,529	1,183	3,580	3,608	3,609
49Ti	0.218	0.727	167	101	146	380	139
51V	0.053	0.177	5.8	3.8	4.1	11	4.6
52Cr	0.337	1.1	24	12	26	41	19
55Mn	0.010	0.033	135	186	49	74	47
57Fe	1.2	4.0	1,215	881	1,159	2,607	1,052
59Co	0.006	0.020	3.6	5.8	2.7	4.3	2.4
60Ni	0.019	0.063	64	40	56	106	54
63Cu	0.018	0.060	14	14	25	29	25
66Zn	0.437	1.5	220	268	207	190	304
75As	0.536	1.8	0.916	0.904	<0.536	0.771	<0.536
77Se	0.309	1.0	13	13	8.3	10	8.8
88Sr	0.001	0.003	4.2	3.2	7.1	9.3	6.7
95Mo	0.001	0.003	0.994	0.559	0.373	0.839	0.528
107Ag	0.001	0.003	0.151	0.162	0.265	0.292	0.248
111Cd	0.081	0.270	1.6	1.2	0.678	1.0	0.775
118Sn	0.040	0.133	0.179	0.275	0.192	0.501	0.179
121Sb	0.008	0.027	0.132	0.105	0.154	0.264	0.132
137Ba	0.001	0.003	186	230	85	161	86
202Hg	0.044	0.147	<0.044	0.079	0.053	<0.044	<0.044
205Tl	0.001	0.003	0.059	0.036	0.052	0.101	0.058
208Pb	0.007	0.023	0.736	0.539	0.518	1.2	0.518
238U	0.001	0.003	0.155	0.111	0.081	0.243	0.109

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	LC_DC3_INV-04_2021-05-03	LC_DC3_INV-05_2021-05-03
		Lab ID	075	076
		Wet Weight (g)	0.5189	0.7597
		Dry Weight (g)	0.1206	0.1977
		Moisture (%)	76.8	74.0
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)
7Li	0.005	0.017	0.836	0.806
11B	0.081	0.270	1.8	1.9
23Na	1.7	5.7	4,283	3,699
24Mg	0.027	0.090	1,899	1,507
27Al	0.044	0.147	1,774	1,786
31P	56	187	14,422	13,244
39K	2.2	7.3	10,448	10,601
44Ca	12	40	4,364	2,788
49Ti	0.218	0.727	192	145
51V	0.053	0.177	5.9	4.6
52Cr	0.337	1.1	26	11
55Mn	0.010	0.033	52	66
57Fe	1.2	4.0	1,482	946
59Co	0.006	0.020	3.3	2.1
60Ni	0.019	0.063	75	30
63Cu	0.018	0.060	20	24
66Zn	0.437	1.5	194	230
75As	0.536	1.8	<0.536	<0.536
77Se	0.309	1.0	7.7	10
88Sr	0.001	0.003	7.8	6.5
95Mo	0.001	0.003	0.342	0.653
107Ag	0.001	0.003	0.227	0.302
111Cd	0.081	0.270	0.678	1.2
118Sn	0.040	0.133	0.206	0.234
121Sb	0.008	0.027	0.143	0.165
137Ba	0.001	0.003	98	103
202Hg	0.044	0.147	0.066	<0.044
205Tl	0.001	0.003	0.055	0.057
208Pb	0.007	0.023	0.586	0.731
238U	0.001	0.003	0.126	0.134

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		LC_DC4_INV-05_2021-05-05			LC_DCDS_INV-05_2021-05-04			LC_GRCK_INV-01_2021-05-07		
Lab ID		024			034			035		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.005	0.660	0.816	21	3.2	3.2	0.0	0.691	0.722	4.4
11B	0.081	1.3	1.7	27	7.7	8.6	11	2.8	3.1	10
23Na	1.7	3,033	3,478	14	2,511	3,041	19	3,311	3,583	7.9
24Mg	0.027	1,493	1,765	17	1,291	1,498	15	2,030	2,299	12
27Al	0.044	951	1,151	19	7,827	9,104	15	1,477	1,448	2.0
31P	56	9,517	11,314	17	8,524	10,020	16	12,494	13,829	10
39K	2.2	10,559	11,984	13	9,651	11,486	17	11,716	12,698	8.0
44Ca	12	2,944	2,889	1.9	2,694	3,374	22	3,056	3,908	25
49Ti	0.218	69	101	38	779	858	9.7	103	108	4.7
51V	0.053	2.9	3.7	24	22	27	20	3.0	3.2	6.5
52Cr	0.337	15	15	0.0	132	152	14	15	15	0.0
55Mn	0.010	45	50	11	616	717	15	52	64	21
57Fe	1.2	799	904	12	4,341	5,470	23	1,071	1,086	1.4
59Co	0.006	1.4	1.7	19	24	28	15	1.5	1.5	0.0
60Ni	0.019	35	37	5.6	289	340	16	33	34	3.0
63Cu	0.018	16	19	17	16	17	6.1	27	28	3.6
66Zn	0.437	223	257	14	274	291	6.0	352	358	1.7
75As	0.536	1.5	1.6	-	2.2	2.2	-	0.649	0.732	-
77Se	0.309	5.9	6.6	11	22	23	4.4	5.7	6.9	19
88Sr	0.001	4.4	5.1	15	13	15	14	12	17	35
95Mo	0.001	0.450	0.510	13	1.2	1.3	8.0	0.504	0.580	14
107Ag	0.001	0.109	0.143	27	0.151	0.165	8.9	0.136	0.144	5.7
111Cd	0.081	1.4	2.0	35	2.6	2.9	11	1.8	2.0	11
118Sn	0.040	0.393	0.491	-	0.207	0.343	-	0.313	0.318	-
121Sb	0.008	0.072	0.088	-	0.539	0.715	28	0.033	0.033	-
137Ba	0.001	106	125	17	434	535	21	54	62	14
202Hg	0.044	<0.044	0.049	-	0.068	0.103	-	0.046	0.081	-
205Tl	0.001	0.030	0.037	21	0.183	0.233	24	0.047	0.053	12
208Pb	0.007	0.249	0.332	29	2.3	2.4	4.3	0.337	0.371	9.6
238U	0.001	0.056	0.065	15	0.314	0.472	40	0.072	0.077	6.7

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

Teck Coal Limited
Tissue QA/QC Relative Percent Difference Results

	Client ID	LC_DC3_RHYA-03_2021-05-03			LC_DC3_INV-02_2021-05-03			LC_DC3_INV-05_2021-05-03		
	Lab ID	058			073			076		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.005	0.240	0.249	3.7	1.8	1.6	12	0.806	0.629	25
11B	0.081	0.435	0.482	-	3.6	3.0	18	1.9	1.5	24
23Na	1.7	1,935	2,254	15	4,771	4,975	4.2	3,699	3,375	9.2
24Mg	0.027	1,205	1,450	19	1,676	1,540	8.5	1,507	1,425	5.6
27Al	0.044	242	259	6.8	3,600	2,998	18	1,786	1,366	27
31P	56	8,291	10,080	20	13,886	13,865	0.2	13,244	12,349	7.0
39K	2.2	6,553	7,651	16	12,324	12,489	1.3	10,601	10,213	3.7
44Ca	12	957	1,088	13	3,608	3,083	16	2,788	2,729	2.1
49Ti	0.218	17	16	6.1	380	304	22	145	106	31
51V	0.053	0.719	0.798	10	11	8.2	29	4.6	3.9	17
52Cr	0.337	6.7	7.0	4.4	41	40	2.5	11	13	17
55Mn	0.010	33	37	11	74	71	4.1	66	64	3.1
57Fe	1.2	259	255	1.6	2,607	2,031	25	946	830	13
59Co	0.006	0.941	1.1	16	4.3	3.7	15	2.1	2.0	4.9
60Ni	0.019	11	13	17	106	99	6.8	30	32	6.5
63Cu	0.018	11	15	31	29	23	23	24	20	18
66Zn	0.437	199	241	19	190	190	0.0	230	201	14
75As	0.536	<0.536	<0.536	-	0.771	0.554	-	<0.536	<0.536	-
77Se	0.309	7.7	8.7	12	10	10	0.0	10	10	0.0
88Sr	0.001	2.1	2.3	9.1	9.3	7.8	18	6.5	5.3	20
95Mo	0.001	0.220	0.220	0.0	0.839	0.746	12	0.653	0.684	4.6
107Ag	0.001	0.054	0.060	11	0.292	0.254	14	0.302	0.227	28
111Cd	0.081	0.597	0.682	-	1.0	1.1	9.5	1.2	0.968	21
118Sn	0.040	0.413	0.538	26	0.501	0.522	4.1	0.234	0.289	-
121Sb	0.008	0.028	0.028	-	0.264	0.209	23	0.165	0.143	14
137Ba	0.001	42	54	25	161	135	18	103	90	14
202Hg	0.044	<0.044	0.060	-	<0.044	0.053	-	<0.044	<0.044	-
205Tl	0.001	0.024	0.028	15	0.101	0.091	10	0.057	0.047	19
208Pb	0.007	0.136	0.159	16	1.2	1.0	18	0.731	0.529	32
238U	0.001	0.022	0.027	20	0.243	0.199	20	0.134	0.101	28

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	0.005	1.21	1.3	108	10	1.3	108	2.0
11B	0.081	4.5	5.8	128	3.4	4.6	102	2.8
23Na	1.7	14,000	15,415	110	4.4	15,097	108	2.6
24Mg	0.027	910	1,014	111	6.1	1,002	110	2.9
27Al	0.044	197.2	192	97	5.5	193	98	7.5
31P	56	8,000	8,561	107	3.3	8,406	105	1.1
39K	2.2	15,500	17,102	110	4.4	16,076	104	2.5
44Ca	12	2,360	2,641	112	3.2	2,579	109	3.5
49Ti	0.218	12.24	11	90	10	12	96	8.0
51V	0.053	1.57	1.8	115	11	1.7	109	8.8
52Cr	0.337	1.87	2.2	116	4.0	2.0	108	3.0
55Mn	0.010	3.17	3.7	118	6.2	3.6	115	2.1
57Fe	1.2	343	403	118	5.5	390	114	3.2
59Co	0.006	0.25	0.278	111	5.3	0.298	119	2.3
60Ni	0.019	1.34	1.5	112	3.5	1.5	112	3.2
63Cu	0.018	15.7	18	116	4.7	18	116	1.6
66Zn	0.437	51.6	59	114	5.3	56	109	2.1
75As	0.536	6.87	7.6	111	3.1	7.4	108	1.3
77Se	0.309	3.45	3.8	110	4.8	3.6	105	8.6
88Sr	0.001	10.1	11	111	3.1	11	113	2.7
95Mo	0.001	0.29	0.306	106	4.4	0.311	107	4.7
107Ag	0.001	0.0252	0.029	113	16	0.027	109	18
111Cd	0.081	0.299	0.303	101	10	0.304	102	11
118Sn	0.040	0.061	0.070	114	17	0.062	102	9.8
121Sb	0.008	0.011	0.011	100	0.0	0.011	100	0.0
137Ba	0.001	8.6	9.9	115	2.7	8.6	100	5.9
202Hg	0.044	0.412	0.452	110	7.6	0.450	109	3.8
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.007	0.404	0.459	114	14	0.410	102	7.7
238U	0.001	0.05	0.057	113	11	0.057	114	5.9

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	0.005	1.21	1.3	108	16	1.4	115	6.7
11B	0.081	4.5	5.2	116	0.8	5.0	111	2.8
23Na	1.7	14,000	15,773	113	6.0	15,801	113	5.2
24Mg	0.027	910	963	106	6.1	999	110	5.1
27Al	0.044	197.2	197	100	2.6	194	98	3.0
31P	56	8,000	8,859	111	3.5	8,711	109	4.0
39K	2.2	15,500	17,235	111	6.7	18,098	117	5.1
44Ca	12	2,360	2,623	111	6.9	2,650	112	4.5
49Ti	0.218	12.24	14	117	16	13	105	6.7
51V	0.053	1.57	1.8	117	6.6	1.7	110	9.9
52Cr	0.337	1.87	2.2	118	7.3	2.2	117	4.8
55Mn	0.010	3.17	3.6	114	8.7	3.7	117	4.5
57Fe	1.2	343	393	115	3.4	400	117	7.2
59Co	0.006	0.25	0.294	118	2.4	0.298	119	2.4
60Ni	0.019	1.34	1.7	124	2.6	1.6	122	6.7
63Cu	0.018	15.7	19	119	6.2	19	120	4.3
66Zn	0.437	51.6	62	120	6.0	60	116	6.3
75As	0.536	6.87	8.0	116	5.8	7.7	112	3.6
77Se	0.309	3.45	3.7	106	4.2	3.7	108	2.8
88Sr	0.001	10.1	11	113	6.5	12	114	6.3
95Mo	0.001	0.29	0.328	113	11	0.348	120	8.4
107Ag	0.001	0.0252	0.030	120	18	0.032	126	12
111Cd	0.081	0.299	0.345	116	13	0.359	120	15
118Sn	0.040	0.061	0.081	133	12	0.071	116	10
121Sb	0.008	0.011	0.013	117	0.0	0.013	120	**34**
137Ba	0.001	8.6	10	116	2.6	9.7	113	3.4
202Hg	0.044	0.412	0.457	111	16	0.496	120	9.5
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.007	0.404	0.465	115	11	0.460	114	8.1
238U	0.001	0.05	0.054	108	5.4	0.053	106	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.

Bold indicates DQO exceedance but result is accepted as it does not impact the reportable results

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	0.005	1.21	1.2	101	6.6	1.2	99	15
11B	0.081	4.5	5.1	113	1.4	4.3	96	4.2
23Na	1.7	14,000	14,357	103	3.2	13,376	96	10
24Mg	0.027	910	923	102	3.8	852	94	12
27Al	0.044	197.2	189	96	3.1	215	109	6.2
31P	56	8,000	7,966	100	3.4	7,577	95	9.2
39K	2.2	15,500	15,915	103	3.4	14,864	96	8.0
44Ca	12	2,360	2,399	102	7.1	2,289	97	12
49Ti	0.218	12.24	13	104	4.0	11	91	6.9
51V	0.053	1.57	1.5	97	6.5	1.6	101	12
52Cr	0.337	1.87	1.9	102	5.0	1.9	99	8.7
55Mn	0.010	3.17	3.2	101	4.9	3.1	99	11
57Fe	1.2	343	360	105	3.8	342	100	7.4
59Co	0.006	0.25	0.259	104	4.9	0.254	102	7.1
60Ni	0.019	1.34	1.3	101	6.5	1.0	75	14
63Cu	0.018	15.7	17	108	6.1	16	102	6.2
66Zn	0.437	51.6	54	104	6.2	52	101	4.4
75As	0.536	6.87	6.8	99	4.0	6.7	97	7.6
77Se	0.309	3.45	3.5	101	5.5	3.7	106	8.7
88Sr	0.001	10.1	10	101	3.4	9.7	96	13
95Mo	0.001	0.29	0.296	102	8.4	0.272	94	12
107Ag	0.001	0.0252	0.027	106	16	0.023	90	12
111Cd	0.081	0.299	0.359	120	12	0.343	115	8.3
118Sn	0.040	0.061	0.060	98	**26**	0.070	115	20
121Sb	0.008	0.011	0.011	100	0.0	0.014	127	**25**
137Ba	0.001	8.6	9.1	106	4.7	8.6	100	2.5
202Hg	0.044	0.412	0.447	108	4.7	0.418	102	12
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.007	0.404	0.362	90	14	0.398	98	**23**
238U	0.001	0.05	0.047	95	7.1	0.050	100	9.1

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.

