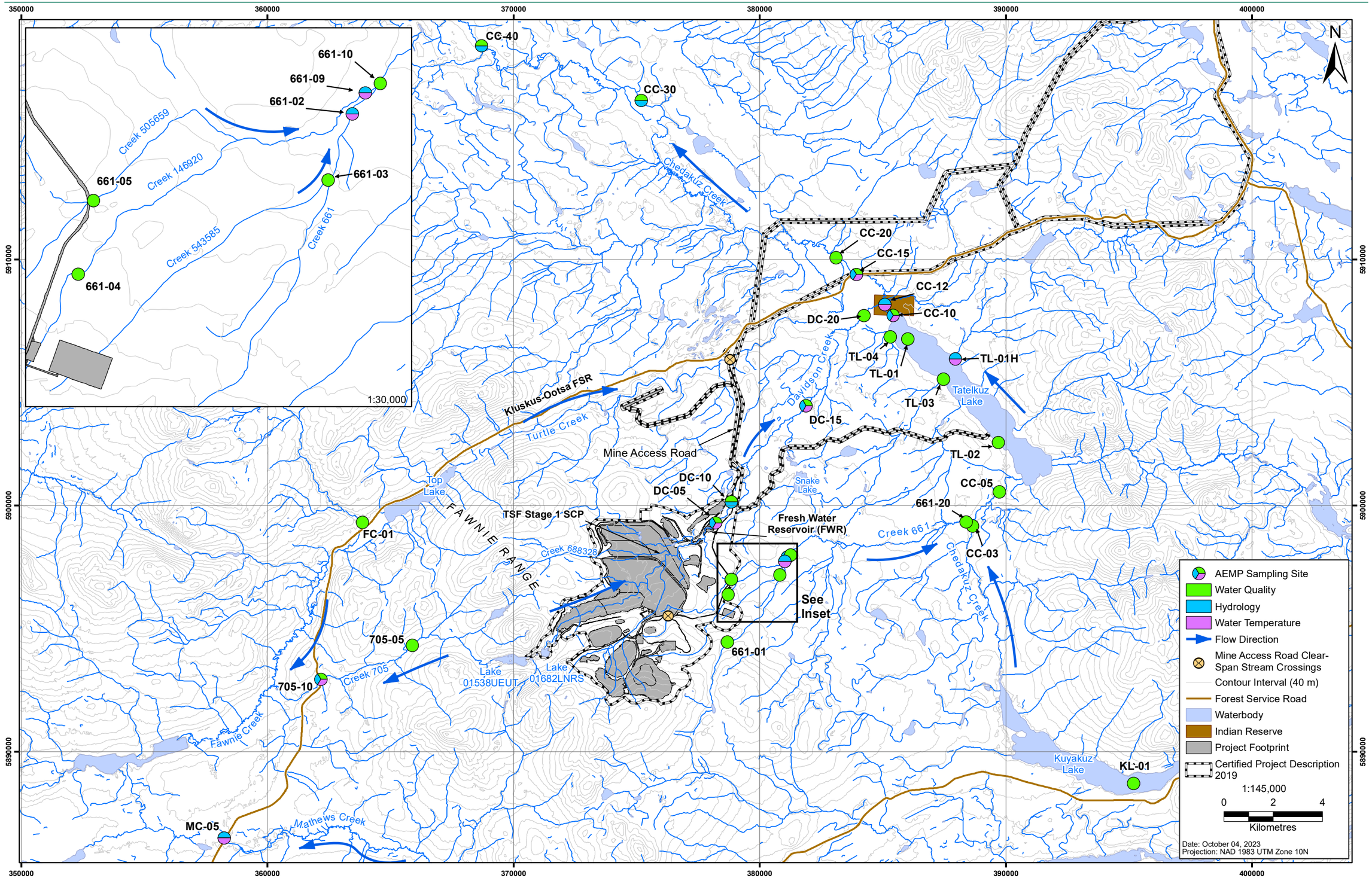


Figure 1-1: Aquatic Effects Monitoring Program Sampling Locations, Federal Decision Statement Condition 3.15.1 and 3.15.2

2.0 Monitoring Flows and Temperature in Davidson Creek (3.15.1)

The DS Condition 3.15.1 requires the Proponent to monitor water flows in Davidson Creek during the open water season from construction until decommissioning, and temperature continuously from construction until decommissioning.

Surface water flows (hydrology) and temperature in Davidson Creek were monitored during the open water season during the early works construction activities (October 1, 2022, to March 31, 2023) in accordance with the AEMP Plan (Section 4.3 and Section 4.4 of the AEMP Plan). The results of the 2022 hydrology and surface water temperature monitoring program are reported in the 2022 AEMP Cumulative Baseline Report (see Appendix A in ERM 2023) and summarized below. The January to March 2023 hydrology and surface water temperature monitoring results will be provided in the 2023 Hydrology and Water Temperature report. The associated follow-up program DS Conditions 2.5, 2.6, 2.9, and 2.10 are not addressed in this report because of the relatively short duration of early works activities. An assessment of hydrology and water temperature effects will be completed following the completion of, at minimum, one year of monitoring data following effluent discharge over a full range of flow conditions.

Hydrology can be an important driver of stream water quality, as snowmelt or storm runoff can transport sediment into surface water bodies. High rainfall or snowmelt can also result in dilution, decreasing concentrations of dissolved solids. Base flows in the Project area are typically characterized by high spring flows driven by snowmelt (freshet), low summer flows sustained by groundwater inflows and periodic rainfall events, followed by smaller fall rainfall events (see Appendix A in ERM 2023). Winter flows are typically very low due to freezing conditions.

The typical annual hydrograph also observed in 2022 for the site has an unimodal shape, with the peak occurring in May or June. One year on record, 2016, shows a bimodal shape with an initial peak in the spring due to snowmelt followed by a pronounced second peak in the summer due to unusually wet conditions. The hydrographs for 2019 and 2020 appear to have three high flow periods, with a primary peak during the spring freshet period followed by unusually high flow periods in July and again in the fall (see Appendix A in ERM 2023).

3.0 Monitoring Water Quality in Davidson Creek, Creek 661, and Chedakuz Creek for Contaminants of Potential Concern (3.15.2)

3.1 Decision Statement Condition Requirements

Condition 3.15.2 requires the monitoring of water quality in Davidson Creek, Creek 661, and Chedakuz Creek for contaminants of potential concern (COPCs[1]), including those identified in Table 5 of the Environmental Assessment report (CEA Agency 2019), during all phases of the Project.

3.2 Field Methods

Surface water quality samples will be collected at sites downstream from the mine site, as indicated in Table 3.2-1 (Figure 1-1). Water quality samples will be collected at each of the sites in accordance with the AEMP Plan (Section 4.4.2.2 of the AEMP Plan).

Table 3.2-1: Surface Water Quality Monitoring Locations and Sampling Frequency in Davidson Creek, Creek 661, and Chedakuz Creek

Watershed	2019 Water Quality Model Site ID[1]	2022 Water Quality Model Site ID[2]	AEMP Plan Site ID	Monthly	Quarterly	5-in-30
Davidson Creek	n/a	WQ28	DC-05	✓	-	✓
	n/a	WQ27	DC-10	✓	-	-
	WQ26	WQ26	DC-15	✓	-	-
	WQ7	WQ7	DC-20	✓	-	✓
Creek 661	n/a	n/a	661-01	✓	-	✓
	n/a	n/a	661-03	✓	-	-
	n/a	n/a	661-04	✓	-	-
	n/a	n/a	661-05	✓	-	-
	WQ5-US	WQ5	661-10	✓	-	✓
	WQ5-DS	CK661	661-20	-	✓	-
Chedakuz Creek	n/a	n/a	CC-03	✓	-	✓
	n/a	n/a	CC-05	-	✓	-
	WQ8	WQ8	CC-10	-	✓	-
	WQ9	WQ9	CC-15	✓	-	✓
	n/a	WQ13	CC-20	✓	-	✓
	n/a	Chedakuz Midway	CC-30	-	✓	✓
	n/a	Chedakuz Outlet	CC-40	✓	-	✓

[1] The federal DS uses the terminology “contaminant of potential concern” or COPC, while provincially the term “parameter of concern” or POC is used. COPC and POC are defined as parameters with concentrations greater than water quality guidelines or parameters that have been identified as “special-case” parameters. For simplicity, COPC is the terminology used in this report.

Notes:

[1] Figure 4 in CEA Agency (2019).

[2] Lorax (2022a).

15-in-30 water sampling refers to the collection of 5 water samples in 30 days during spring freshet and fall rains and replaces the monthly or quarterly sample during the three months when the 5-in-30 samples are collected.

n/a = not applicable because the site was not included in the 2019 or 2022 water quality modelling and predicted water quality is not available for this site.

Dashes indicate sampling component is not completed at that site.

3.3 Data Analysis

3.3.1 Annual Monitoring

Surface water quality concentrations were analyzed as outlined in Section 4.4.2.3 of the AEMP Plan. For the purpose of data analysis and presentation, if a concentration is below the detection limit (DL) then half the DL was used during calculations of summary statistics (BC MOE 2016b).

3.3.1.1 Graphical Analysis

All field and laboratory analyzed water quality parameters for sites listed in Table 3.2-1 are graphically presented in Appendix A (field) and Appendix B (laboratory). Water quality results are presented as monthly means (and standard error if field duplicates or 5-in-30 sampling has been completed) to assess visual annual and seasonal trends in water quality and support statistical analysis. The water quality parameters analyzed are those that were identified as COPCs (BW Gold 2023): pH, total suspended solids (TSS), turbidity, total dissolved solids, chloride, fluoride, sulphate, ammonia-N, nitrate-N, nitrite-N, total phosphorus, cyanide (total and weak acid dissociable), total metals (aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, uranium, vanadium, and zinc); and dissolved metals (aluminum, cadmium, copper, iron, manganese, and zinc).

The October 2022 to March 31, 2023 stream water quality is characterized below. Differences between the baseline and monitored sampling period at receiving environment sites (and potentially impacted by construction activities) were noted for further analysis (see Section 3.3). Sampling sites were grouped by watershed for graphing and discussion purposes as follows:

- Davidson Creek watershed (DC-05, DC-10, DC-15, and DC-20)
- Creek 661 watershed (661-01 [upstream control], 661-05, 661-10, and 661-20)
- Chedakuz Creek watershed (Upper Chedakuz Creek – CC-03 and CC-05; Lower Chedakuz Creek – CC-10, CC-15, CC-20, CC30, CC-40)

A characterization of the regional control sites (705-05, 705-10, and FC-01) is provided for comparison.

Figures of analyzed water quality parameters for all AEMP monitored sites are provided in Appendix B. Figures include data collected up to March 31, 2023. The BC (ENV 2021a, 2021b) or federal (Canadian Council of Ministers of the Environment [CCME] 2022a) water quality guidelines for the protection of aquatic life (WQG-AL) in addition to the proposed Yinka Dene Water Law Standards (YDWL) are indicated where applicable (see Section 3.3.2).

Physical Parameters

pH

All stream sites were generally near-neutral to slightly alkaline with low to moderate sensitivity to acid inputs (Figure B-1). The lowest mean monthly pH values were observed at the furthest upstream sites in the Creek 661 and Davidson Creek watersheds, closest to the deposit. The October 2022 to March 2023 observed pH values were within the BC guideline range at all sampled sites.

Suspended Material

Total suspended solids and turbidity were generally low in Project streams (Figures B-2 and B-3). Suspended material was associated with the hydrological regime, with elevated TSS concentrations corresponding to elevated stream flows in April through June, depending on the year, representing freshet. During periods of increased runoff, such as freshet, sediment is deposited in Project streams, resulting in brief periods of elevated TSS concentrations.

In 2022, peaks in suspended material were also observed in October and November, at downstream sites Chedakuz Creek (Figure B-2). These peaks were likely related to fall rainfall events or in the case of CC-10 as a result of sample contamination by bottom sediments. Elevated mean monthly TSS concentrations and turbidity values during other months were restricted to individual sites and were typically the result of one sample weighting the average value.

Total Dissolved Solids

Total dissolved solids (TDS) was seasonally variable in Project streams and was generally inversely related to stream flows; the lowest mean TDS values were measured during freshet in May and June (Figure B-4). The reduction in TDS values during freshet and other high flow periods was more pronounced at the Davidson Creek sites and can be attributed to the dilution of surface waters as a result of snowmelt and rainfall runoff inputs to the streams.

Major Anions

Monthly mean concentrations of chloride, fluoride, and sulphate are presented in Figures B-5 to B-7. The 2022 and early 2023 concentrations of major anions were low in Project streams and did not exceed BC water quality guidelines in any stream samples during the early works construction period.

Chloride concentrations were typically less than detection (0.5 mg/L) with the exception of DC-20 in March 2023 and Chedakuz Creek sites (CC-10, and CC-40) in January and February 2022 and in February 2023 (CC-30) (Figure B-5). The late 2022 and early 2023 chloride concentrations were similar to concentrations observed during the 2016 to September 2022 baseline period.

Fluoride concentrations were comparable among all sites, except Chedakuz Creek sites monthly average fluoride concentrations were higher than other sampled sites (Figure B-6). The late 2022 and early 2023 monthly fluoride concentrations tended to be greater at Davidson Creek, Creek 661 sites, and the regional control site 705-10 when compared to the 2016 to September 2022 baseline period.

Sulphate concentrations were comparable among all sampled sites, except Chedakuz Creek sites with monthly average sulphate concentrations generally greater than other sampled sites (Figure B-7). The late 2022 and early 2023 monthly sulphate concentrations tended to be greater at Davidson Creek, Creek 661 sites, and control sites 705-10 and FC-01 when compared to the 2016 to September 2022 baseline period.

Nutrients and Organic Carbon

The nitrogen species assessed in Project streams included ammonia-N (Figure B-8), nitrate-N (Figure B-9), nitrite-N (Figure B-10). All nitrogen species were below applicable water quality guidelines from October to December 2022 and January to March 2023.

Ammonia-N concentrations were frequently below the detection. Generally, 2022 ammonia-N concentrations were similar or lower than the concentrations observed during the 2016 to September 2022 baseline period. (exception DC-05 in 2022; Figure B-8). Seasonal variability was observed in nitrate-N and nitrite-N concentrations; higher concentrations of both nitrogen species were typically observed during winter months (November to March). Nitrite-N concentrations were below detection at most stream sites through the summer, and at some sites were below detection year-round (e.g., DC-15, 661-10, 661-20, 705-05, 705-10, FC-01).

Total phosphorus concentrations varied by watershed (Figure B-11). Total phosphorus concentrations were highest at CC-10 (Chedakuz Creek) where mean values in the fall months were above the trigger value for eutrophic conditions (0.035 mg/L to 0.1 mg/L). Phosphorus concentrations at other stream sites were generally in the oligotrophic (0.004 mg/L to 0.01 mg/L) to mesotrophic (0.01 mg/L to 0.02 mg/L) range of values. Phosphorus concentrations tended to vary in 2022 and early 2023 when compared to the 2016 to September 2022 baseline period. and were typically highest in April and May.

Organic carbon concentrations were high across all Project stream sites (ERM 2023c). Organic carbon was predominantly observed as dissolved organic carbon (DOC; ERM 2023c). Organic carbon concentrations were seasonally variable; the highest concentrations of total organic carbon (TOC) and DOC were typically observed during freshet months (May and June). Elevated concentrations of organic carbon were also observed during late summer/early fall (September and October) during the 2016 to 2021 reporting period.

Cyanides

Monthly mean total cyanide concentrations were generally less than DL at all stream sites between October 2022 and March 2023 and as well as the baseline period (Figure B-12). Detectable concentrations of total cyanide were observed at CC-05 in October 2022 (a single sample of the 5-in-30 was 0.0118 mg/L) and at CC-15 in January 2023. Concentrations of weak acid dissociable (WAD) cyanide were below their DLs during the early works construction period and during the baseline (0.005 mg/L; Figure B-13).

Total and Dissolved Metals

For most metals, dissolved concentrations constituted a substantial proportion of the total concentration, indicating that metals were frequently in dissolved rather than particulate form (Figures B-14 to B-41). This observation was consistent with the generally low concentrations of TSS in Project streams and high TDS concentrations. Due to the high proportion of total metals in the dissolved form, metal concentrations followed a similar temporal pattern to that observed for TDS (Figure B-4). The main exception was aluminum (Figure B-14 and B-36). While both total and dissolved aluminum concentrations were elevated across all sites, a substantial proportion of aluminum was in the particulate form, and aluminum trends generally followed the same pattern as TSS (Figure B-2).

Geographical influences have been observed in the distribution of total and dissolved metal guideline exceedances; consequently, individual Project watersheds are discussed independently in the following sections.

Davidson Creek Watershed

Total and dissolved metals guideline exceedances were not observed in the Davidson Creek watershed during the 2022 to March 2023 early works construction period however in January 2023 the total aluminum and total iron WQG-AL was exceeded at DC-20 (see Section 3.3.2). The dissolved aluminum SBEB was not exceeded at any of the Davidson Creek sites (DC-05, DC-10, DC-15, and DC-20).

The mean monthly metal concentrations beginning in October 2022 to March 2023 at Davidson Creek watershed sites were generally similar to that observed during the 2016 to September 2022 baseline period. Exceptions to this were total and dissolved aluminum (Figures B-14 and B-36), total barium (Figure B-17), total beryllium (Figure B-18), total and dissolved iron (Figures B-24 and B-39), total and dissolved manganese (Figures B-26 and B-40), total molybdenum (Figure B-28), and total uranium (Figure B-33).

Consistent with other watersheds and the 2016 to 2021 baseline period, total and dissolved aluminum concentrations were elevated throughout Davidson Creek and followed a similar temporal pattern to TSS, unlike other metals which were dominated by the dissolved fraction. However, late 2022 and early 2023 total and dissolved aluminum concentrations during the early works construction period tended to be lower when compared to the 2016 to September 2022 baseline period (Figure B-14 and B-36).

With the exception of high flow (May, June, July) months, the 2022 monthly and early 2023 total barium, total molybdenum, and total uranium concentrations at Davidson Creek sites tended to be greater than monthly concentrations observed during the 2016 to September 2022 baseline period (Figures B-17).

Greater total and dissolved manganese monthly concentrations and total and dissolved iron were observed at DC-20 in 2022 and early 2023 when compared to the same months in the 2016 to September 2022 baseline period (Figures B-24, B-26, B-39, and B-40). The 2022 and early 2023 monthly total beryllium concentrations appeared to be lower in all months when compared to concentrations observed during the baseline period however this is a result of a higher DL in the years 2016 to 2020 (Figure B-18). Similar trends (lower concentrations in 2022 and early 2023 when compared to the baseline period) were observed for total and dissolved iron concentrations at sites DC-05, DC-10, and DC-15 (Figures B-24 and B-39).

Creek 661 Watershed

Similar to baseline years (2016 to September 2022), the guideline exceedances for total and dissolved metals during the early works construction period was observed in the Creek 661 watershed. Guideline exceedance was observed for total aluminum at site 661-01 in January 2023 and dissolved aluminum at site 661-01 in December 2022 and in January, February, and March of 2023 (see Section 3.3.2).

The 2022 mean monthly metal concentrations and seasonal trends at Creek 661 watershed sites were generally similar to those observed during the 2016 to September 2022 baseline period. Exceptions to this trend were total and dissolved aluminum (Figures B-14 and B-36), total beryllium (Figure B-18), total cadmium (Figure B-20), total molybdenum (Figure B-28), and total uranium (Figure B-33).

Total and dissolved aluminum concentrations followed a similar temporal pattern to TSS, unlike other metals which were dominated by the dissolved fraction. However, total and dissolved aluminum concentrations during the early works construction period tended to be lower when compared to the 2016 to September 2022 baseline period (Figures B-14 and B-36).

With the exception of May and June, the 2022 total beryllium concentrations tended to be less than the DL at all Creek 661 sites including the upstream control site, 661-01. Variable and elevated concentrations were observed for total beryllium in the 2016 to 2021 baseline period when compared to 2022 observations is a result of the greater DLs between 2016 and 2020 (Figure B-18).

Greater concentrations of total cadmium were observed at 661-10 when compared to the upstream sites 661-01 and 661-05 and downstream 661-20 (Figure B-20). Similar trends between sites were observed for the baseline and early works construction periods however concentrations tended to be greater during freshet (May and June) in 2022.

Greater total molybdenum, and total uranium (at 661-20) monthly concentrations were observed in 2022 when compared to the same months in the 2016 to 2022 baseline period (Figures B-28, and B-33). Elevated concentrations of total molybdenum and total uranium were observed during the early works construction activities when compared to the 2016 to September 2022 baseline period at all sites except for the upstream 661-01.

Chedakuz Creek Watershed

During the early works construction period, guideline exceedances were observed in Chedakuz Creek for total aluminum and total iron (see Section 3.3.2). At site CC-15 the proposed YDWL Standard for dissolved aluminum was exceeded in October 2022, and March 2023 (Figure B-36). At site CC-15 the proposed YDWL Standard for dissolved manganese was exceeded in December 2022, and January and March 2023 (Figure B-40).

The October 2022 to March 2023 mean monthly metal concentration and seasonal trends at Chedakuz Creek sites were generally similar to those observed during the 2016 to September 2022 baseline period. Exceptions to this were total and dissolved aluminum (Figures B-14 and B-36), total beryllium (Figure B-18), total molybdenum (Figure B-28), and total uranium (Figure B-33).

In addition, site CC-10, located at the outflow of Tatelkuz Lake, the following metals were elevated during the early works construction when compared to the 2016 to September 2022 baseline period: total and dissolved aluminum (Figures B-14 and B-36), total barium (Figure B-17), total cadmium (Figure B-20), total chromium (Figure B-21), total cobalt (Figure B-22), total copper (Figure B-23), total iron (Figure B-24), total lead (Figure B-25), total nickel (Figure B-29), and total vanadium (Figure B-34). This is likely related to the elevated TSS (and the likelihood the sample was contaminated by sediment) in the October and December samples collected at CC-10.

Similar to the other monitored watersheds, total and dissolved aluminum concentrations followed a similar temporal pattern to TSS, unlike other metals which were dominated by the dissolved fraction (with the exception of CC-10). However, with the exception of CC-10 the 2022 and early 2023 total and dissolved aluminum concentrations during the early works construction period tended to be lower when compared to the 2016 to September 2022 baseline period (Figures B-14 and B-36).

Total beryllium at all Chedakuz Creek sites was generally less than detection through the 2016 to 2021 baseline period. In 2022 and early 2023, the total beryllium concentration at sites was also less than the DL for all months however the DL was lower than in baseline years (Figure B-18).

Greater concentrations of total molybdenum, and total uranium were observed in late 2022 and early 2023 at the lower Chedakuz Creek sites (CC-10, CC-15, CC-20, CC-30, and CC-40) when compared to the 2016 to October 2022 baseline period (Figures B-21, B-28, and B-33). Elevated concentrations were observed during the early works construction activities when compared to the 2016 to September 2022 baseline period at sites CC-30 and CC-40 in addition to the two upper Chedakuz Creek sites CC-03 and CC-05.

Regional Control Sites

During the early works construction period, the dissolved aluminum WQG-AL was exceeded at site 705-10 (January 2023) the total iron WQG-AL was exceeded at site 705-05 (October 2022; see Section 3.3.2).

Similar to the potential impact stream sites, the 2022 and early 2023 mean monthly metal concentrations and seasonal trends at the regional control sites were generally similar to those observed during the 2016 to September 2022 baseline period. Total and dissolved aluminum concentrations followed a similar temporal pattern to TSS, unlike other metals which were dominated by the dissolved fraction. However, total and dissolved aluminum concentrations during the early works construction period tended to be lower when compared to the baseline period (Figures B-14 and B-36).

Mean monthly concentrations of total beryllium at the regional control sites appeared to be less in 2022 and early 2023 when compared to the 2016 to 2021 baseline period however this was related to a higher DL in baseline years when compared to 2022 (Figure B-18).

Elevated monthly concentrations of total molybdenum were also observed at the regional control sites in 2022 and early 2023 when compared to the baseline period (Figures B-28).

3.3.1.2 Before-After-Control-Impact Statistical Analysis

Methods

To further assess Project-related effects on surface water quality a before-after-control-impact (BACI) analysis was completed. Analysis was performed using R statistical computing package (R Core Team 2022).

Data transformations (e.g., log transformation) were completed if determined to be appropriate (e.g., to achieve random distribution of residuals). For all effects analyses, statistical results were considered unreliable if more than 70% of the values in the dataset for a parameter are below analytical DLs (i.e., highly censored data).

The BACI analysis introduces a class effect to a mixed model ANOVA, which is based on the classification of a site as an impact or a control site. To identify the sites and months that differ significantly, the mixed model ANOVA also included the fixed effects of period (before versus after) and month, and a random effect of year to account for variability in water quality data. For the period effect, data were grouped into one of two periods: before the start of early works construction (2016 to September 2022) or after the start of early works construction (October 2022 onwards).

A significant interaction between the (time) period and class effects reveals whether any before (baseline) - after (Construction or Operations phases) change in the mean parameter concentration that occurred in the exposure site has not occurred in the control site. The overall site (control versus impact) and period (before versus after) interaction significance (p-value less than the significance level (α) of 0.05) will be assessed using an F test. To reduce the number of false positives (Type I error) due to the large number of statistical tests conducted, a multiple test correction was applied to the significance level of 0.05.

It is hypothesized that if mine activities affected surface water quality, then there would be a significant change in surface water quality at near-field impact sites in comparison with baseline concentrations or control sites. However, if a change in the mean is detected by the before-after comparison, but the BACI analysis indicates that a parallel change also occurred at the control site (control versus impact), it is reasonable to conclude that this change is likely a natural phenomenon or unrelated to the Project activities. Similarly, if a change is detected at mid- or far-field sites but not at near-field sites or the control site, it is reasonable to conclude that this change is likely the result of non-Project activities (e.g., forestry or agricultural activities downstream of the Project and upstream of the sampling location).

A precautionary approach was used to determine if an effect is attributable to Project activities in cases of unexplained significant interactions using professional judgement, and/or field data to confirm significantly elevated or lower concentrations.

Results

The BACI analyses was completed for the Davidson Creek and Creek 661 watershed sites because early works construction in October to December 2022 was limited to clearing at the Plant Site (upstream of Davidson Creek and the Creek 661 tributaries - Creek 146920 and Creek 505659). Additional clearing in other areas of the mine site (e.g., mine site roads) was not initiated until March 2023. An assessment of effects was not completed at the Creek 661 sites downstream of the Camp (661-03, 661-04) because sites were sampled for the first time in July 2022.

The BACI analyses was limited to water quality parameters that were elevated (greater than the baseline 95th percentile for the months of October to March) in one or more months of the early works construction activities (October 2022 to March 2023). The monthly 95th percentile baseline and monthly mean concentrations during early construction works activities for sites DC-05, DC-10, DC-15, DC-20, 661-05, 661-10, 661-20 are provided in Appendix C-1.

Water quality parameters selected for BACI analysis were pH, TDS, fluoride, sulphate, nitrate-N, total phosphorus, orthophosphate, total arsenic, total barium, total iron, total manganese, total molybdenum, total strontium, total uranium, dissolved iron, and dissolved manganese. A BACI analysis was not completed for TSS, chloride, ammonia-N, nitrite-N (Davidson Creek), total antimony (Davidson Creek), total cobalt, total lead (Davidson Creek), total nickel (Creek 661), total selenium (Davidson Creek), total zinc (Davidson Creek), dissolved cadmium (Davidson Creek), dissolved copper (Davidson Creek), and dissolved zinc (Davidson Creek) because 70% of the observations were less than the analytical DL (Appendix C-2).

Results of the BACI of analysis are detailed in Appendix C-2 and summarized below.

Water quality parameters with a significant ($p < 0.05$) class (control versus impact) and period (before versus after) interaction indicated that changes in the parameter concentrations at monitored impact sites before and after early works construction was significantly different from the change at the control sites. Water quality parameters with significant class-period interactions were observed for only the Davidson Creek sites for fluoride, total manganese, and total uranium. For all other parameters analyzed the observed greater concentrations during the early works construction period was observed at both control and impact sites; therefore, it is not as a result of Project activities (Appendix C-2). Although there was a significant change in orthophosphate from the baseline period at all Davidson Creek and Creek 661 sites, a similar change was not observed for total phosphorus. Thus, the increase is likely related to annual variability.

There was a significant increase in fluoride concentrations at Davidson Creek impact sites during early construction works (October 2022 to March 2023) when compared to the baseline period that was not observed at the regional control sites (Figures 3.3-1 and 3.3-2; Appendix C-2). However, based on graphical analysis the fluoride concentrations at the Davidson Creek sites tended to be variable between October and March during baseline years. Monthly average fluoride concentrations during the early works construction were often less than the 95th percentile of the baseline month. Thus, the increase in fluoride concentrations is likely a result of annual variability and not Project-related effects.

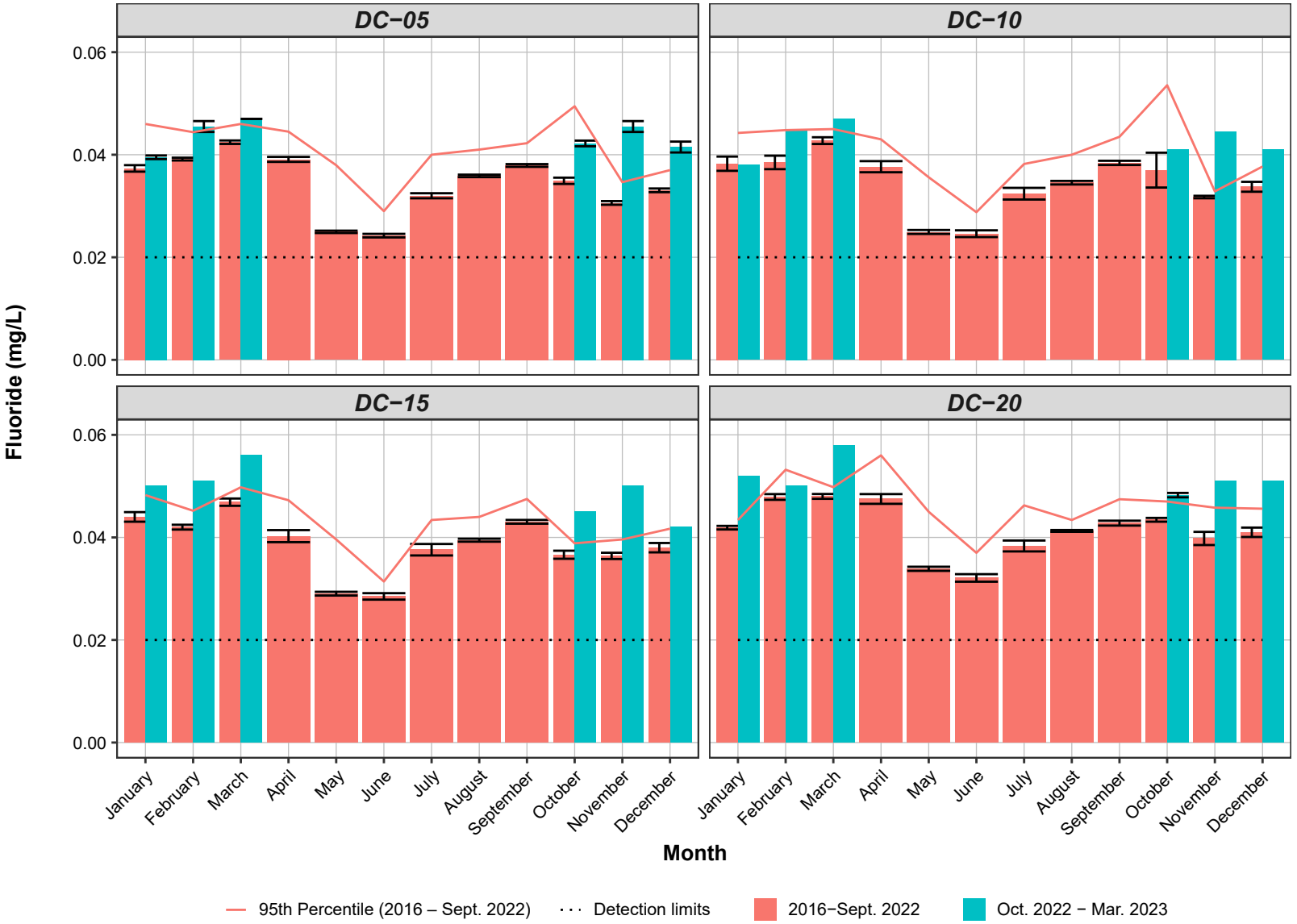
Total manganese concentrations during early construction works (October 2022 to March 2023) were generally greater than or similar to concentrations observed during the baseline period at all Davidson Creek sites (Figure 3.3-3). At the regional control sites, total manganese was variable in both the before and after periods (Figure 3.3-4). However, only at site DC-20 (a mid-field site) and not the near-field sites, elevated total manganese concentrations were observed during early works construction activities. Thus, the significant increase in total manganese is likely the result of non-Project activities (e.g., forestry or agricultural activities downstream of the Project and upstream of the DC-20).

There was an increase in total uranium concentrations at Davidson Creek impact sites during early construction works (October 2022 to March 2023) when compared to the baseline period that was not observed at the regional control sites (Figures 3.3-5 and 3.3-6; Appendix C-2). Based on the graphical analysis the elevated total uranium concentrations at the Davidson Creek sites were restricted to the early works construction period at both near-field and mid-field sites when compared to the monthly concentrations observed during baseline years (Figure 3.3-5). Thus, the increase in total uranium concentrations may be concluded as a Project-related effect based on statistical significance and graphical analysis. However, the following observations suggest that the increasing uranium may not be as a result of early works construction activities:

- There was no effluent discharge to surface waters during the early works construction period and there was limited clearing activities completed during the early works construction period with the majority of clearing activities initiated in March 2023.
- Although not statistically significant, elevated total uranium concentrations during the early works construction activities (October 2022 to March 2023) in comparison to baseline years were also observed at far-field sites in Creek 661 and Chedakuz Creek and not at near-field sites (Figure B-33).

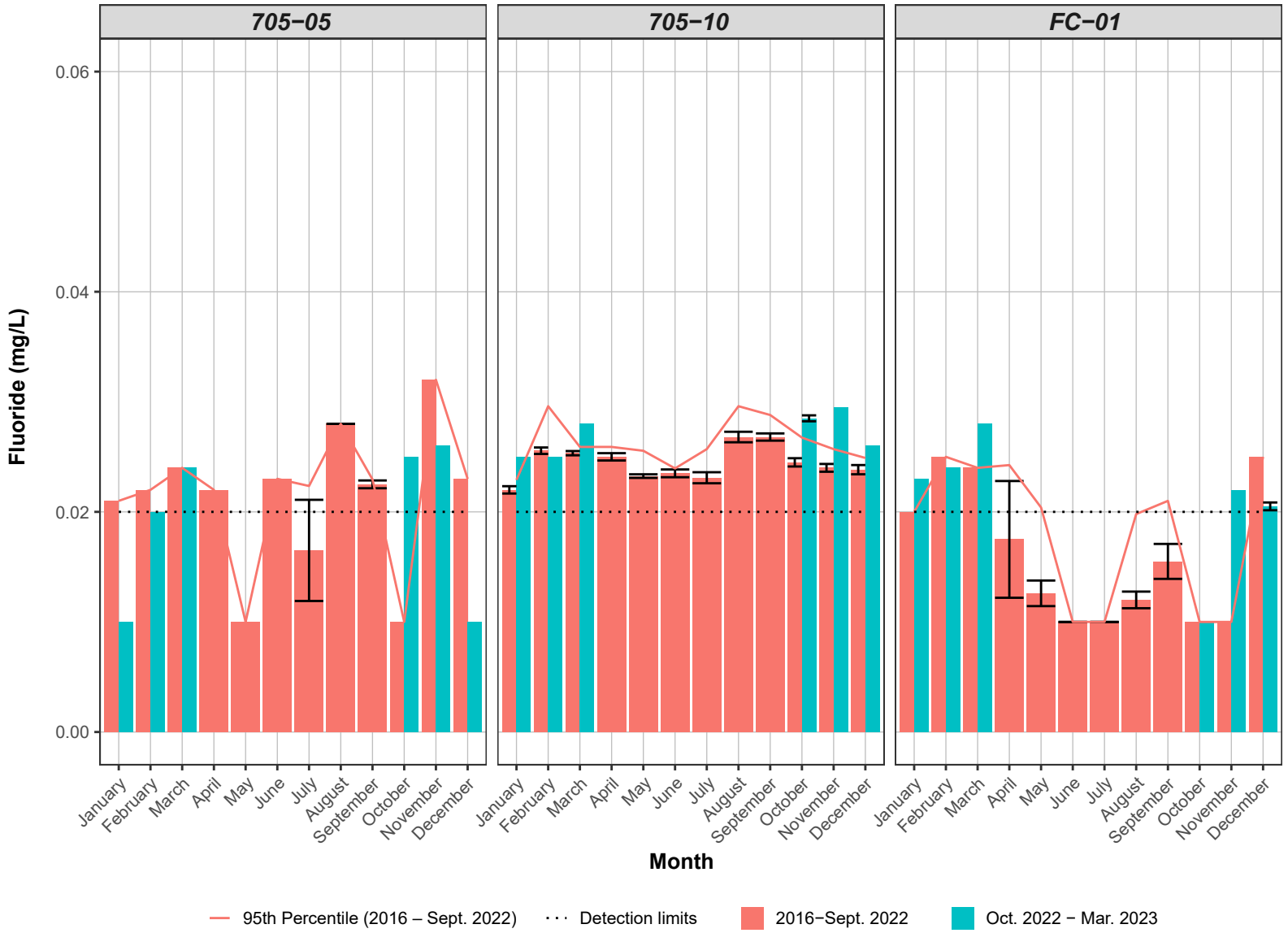
The 2022 dissolved and total uranium concentrations in groundwater were not elevated in comparison to baseline years (KP in prep) suggesting that observed increases are not likely to be a result of groundwater (with elevated uranium concentrations) that has discharged into Davidson Creek surface waters.

The observed concentrations are less than the total uranium BC WQG-AL thus no effects on aquatic life are expected as a result of the elevated concentrations. The continued monitoring of total uranium in surface water and groundwater during the early works construction period is expected to provide a better understanding of the trends in total uranium concentrations in surface waters downstream of the Project.



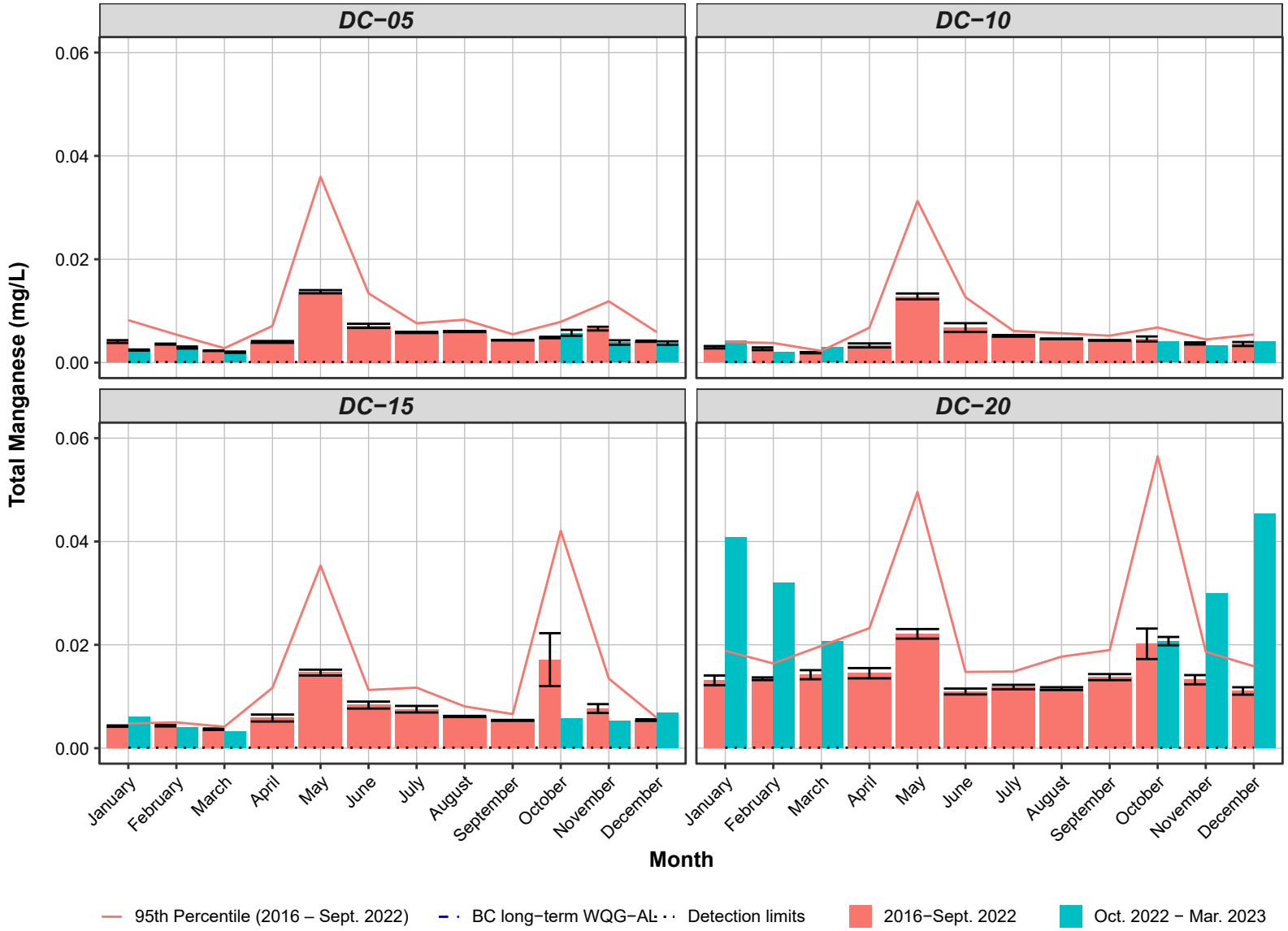
Notes: Gray line indicates minimum detection limit.
Error bars represent standard error of the mean.
There is no BC WQG−AL long−term guideline for fluoride; the CCME interim long−term WQG−AL = 0.12 mg/L.

Figure 3.3-1: Monthly Mean Fluoride Concentrations at Davidson Creek Sites, Baseline Period (2016 to September 2022) and Monitoring Period (October 2022 to March 2023)



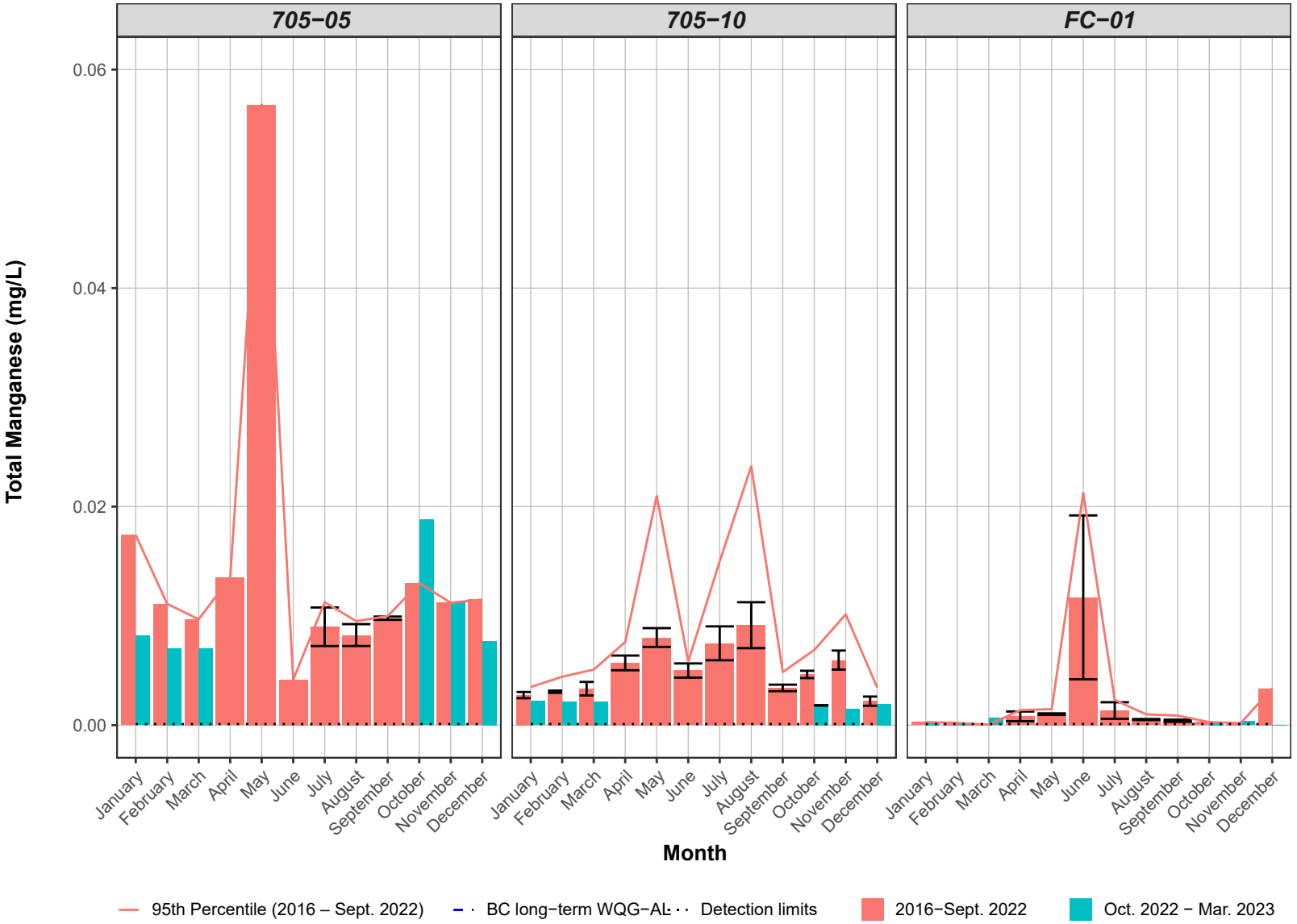
Notes: Gray line indicates minimum detection limit.
Error bars represent standard error of the mean.
There is no BC WQG−AL long−term guideline for fluoride; the CCME interim long−term WQG−AL = 0.12 mg/L.

Figure 3.3-2: Monthly Mean Fluoride Concentrations at Reference Sites, Baseline Period (2016 to September 2022) and Monitoring Period (October 2022 to March 2023)



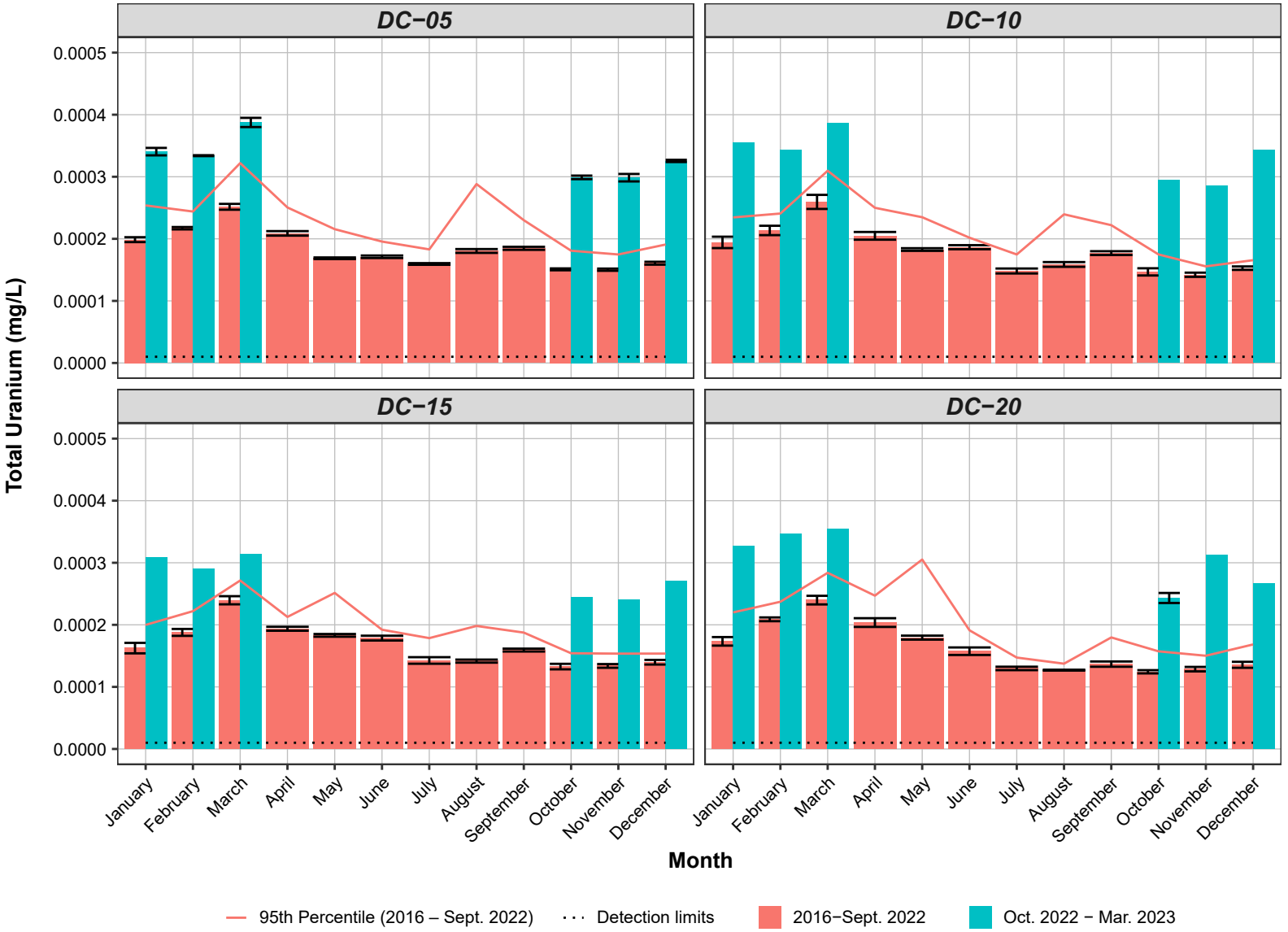
Notes: Gray line indicates minimum detection limit.
Error bars represent standard error of the mean.
Minimum hardness−dependent BC Long−term Guideline for total manganese in Davidson Creek streams is 0.64 mg/L.

Figure 3.3-3: Monthly Mean Total Manganese Concentrations at Davidson Creek Sites, Baseline Period (2016 to September 2022) and Monitoring Period (October 2022 to March 2023)



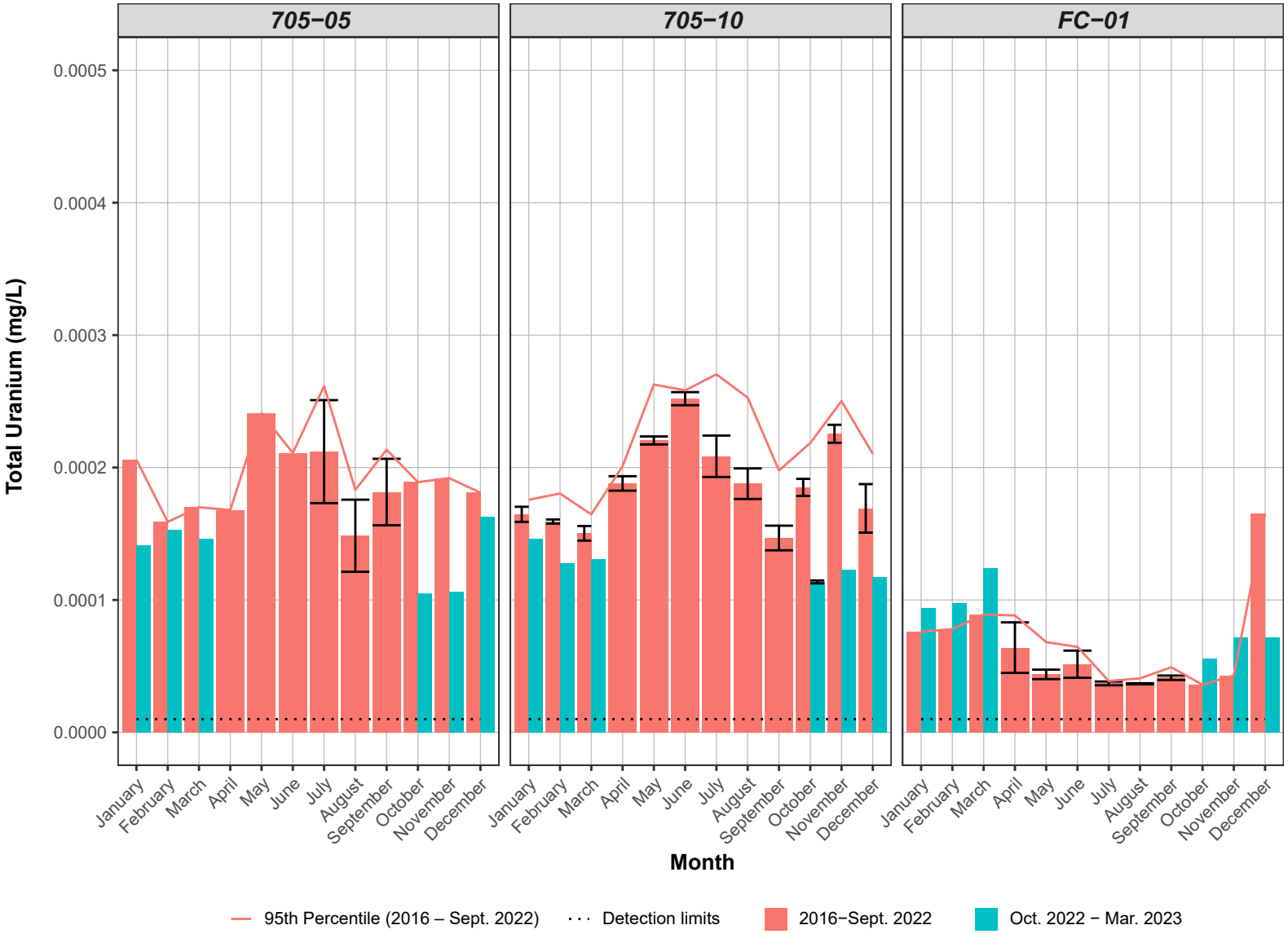
Notes: Gray line indicates minimum detection limit.
Error bars represent standard error of the mean.
Minimum hardness−dependent BC Long−term Guideline for total manganese in Davidson Creek streams is 0.64 mg/L.

Figure 3.3-4: Monthly Mean Total Manganese Concentrations at Reference Sites, Baseline Period (2016 to September 2022) and Monitoring Period (October 2022 to March 2023)



Notes: Gray line indicates minimum detection limit.
Error bars represent standard error of the mean.
BC WQG−AL working long−term guideline for total uranium = 0.0085 mg/L.

Figure 3.3-5: Monthly Mean Total Uranium Concentrations at Davidson Creek Sites, Baseline Period (2016 to September 2022) and Monitoring Period (October 2022 to March 2023)



Notes: Gray line indicates minimum detection limit.
Error bars represent standard error of the mean.
BC WQG−AL working long−term guideline for total uranium = 0.0085 mg/L.

Figure 3.3-6: Monthly Mean Total Uranium Concentrations at Reference Sites, Baseline Period (2016 to September 2022) and Monitoring Period (October 2022 to March 2023)

3.3.2 Comparisons to Environmental Assessment

Methods

Since the CEA Agency (2019) assessment report was issued, an updated water quality model (Lorax 2022) and an updated water balance model (KP 2022) has been completed to reflect Project optimizations, in addition to an updated baseline water quality dataset (ERM 2023b). Generally, parameter concentrations are predicted to be less than WQGs during the Construction and Operations phases. The exception is dissolved aluminum, where guideline exceedances are driven by background concentrations and not by the Project; an SBEB based on background concentrations has been approved for this dissolved aluminum at Davidson Creek sites to be used in place of the WQG-AL (BC ENV 2023).

Table 3.3-1 provides the assessment nodes at which water quality was predicted in the Environmental Assessment (EA) and in 2022 (Lorax 2022), along with the associated baseline and AEMP sampling sites. The monthly predicted concentrations from the CEA Agency report (2019; for the EA) and Lorax (2022) at each of the assessment nodes and the AEMP baseline sampling locations in Davidson Creek and Creek 661 were compared to observed concentrations during the early works construction.

Table 3.3-1: Water Quality Model Assessment Nodes, Baseline Sampling Sites, and Aquatic Effects Monitoring Program Sampling Sites

Criteria	EA Water Quality Assessment Nodes[1]	2022 Water Quality Model Assessment Nodes[2]	Baseline Site ID (up to 2021)	AEMP Site ID (2021 onwards)
Davidson Creek	-	WQ28	WQ-28	DC-05
	-	WQ27	WQ-27	DC-10
	WQ26	WQ26	WQ-26	DC-15
	WQ7	WQ7	WQ-7	DC-20
Creek 661	-	-	WQ-3	661-05
	WQ5_US	WQ5	WQ-5	661-10
	WQ5_DS	WQCk661	WQ-32	661-20

Notes:

EA = Environmental Assessment; AEMP = Aquatic Effects Monitoring Program.

[1] Figure 4 in CEA Agency (2019).

[2] Lorax (2022a).

Station-by-station comparisons of the monthly average water quality at AEMP sites with BC (ENV 2021a, 2021b) or federal (CCME 2022a) WQGs (Tables 3.3-2 to 3.3-4) was also completed to verify the accuracy of the EA. Comparisons of observed water quality to YDWL Standards will be completed for informational purposes only and will not be used to verify the results of the EA because YDWL water quality standards were not considered in the EA.

Comparisons of measured parameter concentrations to WQG-AL (Table 3.3-3) follows the hierarchy provided in Technical Guidance 4: Annual Reporting under the *Environmental Management Act* (BC MOE 2016), with WQG-AL applied in the following order:

1. Use the most current BC Approved WQG-AL (BC ENV 2021a) or approved SBEBs.
2. If no approved WQG-AL are available, use the most current Working Water Quality Guideline for British Columbia (BC ENV 2021b).
3. If neither of these has yet been established, use the most current WQG-AL provided by the CCME (2022a).

For pH-, hardness-, DOC-, and chloride-dependent WQG-AL, the sample-specific hardness, pH, DOC, or chloride values will be used to calculate the WQG-AL. Concentrations that are less than the MDL but greater than the applicable WQG-AL will be noted but excluded from WQG-AL exceedance calculations.

Long-term average ("chronic") WQG-AL will be used for initial comparisons. Long-term WQG-AL are the most conservative; consequently, if no exceedances of long-term guidelines are identified for a parameter, no further investigation is necessary. If exceedances of the chronic WQG-AL are noted, concentrations will also be compared to the short-term ("maximum") WQG-AL, where available. Comparisons to the WQG-AL will be done for each sample or for the average of the five weekly (5-in-30) samples, as recommended by BC MOE (2016c).

Guideline exceedances were characterized for each month or 5-in-30 sampling period as a magnitude (factor) of exceedance (i.e., by how much the WQG-AL is exceeded, calculated as the monthly or 5-in-30 average parameter concentration divided by the WQG-AL).

Results

The monthly predicted concentrations (95th percentile) at each of the assessment nodes (for the EA model predictions and the 2022 model predictions) and the 2022 AEMP baseline sampling locations in Davidson Creek and Creek 661 sites (i.e., sites potentially impacted by early works construction activities) were compiled and provided in Appendix C-3 and Appendix C-4.

Water quality parameters for which the mean monthly concentrations during the early works construction period exceeded the 95th percentile EA model predictions (CEA Agency 2019) in the same month are provided in Table 3.3-5 and exceedances of the 95th percentile 2022 model predictions (Lorax 2022) are provided in Table 3.3-6.

The mean monthly concentrations during the early works construction period were greater than the model prediction for the same month for several water quality parameters at Davidson Creek and Creek 661 sites (Table 3.3-5 and Table 3.3-6). This is likely a result of comparing the average monthly concentration for one year and is not indicative of a Project-related effect (see Sections 3.3.1 and 3.3.3). Elevated concentrations of the water quality parameters identified in Table 3.3-5 and Table 3.3-6 also tended to be elevated at the upstream control site (661-01) and regional control sites (705-05, 705-10, and FC-01; see ERM 2023c). Monitoring in future years will provide a comparison of multi-year average monthly concentrations to the predicted concentration and is expected to resolve this apparent difference in concentrations.

Table 3.3-2: Water Quality Benchmarks Based on Water Quality Guidelines for the Protection of Aquatic Life, Wildlife, and Agriculture (Livestock)

Parameter	Water Quality Guideline[1]				Proposed Yinka Dene Water Law Standard	
	BC WQG	Type of Guideline	CCME WQG	Type of Guideline	DC-05	CC-15
Physical Parameters and Dissolved Anions						
pH	6.5 to 9 pH units	Aquatic life	6.5 to 9 pH units	Aquatic life	6.5 to 9 pH units	6.8 to 8.1 pH units
Total suspended solids	sample specific[2]	Aquatic life	sample specific[2]	Aquatic life	BC WQG	BC WQG
Turbidity	sample specific[2]	Aquatic life	sample specific[2]	Aquatic life	BC WQG	BC WQG
Total dissolved solids	ng[3]	ng	3,000 mg/L	Livestock	ng[3]	ng
Chloride	150 mg/L	Aquatic life	120 mg/L	Aquatic life	120 mg/L	60 mg/L
Fluoride	sample specific[2]	Aquatic life	0.12 mg/L	Aquatic life	1 mg/L	0.53 mg/L
Sulphate	sample specific[2]	Aquatic life	1,000 mg/L	Livestock	218 mg/L	111 mg/L
Nutrients						
Ammonia (as N)	sample specific[2]	Aquatic life	sample specific[2]	Aquatic life	1.83 mg/L (BC WQG)	0.84 mg/L
Nitrate (as N)	3 mg/L	Aquatic life	3 mg/L	Aquatic life	3 mg/L	1.5 mg/L
Nitrite (as N)	sample specific[2]	Aquatic life	0.06 mg/L	Aquatic life	0.02 mg/L (BC WQG)	0.011 mg/L
Total Phosphorous	sample specific[2]	Aquatic life	sample specific[2]	Aquatic life	ng	ng
Cyanides						
Total Cyanide	ng	ng	0.005 mg/L (as free cyanide)	Aquatic life	0.2 mg/L	0.1 mg/L
Cyanide, Weak Acid Dissociable	0.005 mg/L	Aquatic life	ng	ng	0.005 mg/L	0.005 mg/L
Total Metals						
Aluminum	ng	ng	sample specific[2]	Aquatic life	n/a	n/a

Parameter	Water Quality Guideline[1]				Proposed Yinka Dene Water Law Standard	
	BC WQG	Type of Guideline	CCME WQG	Type of Guideline	DC-05	CC-15
Antimony	0.009 mg/L	Aquatic life	ng	ng	n/a	n/a
Arsenic	0.005 mg/L	Aquatic life	0.005 mg/L	Aquatic life	n/a	n/a
Barium	1 mg/L	Aquatic life	ng	ng	n/a	n/a
Beryllium	0.00013 mg/L	Aquatic life	0.1 mg/L	Livestock	n/a	n/a
Boron	1.2 mg/L	Aquatic life	1.5 mg/L	Aquatic life	n/a	n/a
Cadmium	ng	ng	sample specific[2]	Aquatic life	n/a	n/a
Chromium[4]	0.001 mg/L	Aquatic life	0.001 mg/L	Aquatic life	n/a	n/a
Cobalt	0.004 mg/L	Aquatic life	1 mg/L	Livestock	n/a	n/a
Copper	300 mg/L	Wildlife	sample specific[2]	Aquatic life	n/a	n/a
Iron	1 mg/L	Aquatic life	0.3 mg/L	Aquatic life	n/a	n/a
Lead	sample specific[2]	Aquatic life	sample specific[2]	Aquatic life	n/a	n/a
Manganese	sample specific[2]	Aquatic life	ng	ng	n/a	n/a
Mercury	0.00002 mg/L	Aquatic life	0.000026 mg/L	Aquatic life	n/a	n/a
Molybdenum	0.016 mg/L	Livestock	0.073 mg/L	Aquatic life	n/a	n/a
Nickel	sample specific[2]	Aquatic life	sample specific[2]	Aquatic life	n/a	n/a
Selenium	0.002 mg/L	Aquatic life	0.001 mg/L	Aquatic life	n/a	n/a
Silver	sample specific[2]	Aquatic life	0.00025 mg/L	Aquatic life	n/a	n/a
Thallium	0.0008 mg/L	Aquatic life	0.0008 mg/L	Aquatic life	n/a	n/a

Parameter	Water Quality Guideline[1]				Proposed Yinka Dene Water Law Standard	
	BC WQG	Type of Guideline	CCME WQG	Type of Guideline	DC-05	CC-15
Uranium	0.0085 mg/L	Aquatic life	0.015 mg/L	Aquatic life	n/a	n/a
Vanadium	0.1 mg/L	Livestock	0.1 mg/L	Livestock	n/a	n/a
Zinc	sample specific[2]	Aquatic life	5 mg/L	Livestock	n/a	n/a
Dissolved Metals						
Aluminum[5]	sample specific[2]	Aquatic life	ng	ng	0.14 mg/L (April to July) / 0.05 mg/L (August to March)	0.041 mg/L (April to July) / 0.029 mg/L (August to March)
Cadmium	sample specific[2]	Aquatic life	ng	ng	0.00014 mg/L	0.00009 mg/L
Copper	sample specific[2]	Aquatic life	ng	ng	0.0029 mg/L	0.0026 mg/L
Iron	0.35 mg/L	Aquatic life	ng	ng	0.3 mg/L	0.19 mg/L
Manganese	ng	ng	sample specific[2]	Aquatic life	0.02 mg/L	0.019 mg/L
Zinc	ng	ng	sample specific[2]	Aquatic life	0.04 mg/L	0.017 mg/L

Notes:

WQG = water quality guideline; ng = no guideline; n/a = not applicable because the Yinka Dene Water Law Standard is for dissolved.

[1] Only the most conservative WQG is shown in the table. Sources of water quality guidelines include:

Approved or working BC Water quality guidelines for the protection of aquatic life, wildlife, and agriculture-livestock (BC ENV 2021a, 2021b).

Canadian Council of Ministers of the Environment water quality guidelines for the protection of aquatic life or agriculture-livestock (CCME 2022).

[2] This parameter has a water quality guideline based on toxicity modifying factors (e.g., hardness, pH) and calculated as defined in Table 3.3-3. The guideline will be calculated on a sample-by-sample basis, consistent with guidance in BC MOE (2016).

[3] No aquatic life guideline is available for this parameter. A benchmark of 500 mg/L, used in effects assessment for the Joint MA/EMA Application, will be used to confirm the results of the effects assessment.

[4] An updated BC WQG-AL for total aluminum was proved in May 2023, however for consistency with the AEMP Interpretive Report submitted March 31, 2023 (ERM 2023c) the 2021 BC WQG-AL was used.

[5] Based on the guideline for hexavalent chromium, as there is no guideline for total chromium.

[6] The science-based environmental benchmark for dissolved aluminum will replace the BC WQG for dissolved aluminum at Davidson Creek sites (Table 3.3-4).

Table 3.3-3: Water Quality Guidelines for the Protection of Aquatic Life

Parameter	BC Water Quality Guidelines[1]	CCME Guideline for the Protection of Freshwater Aquatic Life[2]
Physical Parameters and Dissolved Anions		
pH	6.5 to 9.0 pH units	6.5 to 9.0 pH units
Total suspended solids	Change from background for 24-h period is 25 mg/L and 5 mg/L for 30-day period; if background is 25-100 mg/L then change from background of 10 mg/L; if background > 100 mg/L then change from background of 10%.	In clear flow, maximum increase of 25 mg/L from background levels for short-term exposure (e.g., 24-h period). Maximum average increase of 5 mg/L from background levels for long-term exposure. In high flow, maximum increase of 25 mg/L from background levels between 25-250 mg/L. If background is ≥ 250 mg/L, then it should not increase more than 10% of background levels.
Turbidity	Change from background of 8 NTU at any one time for a duration of 24 h in all waters during clear flows or in clear waters. Change from background of 2 NTU at any one time for a duration of 30 d in all waters during clear flows or in clear waters. Change from background of 5 NTU at any time when background is 8 - 50 NTU during high flows or in turbid waters. Change from background of 10% when background is > 50 NTU at any time during high flows or in turbid waters.	clear flow: maximum increase of 8 NTUs from background levels for a short-term exposure (e.g., 24-h period). Maximum average increase of 2 NTUs from background levels for a longer term exposure (e.g., 30-d period). high flow or turbid waters: maximum increase of 8 NTUs from background levels at any one time when background levels are between 8 and 80 NTUs. Should not increase more than 10% of background levels when background is > 80 NTUs.
Chloride	600 maximum; 150 for 30-day period	640 short-term; 120 long-term
Fluoride	0.4 mg/L maximum, at hardness ≤ 10 mg/L $CaCO_3$ LC50 = -51.73 + 92.57 log10 (hardness) * 0.01 mg/L, at hardness > 10 mg/L	0.12 mg/L (Interim guideline)
Sulphate	30-day mean is: 128 mg/L, at hardness (as $CaCO_3$) 0-30 mg/L; 218 mg/L, at hardness 31-75 mg/L; 309 mg/L, at hardness 76-180 mg/L 429 mg/L, at hardness 181-250 mg/L site-specific guidelines apply at hardness >250 mg/L	-
Nutrients		
Ammonia-N	30-day mean is pH- and temperature-dependent (see Table 26C in BC ENV 2021a); No more than 1 of 5 of the measured values can exceed 1.5 times the corresponding guideline	pH- and temperature-dependent (long-term)
Nitrate-N	32.8 mg/L maximum; 3.0 mg/L for 30-day period	550 mg/L short-term; 13 mg/L long-term

Parameter	BC Water Quality Guidelines[1]	CCME Guideline for the Protection of Freshwater Aquatic Life[2]
Nitrite-N	the maximum concentration is 0.06 mg/L and the 30-day mean is 0.02 mg/L, at chloride < 2 mg/L; the maximum concentration is 0.12 mg/L and the 30-day mean is 0.04 mg/, at chloride 2-4 mg/L the maximum concentration is 0.06 mg/L and the 30-day mean is 0.18 mg/L, at chloride 4- 6 mg/L; the maximum concentration is 0.24 mg/L and the 30-day mean is 0.08 mg/L, at chloride 6-8 mg/L; the maximum concentration is 0.30 mg/L and the 30-day mean is 0.10 mg/L, at chloride 8-10 mg/L; the maximum concentration is 0.60 mg/L and the 30-day mean is 0.20 mg/L, at chloride > 10 mg/L.	0.06 long-term
Total Phosphorous	0.005 mg/L to 0.015 mg/L (lakes)	greater than the baseline trophic status characterized as follows: < 0.004 mg/L ultra-oligotrophic; 0.004-0.01 mg/L oligotrophic; 0.01-0.02 mg/L mesotrophic; 0.02-0.035 mg/L meso-eutrophic; 0.035-0.1 mg/L eutrophic; > 0.1 mg/L hyper-eutrophic.
Cyanides and Carbon		
Total Cyanide	-	0.005 mg/L (as free cyanide)
Cyanide, Weak Acid Dissociable	0.01 mg/L maximum; 0.005 mg/L for 30-day period	-
Total Organic Carbon	the 30-day median ± 20% of the seasonally adjusted median background concentration	-
Dissolved Organic Carbon	the 30-day median ± 20% of the seasonally adjusted median background concentration	-
Total Metals		
Aluminum	-	0.005 mg/L if pH < 6.5; 0.1 mg/L if pH ≥ 6.5
Antimony	0.009 mg/L (Working guideline)	-
Arsenic	0.005 mg/L 30-day period	0.005 mg/L long-term
Barium	1 mg/L (Working guideline)	-
Beryllium	0.00013 mg/L (Working guideline)	-
Boron	1.2 mg/L, 30-day period	29 mg/L short-term; 1.5 mg/L long-term

Parameter	BC Water Quality Guidelines[1]	CCME Guideline for the Protection of Freshwater Aquatic Life[2]
Cadmium	-	Short-term: 0.00011 mg/L, at hardness (as $CaCO_3$) is < 5.3 mg/L: 10 1.016[log10(hardness)]-1.71 / 1,000 mg/L, at hardness 5.3-360 mg/L; 0.0077 mg/L, if hardness > 360 mg/L. Long-term: 0.00004 mg/L at hardness < 17 mg/L; 10 0.83[log10(hardness)]-2.46 / 1000 mg/L, at hardness 17-280 mg/L; 0.00037 mg/L, at hardness > 280 mg/L.
Chromium	30-day: 0.001 mg/L (hexavalent chromium; Working guideline), 0.0089 mg/L (trivalent chromium; Working guideline)	Long-term: 0.001 mg/L (hexavalent chromium), 0.0089 mg/L (trivalent chromium)
Cobalt	0.11 mg/L maximum; 0.004 mg/L for 30-day period	-
Copper	-	0.002 mg/L, if hardness (as $CaCO_3$) is < 82 mg/L; e 0.8545[ln(hardness)]-1.465 * 0.0002 mg/L, at hardness 82-180 mg/L; 0.004 mg/L, at hardness > 180 mg/L.
Iron	1 mg/L maximum	0.3 mg/L long-term
Lead	maximum concentration: 0.003 mg/L, at hardness (as $CaCO_3$) ≤ 8 mg/L; e 1.273ln(hardness)-1.460 / 1,000 mg/L, at hardness > 8 mg/L; 30-day mean is (3.31+e 1.273 ln (mean[hardness])-4.704) / 1,000 mg/L, at hardness > 8 mg/L.	e 1.273[ln(hardness)]-4.705/1,000 mg/L, at hardness (as $CaCO_3$) ≤ 60 mg/L; 0.001 mg/L, at hardness 60-180 mg/L or unknown; 0.007 mg/L, hardness >180 mg/L.
Manganese	maximum = 0.01102(hardness)+0.54 mg/L 30-day mean concentration = 0.0044(hardness)+ 0.605 mg/L	-
Mercury	0.00002 mg/L when MeHg = 0.5% THg	0.000026 mg/L
Molybdenum	46 mg/L maximum; 7.6 mg/L for 30-day period	0.073 mg/L
Nickel	30-day mean concentration: 0.025 mg/L, at hardness (as $CaCO_3$) 0-60 mg/L; e(0.76 * ln[hardness]+1.06) / 1,000 mg/L, at hardness 60-180 mg/L; 0.150 mg/L, at hardness >180 mg/L (Working guideline).	0.025 mg/L, at hardness (as $CaCO_3$) 0-60 mg/L; e(0.76 * ln[hardness]+1.06) / 1,000 mg/L, at hardness 60-180 mg/L; 0.150 mg/L, at hardness >180 mg/L.
Selenium	0.002 mg/L	0.001 mg/L

Parameter	BC Water Quality Guidelines[1]	CCME Guideline for the Protection of Freshwater Aquatic Life[2]
Silver	maximum concentration is 0.0001 mg/L and the 30-day mean is 0.00005 mg/L, at hardness ≤ 100 mg/L; maximum concentration is 0.003 mg/L and the 30-day mean is 0.0015 mg/L, at hardness > 100 mg/L.	0.00025 mg/L long-term
Thallium	0.0008 mg/L (Working guideline)	0.0008 mg/L long-term
Uranium	0.0085 mg/L (Working guideline)	0.033 mg/L short-term; 0.015 mg/L long-term
Zinc	30-day mean concentration = 7.5 and maximum zinc concentration = 33, when hardness (as $CaCO_3$) < 90 mg/L; 30-day mean concentration = 7.5 + 0.75(hardness - 90)/1,000 mg/L and maximum zinc concentration = 33 + 0.75(hardness - 90)/1,000 mg/L, when hardness (as $CaCO_3$) > 90 mg/L.	-
Dissolved Metals		
Aluminum[3]	the maximum concentration is 0.1 mg/L and the 30-day mean is 0.05 mg/L, at pH ≥ 6.5; the maximum concentration is e(1.209 - 2.426pH + 0.286 K) mg/L where K = (pH)2 and the 30-day mean is e(1.6 - 3.327 (median pH) + 0.402 K) mg/L where K = (median pH)2, if pH < 6.5.	-
Cadmium	the maximum concentration is: 0.000038 mg/L, at hardness (as $CaCO_3$) < 7 mg/L; e(1.03 * ln[hardness]-5.274) / 1,000 mg/L, at hardness ≥ 7mg/L; the 30-day mean concentration is: 0.0000176, at hardness < 3.4 mg/L; e(0.736 * ln[hardness]-4.943) / 1,000 mg/L, at hardness ≥ 3.4 mg/L.	
Copper	British Columbia Copper Biotic Ligand Model	
Iron	0.35 mg/L maximum	-
Manganese	-	Dissolved Manganese guideline long-term guideline is found in a look-up table with hardness and pH as the indices. The short-term = e(0.878 * ln[hardness]+4.76) / 1,000 mg/L.
Zinc	-	e(0.947 * (ln[hardness]) - 0.815 * [pH] + 0.398 * (ln[DOC]) + 4.625)) where the Canadian Water Quality Guideline is expressed in dissolved zinc concentration (µ/L).

Notes:

[1] British Columbia Guidelines for the Protection of Freshwater Aquatic Life, approved (BC ENV 2021a, 2021b) unless otherwise noted for a specific parameter.

[2] Canadian Water Quality Guidelines for the Protection of Freshwater Aquatic Life, Canadian Council of Ministers of the Environment (CCME 2022).

[3] An updated BC WQG-AL for total aluminum was proved in May 2023, however for consistency with the AEMP Interpretive Report submitted March 31, 2023 (ERM 2023c) the 2021 BC WQG-AL was used.

Table 3.3-4: Site-Specific Calculated Dissolved Aluminum Science-Based Environmental Benchmarks for Davidson Creek

Dates for Comparison[1]	DC-05 (Reach A)	DC-10 (Reach B)	DC-15 (Reach C)	DC-20 (Reach D)
April 1 to July 31	0.28 mg/L	0.26 mg/L	0.25 mg/L	0.23 mg/L
August 1 to December 31	0.13 mg/L	0.11 mg/L	0.090 mg/L	0.079 mg/L

Note: [1] Water quality samples collected between January 1 and March 31 will be compared to the dissolved aluminum water quality guideline indicated in Table 3.3-3.

Table 3.3-5: 2022 Water Quality Parameters Greater than Environmental Assessment Model Predictions

Watershed	EA Water Quality Assessment Nodes[1]	Aquatic Effects Monitoring Program Sampling Site	Water Quality Parameters[2]
Davidson Creek	WQ26	DC-15	nutrients: nitrate-N, orthophosphate cyanides: WAD cyanide total metals: arsenic, barium, boron, chromium, molybdenum, strontium, uranium, vanadium
	WQ7	DC-20	dissolved anions: chloride nutrients: total phosphorus cyanides: WAD cyanide total metals: aluminum, antimony, arsenic, barium, boron, chromium, copper, iron, lead, molybdenum, strontium, uranium, vanadium, zinc dissolved metals: iron, manganese
Creek 661	WQ5_US	661-10	nutrients: nitrate-N, total phosphorus, orthophosphate total metals: aluminum, arsenic, boron, chromium, copper, iron, nickel, vanadium dissolved metals: iron
	WQ5_DS	661-20	dissolved anions: fluoride nutrients: nitrite-N, total phosphorus, orthophosphate total metals: antimony, arsenic, barium, boron, copper, iron, mercury, molybdenum, nickel, strontium, uranium, vanadium dissolved metals: copper, iron

[1] Figure 4 in CEA Agency (2019).

[2] 2022 mean monthly concentration in one or more months of the early works construction period was greater than the model predicted 95th percentile.

Table 3.3-6: 2022 Water Quality Parameters Greater than 2022 Model Predictions

Watershed	2022 Water Quality Model Assessment Nodes[1]	Aquatic Effects Monitoring Program Sampling Site	Water Quality Parameters[2]
Davidson Creek	WQ28	DC-05	total metals: uranium
Davidson Creek *(cont'd)*	WQ27	DC-10	total metals: barium, uranium
	WQ26	DC-15	total metals: barium, uranium
	WQ7	DC-20	dissolved anions: chloride nutrients: total phosphorus total metals: barium, copper, iron, strontium, uranium, zinc dissolved metals: iron, zinc
Creek 661	WQ3	661-05	dissolved anions: fluoride nutrients: total phosphorus, orthophosphate cyanides: total cyanide, WAD cyanide total metals: arsenic, barium, boron, chromium, iron, molybdenum, nickel, selenium, strontium, uranium, vanadium, zinc dissolved metals: copper, iron, zinc
	WQ5	661-10	nutrients: total phosphorus, orthophosphate cyanides: WAD cyanide total metals: aluminum, antimony, arsenic, barium, boron, chromium, copper, iron, lead manganese, molybdenum, nickel, strontium, uranium, vanadium, zinc dissolved metals: cadmium, copper, iron, zinc
	WQCk661	661-20	dissolved anions: fluoride, sulphate nutrients: nitrate-N, total phosphorus, orthophosphate cyanides: total cyanide, WAD cyanide total metals: arsenic, barium, boron, chromium, cobalt, copper, iron, mercury, molybdenum, nickel, selenium, strontium, uranium, vanadium, zinc dissolved metals: copper, iron, zinc

[1] Lorax (2022a).

[2] 2022 mean monthly concentration in one or more months of the early works construction period was greater than the model predicted 95th percentile.

Stream water quality observed during early works construction (October 1, 2022 to March 31, 2023) was compared to WQGs (Table 3.3-2).

Mean monthly stream water quality sampling results were compared to WQGs indicated in Table 3.3-3. The exceedance magnitudes of collected samples with concentrations exceeding WQG-AL are presented in Table 3.3-7. Water quality parameters for which no exceedances were observed during early works construction (October 1, 2022 to March 31, 2023) were excluded from Table 3.3-7. Factor represents the average magnitude of samples greater than guideline concentration.

Table 3.3-7: Stream Water Quality Exceedances of Provincial and Federal Water Quality Guidelines, October 1, 2022 to March 31, 2023

Watershed	Station	Month	Exceedance Factor		
			Total Aluminum	Dissolved Aluminum	Total Iron
			CCME Long-term	BC Long-term	CCME Long-term
Davidson Creek	DC-05	5-in-30 (Oct/Nov)	-	-	-
		Dec	-	-	-
		Jan	-	-	-
		Feb	-	-	-
		Mar	-	-	-
	DC-10	Oct	-	-	-
		Nov	-	-	-
		Dec	-	-	-
		Jan	-	-	-
		Feb	-	-	-
		Mar	-	-	-
	DC-15	Oct	-	-	-
		Nov	-	-	-
		Dec	-	-	-
		Jan	-	-	-
		Feb	-	-	-
		Mar	-	-	-
	DC-20	5-in-30 (Oct/Nov)	-	-	-
		Dec	-	-	-
		Jan	1.1	-	1.6
		Feb	-	-	-
		Mar	-	-	-
Creek 661	661-01	5-in-30 (Oct/Nov)	-	-	-
		Dec	-	1.4	-
		Jan	1.01	1.4	-
		Feb	-	1.3	-

Watershed	Station	Month	Exceedance Factor		
			Total Aluminum	Dissolved Aluminum	Total Iron
			CCME Long-term	BC Long-term	CCME Long-term
		Mar	-	1.2	-
	661-05	Oct	-	-	-
		Nov	-	-	-
		Dec	-	-	-
		Jan	-	-	-
		Feb	-	-	-
		Mar	-	-	-
	661-10	5-in-30 (Oct/Nov)	-	-	-
		Dec	-	-	-
		Jan	-	-	-
		Feb	-	-	-
		Mar	-	-	-
	661-20	Oct	-	-	-
		Nov	-	-	-
		Dec	-	-	-
		Jan	-	-	-
		Feb	-	-	-
		Mar	-	-	-
Chedakuz Creek	CC-03	5-in-30 (Oct/Nov)	-	-	-
		Dec	-	-	-
		Jan	-	-	-
		Feb	-	-	-
		Mar	-	-	-
	CC-05	5-in-30 (Oct/Nov)	-	-	-
		Dec	-	-	-
		Feb	-	-	-
	CC-10	5-in-30 (Oct/Nov)	2.6	-	1.2

Watershed	Station	Month	Exceedance Factor		
			Total Aluminum	Dissolved Aluminum	Total Iron
			CCME Long-term	BC Long-term	CCME Long-term
		Dec	-	-	-
		Feb	-	-	-
	CC-15	5-in-30 (Oct/Nov)	-	-	-
		Dec	-	-	-
		Jan	-	-	-
		Feb	-	-	-
		Mar	1.5	-	1.1
	CC-20	5-in-30 (Oct/Nov)	-	-	-
		Dec	-	-	-
		Jan	-	-	-
		Feb	-	-	-
		Mar	-	-	-
	CC-30	5-in-30 (Oct)	-	-	1.04
		Nov	-	-	1.1
		Dec	-	-	-
		Feb	-	-	1.3
	CC-40	5-in-30 (Oct)	-	-	1.06
		Nov	-	-	1.02
		Dec	-	-	-
		Jan	-	-	-
		Feb	-	-	-
		Mar	-	-	1.2
Regional Reference	705-05	Oct	-	-	1.4
		Nov	-	-	-
		Dec	-	-	-
		Jan	-	-	-
		Feb	-	-	-
		Mar	-	-	-

Watershed	Station	Month	Exceedance Factor		
			Total Aluminum	Dissolved Aluminum	Total Iron
			CCME Long-term	BC Long-term	CCME Long-term
	705-10	5-in-30 (Oct/Nov)	-	-	-
		Dec	-	-	-
		Jan	-	1.4	-
		Feb	-	-	-
		Mar	-	-	-
	FC-01	Oct	-	-	-
		Nov	-	-	-
		Dec	-	-	-
		Jan	-	-	-
		Feb	-	-	-
		Mar	-	-	-

Notes:
Dashes indicate no exceedance.
Refer to Table 3.3-3 for specific guidelines.
Values below DL were replaced with half the DL for calculations.
Only parameters greater than guidelines are included in the table.
Factor represents the average magnitude of samples greater than guideline concentration.

There was no exceedance of CCME livestock guidelines at any of the sites or the proposed YDWL Standards for site DC-05. At site CC-15, the proposed YDWL Standard for dissolved aluminum was exceeded in October 2022, and March 2023 (Figure B-36) and the proposed YDWL Standard for dissolved manganese was exceeded in December 2022, and January and March 2023 (Figure B-40).

Water quality at DC-10 in Davidson Creek exceeded the CCME WQG-AL for total aluminum and total iron in January 2023 (Table 3.3-7; Figure B-14 and Figure B-24). The provincial or federal dissolved aluminum WQG-AL or the dissolved aluminum SBEB were not exceeded at any of the Davidson Creek sites sampled during the early works construction period (Figure B-36).

The total aluminum CCME WQG-AL at site 661-01 was exceeded in January 2023 by a factor of 1.01 (Table 3.3-7; Figure B-14). The concentration of dissolved aluminum exceeded the BC WQG-AL long-term guideline at site 661-01 in Creek 661 in December 2022 as well as January, February, and March 2023 (Table 3.3-7; Figure B-36). The guideline exceedance factor ranged between 1.2 and 1.4 times the long-term guideline value (Table 3.3-7).

Water quality at CC-10 in upper Chedakuz Creek exceeded the CCME WQG-AL for total aluminum in November 2022; the exceedance factor was 2.6 times the long-term guideline value (Figure B-14; Table 3.3-7). Water quality at CC-15 in upper Chedakuz Creek exceeded the CCME WQG-AL for total aluminum in March 2023; the exceedance factor was 1.5 times the long-term guideline value (Figure B-14; Table 3.3-7).

Total iron concentrations exceeded the CCME WQG-AL long-term guideline at four stations in Chedakuz Creek (CC-10, CC-15, CC-30, and CC-40). The exceedance factor varied between sites (ranging from 1.02 to 1.3) and exceeded the guideline value in October, November, December 2022 and February and March 2023 (Figure B-24; Table 3.3-7).

Similar to the 2016 to September 2022 baseline period, (see ERM 2023b) the common guideline exceedances during the early works construction period were total and dissolved aluminum and total iron. In addition, water quality at the upstream reference sites (661-01) and a regional control site (705-05) exceeded a WQG-AL for total iron and dissolved aluminum. Together (baseline exceedances and control site exceedances of the WQG-AL) suggest that observed exceedances of the WQG-AL at potential impact sites between October 1, 2022, to March 31, 2023, was not a result of early works construction activities.

3.3.3 Effectiveness of Mitigation Measures and Adaptive Management

Methods

To evaluate the effectiveness of mitigation measures, monthly concentrations of water quality parameters measured in Davidson Creek (DC-05, DC-10, DC-15, DC-20) and Creek 661 (661-05, 661-10, 661-20) were assessed against the WQGs provided Tables 3.3-2 to 3.3-4 and predicted water quality benchmarks (Appendix C-3 and C-4). Mitigation measures are considered to be effective and performing as expected as long as concentrations remain lower than WQGs and the predicted water quality benchmarks.

To address DS Condition 2.5, Section 5 (Adaptive Management) of the AEMP Plan provides the quantitative triggers to assess the levels of environmental change relative to baseline conditions that would require implementation, modification, or additional mitigation measure(s). In addition, the AEMP Plan provides the mechanism for identifying the technically and economically feasible mitigation measures to be implemented by the Proponent if monitoring conducted as part of the AEMP Plan (follow-up program) shows that the levels of environmental change referred to in DS Condition 2.5.4 have been reached or exceeded (DS Condition 2.5.5).

Water quality parameters to be included in the Water Quality Framework were selected based on the rationale discussed in the AEMP Plan:

- Dissolved oxygen;
- pH;
- TSS and TDS;
- Ions: chloride, fluoride, and sulphate;
- Nutrients: total ammonia-N, nitrate-N, nitrite-N, and total phosphorus;
- Total metals: aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, strontium, thallium, uranium, vanadium, and zinc; and
- Dissolved metals: aluminum, cadmium, calcium, copper, iron, manganese, and zinc.

Numeric performance metrics (NPMs) are defined as the thresholds for determining adaptive management action levels (equivalent to “qualitative and quantitative triggers” described in EAC Condition 3(g) for adaptive management). The evaluation of monitoring results against NPMs for water quality was based on near-field sites. The near-field sites represent sites closest to the influence of the mine site discharge points and non-point source seepage. For the early works construction period, the effects of the Project on surface water are likely to be most apparent at the near-field sites, including:

- Davidson Creek: DC-05, DC-10, and DC-15; and
- Creek 661: 661-05 and 661-10 (sites 661-03, 661-04 were not included in this report because 2022 and early 2023 observations at these sites are considered baseline).

Water quality NPMs and management responses for each action level are provided in Table 5.2-2 of the AEMP Plan. Water quality guidelines for several parameters are based on concentrations of toxicity modifying factors (e.g., hardness, DOC). For these parameters, water quality guidelines were calculated for each sample based on the concentration of the parameter and toxicity modifying factors in the same sample, as recommended by BC ENV (2016).

Results

The specific NPMs October to December and January to March baseline concentrations (95th percentile plus 20%) are provided in tables in Appendix C-5 and NPMs used for predicted concentrations are provided in Appendix C-6.

To exceed the ‘none’ NPM for water quality the mean monthly measured water quality parameter concentration meets the following conditions:

- [Condition 1] lower than the WQG-AL, Water Quality Guideline for the protection of wildlife (WQG-WL) or approved SBEB (BC ENV 2021a, 2021b, 2023; CCME 2022a); and
- [Condition 2] less than or equal to (a) the 95th percentile of the predicted concentration (base case) in the same month or (b) the 95th percentile baseline concentration plus 20% in the same month.

Water quality concentrations at the near-field sites meeting both conditions indicate that there is no requirement for a change to current mitigation measures. Thus, water concentrations are below levels of concern and water quality is in the range predicted by the surface water quality model or within site-specific baseline concentrations.

At each of the sites (DC-05, DC-10, DC-15, 661-05, and 661-10) Condition 1 was met (Section 3.3.2) thus Table 3.3-8 provides the results of the comparison to the ‘none’ NPM for Condition 2a and

Condition 2b (see also Appendix C-5 and Appendix C-6). The ‘none’ NPM was exceeded at all sites for water quality parameters indicated as ‘No’ in Table 3.3-8.

To exceed the ‘low’ NPM for water quality the mean monthly measured parameter concentrations in water **in two or more consecutive months** meet the following conditions:

- [Condition 1] lower than the WQG-AL, Water Quality Guideline for the protection of wildlife (WQG-WL) or approved SBEB (ENV 2021a, 2021b, 2023; CCME 2022a); and
- [Condition 2] higher than (a) the 95th percentile of the predicted concentration (base case) in the same month **and** (b) the 95th percentile baseline concentration plus 20% in the same month; **and**
- [Condition 3] changes in concentration are not statistically significant between near-field and control sites or compared to baseline conditions (BACI analysis).

Water quality parameters for two or more consecutive months meeting condition 2 of the ‘low’ NPM are (see Appendix C-5 and C-6): total barium (DC-15), total molybdenum (661-10) and total strontium (661-10), total uranium (DC-05, DC-10, DC-15, 661-05, 661-10). The BACI analysis (condition 2) indicated a significant change in concentrations observed during the early works construction period when compared to the baseline period for total uranium. However, based on observed trends at other monitoring sites and in groundwater, the effects are likely not limited to the early works clearing activities and may be a result of a comparison of limited monitoring data (six months) to the baseline period (see Section 3.3.1.2). Therefore, no additional mitigations are required for early works construction activities.

Table 3.3-8: Comparison of 2022 Monthly Water Quality to Numeric Performance Metric (None)

Parameter	DC-05		DC-10		DC-15		661-05		661-10	
	Condition 2a	Condition 2b	Condition 2a	Condition 2b	Condition 2a	Condition 2b	Condition 2a	Condition 2b	Condition 2a	Condition 2b
Dissolved oxygen	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes
pH	-	Yes	-	Yes	-	Yes	-	Yes	-	Yes
Total Suspended Solids	-	Yes	-	No	-	No	-	No	-	Yes
Total Dissolved Solids	-	No	-	No	-	No	-	No	-	No
Chloride	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fluoride	Yes	No	Yes	No	Yes	No	No	No	Yes	Yes
Sulphate	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Yes
Total ammonia-N	Yes	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Nitrate-N	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Nitrite-N	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total phosphorus	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No
Total aluminum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Total antimony	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Total arsenic	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No
Total barium	Yes	No	No	No	No	No	No	Yes	No	Yes
Total beryllium	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total boron	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes

Parameter	DC-05		DC-10		DC-15		661-05		661-10	
	Condition 2a	Condition 2b	Condition 2a	Condition 2b	Condition 2a	Condition 2b	Condition 2a	Condition 2b	Condition 2a	Condition 2b
Total cadmium	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Total chromium	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No
Total copper	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Total iron	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Total lead	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Total manganese	Yes	Yes	Yes	No	Yes	No	Yes	Yes	No	No
Total mercury	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total molybdenum	Yes	No	Yes	No	Yes	No	No	Yes	No	No
Total nickel	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes
Total selenium	Yes	No	Yes	Yes	Yes	Yes	No	Yes	Yes	No
Total silver	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Total strontium	Yes	No	Yes	No	Yes	No	No	No	No	No
Total uranium	No	No	No	No	No	No	No	No	No	No
Total vanadium	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes
Total zinc	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes
Dissolved Aluminum	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Dissolved Cadmium	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No
Dissolved Copper	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Dissolved Iron	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

Parameter	DC-05		DC-10		DC-15		661-05		661-10	
	Condition 2a	Condition 2b	Condition 2a	Condition 2b	Condition 2a	Condition 2b	Condition 2a	Condition 2b	Condition 2a	Condition 2b
Dissolved Manganese	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Dissolved Zinc	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes

Notes:

Dashes indicate the parameter was not predicted.
'Yes' indicates that condition 2a or 2b NPM was met at any near-field sampling location at any of the early construction period months (October 1, 2022 to March 31, 2023).
Shaded cells indicate 'No' and the condition was not met for one or more of the months during the early works construction period (October 1, 2022 to March 31, 2023).

3.3.4 Summary and Discussion

Limited early works construction activities at the mine site were initiated beginning in late September 2022, which included preparing the Plant Site for construction and permitting and piping for TW-13-01 as a drinking water supply. In March 2023 additional clearing activities were initiated for the construction of the mine site roads, Tailings Storage Facility, water management structures (plant site ditches and sediment pond, installation of rapid infiltration basins), ore stockpile sites, and open pit. There were no Project discharges to watercourses during the early construction period (between October 2022 and March 2023). The results of the surface water quality sampling that was conducted during the monitoring period after early works construction activities began (October 1, 2022, to March 31, 2023) was assessed in Davidson Creek, Creek 661, and Chedakuz Creek to meet DS Condition 3.15.2.

To address the associated DS Condition 2.9, the surface water quality observed during the early works construction period was compared to the baseline period, model predictions, and WQGs. A BACI analysis was also completed to identify statistically significant changes in water quality between the baseline and early works construction period. Water quality parameters with significant class-period interactions were observed at only the Davidson Creek sites for fluoride, total manganese, and total uranium. For all other parameters analyzed the observed greater concentrations during the early works construction period was observed at both control and impact sites; therefore, it is not as a result of Project activities. Graphical analysis suggested that the observed increase in fluoride concentrations is likely a result of annual variability and not Project-related effects. Similarly, the significant increase in total manganese observed at DC-20 (a mid-field site) and not the near-field sites is likely the result of non-Project activities (e.g., forestry or agricultural activities downstream of the Project and upstream of DC-20). The significant increase in total uranium at Davidson Creek sites may be related to the early works construction activities however elevated total uranium concentrations were also observed at other far-field sites (e.g., 661-20).

To address the associated DS Condition 2.5, surface water quality was also assessed against the water quality Response Framework. Based on the results of the comparison to NPM concentrations (WQG-AL, water quality predictions, baseline water quality) for each of the early works construction months (October 2022 to March 2023) and results of the BACI analysis, the action level in the adaptive management framework of the AEMP is “none” for all water quality parameters except total uranium at Davidson Creek sites DC-05, DC-10, and DC-15. There was a significant increase in total uranium concentrations at Davidson Creek monitored sites during early works construction (October 2022 to March 2023) when compared to the baseline period that was not observed at the regional control sites. However, the maximum observed concentration (0.00039 mg/L at DC-05) during the early works construction period was less than 50% of the total uranium WQG-AL (0.0085 mg/L). No changes to the current mitigation measures for surface water quality to protect aquatic life are required at this time; however, continued monitoring of total uranium during the early works construction period is expected to improve understanding of the increasing trend (i.e., is the increase related to groundwater or clearing activities). The results of the early works construction monitoring program are generally in line with expectations, given the limited clearing activities in 2022 and early 2023 and there were no Project effluent discharges to surface water.

No additional sampling or analyses other than that described in the AEMP Plan, Version 1.0 is recommended.

4.0 Monitoring Groundwater Quality and Quantity

The DS Condition 3.15.3 requires the Proponent to monitor groundwater quality and quantity downstream of Tailings Storage Facility D (TSF D), Open Pit, west waste rock dump, and Low-Grade Ore (LGO) Stockpile. Monitoring results should be compared to *"values identified by the Proponent in the modelled predictions in Section 5 of Blackwater Gold Project: Additional Water Quality Model Sensitivity Scenario (July 20, 2017) and Section 3 of Blackwater Gold Project: Water Treatment Responses for Comments 1266, 1270, 1271, 1272, and 1273 (February 15, 2017) for nitrite and contaminants of potential concern, and to verify the effectiveness of water management measures".*

Note that the west waste rock dump is no longer a mine facility in the optimized mine plan and has been replaced by the Upper and Lower Waste Stockpiles.

Monitoring of groundwater quantity (flow) and groundwater quality was completed in 2022 as described in Section 7.3.4 of the MSDP. The associated follow-up program DS Conditions 2.5, 2.6, 2.9, and 2.10 are not addressed in this report because of the relatively short duration of early works activities. An assessment of groundwater flows and quality effects will be completed following the completion of, at minimum, one year of monitoring data following effluent discharge over a full range of flow conditions.

The report will provide the information required by DS Conditions 2.11 and 2.13 that set out annual reporting requirements related to the implementation of conditions in DS 3.15.

5.0 References

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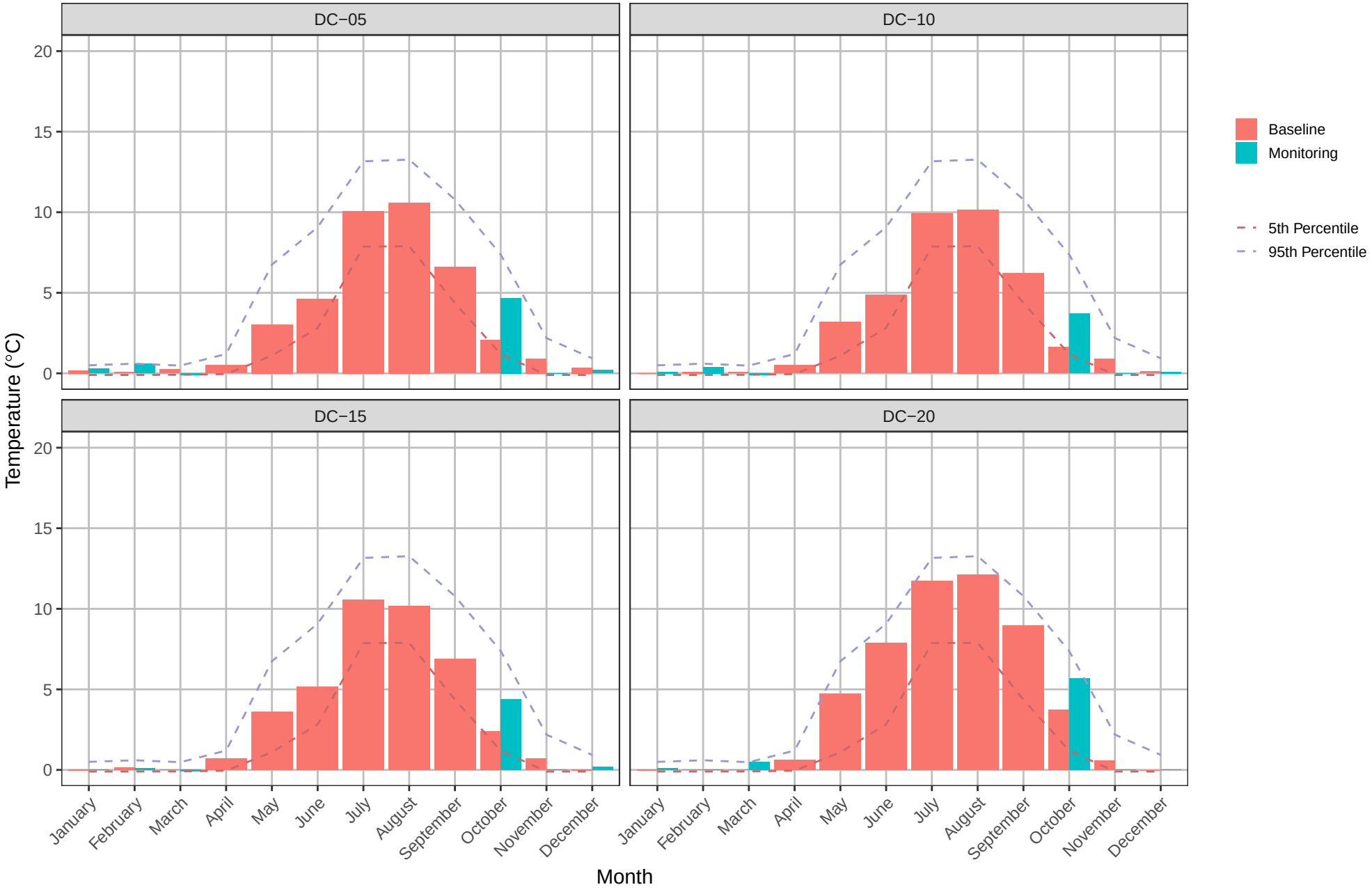
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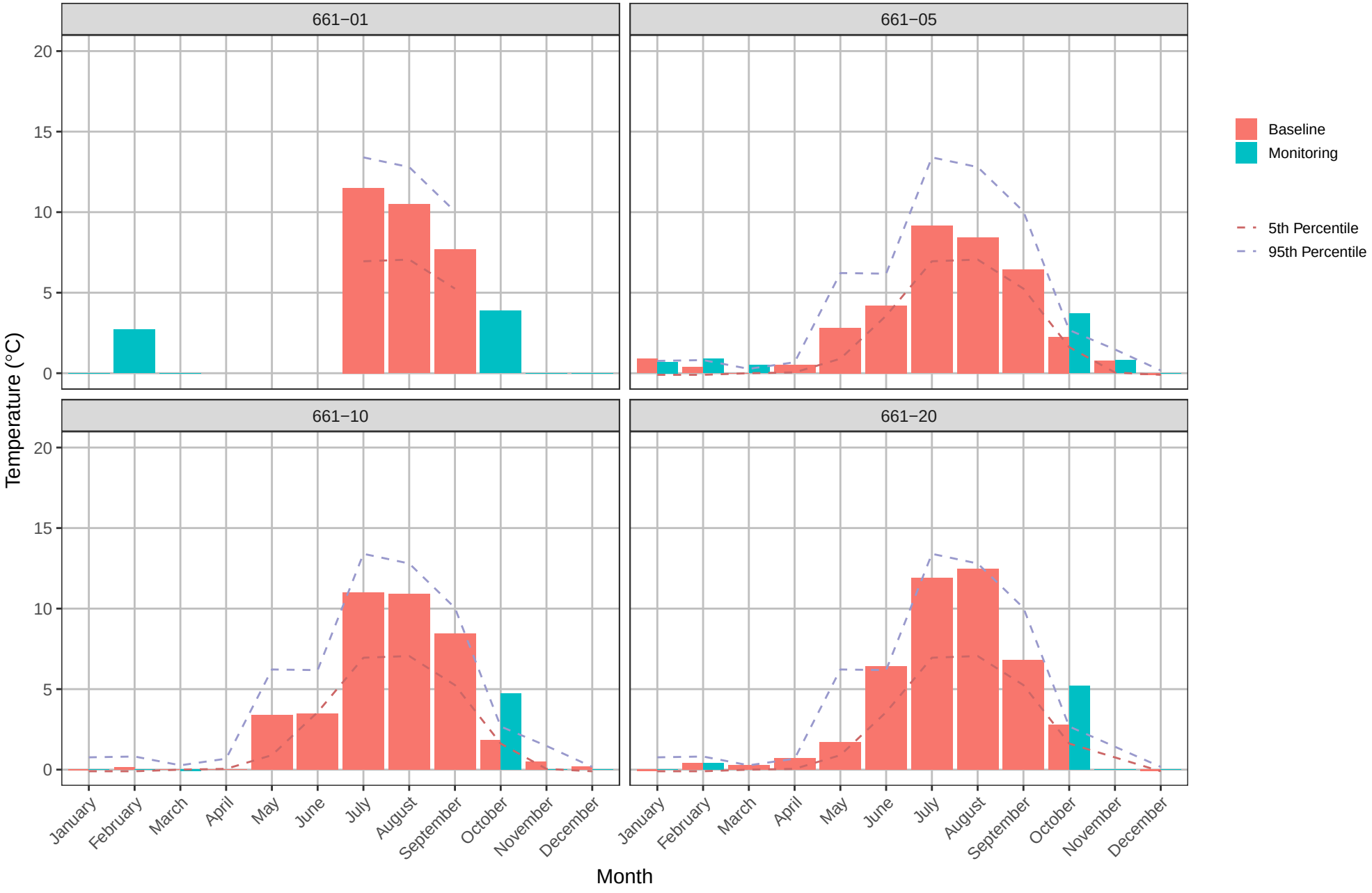
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Appendix A Monthly Field Parameters, Baseline (2016 to September 2022) and Monitoring (October 2022 to March 2023)



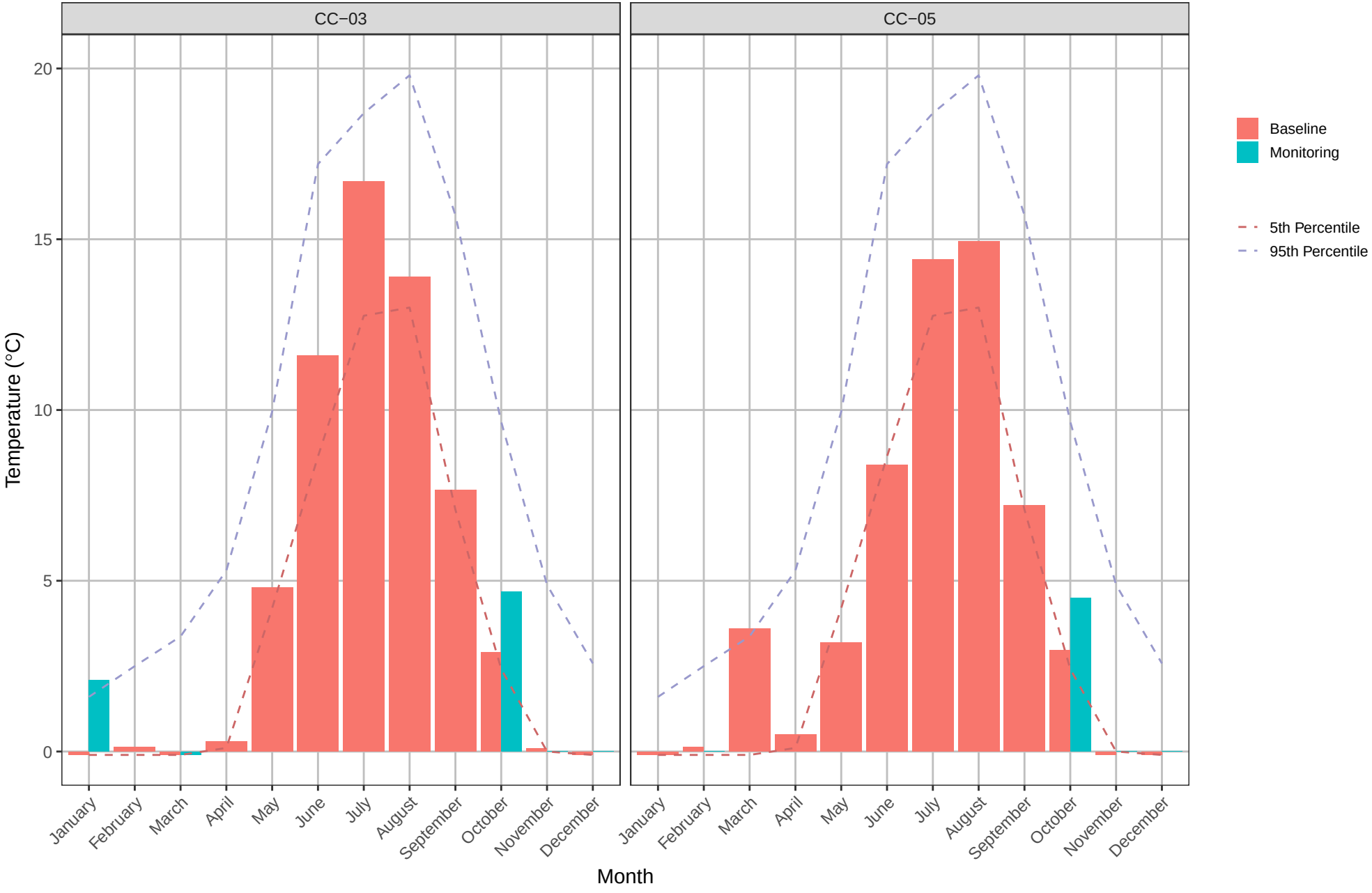
Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

Appendix A−1a Monthly Field Temperature at Davidson Creek Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



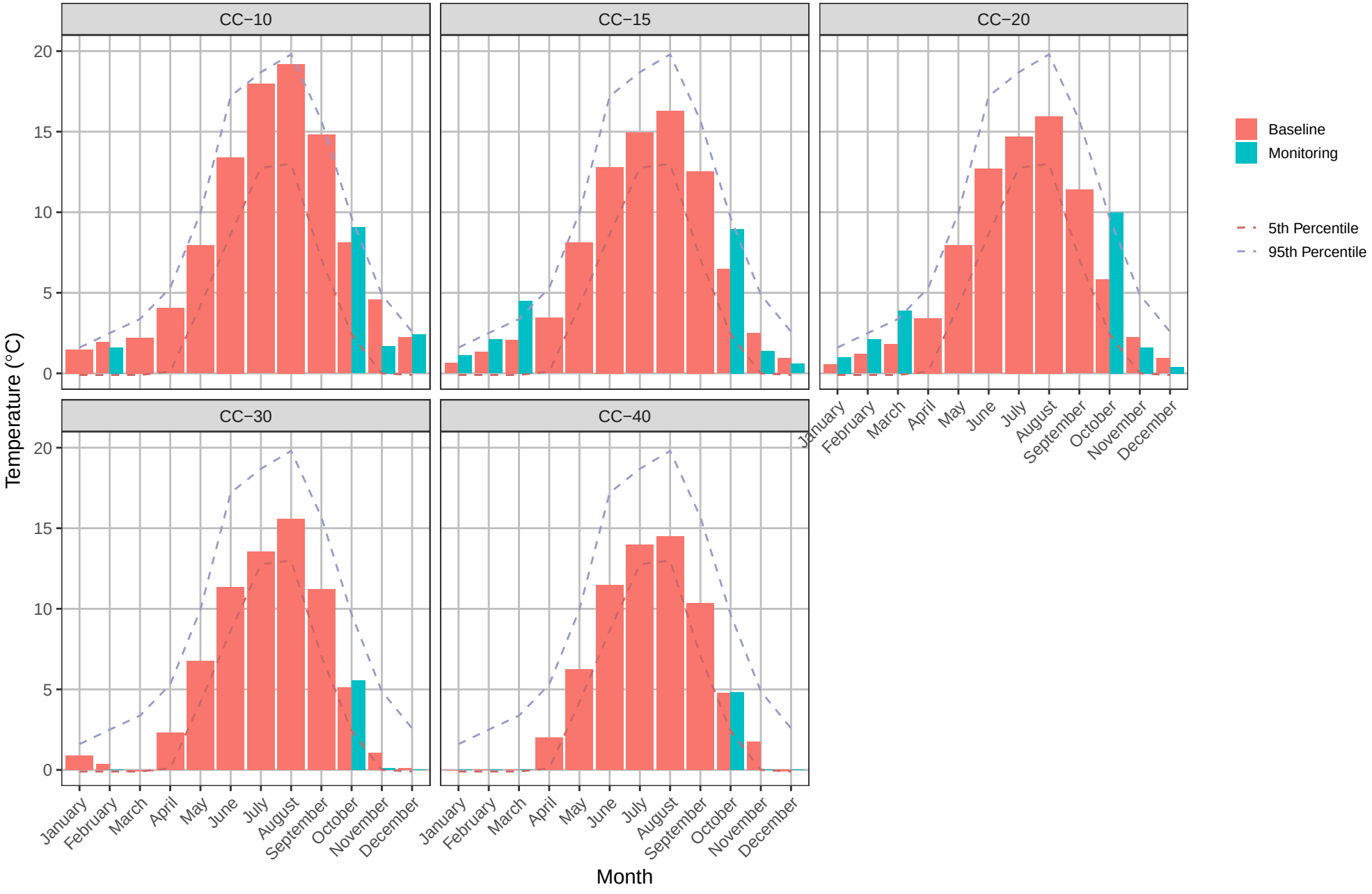
Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

Appendix A−1a Monthly Field Temperature at Creek 661 Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



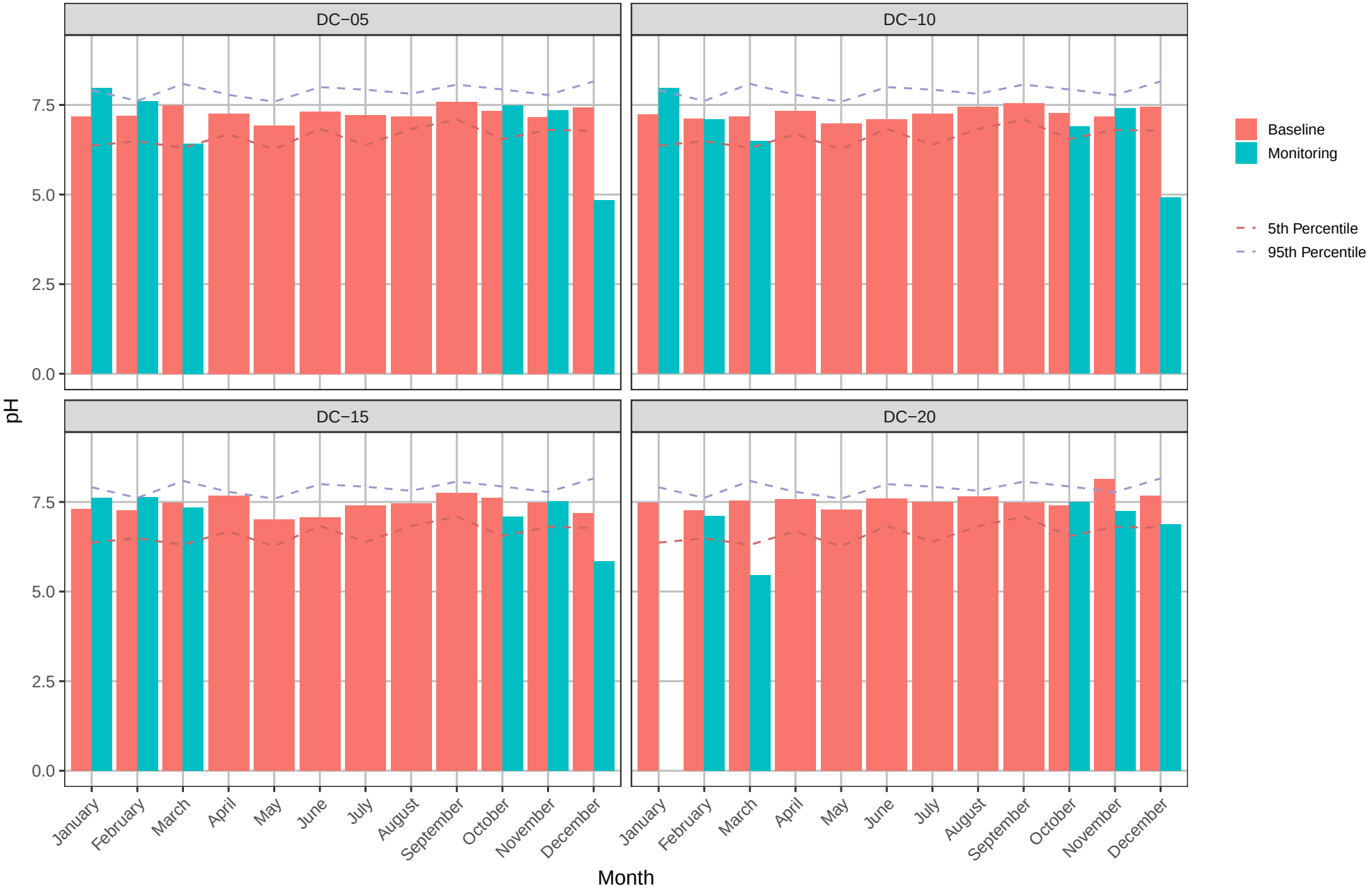
Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

Appendix A−1a Monthly Field Temperature at Upper Chedakuz Creek Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



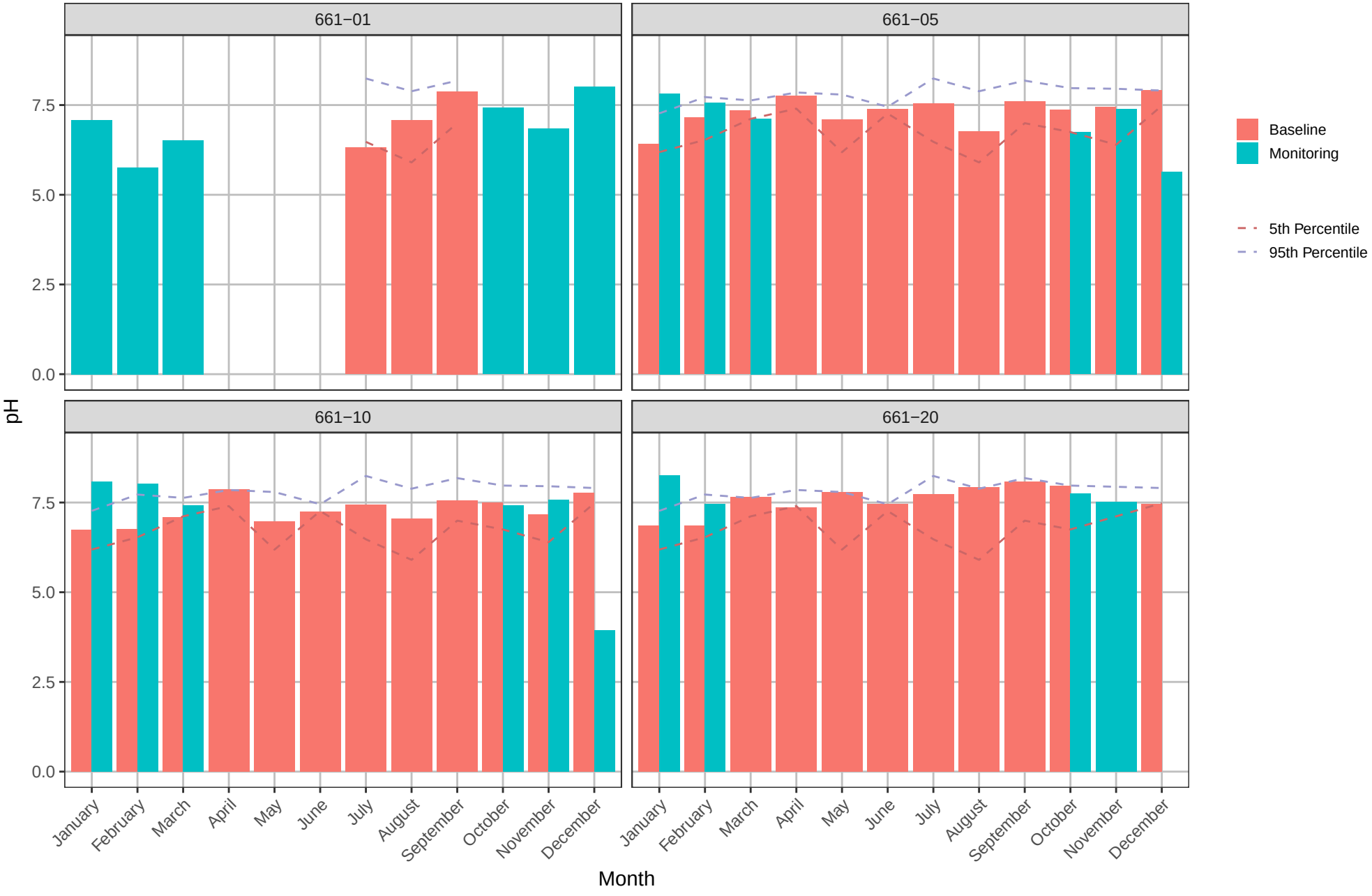
Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

Appendix A−1a Monthly Field Temperature at Lower Chedakuz Creek Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



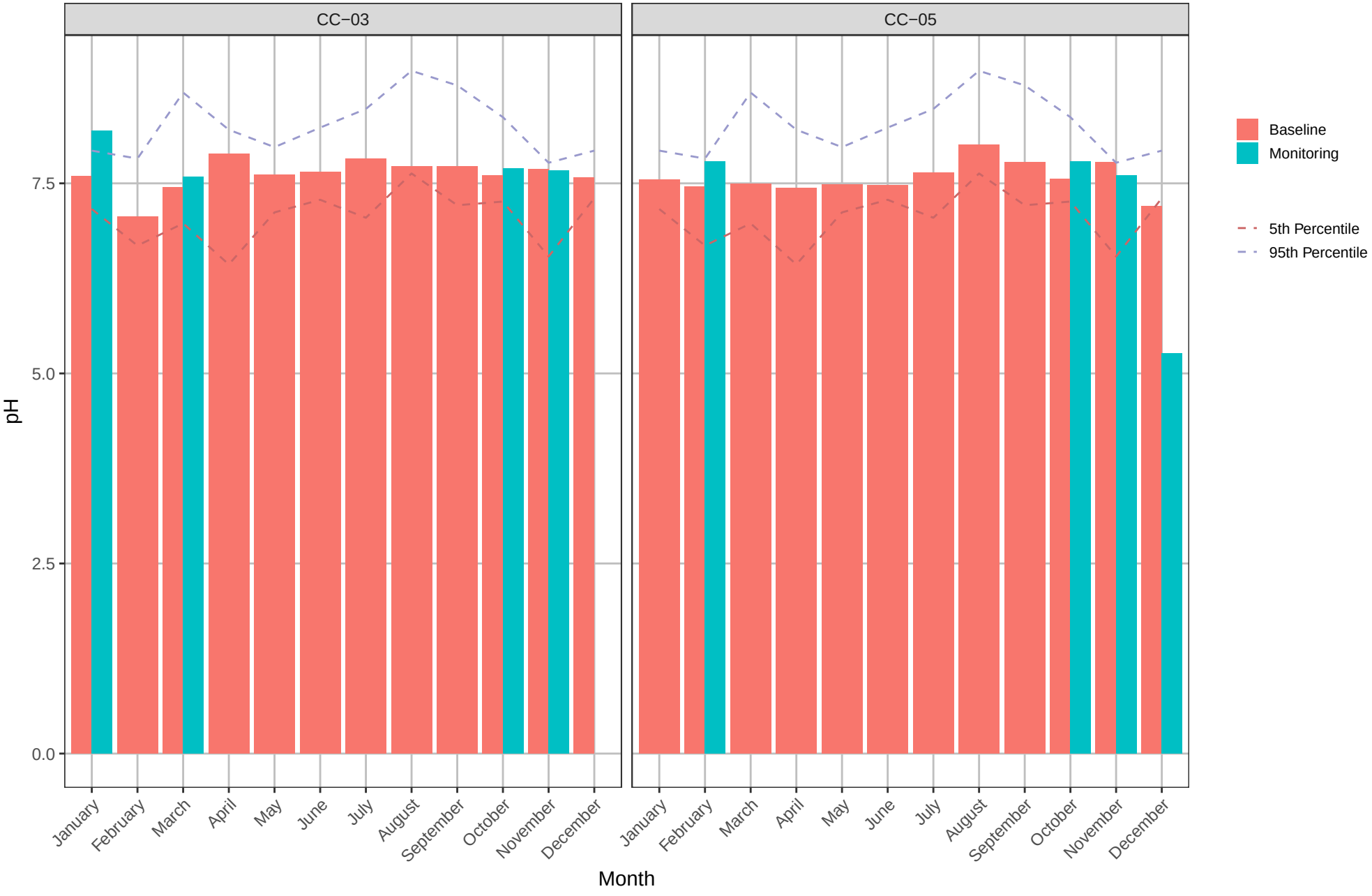
Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

Appendix A−1b Monthly Field pH at Davidson Creek Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



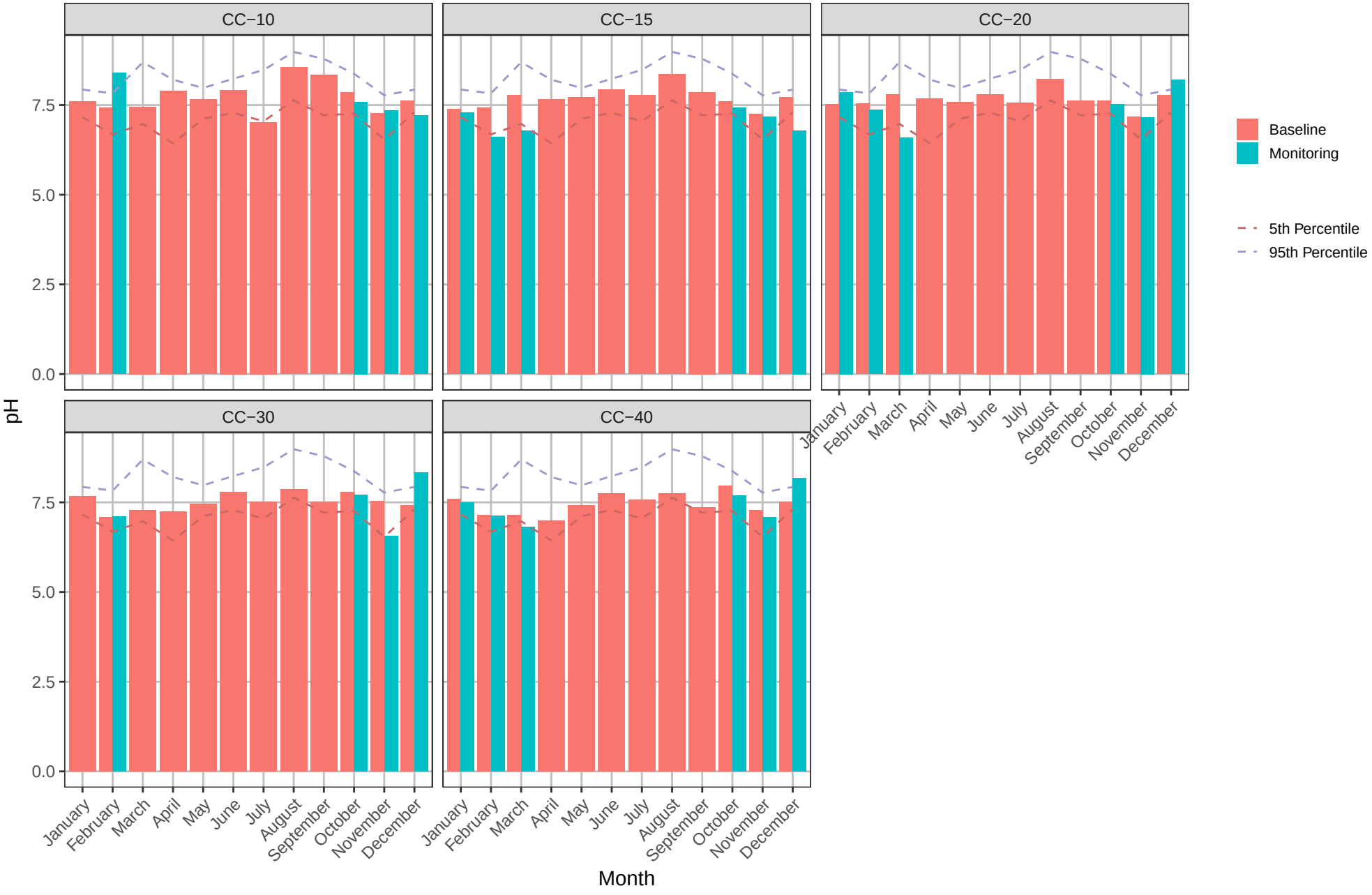
Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

Appendix A−1b Monthly Field pH at Creek 661 Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



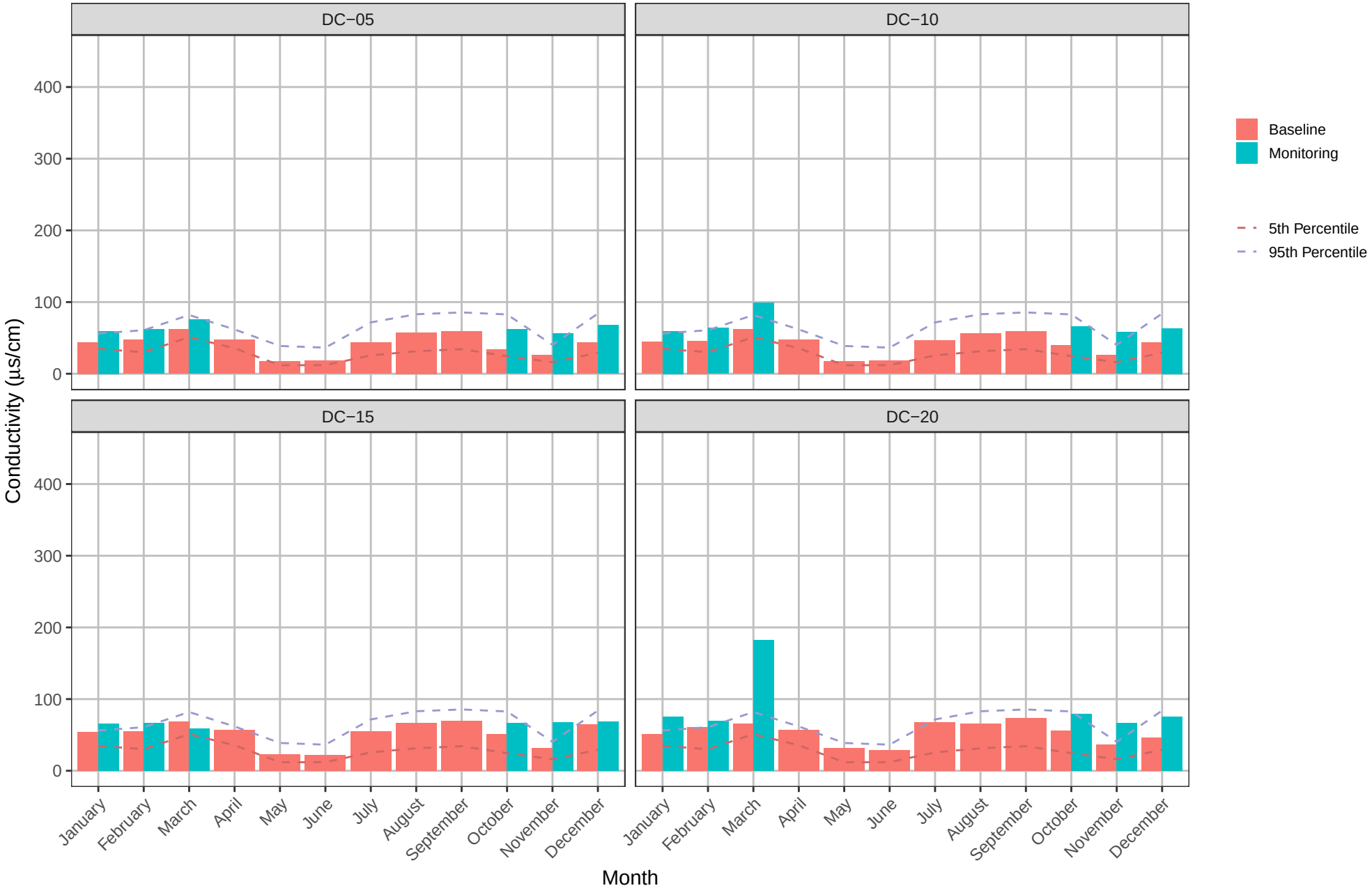
Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

Appendix A−1b Monthly Field pH at Upper Chedakuz Creek Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



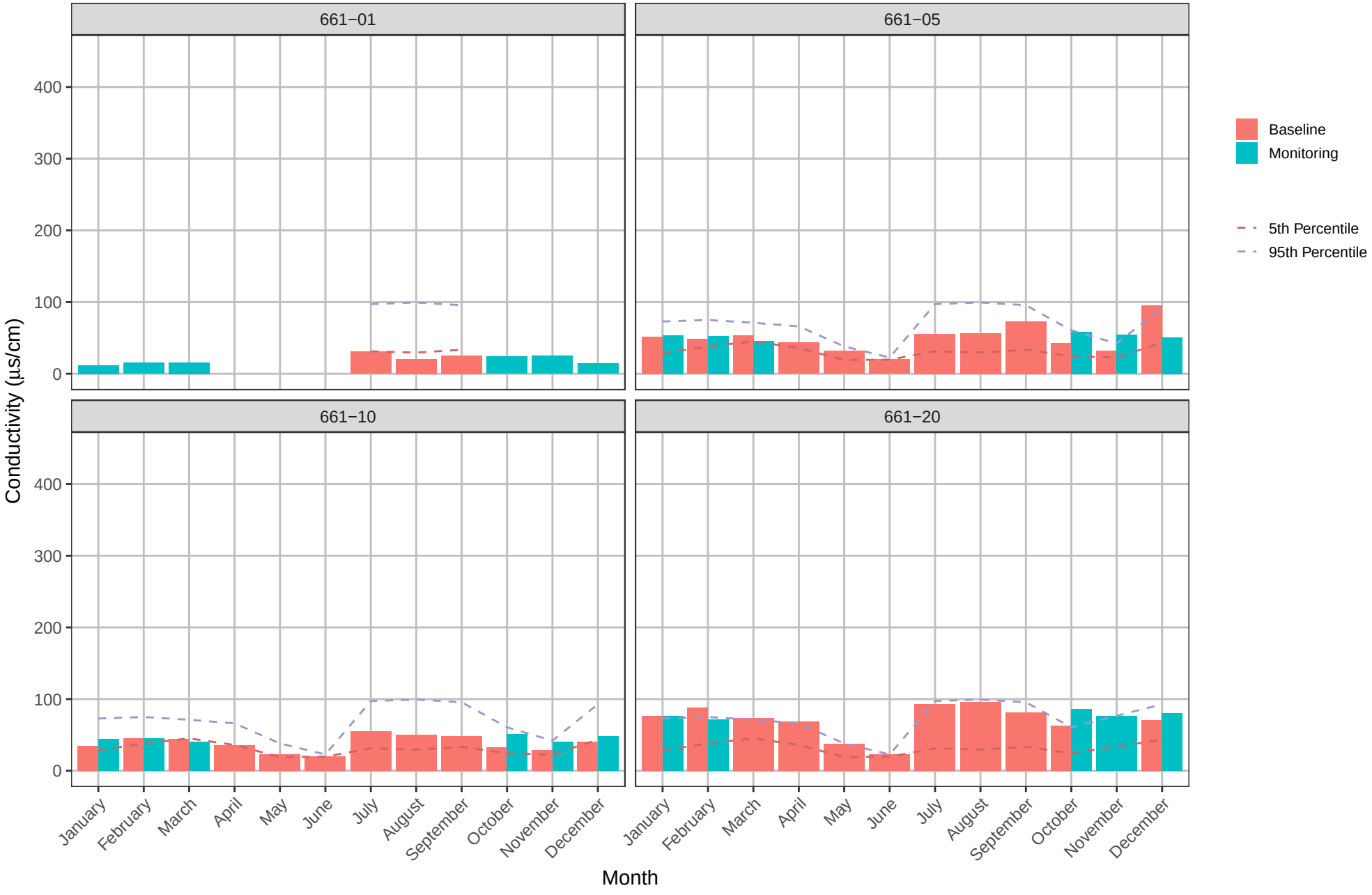
Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

Appendix A−1b Monthly Field pH at Lower Chedakuz Creek Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



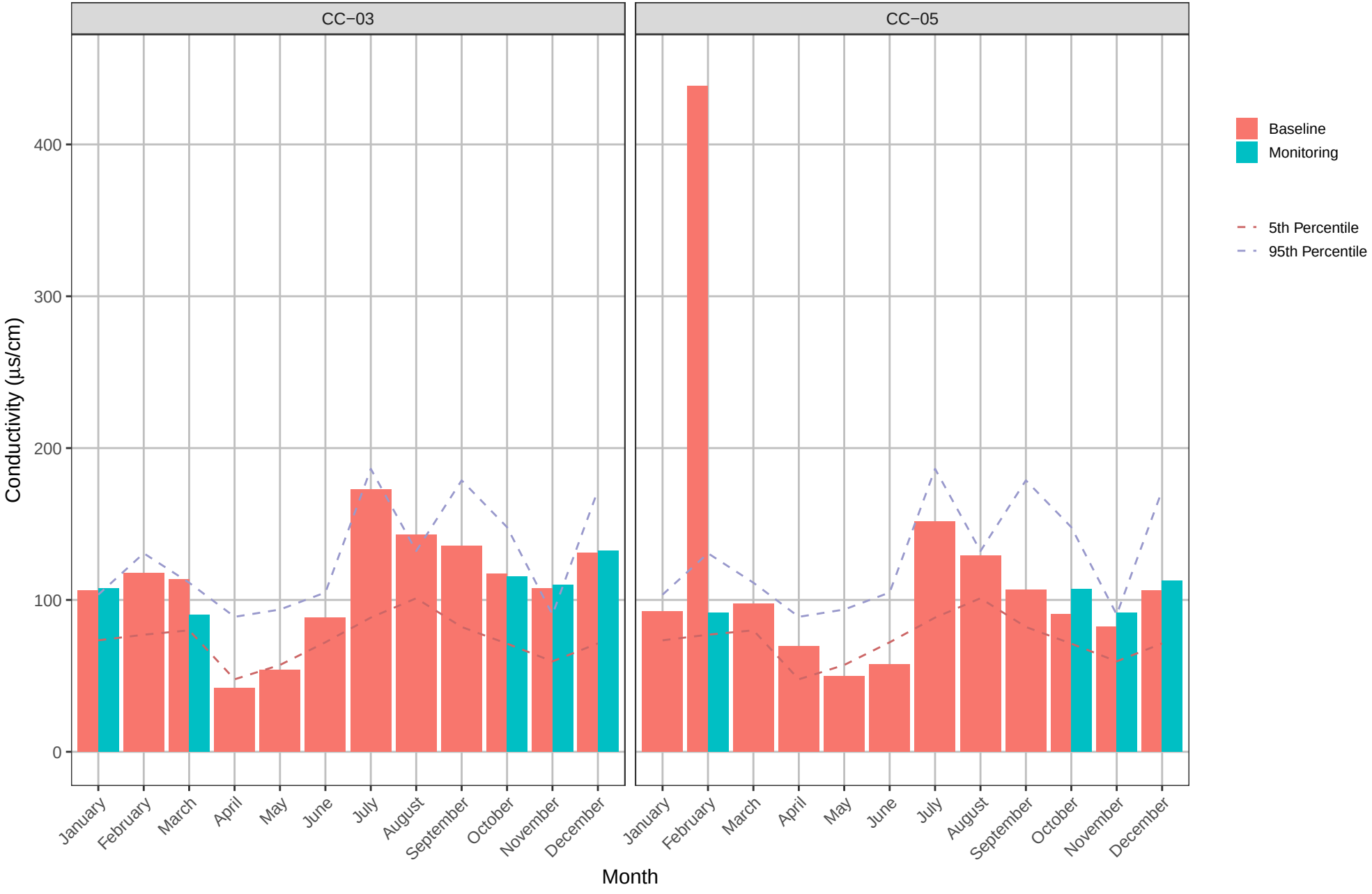
Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

Appendix A−1c Monthly Field Conductivity at Davidson Creek Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



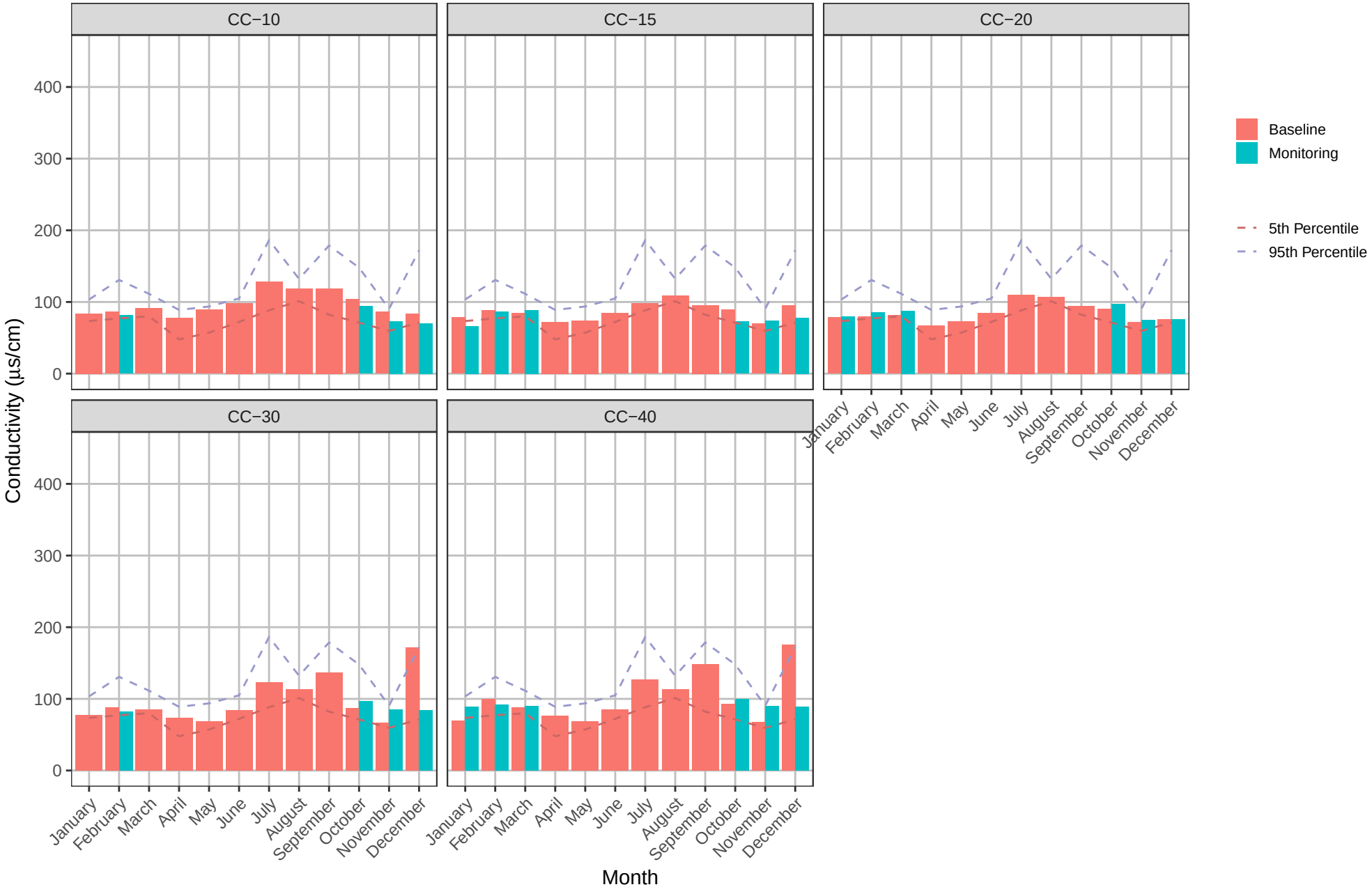
Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

Appendix A−1c Monthly Field Conductivity at Creek 661 Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



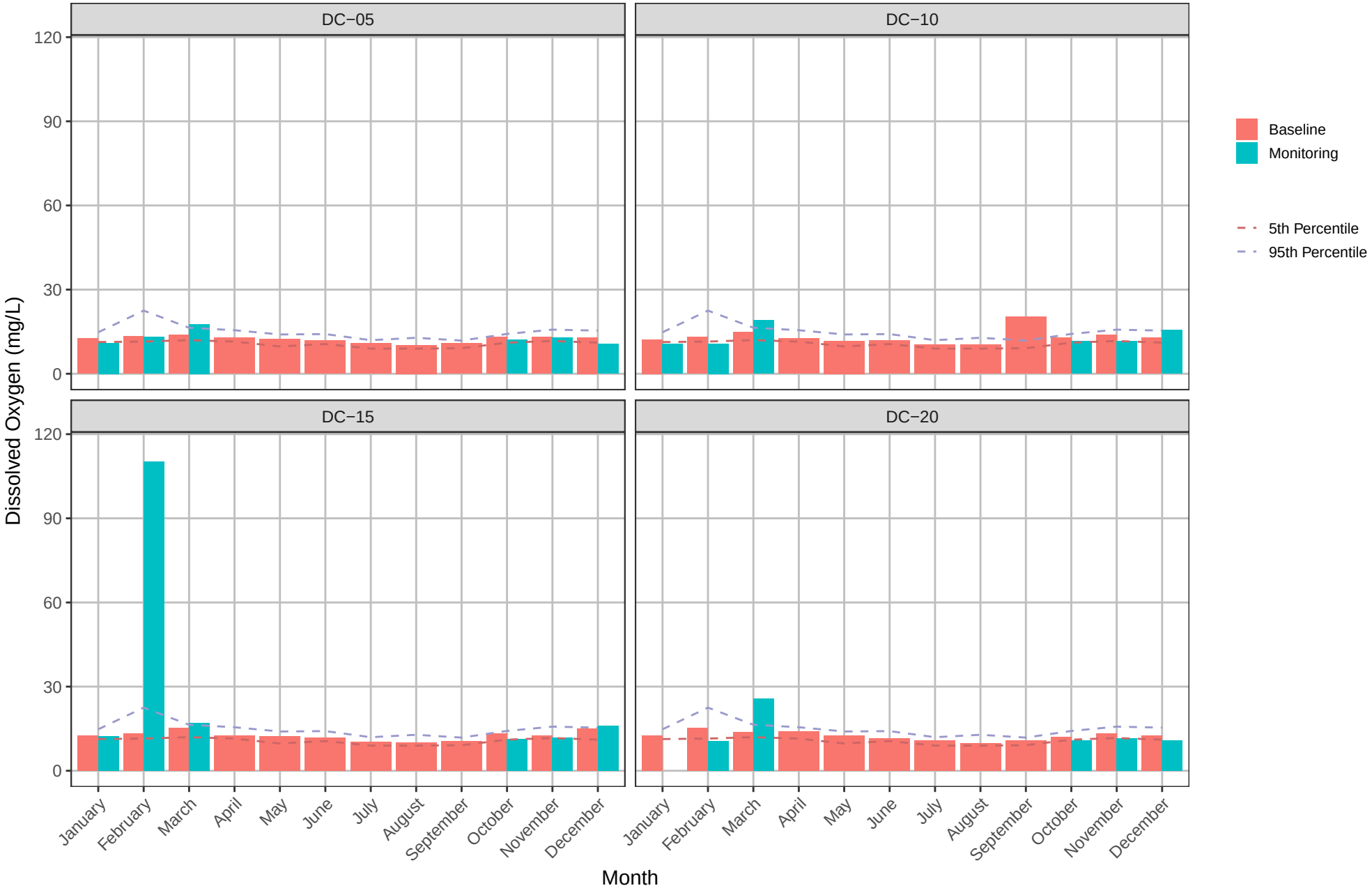
Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

Appendix A−1c Monthly Field Conductivity at Upper Chedakuz Creek Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



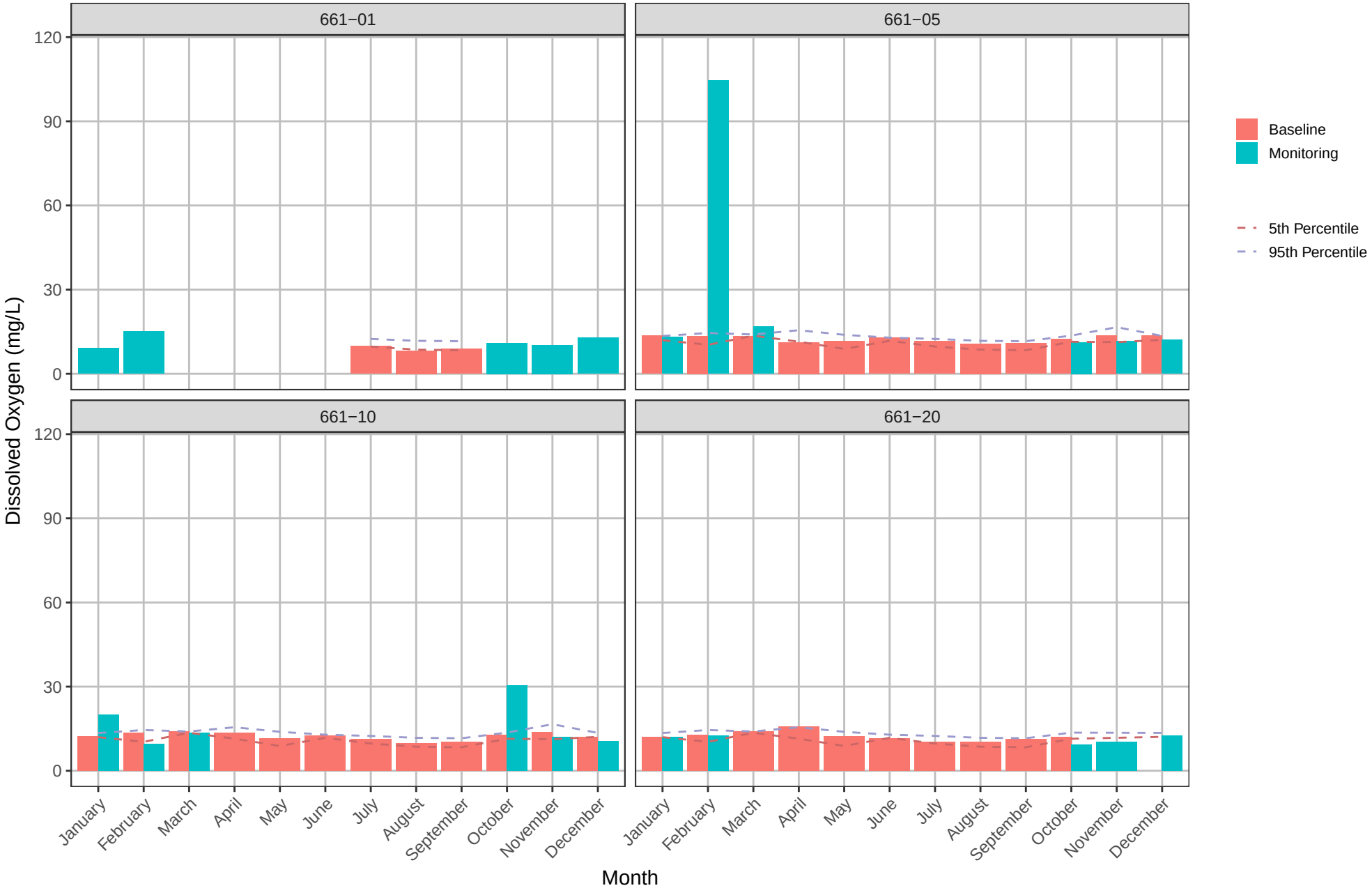
Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

Appendix A−1c Monthly Field Conductivity at Lower Chedakuz Creek Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



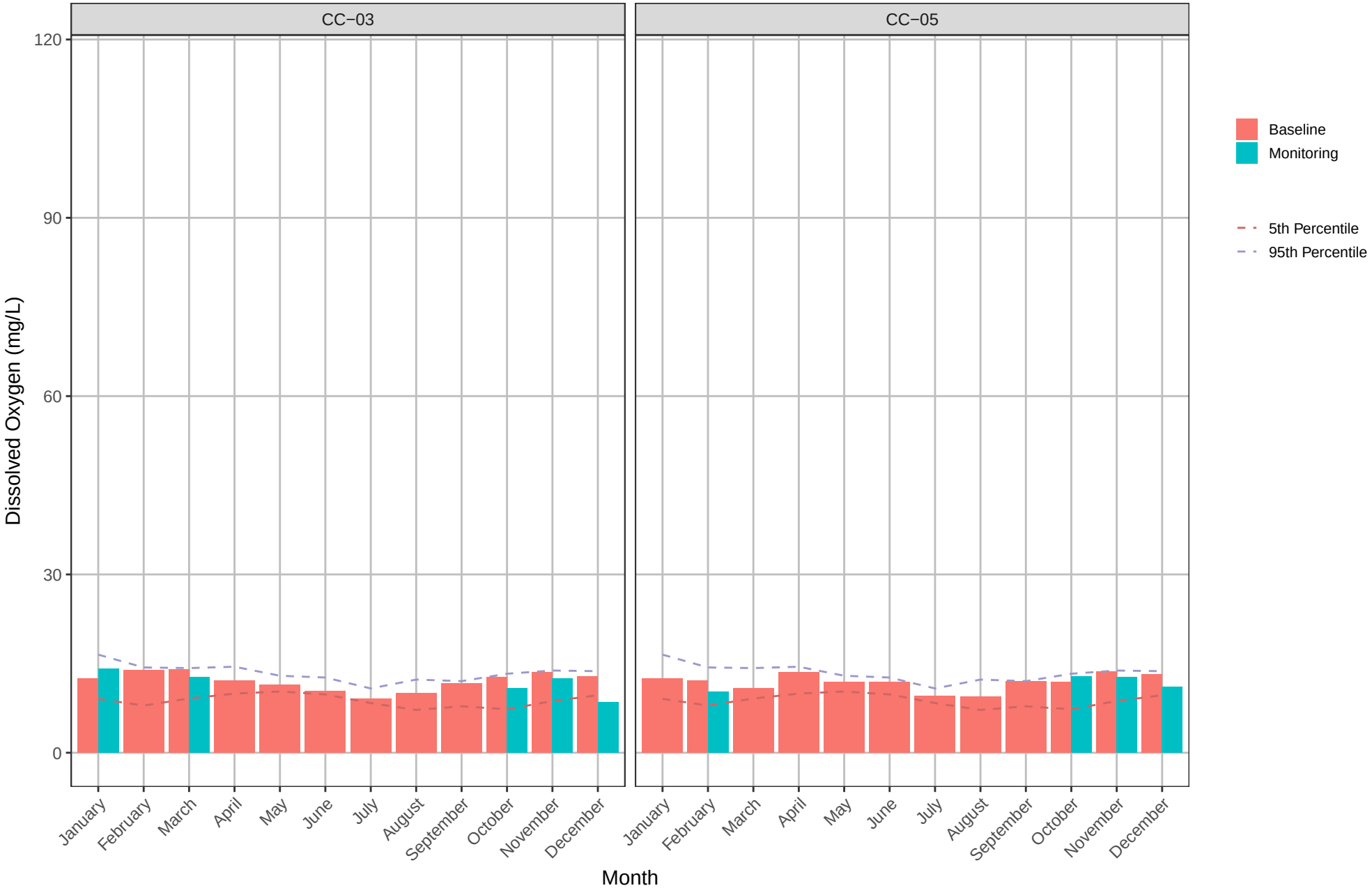
Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

Appendix A−1d Monthly Field Dissolved Oxygen at Davidson Creek Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



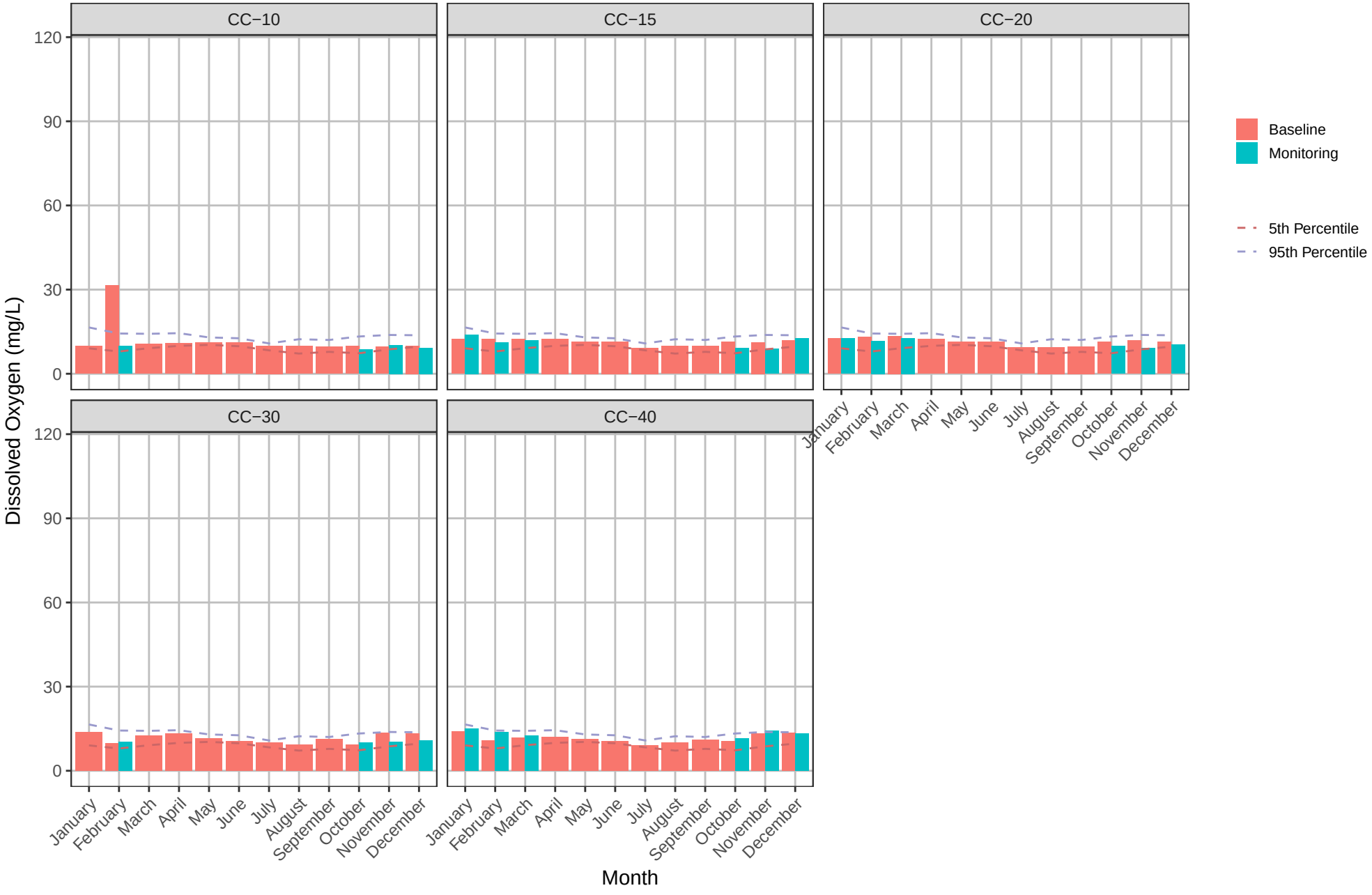
Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

Appendix A−1d Monthly Field Dissolved Oxygen at Creek 661 Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

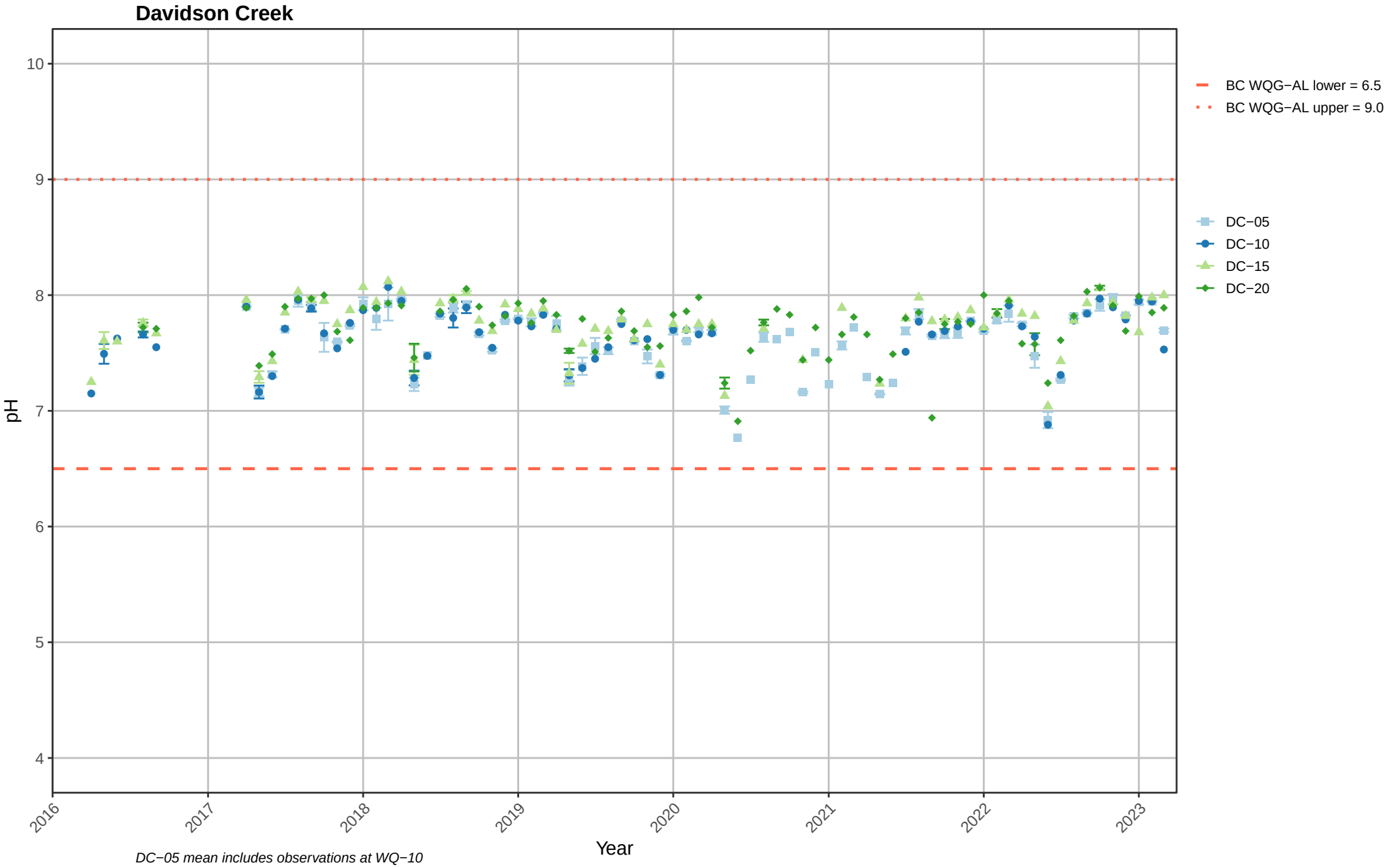
Appendix A−1d Monthly Field Dissolved Oxygen at Upper Chedakuz Creek Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)



Dashed lines indicate the 95th and 5th Percentile for the Baseline within the Watershed