Bold indicates DQO exceedance but result is accepted as it does not impact the reportable results

Tissue QA/QC Accuracy and Precision Results

Sample Group ID			07			08		
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.005	1.21	1.3	106	6.8	1.2	100	4.1
11B	0.081	4.5	4.5	101	1.1	4.9	109	2.9
23Na	1.7	14,000	15,856	113	4.4	14,866	106	2.9
24Mg	0.027	910	1,071	118	2.6	975	107	3.0
27Al	0.044	197.2	203	103	6.4	197	100	4.6
31P	56	8,000	8,797	110	1.9	8,312	104	4.2
39K	2.2	15,500	18,157	117	6.6	15,901	103	5.6
44Ca	12	2,360	2,728	116	5.9	2,553	108	2.9
49Ti	0.218	12.24	13	108	12	12	96	12
51V	0.053	1.57	1.9	120	16	1.8	115	12
52Cr	0.337	1.87	2.2	115	6.3	2.1	110	1.9
55Mn	0.010	3.17	3.7	117	3.6	3.6	114	5.3
57Fe	1.2	343	414	121	7.5	384	112	3.5
59Co	0.006	0.25	0.309	124	3.9	0.288	115	2.2
60Ni	0.019	1.34	1.7	125	8.4	1.4	104	2.6
63Cu	0.018	15.7	19	120	6.0	18	112	3.3
66Zn	0.437	51.6	59	115	6.7	55	106	2.2
75As	0.536	6.87	7.5	109	6.0	7.1	103	2.5
77Se	0.309	3.45	3.6	104	9.8	3.6	103	2.8
88Sr	0.001	10.1	12	122	6.7	11	108	2.5
95Mo	0.001	0.29	0.328	113	8.6	0.317	109	4.4
107Ag	0.001	0.0252	0.032	128	16	0.032	128	0.0
111Cd	0.081	0.299	0.374	125	8.0	0.324	108	7.7
118Sn	0.040	0.061	0.063	103	20	0.068	112	17
121Sb	0.008	0.011	0.011	100	0.0	0.011	100	0.0
137Ba	0.001	8.6	8.5	98	3.3	8.7	101	3.3
202Hg	0.044	0.412	0.464	113	9.2	0.477	116	9.6
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.007	0.404	0.497	123	17	0.444	110	17
238U	0.001	0.05	0.064	127	19	0.058	116	2.7

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 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: 09

Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.005	1.21	1.5	121	8.7
11B	0.081	4.5	4.3	96	3.6
23Na	1.7	14,000	17154	122	9.7
24Mg	0.027	910	1106	122	2.5
27Al	0.044	197.2	175	88	4.2
31P	56	8,000	9087	114	6.3
39K	2.2	15,500	18291	118	7.4
44Ca	12	2,360	2835	120	5.3
49Ti	0.218	12.24	12	96	5.5
51V	0.053	1.57	1.8	115	7.6
52Cr	0.337	1.87	2.2	118	8.4
55Mn	0.010	3.17	3.9	122	7.1
57Fe	1.2	343	412	120	7.4
59Co	0.006	0.25	0.314	126	6.5
60Ni	0.019	1.34	1.7	126	10
63Cu	0.018	15.7	20	126	8.3
66Zn	0.437	51.6	63	122	4.6
75As	0.536	6.87	8.1	118	9.8
77Se	0.309	3.45	3.7	107	10
88Sr	0.001	10.1	12	122	8.4
95Mo	0.001	0.29	0.348	120	10
107Ag	0.001	0.0252	0.031	123	16
111Cd	0.081	0.299	0.368	123	18
118Sn	0.040	0.061	0.080	131	13
121Sb	0.008	0.011	0.011	100	0
137Ba	0.001	8.6	8.8	102	4.8
202Hg	0.044	0.412	0.498	121	12
205Tl	0.001	0.0013	-	-	-
208Pb	0.007	0.404	0.513	127	14
238U	0.001	0.05	0.061	122	10

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	LC_DC4_INV-01_2021-05-05	020	13 May 2021
	LC_DC4_INV-02_2021-05-05	021	
	LC_DC4_INV-03_2021-05-05	022	
	LC_DC4_INV-04_2021-05-05	023	
	LC_DC4_INV-05_2021-05-05	024	
	LC_DCEF_INV-01_2021-05-04	025	
	LC_DCEF_INV-02_2021-05-04	026	
	LC_DCEF_INV-03_2021-05-04	027	
	LC_DCEF_INV-04_2021-05-04	028	
02	LC_DCEF_INV-05_2021-05-04	029	13 May 2021
	LC_DCDC_INV-01_2021-05-04	030	
	LC_DCDS_INV-02_2021-05-04	031	
	LC_DCDS_INV-03_2021-05-04	032	
	LC_DCDS_INV-04_2021-05-04	033	
	LC_DCDS_INV-05_2021-05-04	034	
03	LC_GRCK_INV-01_2021-05-07	035	14 May 2021
	LC_GRCK_INV-02_2021-05-07	036	
	LC_GRCK_INV-03_2021-05-07	037	
	LC_GRCK_INV-04_2021-05-07	038	
	LC_GRCK_INV-05_2021-05-07	039	
	LC_FRB_INV-01_2021-05-06	040	
	LC_FRB_INV-02_2021-05-06	041	
	LC_FRB_INV-03_2021-05-06	042	
	LC_FRB_INV-04_2021-05-06	043	
04	LC_FRB_INV-05_2021-05-06	044	14 May 2021
	LC_FRUS_INV-01_2021-05-07	045	
	LC_FRUS_INV-02_2021-05-07	046	
	LC_FRUS_INV-03_2021-05-07	047	
	LC_FRUS_INV-04_2021-05-07	048	
	LC_FRUS_INV-05_2021-05-07	049	
05	LC_DCDS_RHYA-01_2021-05-04	050	14 May 2021
	LC_DCDS_RHYA-02_2021-05-04	051	
	LC_DCDS_RHYA-03_2021-05-04	052	
	LC_DCDS_PLEC-01_2021-05-04	053	
	LC_DCDS_PLEC-02_2021-05-04	054	
	LC_DCDS_PLEC-03_2021-05-04	055	
	LC_DC3_RHYA-01_2021-05-03	056	
	LC_DC3_RHYA-02_2021-05-03	057	
06	LC_DC3_RHYA-03_2021-05-03	058	17 May 2021
	LC_DC3_PLEC-02_2021-05-03	060	

Sample Group ID	Client ID	Lab ID	Date of Analysis
06	LC_DC3_PLEC-03_2021-05-03	061	
07	LC_DC1_INV-01_2021-05-05	062	14 May 2021
	LC_DC1_INV-02_2021-05-05	063	
	LC_DC1_INV-03_2021-05-05	064	
	LC_DC1_INV-04_2021-05-05	065	
	LC_DC1_INV-05_2021-05-05	066	
	LC_DC2_INV-01_2021-05-06	067	
	LC_DC2_INV-02_2021-05-06	068	
	LC_DC2_INV-03_2021-05-06	069	
08	LC_DC2_INV-04_2021-05-06	070	14 May 2021
	LC_DC2_INV-05_2021-05-06	071	
	LC_DC3_INV-01_2021-05-03	072	
	LC_DC3_INV-02_2021-05-03	073	
	LC_DC3_INV-03_2021-05-03	074	
	LC_DC3_INV-04_2021-05-03	075	
	LC_DC3_INV-05_2021-05-03	076	
09	LC_DC3_PLEC-01_2021-05-03	059	17 May 2021

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: 21-35 (Teck Dry Creek LAEMP)

Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
Address:	PO Box 1777	Address:	204-1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

Sample Identification:			Sample Type:	
			Species	Sample type
062	✓	LC_DC1_INV-01_2021-05-~~06~~ 05	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
063	✓	LC_DC1_INV-02_2021-05-~~06~~ 05	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
064	✓	LC_DC1_INV-03_2021-05-~~06~~ 05	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
065	✓	LC_DC1_INV-04_2021-05-~~06~~ 05	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
066	✓	LC_DC1_INV-05_2021-05-~~06~~ 05	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
067	✓	LC_DC2_INV-01_2021-05-06	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
068	✓	LC_DC2_INV-02_2021-05-06	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
069	✓	LC_DC2_INV-03_2021-05-06	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
070	✓	LC_DC2_INV-04_2021-05-06	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
071	✓	LC_DC2_INV-05_2021-05-06	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
072	AW ~~✓~~	LC_DC3_INV-01_2021_05-03	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
073		LC_DC3_INV-02_2021_05-03	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
074		LC_DC3_INV-03_2021_05-03	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
075		LC_DC3_INV-04_2021_05-03	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
076		LC_DC3_INV-05_2021_05-03	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
020	✓	LC_DC4_INV-01_2021-05-05	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
021	✓	LC_DC4_INV-02_2021-05-05	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
022	✓	LC_DC4_INV-03_2021-05-05	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
023	✓	LC_DC4_INV-04_2021-05-05	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
024	✓	LC_DC4_INV-05_2021-05-05	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis

12 May 2021 AW *

12 May 2021

Sample(s) Released By: Alex McClymont		Sample(s) Received By: Alex Wade
Signature:		Signature:
Date Sent:	11-May-21	Date Received: 11 May 2021
Sample(s) Returned to Client By:		Shipping Conditions:
		Shipping Container: Cooler + ice pack
Signature:		Date Sent:

* confirmed by client – see email 12 May 2021.

Page 1 of 3

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: 21-35 (Teck Dry Creek)

Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
Address:	PO Box 1777	Address:	204-1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

Sample Identification:		Sample Type:	
		Species	Sample type
025 ✓	LC_DCEF_INV-01_2021-05-04	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
026 ✓	LC_DCEF_INV-02_2021-05-04	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
027 ✓	LC_DCEF_INV-03_2021-05-04	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
028 ✓	LC_DCEF_INV-04_2021-05-04	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
029 ✓	LC_DCEF_INV-05_2021-05-04	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
030 ✓	LC_DCDS_INV-01_2021-05-04	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
031 ✓	LC_DCDS_INV-02_2021-05-04	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
032 ✓	LC_DCDS_INV-03_2021-05-04	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
033 ✓	LC_DCDS_INV-04_2021-05-04	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
aw ~~035~~ 034 ✓	LC_DCDS_INV-05_2021-05-04	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
035 ✓	LC_GRCK_INV-01_2021-05-07	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
036 ✓	LC_GRCK_INV-02_2021-05-07	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
037 ✓	LC_GRCK_INV-03_2021-05-07	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
038 ✓	LC_GRCK_INV-04_2021-05-07	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
039 ✓	LC_GRCK_INV-05_2021-05-07	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
040 ✓	LC_FRB_INV-01_2021-05-06	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
041 ✓	LC_FRB_INV-02_2021-05-06	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
042 ✓	LC_FRB_INV-03_2021-05-06	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
043 ✓	LC_FRB_INV-04_2021-05-06	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
044 ✓	LC_FRB_INV-05_2021-05-06	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis

12 May 2021

Sample(s) Released By: Alex McClymont	Sample(s) Received By: Alex Wade
Signature:	Signature:
Date Sent: 11-May-21	Date Received: 11 May 2021
Sample(s) Returned to Client By:	Shipping Conditions:
	Shipping Container: Cooler + ice pack
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: 21-35 (Teck Dry Creek)			
Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
Address:	PO Box 1777	Address:	204-1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

Sample Identification:		Sample Type:	
		Species	Sample type
045 ✓	LC_FRUS_INV-01_2021-05-07	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
046 ✓	LC_FRUS_INV-02_2021-05-07	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
047 ✓	LC_FRUS_INV-03_2021-05-07	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
048 ✓	LC_FRUS_INV-04_2021-05-07	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
049 ✓	LC_FRUS_INV-05_2021-05-07	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
050 ✓	LC_DCDS_RHYA-01_2021-05-04	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
051 ✓	LC_DCDS_RHYA-02_2021-05-04	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
052 ✓	LC_DCDS_RHYA-03_2021-05-04	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
053 ✓	LC_DCDS_PLEC-01_2021-05-04	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
054 ✓	LC_DCDS_PLEC-02_2021-05-04	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
055 ✓	LC_DCDS_PLEC-03_2021-05-04	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
056 ✓	LC_DC3_RHYA-01_2021-05-03	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
057 ✓	LC_DC3_RHYA-02_2021-05-03	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
058 ✓	LC_DC3_RHYA-03_2021-05-03	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
059 ✓	LC_DC3_PLEC-01_2021-05-03	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
060 ✓	LC_DC3_PLEC-02_2021-05-03	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
061 ✓	LC_DC3_PLEC-03_2021-05-03	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis

Sample(s) Released By: Alex McClymont		Sample(s) Received By:	Elliot Howell
Signature:		Signature:	
Date Sent:	11-May-21	Date Received:	11 May 2021
Sample(s) Returned to Client By:		Shipping Conditions:	Cooler & Ice pack
		Shipping Container:	Cooler & Ice pack
Signature:		Date Sent:	

BENTHIC TISSUE CHEMISTRY

TrichAnalytics Laboratory Report 2021-222

TrichAnalytics Inc.

Tissue Microchemistry Analysis Report

Client:	Dave Hasek Aquatic Scientist Minnow Environmental	**Date Received:**	04 Jun 2021
		Date of Analysis:	09 Jun 2021 10 Jun 2021
Phone:	(778) 677-3500	**Final Report Date:**	14 Jun 2021
Email:	dhasek@minnow.ca	**Project No.:**	2021-222
		Method No.:	MET-002.05

Client Project: Teck Coal/Minnow Environmental 21-35 (Dry Creek LAEMP)

Analytical Request: Benthic Invertebrate Tissue Microchemistry (total metals and moisture) – 38 samples.
See chain of custody form provided for sample identification numbers.