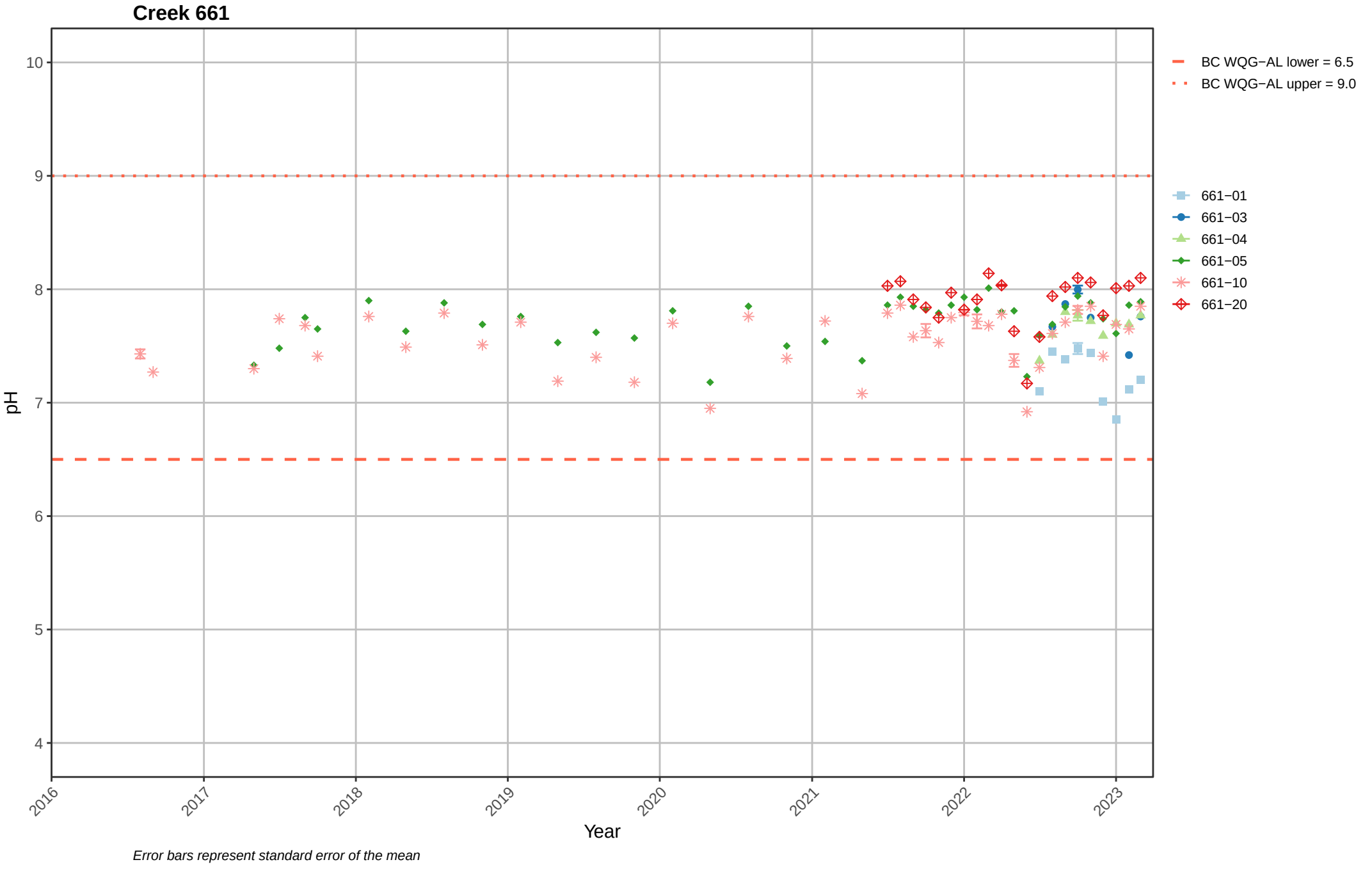
Appendix A−1d Monthly Field Dissolved Oxygen at Lower Chedakuz Creek Sites, Baseline (2016 to September 2022) and Monitoring Periods (October to March 2023)

Appendix B Monthly Mean Water Quality Graphs, Blackwater Gold Project Streams, 2016 to 2022



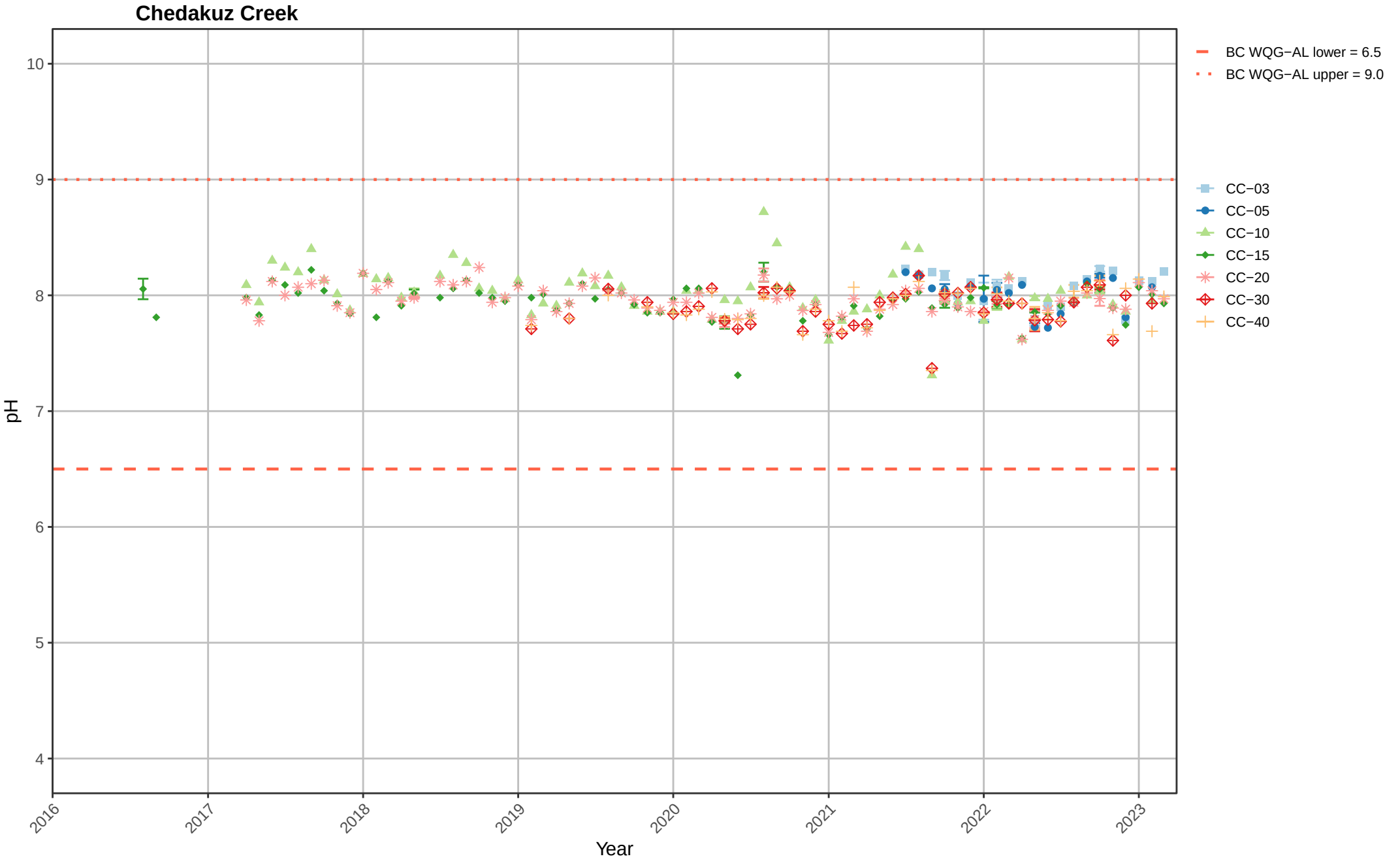
DC−05 mean includes observations at WQ−10
Error bars represent standard error of the mean
Proposed YDWL Standard for DC−05 is 6.5 to 9 pH units

Appendix B−1.a: Monthly Mean pH at Davidson Creek AEMP Sites, 2016 to March 31, 2023



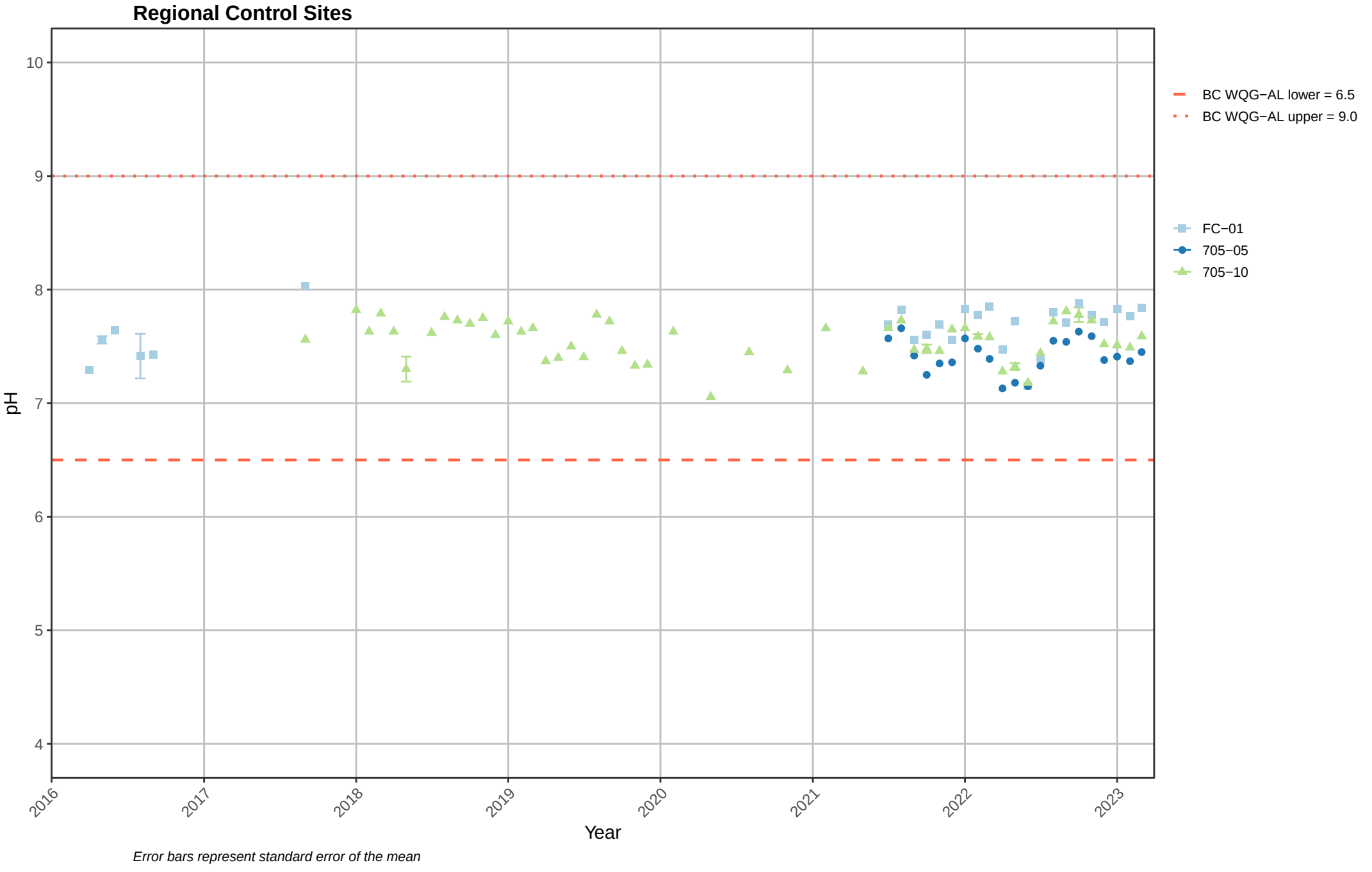
Error bars represent standard error of the mean

Appendix B−1.b: Monthly Mean pH at Creek 661 AEMP Sites, 2016 to March 31, 2023

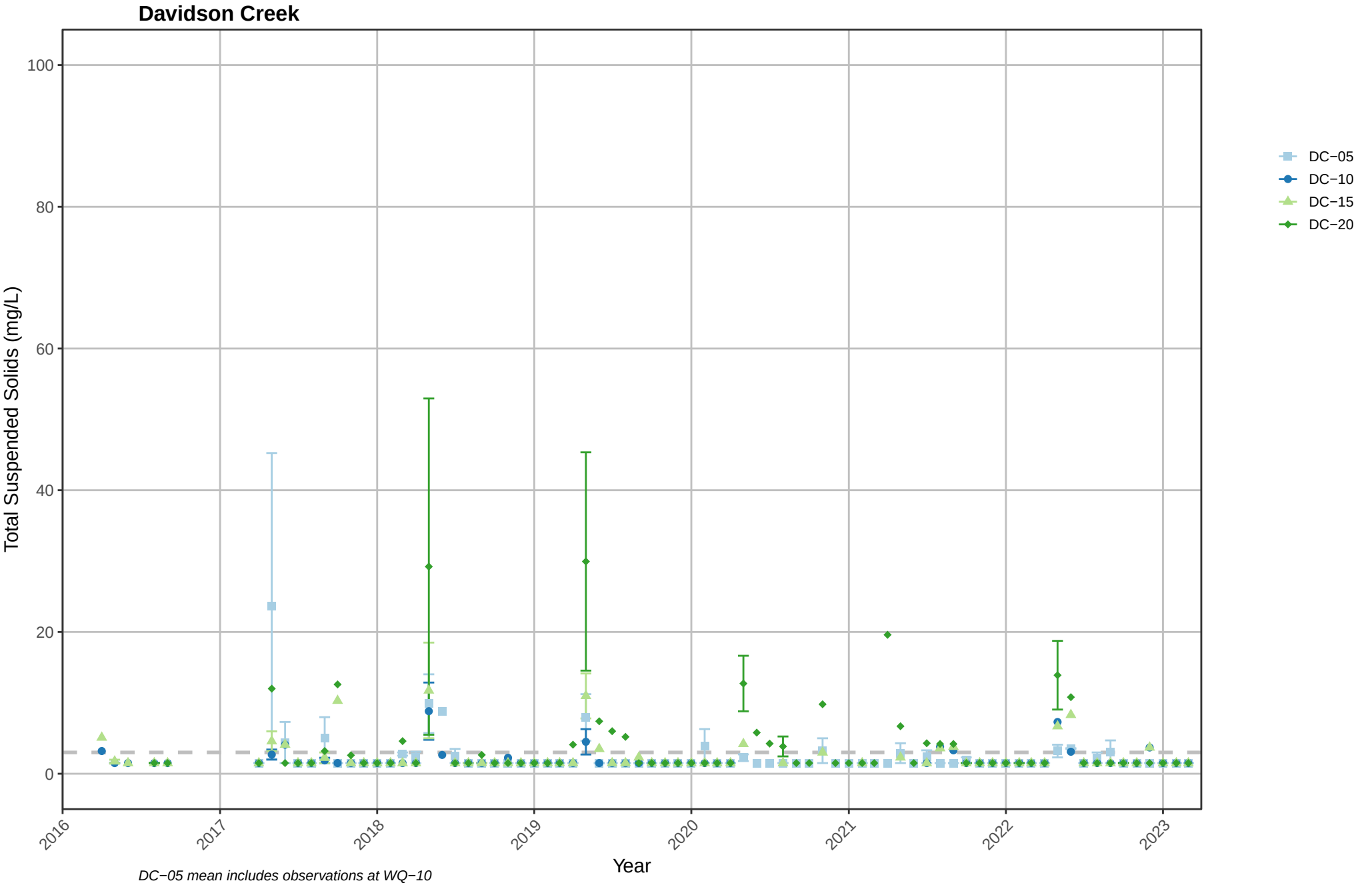


Error bars represent standard error of the mean
Proposed YDWL Standard for CC−15 is 6.5 to 9 pH units

Appendix B−1.c: Monthly Mean pH at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



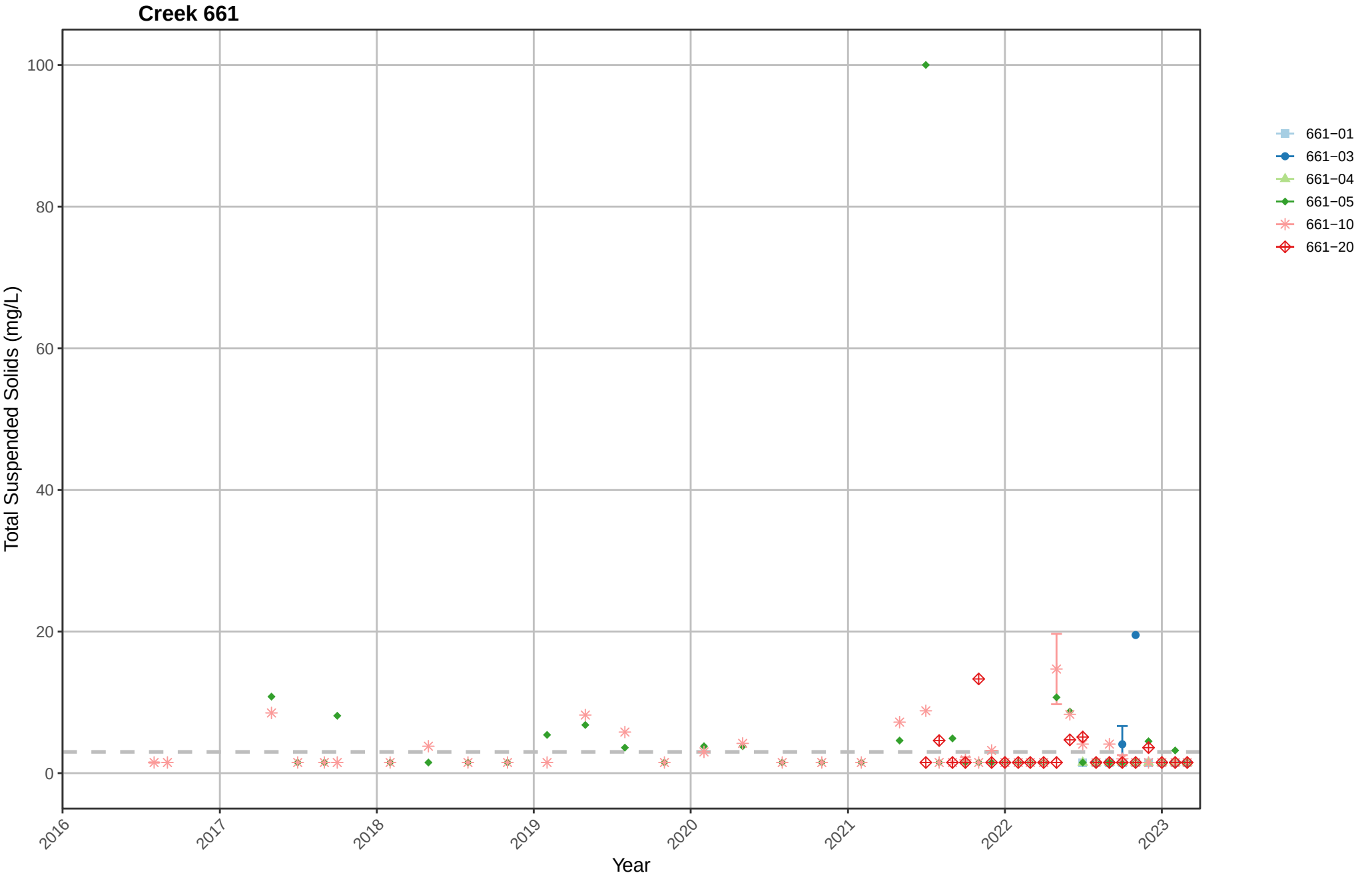
Appendix B−1.d: Monthly Mean pH at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean.
Concentrations below the detection limit were plotted as half the detection limit.

Water quality guidelines for suspended solids are dependent on background levels.
Proposed YDWL Standard for DC−05 is the BC WQG−AL.

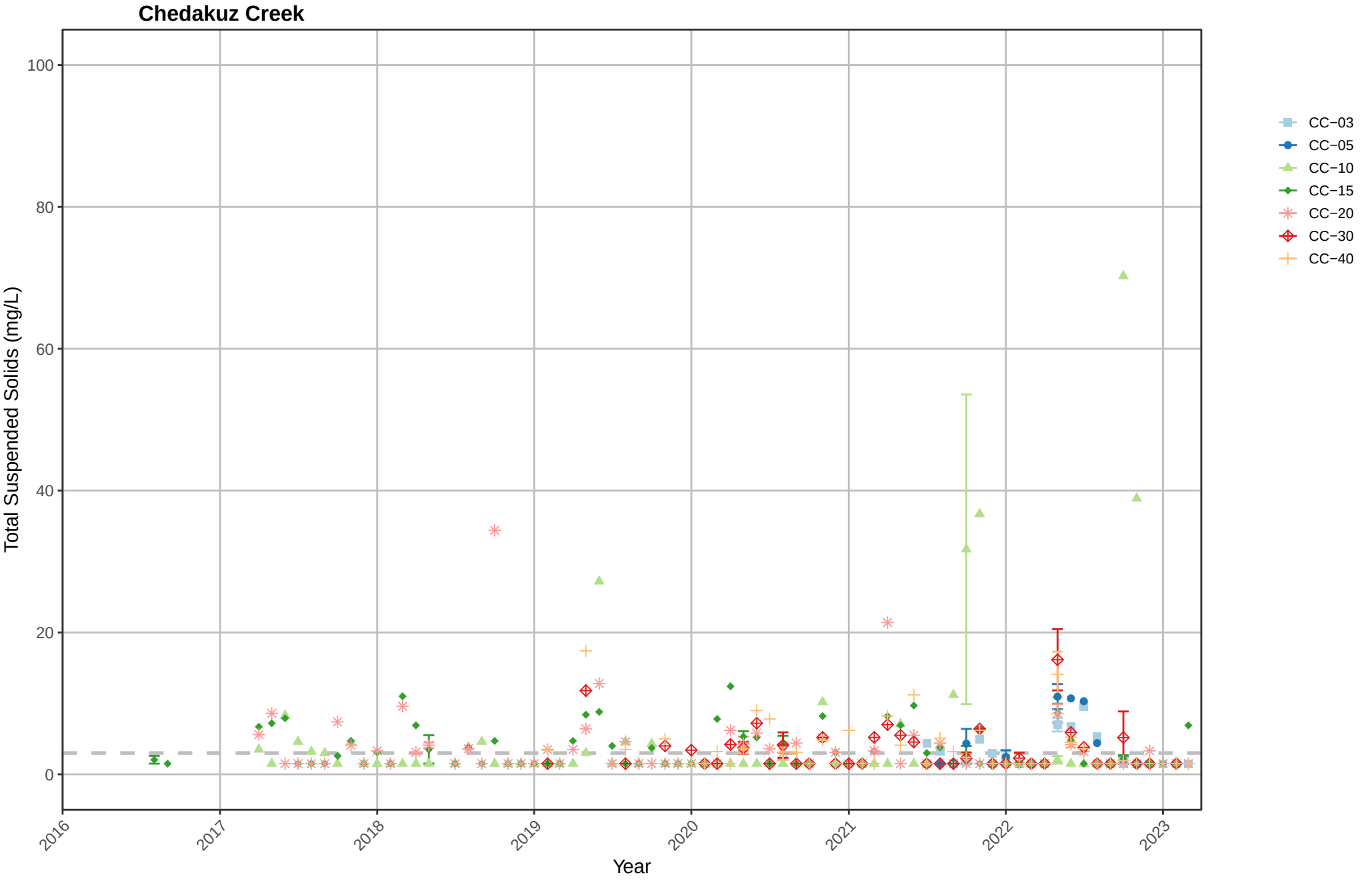
Appendix B−2.a: Monthly Mean Total Suspended Solids at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean.
Concentrations below the detection limit were plotted as half the detection limit.

Water quality guidelines for suspended solids are dependent on background levels.

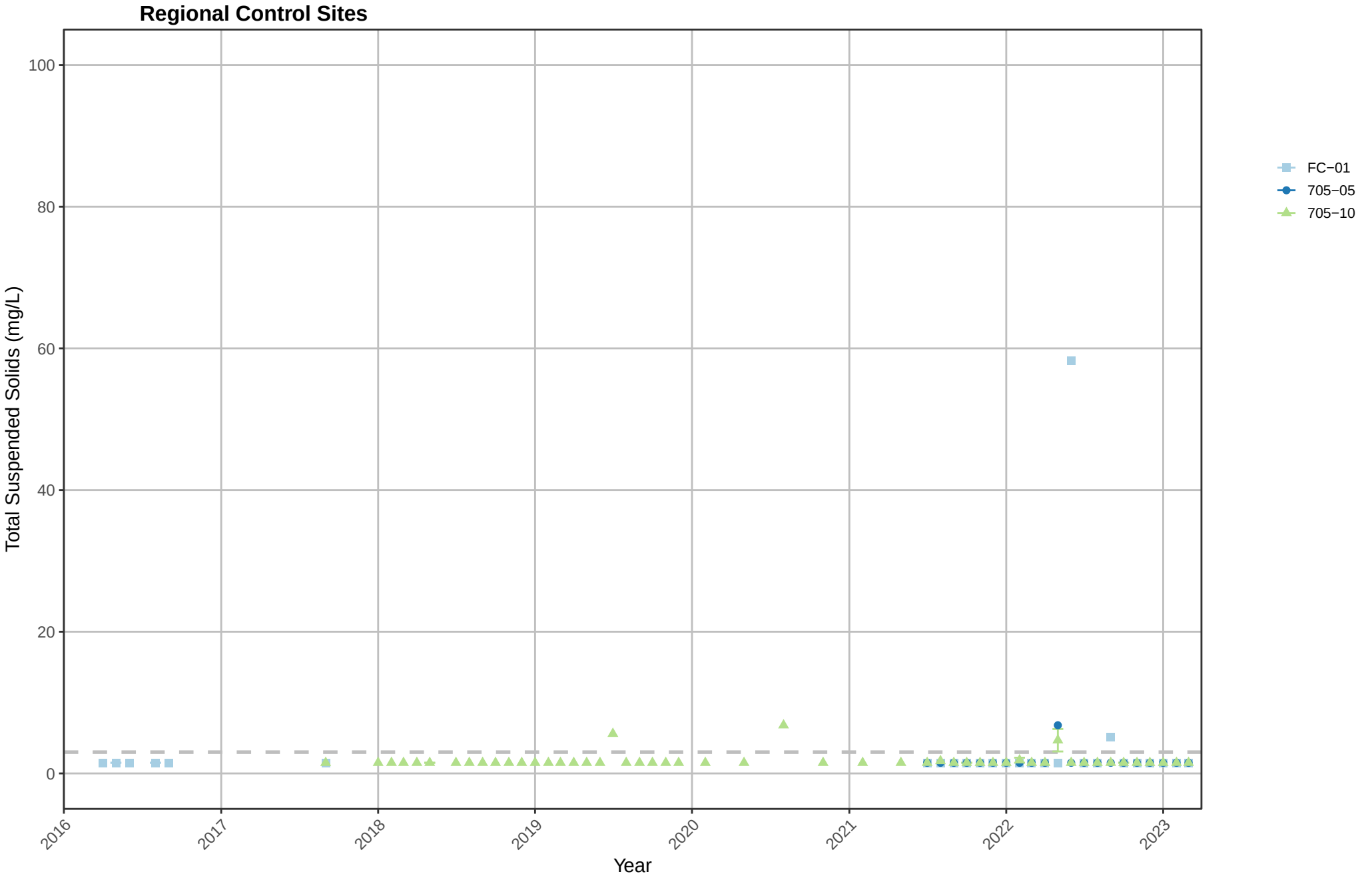
Appendix B−2.b: Monthly Mean Total Suspended Solids at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean.
Concentrations below the detection limit were plotted as half the detection limit.

Water quality guidelines for suspended solids are dependent on background levels.
Proposed YDWL Standard for CC−15 is the BC WQG−AL.

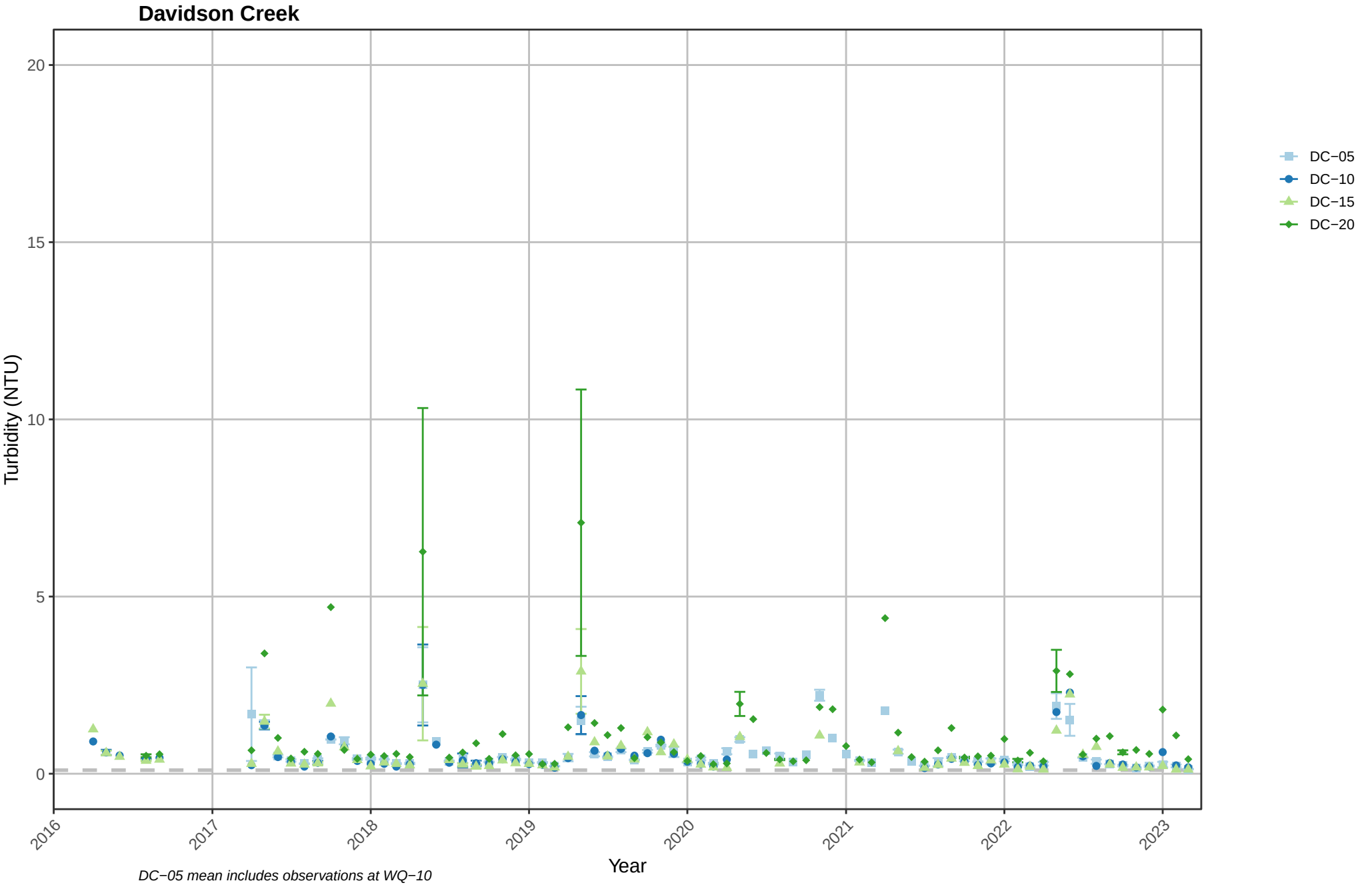
Appendix B−2.c: Monthly Mean Total Suspended Solids at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean.
Concentrations below the detection limit were plotted as half the detection limit.

Water quality guidelines for suspended solids are dependent on background levels.

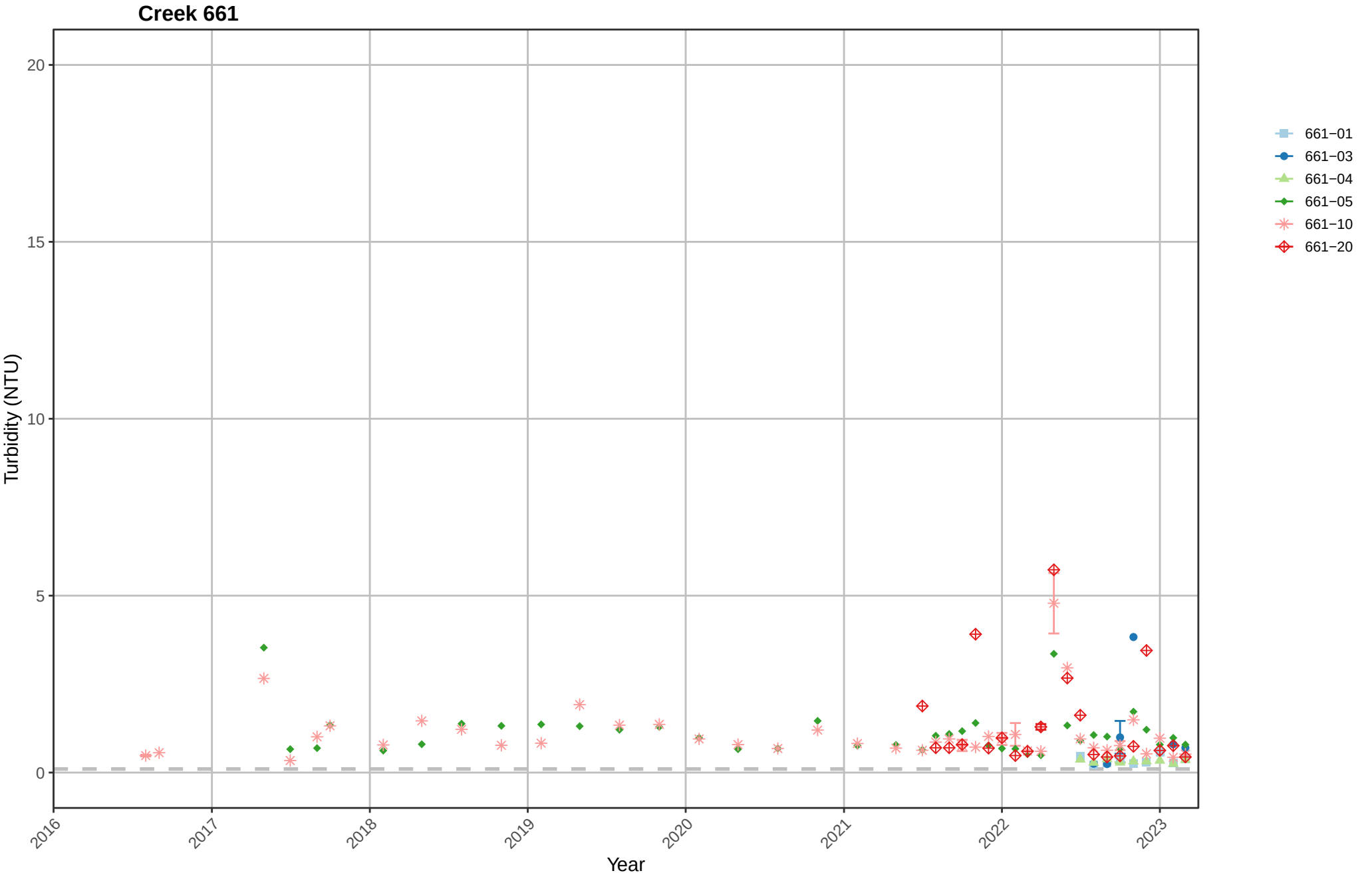
Appendix B−2.d: Monthly Mean Total Suspended Solids at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean.
Concentrations below the detection limit were plotted as half the detection limit.

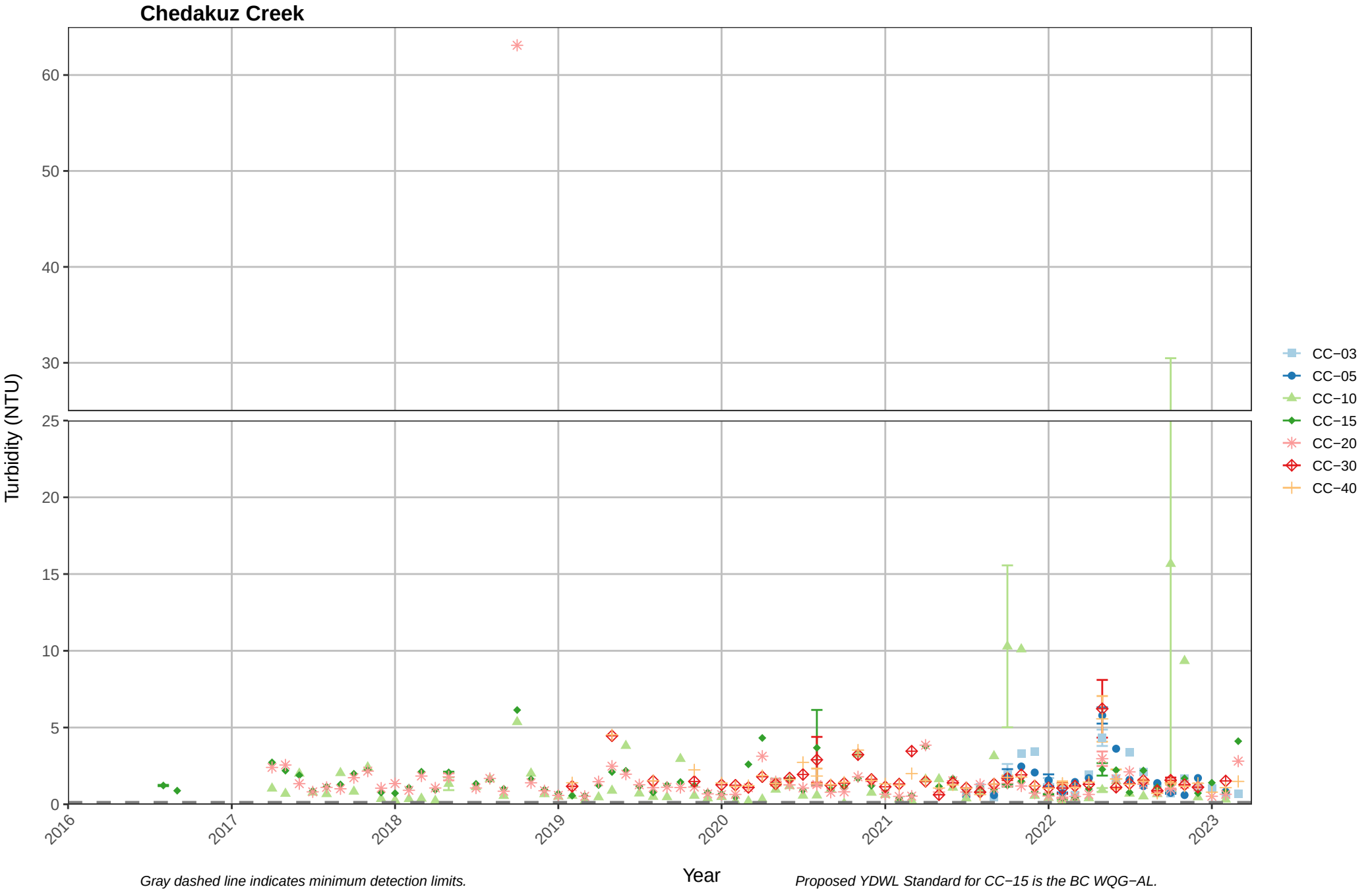
Proposed YDWL Standard for DC−05 is the BC WQG−AL.

Appendix B−3.a: Monthly Mean Turbidity at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean.
Concentrations below the detection limit were plotted as half the detection limit.

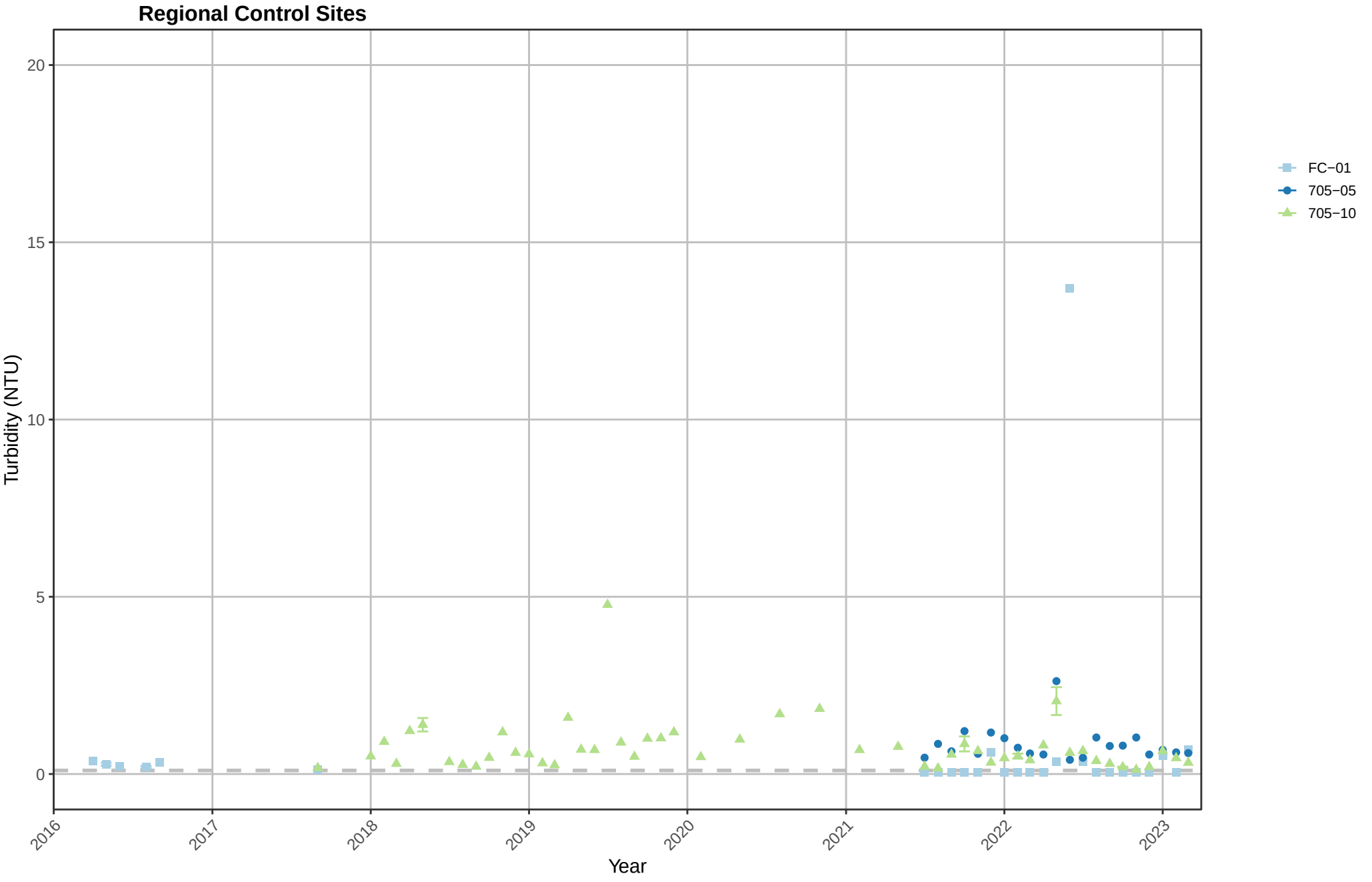
Appendix B−3.b: Monthly Mean Turbidity at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean.
Concentrations below the detection limit were plotted as half the detection limit.

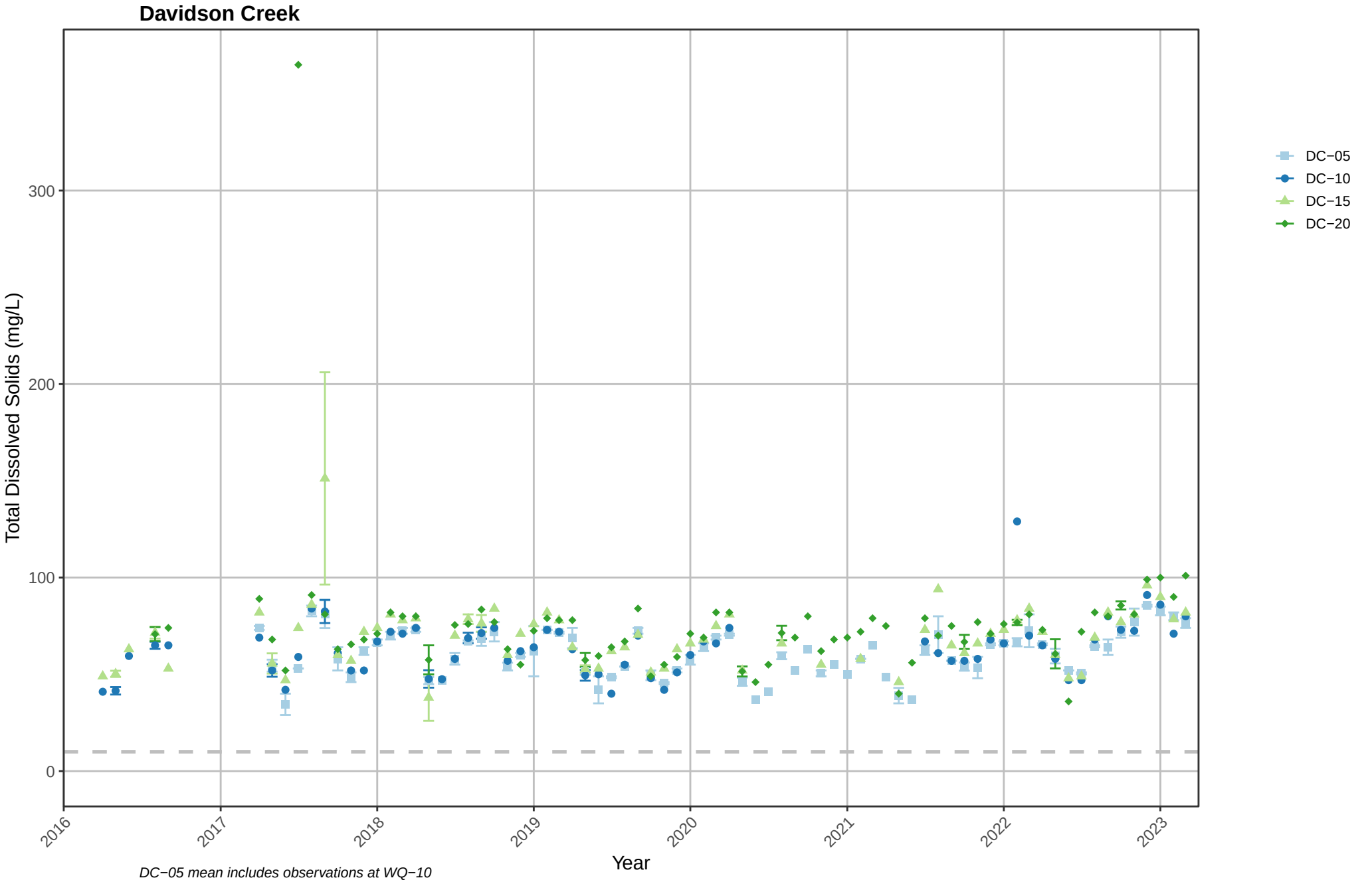
Proposed YDWL Standard for CC−15 is the BC WQG−AL.

Appendix B−3.c: Monthly Mean Turbidity at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean.
Concentrations below the detection limit were plotted as half the detection limit.

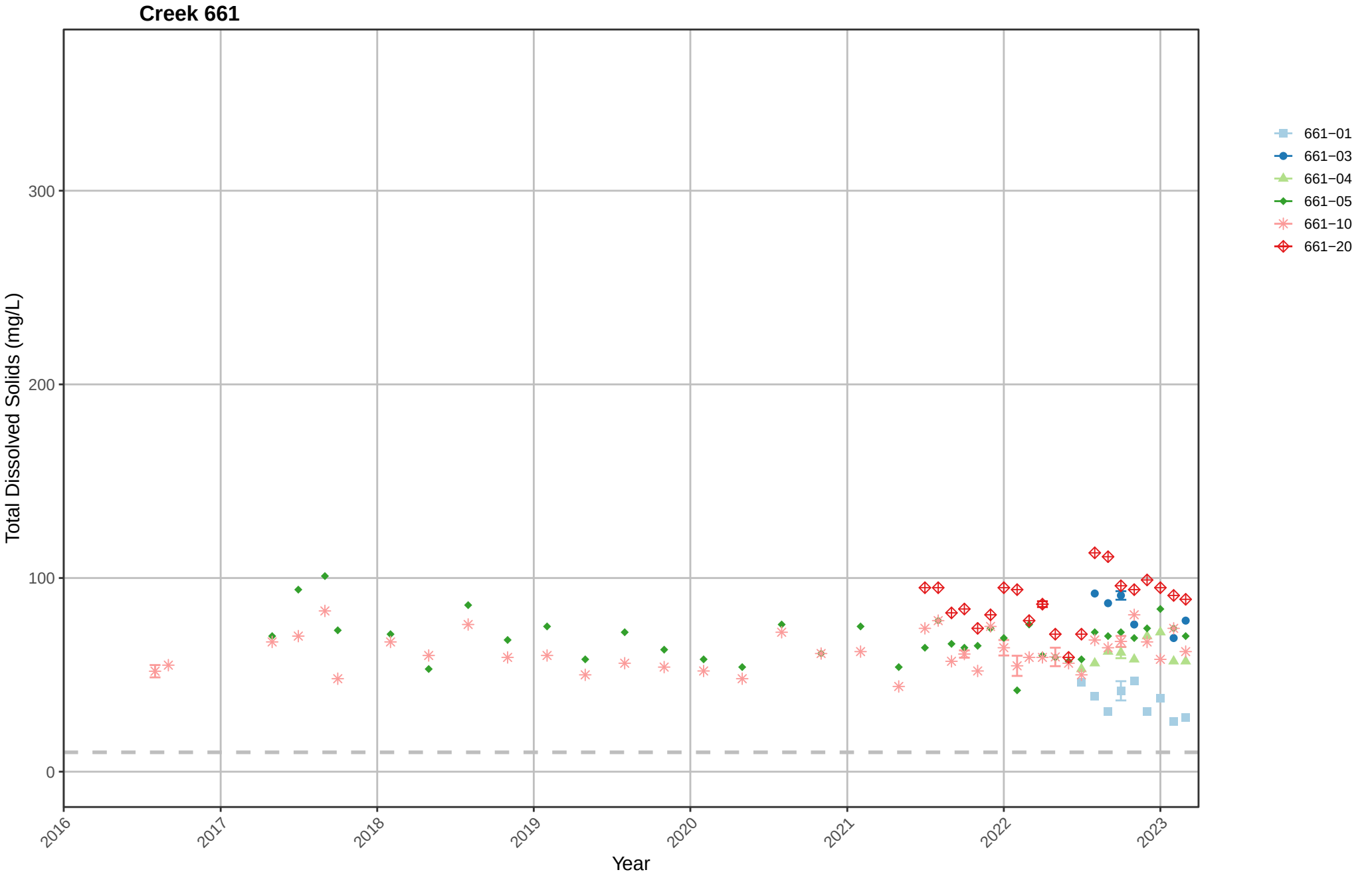
Appendix B−3.d: Monthly Mean Turbidity at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean

No aquatic life guideline is available for this parameter. A benchmark of 500 mg/L will be used as identified in the effects assessment for the Joint MA/EMA Application (BW Gold 2022).

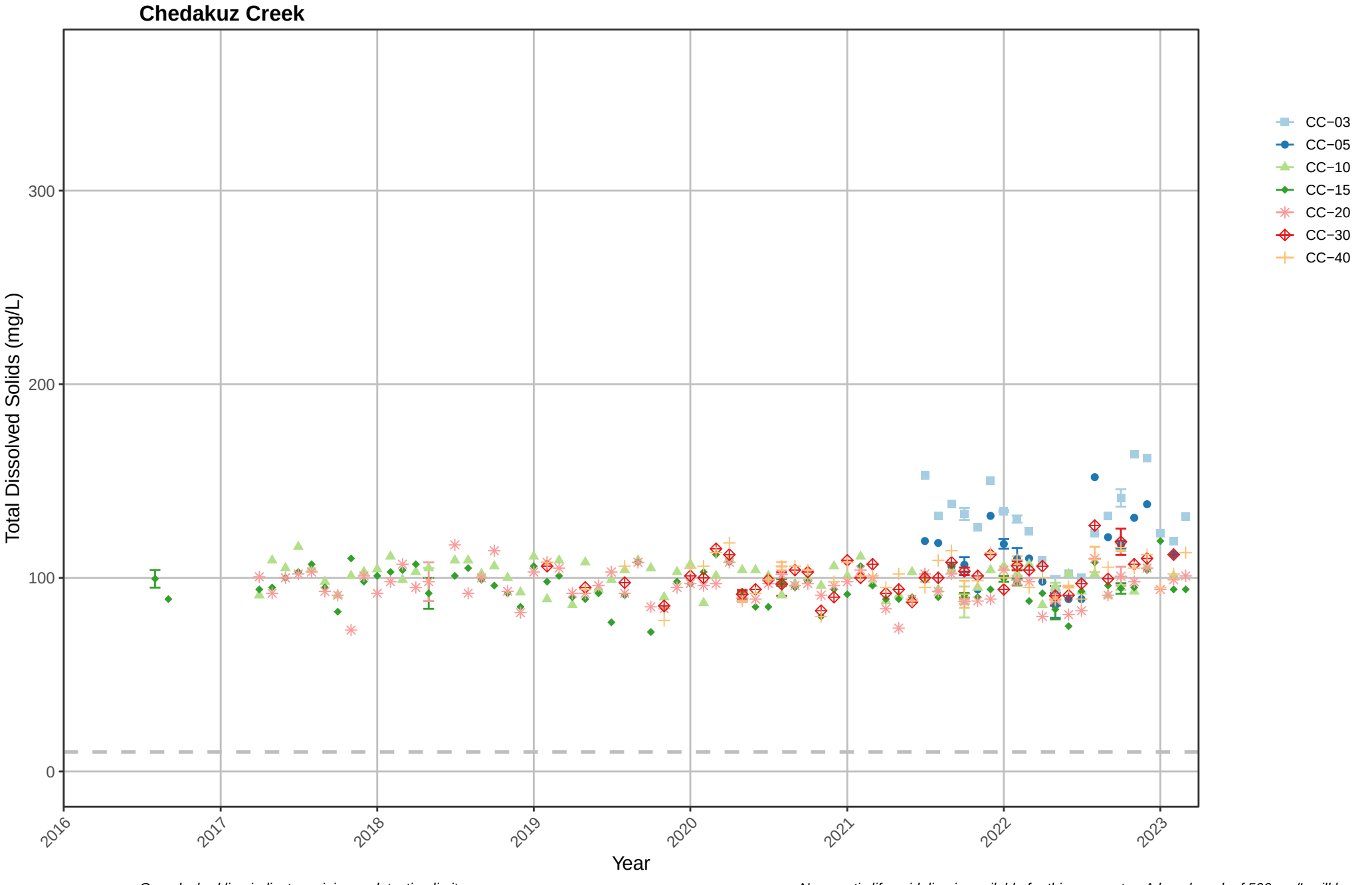
Appendix B−4.a: Monthly Mean Total Dissolved Solids at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean

No aquatic life guideline is available for this parameter. A benchmark of 500 mg/L will be used as identified in the effects assessment for the Joint MA/EMA Application (BW Gold 2022).

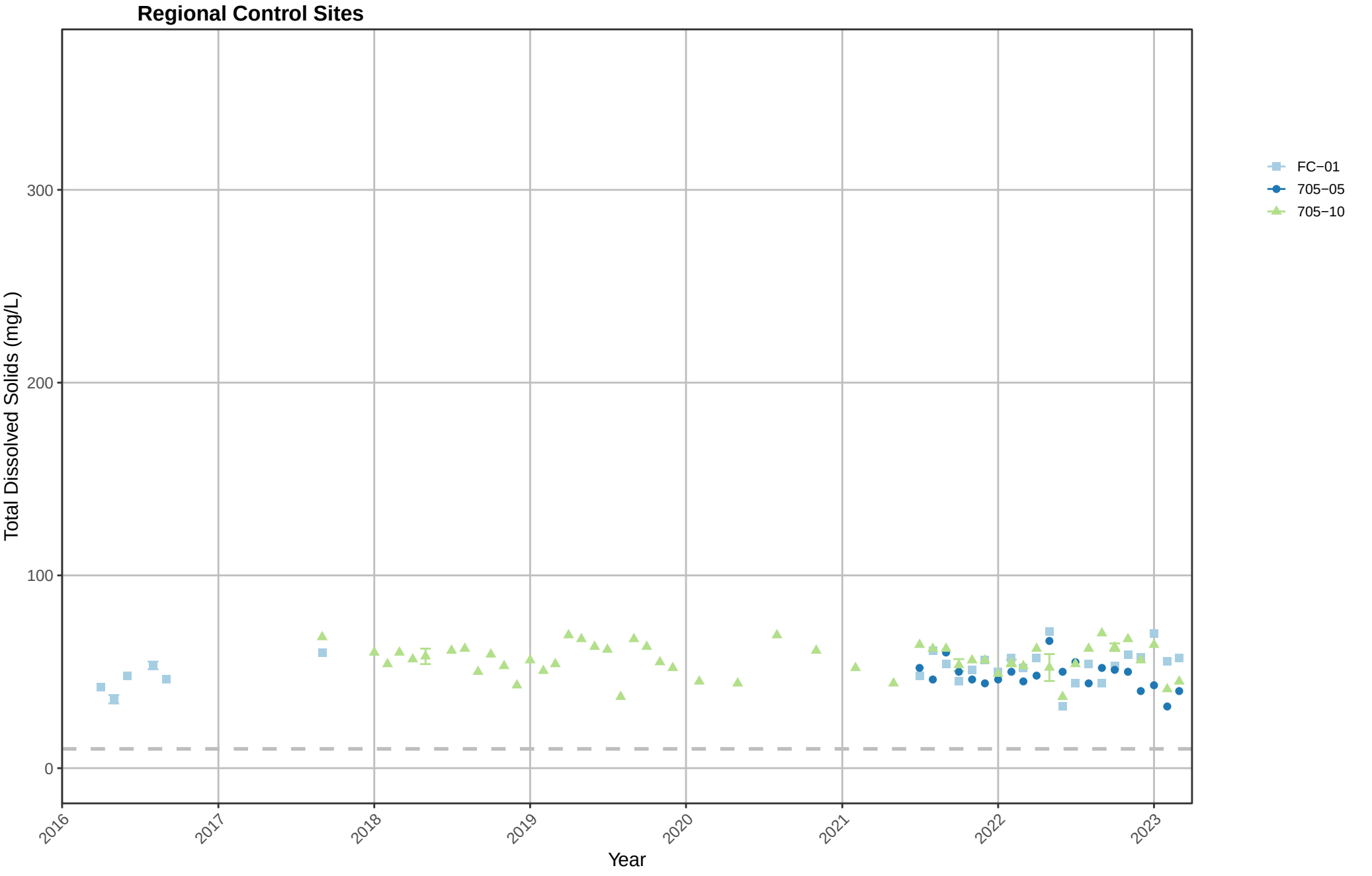
Appendix B−4.b: Monthly Mean Total Dissolved Solids at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean

No aquatic life guideline is available for this parameter. A benchmark of 500 mg/L will be used as identified in the effects assessment for the Joint MA/EMA Application (BW Gold 2022).

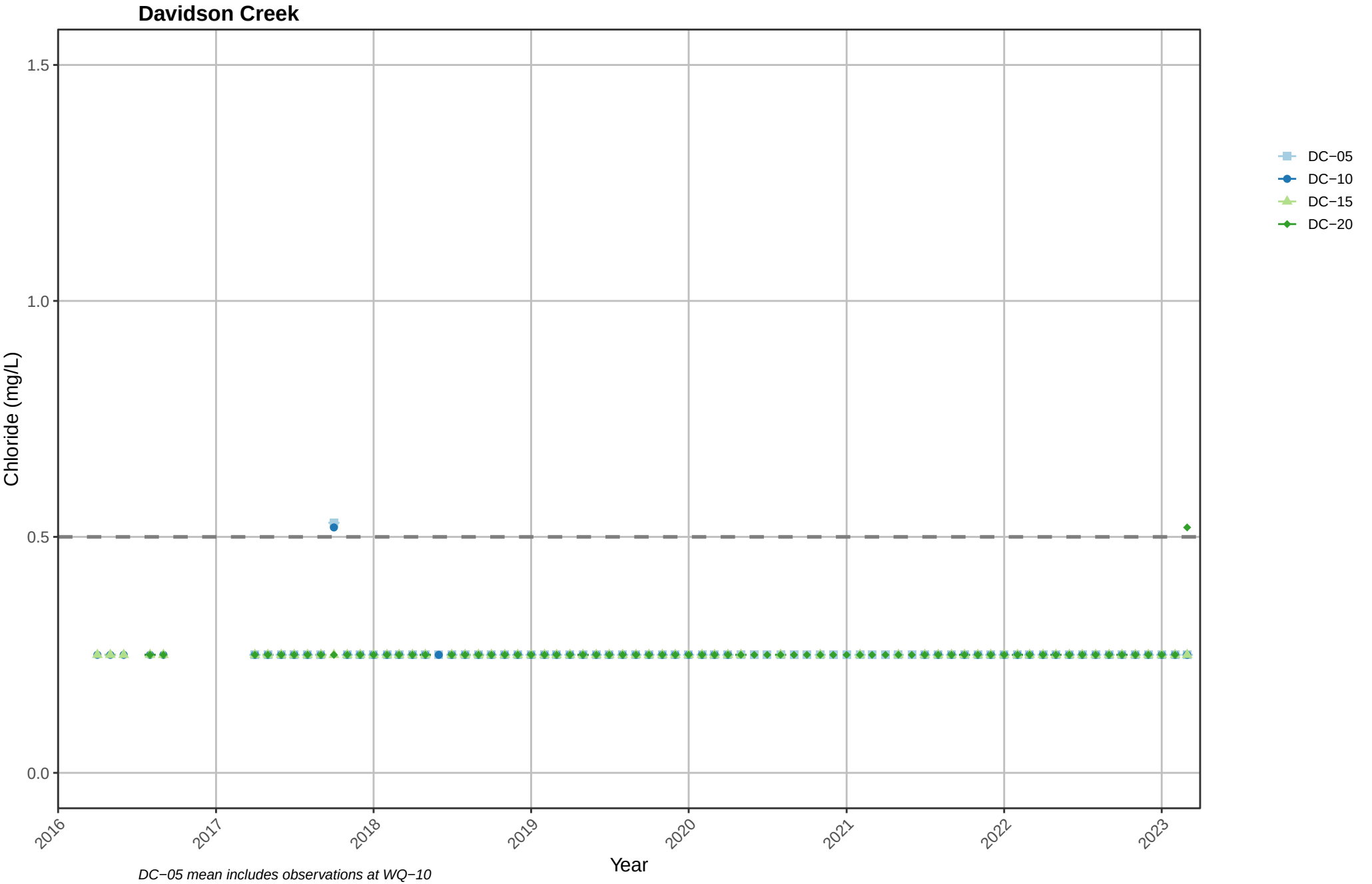
Appendix B−4.c: Monthly Mean Total Dissolved Solids at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean

No aquatic life guideline is available for this parameter. A benchmark of 500 mg/L will be used as identified in the effects assessment for the Joint MA/EMA Application (BW Gold 2022).

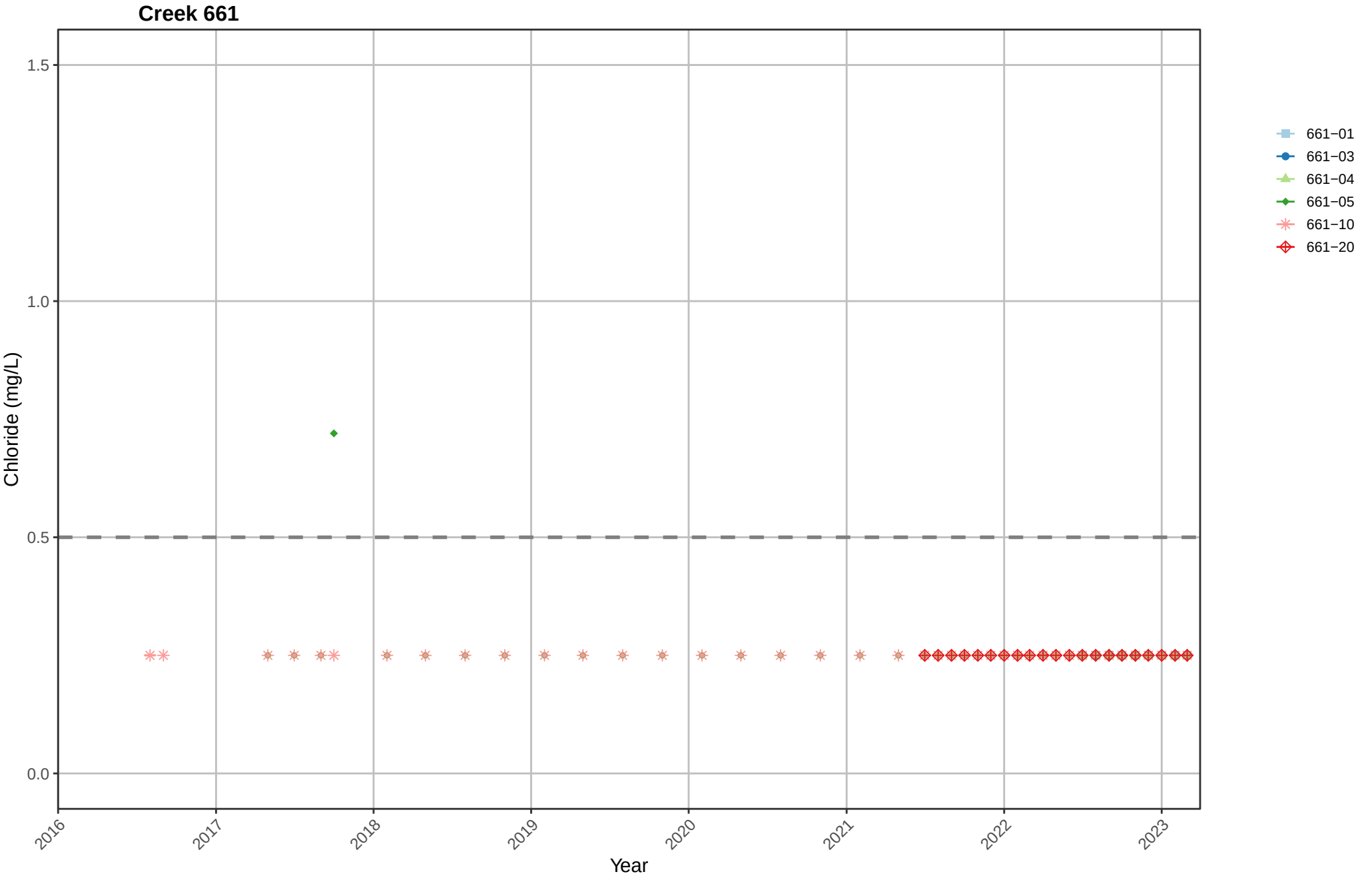
Appendix B−4.d: Monthly Mean Total Dissolved Solids at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for chloride is 150 mg/L.
The CCME livestock WQG for chloride is 3,000 mg/L.
Proposed YDWL Standard for DC−05 is 120 mg/L.

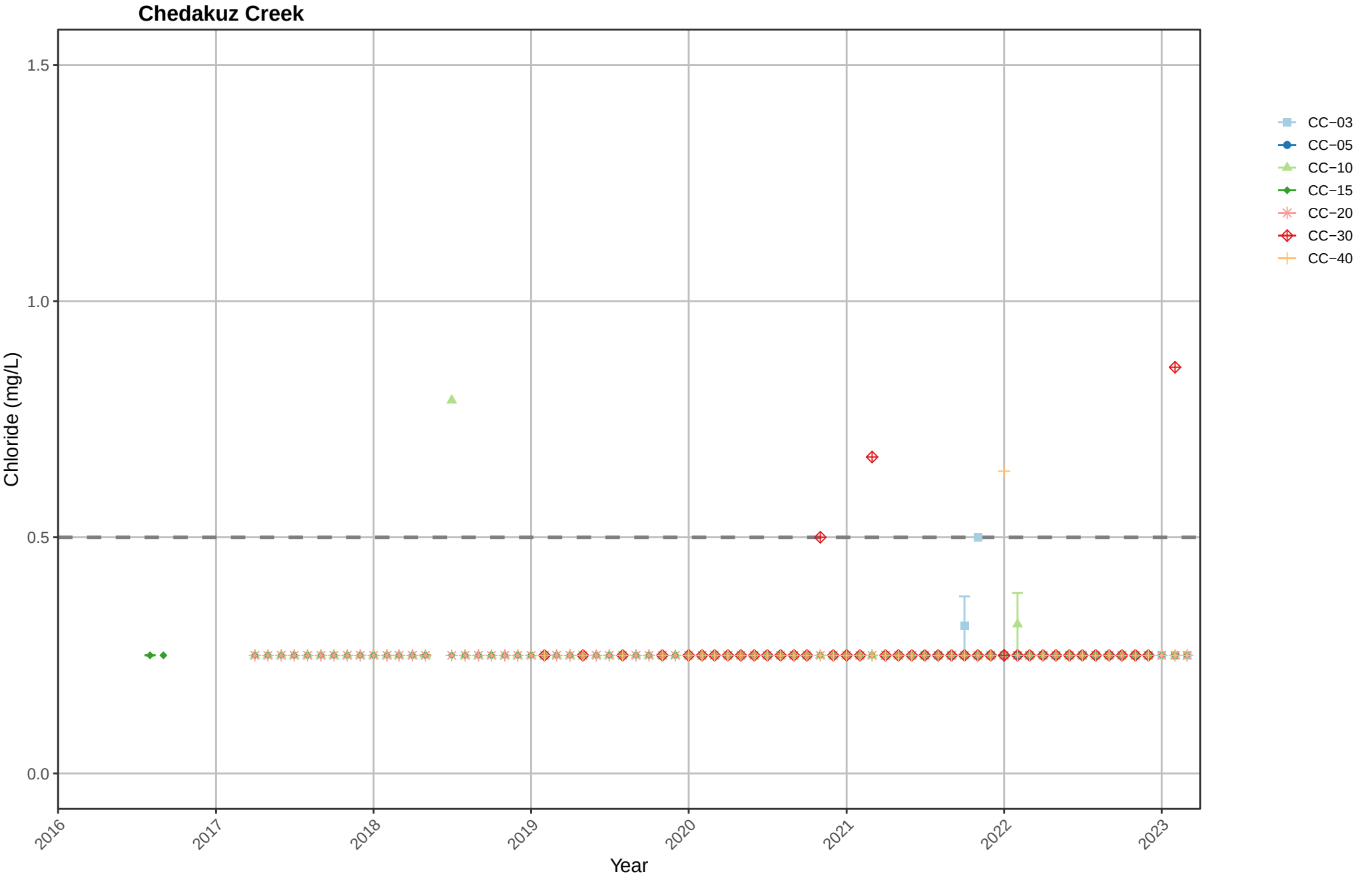
Appendix B−5.a: Monthly Mean Chloride at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for chloride is 150 mg/L.
The CCME livestock WQG for chloride is 3,000 mg/L.

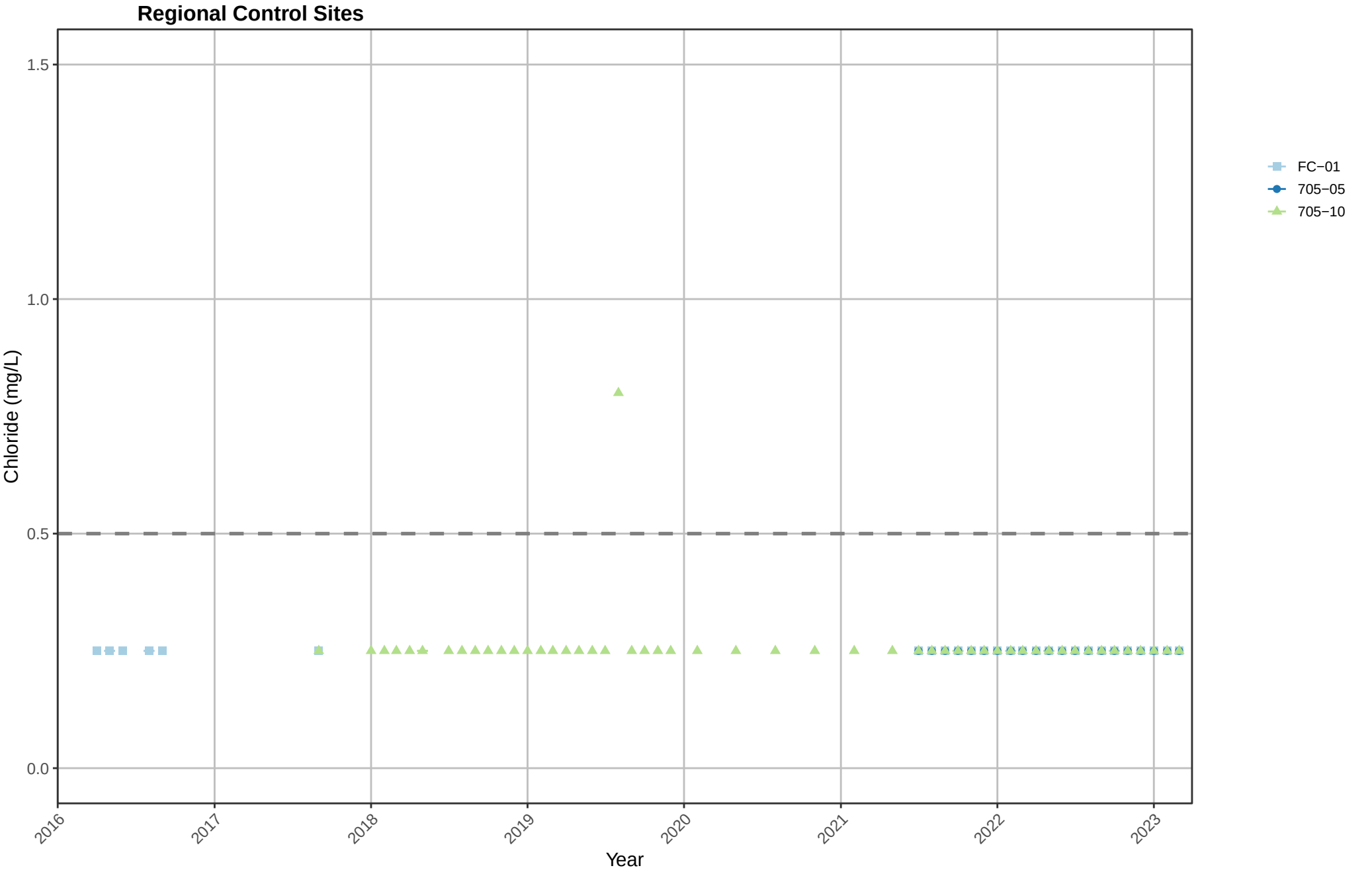
Appendix B−5.b: Monthly Mean Chloride at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for chloride is 150 mg/L.
The CCME livestock WQG for chloride is 3,000 mg/L.
Proposed YDWL Standard for CC−15 is 60 mg/L.

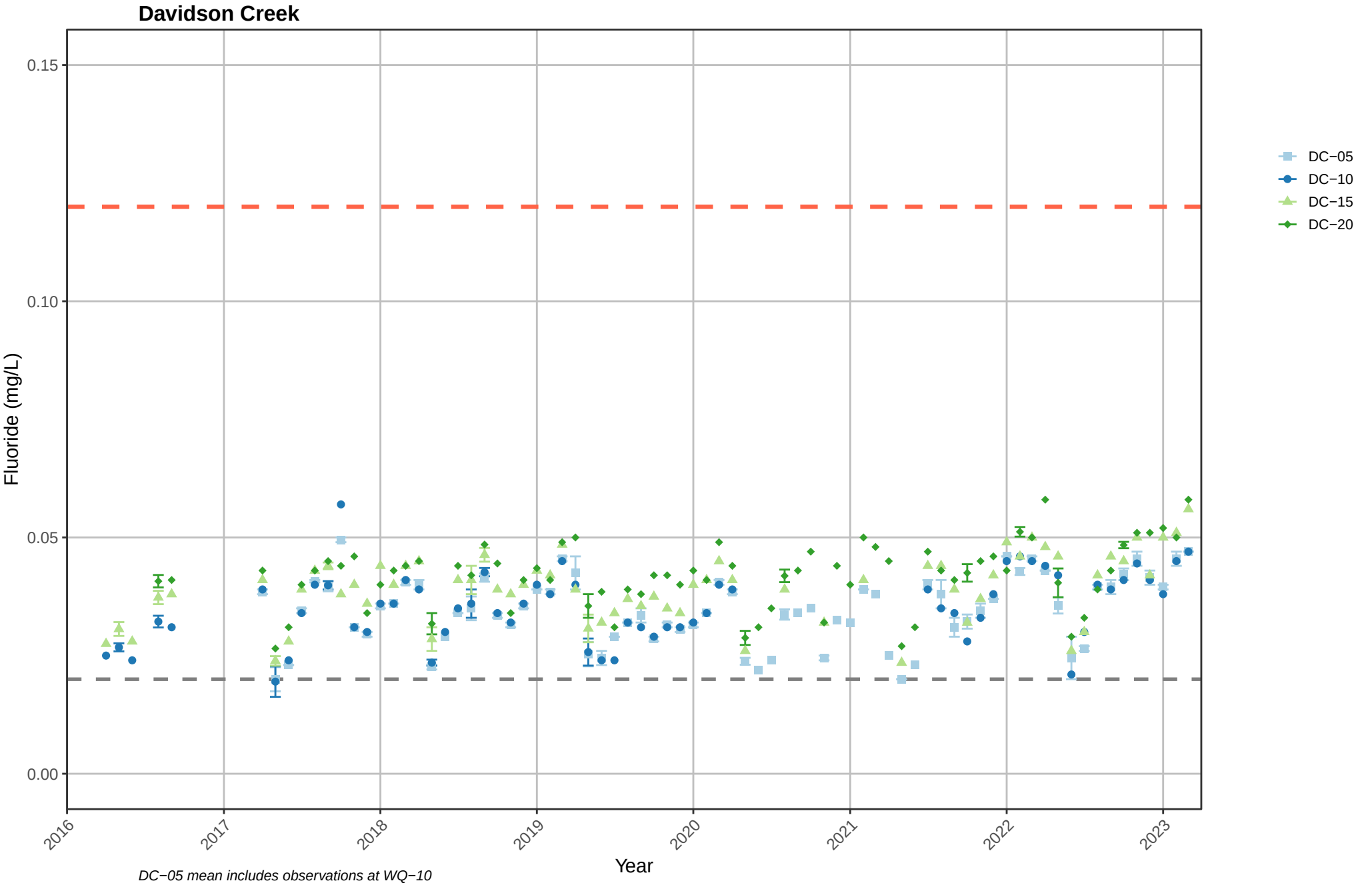
Appendix B−5.c: Monthly Mean Chloride at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for chloride is 150 mg/L.
The CCME livestock WQG for chloride is 3,000 mg/L.

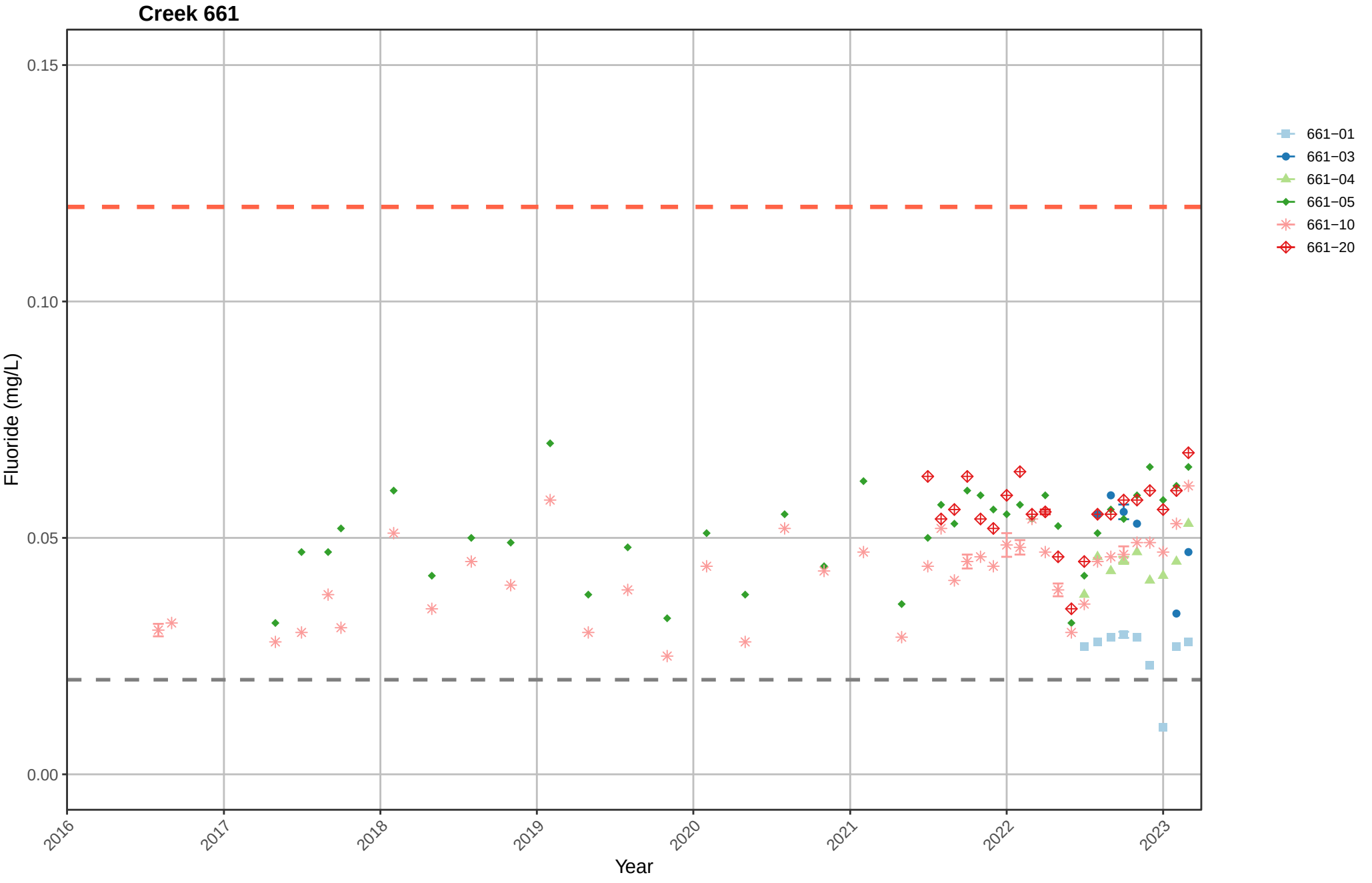
Appendix B−5.d: Monthly Mean Chloride at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

No BC WQG−AL long−term guideline for fluoride; CCME interim WQG−AL = 0.12 mg/L.
Proposed YDWL Standard for fluoride at DC−05 is 1 mg/L.