Notes:

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 106%, range 102 - 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

14 Jun 2021
Date

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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	LC_DC1_INV-01_20210601	LC_DC1_INV-02_20210601	LC_DC1_INV-03_20210601	LC_DC2_INV-01_20210531	LC_DC2_INV-02_20210531
		Lab ID	001	002	003	004	005
		Wet Weight (g)	0.6011	0.5017	0.5053	0.4643	0.4029
		Dry Weight (g)	0.0922	0.1059	0.1221	0.1068	0.0724
		Moisture (%)	84.7	78.9	75.8	77.0	82.0
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.001	0.003	1.3	0.845	0.743	1.5	1.1
11B	0.072	0.240	1.9	0.864	2.1	2.3	1.2
23Na	1.2	4.0	4,655	3,892	3,107	5,149	5,152
24Mg	0.034	0.113	1,635	992	1,596	1,248	1,676
27Al	0.781	2.6	1,486	595	1,679	1,981	995
31P	58	193	14,986	11,840	11,377	12,151	16,135
39K	3.4	11	17,161	13,345	12,174	11,911	14,383
44Ca	15	50	3,002	1,361	3,419	1,468	2,412
49Ti	0.194	0.647	143	56	158	193	88
51V	0.055	0.183	5.8	2.2	6.5	7.7	3.4
52Cr	0.320	1.1	8.2	5.9	30	39	9.9
55Mn	0.017	0.057	159	97	58	183	261
57Fe	1.0	3.3	1,304	526	1,428	1,412	679
59Co	0.006	0.020	3.3	1.4	1.9	6.8	2.1
60Ni	0.033	0.110	25	16	75	85	24
63Cu	0.012	0.040	20	16	16	17	24
66Zn	0.429	1.4	283	236	227	155	324
75As	0.282	0.940	1.7	0.921	1.2	0.842	1.2
77Se	0.385	1.3	10	9.1	5.5	13	14
88Sr	0.001	0.003	5.7	3.0	6.4	5.3	4.9
95Mo	0.001	0.003	0.751	0.554	0.890	1.2	0.949
107Ag	0.001	0.003	0.139	0.126	0.126	0.139	0.164
111Cd	0.099	0.330	6.2	3.4	3.1	1.3	2.0
118Sn	0.034	0.113	0.795	0.394	0.252	0.244	0.473
121Sb	0.005	0.017	0.123	0.064	0.115	0.195	0.097
137Ba	0.001	0.003	213	124	137	134	266
202Hg	0.046	0.153	0.066	0.049	<0.046	0.066	0.049
205Tl	0.001	0.003	0.064	0.033	0.058	0.053	0.051
208Pb	0.005	0.017	0.555	0.257	0.329	0.647	0.426
238U	0.001	0.003	0.069	0.037	0.079	0.082	0.067

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	LC_DC2_INV-03_20210531	LC_DC3_INV-01_20210531	LC_DC3_INV-02_20210531	LC_DC3_INV-03_20210531	LC_DC3_INV-04_20210531
		Lab ID	006	007	008	009	010
		Wet Weight (g)	0.4825	0.2875	0.2101	0.6328	0.4530
		Dry Weight (g)	0.1076	0.0703	0.0498	0.1494	0.1233
		Moisture (%)	77.7	75.5	76.3	76.4	72.8
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.001	0.003	0.678	0.918	0.758	0.656	0.543
11B	0.072	0.240	1.2	1.8	2.1	1.2	1.0
23Na	1.2	4.0	3,406	3,352	3,236	2,470	2,238
24Mg	0.034	0.113	1,563	1,249	1,514	1,353	1,425
27Al	0.781	2.6	1,012	1,383	1,468	1,188	1,017
31P	58	193	12,747	11,071	12,096	9,238	14,348
39K	3.4	11	12,476	11,630	11,616	7,982	7,327
44Ca	15	50	1,694	1,836	2,297	3,200	5,794
49Ti	0.194	0.647	92	124	139	123	108
51V	0.055	0.183	3.8	5.5	4.9	4.1	3.2
52Cr	0.320	1.1	17	18	14	11	9.3
55Mn	0.017	0.057	213	71	55	47	50
57Fe	1.0	3.3	843	946	1,030	796	615
59Co	0.006	0.020	4.4	1.9	1.5	1.4	1.1
60Ni	0.033	0.110	43	45	37	29	24
63Cu	0.012	0.040	17	18	22	21	22
66Zn	0.429	1.4	350	220	216	140	162
75As	0.282	0.940	1.4	0.763	0.632	0.684	0.726
77Se	0.385	1.3	14	15	12	7.2	6.8
88Sr	0.001	0.003	4.3	4.7	5.1	5.7	7.1
95Mo	0.001	0.003	0.910	0.751	0.593	0.455	0.534
107Ag	0.001	0.003	0.145	0.183	0.214	0.151	0.164
111Cd	0.099	0.330	4.2	1.3	0.786	0.423	0.344
118Sn	0.034	0.113	0.602	0.516	0.257	0.153	0.198
121Sb	0.005	0.017	0.099	0.108	0.117	0.138	0.142
137Ba	0.001	0.003	222	166	125	73	83
202Hg	0.046	0.153	0.049	0.049	<0.046	0.066	<0.046
205Tl	0.001	0.003	0.057	0.094	0.046	0.046	0.032
208Pb	0.005	0.017	0.431	0.457	0.429	0.375	0.329
238U	0.001	0.003	0.065	0.080	0.084	0.064	0.051

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	LC_DC3_INV-05_20210531	LC_DC3_PLEC-01_20210531	LC_DC3_PLEC-02_20210531	LC_DC3_PLEC-03_20210531	LC_DC3_RHYA-01_20210531
		Lab ID	011	012	013	014	015
		Wet Weight (g)	0.6348	0.0387	0.0556	0.0946	0.2723
		Dry Weight (g)	0.1477	0.0078	0.0113	0.0185	0.0766
		Moisture (%)	76.7	79.8	79.7	80.4	71.9
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.001	0.003	0.840	0.994	1.5	1.7	0.193
11B	0.072	0.240	2.2	2.0	2.9	3.5	0.730
23Na	1.2	4.0	1,851	2,905	2,838	3,426	2,674
24Mg	0.034	0.113	1,353	1,855	1,896	1,658	1,501
27Al	0.781	2.6	1,934	1,606	2,883	3,799	451
31P	58	193	9,568	15,197	13,159	13,135	10,096
39K	3.4	11	9,235	10,833	10,883	12,843	7,312
44Ca	15	50	2,901	4,986	4,309	3,238	928
49Ti	0.194	0.647	209	147	305	348	42
51V	0.055	0.183	8.4	6.0	9.2	12	2.1
52Cr	0.320	1.1	19	45	39	50	12
55Mn	0.017	0.057	40	45	51	114	61
57Fe	1.0	3.3	1,415	1,689	2,227	2,447	434
59Co	0.006	0.020	0.996	3.7	2.3	4.7	1.7
60Ni	0.033	0.110	61	110	94	117	32
63Cu	0.012	0.040	14	24	23	29	19
66Zn	0.429	1.4	137	349	427	248	215
75As	0.282	0.940	0.922	0.475	0.670	0.824	<0.282
77Se	0.385	1.3	6.2	11	10	16	10
88Sr	0.001	0.003	6.0	8.6	11	9.7	2.3
95Mo	0.001	0.003	0.630	0.954	1.0	0.725	0.401
107Ag	0.001	0.003	0.139	0.498	0.624	0.441	0.113
111Cd	0.099	0.330	1.3	0.803	1.1	1.0	0.746
118Sn	0.034	0.113	0.330	1.2	0.594	0.478	0.153
121Sb	0.005	0.017	0.157	0.114	0.200	0.204	0.074
137Ba	0.001	0.003	75	95	177	161	83
202Hg	0.046	0.153	<0.046	0.047	0.078	0.101	0.062
205Tl	0.001	0.003	0.049	0.091	0.111	0.094	0.023
208Pb	0.005	0.017	0.535	0.438	0.898	1.0	0.229
238U	0.001	0.003	0.105	0.108	0.270	0.228	0.042

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	LC_DC3_RHYA-02_20210531	LC_DC3_RHYA-03_20210531	LC_DC4_INV-01_20210601	LC_DC4_INV-02_20210601	LC_DC4_INV-03_20210601
		Lab ID	016	017	018	019	020
		Wet Weight (g)	0.3414	0.3126	0.6329	1.0467	0.9343
		Dry Weight (g)	0.0866	0.0683	0.1297	0.2154	0.2186
		Moisture (%)	74.6	78.2	79.5	79.4	76.6
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.001	0.003	0.273	0.547	0.920	0.542	0.549
11B	0.072	0.240	0.456	1.8	1.9	0.933	0.917
23Na	1.2	4.0	2,345	3,228	3,480	3,376	2,921
24Mg	0.034	0.113	1,165	1,566	1,499	1,829	1,780
27Al	0.781	2.6	369	1,461	1,457	860	706
31P	58	193	9,540	10,952	11,773	12,898	13,269
39K	3.4	11	8,285	11,563	11,670	13,101	10,883
44Ca	15	50	674	1,044	2,060	3,076	2,664
49Ti	0.194	0.647	31	124	136	88	79
51V	0.055	0.183	1.2	4.9	5.7	2.0	2.1
52Cr	0.320	1.1	5.2	21	10	7.0	7.7
55Mn	0.017	0.057	27	57	104	90	61
57Fe	1.0	3.3	275	948	1,759	665	590
59Co	0.006	0.020	0.567	1.9	2.7	2.1	1.2
60Ni	0.033	0.110	10	53	29	16	21
63Cu	0.012	0.040	12	18	16	15	16
66Zn	0.429	1.4	166	245	269	190	205
75As	0.282	0.940	<0.282	0.447	1.5	2.0	1.6
77Se	0.385	1.3	9.0	13	9.0	5.7	5.9
88Sr	0.001	0.003	1.4	3.8	4.5	4.4	4.6
95Mo	0.001	0.003	0.343	0.458	0.763	0.470	0.627
107Ag	0.001	0.003	0.076	0.151	0.113	0.088	0.126
111Cd	0.099	0.330	0.918	0.746	6.4	3.4	1.5
118Sn	0.034	0.113	0.144	0.164	0.518	0.347	0.220
121Sb	0.005	0.017	0.035	0.100	0.103	0.081	0.091
137Ba	0.001	0.003	39	91	222	118	113
202Hg	0.046	0.153	<0.046	0.062	0.062	<0.046	<0.046
205Tl	0.001	0.003	0.018	0.037	0.058	0.061	0.057
208Pb	0.005	0.017	0.151	0.391	0.485	0.274	0.268
238U	0.001	0.003	0.022	0.070	0.083	0.049	0.043

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	LC_DCDS_INV-01_20210601	LC_DCDS_INV-02_20210601	LC_DCDS_INV-03_20210601	LC_DCDS_PLEC-01_20210601	LC_DCDS_PLEC-02_20210601
		Lab ID	021	022	023	024	025
		Wet Weight (g)	0.9517	0.6193	0.4906	0.1090	0.1079
		Dry Weight (g)	0.1320	0.1705	0.1050	0.0168	0.0183
		Moisture (%)	86.1	72.5	78.6	84.6	83.0
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.001	0.003	0.798	0.656	0.955	0.773	1.0
11B	0.072	0.240	1.9	1.8	1.8	1.6	1.6
23Na	1.2	4.0	3,449	2,897	4,168	2,387	3,069
24Mg	0.034	0.113	1,500	1,704	1,371	2,372	1,785
27Al	0.781	2.6	1,092	1,078	1,733	1,247	1,419
31P	58	193	12,371	13,241	12,251	17,237	15,905
39K	3.4	11	14,124	11,979	14,378	11,260	13,883
44Ca	15	50	2,217	2,742	1,902	5,654	3,907
49Ti	0.194	0.647	108	100	182	114	129
51V	0.055	0.183	3.4	3.1	5.5	3.4	3.8
52Cr	0.320	1.1	7.1	6.1	9.6	25	21
55Mn	0.017	0.057	101	100	370	36	40
57Fe	1.0	3.3	691	613	990	1,174	1,033
59Co	0.006	0.020	2.7	2.4	12	1.4	1.9
60Ni	0.033	0.110	22	16	35	61	50
63Cu	0.012	0.040	20	15	20	22	24
66Zn	0.429	1.4	229	186	174	352	286
75As	0.282	0.940	2.0	1.7	1.9	1.1	1.3
77Se	0.385	1.3	8.1	7.7	15	7.9	7.7
88Sr	0.001	0.003	4.3	5.4	4.9	9.3	6.5
95Mo	0.001	0.003	0.705	0.549	1.1	0.823	0.509
107Ag	0.001	0.003	0.120	0.101	0.176	0.428	0.290
111Cd	0.099	0.330	8.2	5.4	5.3	1.0	1.4
118Sn	0.034	0.113	0.646	0.323	0.318	1.2	1.2
121Sb	0.005	0.017	0.105	0.105	0.187	0.107	0.096
137Ba	0.001	0.003	180	247	172	115	105
202Hg	0.046	0.153	0.056	<0.046	0.056	0.056	0.074
205Tl	0.001	0.003	0.090	0.063	0.159	0.085	0.090
208Pb	0.005	0.017	0.348	0.336	0.670	0.359	0.393
238U	0.001	0.003	0.104	0.116	0.096	0.085	0.076

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	LC_DCDS_PLEC-03_20210601	LC_DCDS_RHYA-01_20210601	LC_DCDS_RHYA-02_20210601	LC_DCDS_RHYA-03_20210601	LC_DCEF_INV-02_20210531
		Lab ID	026	027	028	029	030
		Wet Weight (g)	0.0820	0.2956	0.2841	0.5071	0.5528
		Dry Weight (g)	0.0172	0.0586	0.0698	0.1444	0.1419
		Moisture (%)	79.0	80.2	75.4	71.5	74.3
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.001	0.003	1.3	0.385	0.239	0.682	0.391
11B	0.072	0.240	2.4	0.673	0.538	2.3	0.855
23Na	1.2	4.0	2,889	3,032	2,853	2,455	3,221
24Mg	0.034	0.113	2,029	1,609	1,614	1,291	1,804
27Al	0.781	2.6	2,198	457	256	2,206	302
31P	58	193	16,353	14,024	11,807	12,366	14,015
39K	3.4	11	14,205	12,800	11,077	11,787	10,207
44Ca	15	50	4,194	1,543	1,076	1,373	3,448
49Ti	0.194	0.647	256	44	21	200	24
51V	0.055	0.183	6.1	1.8	1.0	9.5	1.2
52Cr	0.320	1.1	23	5.6	3.9	25	6.4
55Mn	0.017	0.057	47	258	81	125	30
57Fe	1.0	3.3	1,391	385	214	1,710	355
59Co	0.006	0.020	2.5	6.8	1.7	4.7	0.349
60Ni	0.033	0.110	57	19	9.7	65	13
63Cu	0.012	0.040	29	16	15	14	20
66Zn	0.429	1.4	328	283	258	251	215
75As	0.282	0.940	1.4	1.3	0.757	1.7	1.6
77Se	0.385	1.3	8.9	21	18	13	4.7
88Sr	0.001	0.003	17	4.3	3.0	6.6	5.0
95Mo	0.001	0.003	0.705	1.2	0.787	1.1	0.476
107Ag	0.001	0.003	0.454	0.151	0.113	0.113	0.101
111Cd	0.099	0.330	0.961	2.2	1.3	1.5	2.5
118Sn	0.034	0.113	1.0	0.340	0.111	0.489	0.109
121Sb	0.005	0.017	0.190	0.104	0.045	0.189	0.034
137Ba	0.001	0.003	180	163	151	252	147
202Hg	0.046	0.153	0.093	0.056	0.094	0.075	0.057
205Tl	0.001	0.003	0.134	0.056	0.030	0.091	0.014
208Pb	0.005	0.017	0.610	0.271	0.149	0.933	0.091
238U	0.001	0.003	0.144	0.041	0.038	0.129	0.030

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	LC_DCEF_INV-03_20210531	LC_DCEF_INV-01_20210531	LC_FRB_INV-01_20210602	LC_FRB_INV-02_20210602	LC_FRB_INV-03_20210602
		Lab ID	031	032	033	034	035
		Wet Weight (g)	0.3733	0.3943	0.2894	0.7298	0.6928
		Dry Weight (g)	0.0781	0.0999	0.0823	0.2198	0.2023
		Moisture (%)	79.1	74.7	71.6	69.9	70.8
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.001	0.003	1.4	0.333	1.5	1.0	0.869
11B	0.072	0.240	3.0	0.792	2.8	1.7	1.1
23Na	1.2	4.0	3,188	3,270	2,984	2,980	3,456
24Mg	0.034	0.113	1,815	1,986	1,369	1,997	1,691
27Al	0.781	2.6	2,667	284	2,134	1,253	705
31P	58	193	12,164	14,476	9,609	12,800	11,698
39K	3.4	11	13,111	11,016	10,371	9,445	11,063
44Ca	15	50	3,192	3,321	2,171	4,992	2,836
49Ti	0.194	0.647	199	20	255	128	74
51V	0.055	0.183	8.3	1.4	6.1	3.4	2.2
52Cr	0.320	1.1	32	6.3	19	9.2	13
55Mn	0.017	0.057	58	34	39	35	34
57Fe	1.0	3.3	1,980	408	1,133	793	763
59Co	0.006	0.020	3.200	0.826	1.7	1.0	1.3
60Ni	0.033	0.110	100	12	49	21	32
63Cu	0.012	0.040	25	29	20	19	20
66Zn	0.429	1.4	194	290	196	201	168
75As	0.282	0.940	2.2	1.7	0.670	0.437	0.364
77Se	0.385	1.3	9.1	7.0	6.7	5.0	5.0
88Sr	0.001	0.003	7.7	5.0	5.1	8.0	4.9
95Mo	0.001	0.003	0.621	0.539	0.621	0.373	0.290
107Ag	0.001	0.003	0.195	0.113	0.088	0.151	0.151
111Cd	0.099	0.330	4.3	8.0	3.8	1.4	1.3
118Sn	0.034	0.113	0.351	0.379	0.597	0.512	0.227
121Sb	0.005	0.017	0.161	0.037	0.058	0.048	0.039
137Ba	0.001	0.003	167	146	57	47	33
202Hg	0.046	0.153	0.094	0.047	0.057	<0.046	<0.046
205Tl	0.001	0.003	0.088	0.020	0.062	0.037	0.026
208Pb	0.005	0.017	0.856	0.099	0.596	0.359	0.254
238U	0.001	0.003	0.161	0.046	0.080	0.062	0.036