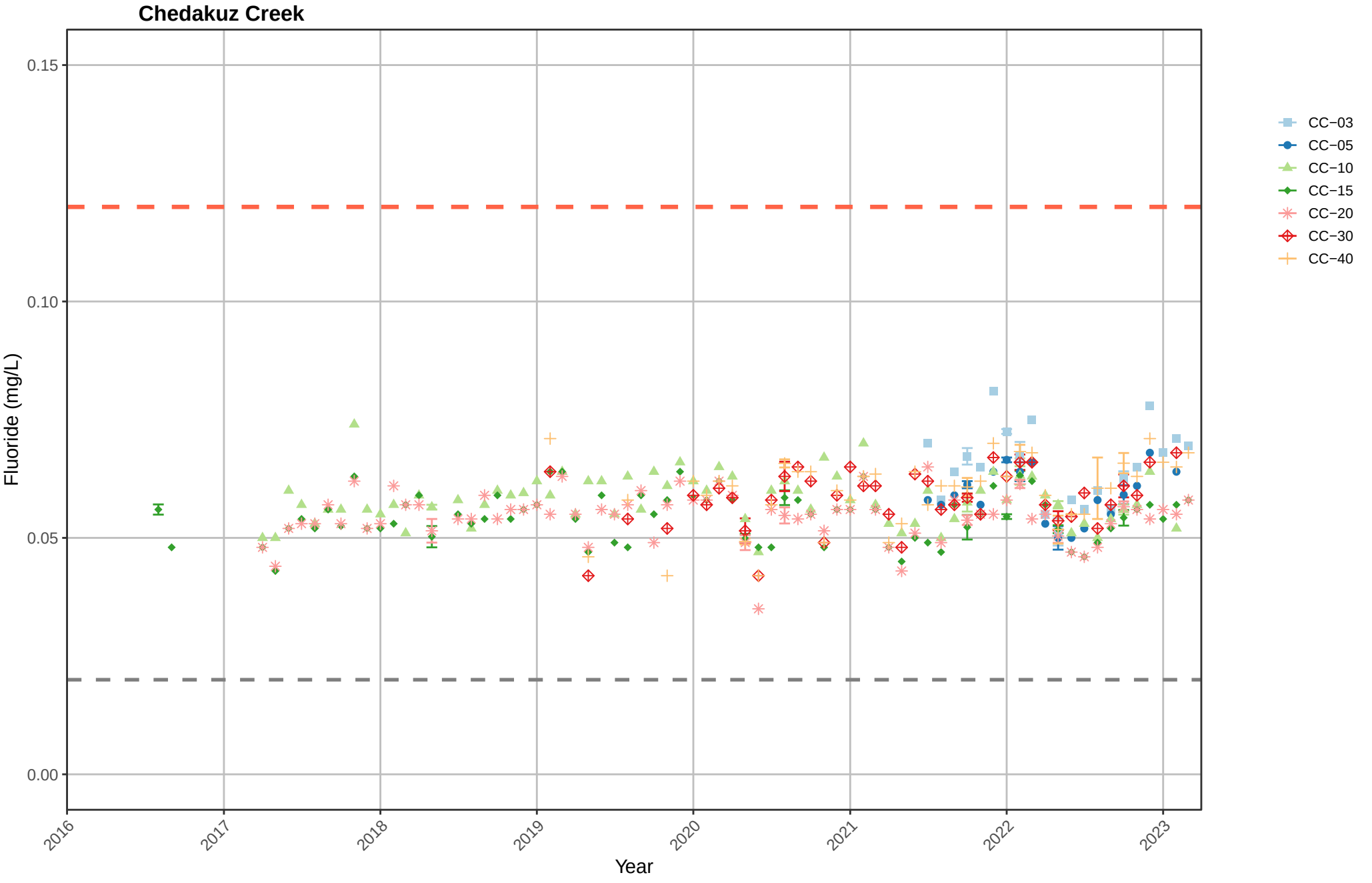
Appendix B−6.a: Monthly Mean Fluoride at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

No BC WQG−AL long−term guideline for fluoride; CCME interim WQG−AL = 0.12 mg/L.

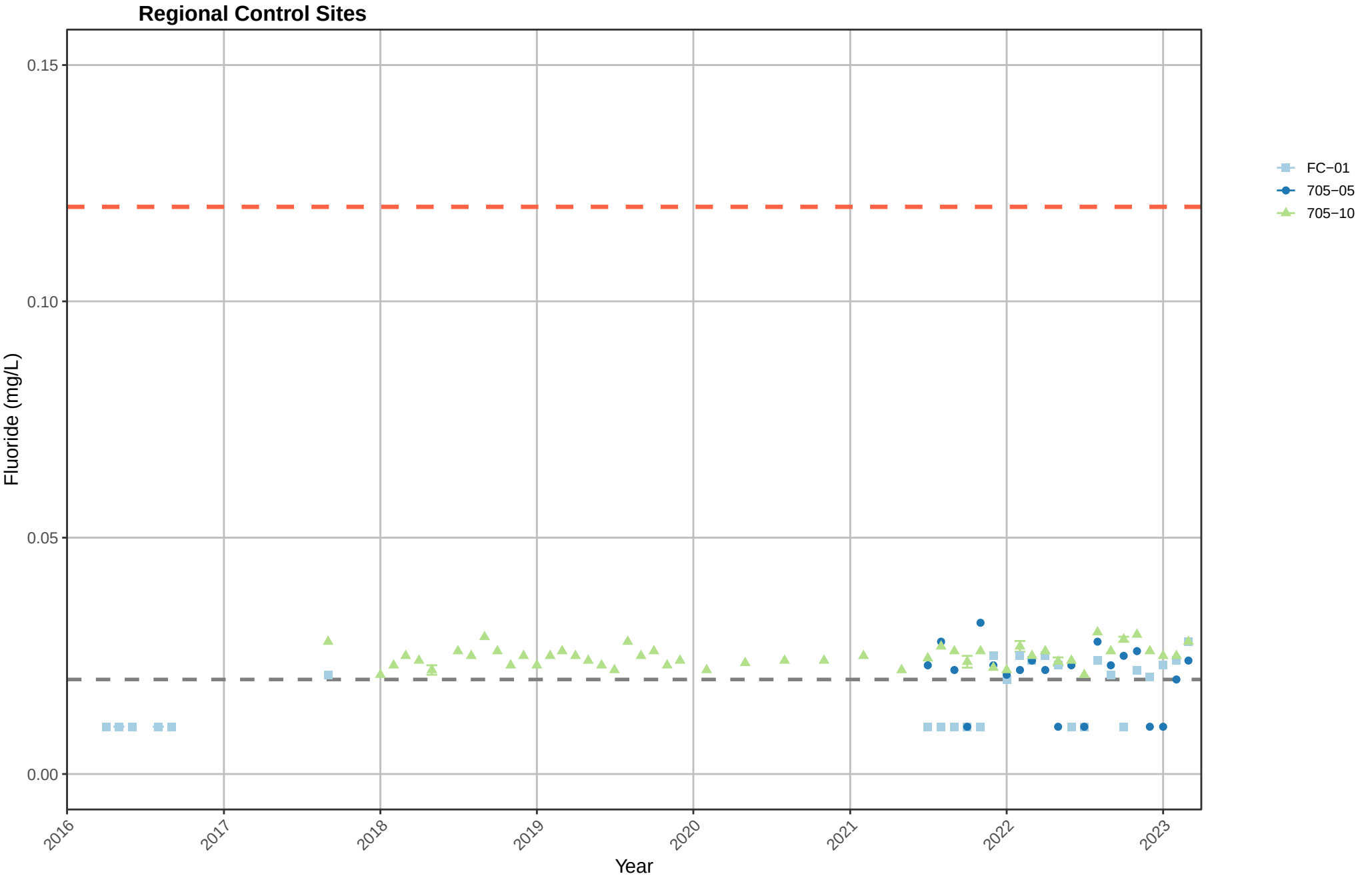
Appendix B−6.b: Monthly Mean Fluoride at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

No BC WQG−AL long−term guideline for fluoride; CCME interim WQG−AL = 0.12 mg/L.
Proposed YDWL Standard for fluoride at CC−15 is 0.53 mg/L.

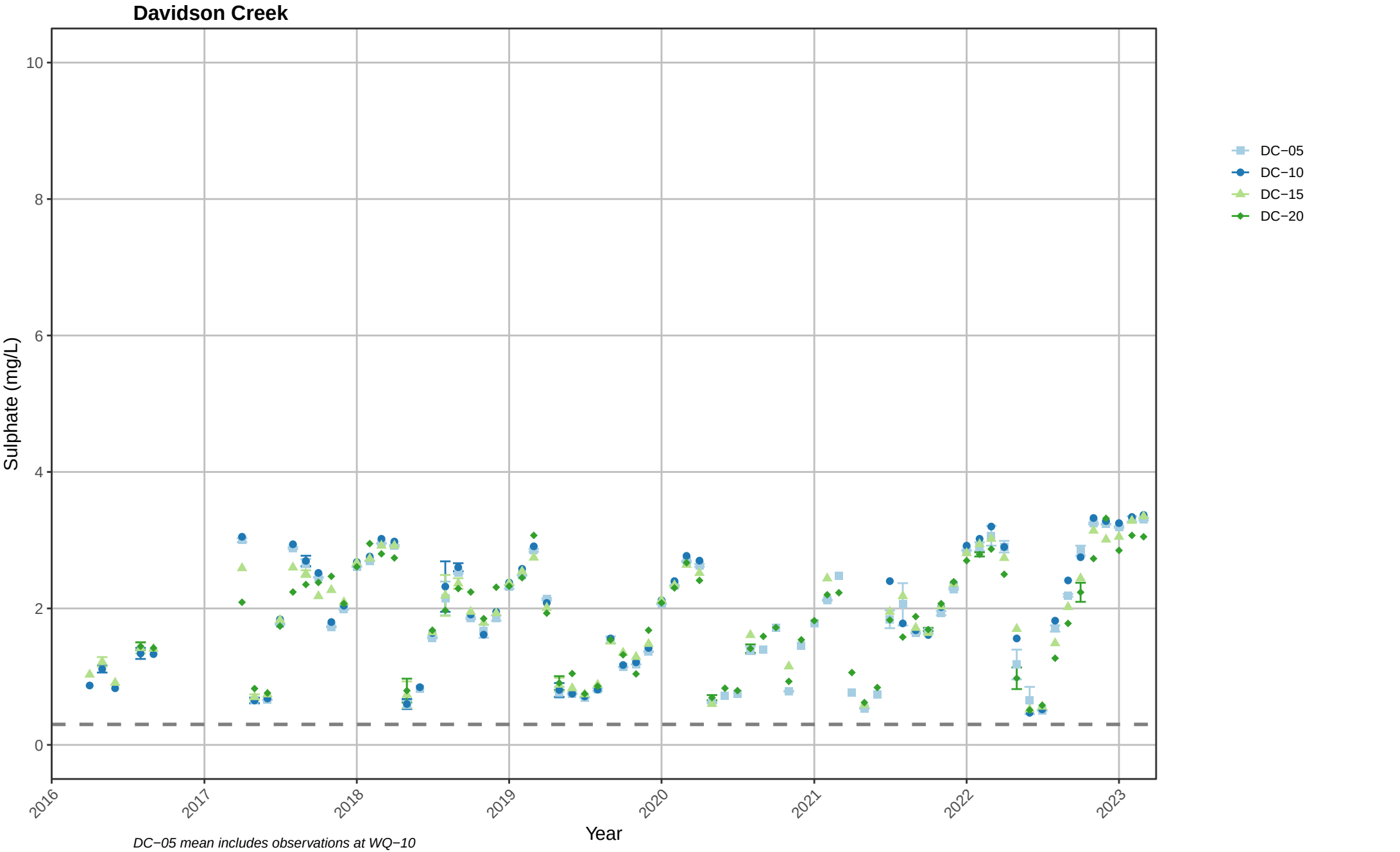
Appendix B−6.c: Monthly Mean Fluoride at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

No BC WQG−AL long−term guideline for fluoride; CCME interim WQG−AL = 0.12 mg/L.

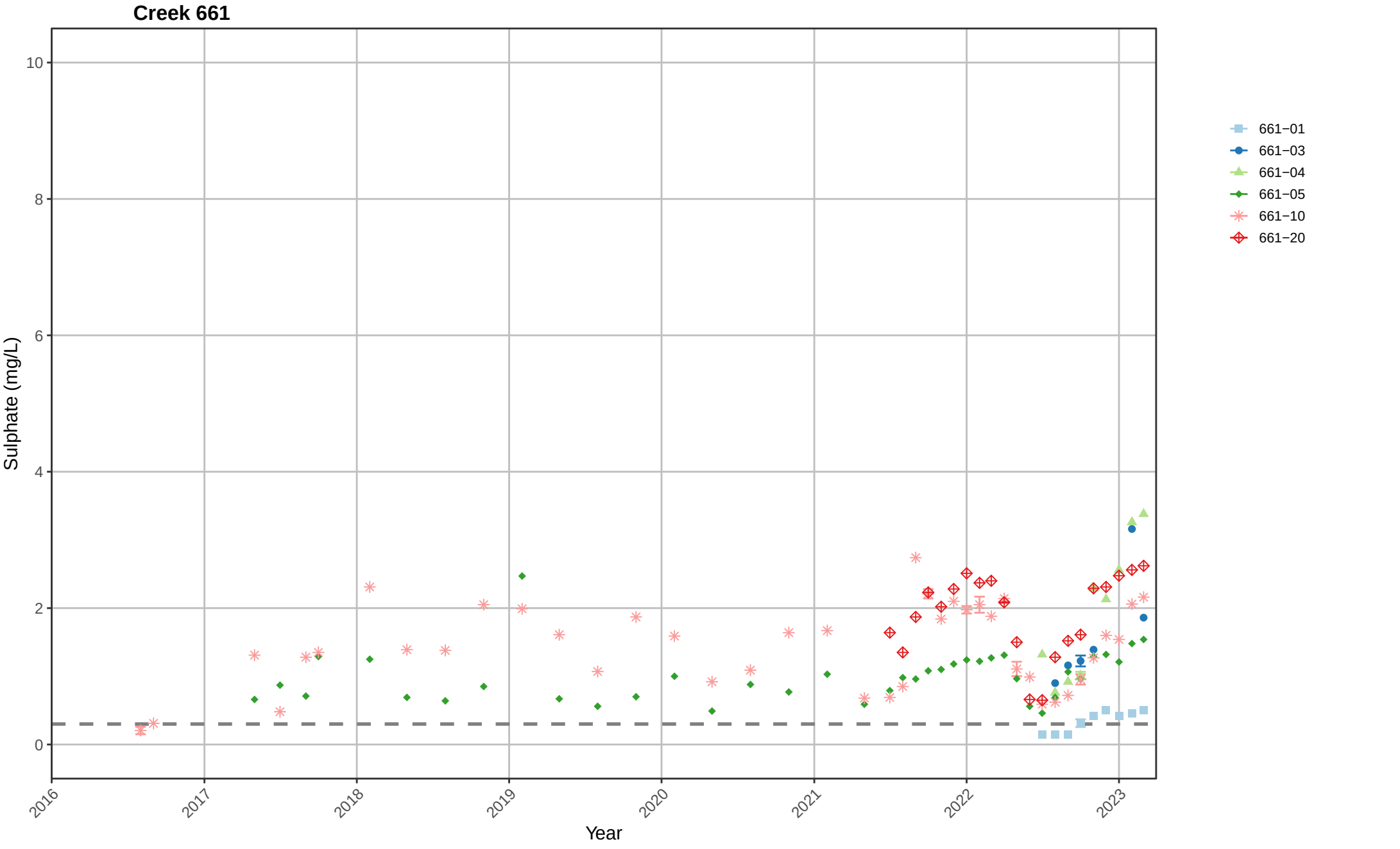
Appendix B−6.d: Monthly Mean Fluoride at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

The BC long−term WQG−AL for sulphate is hardness dependent.The lowest long−term guideline value is 128 mg/L.
The CCME livestock WQG for sulphate is 1,000 mg/L.
Proposed YDWL Standard for sulphate at DC−05 is 120 mg/L.

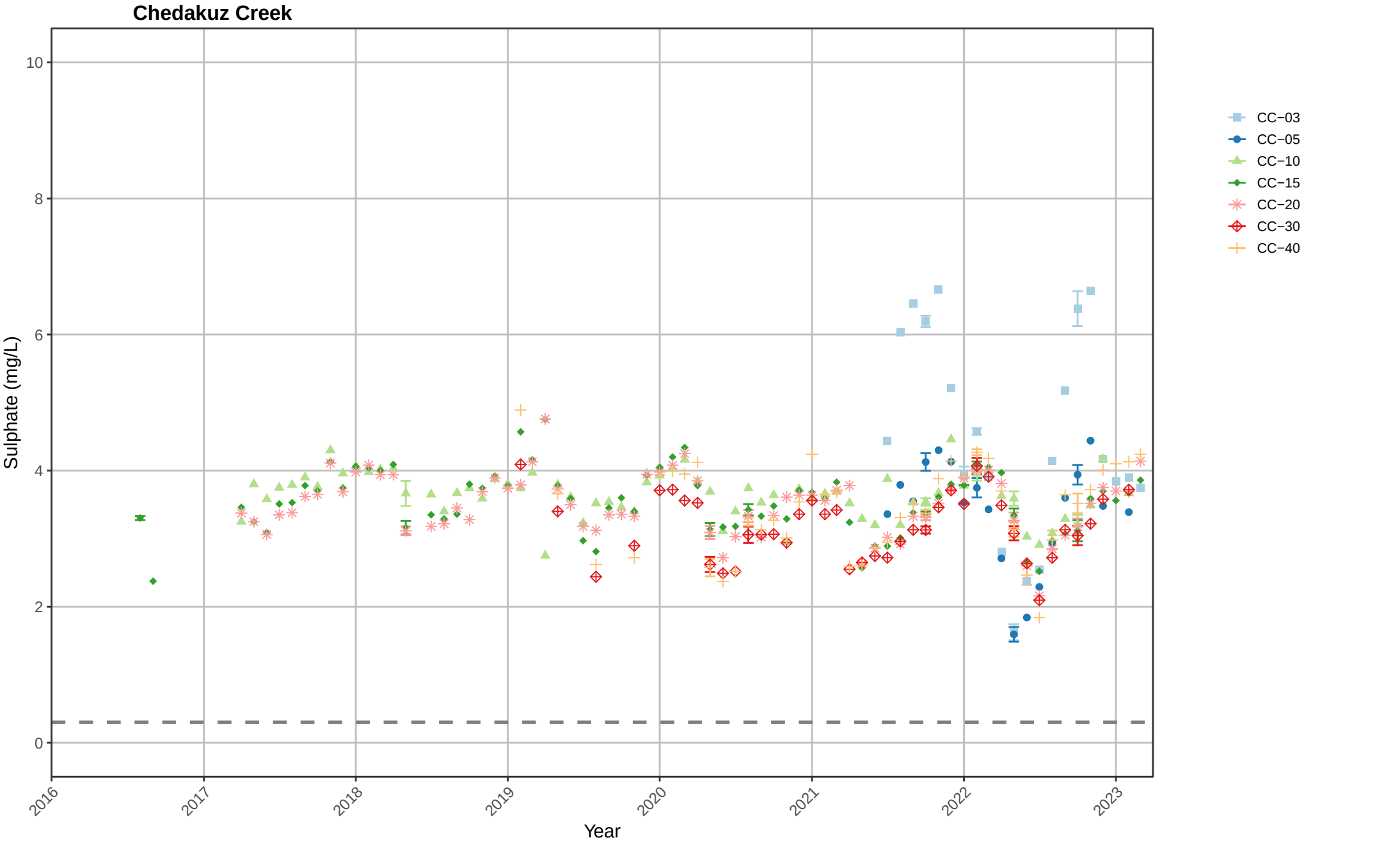
Appendix B−7.a: Monthly Mean Sulphate at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

The BC long−term WQG−AL for sulphate is hardness dependent.The lowest long−term guideline value is 128 mg/L.
The CCME livestock WQG for sulphate is 1,000 mg/L.

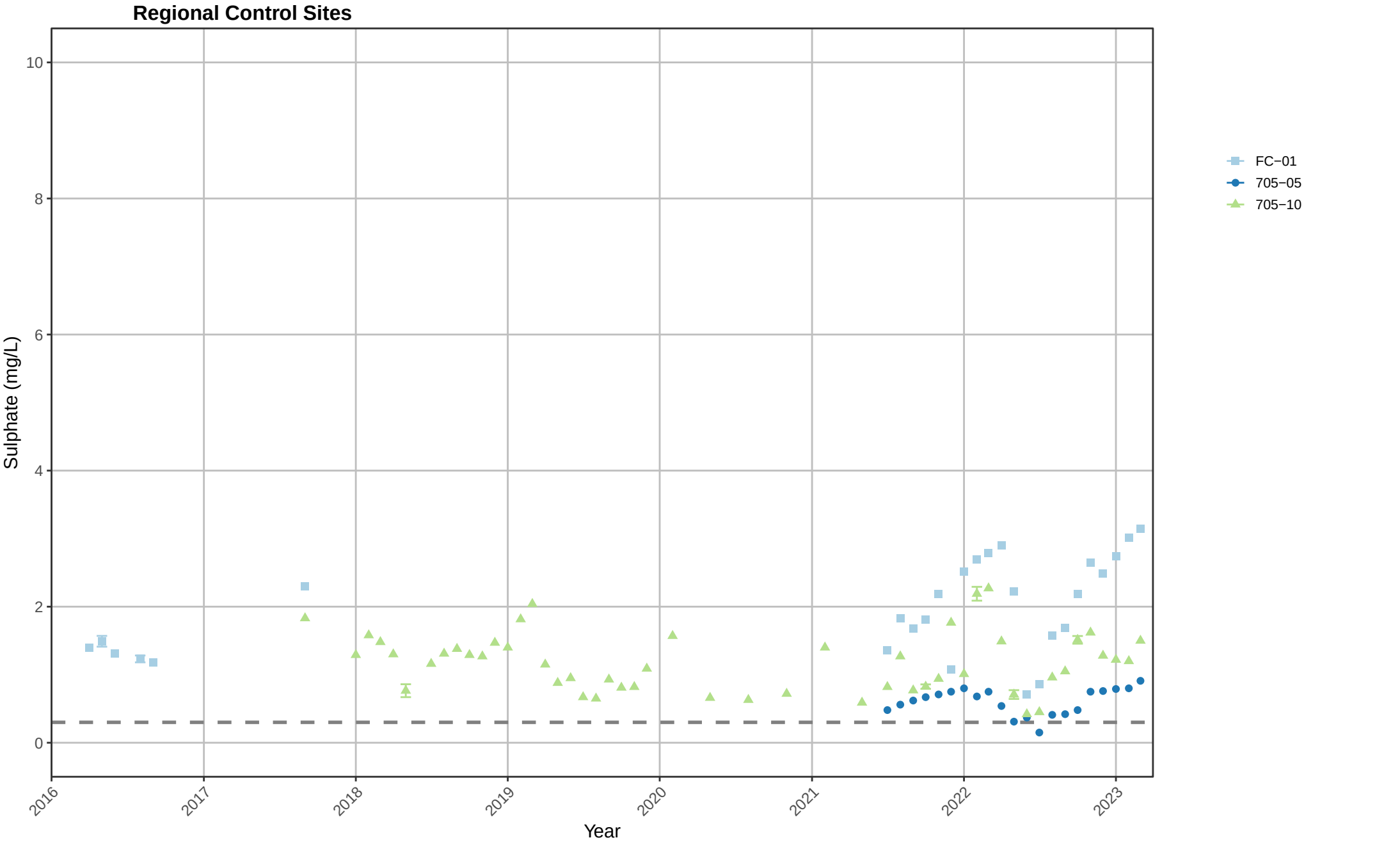
Appendix B−7.b: Monthly Mean Sulphate at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

The BC long−term WQG−AL for sulphate is hardness dependent.The lowest long−term guideline value is 128 mg/L.
The CCME livestock WQG for sulphate is 1,000 mg/L.
Proposed YDWL Standard for sulphate at CC−15 is 60 mg/L.

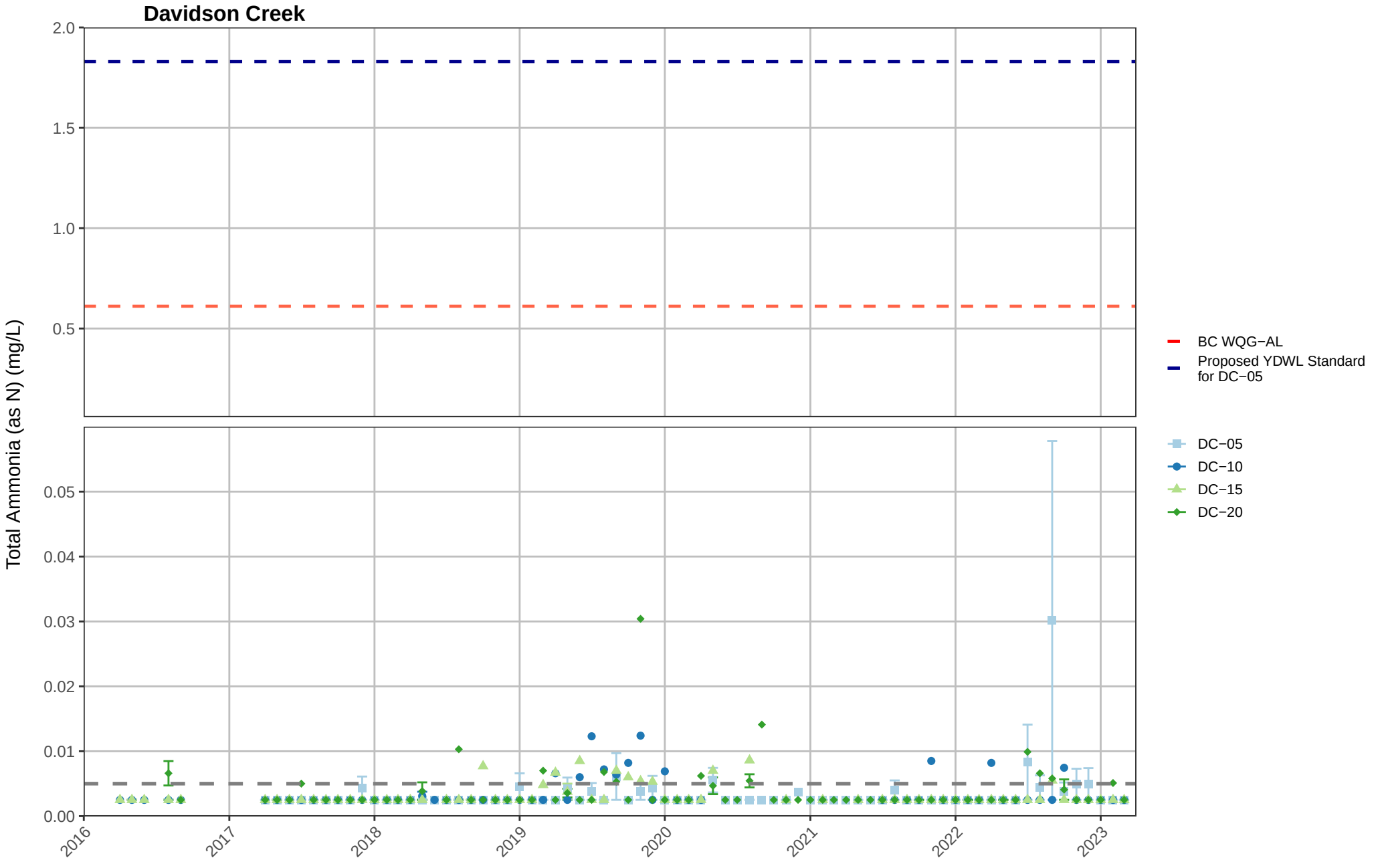
Appendix B−7.c: Monthly Mean Sulphate at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

The BC long−term WQG−AL for sulphate is hardness dependent.The lowest long−term guideline value is 128 mg/L.
The CCME livestock WQG for sulphate is 1,000 mg/L.

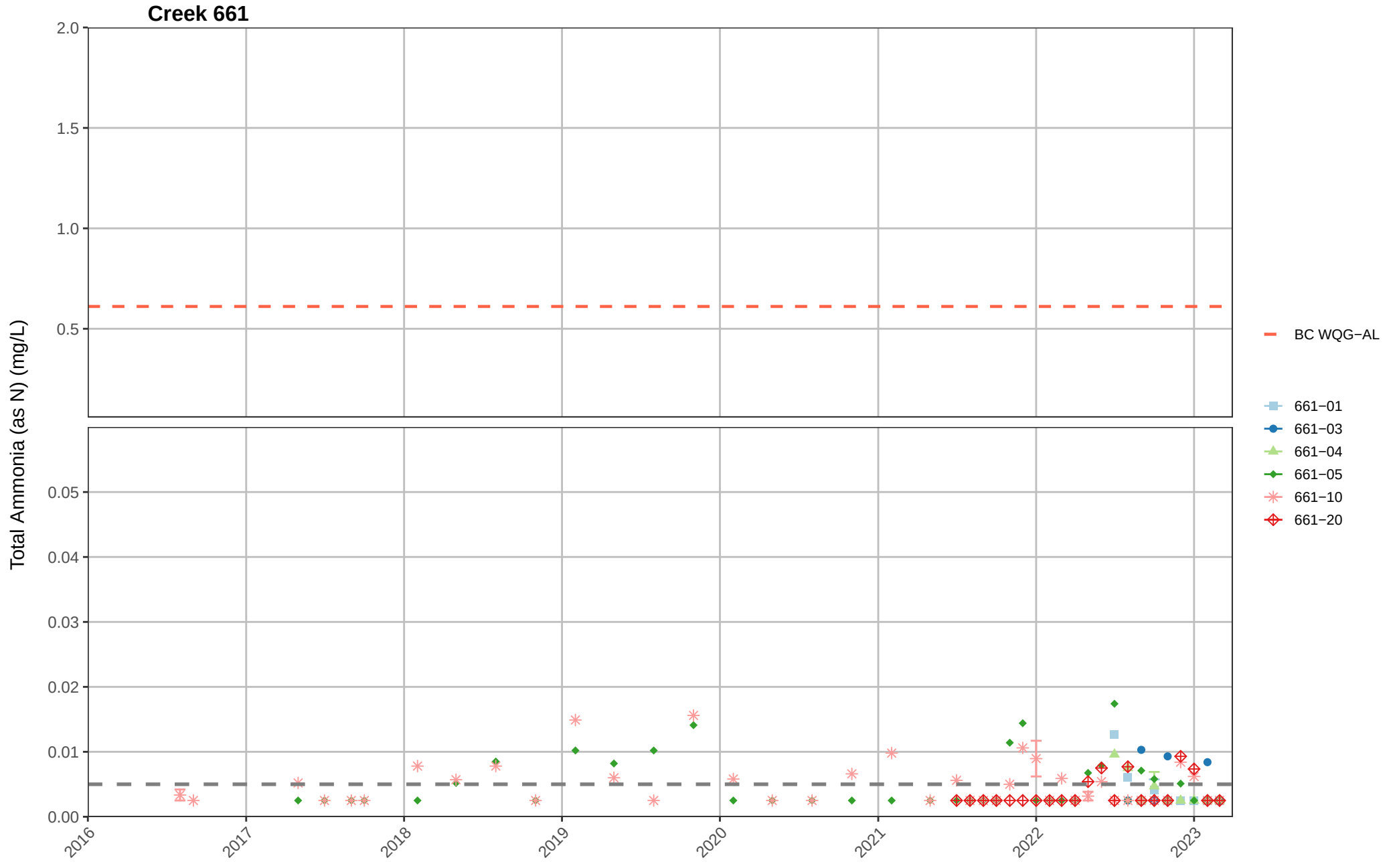
Appendix B−7.d: Monthly Mean Sulphate at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum pH and temperature dependent BC WQG−AL long−term guideline for total ammonia−N is 0.611 mg/L.
Proposed YDWL Standard for ammonia−N at DC−05 is 1.83 mg/L.

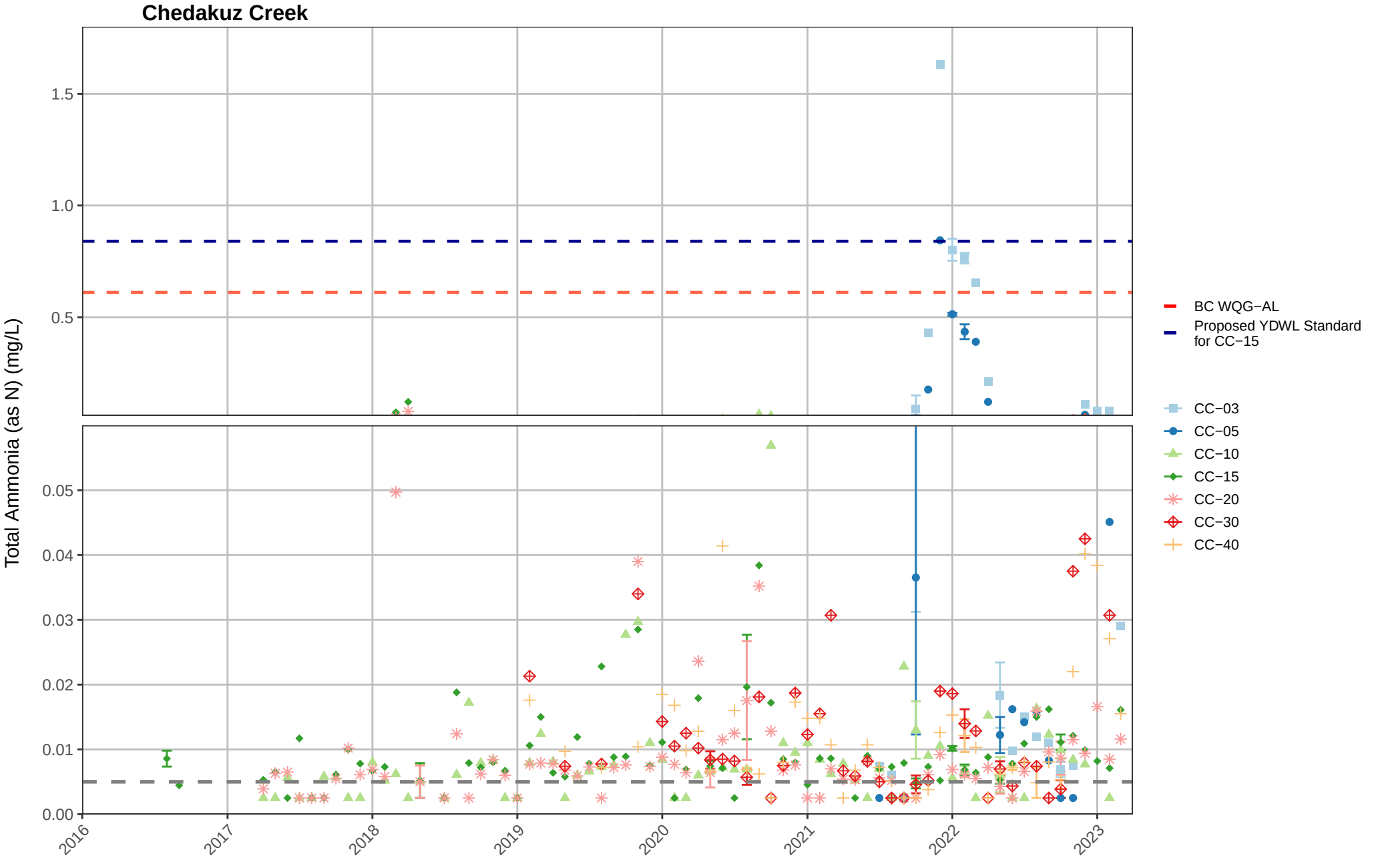
Appendix B−8.a: Monthly Mean Total Ammonia−N at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum pH and temperature dependent BC WQG−AL long−term guideline for total ammonia−N is 0.611 mg/L.

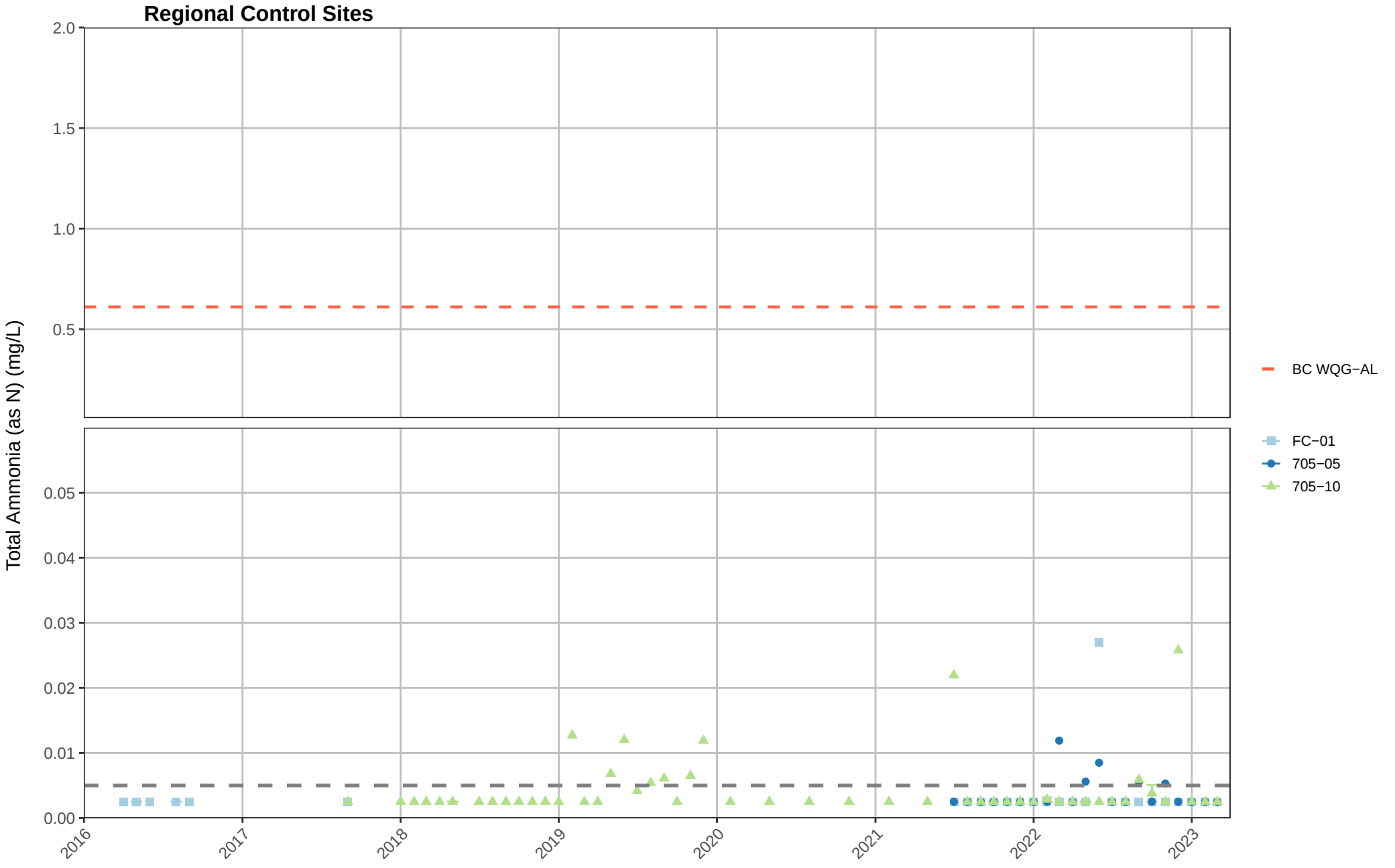
Appendix B−8.b: Monthly Mean Total Ammonia−N at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum pH and temperature dependent BC WQG−AL long−term guideline for total ammonia−N is 0.611 mg/L.
Proposed YDWL Standard for ammonia−N at CC−15 is 0.84 mg/L.

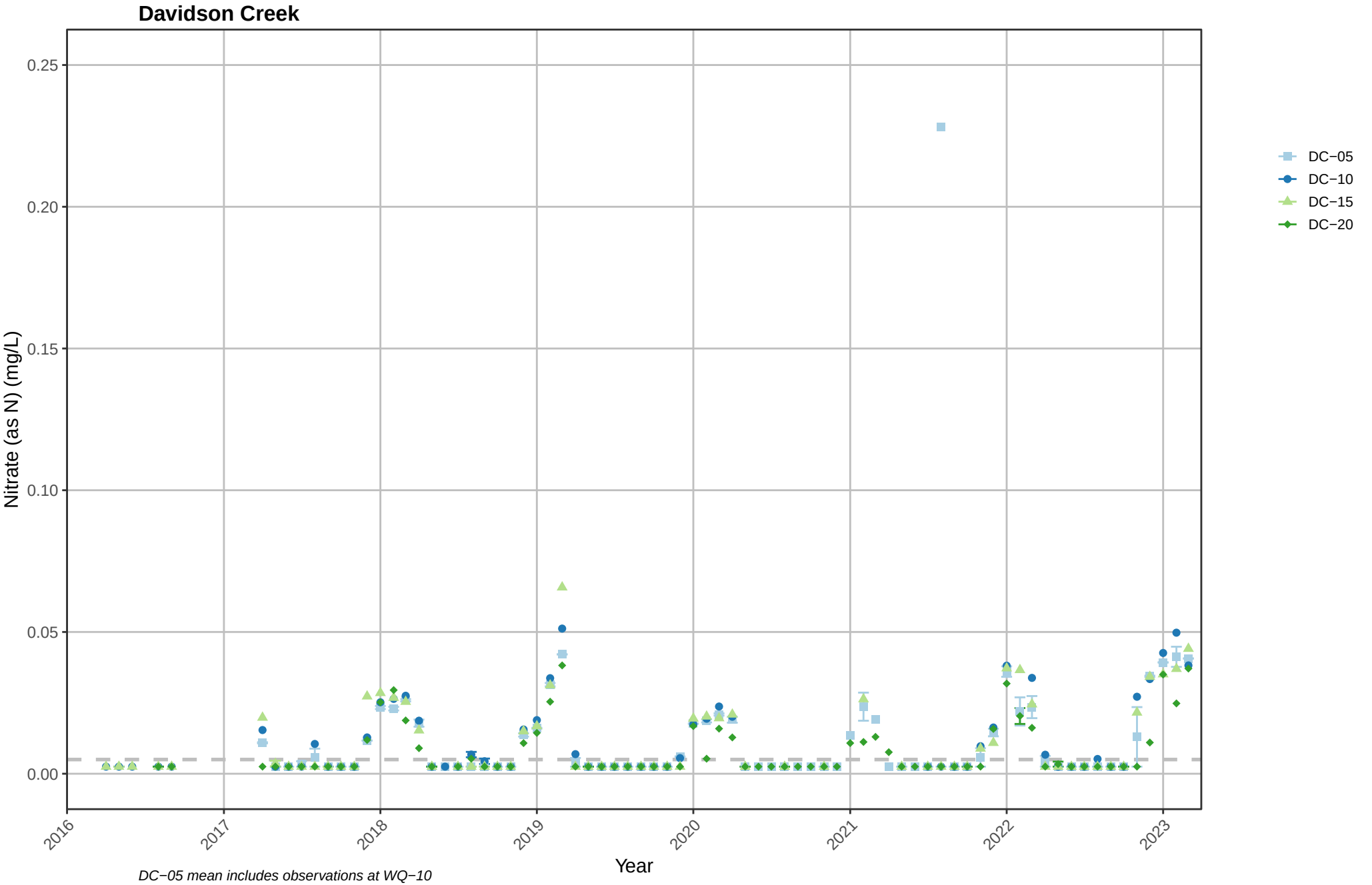
Appendix B−8.c: Monthly Mean Total Ammonia−N at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum pH and temperature dependent BC WQG−AL long−term guideline for total ammonia−N is 0.611 mg/L.

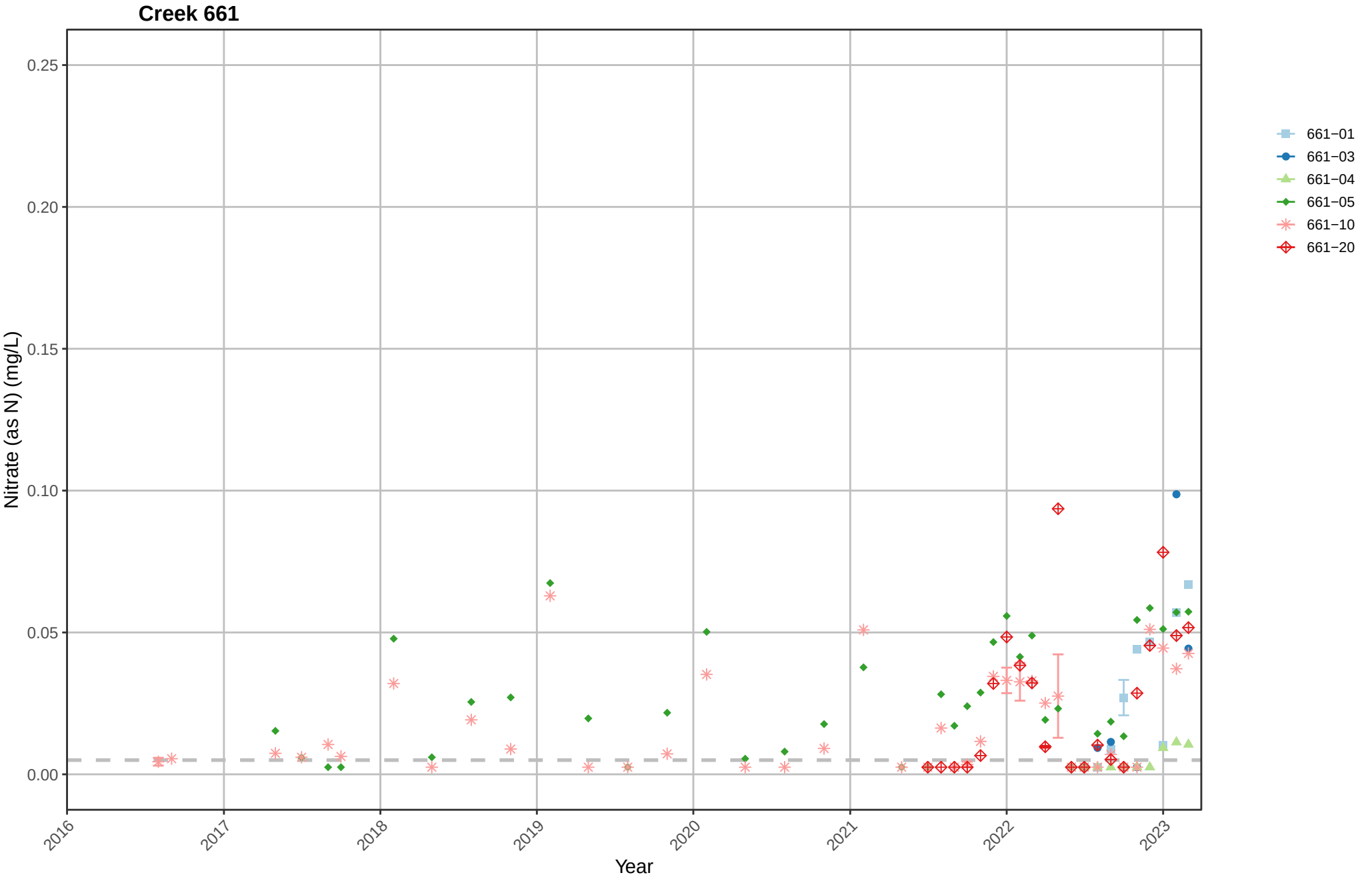
Appendix B−8.d: Monthly Mean Total Ammonia−N at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for nitrate−N is 3 mg/L.
Proposed YDWL Standard for nitrate−N at DC−05 is 3 mg/L.

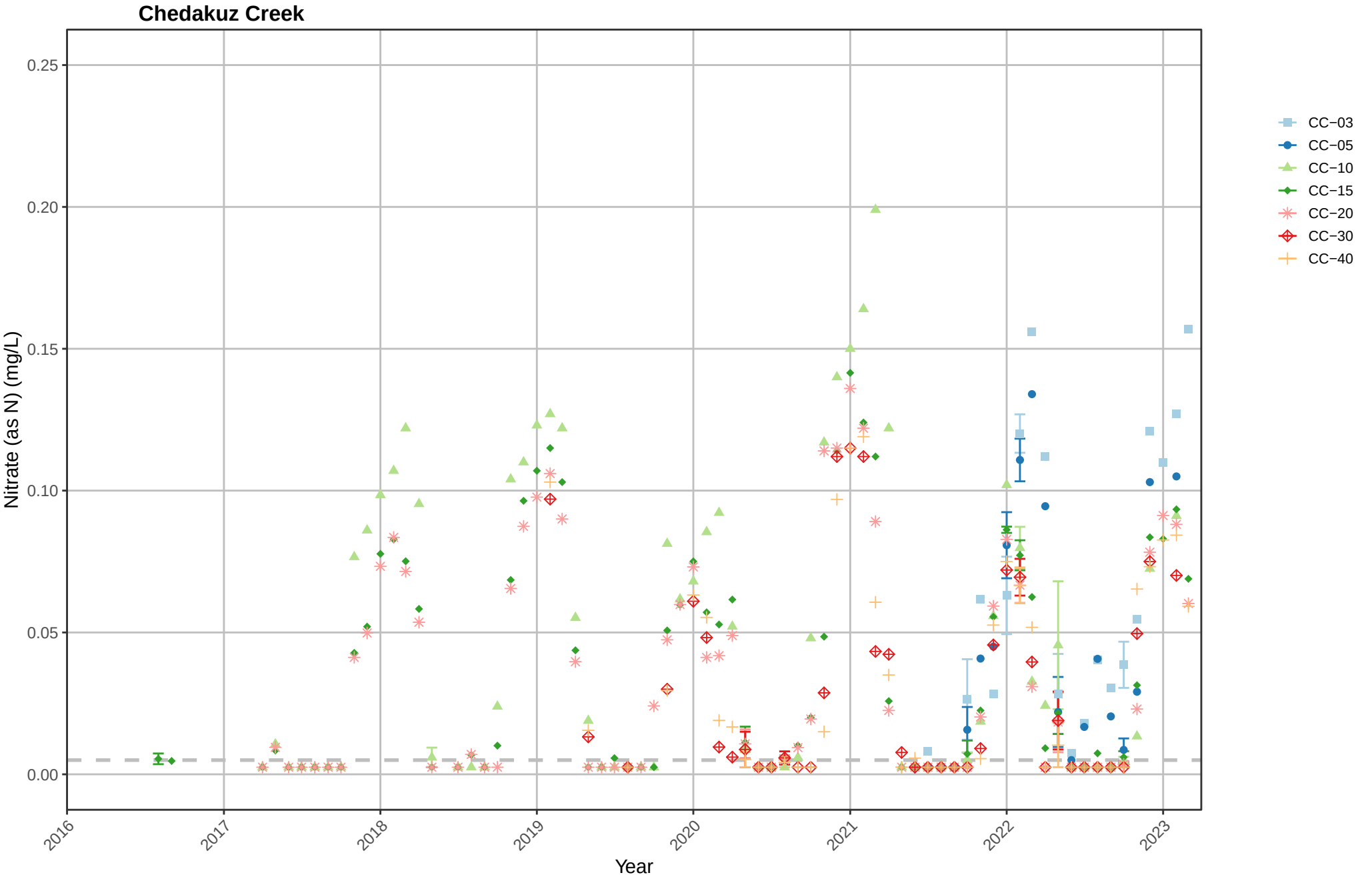
Appendix B−9.a: Monthly Mean Nitrate−N at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for nitrate−N is 3 mg/L.

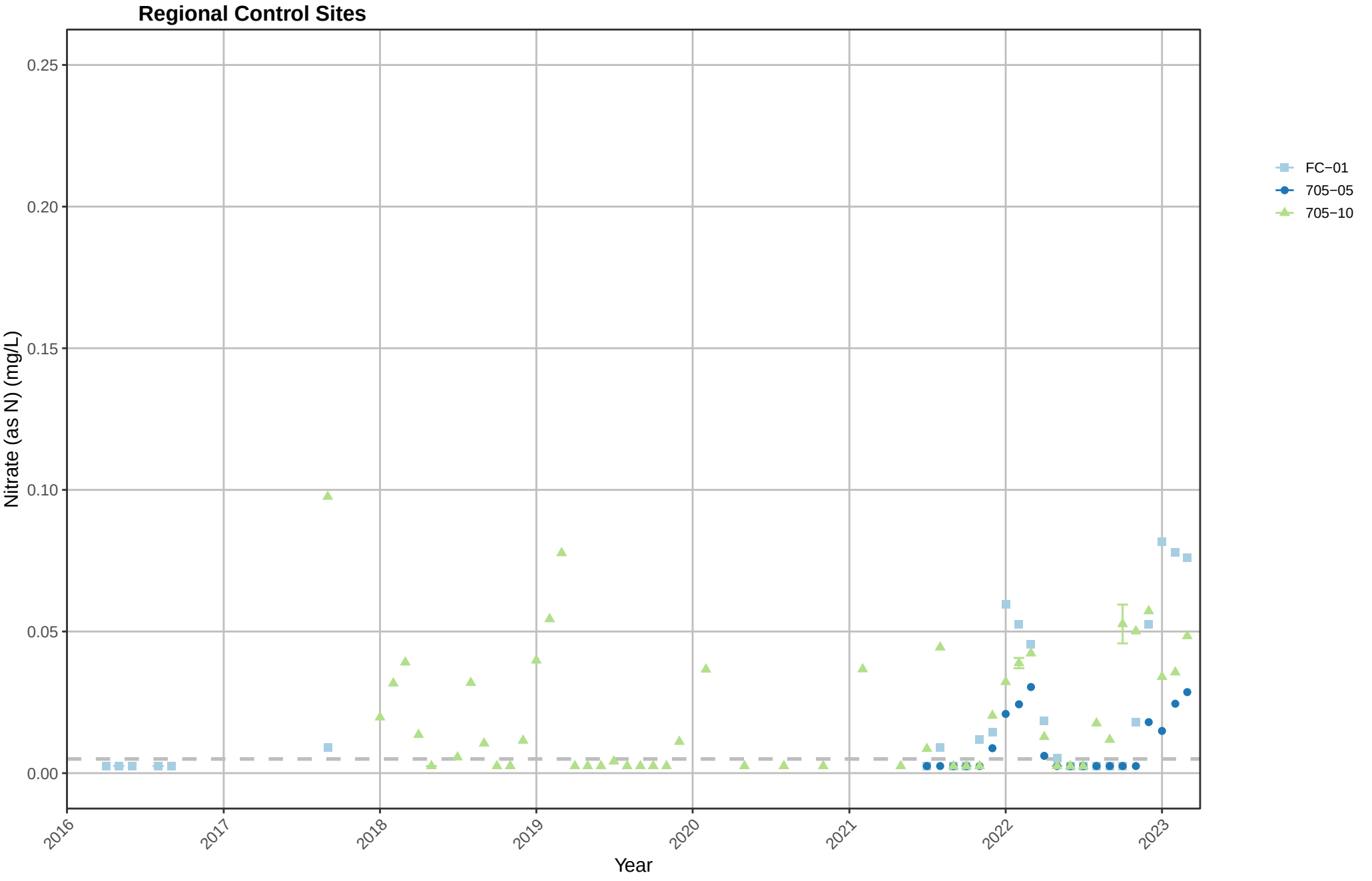
Appendix B−9.b: Monthly Mean Nitrate−N at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for nitrate−N is 3 mg/L.
Proposed YDWL Standard for nitrate−N at CC−15 is 1.5 mg/L.

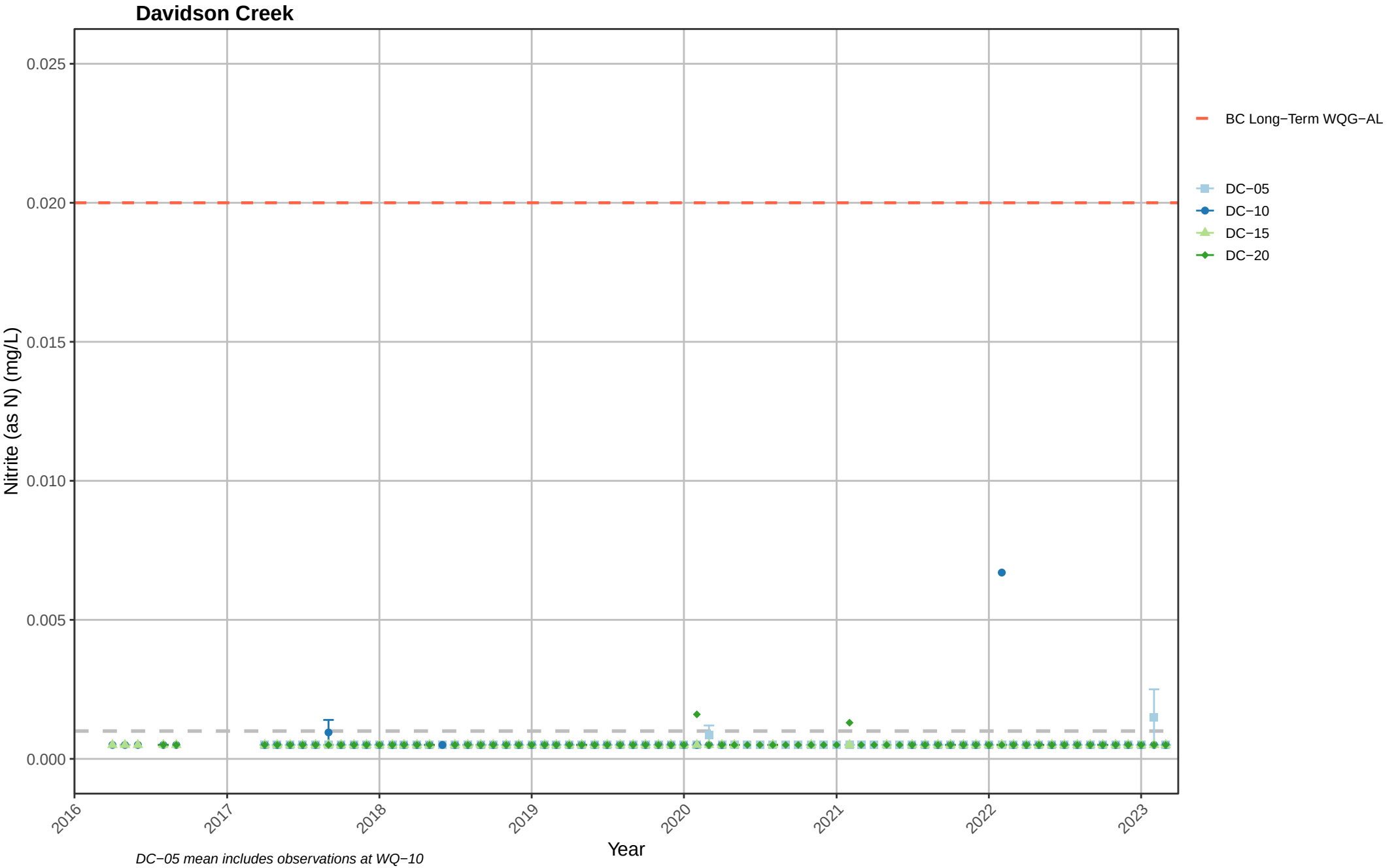
Appendix B−9.c: Monthly Mean Nitrate−N at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for nitrate−N is 3 mg/L.

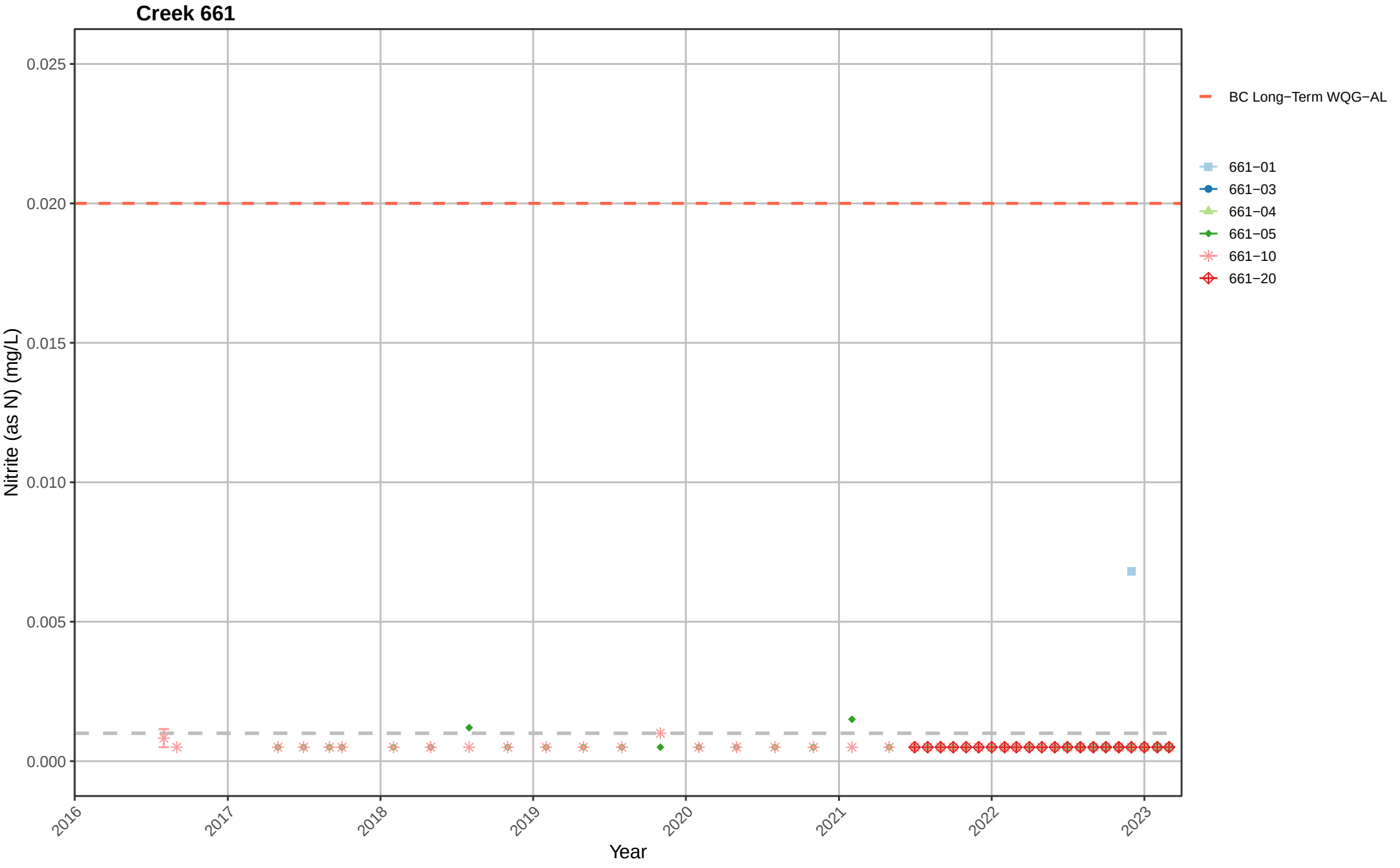
Appendix B−9.d: Monthly Mean Nitrate−N at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for nitrite−N is chloride dependent.
Proposed YDWL Standard for nitrite−N at DC−05 is 0.02 mg/L (BC WQG).

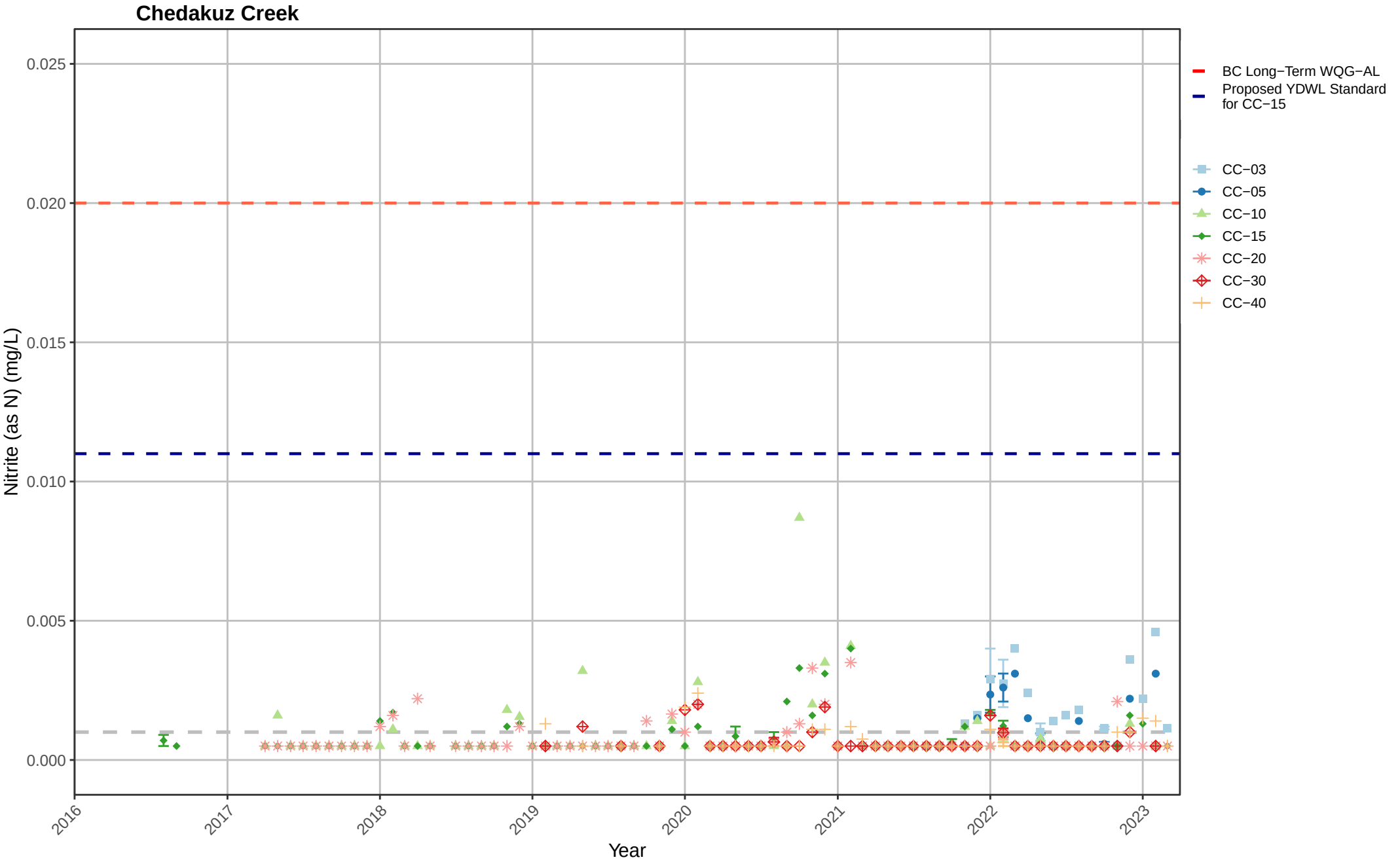
Appendix B−10.a: Monthly Mean Nitrite−N at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for nitrite−N is chloride dependent.

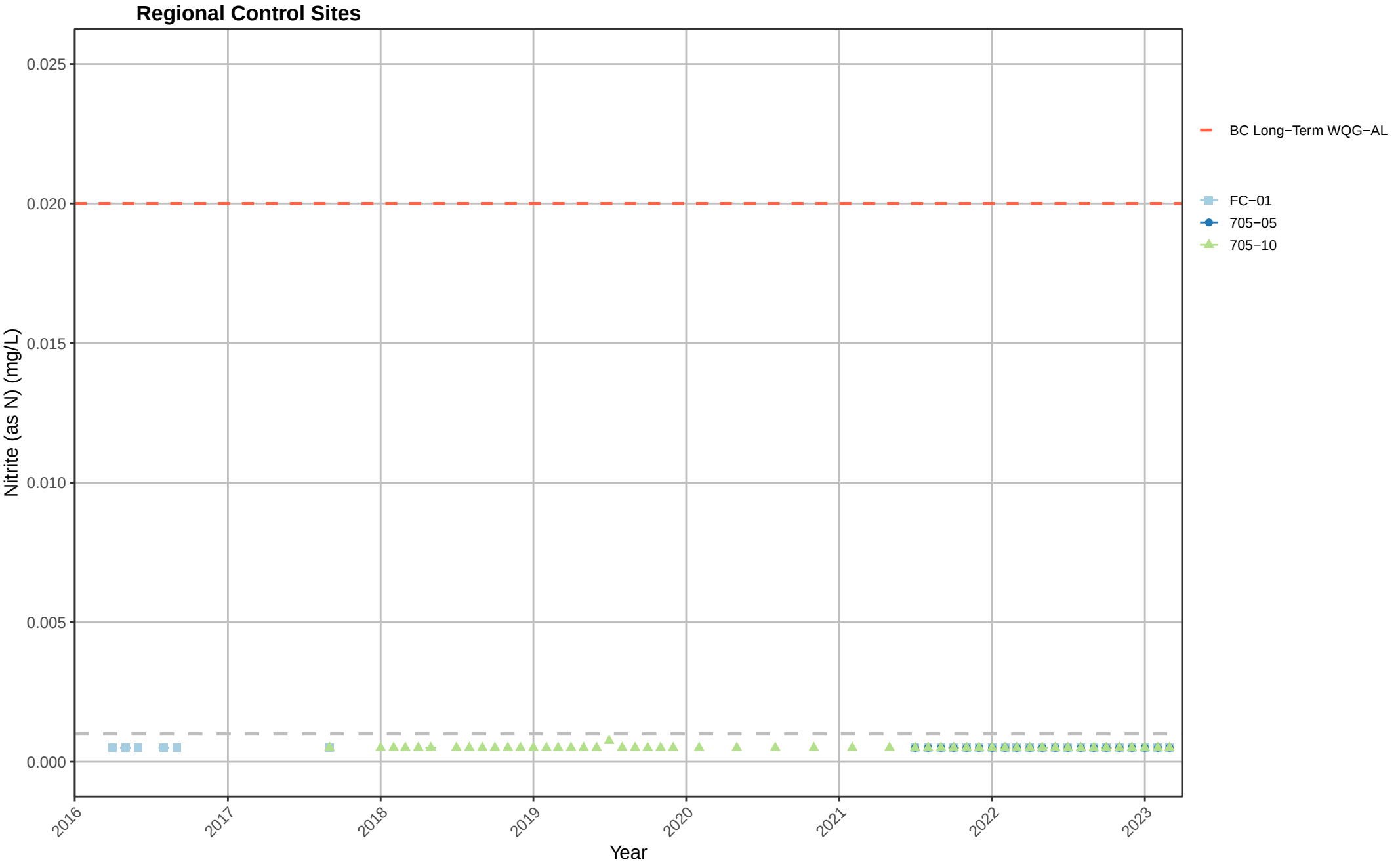
Appendix B−10.b: Monthly Mean Nitrite−N at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for nitrite−N is chloride dependent.
Proposed YDWL Standard for nitrite−N at CC−15 is 0.011 mg/L.

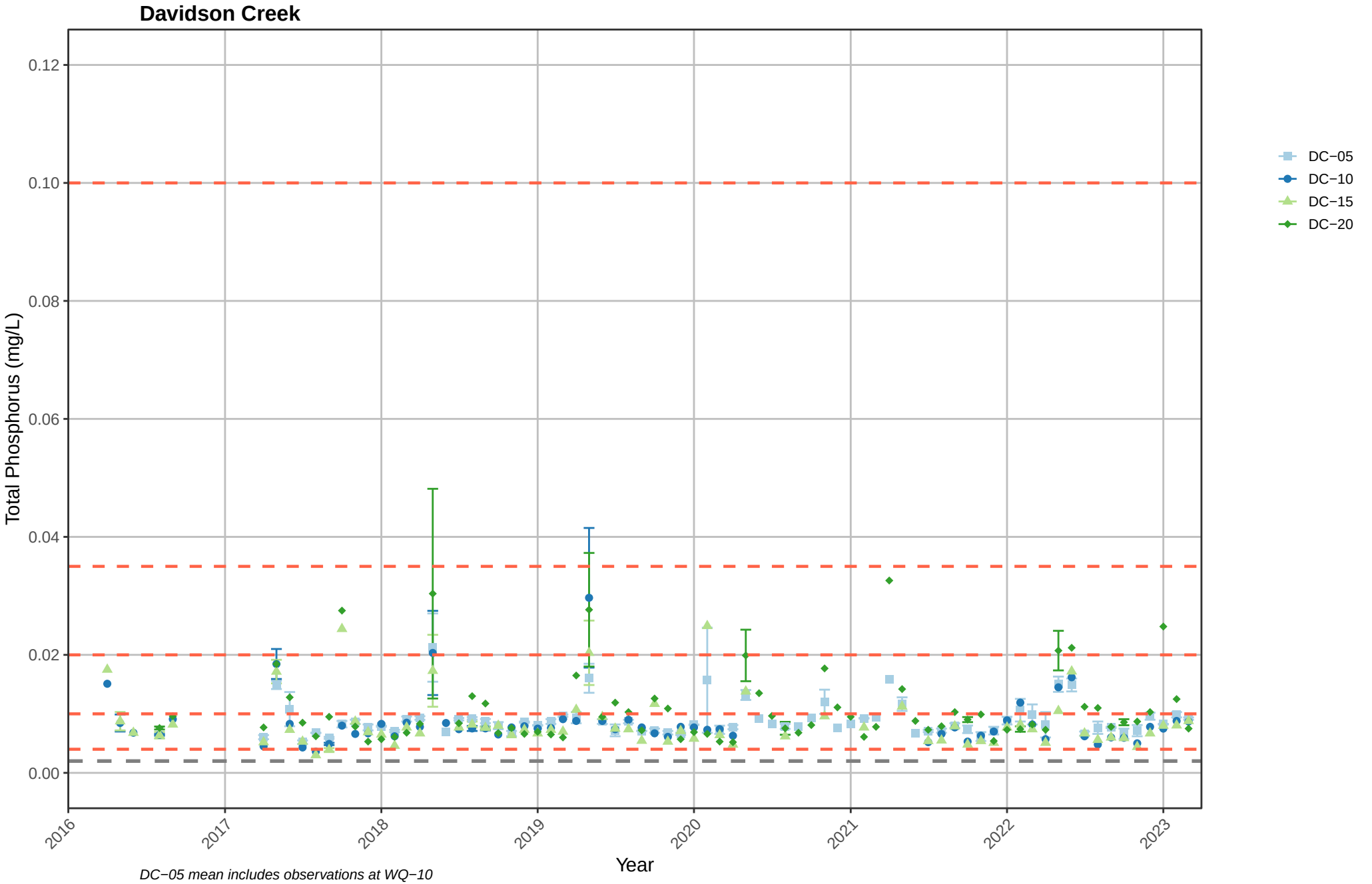
Appendix B−10.c: Monthly Mean Nitrite−N at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for nitrite−N is chloride dependent.