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	LC_FRUS_INV-01_20210602	LC_FRUS_INV-02_20210602	LC_FRUS_INV-03_20210602
		Lab ID	036	037	038
		Wet Weight (g)	0.5912	0.3102	1.0009
		Dry Weight (g)	0.1833	0.0623	0.2886
		Moisture (%)	69.0	79.9	71.2
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)
7Li	0.001	0.003	0.790	1.1	0.738
11B	0.072	0.240	0.602	0.991	0.837
23Na	1.2	4.0	3,543	4,119	2,997
24Mg	0.034	0.113	1,701	1,040	1,633
27Al	0.781	2.6	427	883	617
31P	58	193	10,857	9,342	12,010
39K	3.4	11	11,452	11,609	10,066
44Ca	15	50	3,188	1,778	3,572
49Ti	0.194	0.647	35	67	44
51V	0.055	0.183	1.2	2.5	1.6
52Cr	0.320	1.1	8.2	15	9.8
55Mn	0.017	0.057	35	28	32
57Fe	1.0	3.3	510	851	594
59Co	0.006	0.020	0.576	1.6	0.754
60Ni	0.033	0.110	19	38	21
63Cu	0.012	0.040	46	22	30
66Zn	0.429	1.4	255	196	331
75As	0.282	0.940	0.306	0.368	0.315
77Se	0.385	1.3	5.5	7.2	4.9
88Sr	0.001	0.003	3.7	3.0	5.2
95Mo	0.001	0.003	0.331	0.435	0.406
107Ag	0.001	0.003	0.170	0.168	0.221
111Cd	0.099	0.330	0.707	1.9	0.818
118Sn	0.034	0.113	0.184	0.542	0.179
121Sb	0.005	0.017	0.024	0.030	0.025
137Ba	0.001	0.003	19	26	27
202Hg	0.046	0.153	0.075	<0.046	<0.046
205Tl	0.001	0.003	0.014	0.034	0.022
208Pb	0.005	0.017	0.138	0.289	0.196
238U	0.001	0.003	0.023	0.038	0.035

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	LC_DC1_INV-01_20210601			LC_DC4_INV-02_20210601			LC_DCEF_INV-03_20210531		
	Lab ID	001			019			032		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.001	1.3	1.1	17	0.542	0.720	28	0.391	0.369	5.8
11B	0.072	1.9	1.6	17	0.933	1.3	33	0.855	0.665	-
23Na	1.2	4,655	4,026	15	3,376	3,849	13	3,221	3,057	5.2
24Mg	0.034	1,635	1,357	19	1,829	2,123	15	1,804	1,470	20
27Al	0.781	1,486	1,208	21	860	942	9.1	302	291	3.7
31P	58	14,986	12,867	15	12,898	14,602	12	14,015	10,971	24
39K	3.4	17,161	13,280	26	13,101	15,287	15	10,207	9,676	5.3
44Ca	15	3,002	2,192	31	3,076	3,576	15	3,448	2,926	16
49Ti	0.194	143	107	29	88	90	2.2	24	24	0.0
51V	0.055	5.8	4.5	25	2.0	2.8	33	1.2	1.1	8.7
52Cr	0.320	8.2	7.6	7.6	7.0	9.0	25	6.4	5.7	12
55Mn	0.017	159	118	30	90	101	12	30	26	14
57Fe	1.0	1,304	1,036	23	665	791	17	355	338	4.9
59Co	0.006	3.3	2.7	20	2.1	2.7	25	0.349	0.292	18
60Ni	0.033	25	19	27	16	21	27	13	11	17
63Cu	0.012	20	16	22	15	18	18	20	20	0.0
66Zn	0.429	283	237	18	190	223	16	215	163	28
75As	0.282	1.7	1.4	-	2.0	2.0	-	1.6	1.3	-
77Se	0.385	10	8.1	21	5.7	6.2	8.4	4.7	3.6	-
88Sr	0.001	5.7	4.5	24	4.4	5.4	20	5.0	3.5	35
95Mo	0.001	0.751	0.633	17	0.470	0.588	22	0.476	0.456	4.3
107Ag	0.001	0.139	0.101	32	0.088	0.132	40	0.101	0.076	28
111Cd	0.099	6.2	4.8	26	3.4	4.5	28	2.5	1.9	27
118Sn	0.034	0.795	0.562	34	0.347	0.351	1.1	0.109	0.114	-
121Sb	0.005	0.123	0.100	21	0.081	0.107	28	0.034	0.029	-
137Ba	0.001	213	149	35	118	140	17	147	99	39
202Hg	0.046	0.066	<0.046	-	<0.046	0.074	-	0.057	<0.046	-
205Tl	0.001	0.064	0.053	19	0.061	0.078	25	0.014	0.013	7.4
208Pb	0.005	0.555	0.426	26	0.274	0.399	37	0.091	0.094	3.2
238U	0.001	0.069	0.060	14	0.049	0.070	35	0.030	0.025	18

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	LC_FRUS_INV-03_20210602
Lab ID	038

Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.001	0.738	0.872	17
11B	0.072	0.837	1.1	27
23Na	1.2	2,997	3,302	9.7
24Mg	0.034	1,633	1,773	8.2
27Al	0.781	617	896	37
31P	58	12,010	14,028	16
39K	3.4	10,066	10,744	6.5
44Ca	15	3,572	3,581	0.3
49Ti	0.194	44	54	20
51V	0.055	1.6	2.1	27
52Cr	0.320	9.8	11	12
55Mn	0.017	32	34	6.1
57Fe	1.0	594	698	16
59Co	0.006	0.754	0.821	8.5
60Ni	0.033	21	23	9.1
63Cu	0.012	30	33	9.5
66Zn	0.429	331	322	2.8
75As	0.282	0.315	0.420	-
77Se	0.385	4.9	5.8	17
88Sr	0.001	5.2	5.3	1.9
95Mo	0.001	0.406	0.464	13
107Ag	0.001	0.221	0.263	17
111Cd	0.099	0.818	1.0	-
118Sn	0.034	0.179	0.202	-
121Sb	0.005	0.025	0.027	-
137Ba	0.001	27	31	14
202Hg	0.046	<0.046	<0.046	-
205Tl	0.001	0.022	0.029	28
208Pb	0.005	0.196	0.257	27
238U	0.001	0.035	0.040	13

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	0.001	1.21	1.3	108	7.4	1.2	102	9.4
11B	0.072	4.5	4.3	96	3.4	4.8	107	3.3
23Na	1.2	14,000	15,662	112	3.8	14,575	104	3.6
24Mg	0.034	910	968	106	8.7	932	102	4.5
27Al	0.781	197.2	189	96	3.4	198	100	4.2
31P	58	8,000	8,514	106	7.4	8,304	104	3.3
39K	3.4	15,500	16,096	104	6.6	15,802	102	2.7
44Ca	15	2,360	2,543	108	7.1	2,560	108	4.1
49Ti	0.194	12.24	13	106	11	13	103	11
51V	0.055	1.57	1.8	117	18	1.8	117	7.6
52Cr	0.320	1.87	2.0	106	4.4	2.1	110	4.7
55Mn	0.017	3.17	3.3	106	8.2	3.3	105	7.1
57Fe	1.0	343	368	107	9.2	369	108	6.1
59Co	0.006	0.25	0.257	103	5.0	0.296	118	4.7
60Ni	0.033	1.34	1.5	111	6.0	1.5	114	6.0
63Cu	0.012	15.7	17	111	11	17	110	5.1
66Zn	0.429	51.6	54	105	8.2	58	113	5.1
75As	0.282	6.87	7.1	103	6.4	7.3	107	2.6
77Se	0.385	3.45	3.5	102	8.4	3.8	110	9.5
88Sr	0.001	10.1	11	110	6.9	11	105	4.3
95Mo	0.001	0.29	0.316	109	8.8	0.324	112	5.9
107Ag	0.001	0.0252	0.025	100	0.0	0.025	99	0.0
111Cd	0.099	0.299	0.295	99	19	0.299	100	19
118Sn	0.034	0.061	0.073	119	20	0.062	101	7.9
121Sb	0.005	0.011	0.012	111	**42**	0.014	126	13
137Ba	0.001	8.6	8.7	101	3.2	9.1	106	2.6
202Hg	0.046	0.412	0.445	108	7.6	0.426	103	8.6
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.005	0.404	0.505	125	15	0.442	109	11
238U	0.001	0.05	0.056	113	11	0.058	116	6.9

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.

Bold indicates DQO exceedance but result is accepted as it does not impact the reportable results

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	0.001	1.21	1.3	107	7.5	1.2	102	5.9
11B	0.072	4.5	4.5	100	2.7	4.7	104	1.7
23Na	1.2	14,000	14,571	104	3.1	13,575	97	2.8
24Mg	0.034	910	986	108	2.2	891	98	2.8
27Al	0.781	197.2	198	100	4.6	190	96	5.0
31P	58	8,000	8,426	105	2.5	7,832	98	2.1
39K	3.4	15,500	16,027	103	3.7	15,489	100	1.7
44Ca	15	2,360	2,439	103	3.6	2,259	96	2.2
49Ti	0.194	12.24	13	106	7.0	12	100	10
51V	0.055	1.57	1.4	88	10	1.7	108	14
52Cr	0.320	1.87	1.9	102	6.4	1.9	102	1.6
55Mn	0.017	3.17	3.6	114	2.1	3.2	102	2.2
57Fe	1.0	343	369	108	3.3	356	104	2.1
59Co	0.006	0.25	0.256	102	4.6	0.259	104	6.7
60Ni	0.033	1.34	1.4	103	5.3	1.4	103	3.1
63Cu	0.012	15.7	17	110	7.9	16	101	4.7
66Zn	0.429	51.6	56	108	4.9	53	102	5.7
75As	0.282	6.87	7.2	106	2.2	6.9	101	1.7
77Se	0.385	3.45	3.6	103	6.5	3.7	106	4.1
88Sr	0.001	10.1	11	105	3.5	10	99	2.0
95Mo	0.001	0.29	0.298	103	7.2	0.307	106	12
107Ag	0.001	0.0252	0.025	100	0.0	0.025	100	0.0
111Cd	0.099	0.299	0.313	104	12	0.329	110	20
118Sn	0.034	0.061	0.052	85	**32**	0.084	138	17
121Sb	0.005	0.011	0.012	109	8.1	0.011	95	5.5
137Ba	0.001	8.6	8.4	98	1.8	9.1	106	2.7
202Hg	0.046	0.412	0.494	120	6.3	0.418	102	9.1
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.005	0.404	0.412	102	9.4	0.435	108	6.5
238U	0.001	0.05	0.050	99	9.1	0.055	110	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.

Bold indicates DQO exceedance but result is accepted as it does not impact the reportable results

Teck Coal Limited
Tissue QA/QC Accuracy and Precision Results

Sample Group ID	05

Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.001	1.21	1.3	110	7.0
11B	0.072	4.5	4.9	108	4.8
23Na	1.2	14,000	16,213	116	4.3
24Mg	0.034	910	1,018	112	8.5
27Al	0.781	197.2	205	104	5.6
31P	58	8,000	9,166	115	5.4
39K	3.4	15,500	17,512	113	4.9
44Ca	15	2,360	2,625	111	5.9
49Ti	0.194	12.24	14	113	6.8
51V	0.055	1.57	1.9	120	7.7
52Cr	0.320	1.87	2.2	115	2.3
55Mn	0.017	3.17	3.7	116	3.7
57Fe	1.0	343	404	118	4.2
59Co	0.006	0.25	0.296	118	3.8
60Ni	0.033	1.34	1.6	121	2.9
63Cu	0.012	15.7	19	119	3.4
66Zn	0.429	51.6	64	125	6.3
75As	0.282	6.87	7.8	114	4.1
77Se	0.385	3.45	3.8	110	5.3
88Sr	0.001	10.1	11	113	4.2
95Mo	0.001	0.29	0.313	108	7.7
107Ag	0.001	0.0252	0.032	125	12
111Cd	0.099	0.299	0.351	117	15
118Sn	0.034	0.061	0.061	101	17
121Sb	0.005	0.011	0.010	91	20
137Ba	0.001	8.6	9.2	107	2.0
202Hg	0.046	0.412	0.439	107	4.8
205Tl	0.001	0.0013	-	-	-
208Pb	0.005	0.404	0.437	108	11
238U	0.001	0.05	0.054	108	11

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	LC_DC1_INV-01_20210601	001	09 Jun 2021
	LC_DC1_INV-02_20210601	002	
	LC_DC1_INV-03_20210601	003	
	LC_DC2_INV-01_20210531	004	
	LC_DC2_INV-02_20210531	005	
	LC_DC2_INV-03_20210531	006	
	LC_DC3_INV-01_20210531	007	
	LC_DC3_INV-02_20210531	008	
	LC_DC3_INV-03_20210531	009	
02	LC_DC3_INV-04_20210531	010	09 Jun 2021
	LC_DC3_INV-05_20210531	011	
	LC_DC3_PLEC-01_20210531	012	
	LC_DC3_PLEC-02_20210531	013	
	LC_DC3_PLEC-03_20210531	014	
	LC_DC3_RHYA-01_20210531	015	
	LC_DC3_RHYA-02_20210531	016	
	LC_DC3_RHYA-03_20210531	017	
	LC_DC4_INV-01_20210601	018	
03	LC_DC4_INV-02_20210601	019	09 Jun 2021
	LC_DC4_INV-03_20210601	020	
	LC_DCDS_INV-01_20210601	021	
	LC_DCDS_INV-02_20210601	022	
	LC_DCDS_INV-03_20210601	023	
	LC_DCDS_PLEC-01_20210601	024	
	LC_DCDS_PLEC-02_20210601	025	
	LC_DCDS_PLEC-03_20210601	026	
	LC_DCDS_RHYA-01_20210601	027	
04	LC_DCDS_RHYA-02_20210601	028	09 Jun 2021
	LC_DCDS_RHYA-03_20210601	029	
	LC_DCEF_INV-02_20210531	030	
	LC_DCEF_INV-03_20210531	031	
	LC_DCEF_INV-01_20210531	032	
	LC_FRB_INV-01_20210602	033	
	LC_FRB_INV-02_20210602	034	
	LC_FRB_INV-03_20210602	035	
	LC_FRUS_INV-01_20210602	036	
05	LC_FRUS_INV-02_20210602	037	10 Jun 2021
	LC_FRUS_INV-03_20210602	038	

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: 21-35 (Teck Dry Creek LAEMP)	Project # 2021-222

Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
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City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

Trich ID		Sample Identification:		Sample Type:	
				Species	Sample type
001	1	LC_DC1_INV-01_20210601	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
002	2	LC_DC1_INV-02_20210601	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
003	3	LC_DC1_INV-03_20210601	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
004	4	LC_DC2_INV-01_20210531	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
005	5	LC_DC2_INV-02_20210531	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
006	6	LC_DC2_INV-03_20210531	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
007	7	LC_DC3_INV-01_20210531	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
008	8	LC_DC3_INV-02_20210531	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
009	9	LC_DC3_INV-03_20210531	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
010	10	LC_DC3_INV-04_20210531	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
011	11	LC_DC3_INV-05_20210531	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
012	12	LC_DC3_PLEC-01_20210531	✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
013	13	LC_DC3_PLEC-02_20210531	✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
014	14	LC_DC3_PLEC-03_20210531	✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
015	15	LC_DC3_RHYA-01_20210531	✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
016	16	LC_DC3_RHYA-02_20210531	✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
017	17	LC_DC3_RHYA-03_20210531	✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
018	18	LC_DC4_INV-01_20210601	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
019	19	LC_DC4_INV-02_20210601	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
020	20	LC_DC4_INV-03_20210601	✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis

Sample(s) Release	Alex McClymont	Sample(s) Received By:	Dwayne Smith
Signature:		Signature:	
Date Sent:	4-Jun-21	Date Received:	04 Jun 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: 21-35 (Teck Dry Creek)		Project #2021 - 222	
Company Name:	Teck	Company Name:	Minnow Environmental
Contact Name:	Cait Good	Contact Name:	Dave Hasek
Address:	PO Box 1777	Address:	204-1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250.425.8202	Phone:	778.677.3500
Email:	Cait.Good@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

Trich ID	Sample Identification:	Sample Type:	
		Species	Sample type
021.	1 LC_DCDS_INV-01_20210601 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
022	LC_DCDS_INV-02_20210601 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
023	LC_DCDS_INV-03_20210601 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
024	LC_DCDS_PLEC-01_20210601 ✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
025	LC_DCDS_PLEC-02_20210601 ✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
026	LC_DCDS_PLEC-03_20210601 ✓	Non-perlid plecoptera	Freshwater Benthic Invertebrate Tissue for Metals Analysis
027	LC_DCDS_RHYA-01_20210601 ✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
028	LC_DCDS_RHYA-02_20210601 ✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
029	LC_DCDS_RHYA-03_20210601 ✓	Rhyacophilidae	Freshwater Benthic Invertebrate Tissue for Metals Analysis
030	LC_DCEF_INV-02_20210531 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
031	LC_DCEF_INV-03_20210531 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
032	LC_DCEF_INV-01_20210531 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
033	LC_FRB_INV-01_20210602 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
034	LC_FRB_INV-02_20210602 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
035	LC_FRB_INV-03_20210602 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
036	LC_FRUS_INV-01_20210602 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
037	LC_FRUS_INV-02_20210602 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis
038.	LC_FRUS_INV-03_20210602 ✓	Composite	Freshwater Benthic Invertebrate Tissue for Metals Analysis

Sample(s) Released	Alex McClymont	Sample(s) Received By:	Dwayne Smith
Signature:		Signature:	
Date Sent:	4-Jun-21	Date Received:	04 Jun 2021
Sample(s) Returned to Client By:		Shipping Conditions:	
		Shipping Container:	
Signature:		Date Sent:	

BENTHIC TISSUE CHEMISTRY

TrichAnalytics Laboratory Report 2021-257

TrichAnalytics Inc.

Tissue Microchemistry Analysis Report

Client: Dave Hasek
Aquatic Scientist
Minnow Environmental
Phone: (778) 677-3500
Email: dhasek@minnow.ca

Client Project: DRY CREEK LAEMP (21-35) (PO 748530)

Date Received: 28 Sep 2021
Date of Analysis: 01 Oct 2021
04 Oct 2021
05 Oct 2021
06 Oct 2021
Final Report Date: 08 Oct 2021
Project No.: 2021-257
Method No.: MET-002.05

Analytical Request: Benthic Invertebrate Tissue Microchemistry (total metals and moisture) - 58 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.
Client specific DQO for Selenium accuracy is 90-110% of the certified value; result achieved 107% (ranging from 104-110%).
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.

08 Oct 2021

Reviewed and Approved by Jennie Christensen, PhD, RPBio
Date

[The analytical report shall not be reproduced except in full under the expressed written consent of TrichAnalytics Inc.]

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	LC_DC4_INV-1_2021-09-09	LC_DC4_INV-2_2021-09-09	LC_DC4_INV-3_2021-09-09	LC_DC4_INV-4_2021-09-09	LC_DC4_INV-5_2021-09-09
		Lab ID	**228**	**229**	**230**	**231**	**232**
		Wet Weight (g)	0.2327	0.4484	0.3906	0.3115	0.4202
		Dry Weight (g)	0.0543	0.0997	0.0703	0.0725	0.0950
		Moisture (%)	76.7	77.8	82.0	76.7	77.4
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.486	0.601	0.883	0.631	0.765
11B	0.107	0.357	1.2	1.4	2.5	1.7	1.6
23Na	1.3	4.3	3,027	3,832	3,246	3,506	4,621
24Mg	0.021	0.070	1,125	1,597	1,420	1,067	1,478
27Al	0.167	0.557	838	1,000	1,810	1,323	1,284
31P	40	133	10,383	12,166	10,091	10,581	12,994
39K	6.1	20	9,641	8,900	7,946	8,235	11,842
44Ca	104	347	2,484	3,062	4,879	2,471	2,521
49Ti	0.392	1.3	50	67	136	96	79
51V	0.062	0.207	1.9	2.5	5.1	2.7	2.9
52Cr	1.2	4.0	19	19	32	16	22
55Mn	0.008	0.027	55	48	68	46	61
57Fe	1.9	6.3	531	781	1,122	715	811
59Co	0.010	0.033	1.1	2.4	2.0	1.6	1.5
60Ni	0.050	0.167	38	36	54	31	41
63Cu	0.010	0.033	12	12	13	10	15
66Zn	0.450	1.5	156	208	174	178	185
75As	0.502	1.7	0.646	0.884	1.0	0.808	0.905
77Se	0.360	1.2	6.8	8.4	6.3	7.3	7.9
88Sr	0.001	0.003	3.4	3.0	6.4	3.8	3.9
95Mo	0.001	0.003	0.580	0.559	0.642	0.476	0.766
107Ag	0.001	0.003	0.063	0.073	0.093	0.073	0.102
111Cd	0.128	0.427	3.8	4.7	3.0	4.4	4.3
118Sn	0.030	0.100	0.754	0.465	0.719	0.391	0.555
121Sb	0.004	0.013	0.066	0.061	0.116	0.072	0.083
137Ba	0.001	0.003	76	79	122	68	117
202Hg	0.022	0.073	0.035	0.056	0.049	0.049	0.035
205Tl	0.001	0.003	0.035	0.060	0.067	0.046	0.051
208Pb	0.001	0.003	0.218	0.306	0.558	0.393	0.384
238U	0.001	0.003	0.073	0.074	0.143	0.068	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	LC_DC2_INV-1_2021-09-09	LC_DC2_INV-2_2021-09-09	LC_DC2_INV-3_2021-09-09	LC_DC2_INV-4_2021-09-09	LC_DC2_INV-5_2021-09-09
		Lab ID	233	234	235	236	237
		Wet Weight (g)	0.8224	0.4766	0.5458	0.5551	0.6904
		Dry Weight (g)	0.2468	0.1235	0.1410	0.1209	0.1627
		Moisture (%)	70.0	74.1	74.2	78.2	76.4
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.447	0.883	0.659	0.765	0.239
11B	0.107	0.357	0.833	1.6	1.7	1.4	0.843
23Na	1.3	4.3	2,844	3,678	4,216	5,296	2,985
24Mg	0.021	0.070	840	1,439	1,261	1,739	940
27Al	0.167	0.557	666	1,689	1,028	1,189	350
31P	40	133	9,296	11,160	11,360	14,970	8,224
39K	6.1	20	7,136	9,330	10,107	13,643	4,504
44Ca	104	347	1,182	2,963	2,378	3,008	1,101
49Ti	0.392	1.3	40	122	67	80	24
51V	0.062	0.207	1.5	3.4	2.9	2.8	0.693
52Cr	1.2	4.0	7.9	16	15	13	2.8
55Mn	0.008	0.027	58	64	77	61	28
57Fe	1.9	6.3	390	734	594	511	155
59Co	0.010	0.033	1.4	1.9	2.0	1.5	0.725
60Ni	0.050	0.167	25	40	43	37	12
63Cu	0.010	0.033	11	11	13	13	7.8
66Zn	0.450	1.5	125	145	156	206	108
75As	0.502	1.7	0.776	0.981	1.3	1.5	0.523
77Se	0.360	1.2	5.5	7.5	6.9	7.6	4.1
88Sr	0.001	0.003	2.1	4.3	3.2	4.2	1.5
95Mo	0.001	0.003	0.435	0.435	0.746	0.559	0.142
107Ag	0.001	0.003	0.093	0.093	0.112	0.102	0.070
111Cd	0.128	0.427	1.7	1.5	2.1	3.2	1.5
118Sn	0.030	0.100	0.164	0.551	0.531	0.355	0.220
121Sb	0.004	0.013	0.044	0.077	0.077	0.077	0.033
137Ba	0.001	0.003	48	63	58	85	23
202Hg	0.022	0.073	0.028	0.070	0.042	0.063	0.033
205Tl	0.001	0.003	0.037	0.104	0.057	0.060	0.043
208Pb	0.001	0.003	0.234	0.480	0.337	0.329	0.104
238U	0.001	0.003	0.079	0.123	0.123	0.166	0.049

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	LC_FRB_INV-1_2021-09-12	LC_FRB_INV-2_2021-09-12	LC_FRB_INV-3_2021-09-12	LC_FRUS_INV-1_2021-09-12	LC_FRUS_INV-2_2021-09-12
		Lab ID	**238**	**239**	**240**	**241**	**242**
		Wet Weight (g)	0.6185	1.9432	1.9432	1.1536	1.0038
		Dry Weight (g)	0.1589	0.4626	0.4626	0.3124	0.3026
		Moisture (%)	74.3	76.2	76.2	72.9	69.9
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.520	0.427	0.427	2.4	1.2
11B	0.107	0.357	1.2	1.7	1.5	7.4	3.8
23Na	1.3	4.3	2,919	2,833	2,385	2,704	3,040
24Mg	0.021	0.070	1,166	1,138	1,189	1,571	1,410
27Al	0.167	0.557	388	462	462	7,554	2,251
31P	40	133	10,861	9,768	8,694	8,495	11,298
39K	6.1	20	8,004	8,697	6,617	10,324	10,147
44Ca	104	347	2,423	2,401	2,257	2,225	2,878
49Ti	0.392	1.3	24	28	22	1,036	159
51V	0.062	0.207	0.794	0.647	0.641	19	3.6
52Cr	1.2	4.0	5.2	2.8	3.7	7.4	6.6
55Mn	0.008	0.027	106	92	74	174	225
57Fe	1.9	6.3	354	364	326	1,637	1,369
59Co	0.010	0.033	1.3	1.5	1.5	1.1	3.1
60Ni	0.050	0.167	10	6.9	8.2	17	20
63Cu	0.010	0.033	13	13	12	16	13
66Zn	0.450	1.5	177	215	182	155	289
75As	0.502	1.7	<0.502	0.558	0.523	0.791	0.907
77Se	0.360	1.2	8.0	8.5	7.7	8.9	11
88Sr	0.001	0.003	3.6	2.9	3.4	10	6.0
95Mo	0.001	0.003	0.249	0.337	0.266	0.479	0.479
107Ag	0.001	0.003	0.108	0.108	0.097	0.130	0.092
111Cd	0.128	0.427	2.2	3.6	2.3	1.5	2.6
118Sn	0.030	0.100	0.514	0.565	0.407	0.506	0.316
121Sb	0.004	0.013	0.033	0.046	0.033	0.290	0.112
137Ba	0.001	0.003	39	35	37	209	167
202Hg	0.022	0.073	0.043	0.046	0.027	0.060	0.053
205Tl	0.001	0.003	0.027	0.031	0.025	0.305	0.089
208Pb	0.001	0.003	0.186	0.236	0.192	2.0	0.837
238U	0.001	0.003	0.063	0.070	0.066	0.402	0.245

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	LC_FRUS_INV-3_2021-09-12	LC_FRUS_INV-4_2021-09-12	LC_FRUS_INV-5_2021-09-12	LC_GRCK_INV-1_2021-09-13	LC_GRCK_INV-2_2021-09-13
		Lab ID	243	244	245	246	247
		Wet Weight (g)	0.6969	0.6566	0.6318	0.7920	0.6739
		Dry Weight (g)	0.1936	0.1641	0.1979	0.2078	0.1985
		Moisture (%)	72.2	75.0	68.7	73.8	70.5
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.774	0.623	0.369	0.467	0.414
11B	0.107	0.357	2.9	1.9	0.640	1.9	1.8
23Na	1.3	4.3	2,364	3,526	2,654	3,023	3,119
24Mg	0.021	0.070	1,571	1,572	790	1,195	2,000
27Al	0.167	0.557	1,924	871	304	1,044	1,041
31P	40	133	7,938	11,679	9,378	9,277	14,130
39K	6.1	20	7,842	10,179	8,349	8,287	10,007
44Ca	104	347	6,601	3,559	1,463	1,373	4,029
49Ti	0.392	1.3	121	48	12	83	73
51V	0.062	0.207	3.0	1.4	0.462	1.4	1.4
52Cr	1.2	4.0	38	12	5.7	6.5	7.5
55Mn	0.008	0.027	160	115	44	55	60
57Fe	1.9	6.3	1,390	602	261	518	520
59Co	0.010	0.033	2.0	1.7	0.786	0.587	0.762
60Ni	0.050	0.167	64	21	11	9.9	11
63Cu	0.010	0.033	16	15	12	14	18
66Zn	0.450	1.5	247	210	237	223	376
75As	0.502	1.7	0.744	0.546	<0.502	<0.502	<0.502
77Se	0.360	1.2	8.6	11	8.7	5.3	5.3
88Sr	0.001	0.003	9.4	5.4	1.6	4.7	9.8
95Mo	0.001	0.003	0.755	0.355	0.408	0.311	0.414
107Ag	0.001	0.003	0.097	0.108	0.097	0.078	0.140
111Cd	0.128	0.427	1.5	2.3	0.884	0.703	1.1
118Sn	0.030	0.100	0.529	0.352	0.147	0.384	0.599
121Sb	0.004	0.013	0.092	0.046	0.026	0.096	0.063
137Ba	0.001	0.003	123	58	21	58	34
202Hg	0.022	0.073	0.099	0.050	0.036	0.072	0.079
205Tl	0.001	0.003	0.049	0.036	0.022	0.053	0.049
208Pb	0.001	0.003	0.579	0.418	0.159	0.362	0.302
238U	0.001	0.003	0.184	0.137	0.048	0.089	0.059