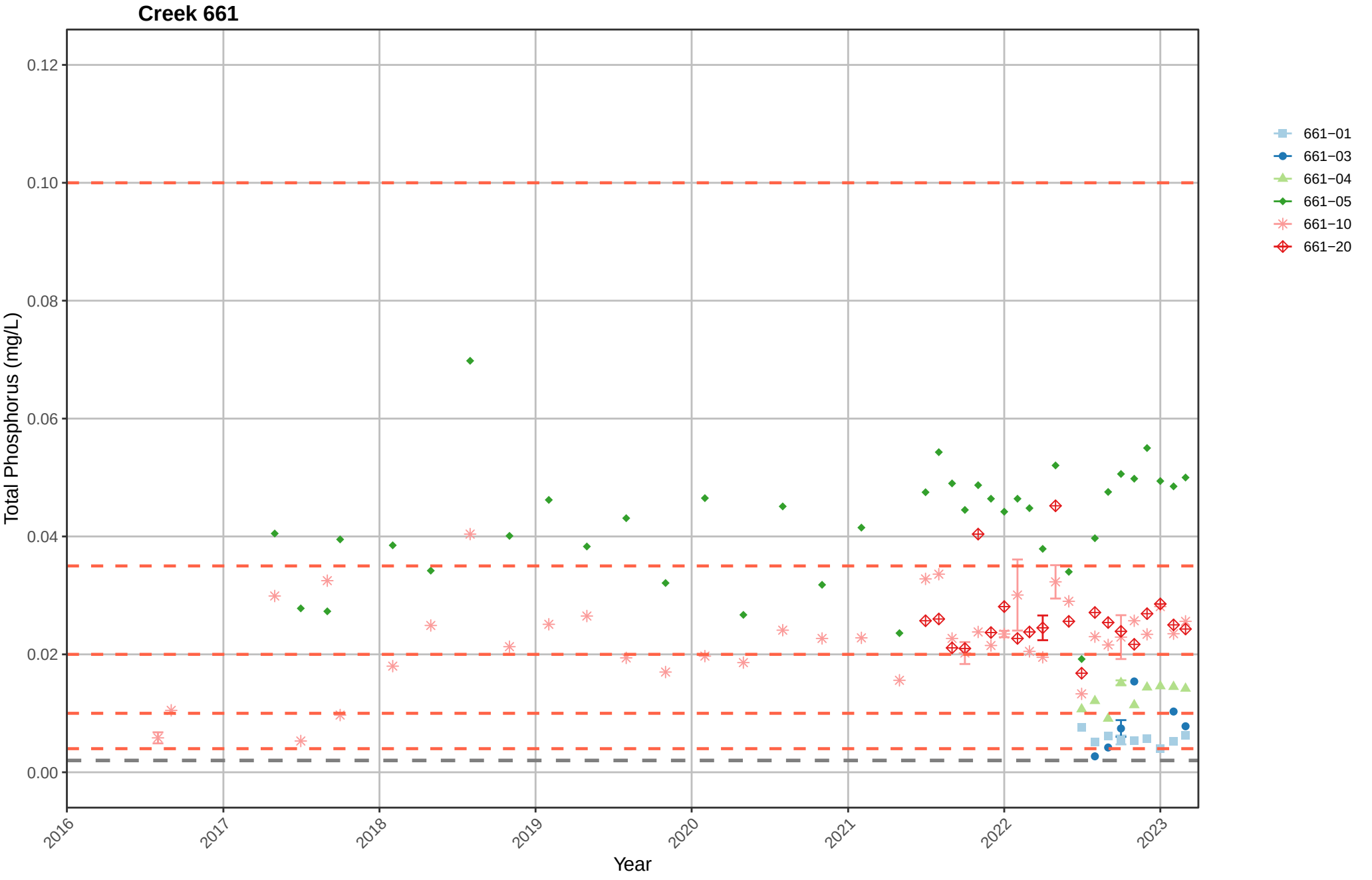
Appendix B−10.d: Monthly Mean Nitrite−N at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean

Red dashed lines indicate CCME trigger ranges for total phosphorus in Canadian lakes and rivers:
Hyper−eutrophic > 0.1 mg/L
Eutrophic 0.035 to 0.1 mg/L
Meso−eutrophic 0.02 to 0.035 mg/L
Mesotrophic 0.01 to 0.02 mg/L
Oligotrophic 0.004 to 0.01 mg/L
Ultra−oligotrophic < 0.004 mg/L

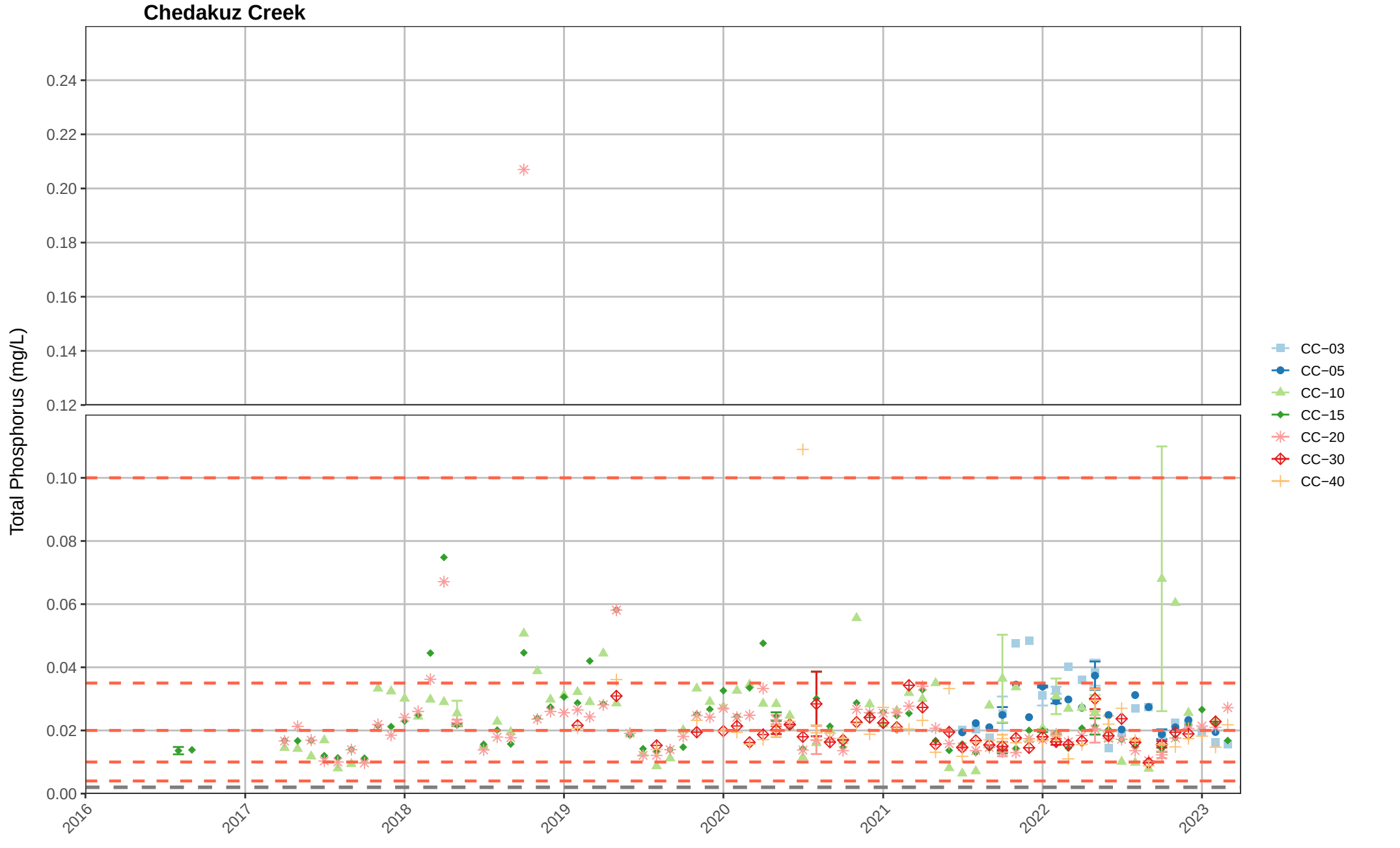
Appendix B−11.a: Monthly Mean Total Phophorus at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean

Red dashed lines indicate CCME trigger ranges for total phosphorus in Canadian lakes and rivers:
Hyper−eutrophic > 0.1 mg/L
Eutrophic 0.035 to 0.1 mg/L
Meso−eutrophic 0.02 to 0.035 mg/L
Mesotrophic 0.01 to 0.02 mg/L
Oligotrophic 0.004 to 0.01 mg/L
Ultra−oligotrophic < 0.004 mg/L

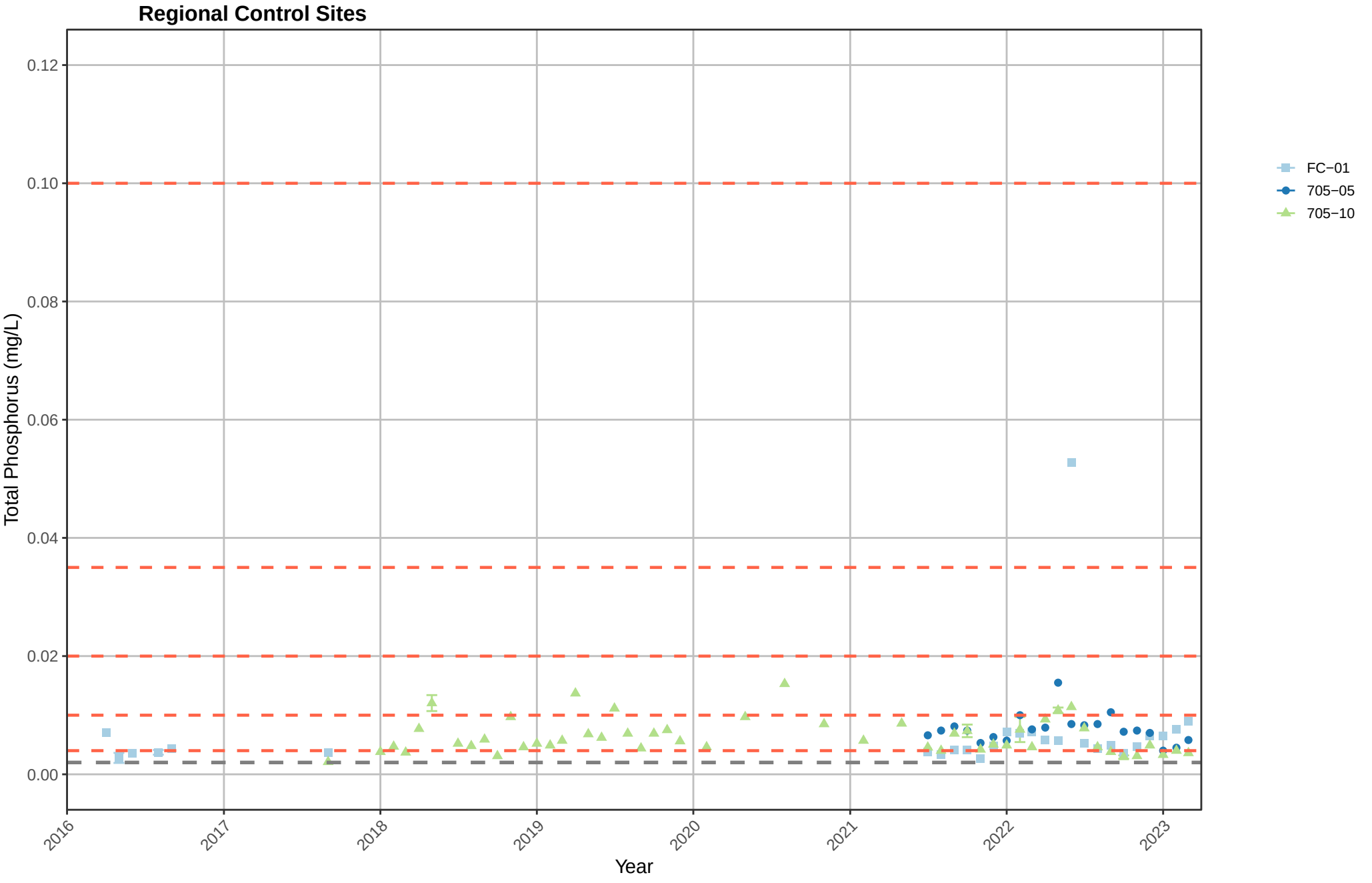
Appendix B−11.b: Monthly Mean Total Phophorus at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean

Red dashed lines indicate CCME trigger ranges for total phosphorus in Canadian lakes and rivers:
Hyper−eutrophic > 0.1 mg/L
Eutrophic 0.035 to 0.1 mg/L
Meso−eutrophic 0.02 to 0.035 mg/L
Mesotrophic 0.01 to 0.02 mg/L
Oligotrophic 0.004 to 0.01 mg/L
Ultra−oligotrophic < 0.004 mg/L

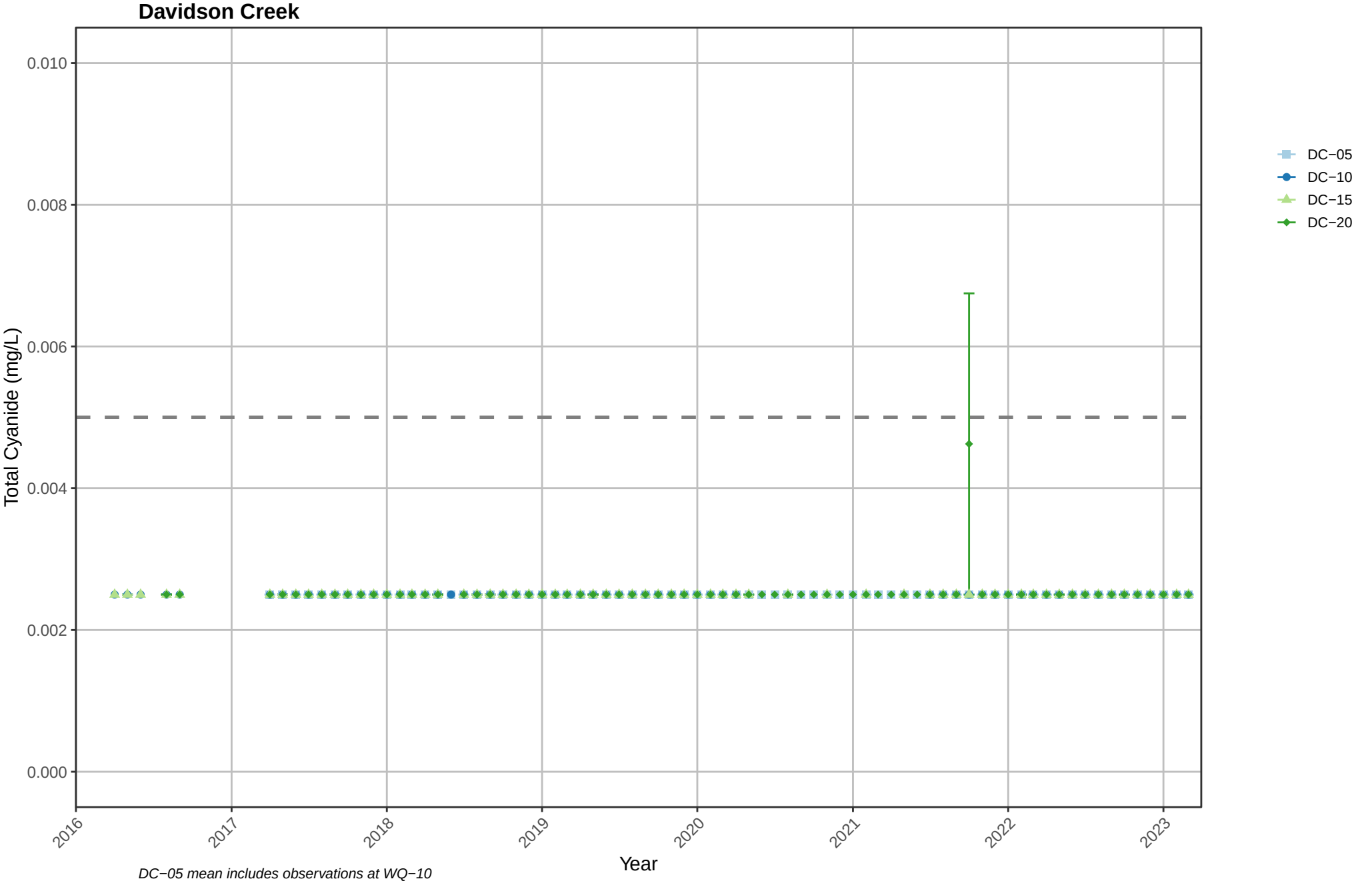
Appendix B−11.c: Monthly Mean Total Phophorus at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean

Red dashed lines indicate CCME trigger ranges for total phosphorus in Canadian lakes and rivers:
Hyper−eutrophic > 0.1 mg/L
Eutrophic 0.035 to 0.1 mg/L
Meso−eutrophic 0.02 to 0.035 mg/L
Mesotrophic 0.01 to 0.02 mg/L
Oligotrophic 0.004 to 0.01 mg/L
Ultra−oligotrophic < 0.004 mg/L

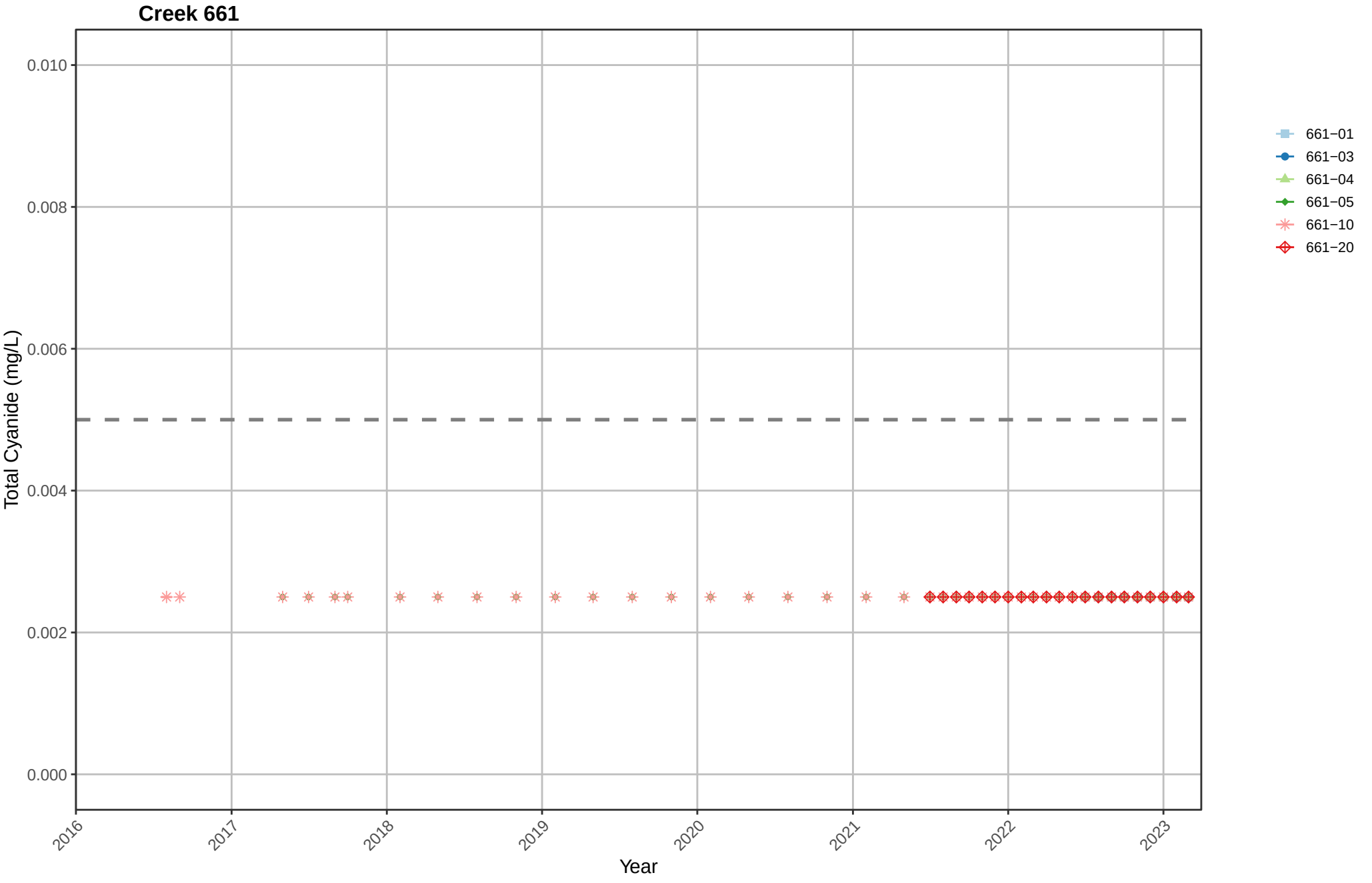
Appendix B−11.d: Monthly Mean Total Phophorus at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

No BC or CCME long−term WQG−AL for total cyanide.
Proposed YDWL Standard for total cyanide at DC−05 is 0.2 mg/L.

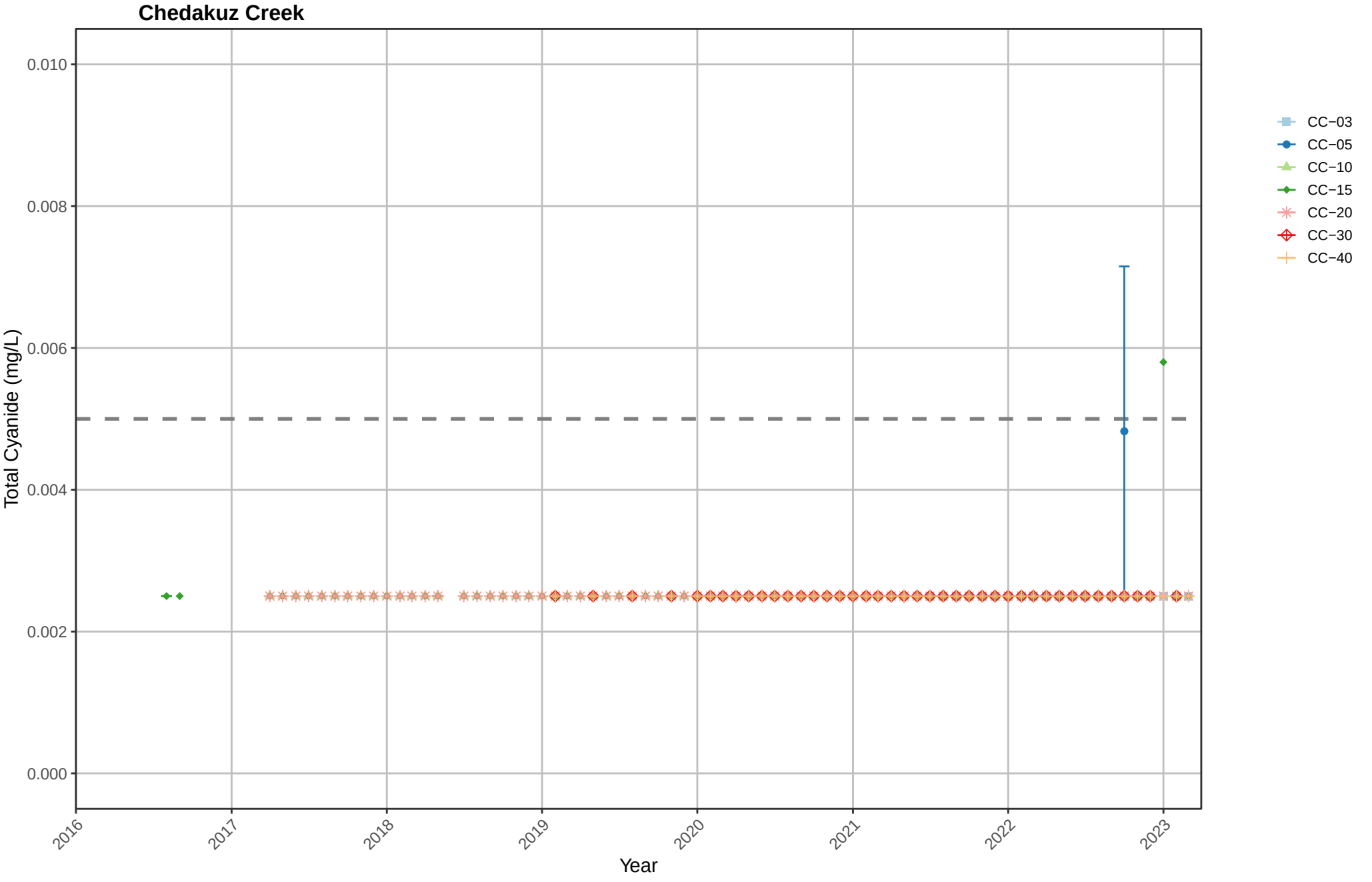
Appendix B−12.a: Monthly Mean Total Cyanide at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

No BC or CCME long−term WQG−AL for total cyanide.

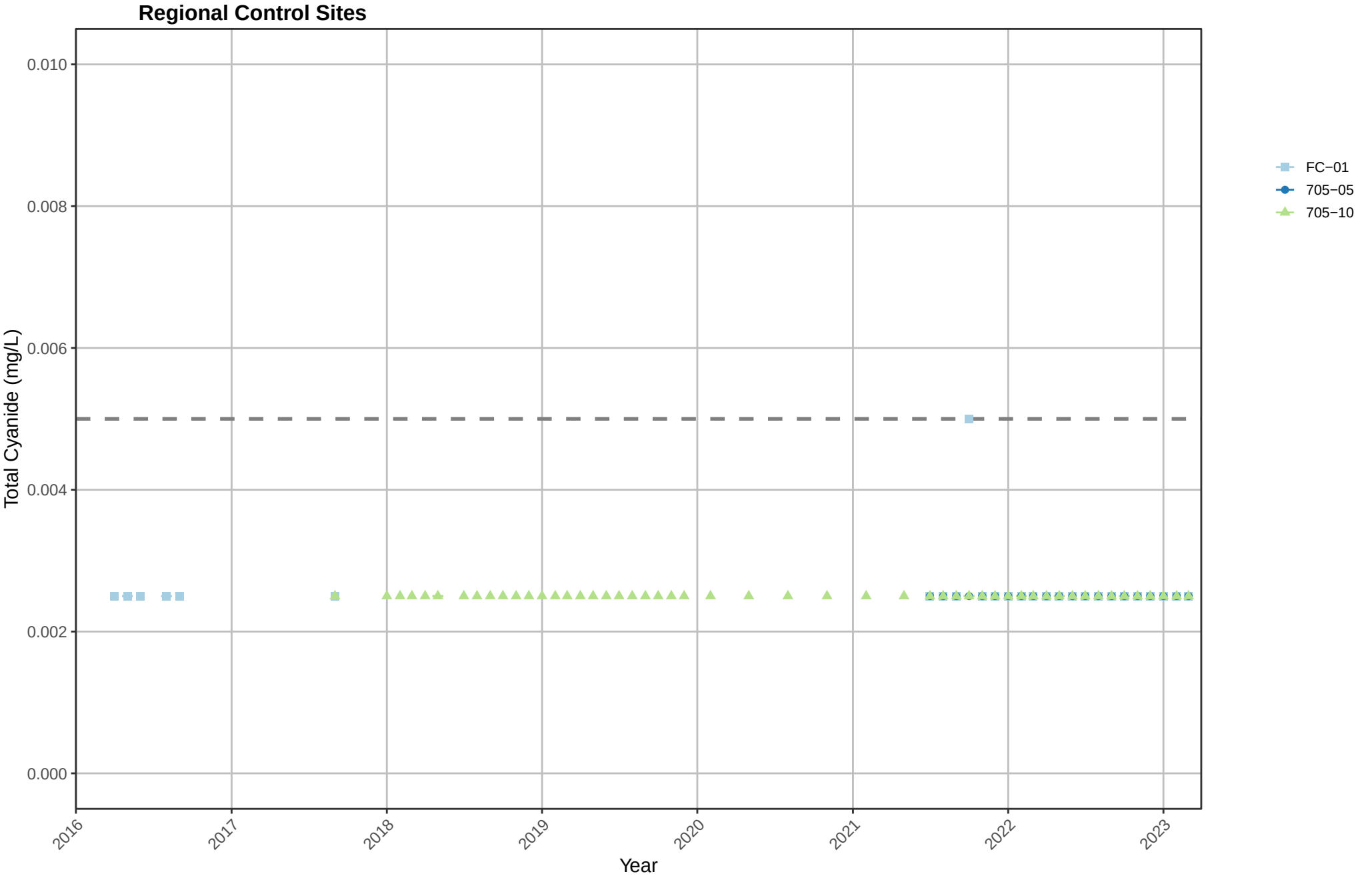
Appendix B−12.b: Monthly Mean Total Cyanide at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

No BC or CCME long−term WQG−AL for total cyanide.
Proposed YDWL Standard for total cyanide at CC−15 is 0.1 mg/L.

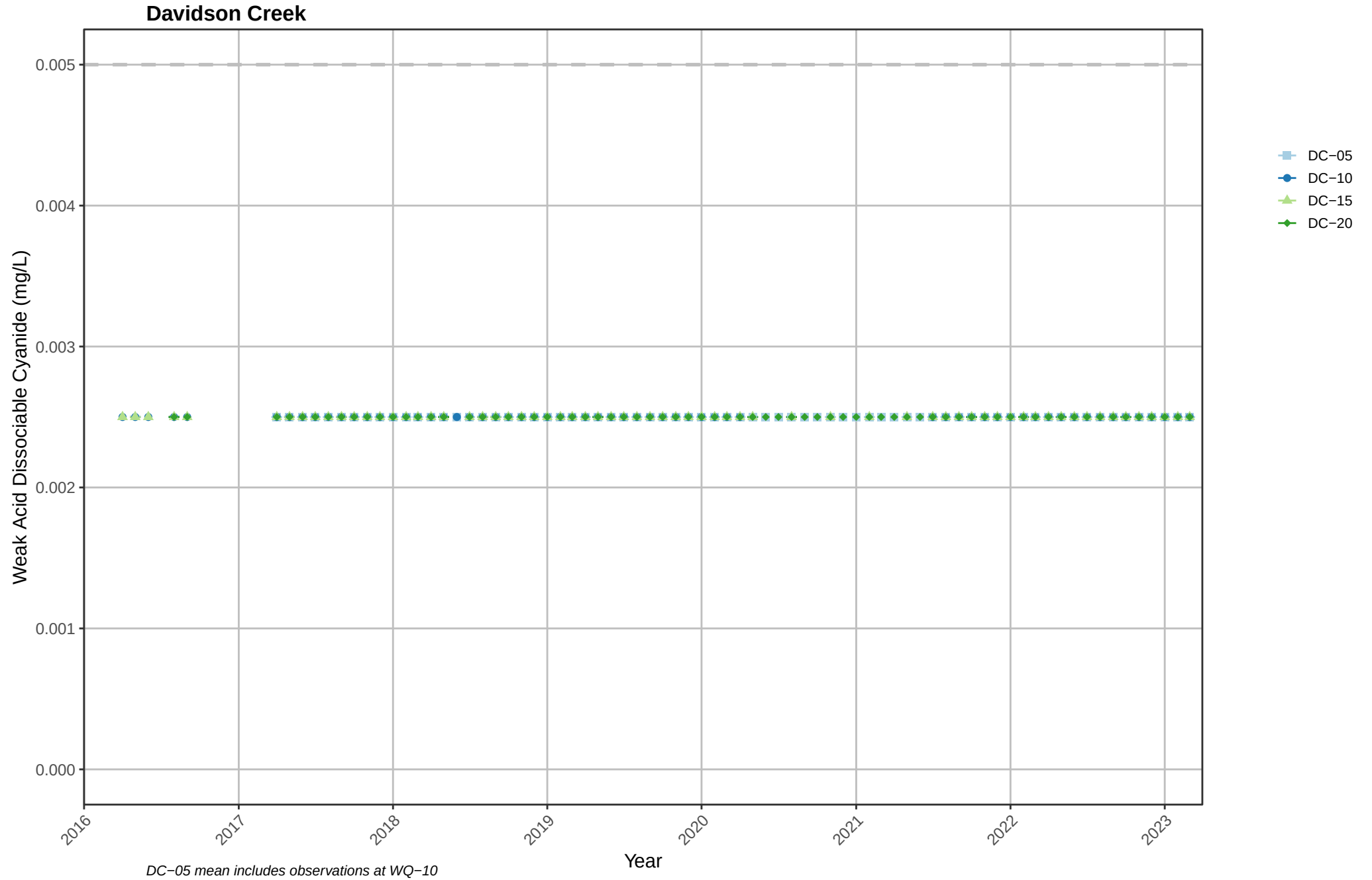
Appendix B−12.c: Monthly Mean Total Cyanide at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

No BC or CCME long−term WQG−AL for total cyanide.

Appendix B−12.d: Monthly Mean Total Cyanide at Regional Control AEMP Sites, 2016 to March 31, 2023

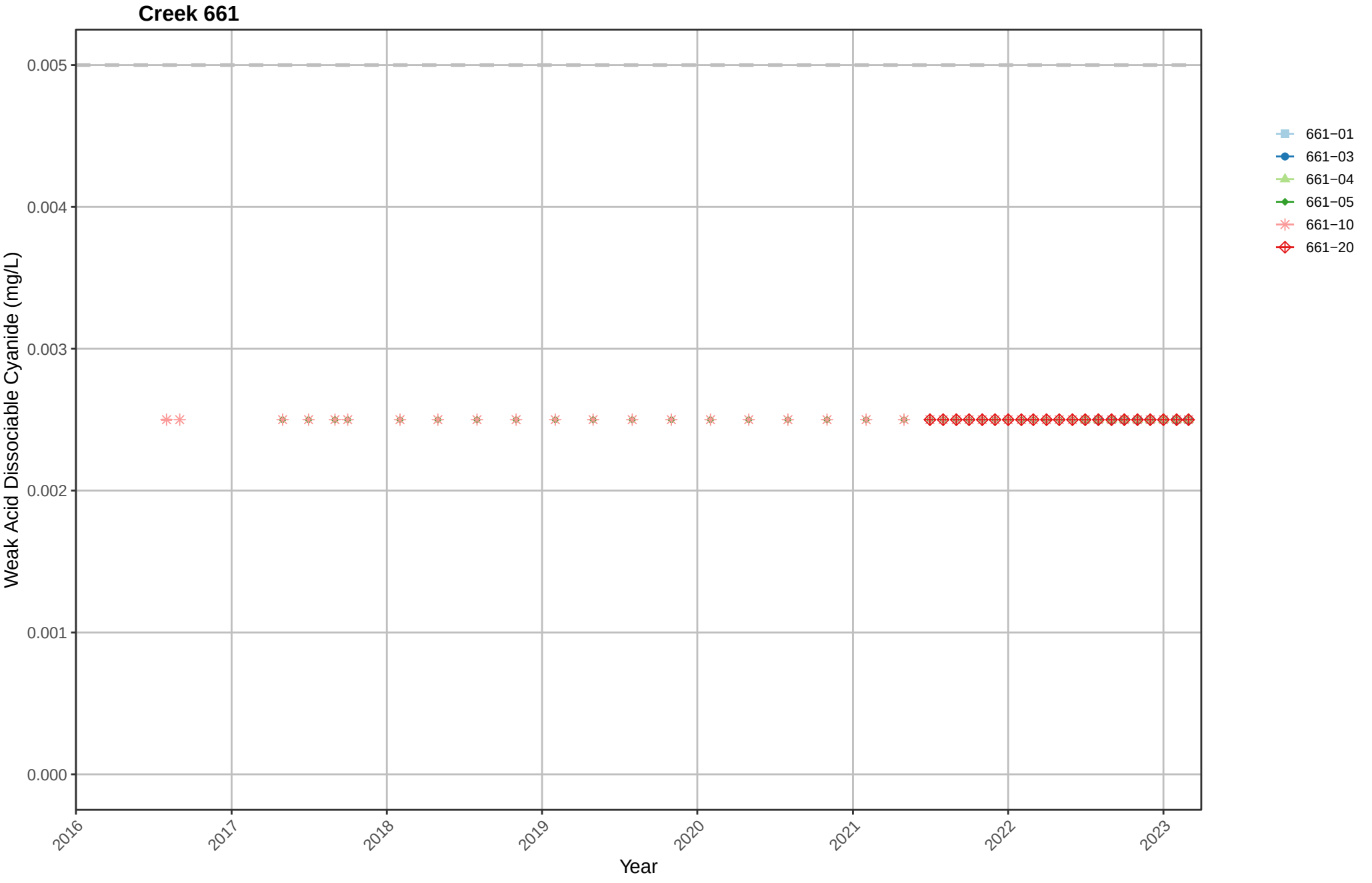


DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.

The BC long−term WQG−AL for cyanide, weak acid dissociable is 0.005 mg/L.
Proposed YDWL Standard for cyanide, weak acid dissociable is 0.005 mg/L.

Concentrations below the detection limit were plotted as half the detection limit.

Appendix B−13.a: Monthly Mean Weak Acid Dissociable Cyanide at Davidson Creek AEMP Sites, 2016 to March 31, 2023

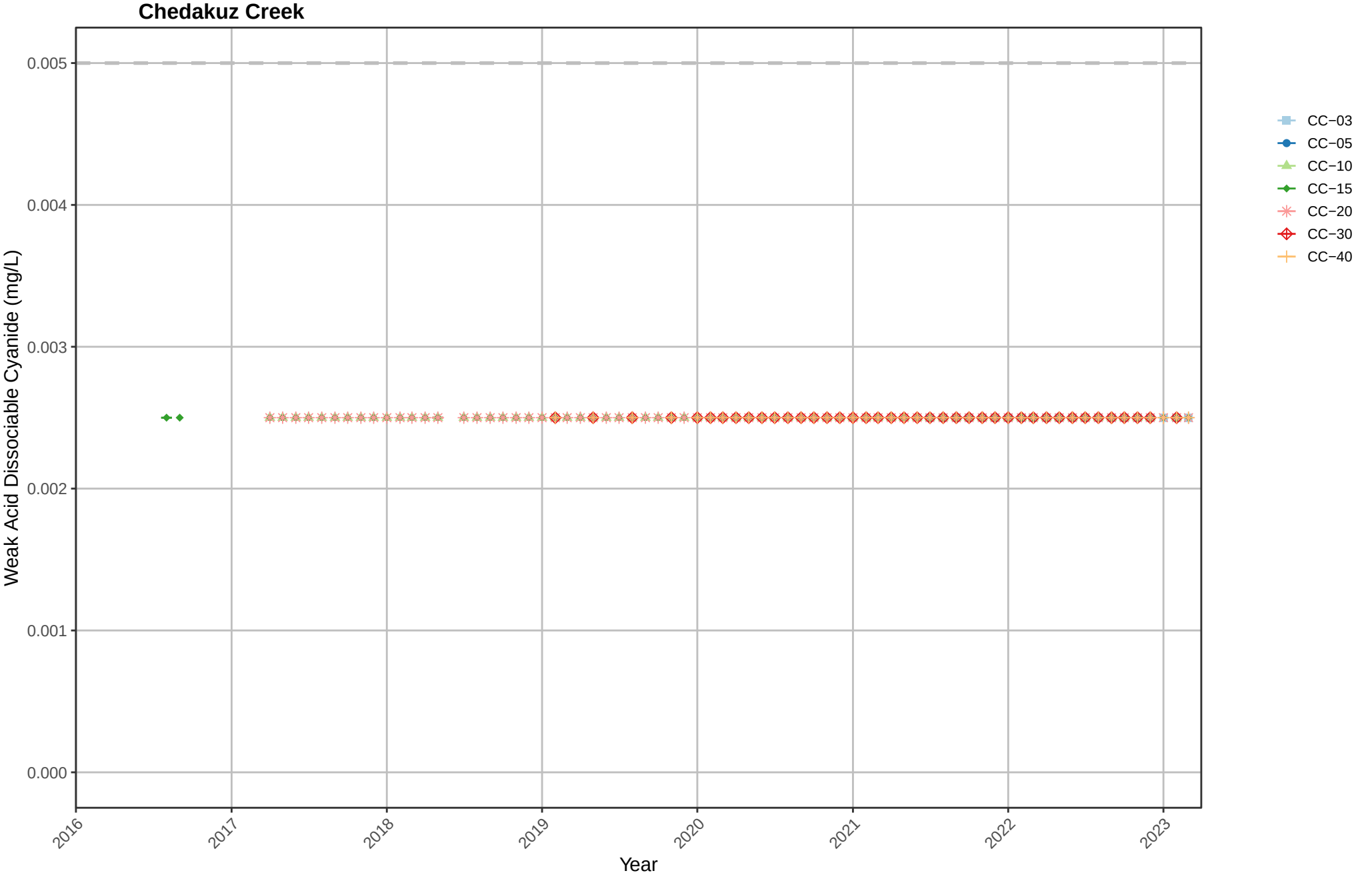


Gray dashed line indicates minimum detection limits.

The BC long−term WQG−AL for cyanide, weak acid dissociable is 0.005 mg/L.

Concentrations below the detection limit were plotted as half the detection limit.

Appendix B−13.b: Monthly Mean Weak Acid Dissociable Cyanide at Creek 661 AEMP Sites, 2016 to March 31, 2023

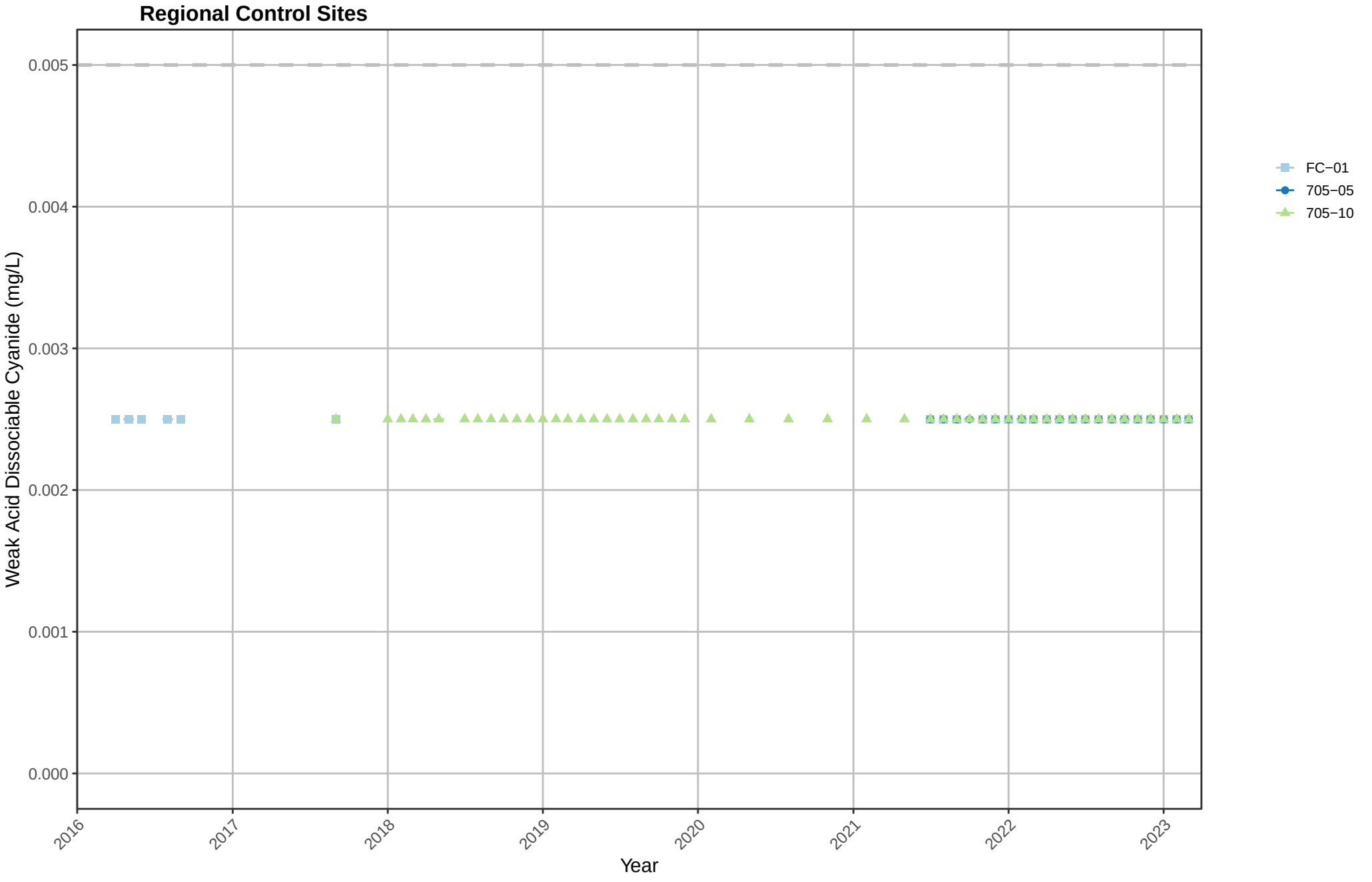


Gray dashed line indicates minimum detection limits.

The BC long−term WQG−AL for cyanide, weak acid dissociable is 0.005 mg/L.
Proposed YDWL Standard for t cyanide, weak acid dissociable is 0.005 mg/L.

Concentrations below the detection limit were plotted as half the detection limit.

Appendix B−13.c: Monthly Mean Weak Acid Dissociable Cyanide at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023

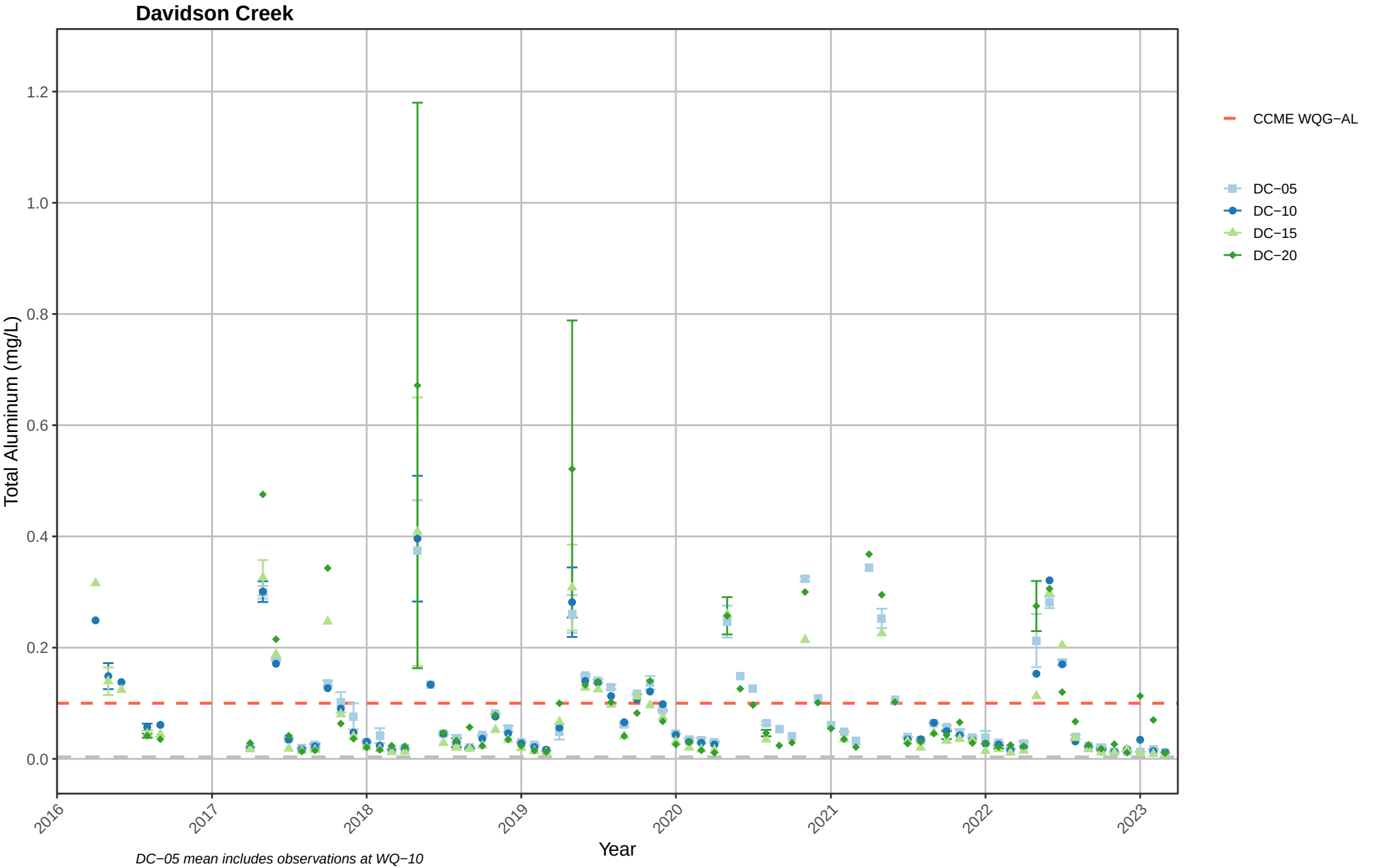


Gray dashed line indicates minimum detection limits.

The BC long−term WQG−AL for cyanide, weak acid dissociable is 0.005 mg/L.

Concentrations below the detection limit were plotted as half the detection limit.

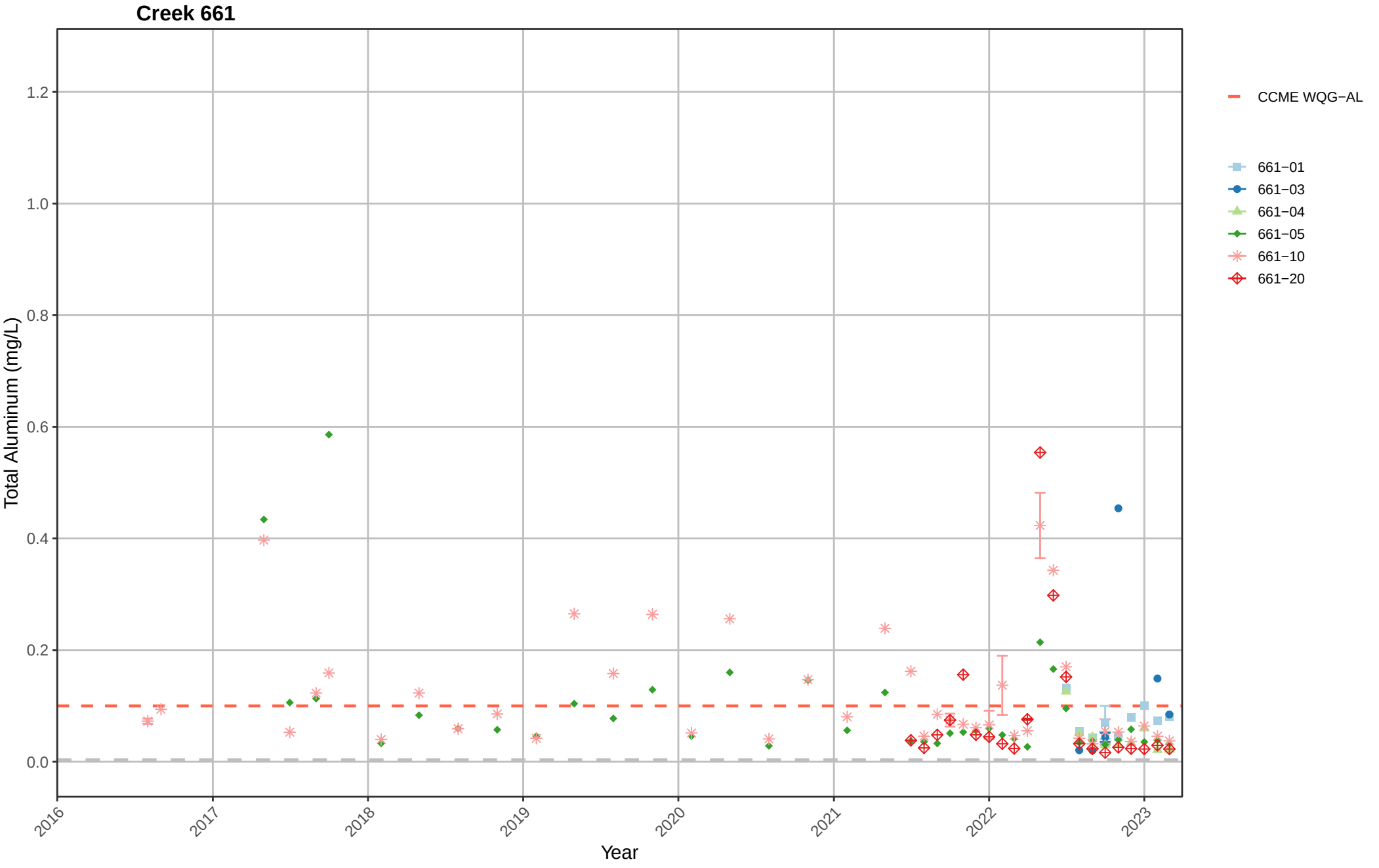
Appendix B−13.d: Monthly Mean Weak Acid Dissociable Cyanide at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limit.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total aluminum is pH dependent.

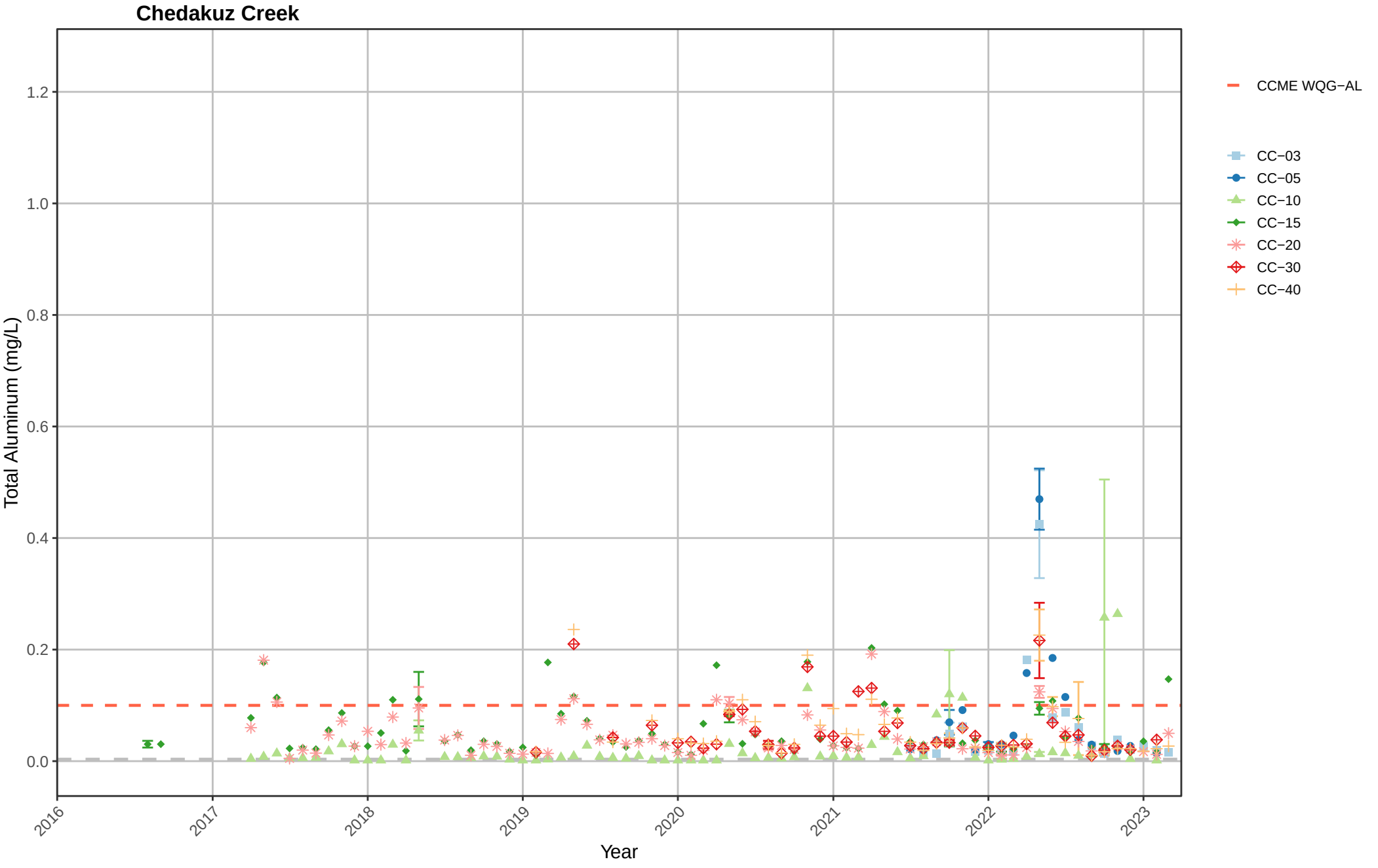
Appendix B−14.a: Monthly Mean Total Aluminum at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limit.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total aluminum is pH dependent.

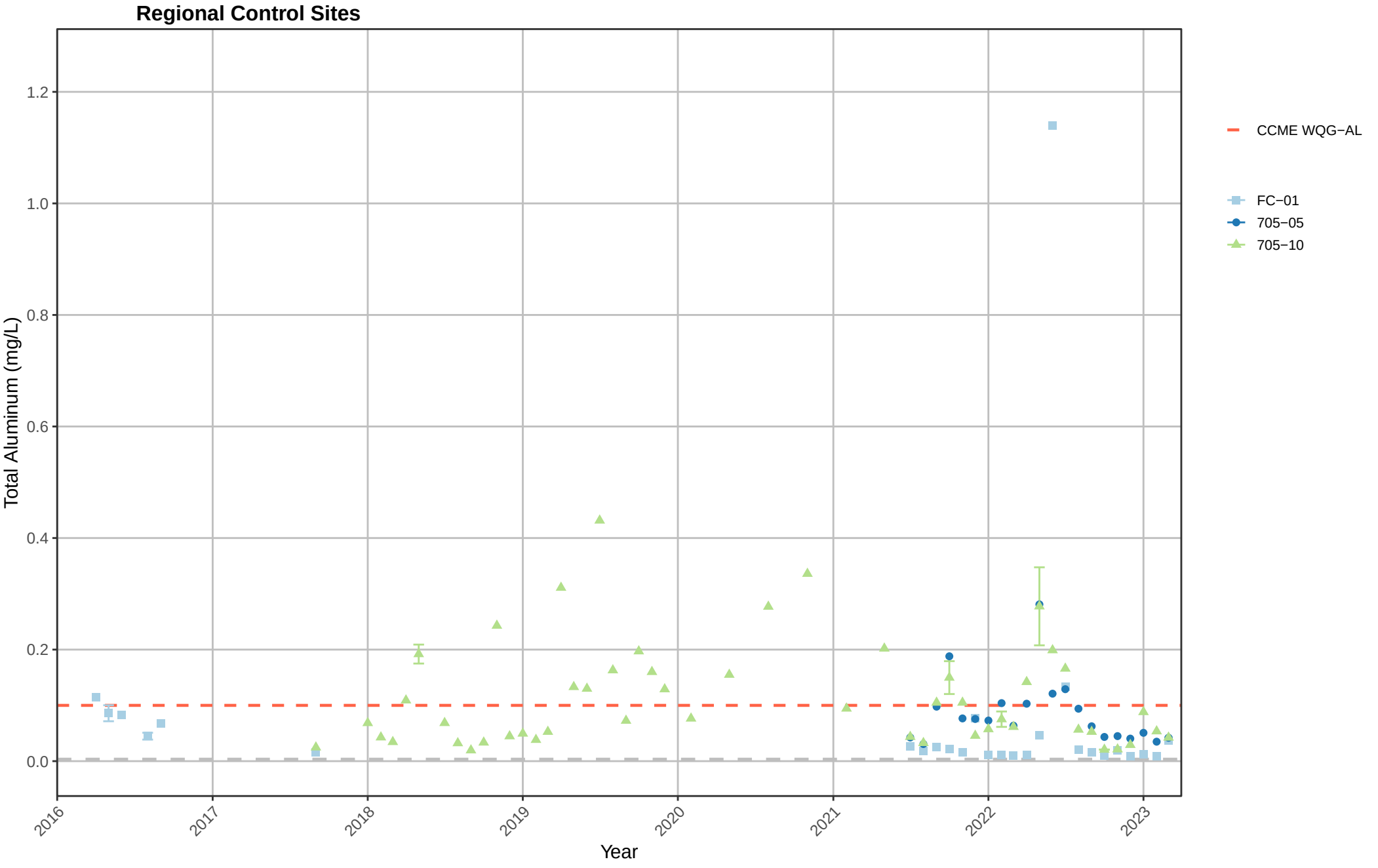
Appendix B−14.b: Monthly Mean Total Aluminum at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limit.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total aluminum is pH dependent.

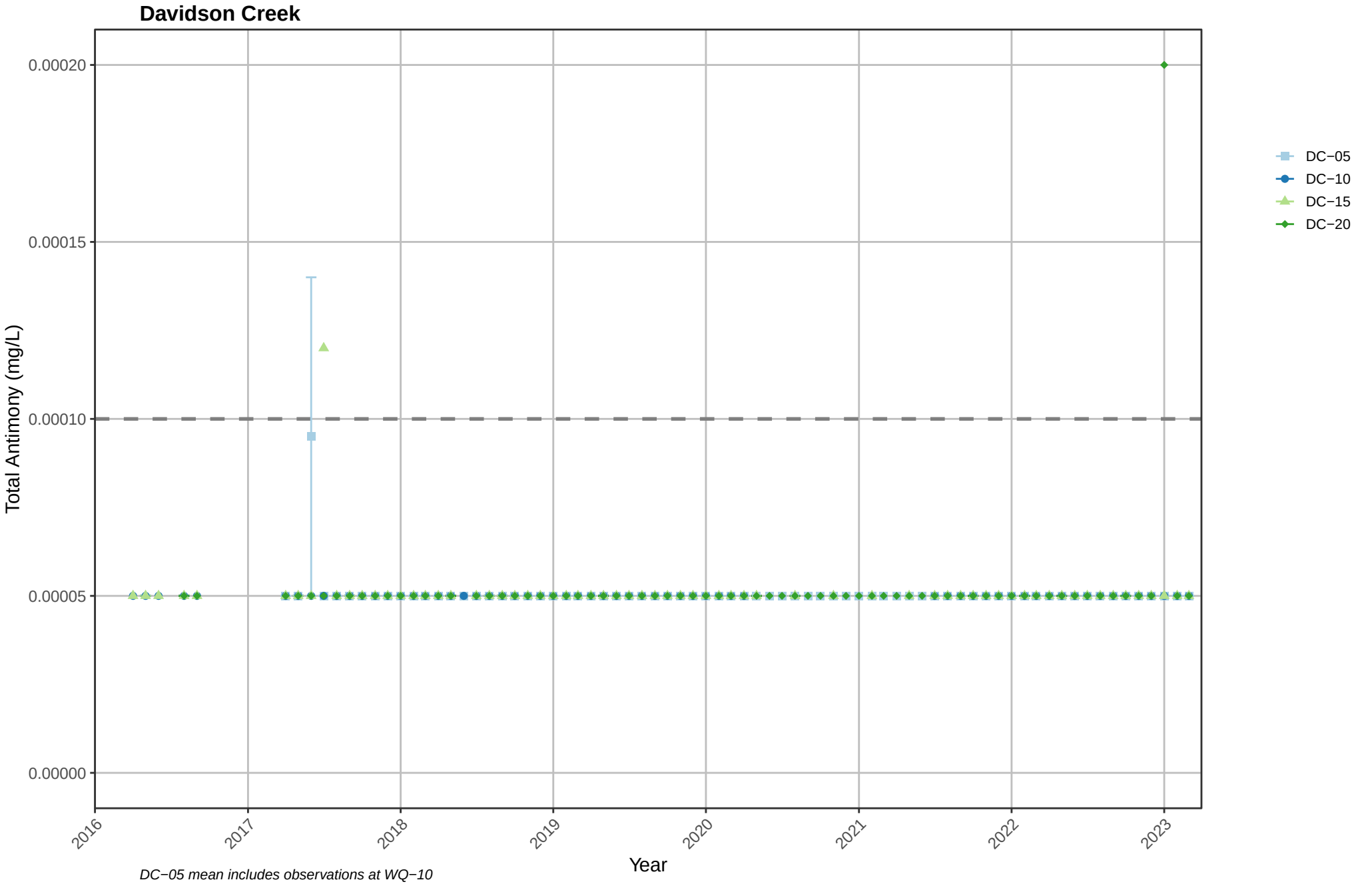
Appendix B−14.c: Monthly Mean Total Aluminum at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limit.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total aluminum is pH dependent.

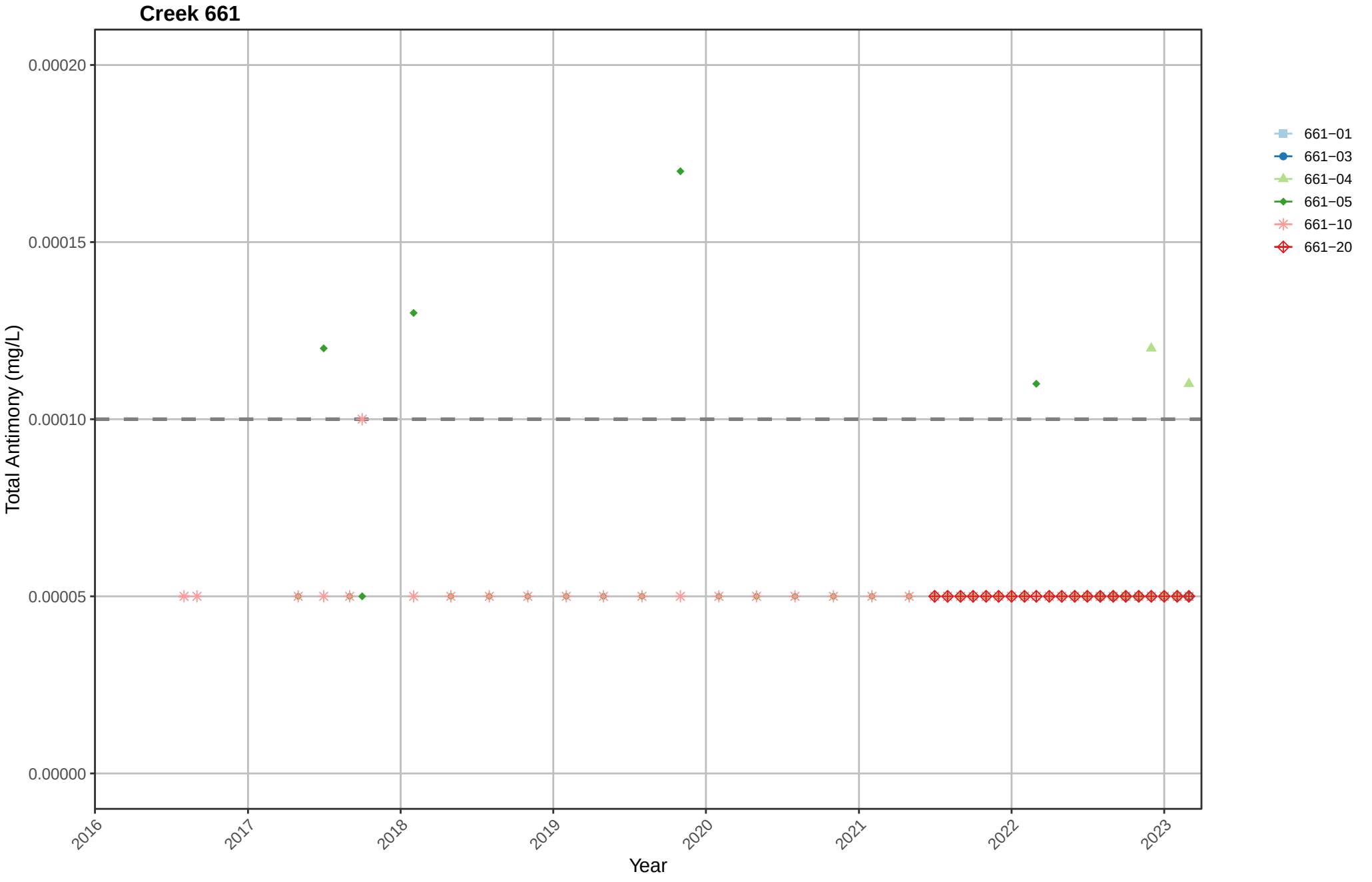
Appendix B−14.d: Monthly Mean Total Aluminum at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL working long−term guideline for antimony = 0.009 mg/L.

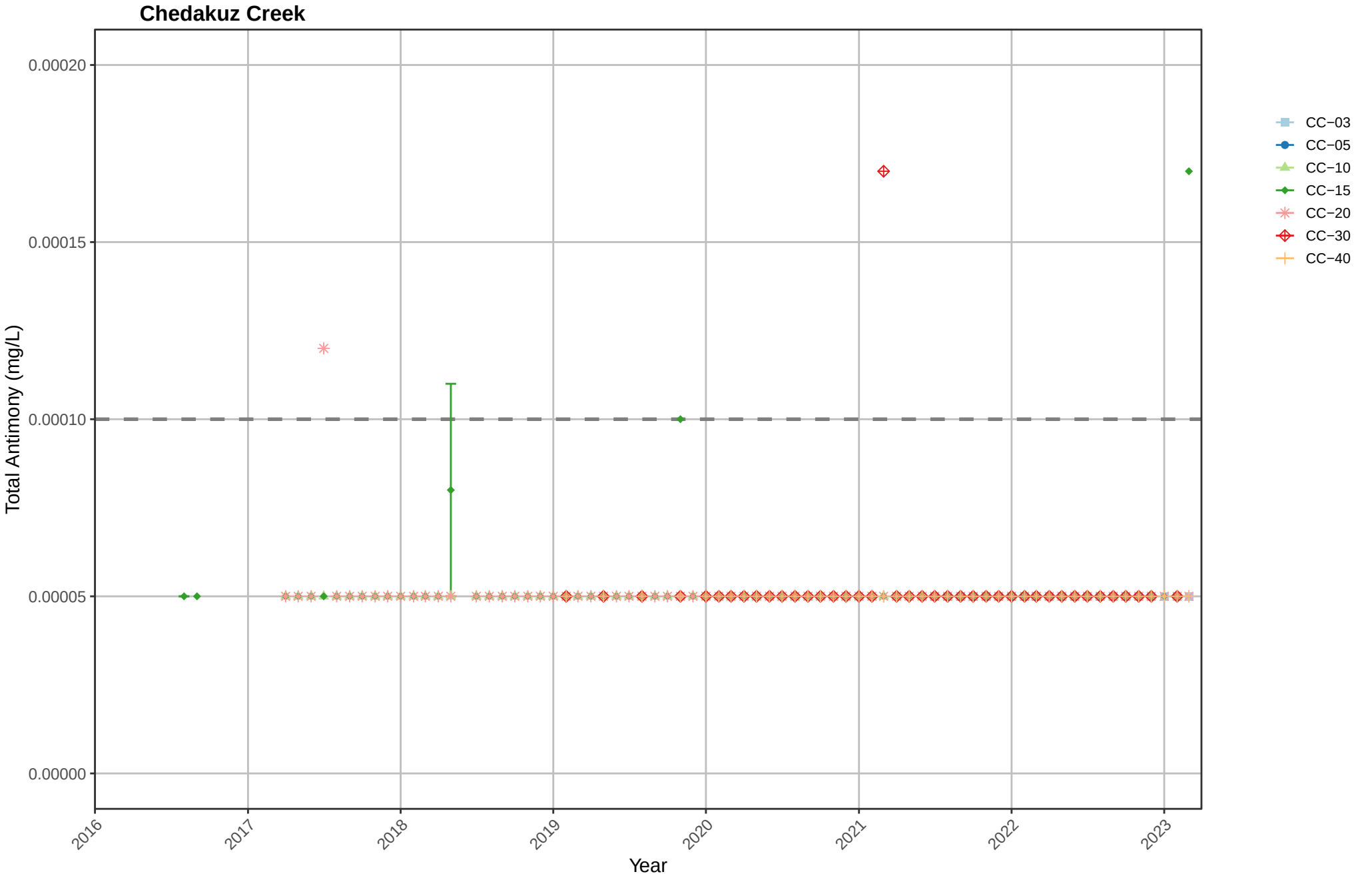
Appendix B−15.a: Monthly Mean Total Antimony at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL working long−term guideline for antimony = 0.009 mg/L.

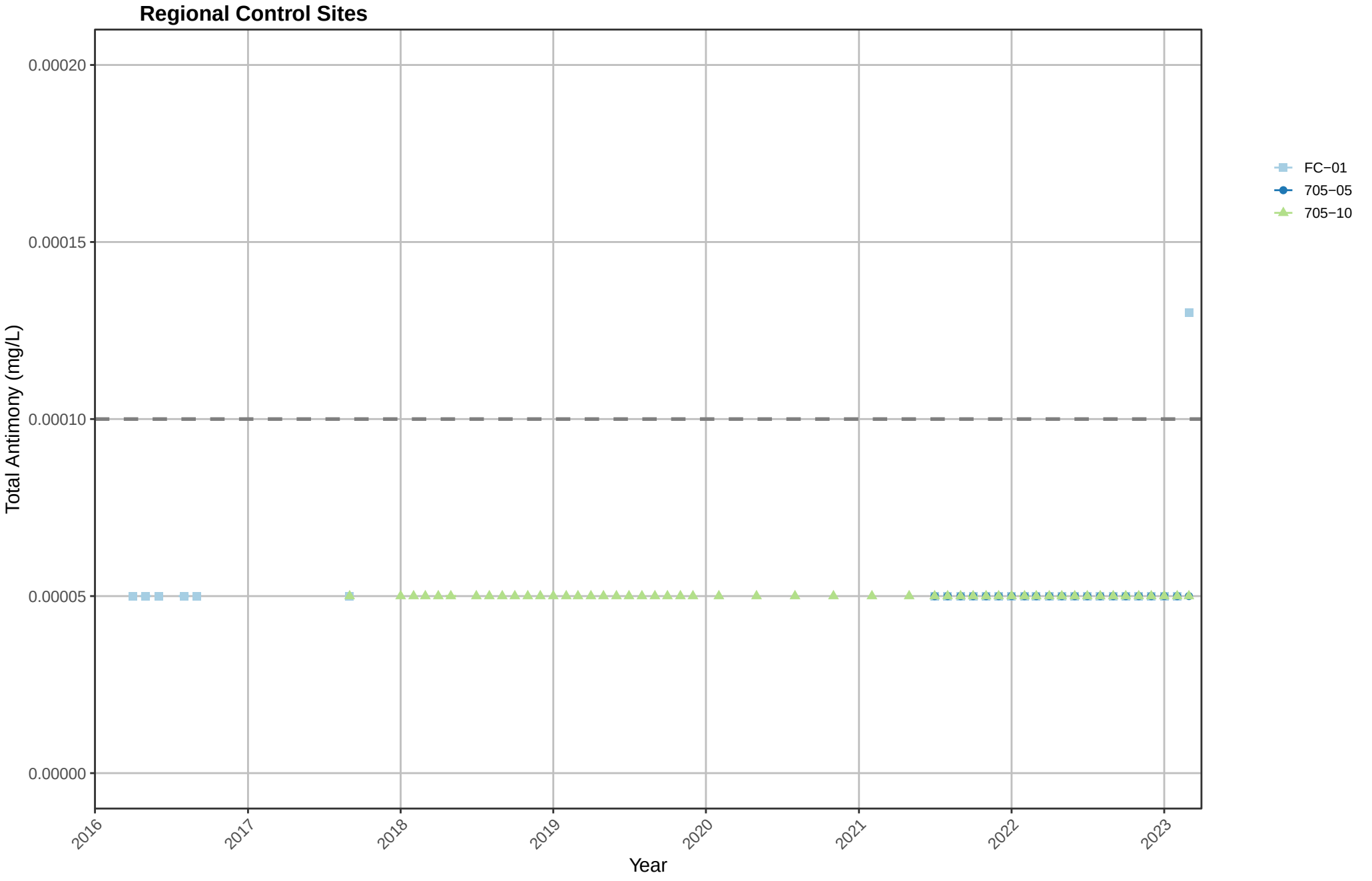
Appendix B−15.b: Monthly Mean Total Antimony at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL working long−term guideline for antimony = 0.009 mg/L.

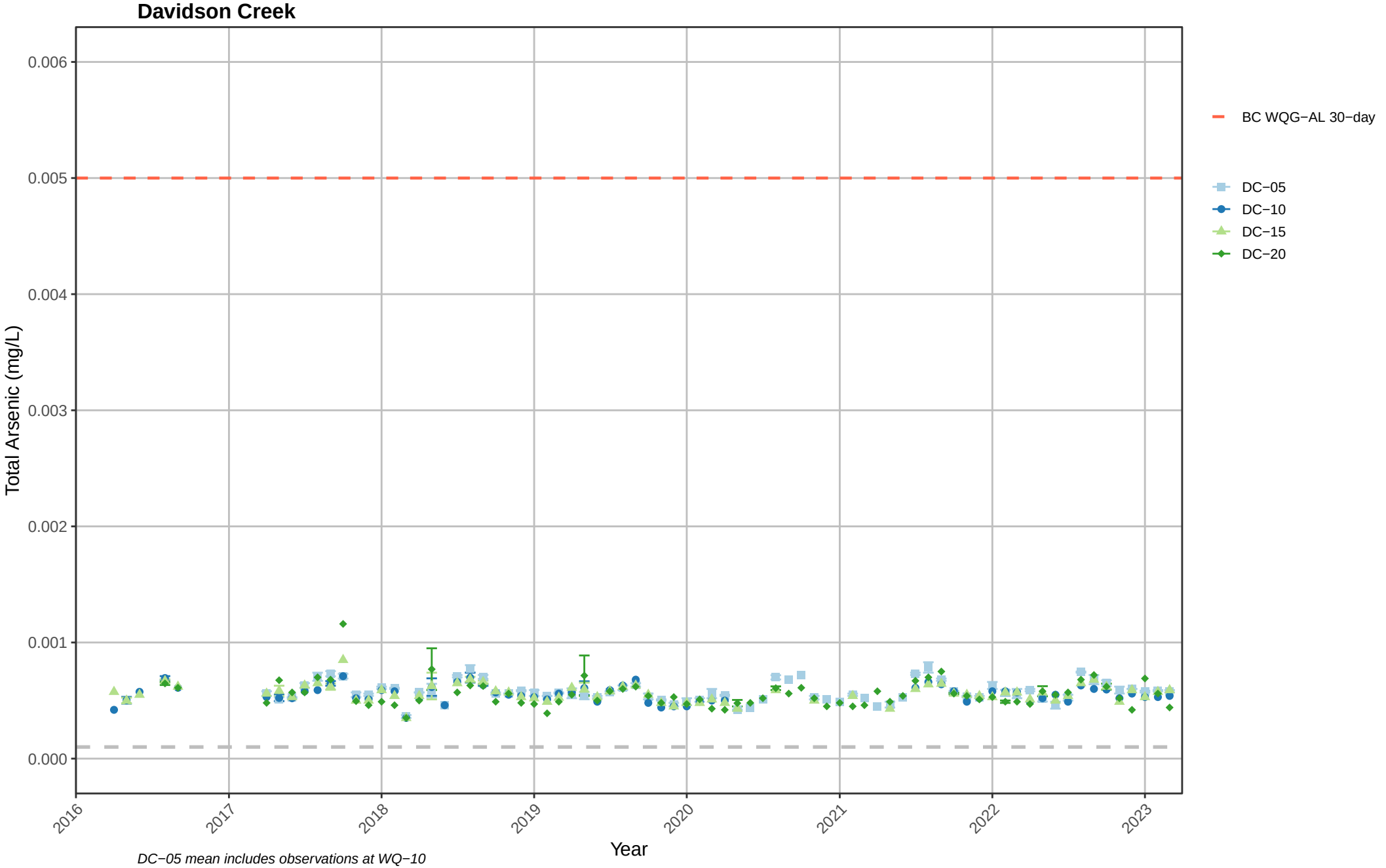
Appendix B−15.c: Monthly Mean Total Antimony at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL working long−term guideline for antimony = 0.009 mg/L.

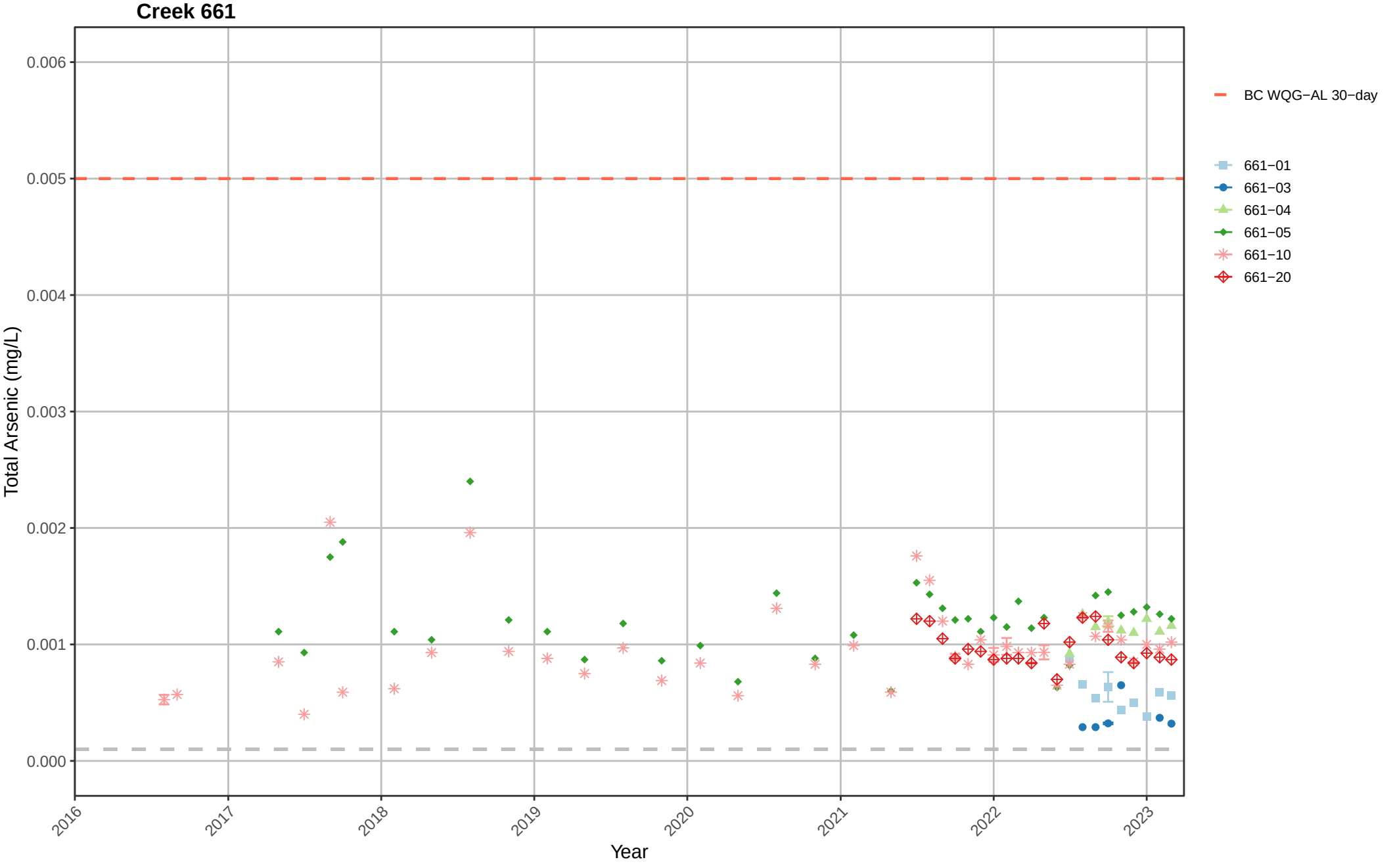
Appendix B−15.d: Monthly Mean Total Antimony at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total arsenic = 0.005 mg/L for a 30−day period.

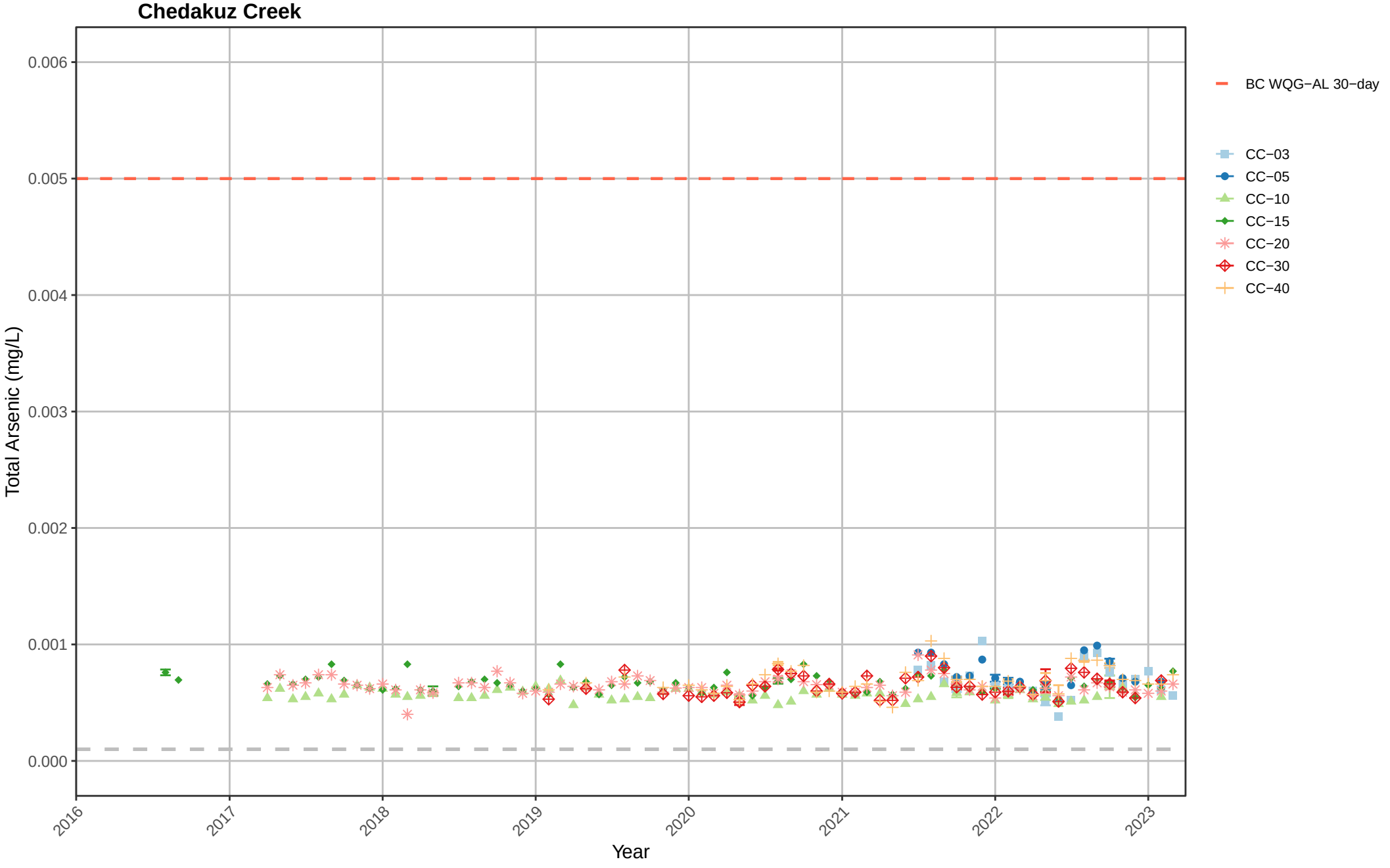
Appendix B−16.a: Monthly Mean Total Arsenic at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total arsenic = 0.005 mg/L for a 30−day period.

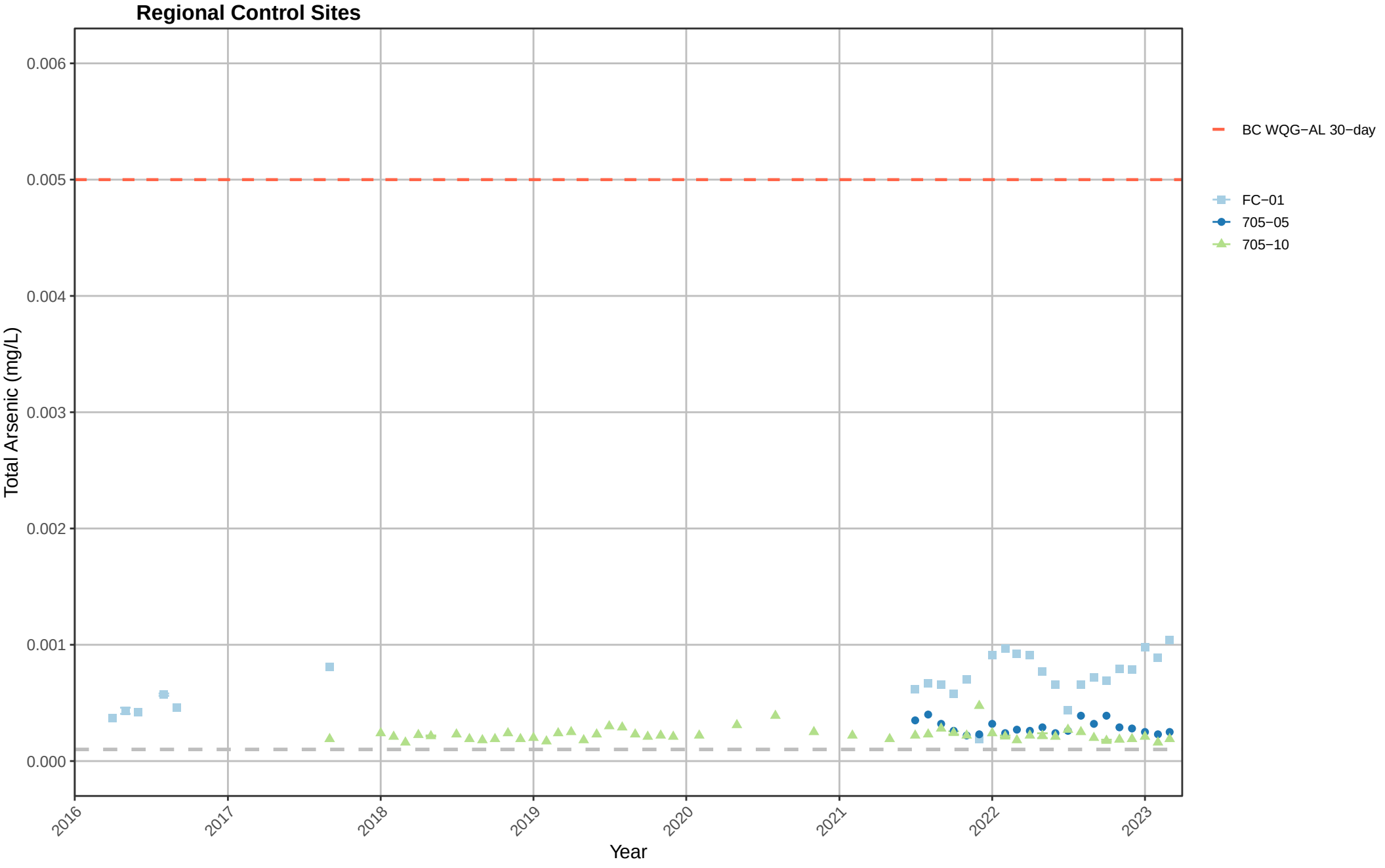
Appendix B−16.b: Monthly Mean Total Arsenic at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total arsenic = 0.005 mg/L for a 30−day period.

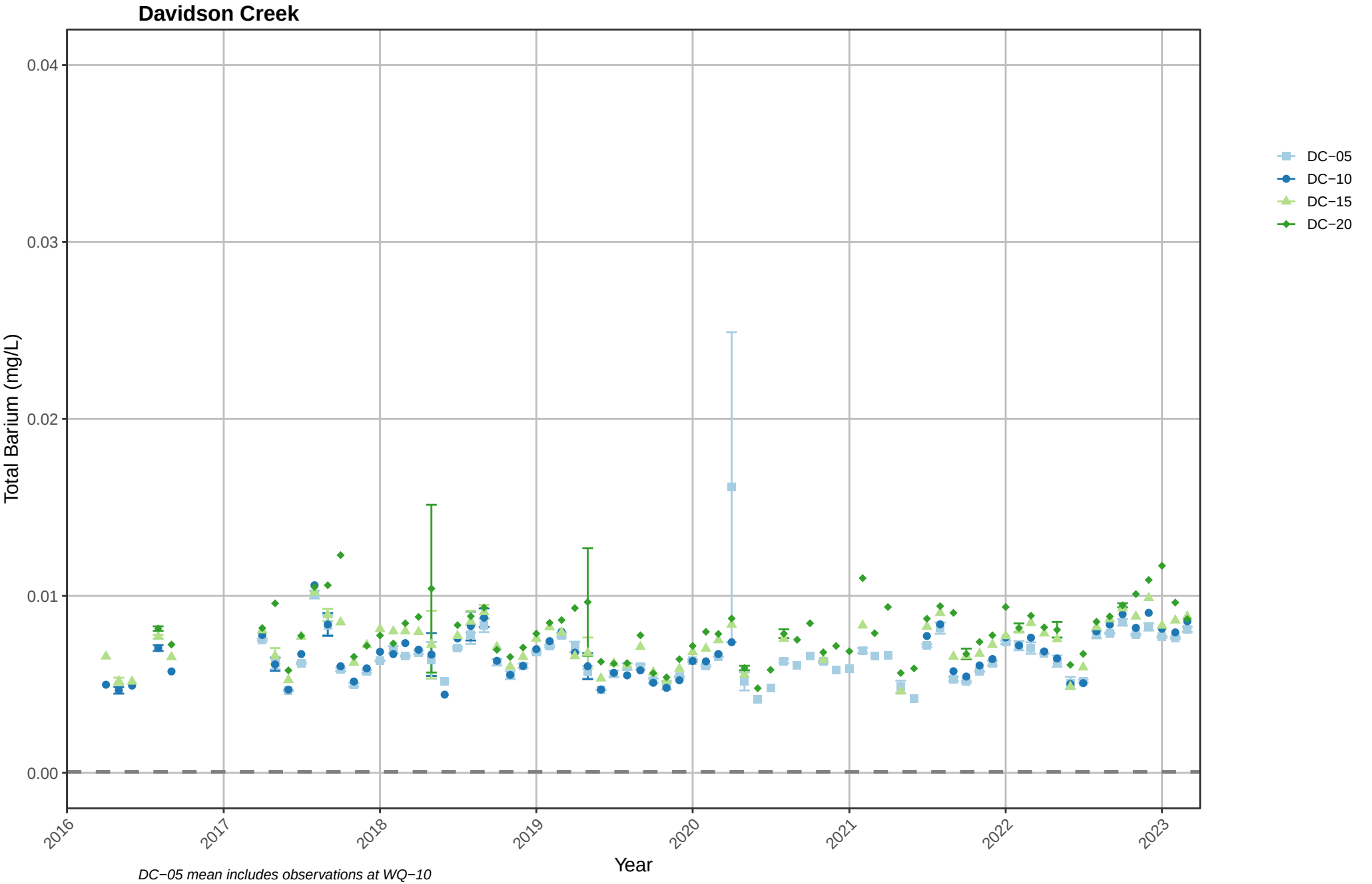
Appendix B−16.c: Monthly Mean Total Arsenic at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total arsenic = 0.005 mg/L for a 30−day period.