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	LC_GRCK_INV-3_2021-09-13	LC_DC1_INV-1_2021-09-07	LC_DC1_INV-2_2021-09-07	LC_DC1_INV-3_2021-09-07	LC_DC1_INV-4_2021-09-07
		Lab ID	**248**	**249**	**250**	**251**	**252**
		Wet Weight (g)	0.4906	0.2731	0.3288	0.4780	0.3252
		Dry Weight (g)	0.1520	0.0562	0.0685	0.0992	0.0795
		Moisture (%)	69.0	79.4	79.2	79.2	75.6
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.307	0.490	0.440	0.649	0.812
11B	0.107	0.357	2.5	1.3	1.9	1.7	3.1
23Na	1.3	4.3	3,174	5,258	3,211	5,210	4,977
24Mg	0.021	0.070	1,801	1,867	1,129	1,419	1,437
27Al	0.167	0.557	559	545	820	960	1,843
31P	40	133	13,202	13,472	9,057	12,430	12,938
39K	6.1	20	11,718	12,024	8,119	10,581	11,191
44Ca	104	347	3,373	2,852	2,521	2,787	2,441
49Ti	0.392	1.3	36	40	45	52	151
51V	0.062	0.207	0.919	1.3	2.0	2.1	6.1
52Cr	1.2	4.0	5.6	9.9	19	8.3	52
55Mn	0.008	0.027	102	51	59	64	92
57Fe	1.9	6.3	372	678	816	713	1,750
59Co	0.010	0.033	0.569	0.496	1.3	1.4	2.6
60Ni	0.050	0.167	8.4	24	41	31	96
63Cu	0.010	0.033	21	15	12	13	12
66Zn	0.450	1.5	345	172	158	213	153
75As	0.502	1.7	<0.502	0.571	0.547	0.713	0.666
77Se	0.360	1.2	5.9	9.7	8.8	11	8.5
88Sr	0.001	0.003	7.9	3.1	3.7	4.2	4.7
95Mo	0.001	0.003	0.311	0.497	0.383	0.476	0.456
107Ag	0.001	0.003	0.135	0.113	0.065	0.070	0.081
111Cd	0.128	0.427	0.759	3.1	3.1	3.4	1.9
118Sn	0.030	0.100	0.388	0.854	0.638	0.431	0.474
121Sb	0.004	0.013	0.033	0.059	0.059	0.079	0.119
137Ba	0.001	0.003	74	85	80	98	158
202Hg	0.022	0.073	0.072	0.039	0.033	0.059	0.046
205Tl	0.001	0.003	0.034	0.056	0.049	0.059	0.084
208Pb	0.001	0.003	0.266	0.213	0.201	0.287	0.569
238U	0.001	0.003	0.131	0.062	0.062	0.082	0.137

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	LC_DC1_INV-5_2021-09-07	LC_DCEF_INV-1_2021-09-07	LC_DCEF_INV-2_2021-09-07	LC_DCEF_INV-3_2021-09-07	LC_DCEF_INV-4_2021-09-07
		Lab ID	253	254	255	256	257
		Wet Weight (g)	0.2848	0.6254	0.5821	0.2422	0.2290
		Dry Weight (g)	0.0833	0.1424	0.1341	0.0555	0.0541
		Moisture (%)	70.8	77.2	77.0	77.1	76.4
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	1.0	0.406	0.372	0.294	0.535
11B	0.107	0.357	3.1	1.2	1.0	1.2	0.770
23Na	1.3	4.3	4,472	3,884	3,491	3,054	4,727
24Mg	0.021	0.070	1,659	1,556	1,368	1,515	1,500
27Al	0.167	0.557	2,990	197	204	235	140
31P	40	133	14,176	13,828	12,775	11,927	13,614
39K	6.1	20	14,702	9,254	13,454	10,189	12,810
44Ca	104	347	2,775	2,676	2,053	3,836	3,279
49Ti	0.392	1.3	242	8.7	14	12	6.9
51V	0.062	0.207	7.9	0.875	1.3	1.2	0.929
52Cr	1.2	4.0	50	3.9	8.0	15	9.7
55Mn	0.008	0.027	95	26	36	23	18
57Fe	1.9	6.3	3,337	197	266	344	252
59Co	0.010	0.033	2.4	0.239	0.498	0.639	0.397
60Ni	0.050	0.167	84	6.6	10	22	14
63Cu	0.010	0.033	16	22	19	27	23
66Zn	0.450	1.5	203	195	166	260	237
75As	0.502	1.7	1.2	0.583	0.700	0.589	<0.502
77Se	0.360	1.2	13	4.8	7.3	5.6	4.6
88Sr	0.001	0.003	9.8	2.9	2.8	4.1	3.2
95Mo	0.001	0.003	0.627	0.352	0.346	0.395	0.280
107Ag	0.001	0.003	0.092	0.070	0.102	0.154	0.118
111Cd	0.128	0.427	2.2	3.9	4.9	3.8	3.8
118Sn	0.030	0.100	0.379	0.401	0.630	0.551	0.712
121Sb	0.004	0.013	0.155	0.040	0.051	0.045	0.033
137Ba	0.001	0.003	236	60	64	69	42
202Hg	0.022	0.073	0.035	0.026	0.043	0.055	0.052
205Tl	0.001	0.003	0.049	0.018	0.019	0.011	0.011
208Pb	0.001	0.003	0.546	0.082	0.121	0.083	0.073
238U	0.001	0.003	0.123	0.041	0.059	0.033	0.021

Notes:

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Teck Coal Limited
Tissue Analysis Results

		Client ID	LC_DCEF_INV-5_2021-09-07	LC_FRB_INV-4_2021-09-11	LC_FRB_INV-5_2021-09-11	LC_DCDS_INV_1_2021-09-10	LC_DCDS_INV_2_2021-09-10
		Lab ID	**258**	**259**	**260**	**261**	**262**
		Wet Weight (g)	0.2235	1.3815	1.3630	0.3882	0.4722
		Dry Weight (g)	0.0619	0.3411	0.3514	0.0841	0.1316
		Moisture (%)	72.3	75.3	74.2	78.3	72.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.411	0.888	0.959	1.6	1.1
11B	0.107	0.357	0.953	2.8	1.6	3.9	2.4
23Na	1.3	4.3	3,829	3,403	4,365	2,923	3,447
24Mg	0.021	0.070	1,817	1,499	1,751	1,347	1,367
27Al	0.167	0.557	370	1,570	645	2,631	2,382
31P	40	133	15,563	9,296	13,378	9,356	11,819
39K	6.1	20	13,041	9,287	13,724	9,423	14,502
44Ca	104	347	4,290	4,429	3,242	3,873	2,917
49Ti	0.392	1.3	21	107	42	268	173
51V	0.062	0.207	1.3	3.5	1.3	8.3	4.3
52Cr	1.2	4.0	13	50	10	34	18
55Mn	0.008	0.027	22	103	92	123	112
57Fe	1.9	6.3	391	1,498	452	1,761	928
59Co	0.010	0.033	0.541	1.6	1.4	3.7	1.7
60Ni	0.050	0.167	16	68	14	80	46
63Cu	0.010	0.033	29	18	18	17	17
66Zn	0.450	1.5	269	200	174	222	185
75As	0.502	1.7	0.727	0.746	<0.502	1.1	0.865
77Se	0.360	1.2	6.4	8.0	11	13	11
88Sr	0.001	0.003	5.0	6.5	4.5	9.1	5.5
95Mo	0.001	0.003	0.494	0.939	0.379	1.0	0.676
107Ag	0.001	0.003	0.154	0.110	0.138	0.224	0.179
111Cd	0.128	0.427	9.5	2.2	2.1	5.2	2.8
118Sn	0.030	0.100	0.746	0.474	0.540	0.410	0.377
121Sb	0.004	0.013	0.053	0.083	0.041	0.190	0.125
137Ba	0.001	0.003	83	83	44	152	107
202Hg	0.022	0.073	0.075	0.040	0.055	0.130	0.092
205Tl	0.001	0.003	0.020	0.033	0.025	0.110	0.084
208Pb	0.001	0.003	0.122	0.607	0.266	1.1	0.615
238U	0.001	0.003	0.049	0.134	0.119	0.277	0.162

Notes:

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Teck Coal Limited
Tissue Analysis Results

Client ID			LC_DCDS_INV_3_ 2021-09-10	LC_DCDS_INV_4_ 2021-09-10	LC_DCDS_INV_5_ 2021-09-10	LC_DC3_INV-1_2021-09-10	LC_DC3_INV-2_2021-09-10
Lab ID			**263**	**264**	**265**	**266**	**267**
Wet Weight (g)			0.7440	0.6631	0.5189	1.1541	0.2711
Dry Weight (g)			0.1641	0.1623	0.1182	0.2642	0.0742
Moisture (%)			77.9	75.5	77.2	77.1	72.6
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	1.1	2.3	0.940	1.3	1.4
11B	0.107	0.357	2.8	6.0	2.4	3.2	3.6
23Na	1.3	4.3	3,039	4,418	3,827	3,466	3,250
24Mg	0.021	0.070	1,091	1,659	1,521	1,703	1,865
27Al	0.167	0.557	2,583	5,987	1,750	3,072	4,030
31P	40	133	9,449	12,316	12,717	12,213	13,774
39K	6.1	20	10,491	15,945	11,582	11,385	11,530
44Ca	104	347	2,892	3,620	2,832	4,303	4,900
49Ti	0.392	1.3	201	452	124	326	348
51V	0.062	0.207	5.1	11	3.7	6.7	8.7
52Cr	1.2	4.0	29	38	17	28	43
55Mn	0.008	0.027	115	199	145	91	86
57Fe	1.9	6.3	1,185	2,137	927	1,345	1,866
59Co	0.010	0.033	2.7	4.1	1.4	2.6	3.3
60Ni	0.050	0.167	66	101	54	52	77
63Cu	0.010	0.033	13	17	16	17	18
66Zn	0.450	1.5	156	261	194	226	318
75As	0.502	1.7	0.700	1.3	0.688	0.556	0.792
77Se	0.360	1.2	11	15	9.6	9.5	10
88Sr	0.001	0.003	6.1	10	6.6	9.0	11
95Mo	0.001	0.003	0.775	0.943	0.870	0.580	0.508
107Ag	0.001	0.003	0.138	0.202	0.168	0.185	0.183
111Cd	0.128	0.427	2.2	5.0	1.4	1.2	1.4
118Sn	0.030	0.100	0.356	0.413	0.420	0.504	0.476
121Sb	0.004	0.013	0.139	0.272	0.137	0.197	0.234
137Ba	0.001	0.003	125	242	109	104	143
202Hg	0.022	0.073	0.084	0.084	0.075	0.062	0.077
205Tl	0.001	0.003	0.081	0.159	0.077	0.104	0.105
208Pb	0.001	0.003	0.734	1.4	0.522	0.899	0.892
238U	0.001	0.003	0.209	0.445	0.168	0.218	0.296

Notes:

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Teck Coal Limited
Tissue Analysis Results

		Client ID	LC_DC3_INV-3_2021-09-10	LC_DC3_INV-4_2021-09-10	LC_DC3_INV-5_2021-09-10	LC_DCDS_INVRHY-1_2021-09-10	LC_DCDS_INVRHY-2_2021-09-10
		Lab ID	**268**	**269**	**270**	**271**	**272**
		Wet Weight (g)	0.3175	0.2294	0.3360	0.1501	0.2831
		Dry Weight (g)	0.0895	0.0827	0.0998	0.0405	0.0701
		Moisture (%)	71.8	63.9	70.3	73.0	75.2
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	1.5	0.833	1.6	0.368	0.216
11B	0.107	0.357	3.8	2.1	2.6	0.835	0.382
23Na	1.3	4.3	3,285	3,489	5,164	5,044	3,113
24Mg	0.021	0.070	2,095	1,373	1,777	1,866	1,634
27Al	0.167	0.557	4,838	2,105	2,849	715	201
31P	40	133	13,411	11,454	13,650	12,714	10,728
39K	6.1	20	12,324	10,459	12,751	13,193	9,964
44Ca	104	347	4,030	1,932	3,348	1,952	1,831
49Ti	0.392	1.3	379	138	278	52	13
51V	0.062	0.207	9.5	4.0	5.9	1.8	0.570
52Cr	1.2	4.0	38	27	40	18	7.0
55Mn	0.008	0.027	117	50	69	47	49
57Fe	1.9	6.3	1,566	762	1,180	423	215
59Co	0.010	0.033	3.2	1.5	2.8	0.756	0.806
60Ni	0.050	0.167	76	48	68	30	14
63Cu	0.010	0.033	22	13	17	16	16
66Zn	0.450	1.5	306	145	215	226	246
75As	0.502	1.7	0.600	<0.502	<0.502	<0.502	<0.502
77Se	0.360	1.2	11	8.7	9.9	18	17
88Sr	0.001	0.003	11	6.2	7.8	5.3	4.5
95Mo	0.001	0.003	0.616	0.508	0.489	0.798	0.517
107Ag	0.001	0.003	0.204	0.063	0.164	0.155	0.130
111Cd	0.128	0.427	1.4	0.933	1.3	1.4	1.4
118Sn	0.030	0.100	0.516	0.187	0.400	0.227	0.278
121Sb	0.004	0.013	0.184	0.114	0.153	0.058	0.042
137Ba	0.001	0.003	158	73	97	94	57
202Hg	0.022	0.073	0.056	0.031	0.068	0.068	0.068
205Tl	0.001	0.003	0.105	0.074	0.096	0.078	0.044
208Pb	0.001	0.003	0.895	0.336	0.651	0.231	0.105
238U	0.001	0.003	0.212	0.081	0.183	0.073	0.037

Notes:

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% = percent

Teck Coal Limited
Tissue Analysis Results

		Client ID	LC_DCDS_INVRHY-3_2021-09-10	LC_DCDS_INVPLE-1_2021-09-10	LC_DCDS_INVPLE-2_2021-09-10	LC_DCDS_INVPLE-3_2021-09-10	LC_DC3_INVRHY-1_2021-09-10
		Lab ID	**273**	**274**	**275**	**276**	**277**
		Wet Weight (g)	0.1280	0.2341	0.1869	0.1511	0.6385
		Dry Weight (g)	0.0286	0.0625	0.0529	0.0341	0.1966
		Moisture (%)	77.7	73.3	71.7	77.4	69.2
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.662	2.5	0.799	1.8	0.536
11B	0.107	0.357	1.5	6.3	2.3	4.8	1.4
23Na	1.3	4.3	5,077	3,609	4,194	5,283	3,836
24Mg	0.021	0.070	1,326	1,763	1,739	1,906	2,015
27Al	0.167	0.557	1,235	6,569	2,022	4,472	1,327
31P	40	133	12,448	12,723	15,253	15,055	14,035
39K	6.1	20	12,507	13,890	16,696	17,372	12,420
44Ca	104	347	2,234	4,493	3,083	4,403	1,643
49Ti	0.392	1.3	81	506	160	349	96
51V	0.062	0.207	2.5	11	4.2	9.7	3.0
52Cr	1.2	4.0	31	32	24	56	21
55Mn	0.008	0.027	54	106	55	105	50
57Fe	1.9	6.3	766	2,219	1,003	2,038	690
59Co	0.010	0.033	1.2	2.8	1.7	4.0	1.4
60Ni	0.050	0.167	60	80	55	109	45
63Cu	0.010	0.033	15	21	17	18	18
66Zn	0.450	1.5	236	194	212	216	240
75As	0.502	1.7	<0.502	1.3	0.864	0.837	0.672
77Se	0.360	1.2	16	9.1	6.2	7.6	14
88Sr	0.001	0.003	5.6	12	5.4	9.7	4.1
95Mo	0.001	0.003	0.798	0.653	0.564	0.552	0.435
107Ag	0.001	0.003	0.155	0.256	0.208	0.225	0.126
111Cd	0.128	0.427	1.7	2.1	1.5	2.1	0.761
118Sn	0.030	0.100	0.469	0.464	0.502	1.1	0.200
121Sb	0.004	0.013	0.093	0.275	0.110	0.212	0.103
137Ba	0.001	0.003	73	188	67	142	82
202Hg	0.022	0.073	0.056	0.075	0.073	0.069	0.045
205Tl	0.001	0.003	0.073	0.166	0.063	0.102	0.053
208Pb	0.001	0.003	0.317	1.4	0.517	0.966	0.262
238U	0.001	0.003	0.102	0.259	0.120	0.254	0.081

Notes:

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g = grams

% = percent

Teck Coal Limited
Tissue Analysis Results

		Client ID	LC_DC3_INVRHY-2_2021-09-10	LC_DC3_INVRHY-3_2021-09-10	LC_DC3_INVPLE-1_2021-09-10	LC_DC3_INVPLE-2_2021-09-10	LC_DC3_INVPLE-3_2021-09-10
		Lab ID	**278**	**279**	**280**	**281**	**282**
		Wet Weight (g)	0.3439	0.2217	0.3224	0.1957	0.1251
		Dry Weight (g)	0.0914	0.0742	0.0905	0.0609	0.0332
		Moisture (%)	73.4	66.5	71.9	68.9	73.5
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	0.615	0.624	2.7	1.2	1.8
11B	0.107	0.357	1.6	2.1	5.8	3.8	5.4
23Na	1.3	4.3	4,057	3,821	2,685	3,436	3,752
24Mg	0.021	0.070	1,756	1,942	2,012	1,820	1,890
27Al	0.167	0.557	1,385	1,771	10,365	3,861	5,269
31P	40	133	11,649	12,528	12,162	14,199	12,304
39K	6.1	20	11,555	11,051	14,338	14,907	11,854
44Ca	104	347	1,623	1,747	3,739	3,791	3,880
49Ti	0.392	1.3	103	131	958	361	472
51V	0.062	0.207	3.0	4.2	22	8.8	11
52Cr	1.2	4.0	14	46	52	38	74
55Mn	0.008	0.027	50	54	94	80	73
57Fe	1.9	6.3	668	1,064	3,198	2,197	2,382
59Co	0.010	0.033	0.854	2.3	2.5	2.1	4.4
60Ni	0.050	0.167	29	75	99	91	144
63Cu	0.010	0.033	17	17	20	21	16
66Zn	0.450	1.5	195	236	168	195	205
75As	0.502	1.7	<0.502	0.504	1.0	0.621	0.672
77Se	0.360	1.2	10	11	5.4	6.0	6.0
88Sr	0.001	0.003	4.3	4.7	17	7.7	9.9
95Mo	0.001	0.003	0.508	0.399	1.1	0.898	0.471
107Ag	0.001	0.003	0.096	0.117	0.161	0.159	0.165
111Cd	0.128	0.427	0.663	0.822	1.3	1.2	2.6
118Sn	0.030	0.100	0.135	0.131	0.624	0.448	0.624
121Sb	0.004	0.013	0.121	0.135	0.425	0.195	0.180
137Ba	0.001	0.003	80	82	215	109	106
202Hg	0.022	0.073	0.042	0.045	0.052	0.041	0.056
205Tl	0.001	0.003	0.054	0.078	0.166	0.095	0.109
208Pb	0.001	0.003	0.317	0.382	1.9	0.816	0.981
238U	0.001	0.003	0.092	0.102	0.394	0.194	0.201

Notes:

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Teck Coal Limited
Tissue Analysis Results

		Client ID	LC_DC2_INVOLI-1_2021-09-09	LC_GRCK_INV-5_2021-09-13	LC_GRCK_INV-4_2021-09-13
		Lab ID	**283**	**284**	**285**
		Wet Weight (g)	0.4286	0.5966	0.5683
		Dry Weight (g)	0.0317	0.1588	0.1583
		Moisture (%)	92.6	73.4	72.1
Parameter	DL (ppm)	LOQ (ppm)	(ppm)	(ppm)	(ppm)
7Li	0.009	0.030	4.4	0.475	0.381
11B	0.107	0.357	14	2.5	1.6
23Na	1.3	4.3	2,726	4,336	4,254
24Mg	0.021	0.070	2,085	1,990	1,457
27Al	0.167	0.557	17,306	1,333	735
31P	40	133	11,816	14,641	13,723
39K	6.1	20	15,790	14,763	12,142
44Ca	104	347	6,620	3,710	1,747
49Ti	0.392	1.3	1,424	84	58
51V	0.062	0.207	42	2.0	1.3
52Cr	1.2	4.0	335	15	7.0
55Mn	0.008	0.027	181	102	70
57Fe	1.9	6.3	10,239	752	413
59Co	0.010	0.033	17	1.1	0.789
60Ni	0.050	0.167	540	20	9.6
63Cu	0.010	0.033	26	20	20
66Zn	0.450	1.5	239	336	253
75As	0.502	1.7	4.0	<0.502	<0.502
77Se	0.360	1.2	47	8.3	8.0
88Sr	0.001	0.003	25	10	4.9
95Mo	0.001	0.003	2.6	0.552	0.544
107Ag	0.001	0.003	0.279	0.148	0.122
111Cd	0.128	0.427	109	1.5	1.5
118Sn	0.030	0.100	2.3	0.729	0.143
121Sb	0.004	0.013	0.710	0.140	0.043
137Ba	0.001	0.003	562	74	63
202Hg	0.022	0.073	0.211	0.105	0.098
205Tl	0.001	0.003	0.426	0.040	0.032
208Pb	0.001	0.003	3.7	0.387	0.294
238U	0.001	0.003	0.530	0.101	0.093

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	LC_DC1_INV-2_2021-09-07			LC_DCEF_INV-2_2021-09-07			LC_DC3_INV-2_2021-09-10		
	Lab ID	250			255			267		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.009	0.440	0.548	22	0.372	0.253	38	1.4	1.4	0.0
11B	0.107	1.9	2.2	15	1.0	0.872	-	3.6	3.4	5.7
23Na	1.3	3,211	4,233	28	3,491	2,723	25	3,250	3,228	0.7
24Mg	0.021	1,129	1,452	25	1,368	1,021	29	1,865	1,967	5.3
27Al	0.167	820	1,075	27	204	190	7.1	4,030	3,963	1.7
31P	40	9,057	12,442	32	12,775	9,990	25	13,774	12,720	8.0
39K	6.1	8,119	9,848	19	13,454	8,980	40	11,530	11,511	0.2
44Ca	104	2,521	2,996	17	2,053	1,893	8.1	4,900	4,316	13
49Ti	0.392	45	67	39	14	10	33	348	365	4.8
51V	0.062	2.0	2.6	26	1.3	0.906	36	8.7	8.3	4.7
52Cr	1.2	19	27	35	8.0	7.0	-	43	50	15
55Mn	0.008	59	71	19	36	28	25	86	88	2.3
57Fe	1.9	816	1,115	31	266	223	18	1,866	2,038	8.8
59Co	0.010	1.3	1.8	32	0.498	0.492	1.2	3.3	3.8	14
60Ni	0.050	41	56	31	10	8.9	12	77	94	20
63Cu	0.010	12	13	8.0	19	19	0.0	18	19	5.4
66Zn	0.450	158	178	12	166	166	0.0	318	332	4.3
75As	0.502	0.547	0.595	-	0.700	0.589	-	0.792	0.708	-
77Se	0.360	8.8	11	22	7.3	6.8	7.1	10	9.6	4.1
88Sr	0.001	3.7	4.4	17	2.8	2.1	29	11	11	0.0
95Mo	0.001	0.383	0.435	13	0.346	0.379	9.1	0.508	0.526	3.5
107Ag	0.001	0.065	0.078	18	0.102	0.098	4.0	0.183	0.193	5.3
111Cd	0.128	3.1	3.5	12	4.9	4.6	6.3	1.4	1.5	6.9
118Sn	0.030	0.638	0.767	18	0.630	0.702	11	0.476	0.519	8.6
121Sb	0.004	0.059	0.073	21	0.051	0.054	5.7	0.234	0.201	15
137Ba	0.001	80	95	17	64	49	27	143	144	0.7
202Hg	0.022	0.033	0.033	-	0.043	0.052	-	0.077	0.056	-
205Tl	0.001	0.049	0.058	17	0.019	0.019	0.0	0.105	0.098	6.9
208Pb	0.001	0.201	0.256	24	0.121	0.117	3.4	0.892	0.926	3.7
238U	0.001	0.062	0.081	27	0.059	0.041	36	0.296	0.260	13

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	LC_DCDS_INVPLE-2_2021-09-10			LC_GRCK_INV-5_2021-09-13			LC_GRCK_INV-4_2021-09-13		
	Lab ID	275			284			285		
Parameter	DL (ppm)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)	Sample (ppm)	Sample Duplicate (ppm)	RPD (%)
7Li	0.009	0.799	0.907	13	0.475	0.473	0.4	0.381	0.408	6.8
11B	0.107	2.3	2.8	20	2.5	2.3	8.3	1.6	1.6	0.0
23Na	1.3	4,194	3,967	5.6	4,336	4,510	3.9	4,254	4,692	9.8
24Mg	0.021	1,739	1,665	4.3	1,990	2,033	2.1	1,457	1,491	2.3
27Al	0.167	2,022	2,417	18	1,333	1,297	2.7	735	899	20
31P	40	15,253	14,023	8.4	14,641	14,448	1.3	13,723	12,790	7.0
39K	6.1	16,696	16,281	2.5	14,763	15,512	4.9	12,142	11,690	3.8
44Ca	104	3,083	3,267	5.8	3,710	3,359	9.9	1,747	1,816	3.9
49Ti	0.392	160	228	35	84	68	21	58	46	23
51V	0.062	4.2	4.9	15	2.0	1.7	16	1.3	1.3	0.0
52Cr	1.2	24	26	8.0	15	8.8	-	7.0	6.4	-
55Mn	0.008	55	54	1.8	102	83	21	70	99	34
57Fe	1.9	1,003	1,140	13	752	638	16	413	449	8.4
59Co	0.010	1.7	1.8	5.7	1.1	0.879	22	0.789	0.891	12
60Ni	0.050	55	55	0.0	20	21	4.9	9.6	9.7	1.0
63Cu	0.010	17	17	0.0	20	21	4.9	20	24	18
66Zn	0.450	212	198	6.8	336	341	1.5	253	328	26
75As	0.502	0.864	0.810	-	<0.502	<0.502	-	<0.502	<0.502	-
77Se	0.360	6.2	6.1	1.6	8.3	8.8	5.8	8.0	8.4	4.9
88Sr	0.001	5.4	5.8	7.1	10	8.2	20	4.9	6.2	23
95Mo	0.001	0.564	0.529	6.4	0.552	0.644	15	0.544	0.462	16
107Ag	0.001	0.208	0.236	13	0.148	0.129	14	0.122	0.113	7.7
111Cd	0.128	1.5	1.5	0.0	1.5	1.5	0.0	1.5	1.4	6.9
118Sn	0.030	0.502	0.459	8.9	0.729	0.558	27	0.143	0.147	-
121Sb	0.004	0.110	0.115	4.4	0.140	0.135	3.6	0.043	0.052	19
137Ba	0.001	67	79	16	74	60	21	63	67	6.2
202Hg	0.022	0.073	0.065	-	0.105	0.089	-	0.098	0.091	-
205Tl	0.001	0.063	0.080	24	0.040	0.039	2.5	0.032	0.034	6.1
208Pb	0.001	0.517	0.553	6.7	0.387	0.350	10	0.294	0.314	6.6
238U	0.001	0.120	0.136	13	0.101	0.085	17	0.093	0.096	3.2

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	0.009	1.21	1.3	112	6.2	1.3	106	14
11B	0.107	4.5	4.3	95	3.8	5.2	116	2.7
23Na	1.3	14,000	15,830	113	5.7	15,230	109	1.3
24Mg	0.021	910	1,030	113	3.6	1,019	112	1.2
27Al	0.167	197.2	195	99	5.0	206	104	7.9
31P	40	8,000	8,684	108	3.6	8,447	106	2.3
39K	6.1	15,500	17,090	110	5.9	16,904	109	1.9
44Ca	104	2,360	2,588	110	5.7	2,718	115	2.3
49Ti	0.392	12.24	11	91	6.0	12	102	16
51V	0.062	1.57	1.7	106	8.3	1.7	108	9.6
52Cr	1.2	1.87	1.9	100	17	1.9	103	11
55Mn	0.008	3.17	3.5	112	4.9	3.6	113	2.5
57Fe	1.9	343	371	108	4.5	399	116	2.7
59Co	0.010	0.25	0.282	113	5.8	0.279	111	2.4
60Ni	0.050	1.34	1.4	104	7.8	1.6	120	2.8
63Cu	0.010	15.7	17	109	6.4	19	118	2.9
66Zn	0.450	51.6	57	110	6.6	59	115	5.2
75As	0.502	6.87	7.5	109	3.4	7.3	106	3.1
77Se	0.360	3.45	3.7	108	6.1	3.6	104	4.3
88Sr	0.001	10.1	11	110	6.8	12	114	3.9
95Mo	0.001	0.29	0.348	120	7.8	0.316	109	11
107Ag	0.001	0.0252	0.028	112	7.7	0.032	127	0.0
111Cd	0.128	0.299	0.368	123	5.5	0.348	116	14
118Sn	0.030	0.061	0.066	109	10	0.060	99	9.5
121Sb	0.004	0.011	0.011	100	0.0	0.013	120	0.0
137Ba	0.001	8.6	8.5	99	6.2	9.7	112	2.8
202Hg	0.022	0.412	0.432	105	9.4	0.439	107	6.9
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.450	111	16	0.472	117	12
238U	0.001	0.05	0.051	102	4.8	0.058	117	11

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	0.009	1.21	1.4	119	4.6	1.2	97	9.2
11B	0.107	4.5	5.4	120	3.9	5.6	124	3.6
23Na	1.3	14,000	15,604	112	4.4	14,101	101	10
24Mg	0.021	910	1,010	111	5.2	950	104	9.9
27Al	0.167	197.2	234	119	9.6	240	122	7.6
31P	40	8,000	8,406	105	6.2	8,176	102	7.6
39K	6.1	15,500	17,116	110	2.7	16,145	104	11
44Ca	104	2,360	2,716	115	5.2	2,380	101	6.5
49Ti	0.392	12.24	15	123	14	15	126	17
51V	0.062	1.57	1.8	117	5.2	1.7	107	13
52Cr	1.2	1.87	2.0	105	6.3	2.0	106	8.5
55Mn	0.008	3.17	3.8	118	7.2	3.3	103	6.1
57Fe	1.9	343	406	118	4.3	362	106	7.7
59Co	0.010	0.25	0.301	120	4.8	0.269	107	7.7
60Ni	0.050	1.34	1.6	122	4.0	1.5	112	6.3
63Cu	0.010	15.7	20	125	5.0	18	112	4.5
66Zn	0.450	51.6	62	120	4.2	56	109	2.6
75As	0.502	6.87	7.3	106	2.1	7.0	101	9.6
77Se	0.360	3.45	3.8	107	0.0	3.6	105	7.9
88Sr	0.001	10.1	12	117	5.3	10	101	11
95Mo	0.001	0.29	0.323	111	5.7	0.286	99	6.3
107Ag	0.001	0.0252	0.031	124	9.8	0.027	108	9.8
111Cd	0.128	0.299	0.353	118	9.0	0.344	115	11
118Sn	0.030	0.061	0.071	117	19	0.049	80	8.1
121Sb	0.004	0.011	0.011	100	32	0.013	118	20
137Ba	0.001	8.6	9.7	113	7.0	10	122	2.8
202Hg	0.022	0.412	0.419	102	6.5	0.442	107	9.9
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.430	106	7.7	0.396	98	17
238U	0.001	0.05	0.056	112	6.2	0.049	99	17