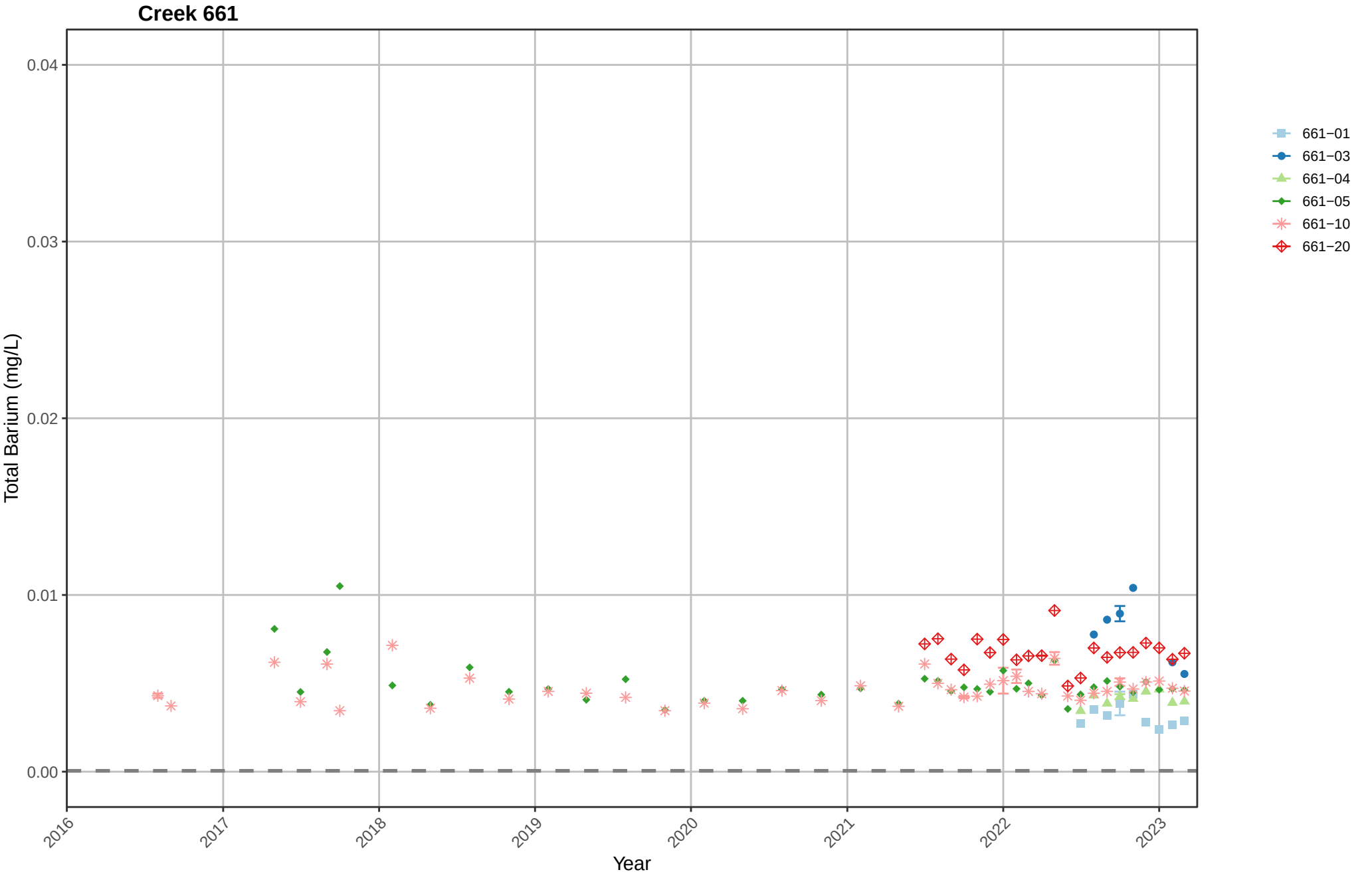
Appendix B−16.d: Monthly Mean Total Arsenic at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term interim guideline for total barium = 1 mg/L.

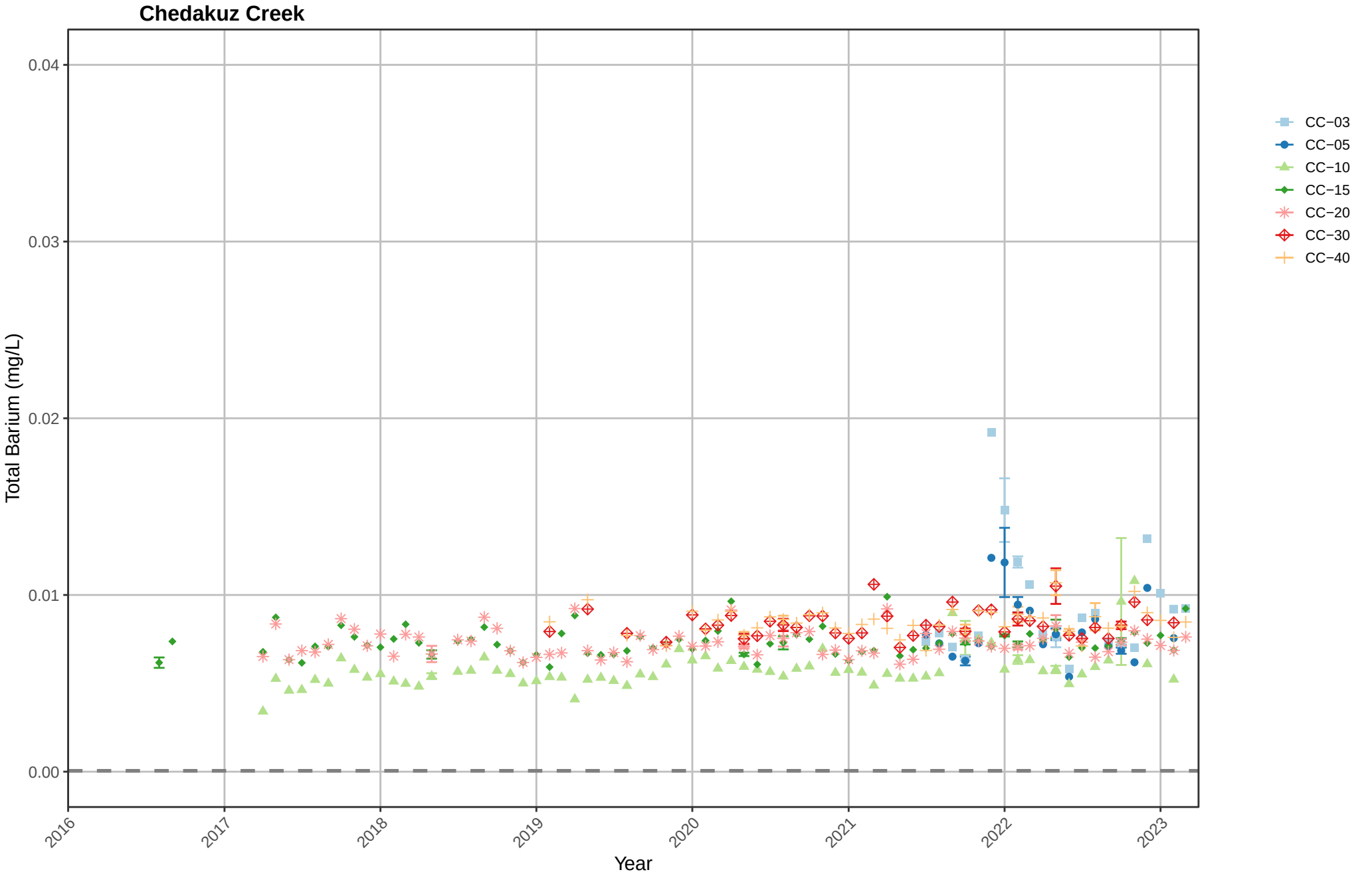
Appendix B−17.a: Monthly Mean Total Barium at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

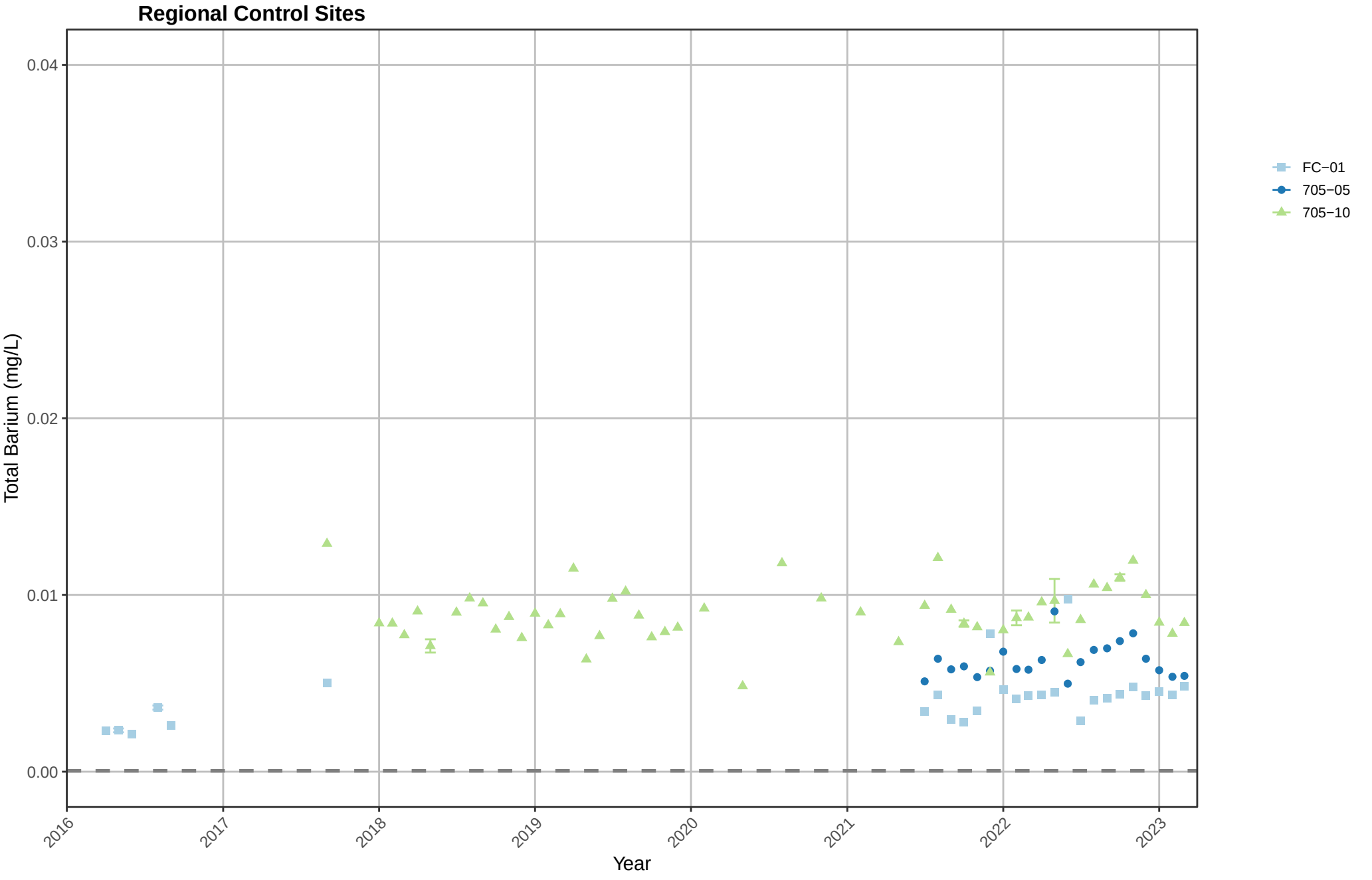
BC WQG−AL long−term interim guideline for total barium = 1 mg/L.

Appendix B−17.b: Monthly Mean Total Barium at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.
BC WQG−AL long−term interim guideline for total barium = 1 mg/L.

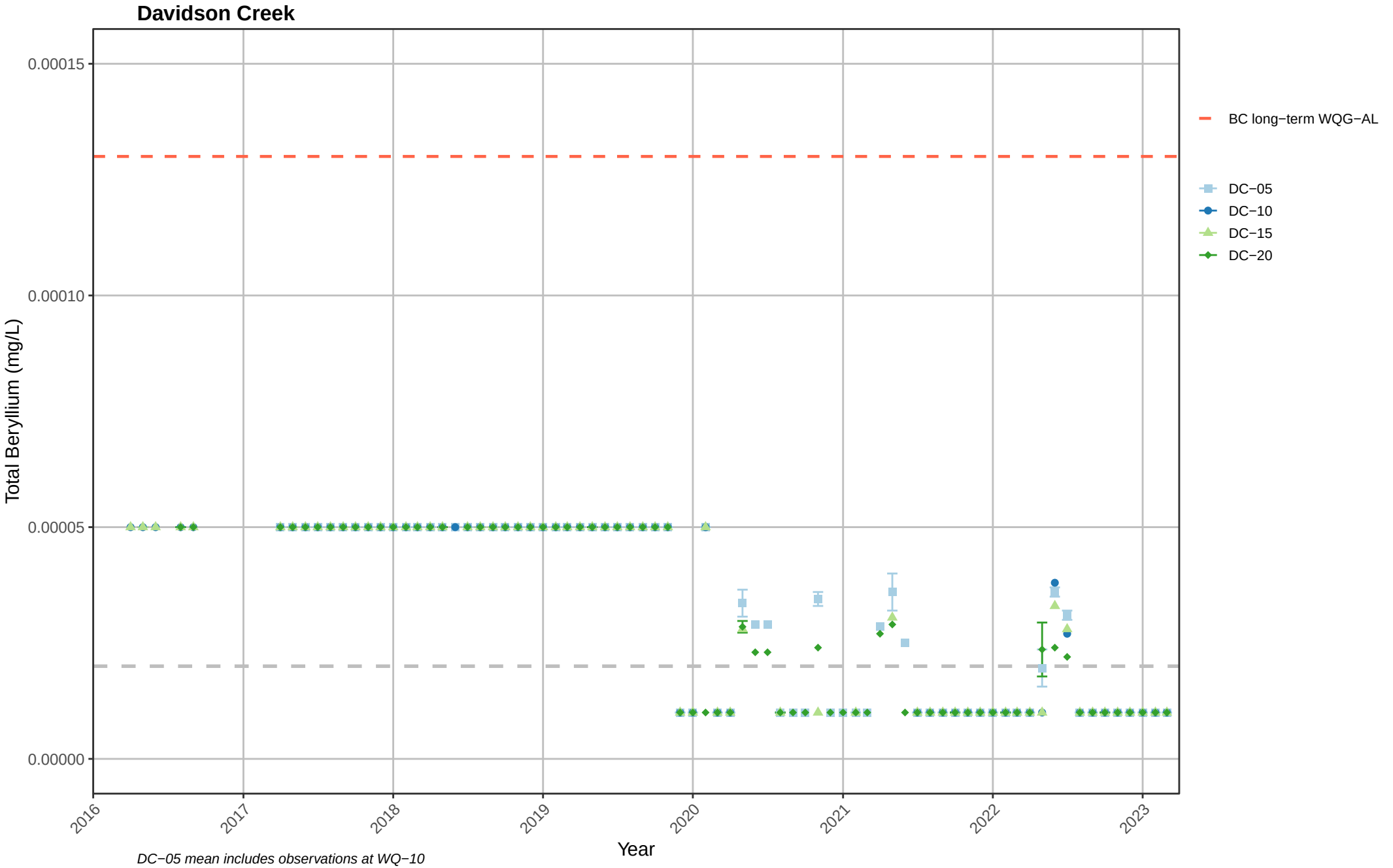
Appendix B−17.c: Monthly Mean Total Barium at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term interim guideline for total barium = 1 mg/L.

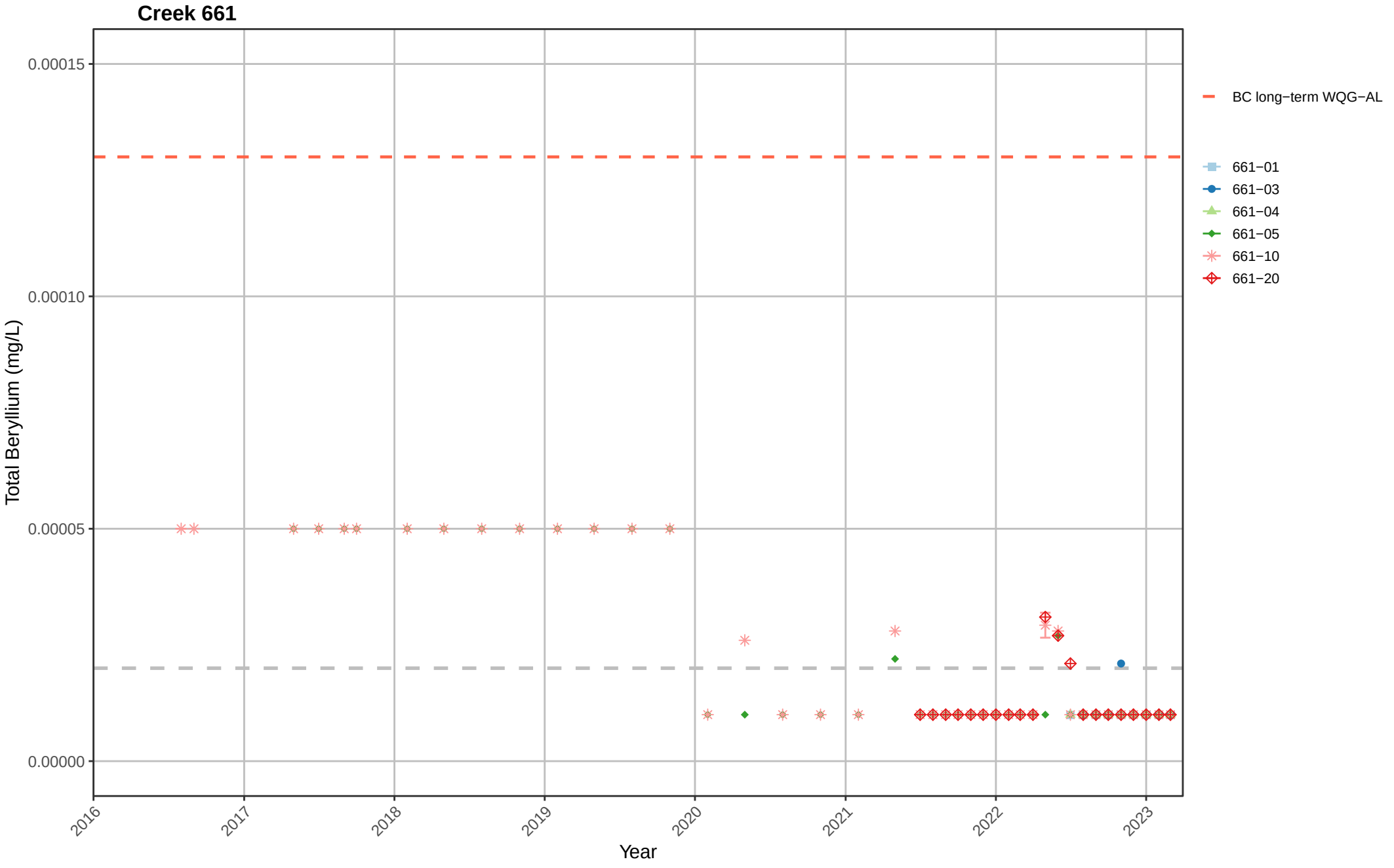
Appendix B−17.d: Monthly Mean Total Barium at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term interim guideline for total beryllium = 0.00013 mg/L.

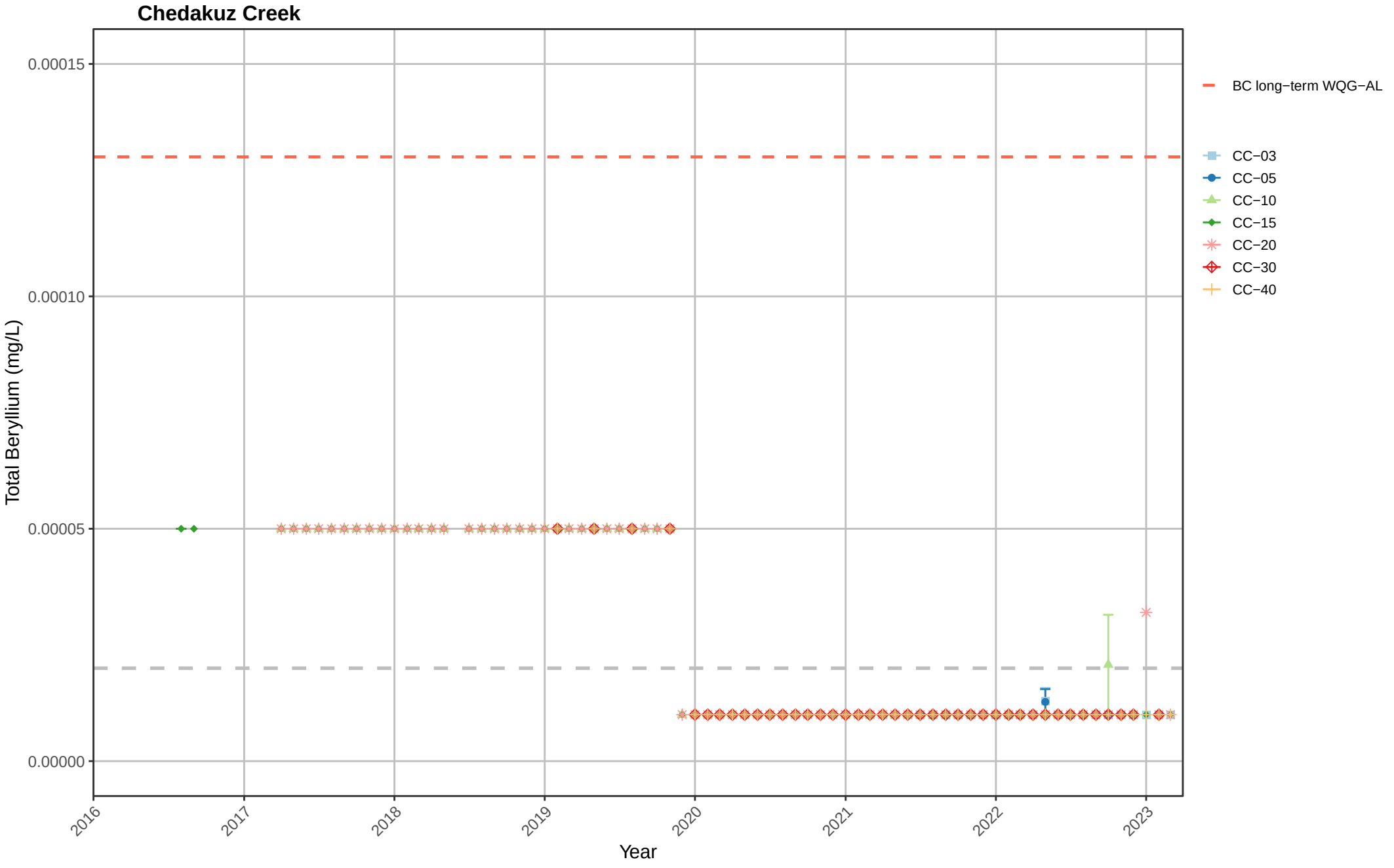
Appendix B−18.a: Monthly Mean Total Beryllium at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term interim guideline for total beryllium = 0.00013 mg/L.

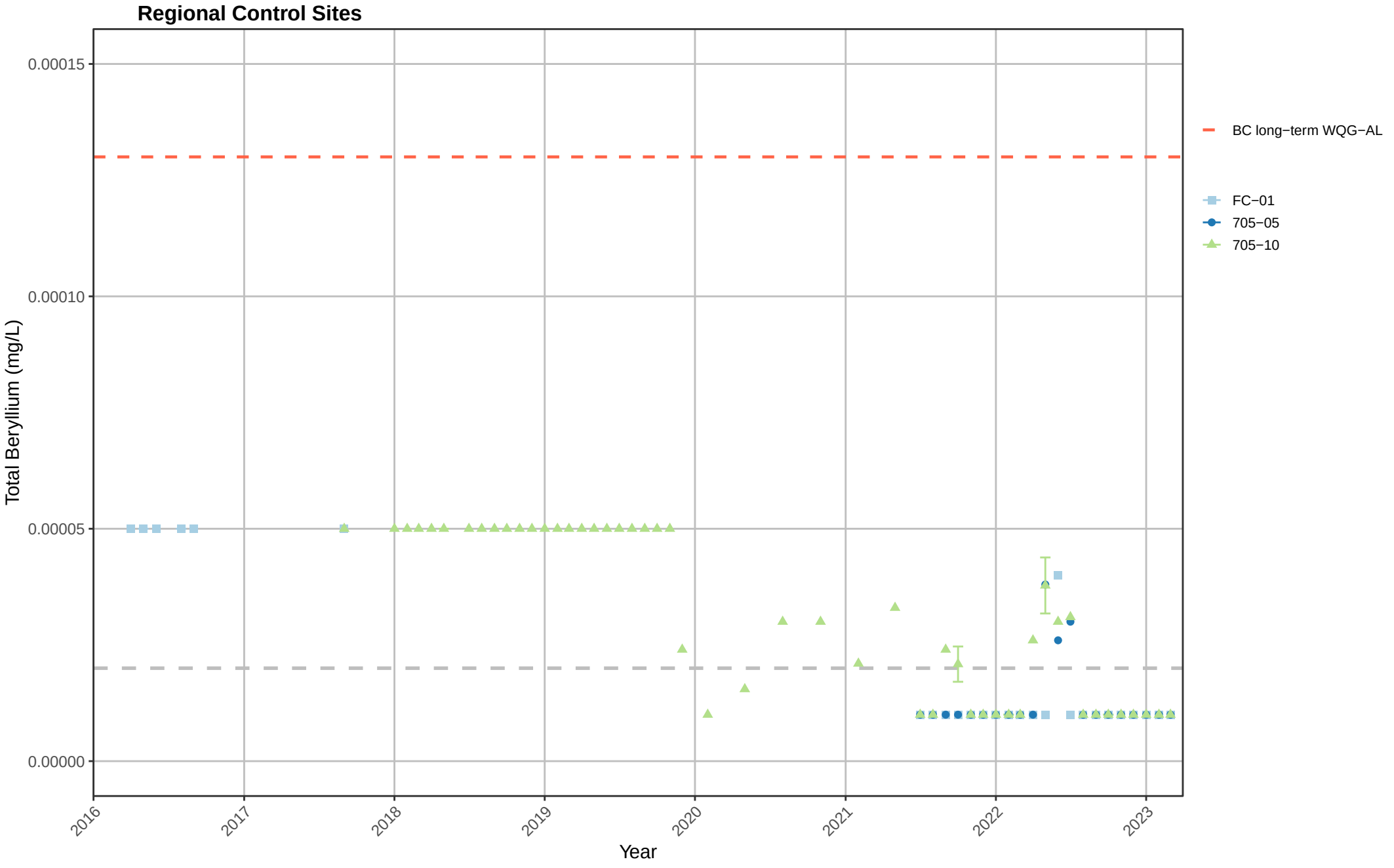
Appendix B−18.b: Monthly Mean Total Beryllium at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term interim guideline for total beryllium = 0.00013 mg/L.

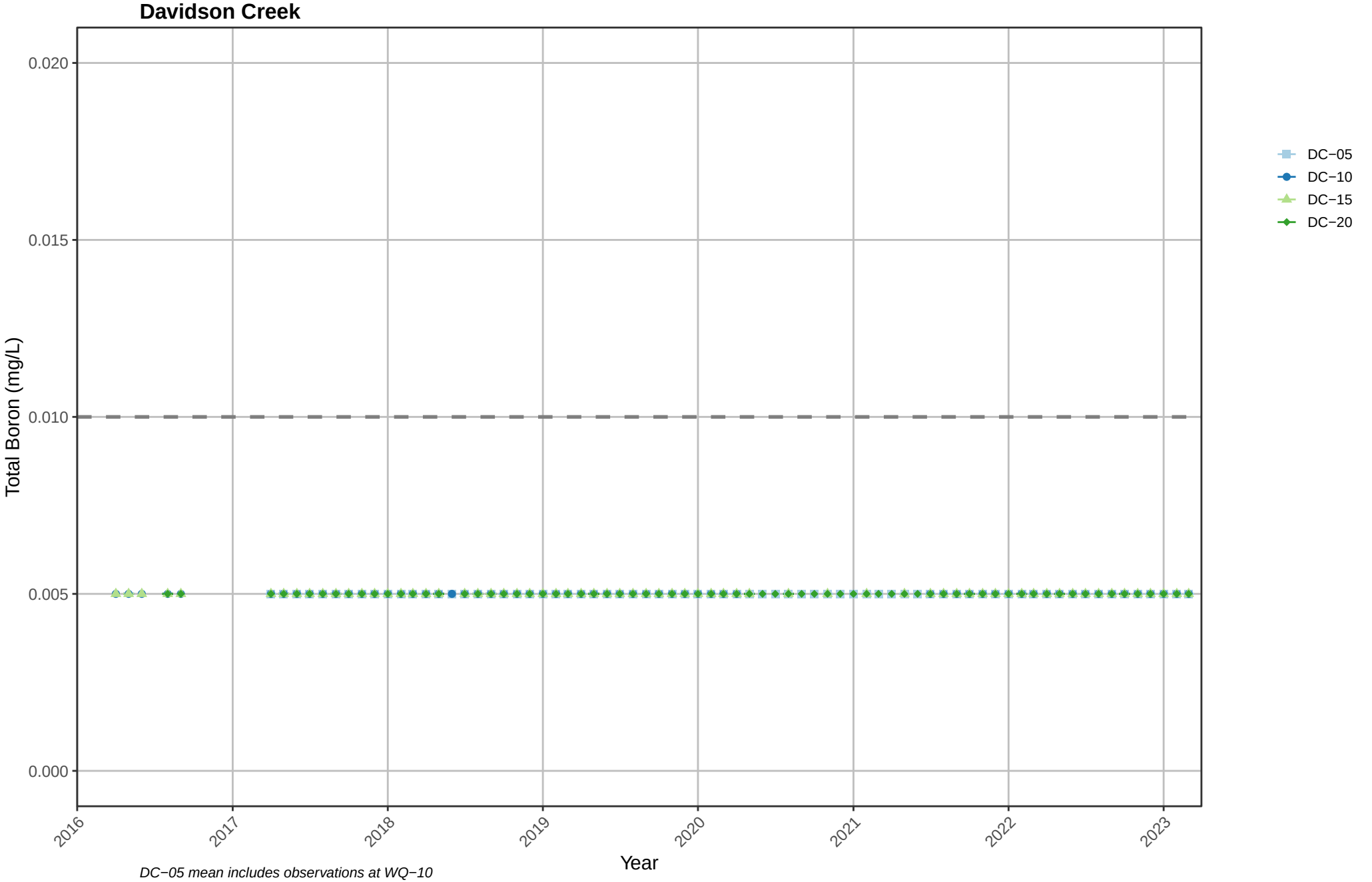
Appendix B−18.c: Monthly Mean Total Beryllium at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term interim guideline for total beryllium = 0.00013 mg/L.

Appendix B−18.d: Monthly Mean Total Beryllium at Regional Control AEMP Sites, 2016 to March 31, 2023

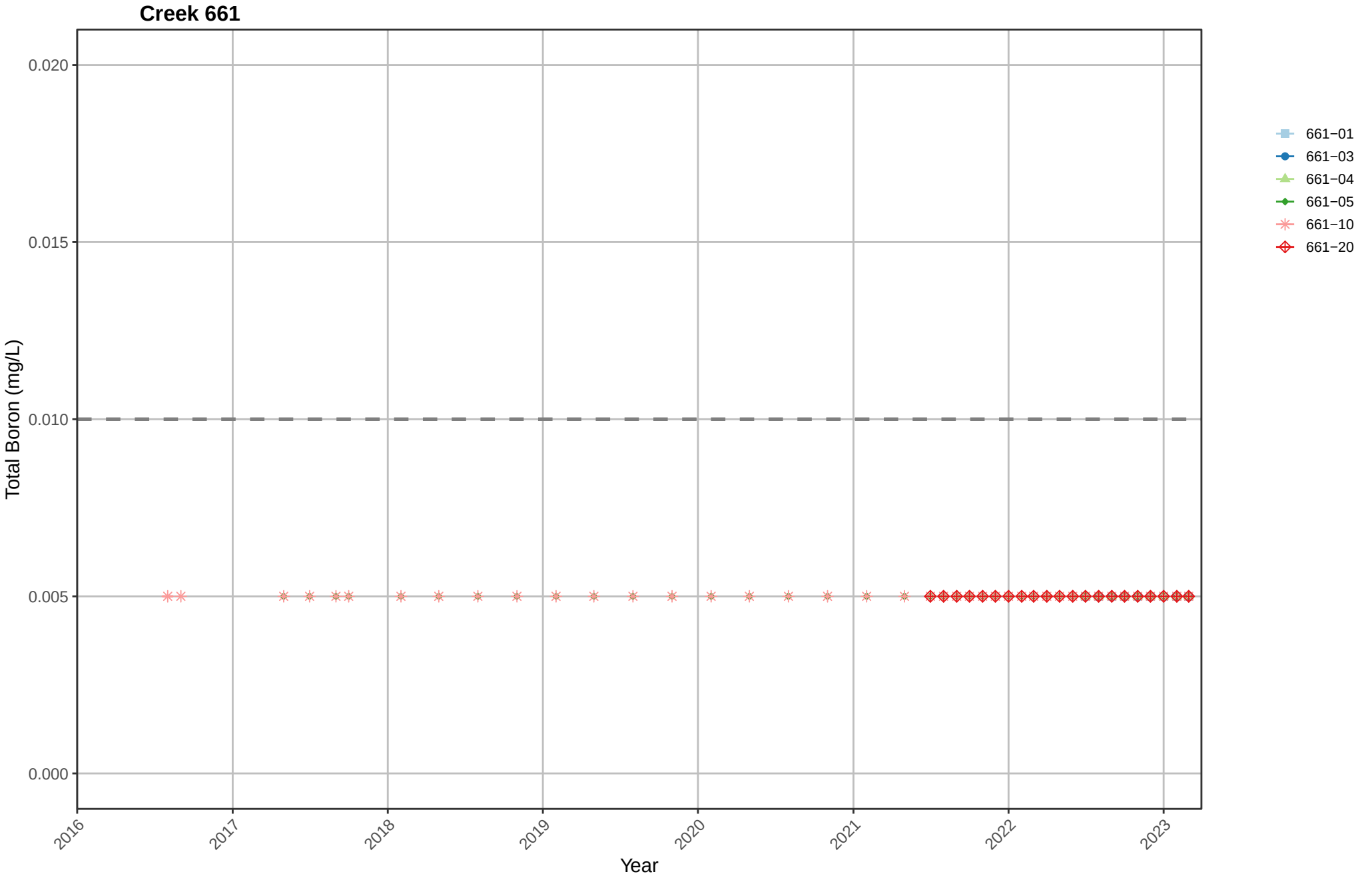


DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.

BC 30−day WQG−AL for total boron = 1.2 mg/L.

Concentrations below the detection limit were plotted as half the detection limit.

Appendix B−19.a: Monthly Mean Total Boron at Davidson Creek AEMP Sites, 2016 to March 31, 2023

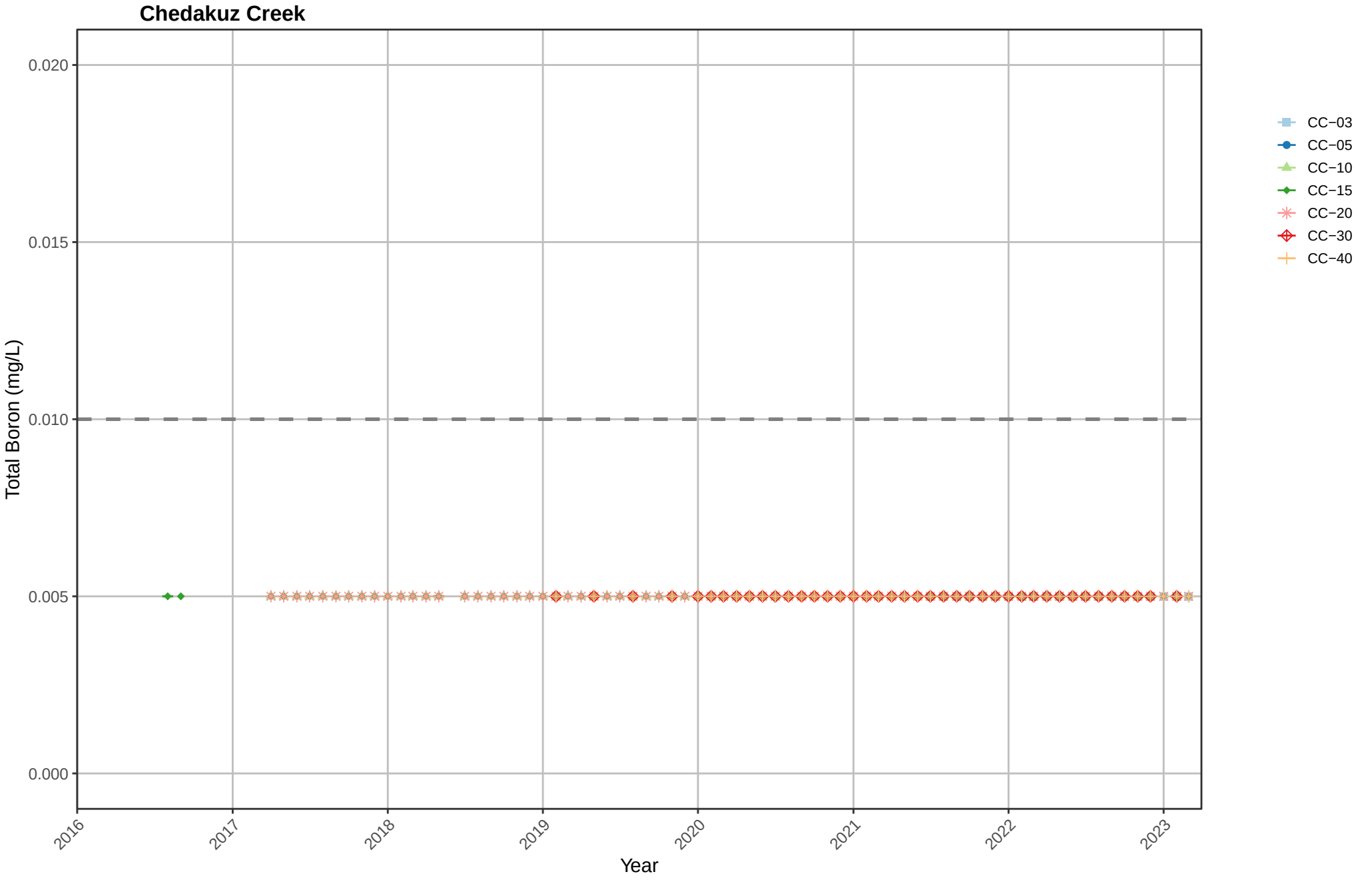


Gray dashed line indicates minimum detection limits.

BC 30−day WQG−AL for total boron = 1.2 mg/L.

Concentrations below the detection limit were plotted as half the detection limit.

Appendix B−19.b: Monthly Mean Total Boron at Creek 661 AEMP Sites, 2016 to March 31, 2023

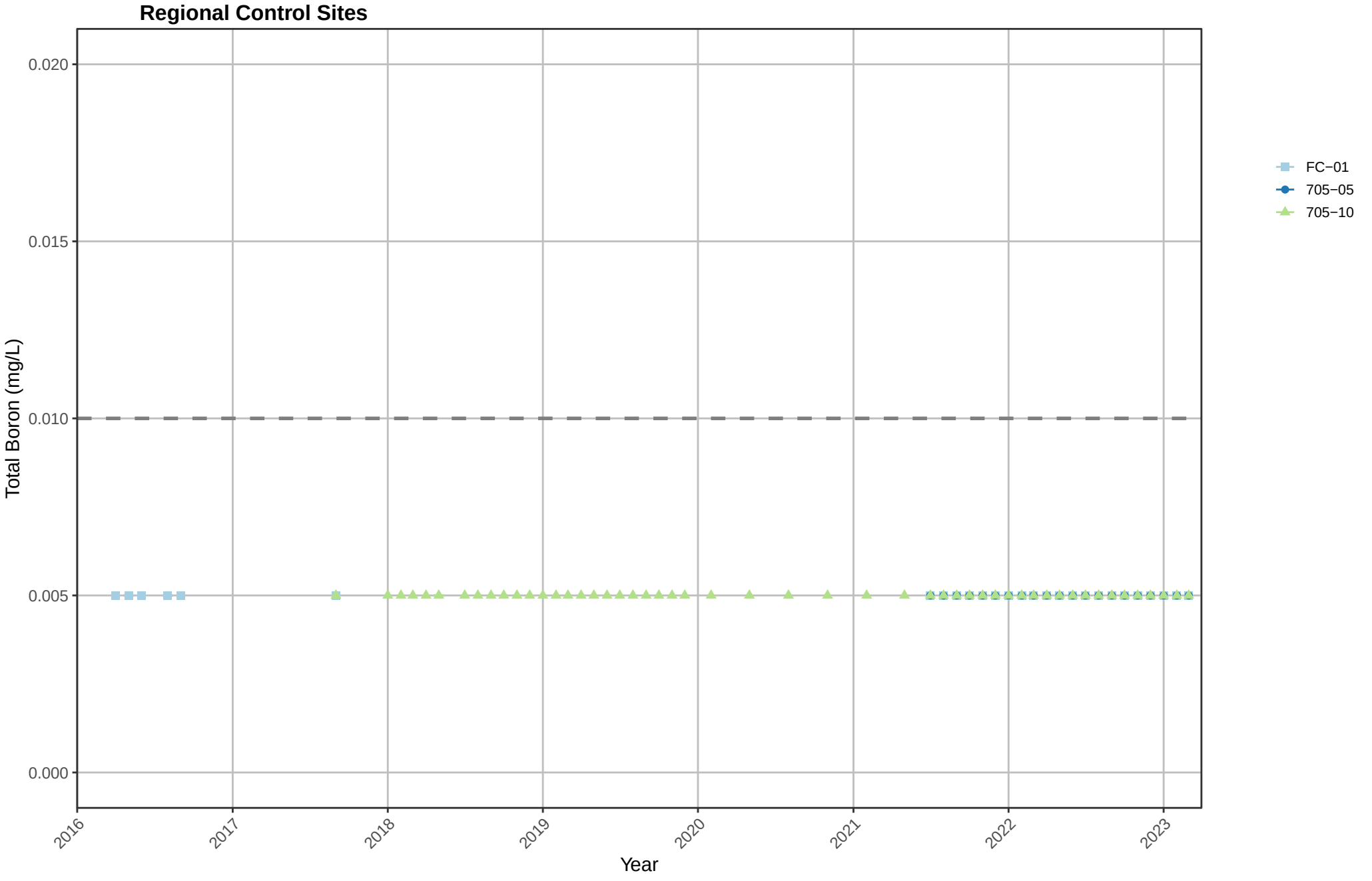


Gray dashed line indicates minimum detection limits.

BC 30−day WQG−AL for total boron = 1.2 mg/L.

Concentrations below the detection limit were plotted as half the detection limit.

Appendix B−19.c: Monthly Mean Total Boron at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023

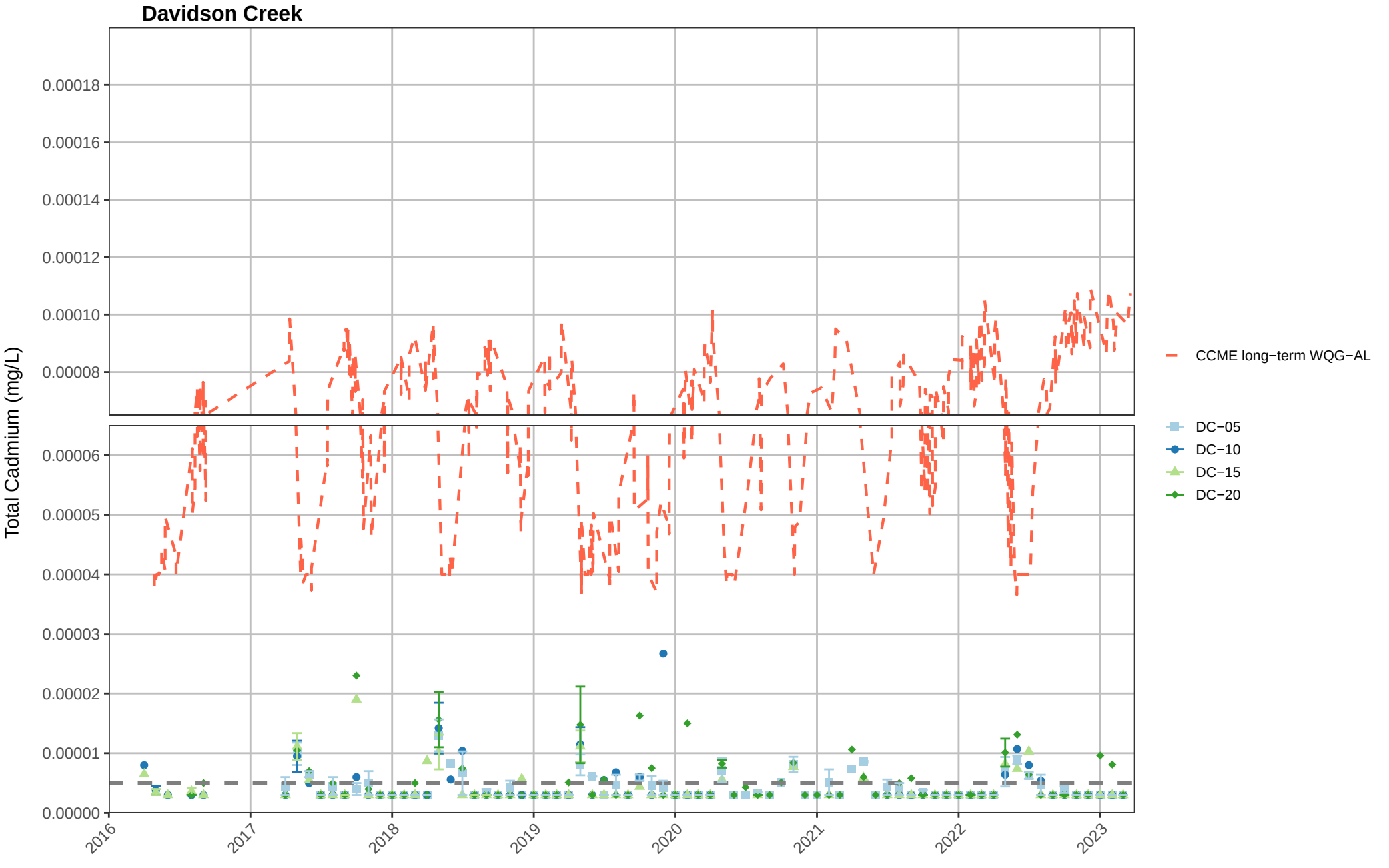


Gray dashed line indicates minimum detection limits.

BC 30−day WQG−AL for total boron = 1.2 mg/L.

Concentrations below the detection limit were plotted as half the detection limit.

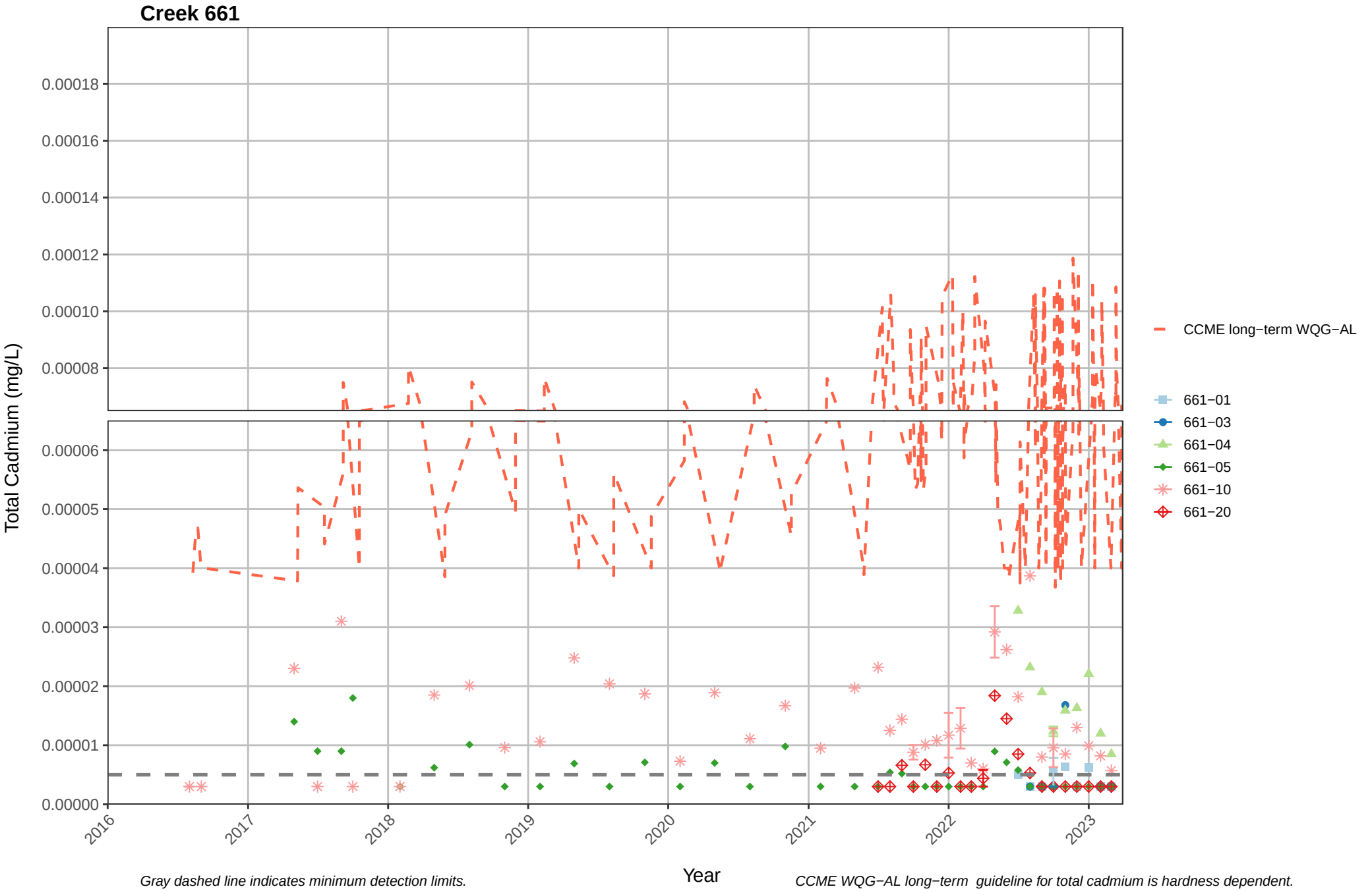
Appendix B−19.d: Monthly Mean Total Boron at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total cadmium is hardness dependent.

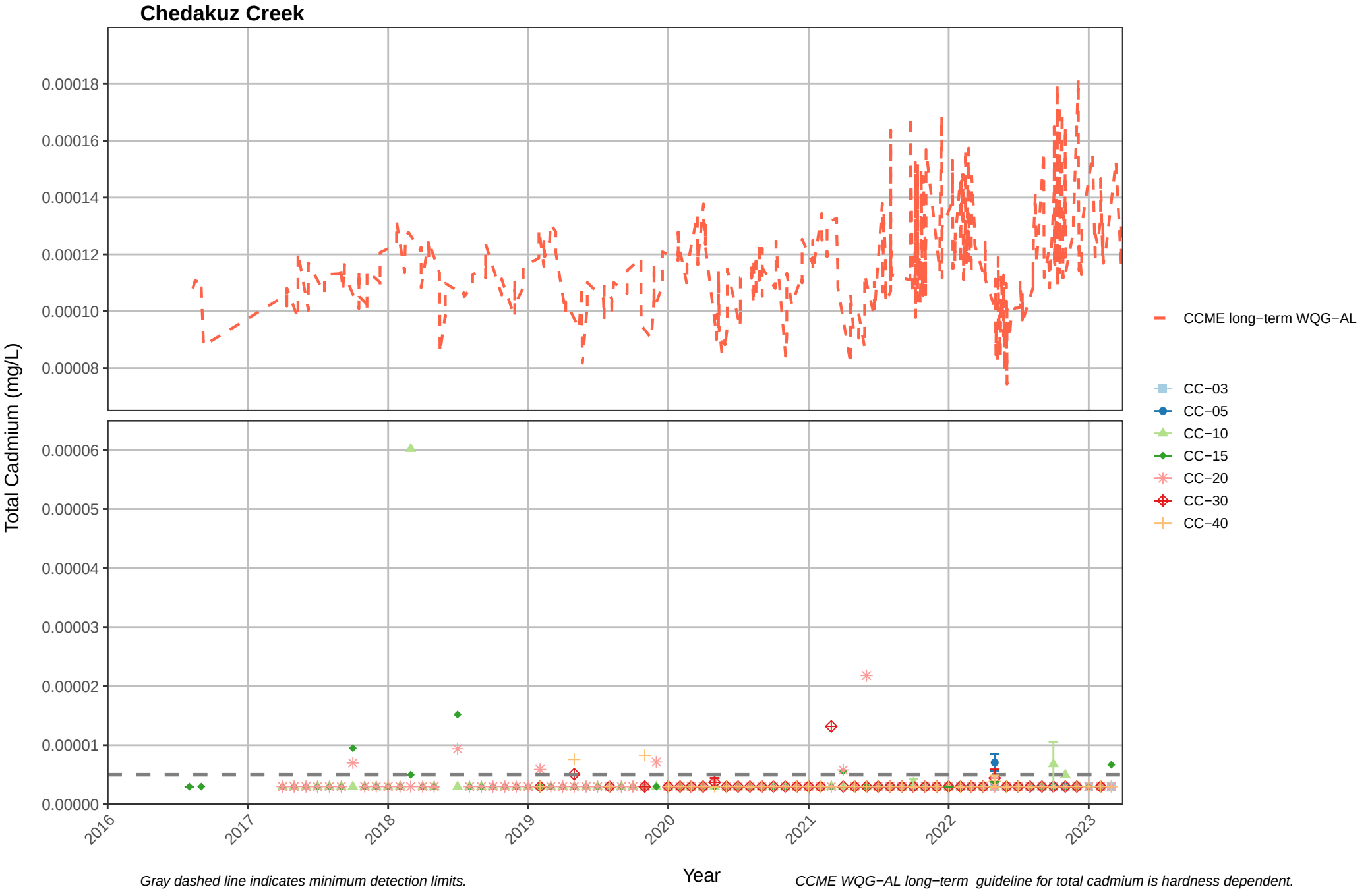
Appendix B−20.a: Monthly Mean Total Cadmium at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total cadmium is hardness dependent.

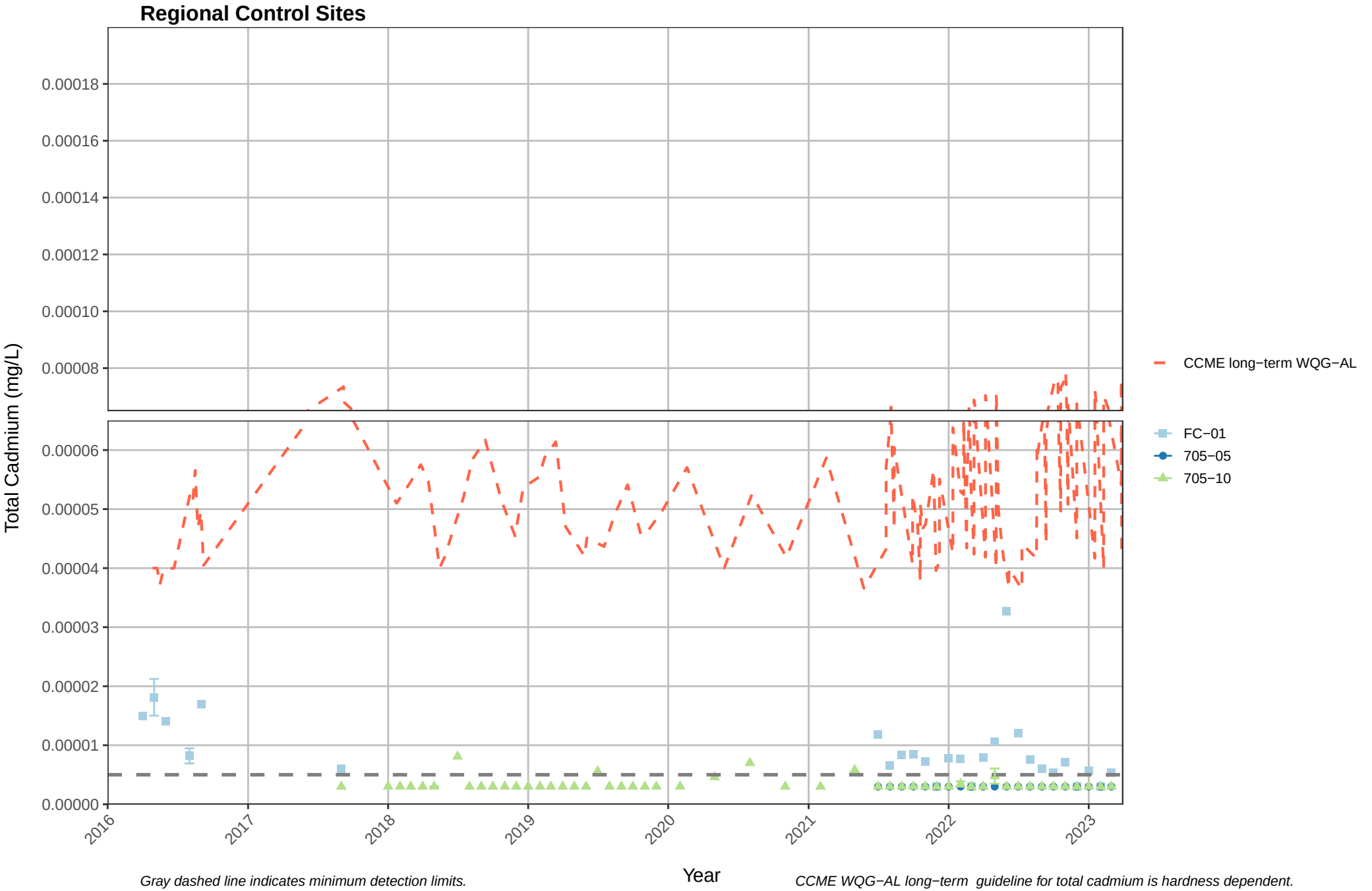
Appendix B−20.b: Monthly Mean Total Cadmium at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total cadmium is hardness dependent.

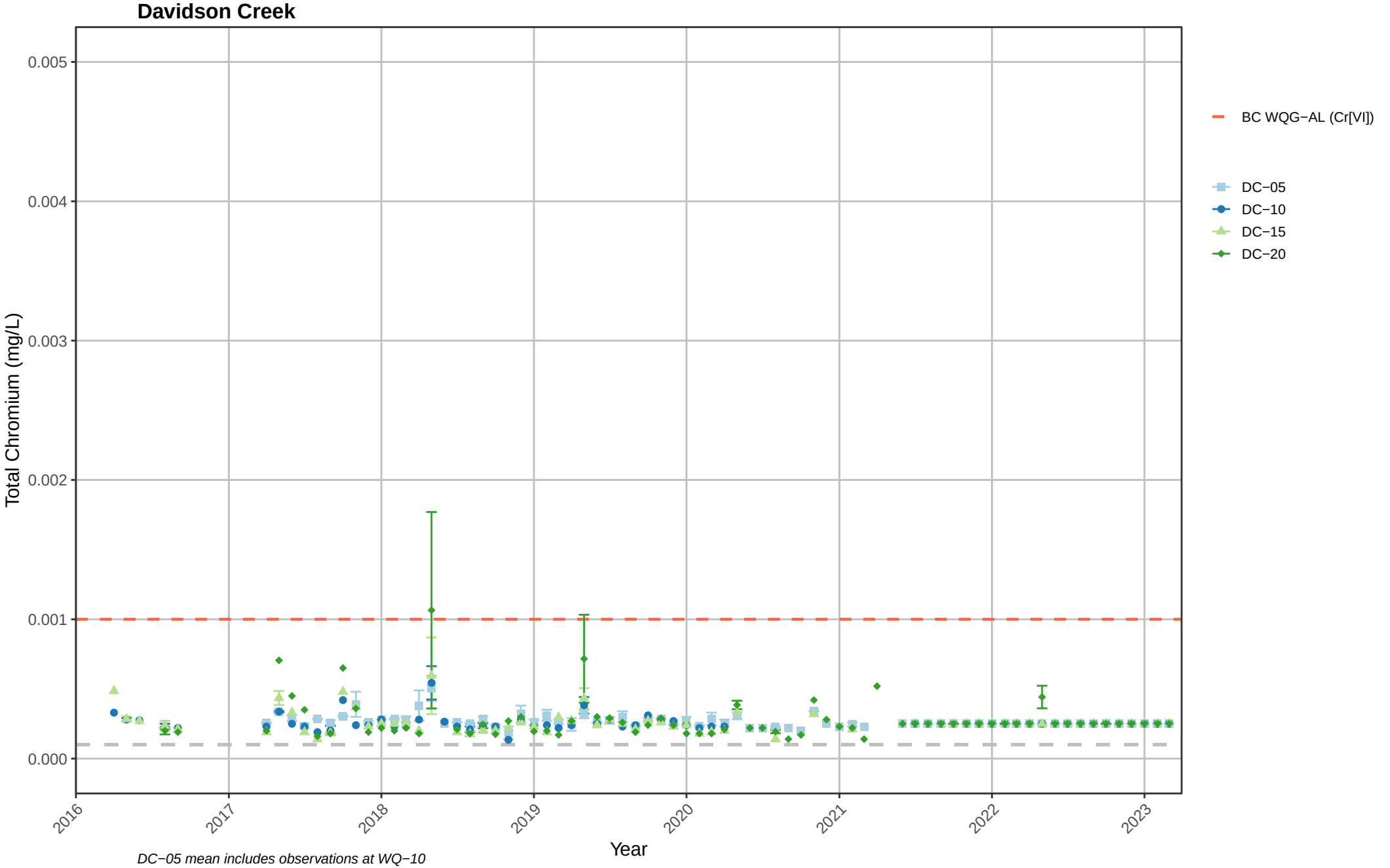
Appendix B−20.c: Monthly Mean Total Cadmium at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total cadmium is hardness dependent.

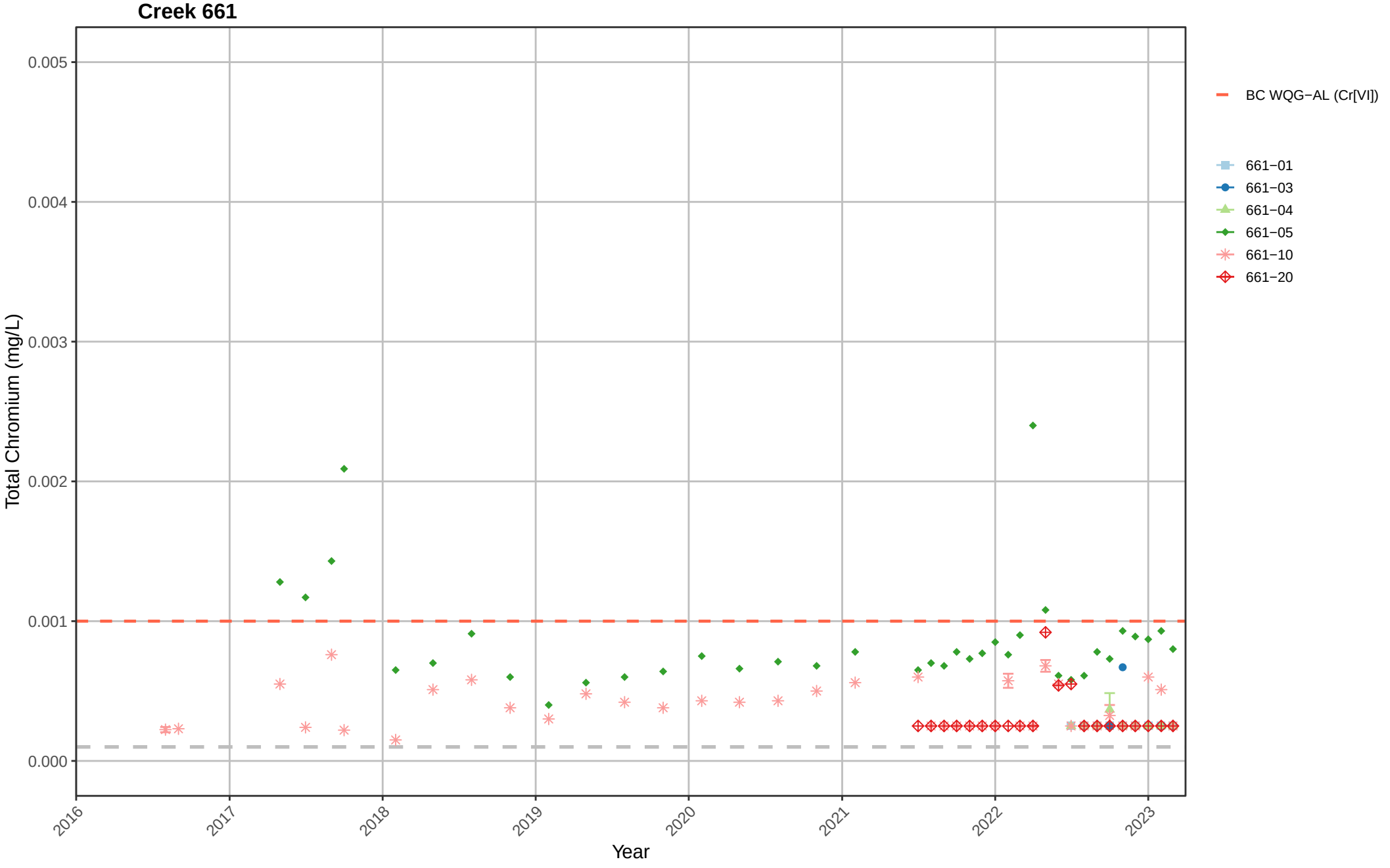
Appendix B−20.d: Monthly Mean Total Cadmium at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term 30−day guideline for total chromium[VI] = 0.001 mg/L.
BC WQG−AL long−term 30−day guideline for total chromium[III] = 0.0089 mg/L.

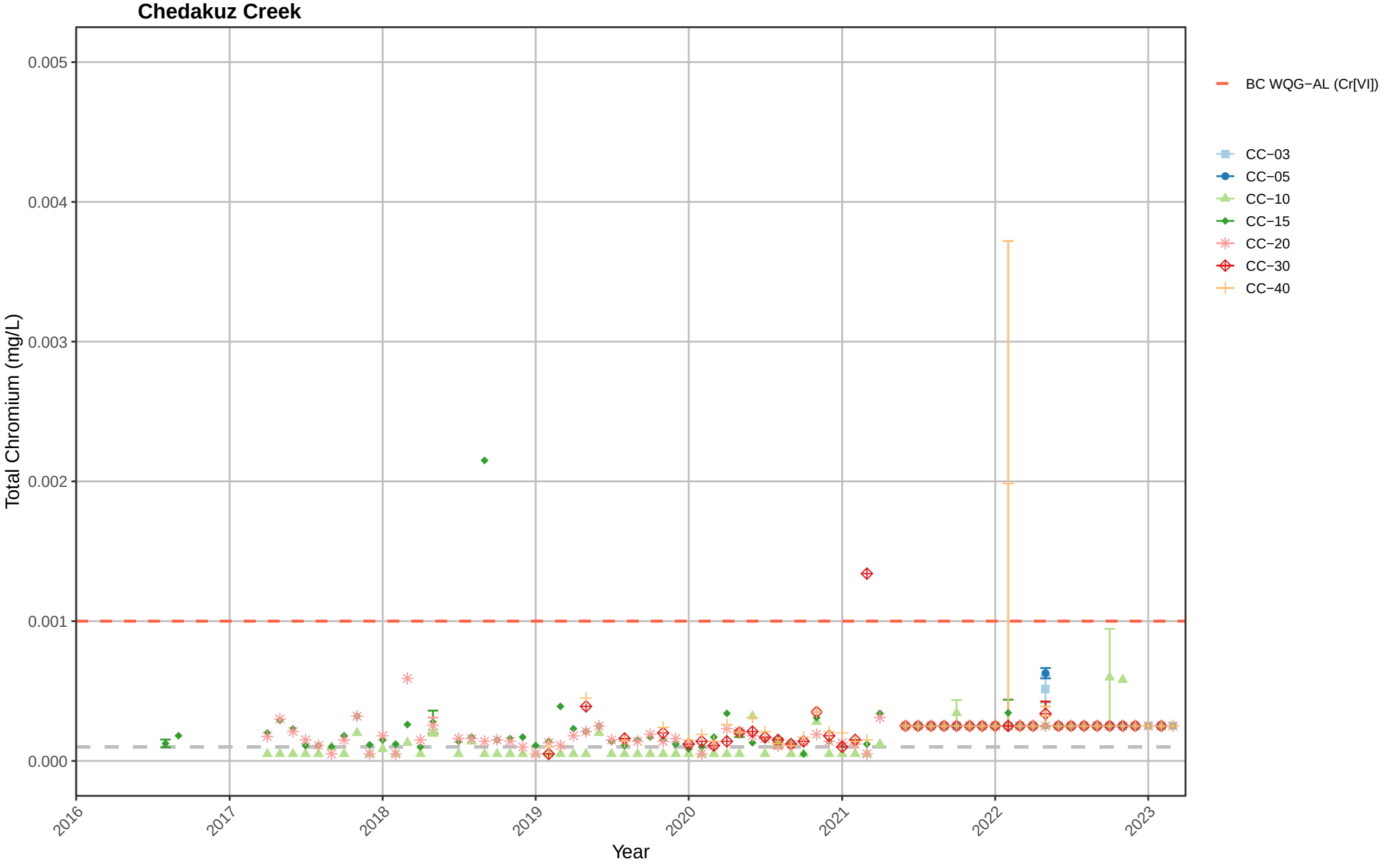
Appendix B−21.a: Monthly Mean Total Chromium at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term 30−day guideline for total chromium[VI] = 0.001 mg/L.
BC WQG−AL long−term 30−day guideline for total chromium[III] = 0.0089 mg/L.

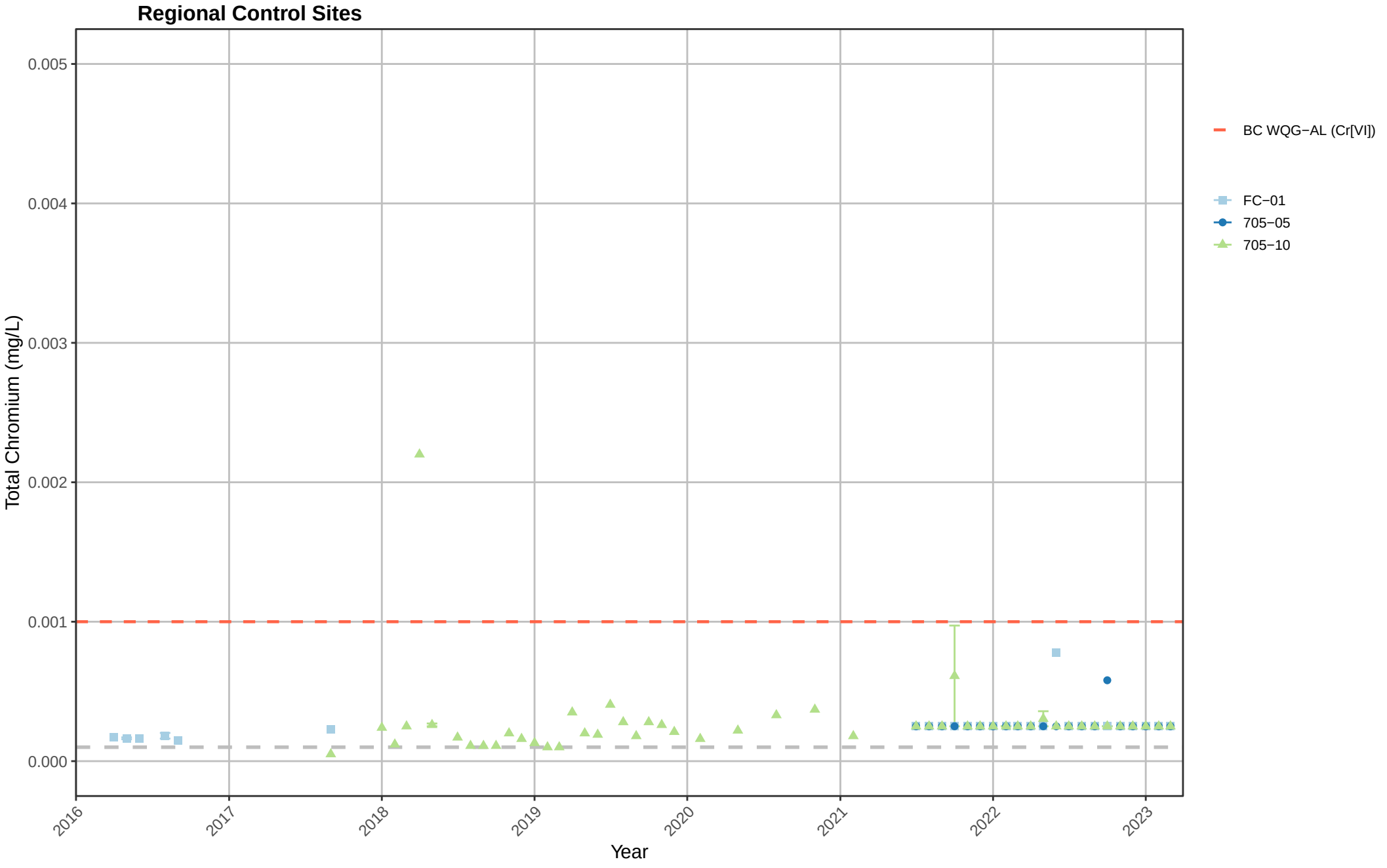
Appendix B−21.b: Monthly Mean Total Chromium at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term 30−day guideline for total chromium[VI] = 0.001 mg/L.
BC WQG−AL long−term 30−day guideline for total chromium[III] = 0.0089 mg/L.

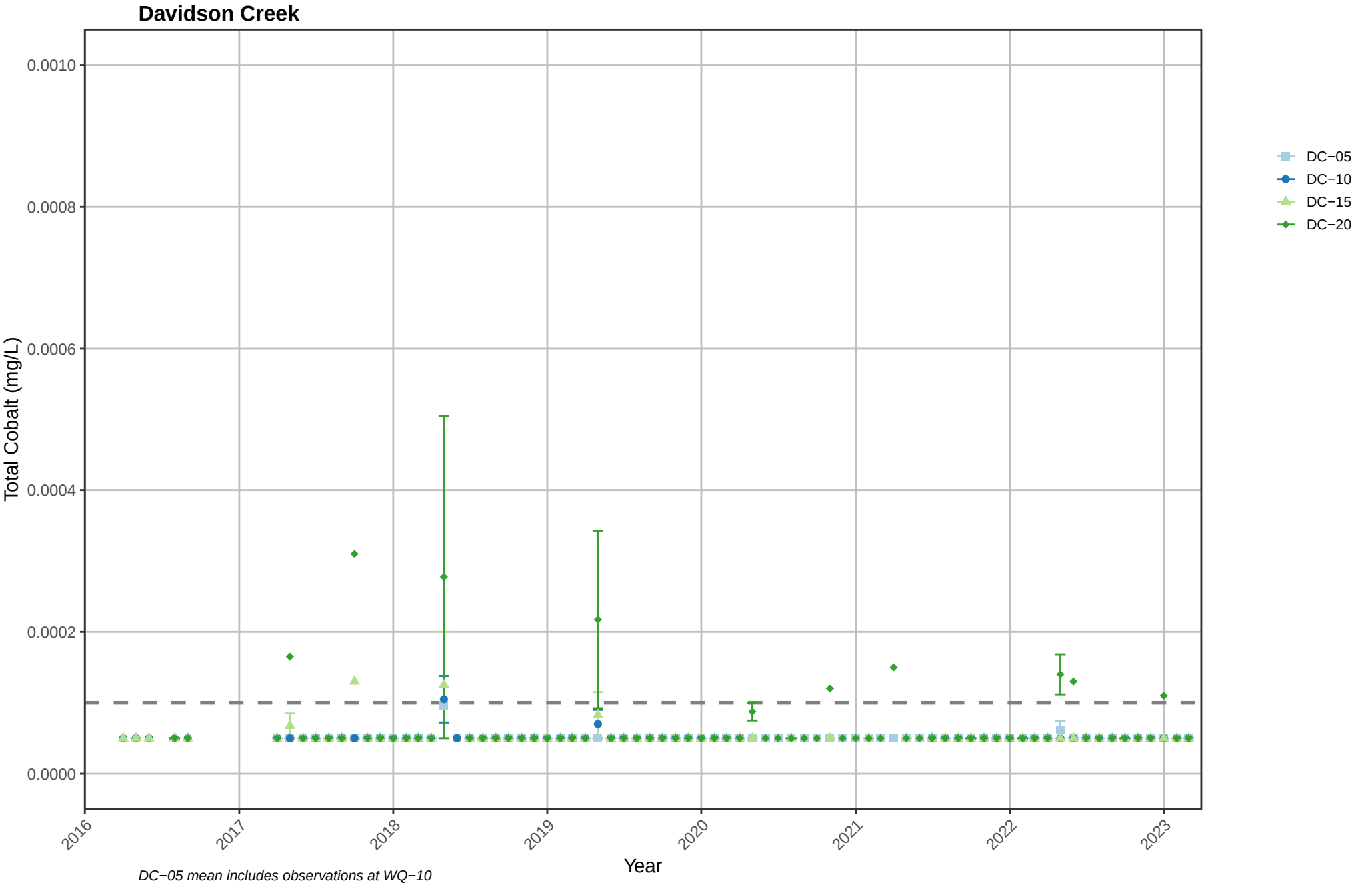
Appendix B−21.c: Monthly Mean Total Chromium at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term 30−day guideline for total chromium[VI] = 0.001 mg/L.
BC WQG−AL long−term 30−day guideline for total chromium[III] = 0.0089 mg/L.

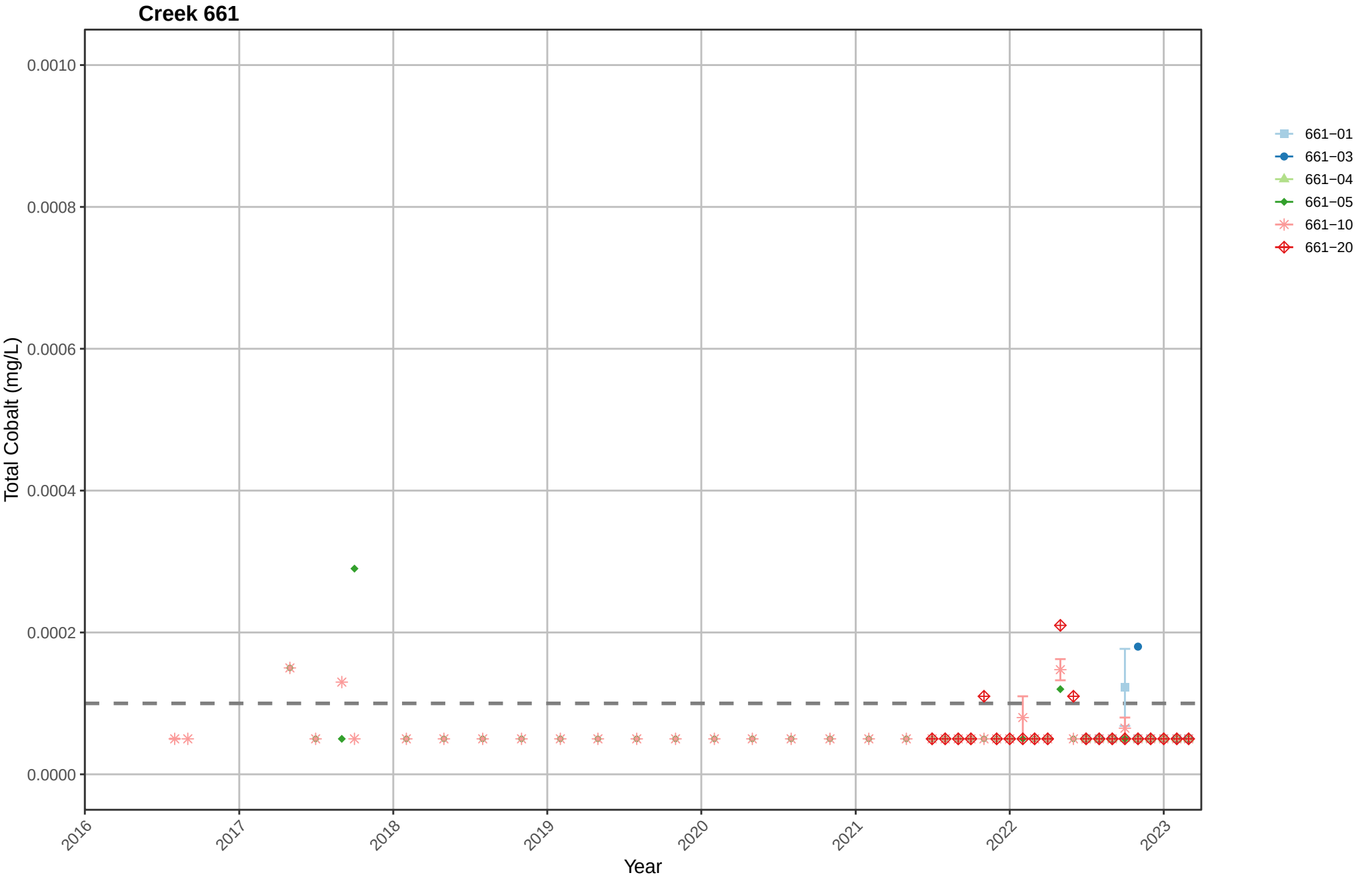
Appendix B−21.d: Monthly Mean Total Chromium at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term 30−day guideline for total cobalt = 0.004 mg/L.

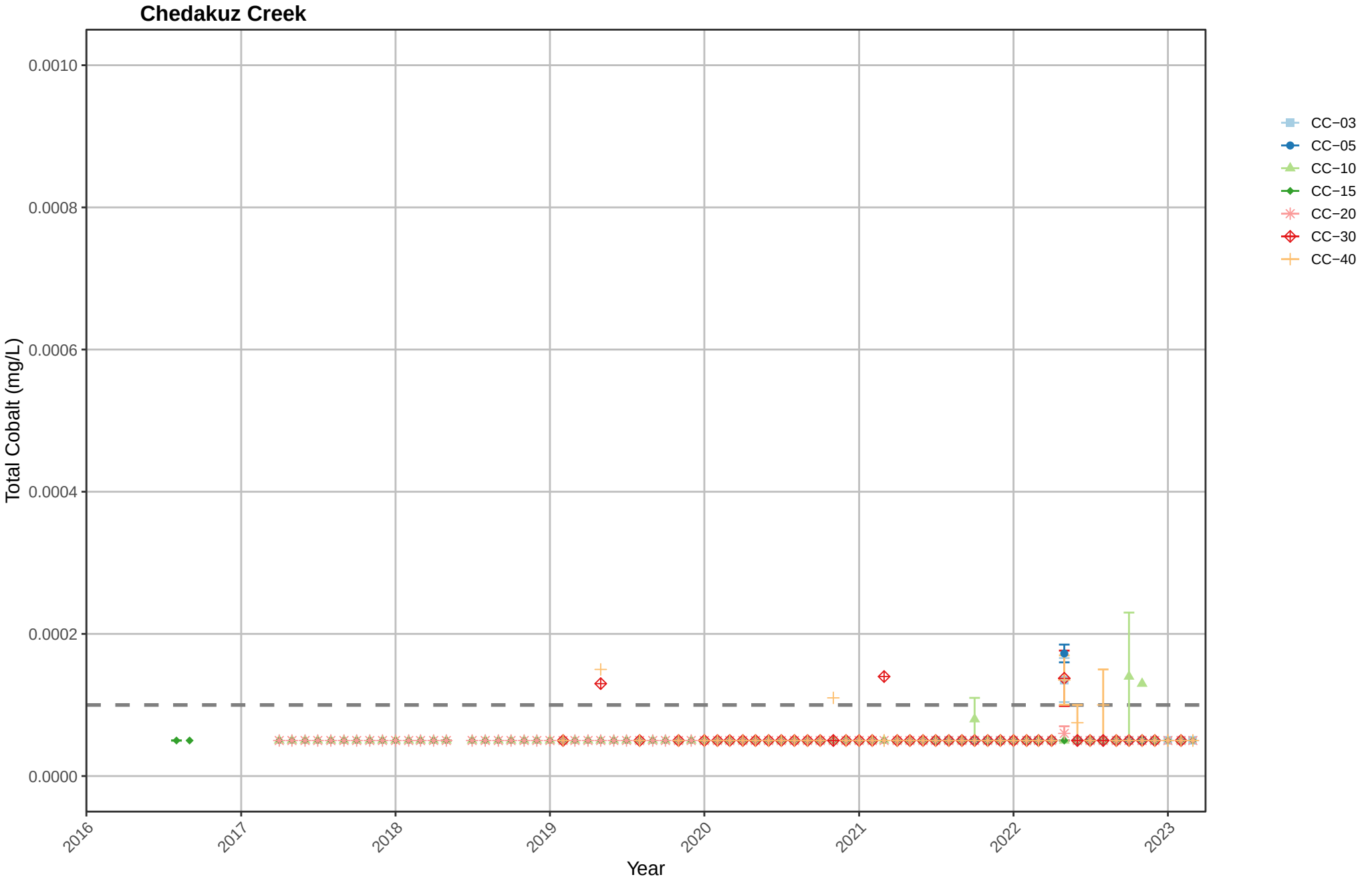
Appendix B−22.a: Monthly Mean Total Cobalt at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term 30−day guideline for total cobalt = 0.004 mg/L.

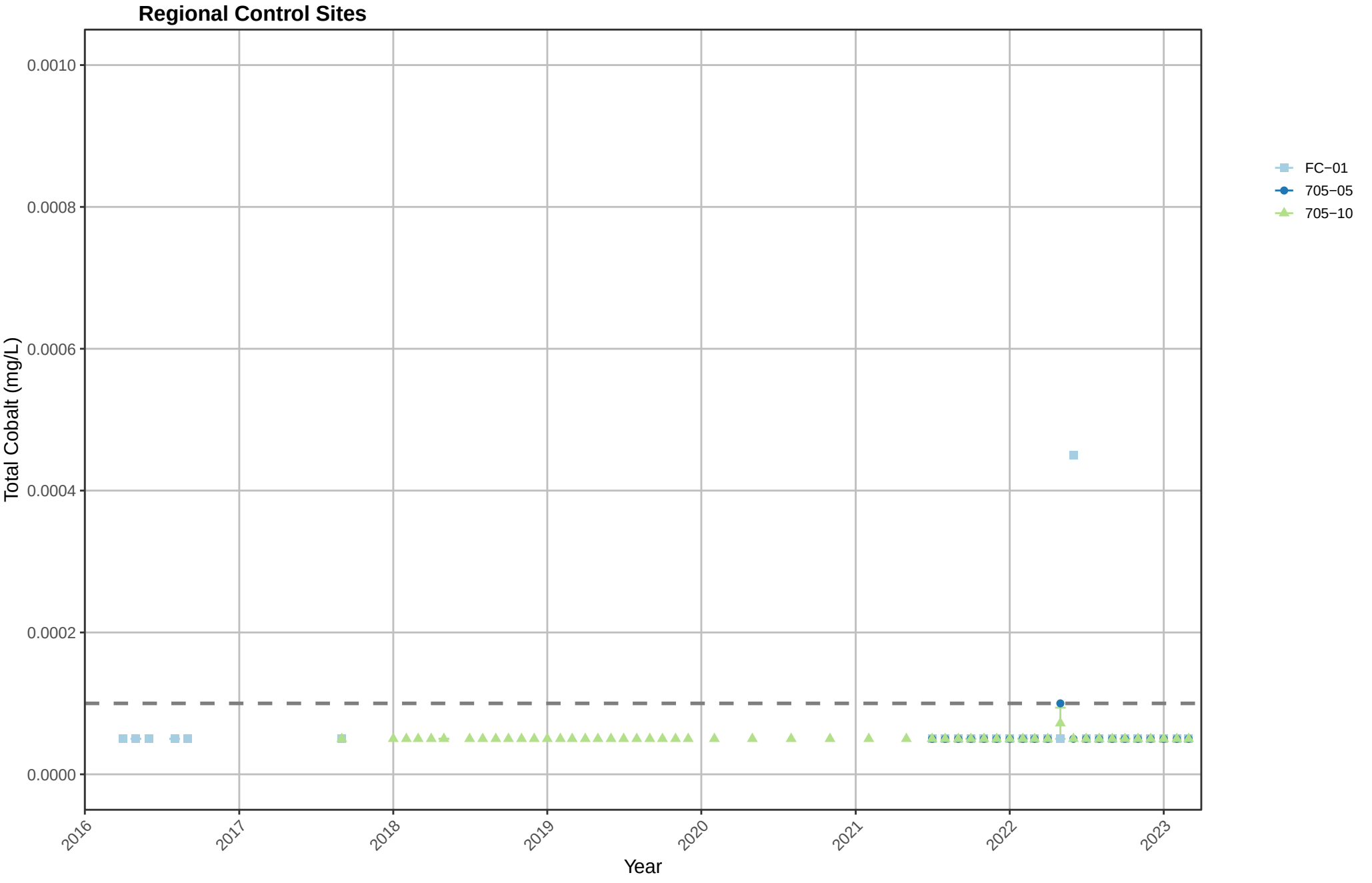
Appendix B−22.b: Monthly Mean Total Cobalt at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term 30−day guideline for total cobalt = 0.004 mg/L.

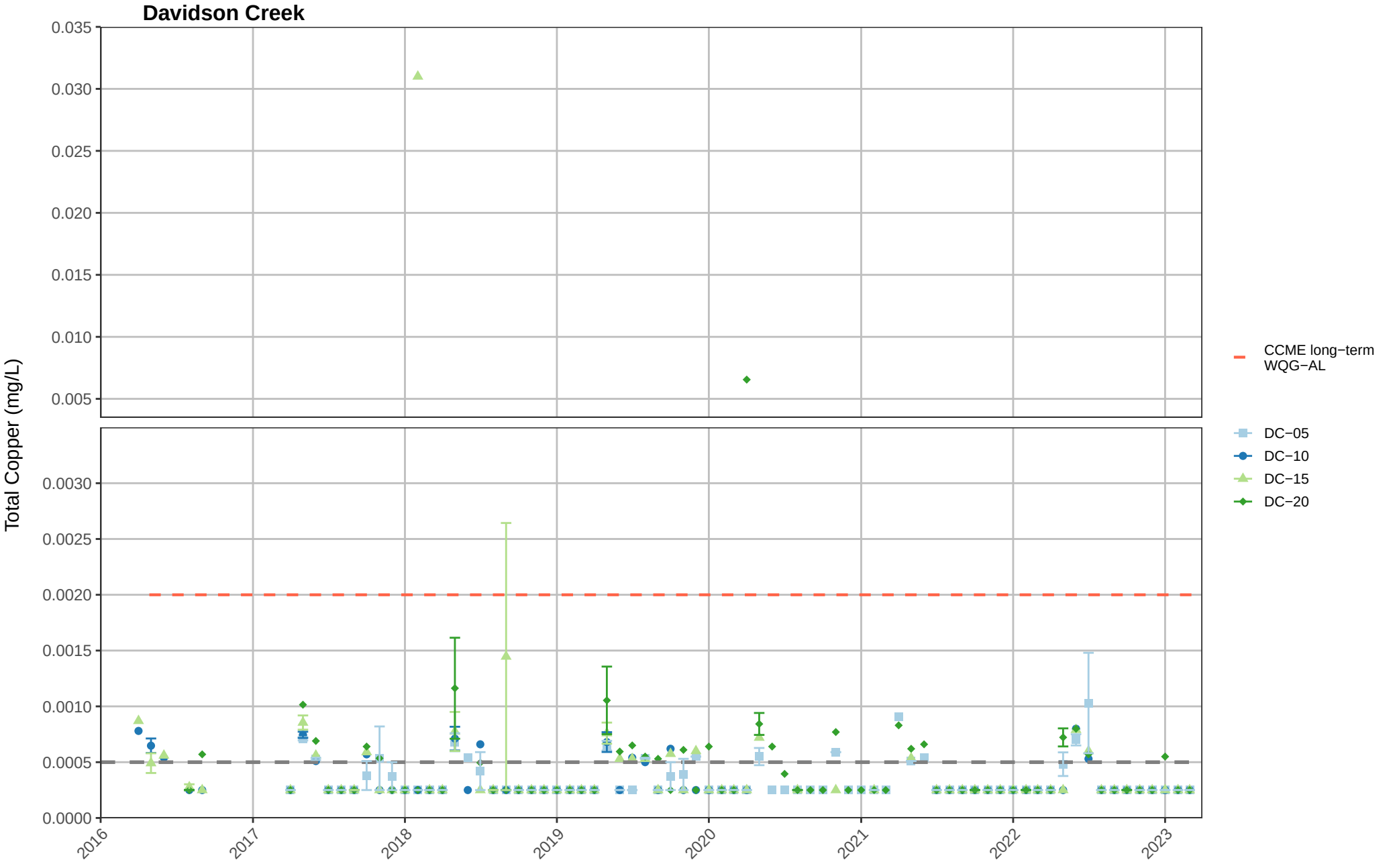
Appendix B−22.c: Monthly Mean Total Cobalt at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term 30−day guideline for total cobalt = 0.004 mg/L.

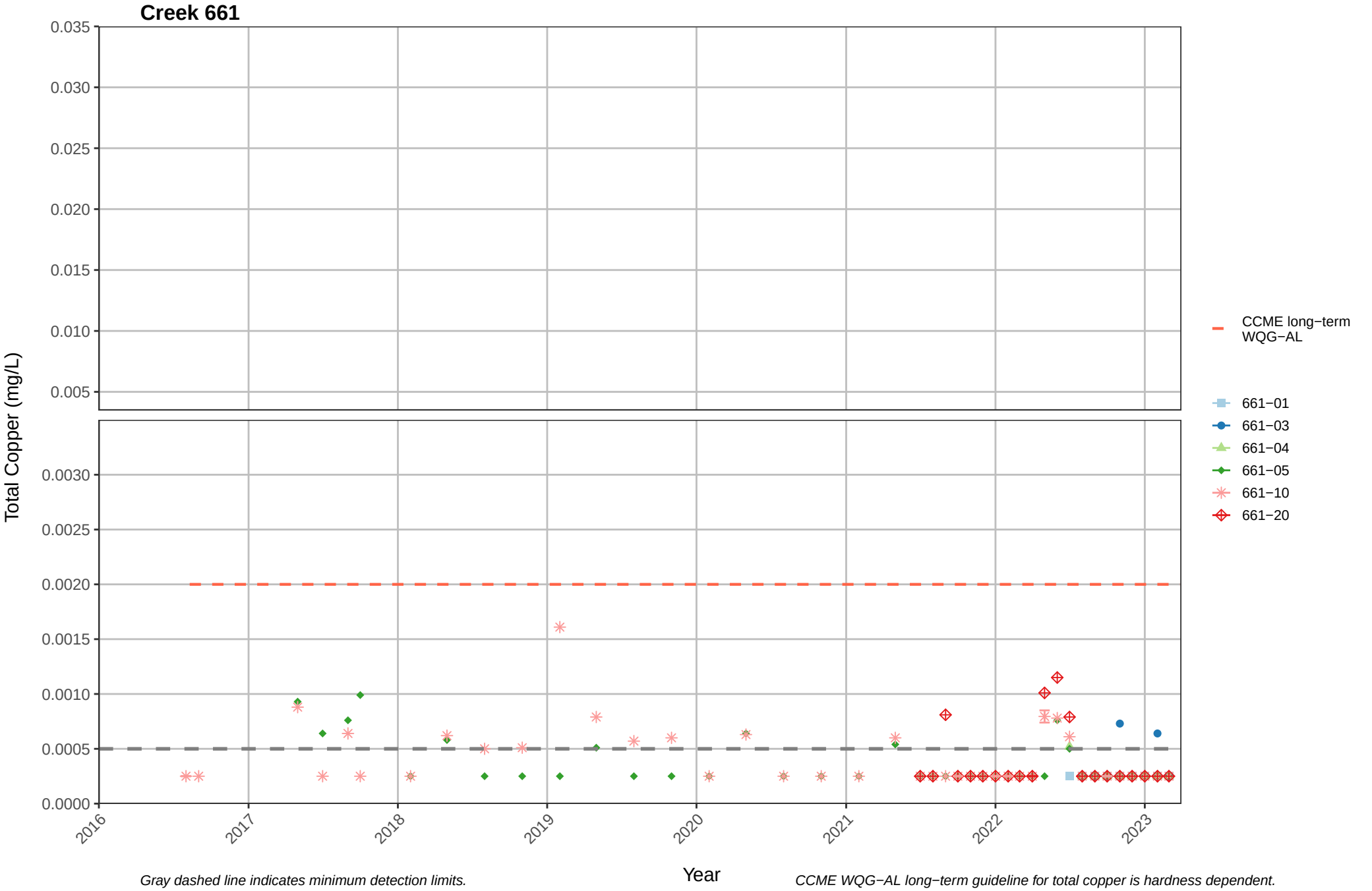
Appendix B−22.d: Monthly Mean Total Cobalt at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total copper is hardness dependent.

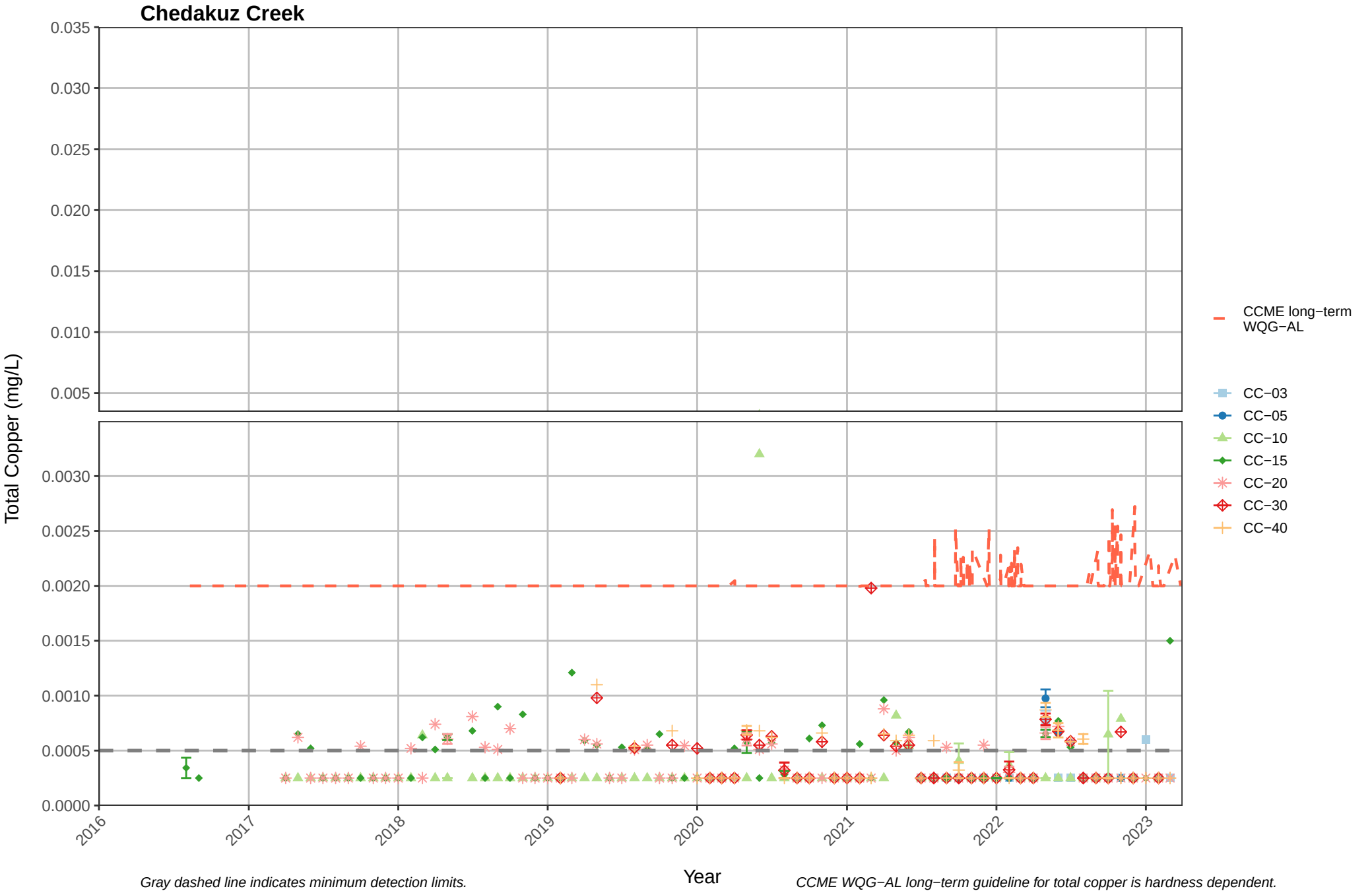
Appendix B−23.a: Monthly Mean Total Copper at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total copper is hardness dependent.

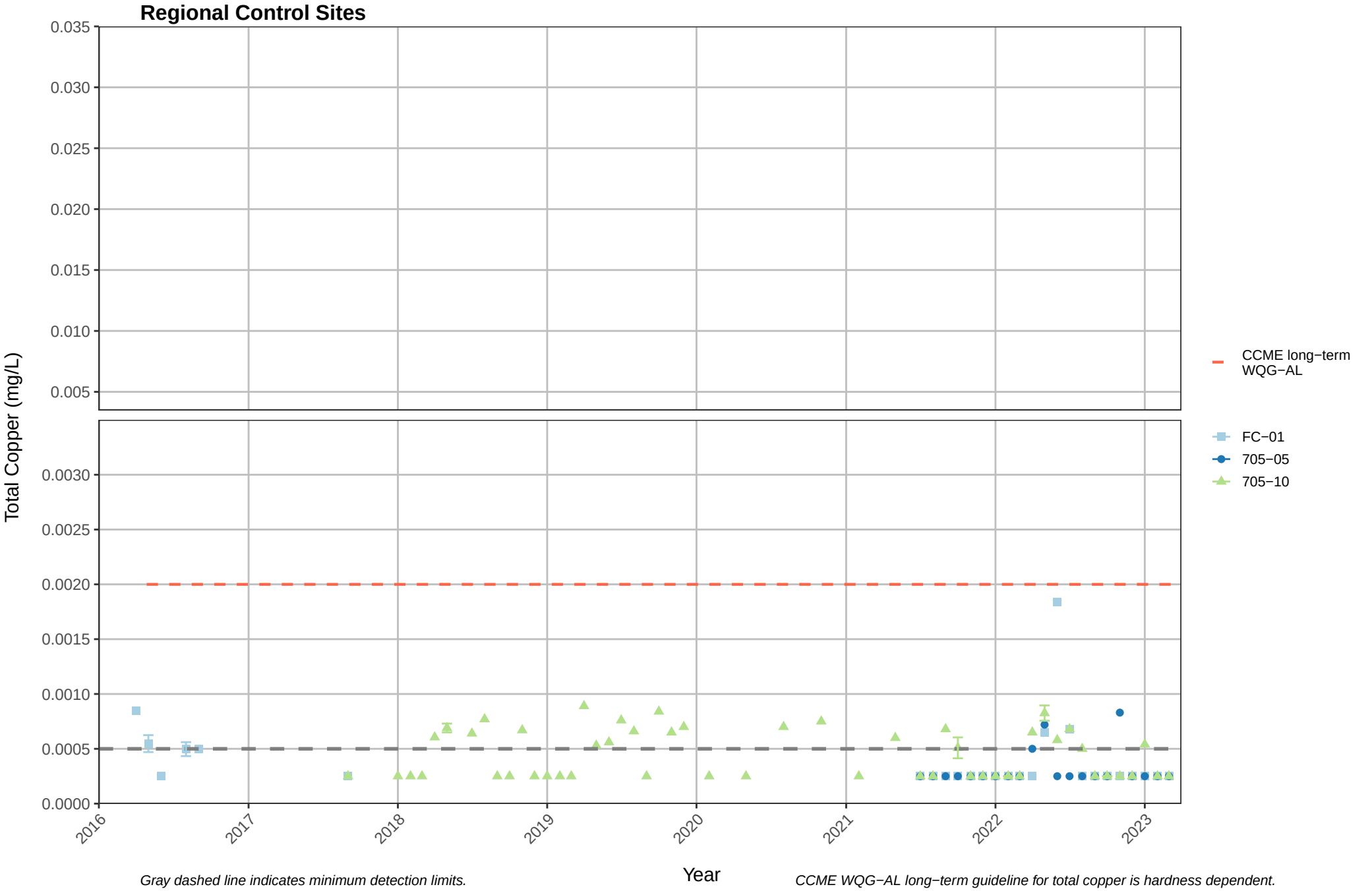
Appendix B−23.b: Monthly Mean Total Copper at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total copper is hardness dependent.

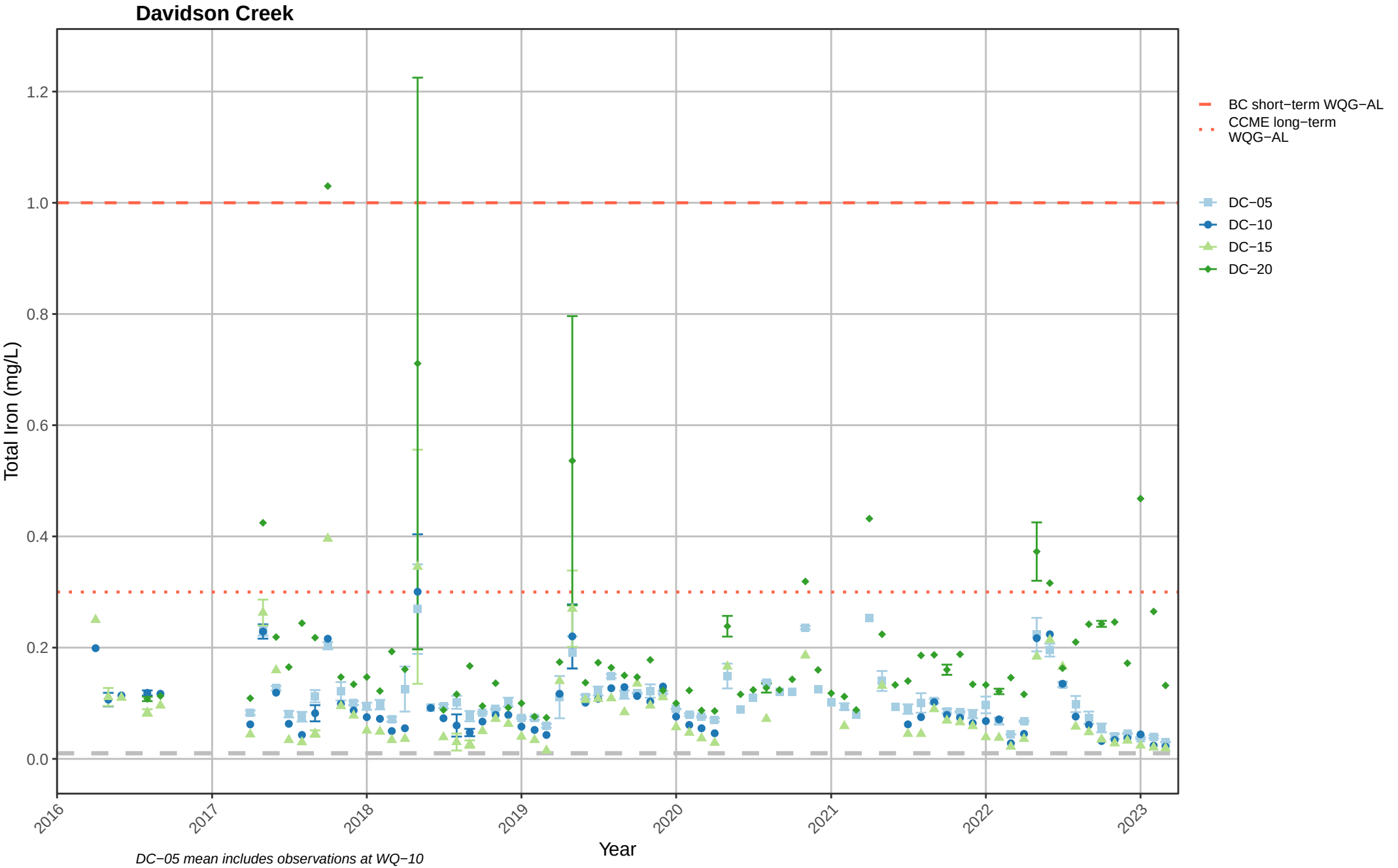
Appendix B−23.c: Monthly Mean Total Copper at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total copper is hardness dependent.

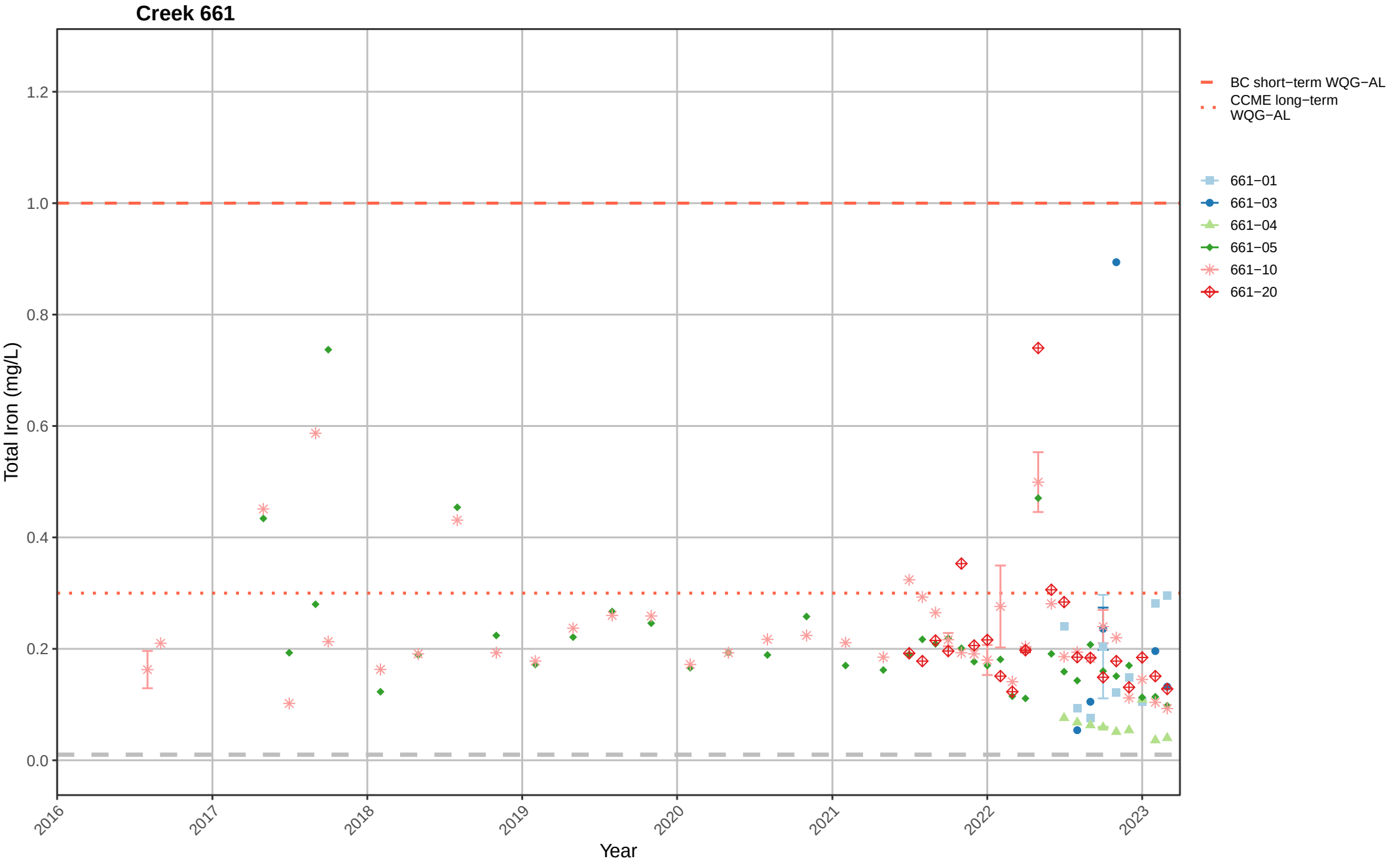
Appendix B−23.d: Monthly Mean Total Copper at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total iron = 0.3 mg/L.
BC WQG−AL short−term maxium guideline for total iron = 1.0 mg/L.

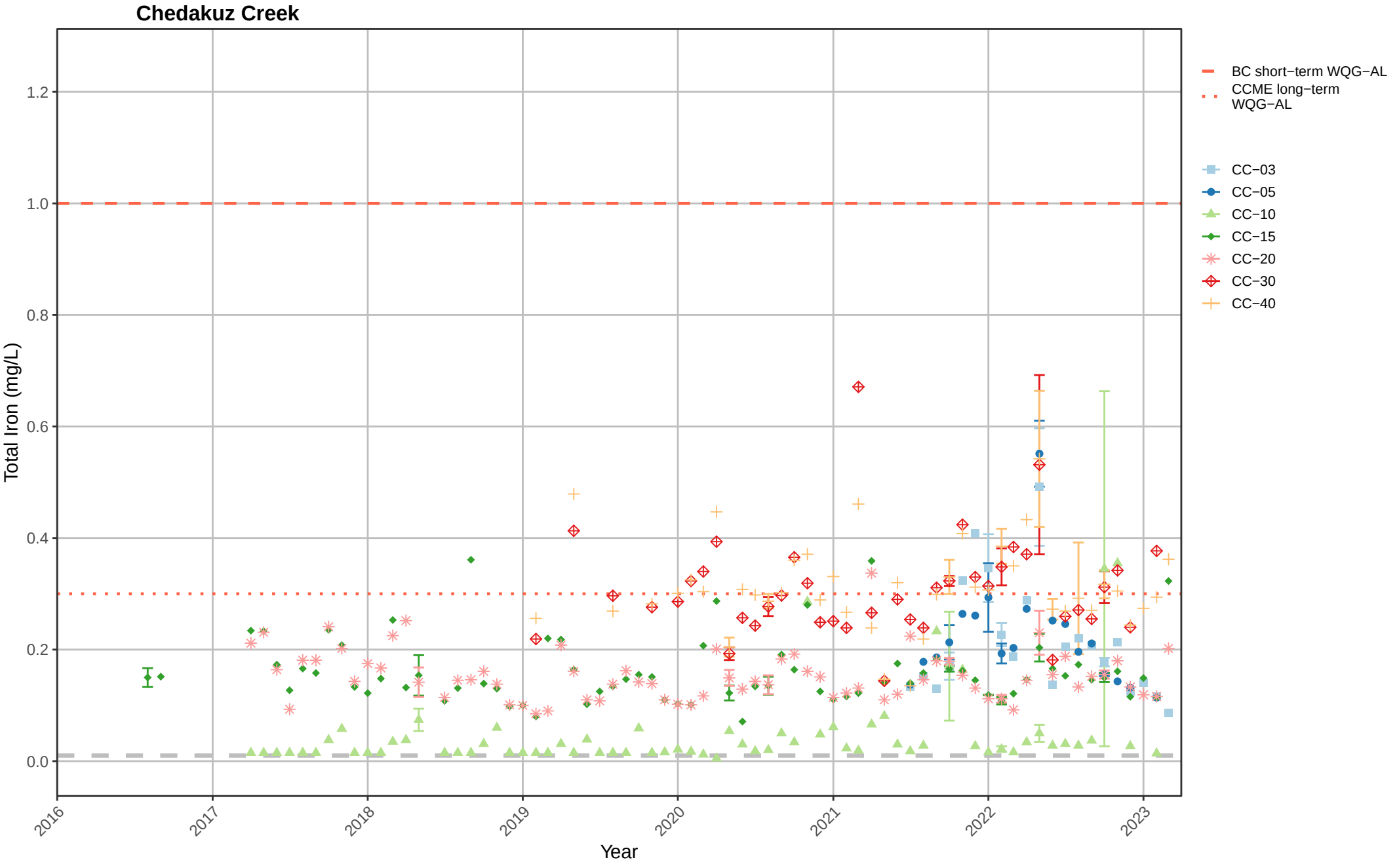
Appendix B−24.a: Monthly Mean Total Iron at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total iron = 0.3 mg/L.
BC WQG−AL short−term maxium guideline for total iron = 1.0 mg/L.

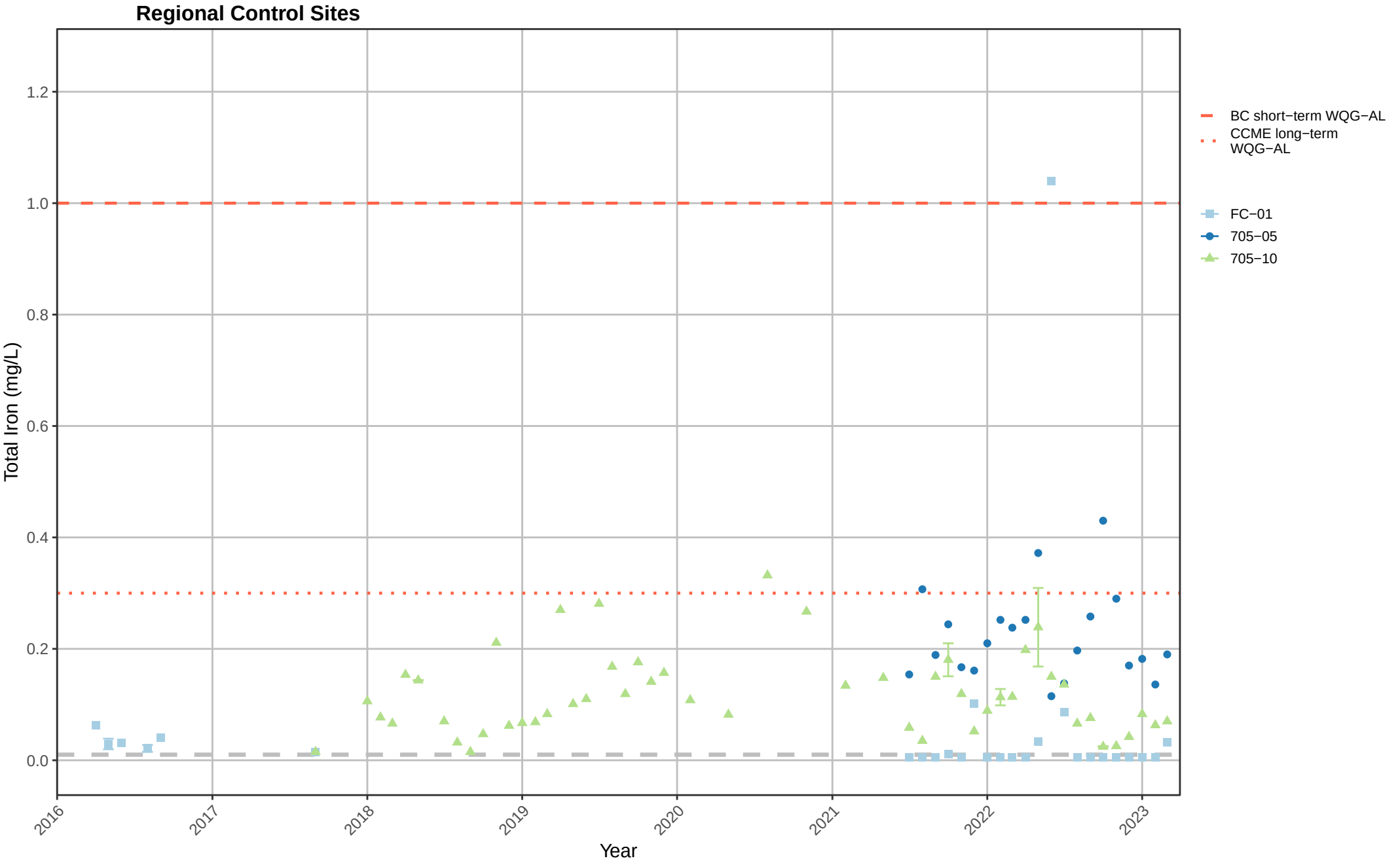
Appendix B−24.b: Monthly Mean Total Iron at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total iron = 0.3 mg/L.
BC WQG−AL short−term maxium guideline for total iron = 1.0 mg/L.

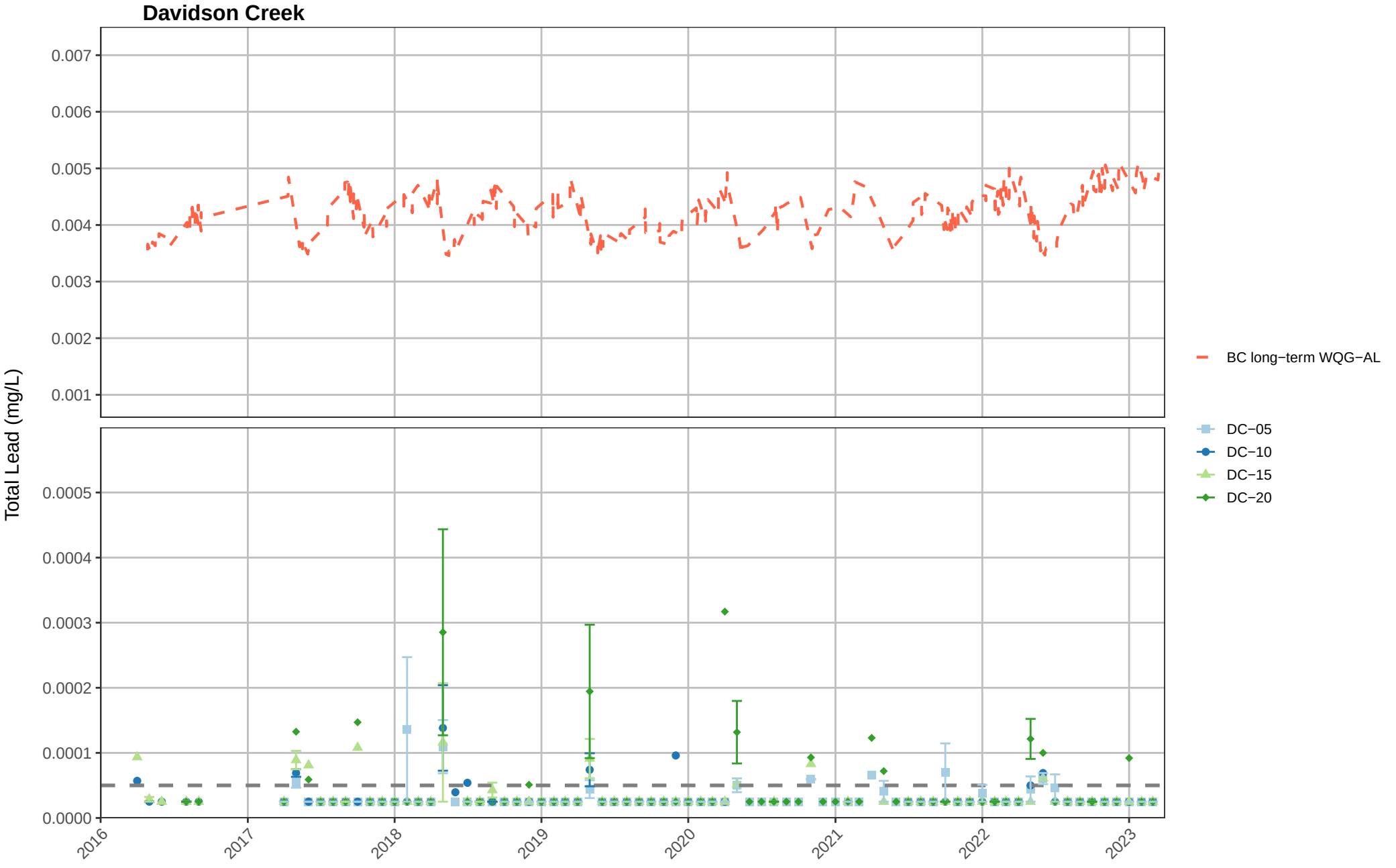
Appendix B−24.c: Monthly Mean Total Iron at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for total iron = 0.3 mg/L.
BC WQG−AL short−term maxium guideline for total iron = 1.0 mg/L.

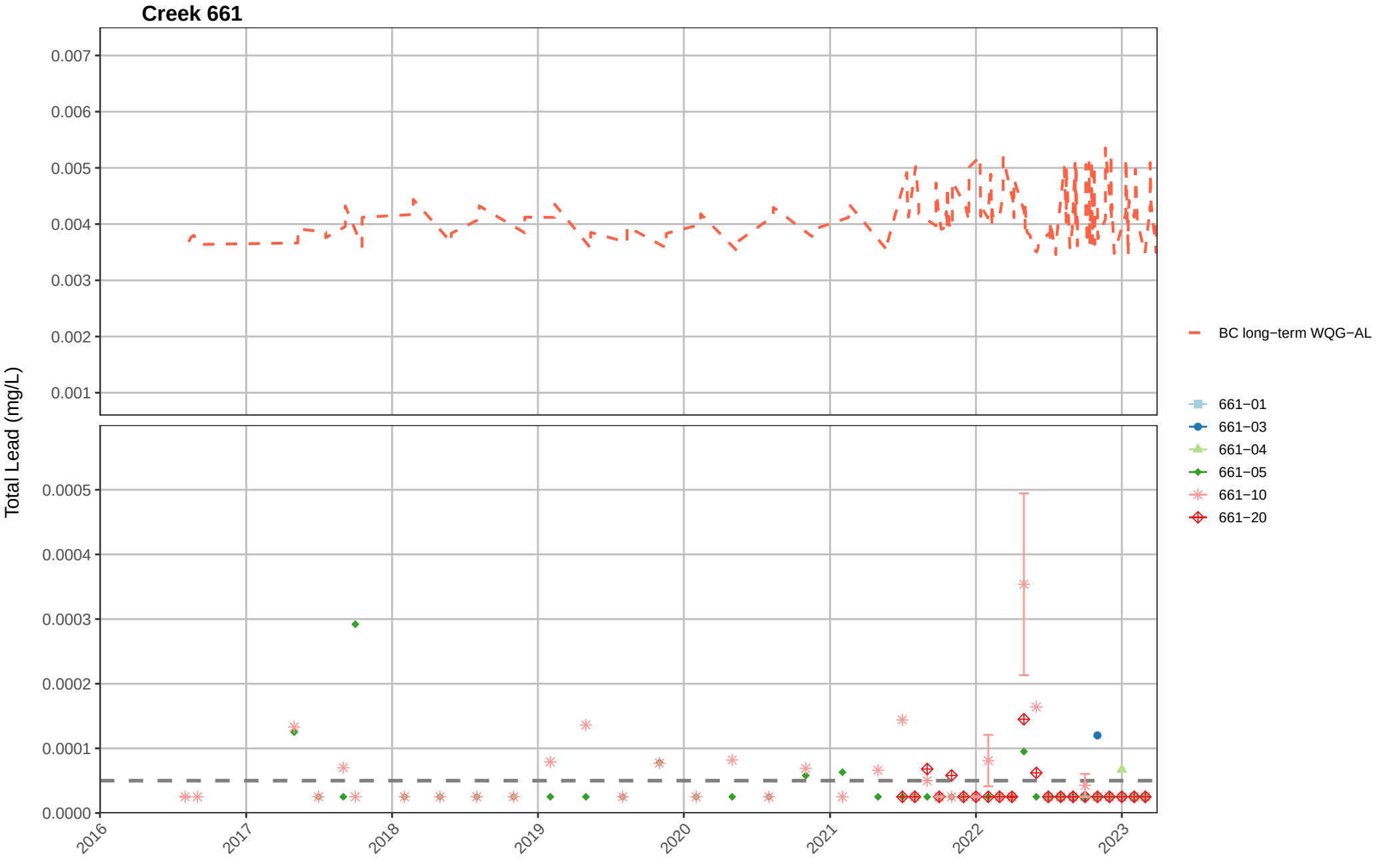
Appendix B−24.d: Monthly Mean Total Iron at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum hardness dependent BC WQG−AL long−term guideline for total lead in Project streams is 0.0034 mg/L.

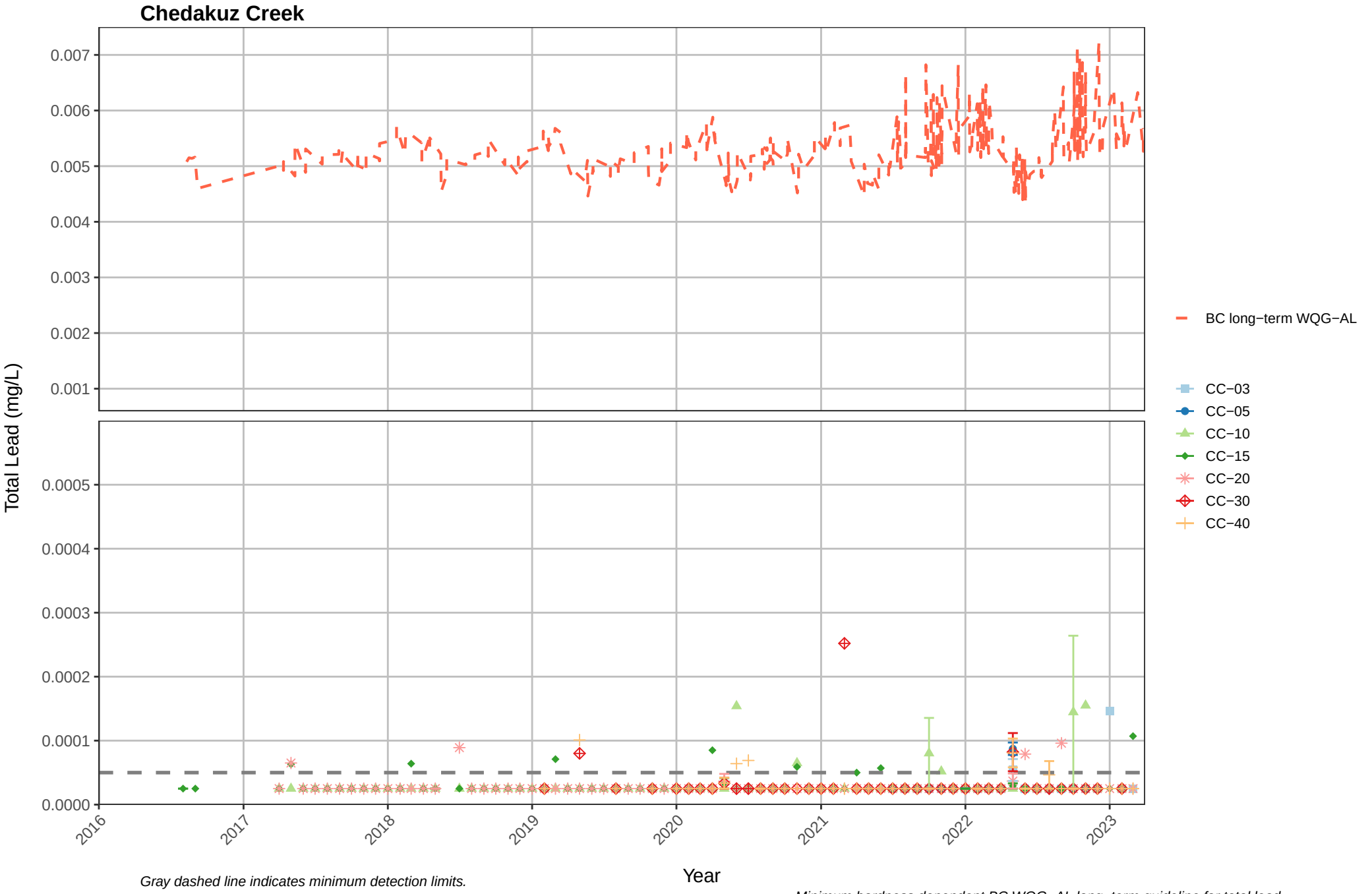
Appendix B−25.a: Monthly Mean Total Lead at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum hardness dependent BC WQG−AL long−term guideline for total lead in Project streams is 0.0034 mg/L.

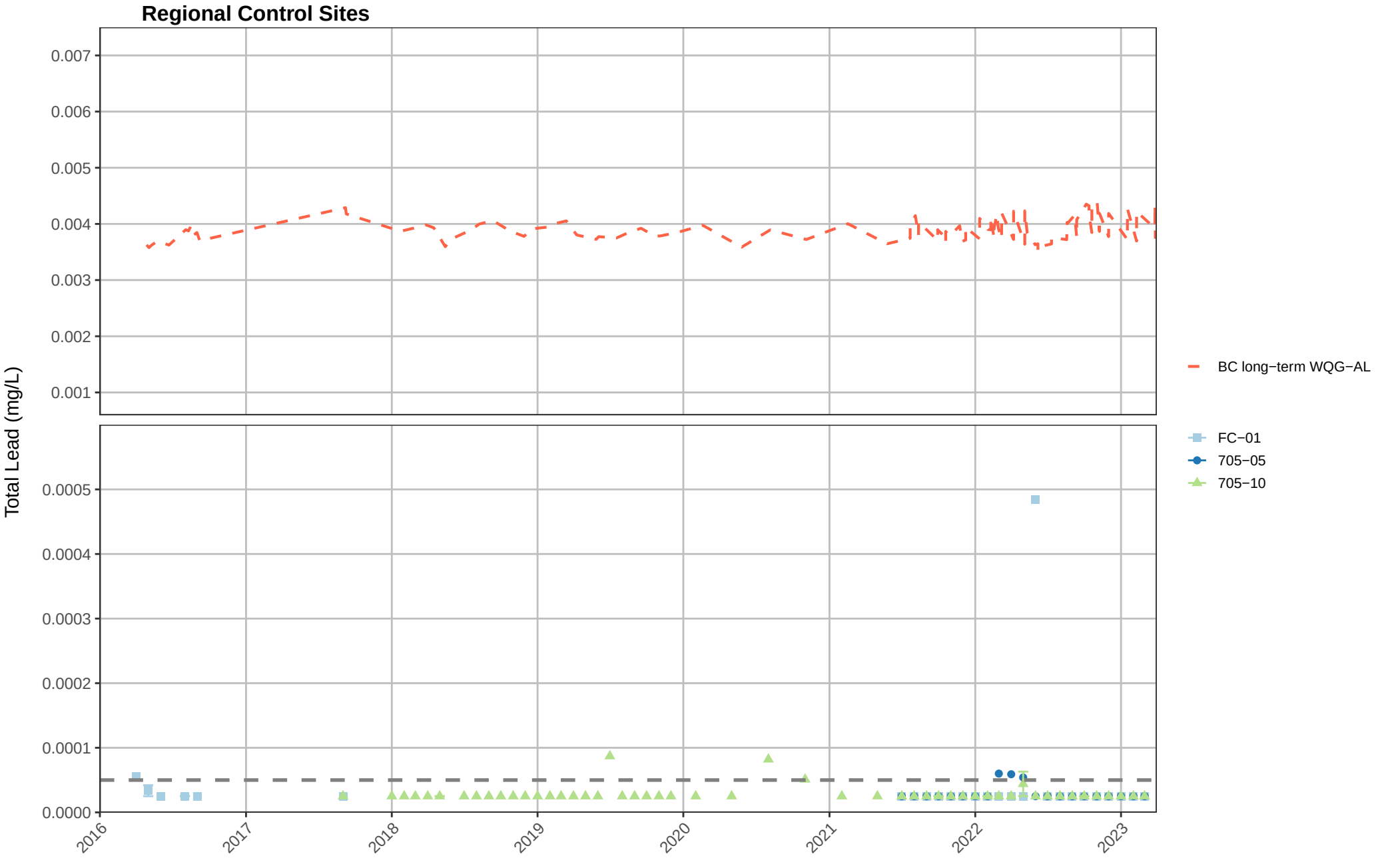
Appendix B−25.b: Monthly Mean Total Lead at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum hardness dependent BC WQG−AL long−term guideline for total lead in Project streams is 0.0034 mg/L.

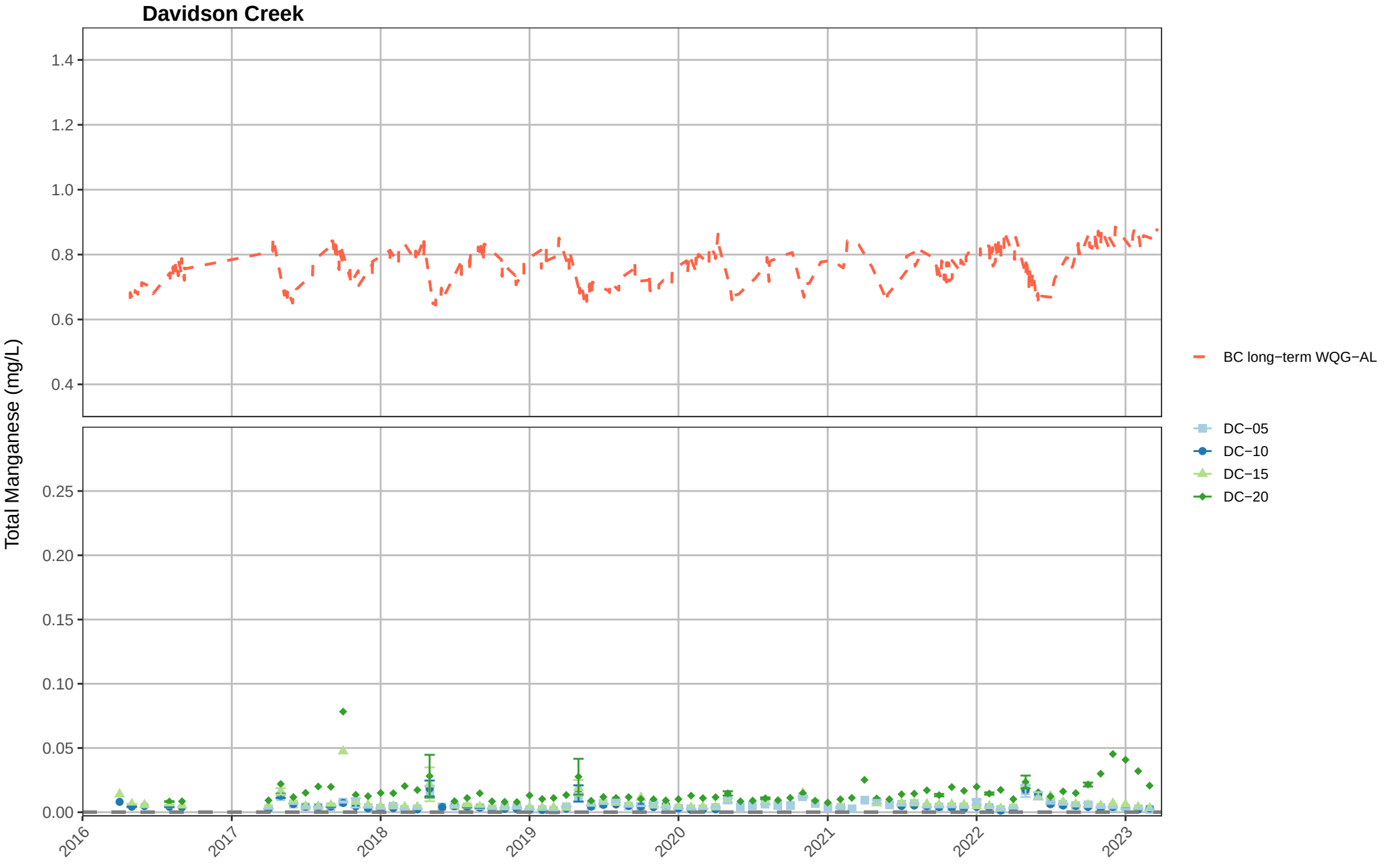
Appendix B−25.c: Monthly Mean Total Lead at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum hardness dependent BC WQG−AL long−term guideline for total lead in Project streams is 0.0034 mg/L.

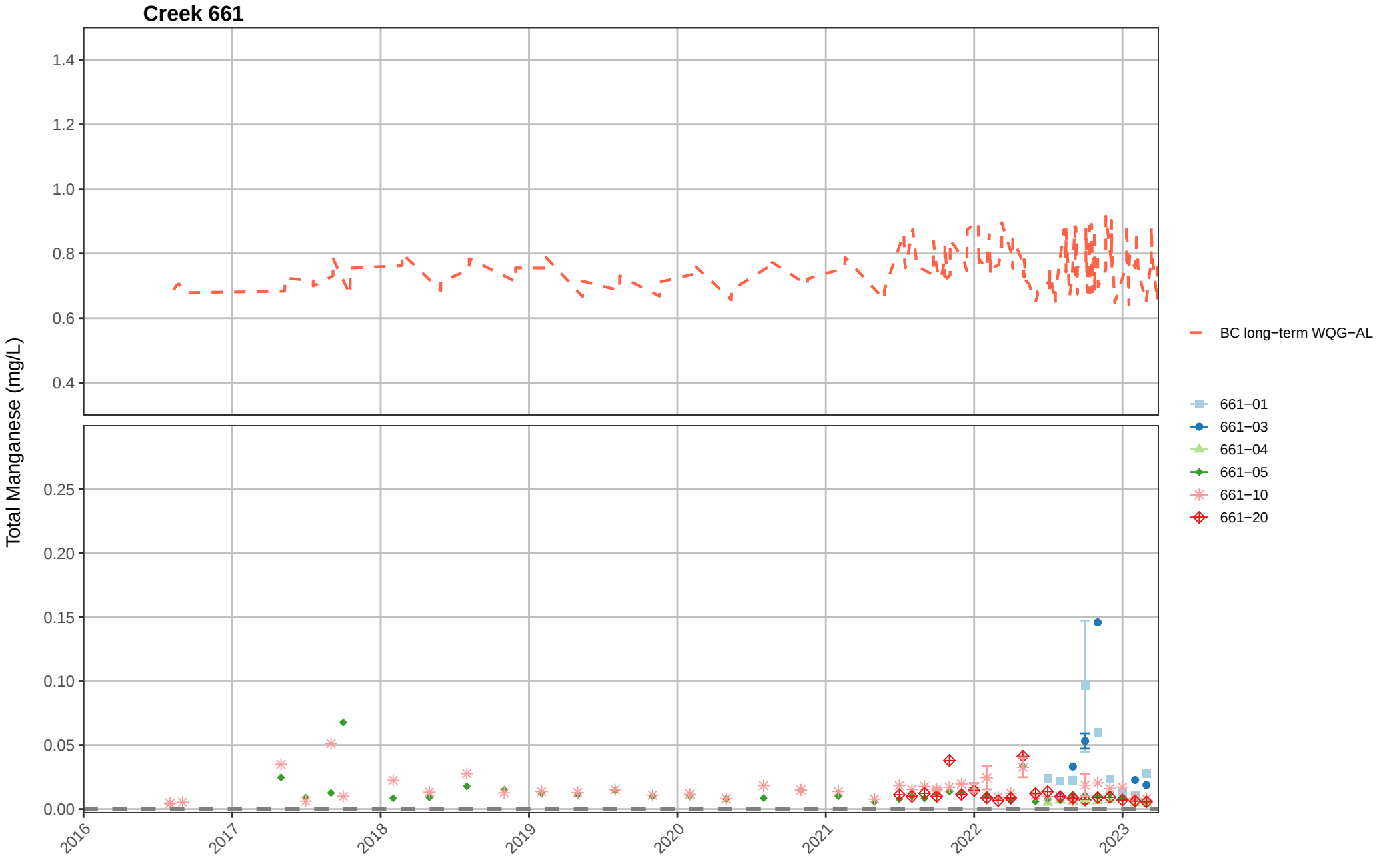
Appendix B−25.d: Monthly Mean Total Lead at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum hardness dependent BC WQG−AL long−term guideline for total manganese in Project streams is 0.67 mg/L.

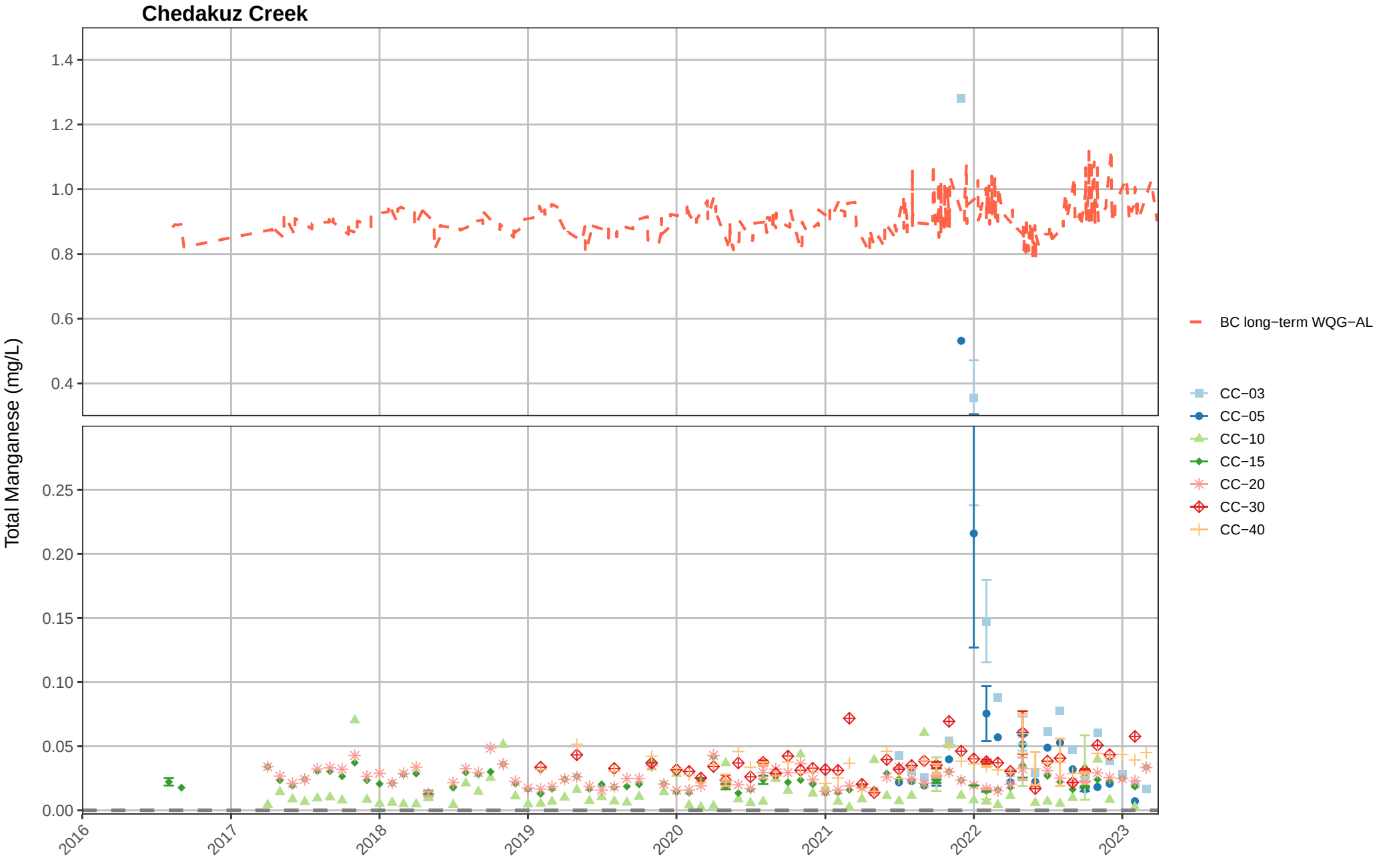
Appendix B−26.a: Monthly Mean Total Manganese at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum hardness dependent BC WQG−AL long−term guideline for total manganese in Project streams is 0.67 mg/L.

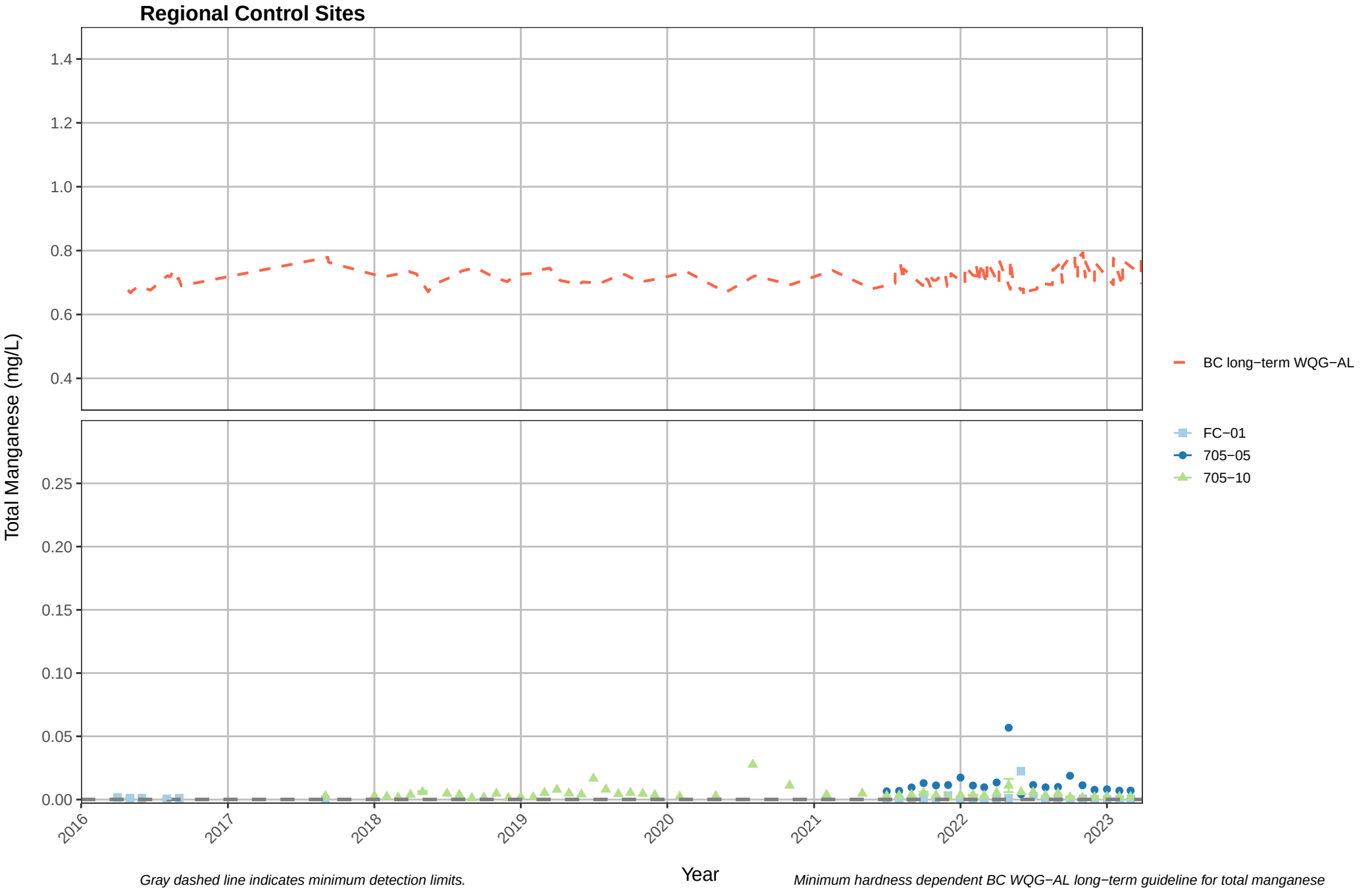
Appendix B−26.b: Monthly Mean Total Manganese at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum hardness dependent BC WQG−AL long−term guideline for total manganese in Project streams is 0.67 mg/L.

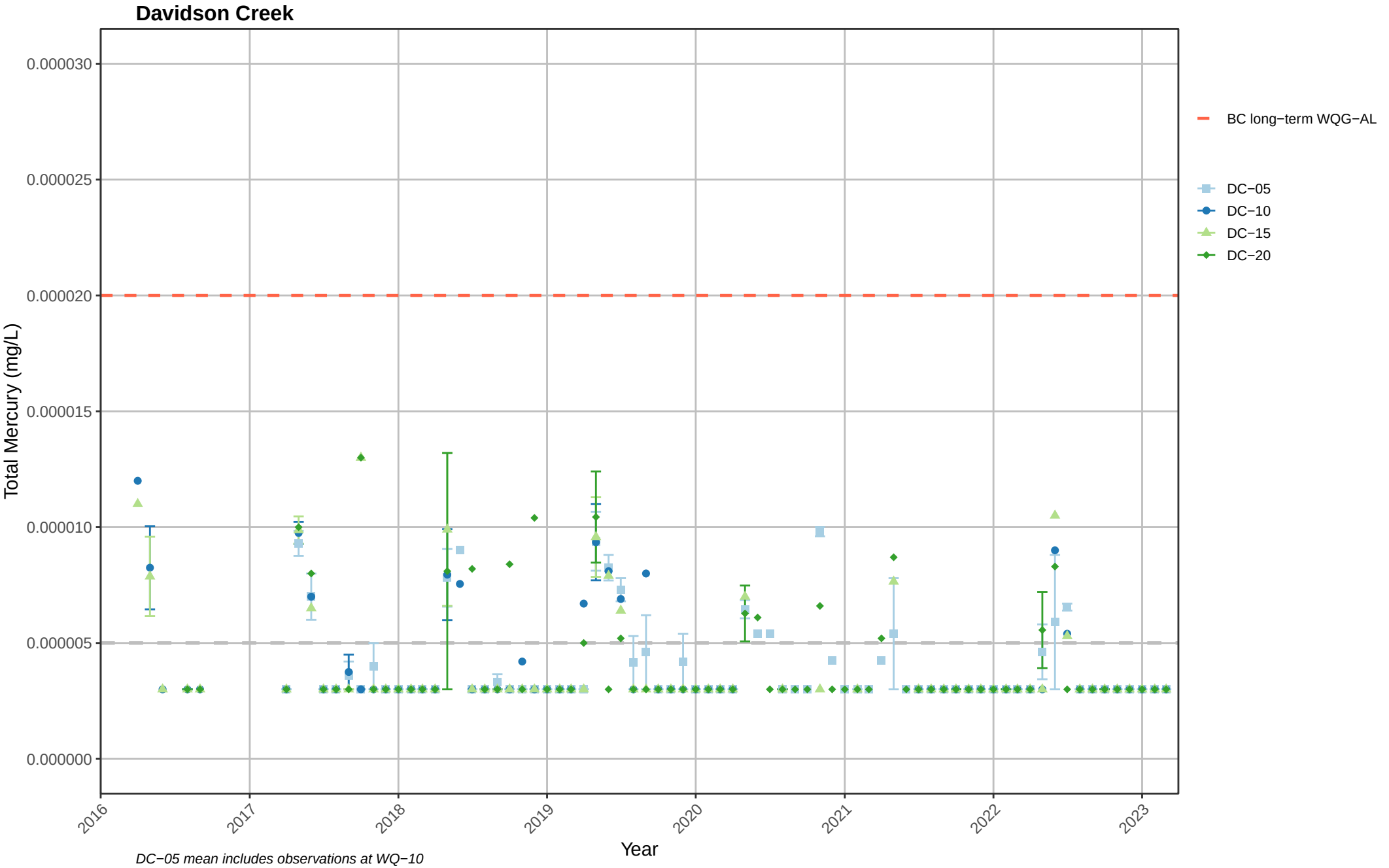
Appendix B−26.c: Monthly Mean Total Manganese at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum hardness dependent BC WQG−AL long−term guideline for total manganese in Project streams is 0.67 mg/L.

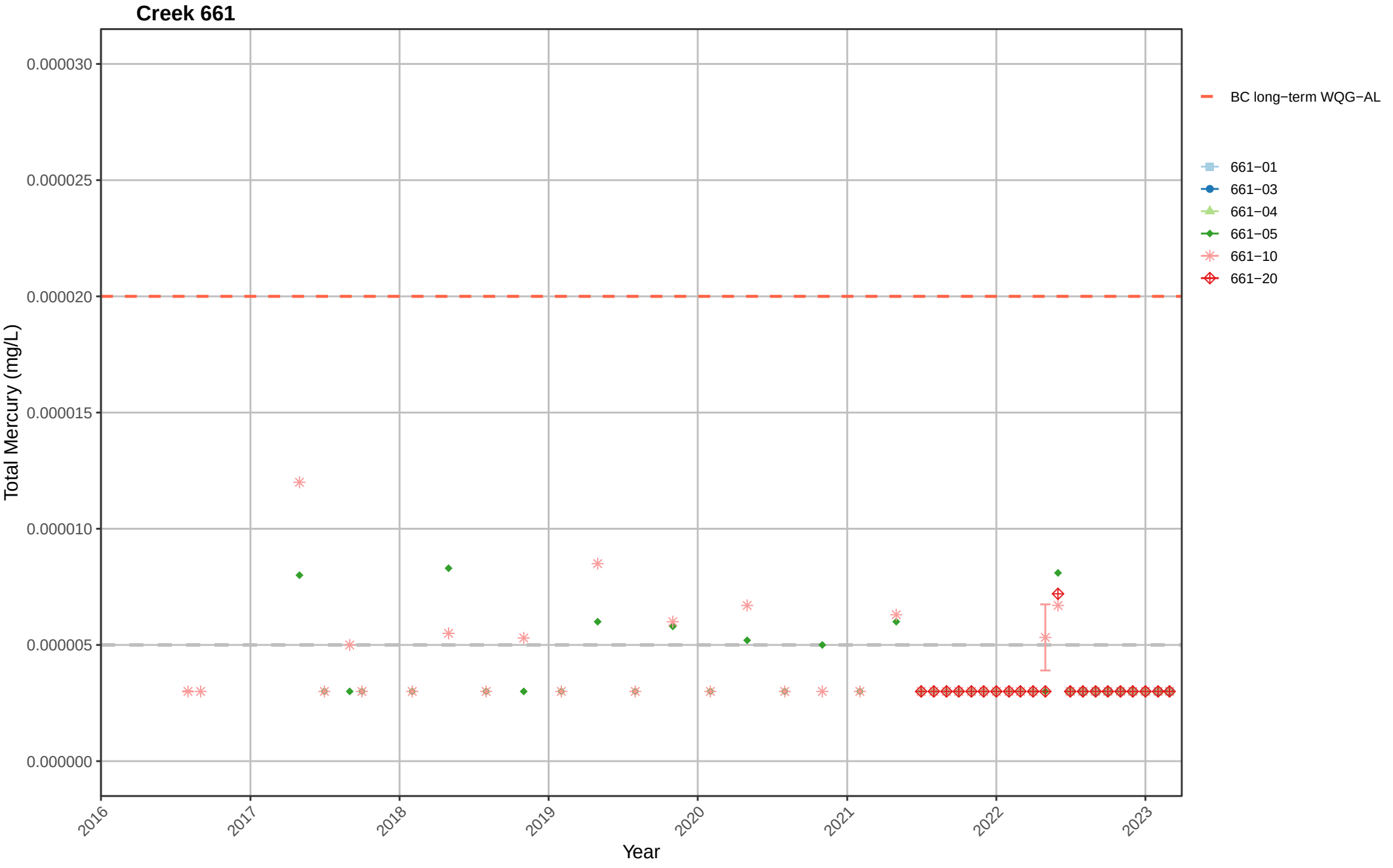
Appendix B−26.d: Monthly Mean Total Manganese at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total mercury = 0.00002 mg/L.

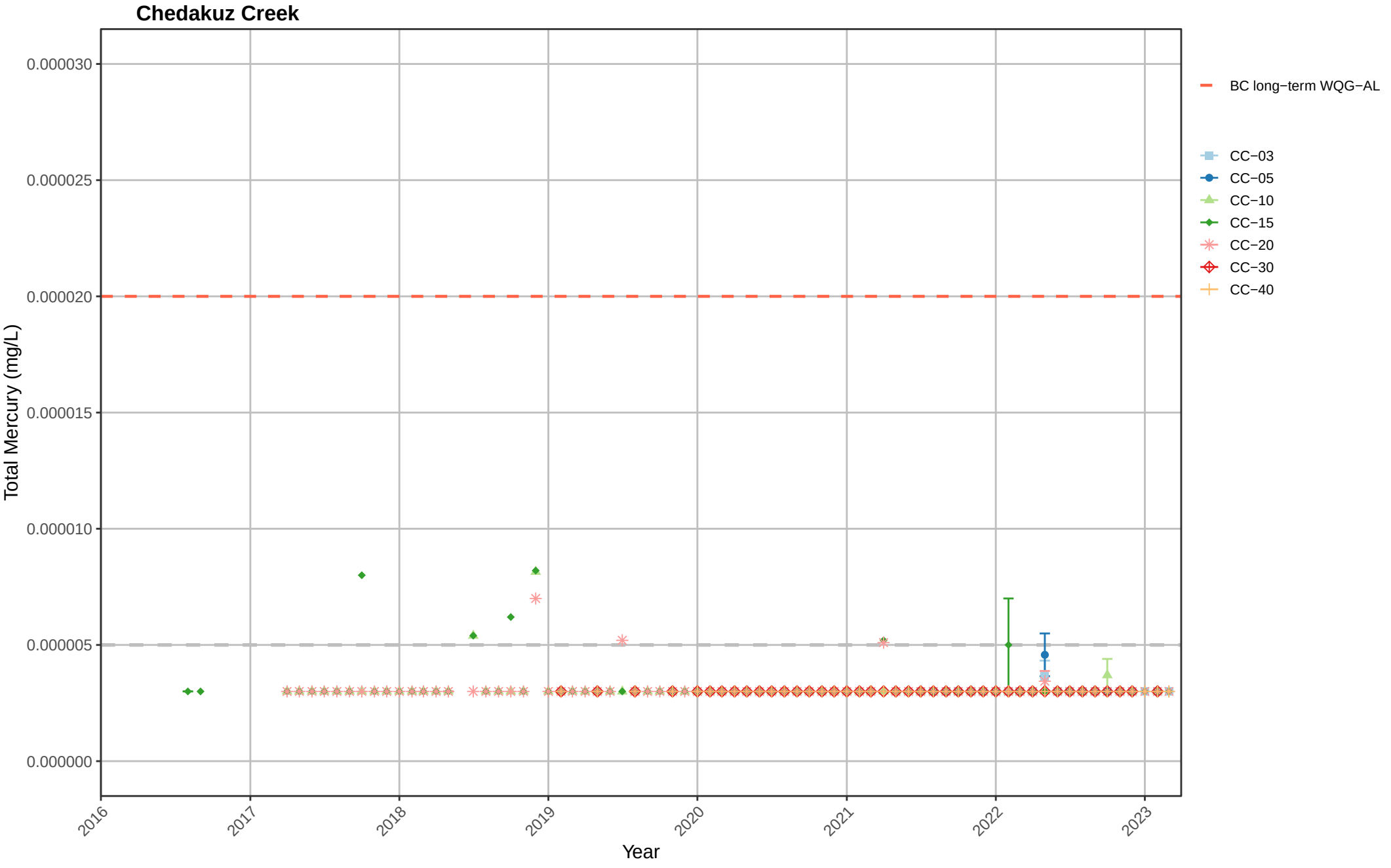
Appendix B−27.a: Monthly Mean Total Mercury at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total mercury = 0.00002 mg/L.