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	0.009	1.21	1.5	123	5.9	1.3	110	2.4
11B	0.107	4.5	5.4	119	4.6	5.3	118	2.0
23Na	1.3	14,000	16,601	119	4.6	14,866	106	5.7
24Mg	0.021	910	1,118	123	5.7	966	106	4.6
27Al	0.167	197.2	249	126	5.7	214	109	4.1
31P	40	8,000	9,161	114	7.6	8,526	107	5.0
39K	6.1	15,500	18,714	121	3.9	16,225	105	5.5
44Ca	104	2,360	2,826	120	4.7	2,468	105	6.8
49Ti	0.392	12.24	15	122	17	14	113	11
51V	0.062	1.57	1.7	105	9.9	1.6	104	11
52Cr	1.2	1.87	1.9	100	15	1.9	103	9.4
55Mn	0.008	3.17	4.0	125	6.0	3.4	108	4.5
57Fe	1.9	343	426	124	4.2	361	105	5.5
59Co	0.010	0.25	0.321	128	1.5	0.260	104	7.4
60Ni	0.050	1.34	1.6	122	2.9	1.4	107	5.4
63Cu	0.010	15.7	20	126	4.3	17	106	3.7
66Zn	0.450	51.6	62	121	5.5	57	110	2.3
75As	0.502	6.87	7.9	115	5.4	7.0	103	3.2
77Se	0.360	3.45	3.8	110	3.2	3.8	110	3.3
88Sr	0.001	10.1	12	121	3.7	11	106	9.0
95Mo	0.001	0.29	0.356	123	5.3	0.319	110	8.6
107Ag	0.001	0.0252	0.032	127	6.9	0.026	103	7.2
111Cd	0.128	0.299	0.373	125	6.6	0.339	113	7.2
118Sn	0.030	0.061	0.072	118	5.5	0.062	102	18
121Sb	0.004	0.011	0.013	118	17	0.013	118	16
137Ba	0.001	8.6	10	120	4.2	9.9	115	1.3
202Hg	0.022	0.412	0.471	114	8.7	0.446	108	4.1
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.414	103	7.6	0.441	109	17
238U	0.001	0.05	0.057	114	6.1	0.053	107	9.4

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	07			08		
Parameter	DL (ppm)	Certified Conc. (ppm)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)	Mean Estimated Conc. (ppm)	Accuracy (%)	Precision RSD (%)
7Li	0.009	1.21	1.3	107	8.1	1.2	100	5.8
11B	0.107	4.5	5.0	111	3.0	4.6	102	3.4
23Na	1.3	14,000	15,005	107	3.9	13,316	95	4.7
24Mg	0.021	910	978	108	6.4	892	98	4.7
27Al	0.167	197.2	226	114	4.9	190	96	5.4
31P	40	8,000	8,742	109	4.0	7,604	95	3.7
39K	6.1	15,500	16,802	108	3.8	14,874	96	4.8
44Ca	104	2,360	2,543	108	2.9	2,337	99	0.7
49Ti	0.392	12.24	14	118	7.3	13	103	9.4
51V	0.062	1.57	1.6	103	7.8	1.6	99	7.2
52Cr	1.2	1.87	2.0	106	1.8	1.8	98	4.5
55Mn	0.008	3.17	3.5	109	4.4	3.1	99	3.9
57Fe	1.9	343	380	111	4.3	337	98	4.1
59Co	0.010	0.25	0.266	106	3.7	0.247	99	2.4
60Ni	0.050	1.34	1.5	108	4.5	1.3	98	5.4
63Cu	0.010	15.7	17	108	2.9	16	101	5.3
66Zn	0.450	51.6	57	111	4.1	52	100	3.4
75As	0.502	6.87	7.4	107	2.0	6.7	98	4.1
77Se	0.360	3.45	3.6	104	7.9	3.6	104	4.3
88Sr	0.001	10.1	11	108	2.8	10	99	4.7
95Mo	0.001	0.29	0.294	101	12	0.331	114	10
107Ag	0.001	0.0252	0.027	105	3.7	0.026	104	9.3
111Cd	0.128	0.299	0.318	106	9.6	0.331	111	18
118Sn	0.030	0.061	0.062	101	8.8	0.052	86	15
121Sb	0.004	0.011	0.011	100	17	0.013	114	14
137Ba	0.001	8.6	9.4	109	3.7	8.9	103	2.2
202Hg	0.022	0.412	0.434	105	6.0	0.415	101	6.8
205Tl	0.001	0.0013	-	-	-	-	-	-
208Pb	0.001	0.404	0.402	99	5.5	0.385	95	9.3
238U	0.001	0.05	0.049	98	8.4	0.050	99	6.6

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.

Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
01	LC_DC4_INV-1_2021-09-09	228	01 Oct 2021
	LC_DC4_INV-2_2021-09-09	229	
	LC_DC4_INV-3_2021-09-09	230	
	LC_DC4_INV-4_2021-09-09	231	
	LC_DC4_INV-5_2021-09-09	232	
	LC_DC2_INV-1_2021-09-09	233	
	LC_DC2_INV-2_2021-09-09	234	
	LC_DC2_INV-3_2021-09-09	235	
	LC_DC2_INV-4_2021-09-09	236	
02	LC_DC2_INV-5_2021-09-09	237	01 Oct 2021
	LC_FRB_INV-1_2021-09-12	238	
	LC_FRB_INV-2_2021-09-12	239	
	LC_FRB_INV-3_2021-09-12	240	
	LC_FRUS_INV-1_2021-09-12	241	
	LC_FRUS_INV-2_2021-09-12	242	
	LC_FRUS_INV-3_2021-09-12	243	
	LC_FRUS_INV-4_2021-09-12	244	
	LC_FRUS_INV-5_2021-09-12	245	
03	LC_GRCK_INV-1_2021-09-13	246	01 Oct 2021
	LC_GRCK_INV-2_2021-09-13	247	
	LC_GRCK_INV-3_2021-09-13	248	
	LC_DC1_INV-1_2021-09-07	249	
	LC_DC1_INV-2_2021-09-07	250	
	LC_DC1_INV-3_2021-09-07	251	
	LC_DC1_INV-4_2021-09-07	252	
	LC_DCEF_INV-1_2021-09-07	254	
04	LC_DC1_INV-5_2021-09-07	253	06 Oct 2021
05	LC_DCEF_INV-2_2021-09-07	255	04 Oct 2021
	LC_DCEF_INV-3_2021-09-07	256	
	LC_DCEF_INV-4_2021-09-07	257	
	LC_DCEF_INV-5_2021-09-07	258	
	LC_FRB_INV-4_2021-09-11	259	
	LC_FRB_INV-5_2021-09-11	260	
	LC_DCDS_INV_1_2021-09-10	261	
	LC_DCDS_INV_2_2021-09-10	262	
	LC_DCDS_INV_3_2021-09-10	263	
06	LC_DCDS_INV_4_2021-09-10	264	04 Oct 2021
	LC_DCDS_INV_5_2021-09-10	265	
	LC_DC3_INV-1_2021-09-10	266	
	LC_DC3_INV-4_2021-09-10	269	

Sample Group Information

Sample Group ID	Client ID	Lab ID	Date of Analysis
06	LC_DC3_INV-5_2021-09-10	270	04 Oct 2021
	LC_DCDS_INVRHY-1_2021-09-10	271	
	LC_DCDS_INVRHY-2_2021-09-10	272	
	LC_DCDS_INVRHY-3_2021-09-10	273	
	LC_DCDS_INVPLE-1_2021-09-10	274	
07	LC_DC3_INV-2_2021-09-10	267	05 Oct 2021
	LC_DC3_INV-3_2021-09-10	268	
	LC_DC3_INVRHY-1_2021-09-10	277	
	LC_DC3_INVRHY-2_2021-09-10	278	
	LC_DC3_INVRHY-3_2021-09-10	279	
	LC_DC3_INVPLE-1_2021-09-10	280	
	LC_DC3_INVPLE-3_2021-09-10	282	
	LC_GRCK_INV-4_2021-09-13	285	
08	LC_DCDS_INVPLE-2_2021-09-10	275	04 Oct 2021
	LC_DCDS_INVPLE-3_2021-09-10	276	
	LC_DC3_INVPLE-2_2021-09-10	281	
	LC_DC2_INVOLI-1_2021-09-09	283	
	LC_GRCK_INV-5_2021-09-13	284	

T r i c h A n a l y t i c s I n c. 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: DRY CREEK LAEMP (21-35) (PO 748530)

Company Name:	Teck Coal Limited	Company Name:	Minnow Environmental
Contact Name:	Mike Pope	Contact Name:	Dave Hasek
Address:	421 Pine Avenue	Address:	204 - 1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250-425-7642	Phone:	(778) 677 - 3500
Email:	mike.pope@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

Trich ID		Sample Identification:	Sample Type:	
			Species	Sample type
228	1	LC_DC4_INV-1_2021-09-09	Composite	Composite-taxa benthic invertebrate tissue samples
229	2	LC_DC4_INV-2_2021-09-09	Composite	Composite-taxa benthic invertebrate tissue samples
230	3	LC_DC4_INV-3_2021-09-09	Composite	Composite-taxa benthic invertebrate tissue samples
231	4	LC_DC4_INV-4_2021-09-09	Composite	Composite-taxa benthic invertebrate tissue samples
232	5	LC_DC4_INV-5_2021-09-09	Composite	Composite-taxa benthic invertebrate tissue samples
233	6	LC_DC2_INV-1_2021-09-09	Composite	Composite-taxa benthic invertebrate tissue samples
234	7	LC_DC2_INV-2_2021-09-09	Composite	Composite-taxa benthic invertebrate tissue samples
235	8	LC_DC2_INV-3_2021-09-09	Composite	Composite-taxa benthic invertebrate tissue samples
236	9	LC_DC2_INV-4_2021-09-09	Composite	Composite-taxa benthic invertebrate tissue samples
237	10	LC_DC2_INV-5_2021-09-09 *	Composite	Composite-taxa benthic invertebrate tissue samples
238	11	LC_FRB_INV-1_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
239	12	LC_FRB_INV-2_2021-09-12 **	Composite	Composite-taxa benthic invertebrate tissue samples
240	13	LC_FRB_INV-3_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
241	14	LC_FRUS_INV-1_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
242	15	LC_FRUS_INV-2_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
243	16	LC_FRUS_INV-3_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
244	17	LC_FRUS_INV-4_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
245	18	LC_FRUS_INV-5_2021-09-12	Composite	Composite-taxa benthic invertebrate tissue samples
246	19	LC_GRCK_INV-1_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
247	20	LC_GRCK_INV-2_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples

Sample(s) Released By:	Sample(s) Received By: Elliot Howell
Signature:	Signature: (Proj 2021-257)
Date Sent:	Date Received: 28 Sep 2021
Sample(s) Returned to Client By:	Shipping Conditions:
	Shipping Container:
Signature:	Date Sent:

aw 4 Oct 2021

* 3 containers recieved ; Sample IDs confirmed by client

* * client requested sample to be subsampled from 240

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: DRY CREEK LAEMP (21-35) (PO 748530)

Company Name:	Teck Coal Limited	Company Name:	Minnow Environmental
Contact Name:	Mike Pope	Contact Name:	Dave Hasek
Address:	421 Pine Avenue	Address:	204 - 1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250-425-7642	Phone:	(778) 677 - 3500
Email:	mike.pope@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

Trich ID		Sample Identification:	Sample Type:	
			Species	Sample type
248	21	LC_GRCK_INV-3_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
249	22	LC_DC1_INV-1_2021-09-07	Composite	Composite-taxa benthic invertebrate tissue samples
250	23	LC_DC1_INV-2_2021-09-07	Composite	Composite-taxa benthic invertebrate tissue samples
251	24	LC_DC1_INV-3_2021-09-07	Composite	Composite-taxa benthic invertebrate tissue samples
252	25	LC_DC1_INV-4_2021-09-07	Composite	Composite-taxa benthic invertebrate tissue samples
253	26	LC_DC1_INV-5_2021-09-07 *	Composite	Composite-taxa benthic invertebrate tissue samples
254	27	LC_DCEF_INV-1_2021-09-07	Composite	Composite-taxa benthic invertebrate tissue samples
255	28	LC_DCEF_INV-2_2021-09-07	Composite	Composite-taxa benthic invertebrate tissue samples
256	29	LC_DCEF_INV-3_2021-09-07	Composite	Composite-taxa benthic invertebrate tissue samples
257	30	LC_DCEF_INV-4_2021-09-07	Composite	Composite-taxa benthic invertebrate tissue samples
258	31	LC_DCEF_INV-5_2021-09-07	Composite	Composite-taxa benthic invertebrate tissue samples
259	32	LC_FRB_INV-4_2021-09-11	Composite	Composite-taxa benthic invertebrate tissue samples
260	33	LC_FRB_INV-5_2021-09-11	Composite	Composite-taxa benthic invertebrate tissue samples
261	34	LC_DCDS_INV_1_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
262	35	LC_DCDS_INV_2_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
263	36	LC_DCDS_INV_3_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
264	37	LC_DCDS_INV_4_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
265	38	LC_DCDS_INV_5_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
266	39	LC_DC3_INV-1_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
267	40	LC_DC3_INV-2_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples

Sample(s) Released By:	Sample(s) Received By: Elliot Howell
Signature:	Signature: (Proj 2021-257)
Date Sent:	Date Received: 28 Sep 2021
Sample(s) Returned to Client By:	Shipping Conditions: Shipping Container:
Signature:	Date Sent:

aw
04 oct 2021
* missing sample

EPH
05 oct 2021
* Sample 237B assigned to 253
confirmed by client

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: DRY CREEK LAEMP (21-35) (PO 748530)			
Company Name:	Teck Coal Limited	Company Name:	Minnow Environmental
Contact Name:	Mike Pope	Contact Name:	Dave Hasek
Address:	421 Pine Avenue	Address:	204 - 1006 Fort Street
City, Province:	Sparwood, BC	City, Province:	Victoria, BC
Postal Code:	V0B 2G0	Postal Code:	V8V 3K4
Phone:	250-425-7642	Phone:	(778) 677 - 3500
Email:	mike.pope@teck.com	Email:	dhasek@minnow.ca

Sample Analysis Requested

Trich ID		Sample Identification:	Sample Type:	
			Species	Sample type
268	41	LC_DC3_INV-3_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
269	42	LC_DC3_INV-4_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
270	43	LC_DC3_INV-5_2021-09-10	Composite	Composite-taxa benthic invertebrate tissue samples
271	44	LC_DCDS_INVRHY-1_2021-09-10	Single Taxon	Benthic invertebrate tissue samples
272	45	LC_DCDS_INVRHY-2_2021-09-10	Single Taxon	Benthic invertebrate tissue samples
273	46	LC_DCDS_INVRHY-3_2021-09-10	Single Taxon	Benthic invertebrate tissue samples
274	47	LC_DCDS_INVPLE-1_2021-09-10	Single Taxon	Benthic invertebrate tissue samples
275	48	LC_DCDS_INVPLE-2_2021-09-10	Single Taxon	Benthic invertebrate tissue samples
276	49	LC_DCDS_INVPLE-3_2021-09-10	Single Taxon	Benthic invertebrate tissue samples
277	50	LC_DC3_INVRHY-1_2021-09-10	Single Taxon	Benthic invertebrate tissue samples
278	51	LC_DC3_INVRHY-2_2021-09-10	Single Taxon	Benthic invertebrate tissue samples
279	52	LC_DC3_INVRHY-3_2021-09-10	Single Taxon	Benthic invertebrate tissue samples
280	53	LC_DC3_INVPLE-1_2021-09-10	Single Taxon	Benthic invertebrate tissue samples
281	54	LC_DC3_INVPLE-2_2021-09-10	Single Taxon	Benthic invertebrate tissue samples
282	55	LC_DC3_INVPLE-3_2021-09-10	Single Taxon	Benthic invertebrate tissue samples
283	56	LC_DC2_INVOLI-1_2021-09-09 *	Single Taxon	Benthic invertebrate tissue samples
285	57	LC_GRCK_INV-4_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples
284	58	LC_GRCK_INV-5_2021-09-13	Composite	Composite-taxa benthic invertebrate tissue samples

Sample(s) Released By:	Sample(s) Received By: Jennie Christensen
Signature:	Signature: JChristensen
Date Sent:	Date Received: 01 Oct 2021.
Sample(s) Returned to Client By:	Shipping Conditions: Frozen
	Shipping Container: Cooler.
Signature:	Date Sent:

aw 04 Oct 2021 * sample 237 (LC-DC2_INV-5-2021-09-09) reassigned to 283 as client requested