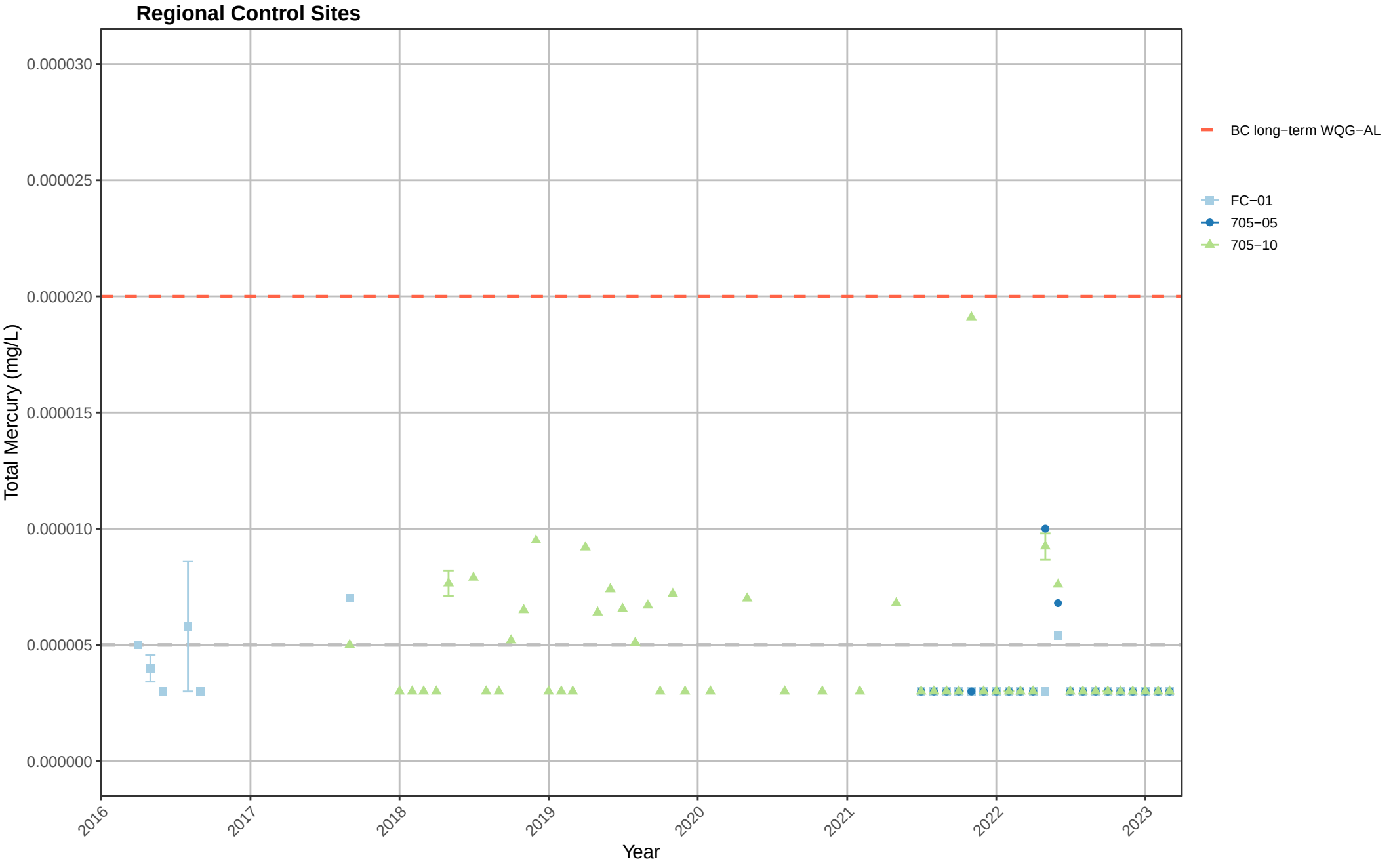
Appendix B−27.b: Monthly Mean Total Mercury at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total mercury = 0.00002 mg/L.

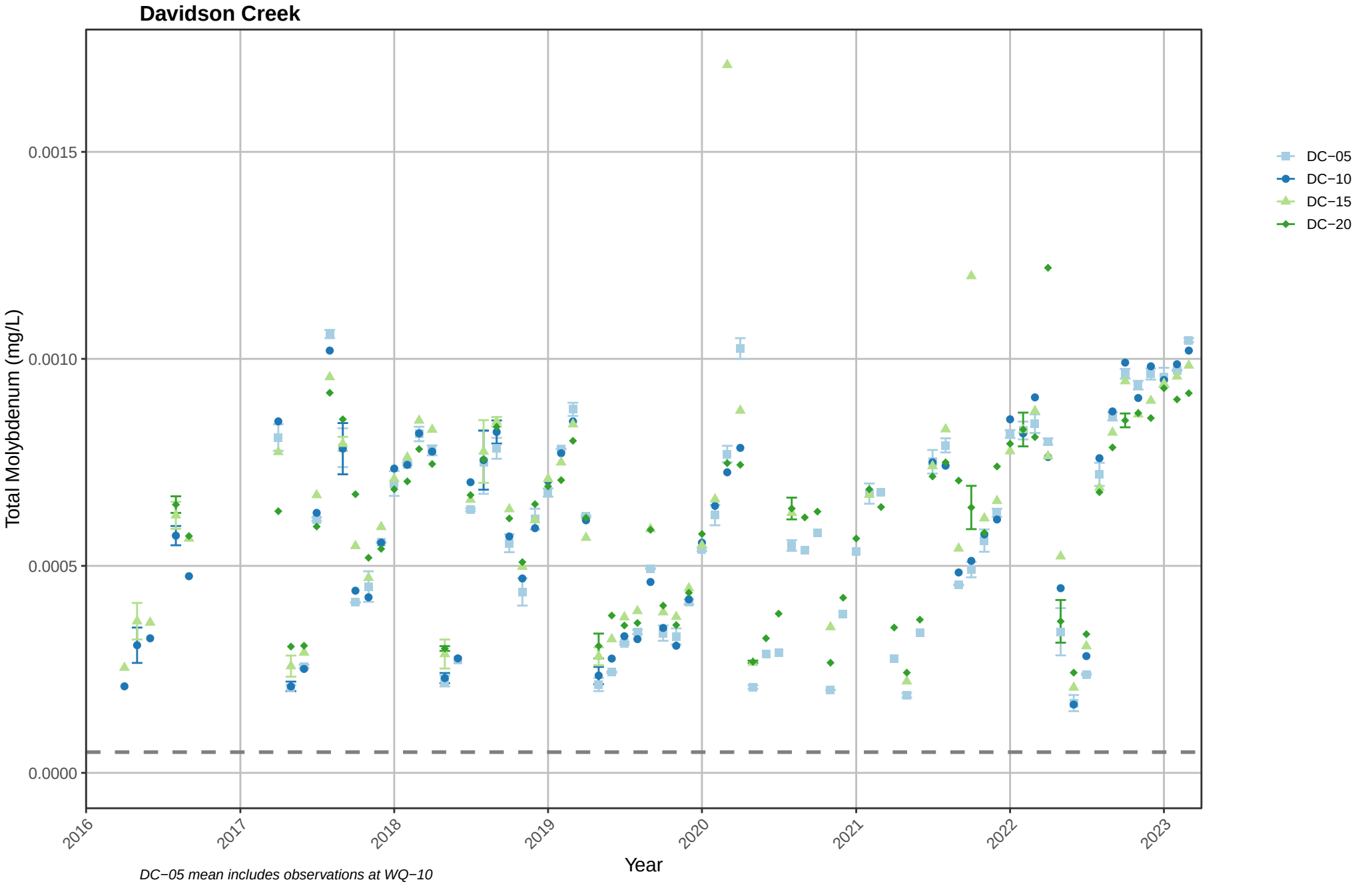
Appendix B−27.c: Monthly Mean Total Mercury at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total mercury = 0.00002 mg/L.

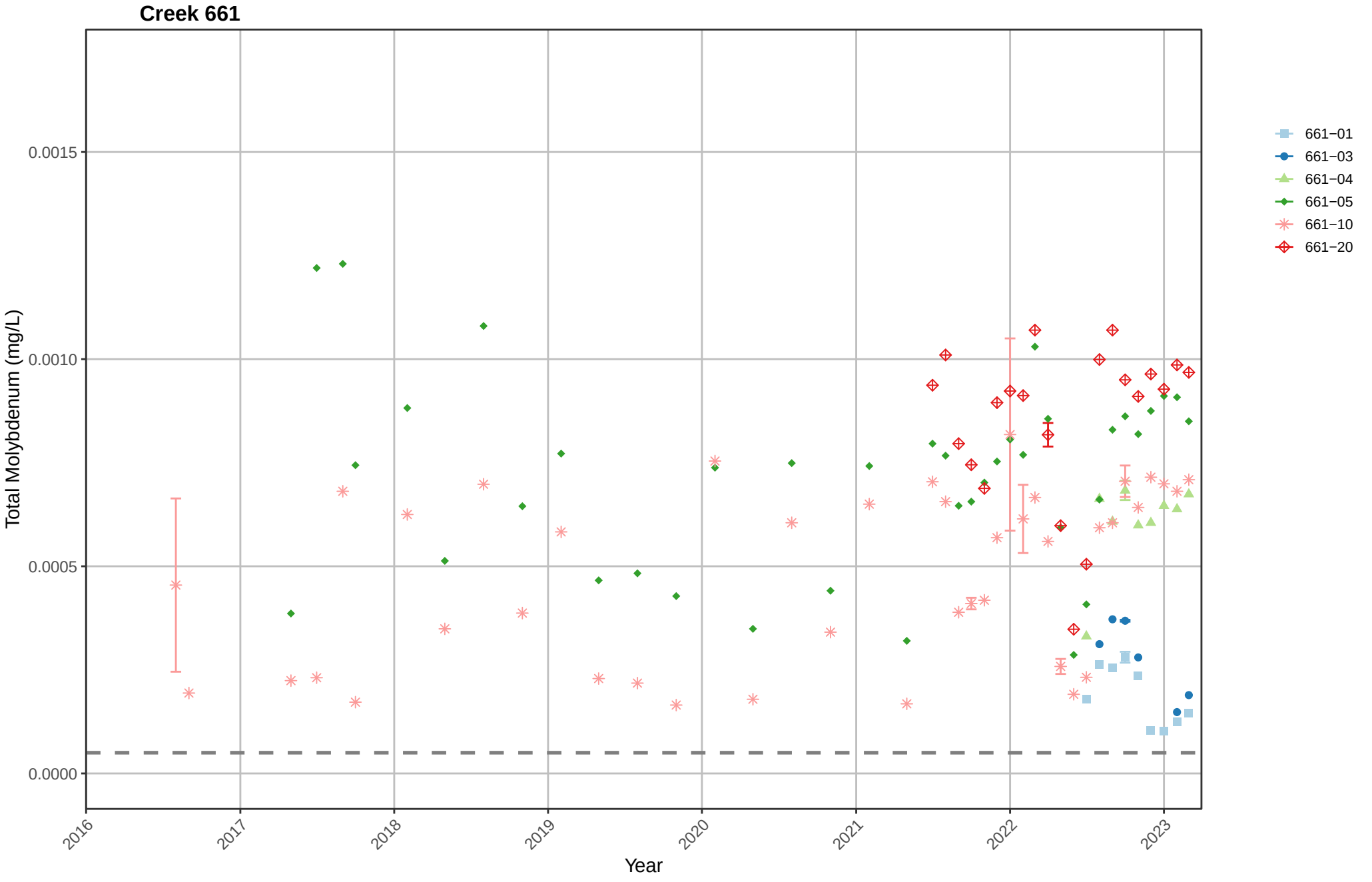
Appendix B−27.d: Monthly Mean Total Mercury at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL 30−day long−term guideline for total molybedenum = 7.61 mg/L.

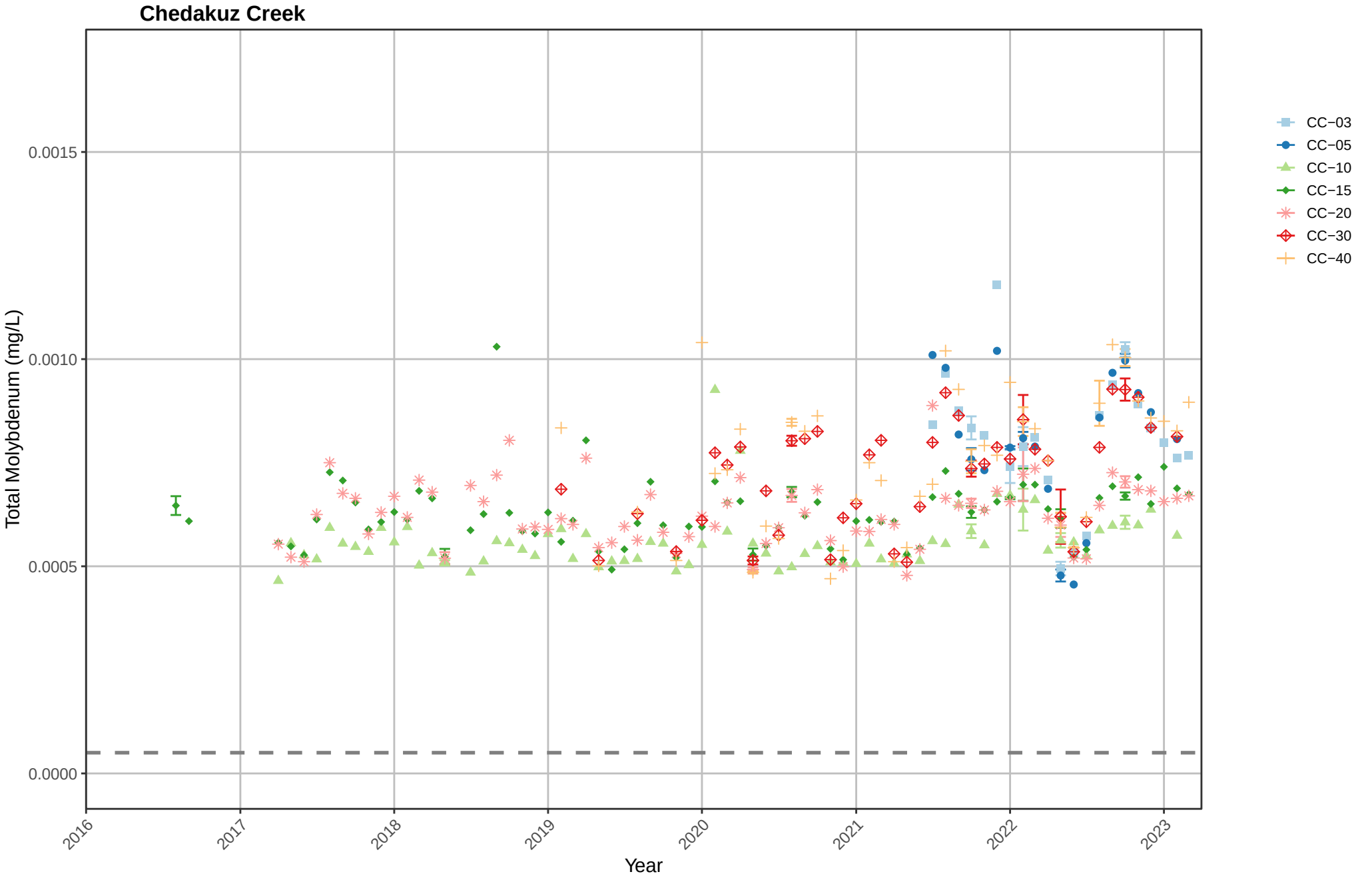
Appendix B−28.a: Monthly Mean Total Molybdenum at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL 30−day long−term guideline for total molybedenum = 7.61 mg/L.

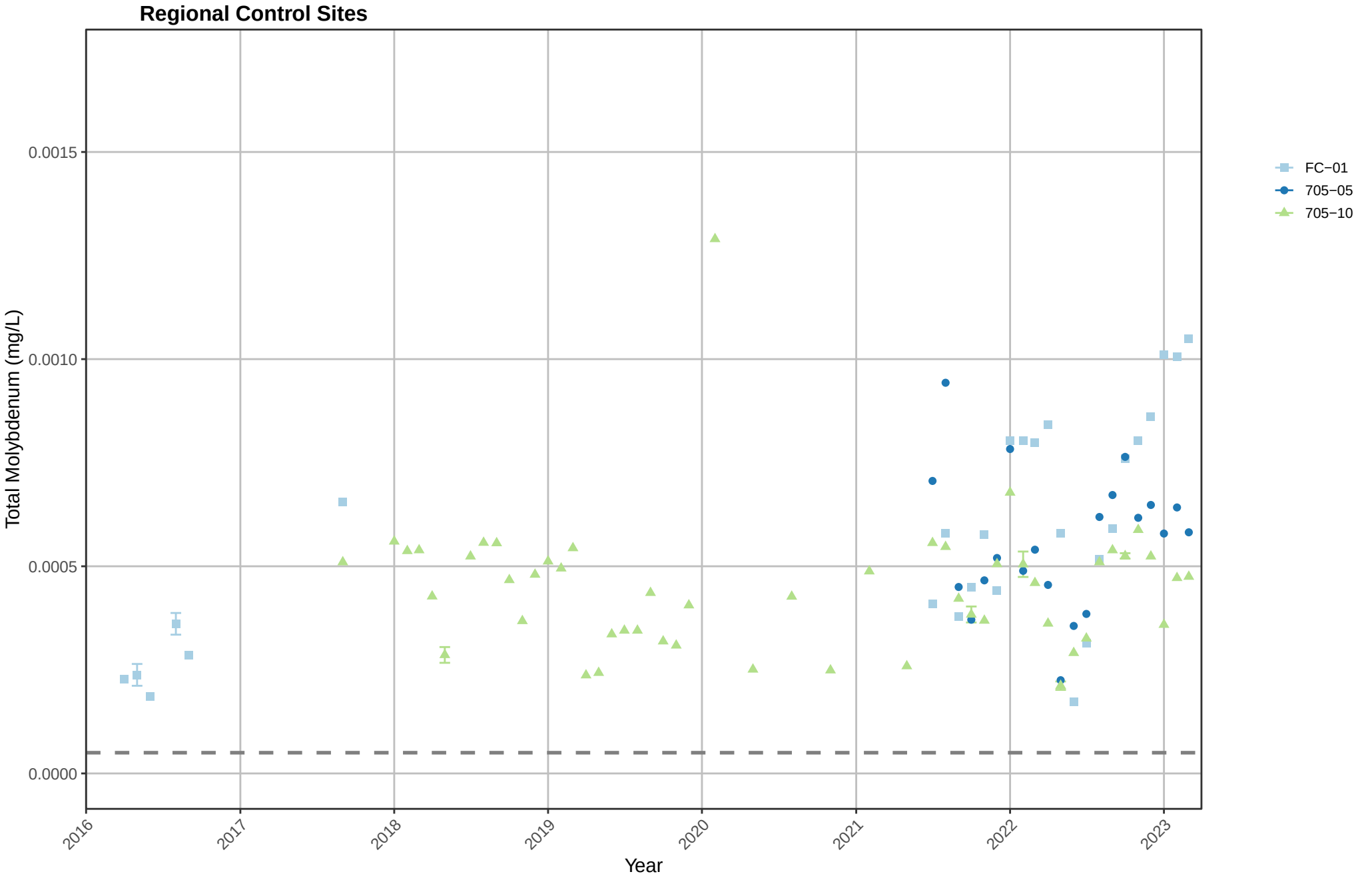
Appendix B−28.b: Monthly Mean Total Molybdenum at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL 30−day long−term guideline for total molybedenum = 7.61 mg/L.

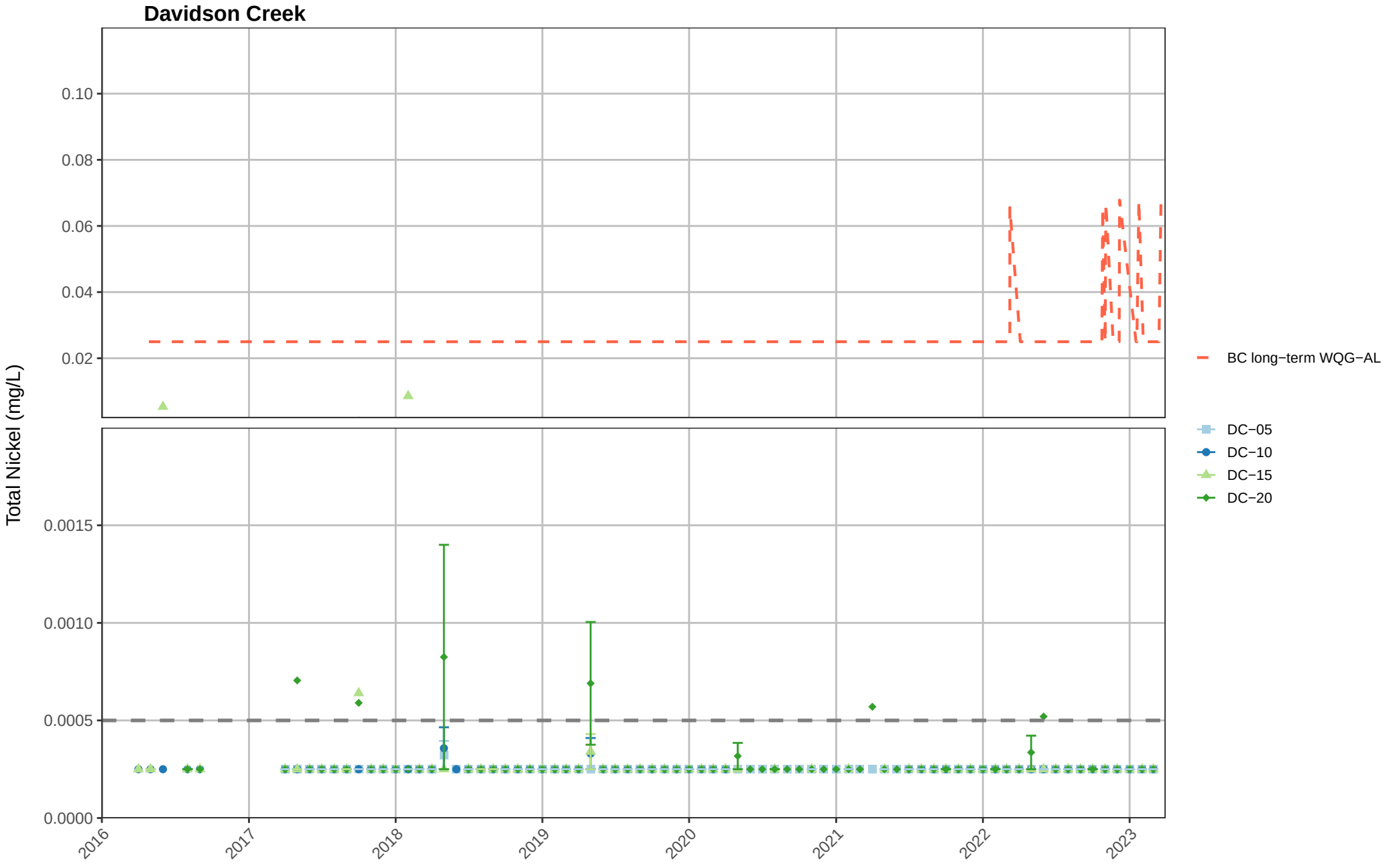
Appendix B−28.c: Monthly Mean Total Molybdenum at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL 30−day long−term guideline for total molybedenum = 7.61 mg/L.

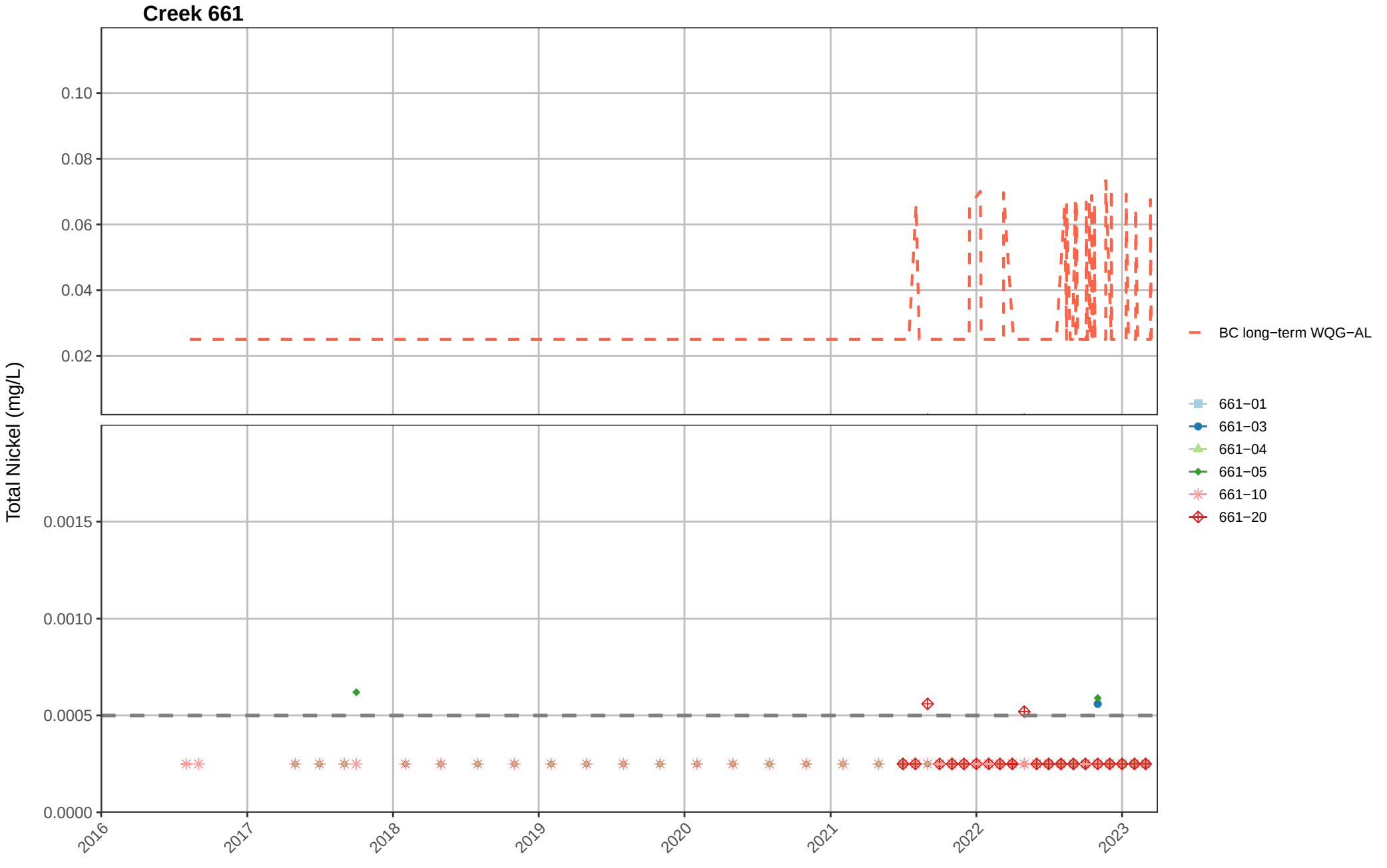
Appendix B−28.d: Monthly Mean Total Molybdenum at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum hardness dependent BC WQG−AL long−term guideline for total nickel in Project streams is 0.025 mg/L.

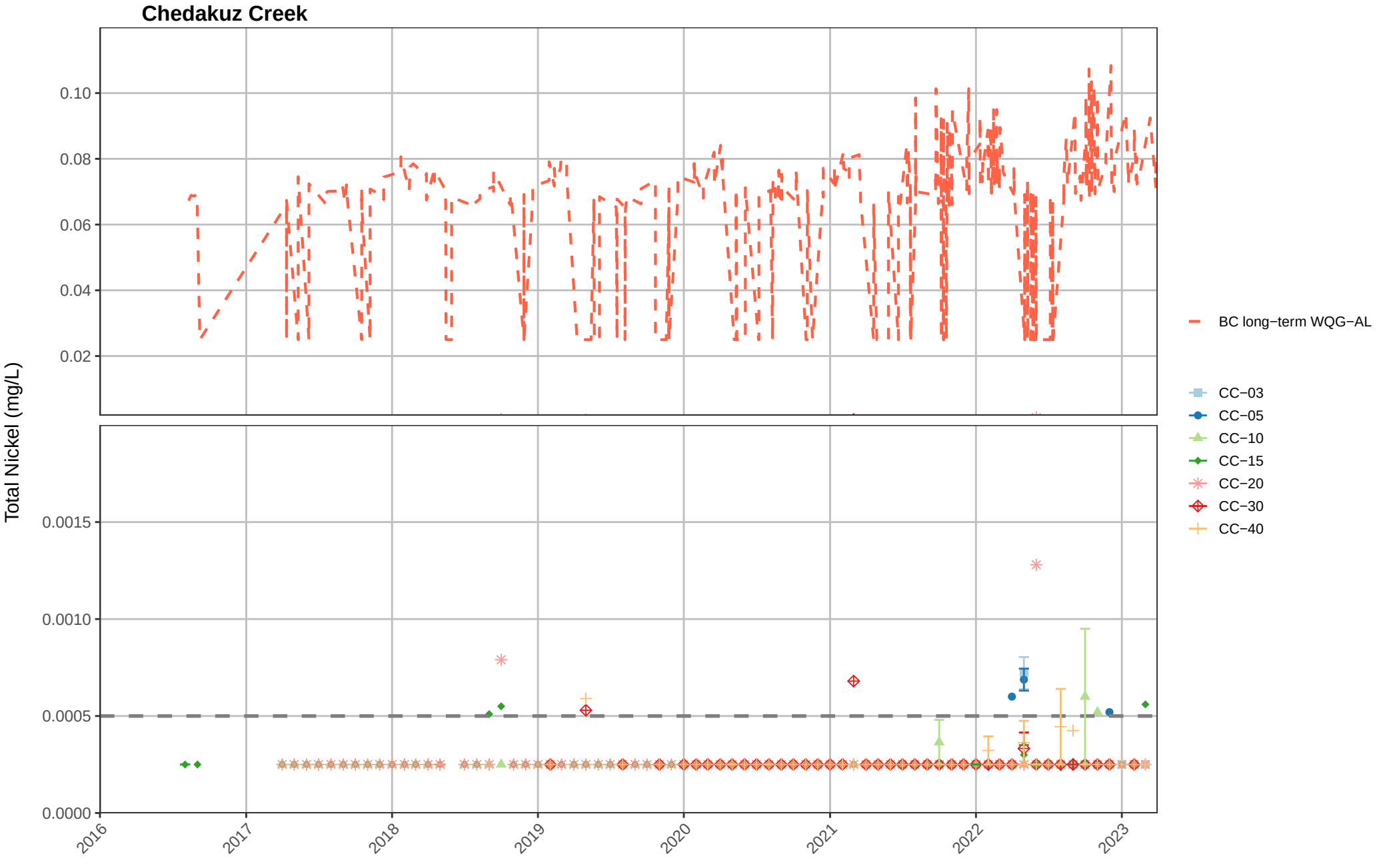
Appendix B−29.a: Monthly Mean Total Nickel at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum hardness dependent BC WQG−AL long−term guideline for total nickel in Project streams is 0.025 mg/L.

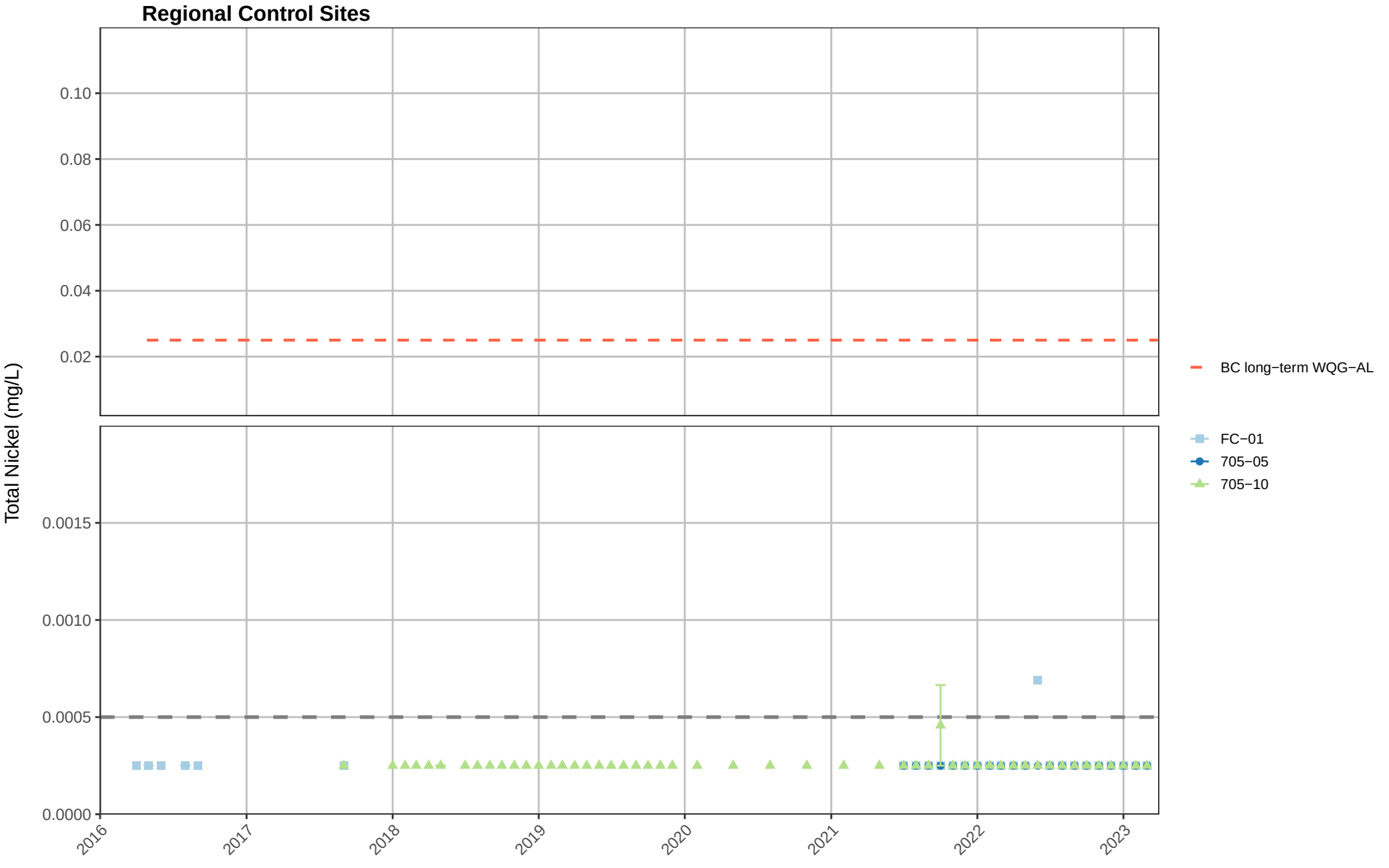
Appendix B−29.b: Monthly Mean Total Nickel at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum hardness dependent BC WQG−AL long−term guideline for total nickel in Project streams is 0.025 mg/L.

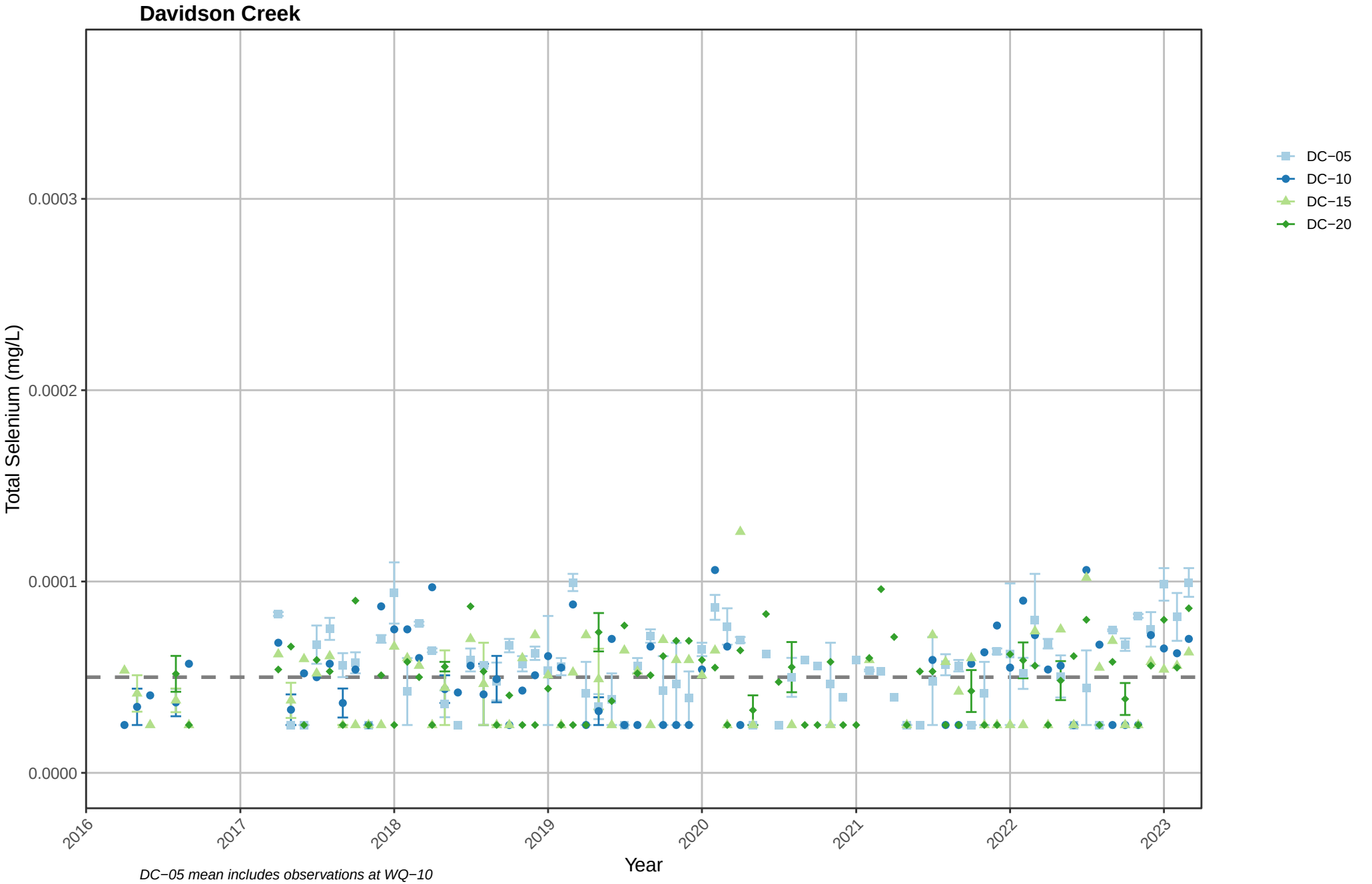
Appendix B−29.c: Monthly Mean Total Nickel at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Minimum hardness dependent BC WQG−AL long−term guideline for total nickel in Project streams is 0.025 mg/L.

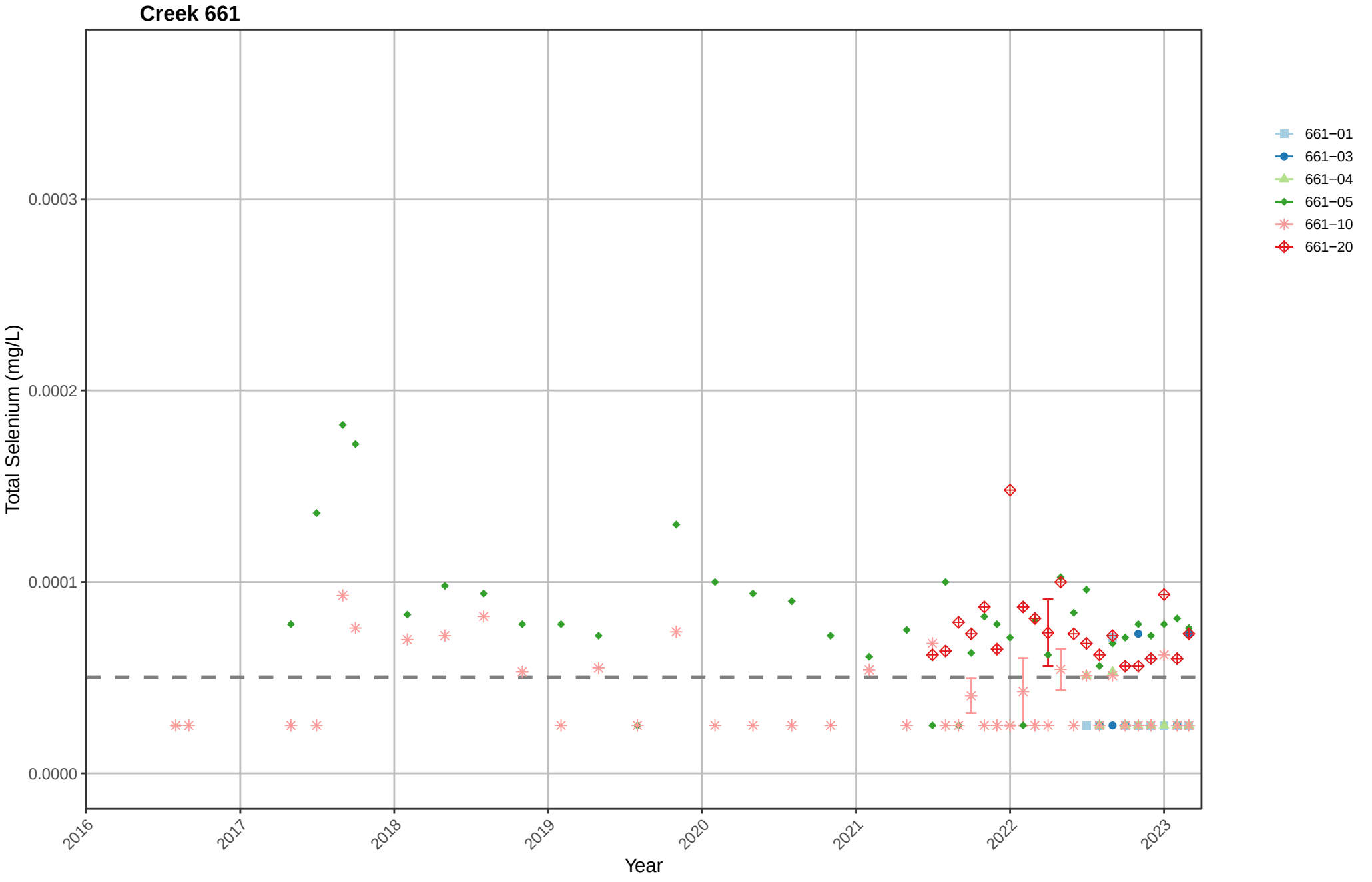
Appendix B−29.d: Monthly Mean Total Nickel at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total selenium = 0.002 mg/L.

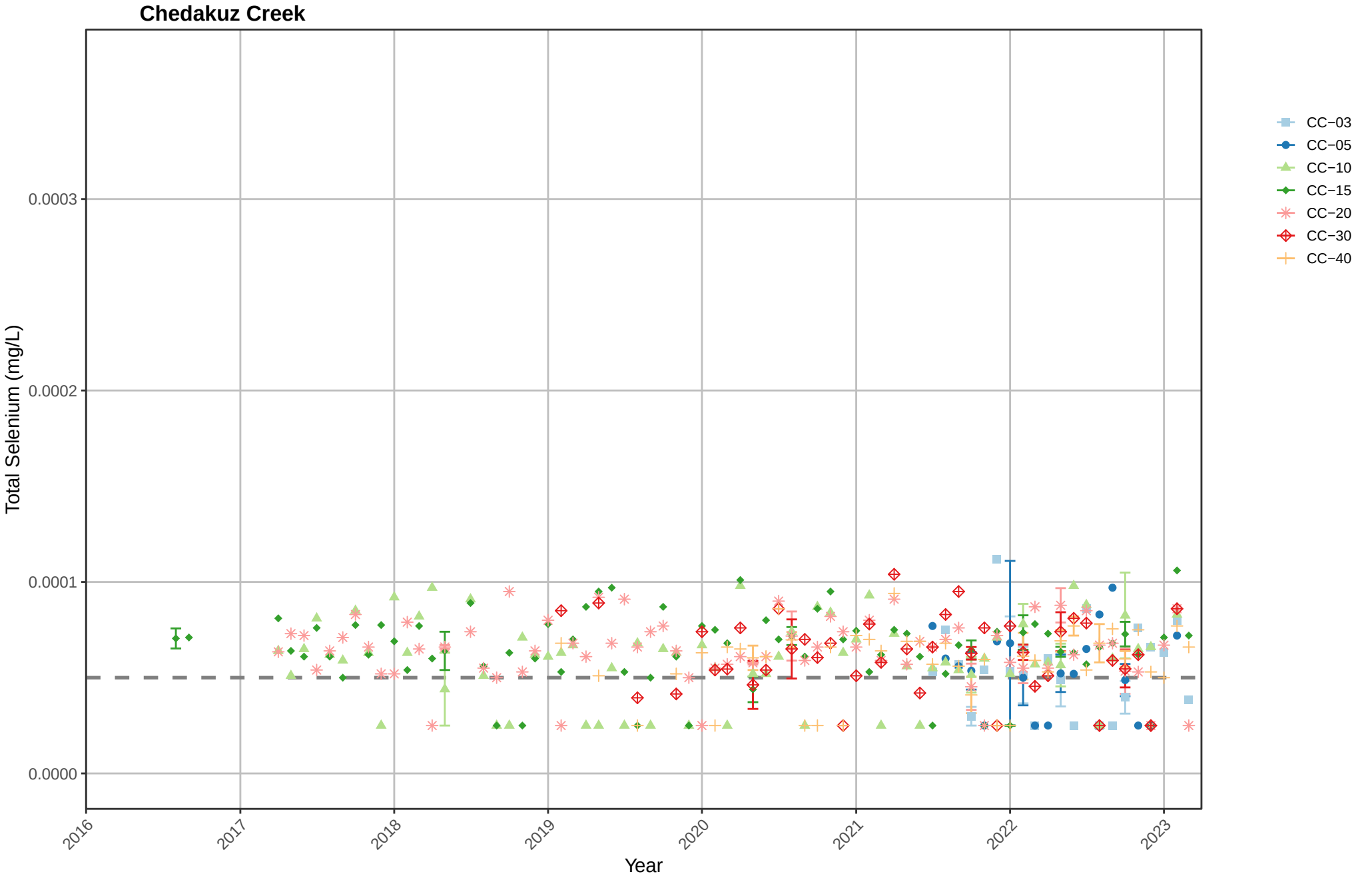
Appendix B−30.a: Monthly Mean Total Selenium at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total selenium = 0.002 mg/L.

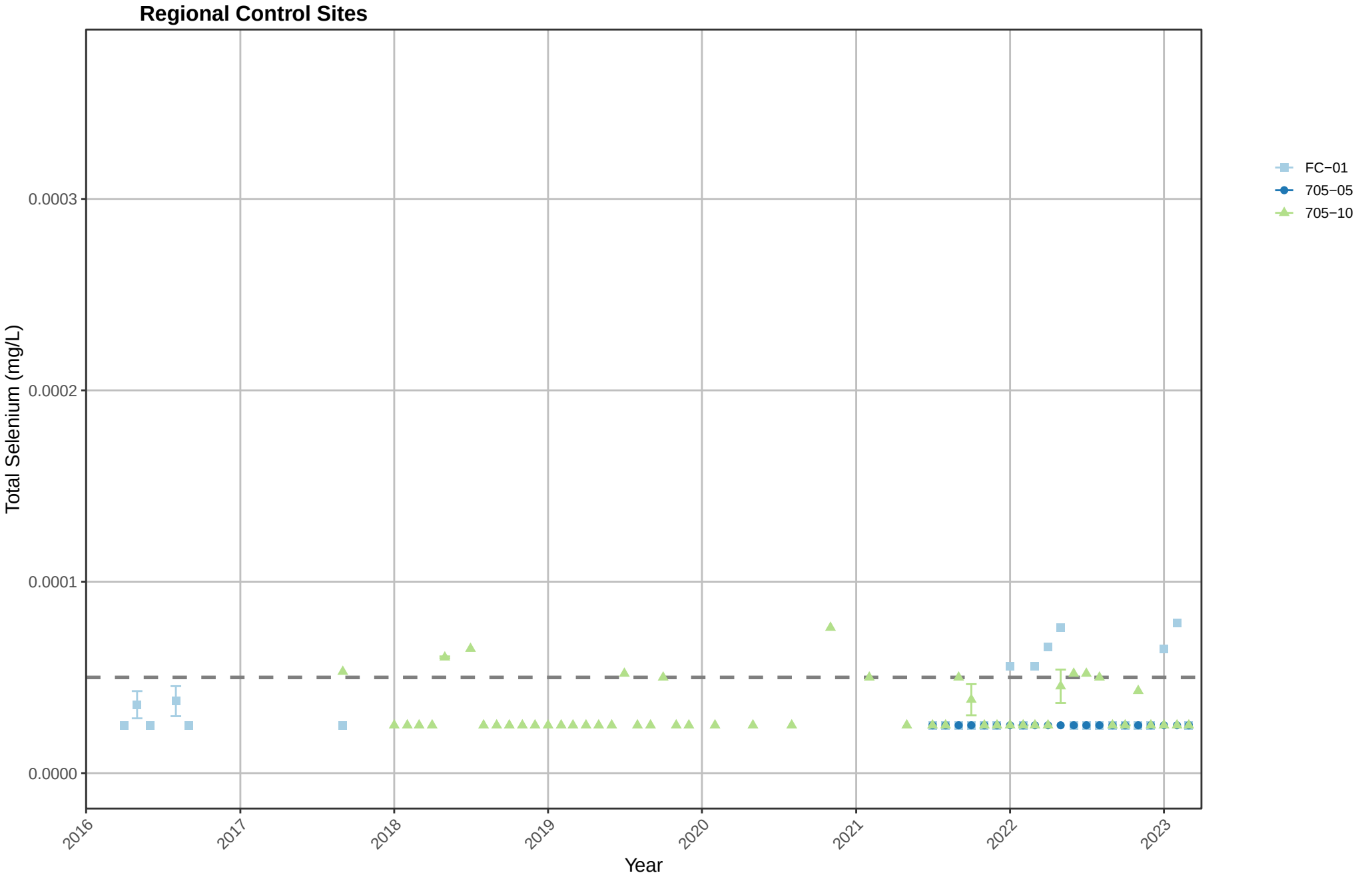
Appendix B−30.b: Monthly Mean Total Selenium at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

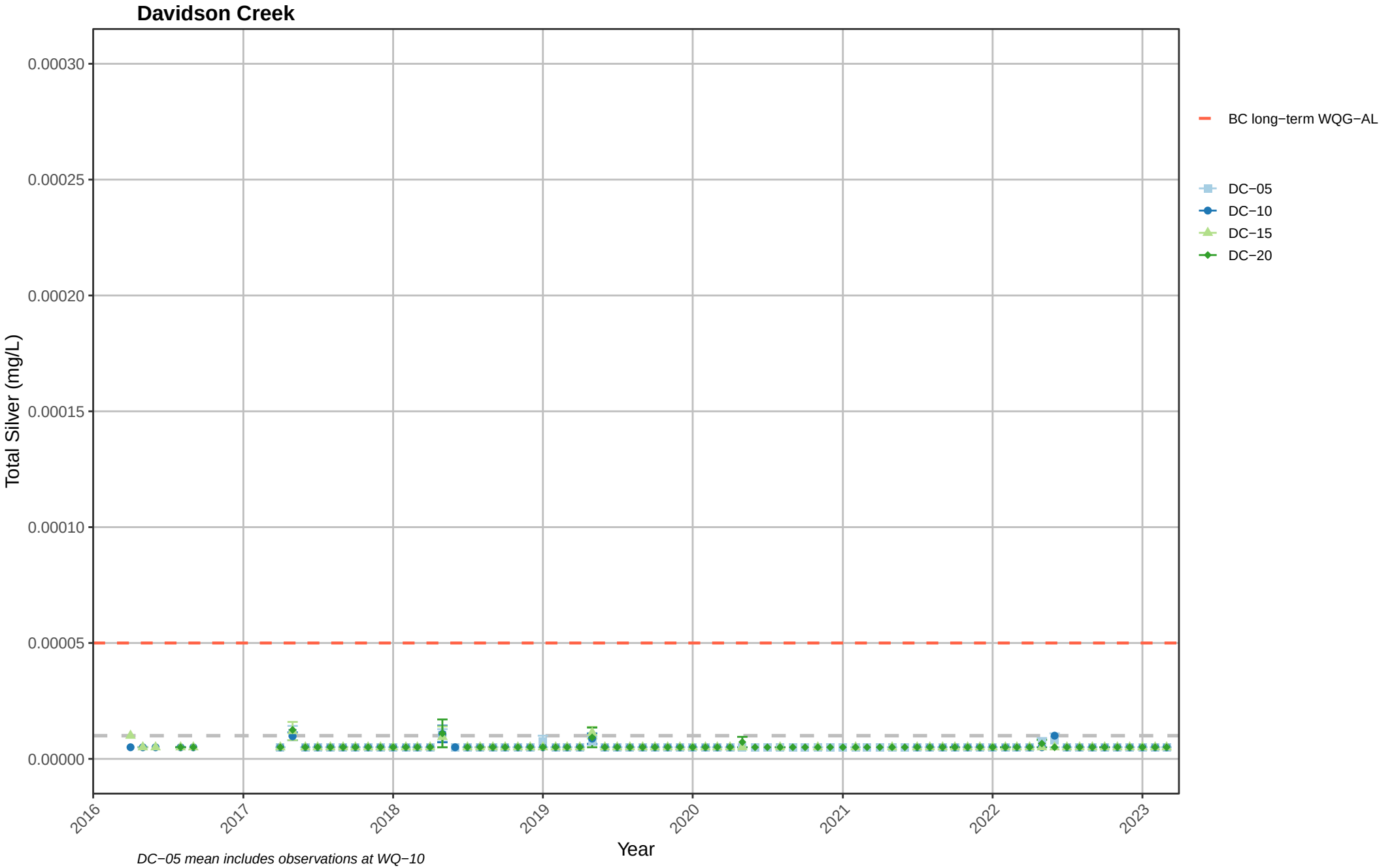
BC WQG−AL long−term guideline for total selenium = 0.002 mg/L.

Appendix B−30.c: Monthly Mean Total Selenium at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.
BC WQG−AL long−term guideline for total selenium = 0.002 mg/L.

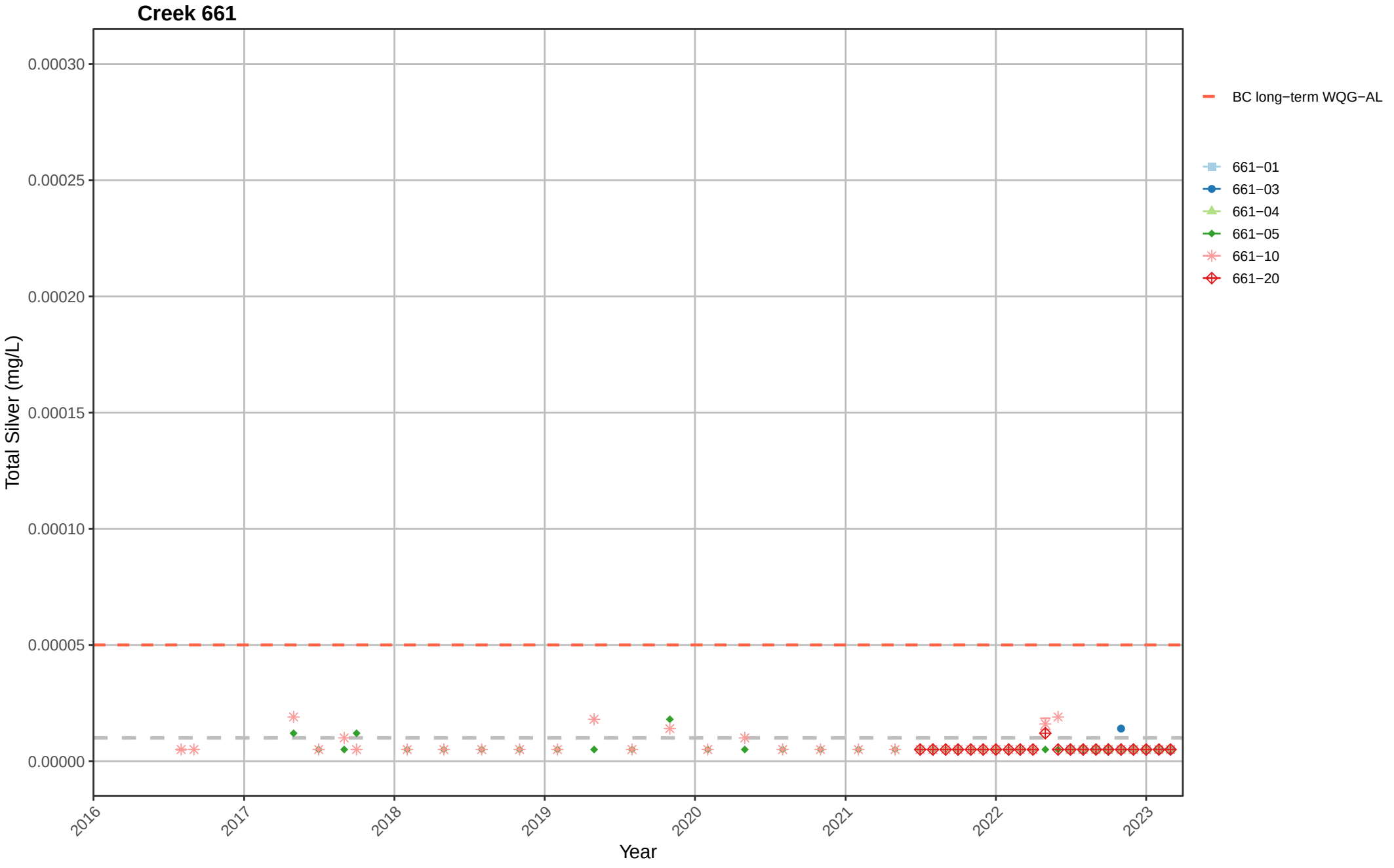
Appendix B−30.d: Monthly Mean Total Selenium at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total silver is hardness dependent.

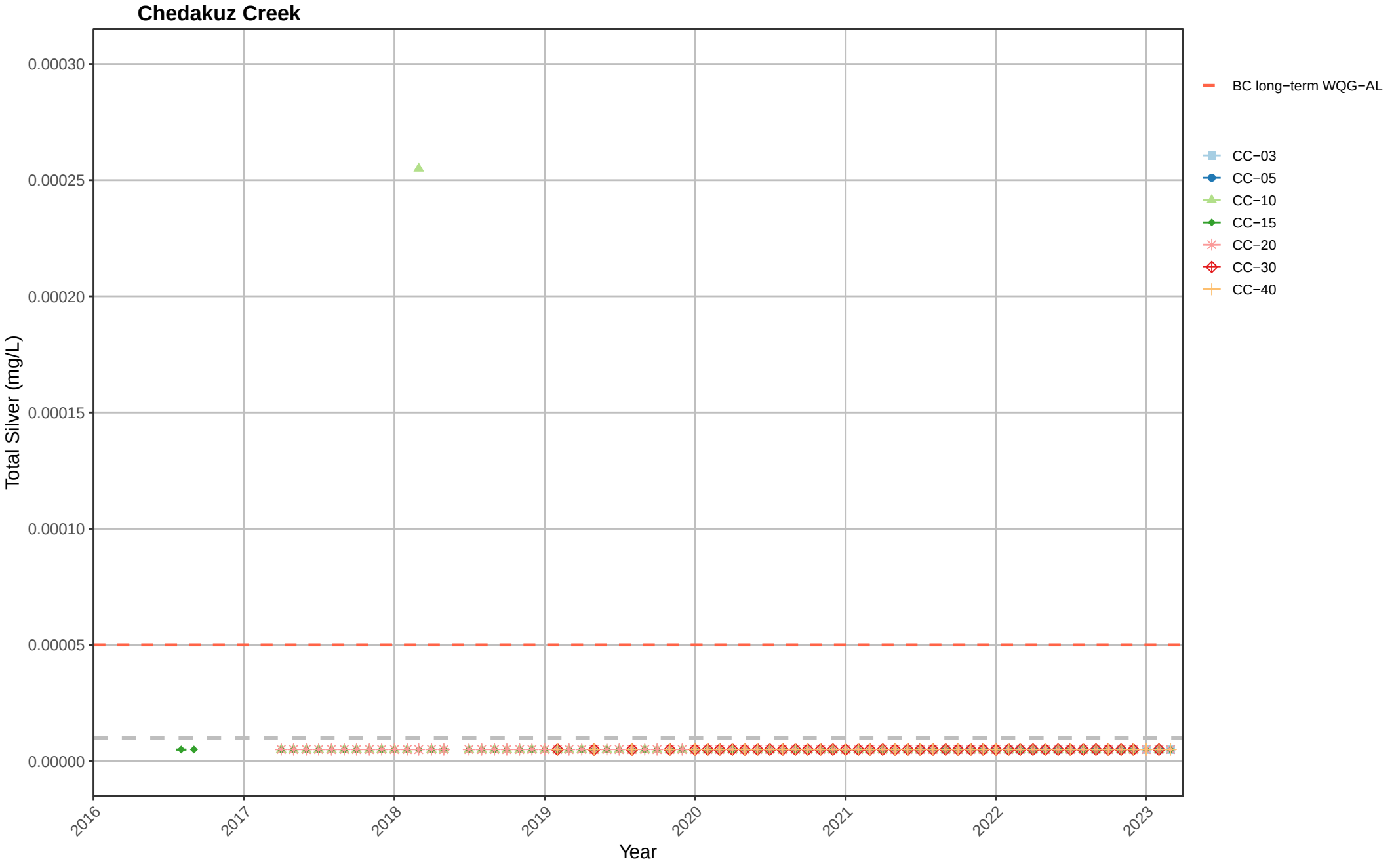
Appendix B−31.a: Monthly Mean Total Silver at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total silver is hardness dependent.

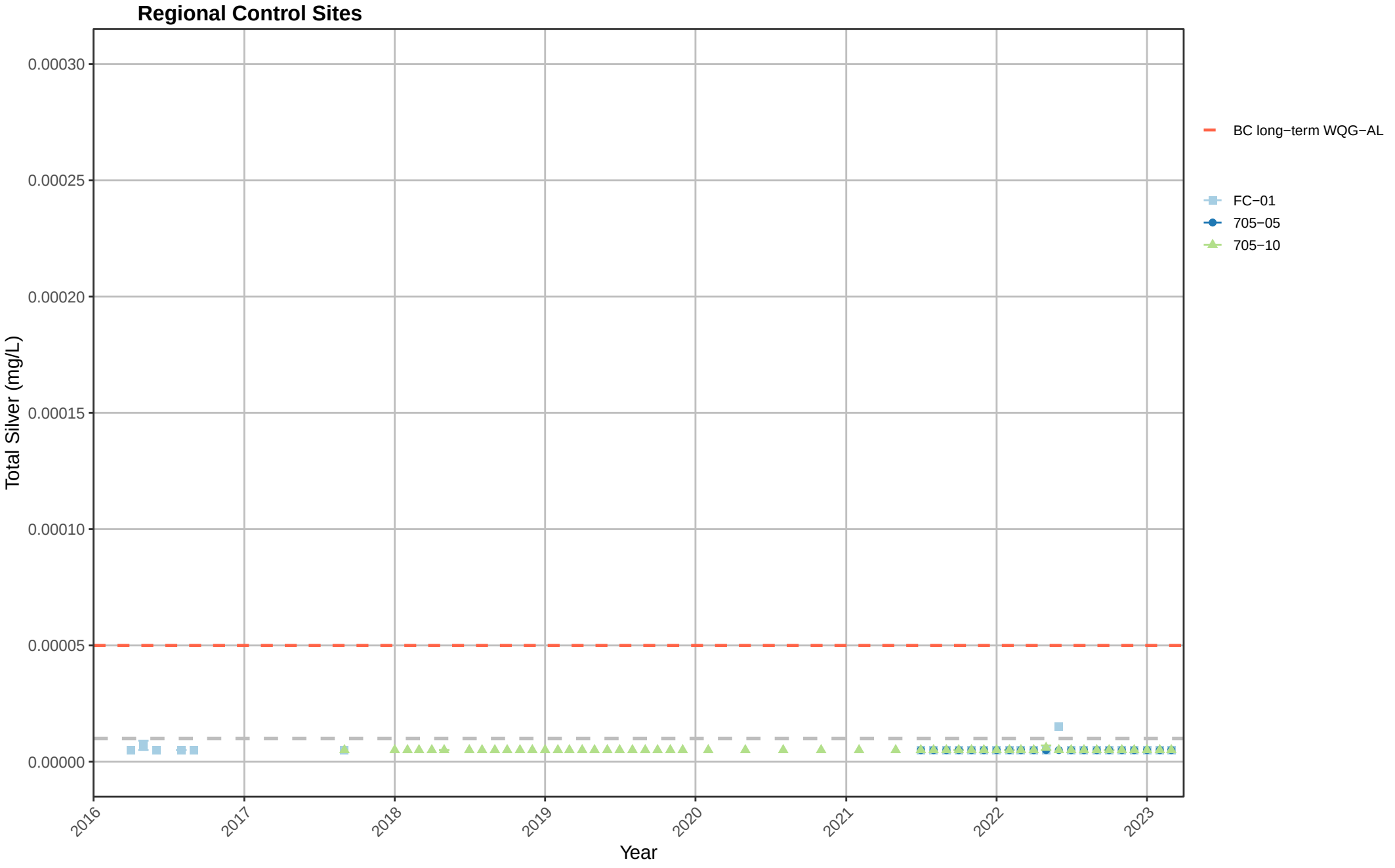
Appendix B−31.b: Monthly Mean Total Silver at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total silver is hardness dependent.

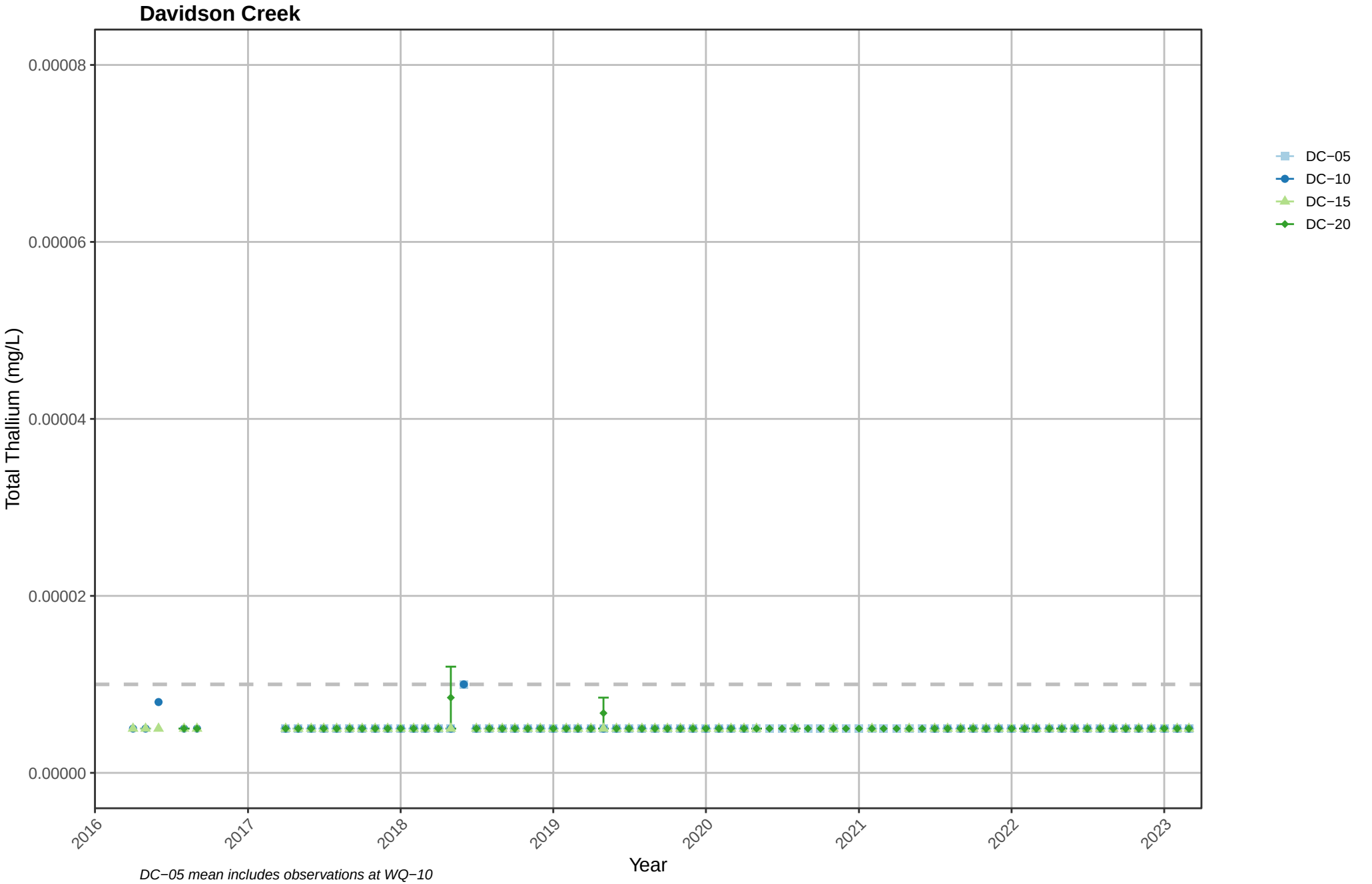
Appendix B−31.c: Monthly Mean Total Silver at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

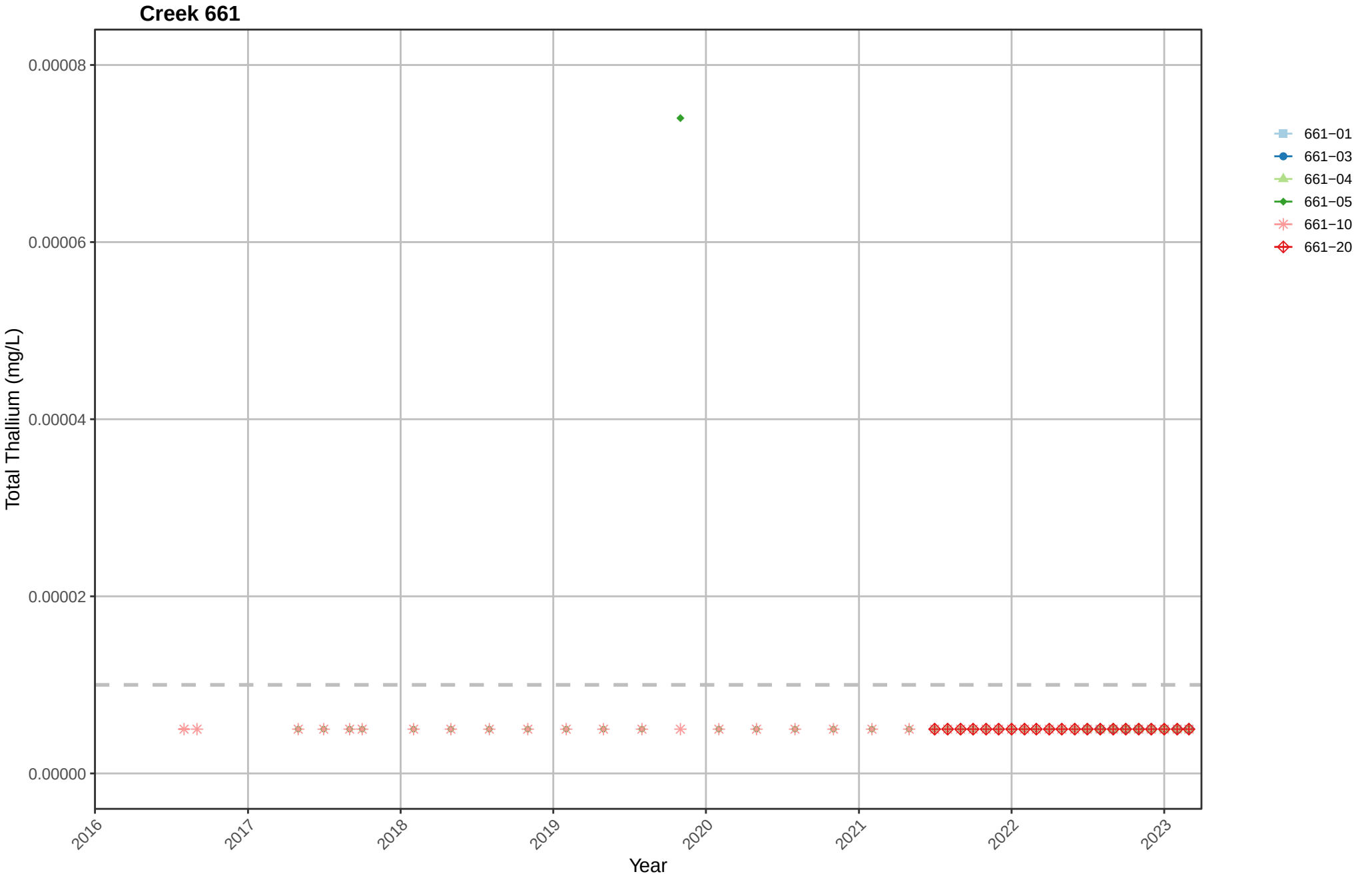
BC WQG−AL long−term guideline for total silver is hardness dependent.

Appendix B−31.d: Monthly Mean Total Silver at Regional Control AEMP Sites, 2016 to March 31, 2023



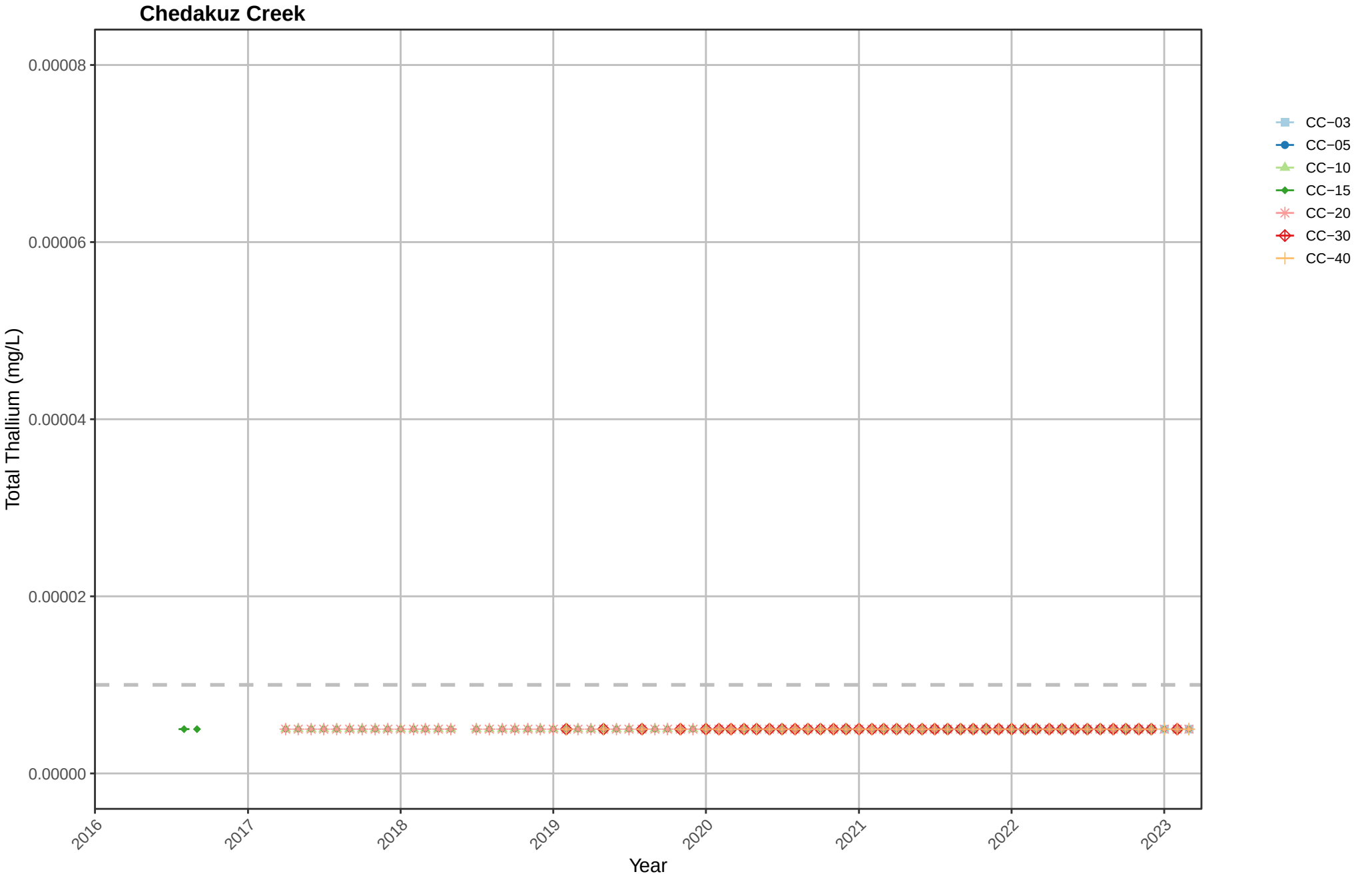
DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Appendix B−32.a: Monthly Mean Total Thallium at Davidson Creek AEMP Sites, 2016 to March 31, 2023



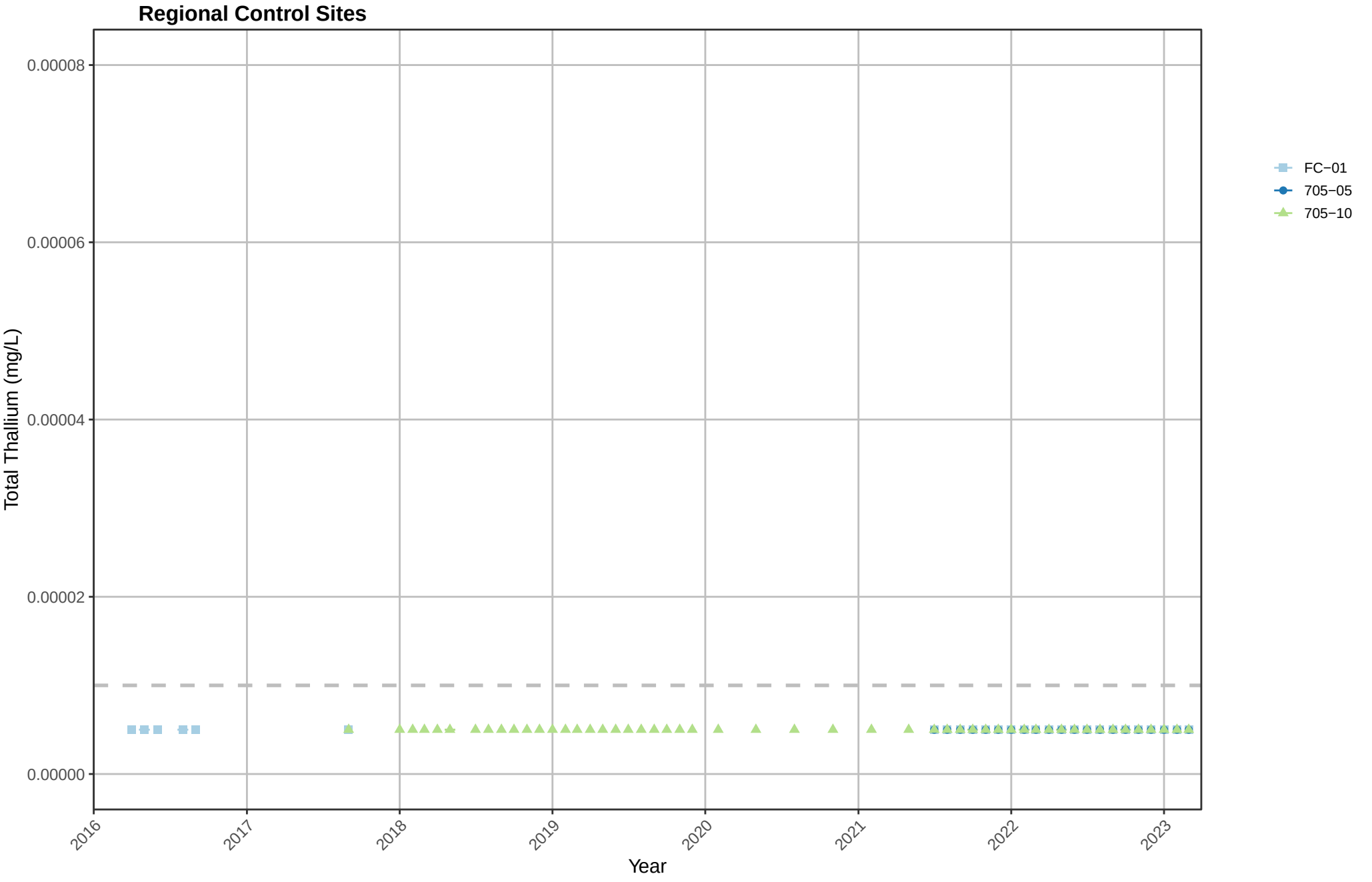
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Appendix B−32.b: Monthly Mean Total Thallium at Creek 661 AEMP Sites, 2016 to March 31, 2023



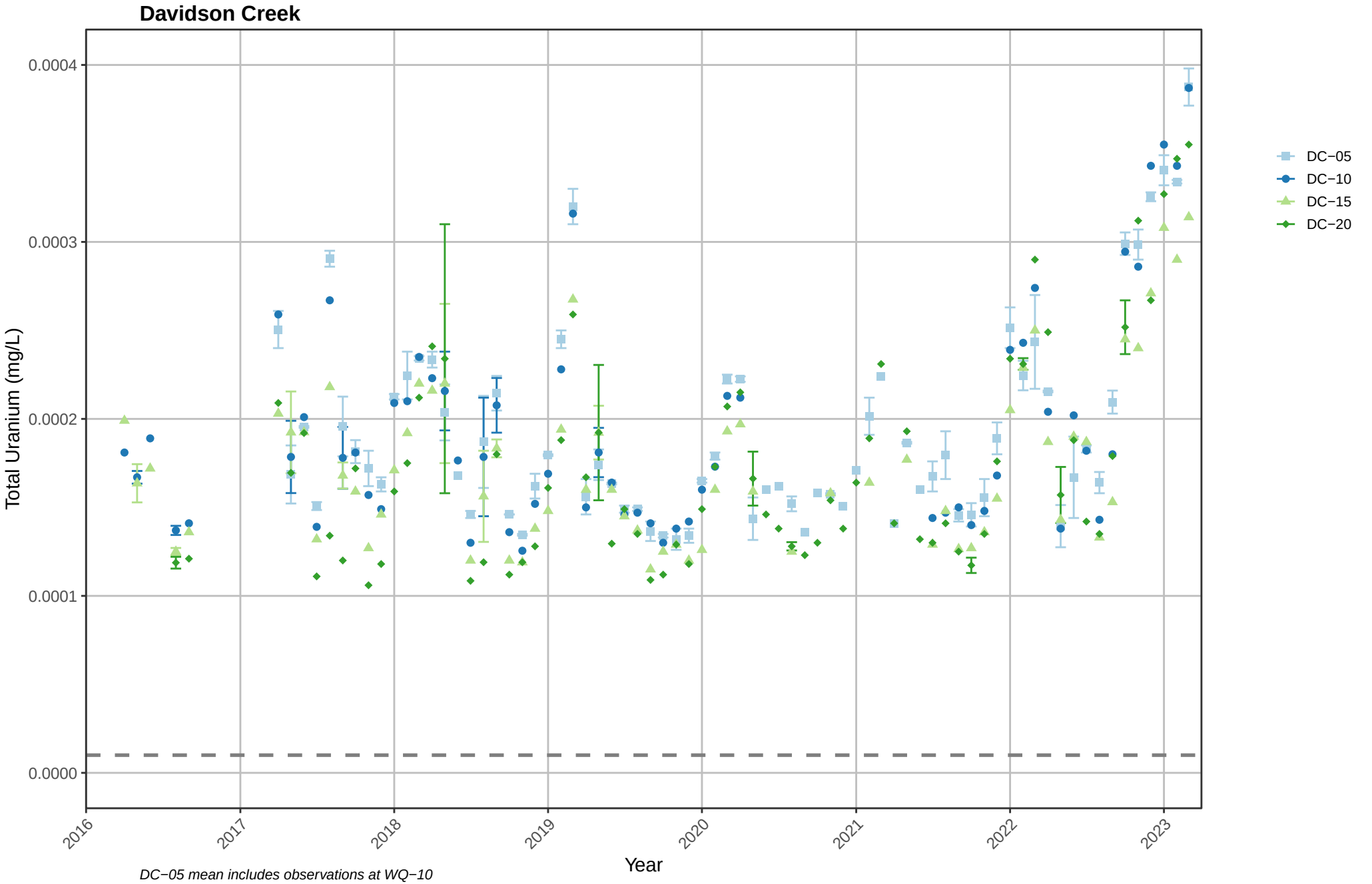
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Appendix B−32.c: Monthly Mean Total Thallium at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

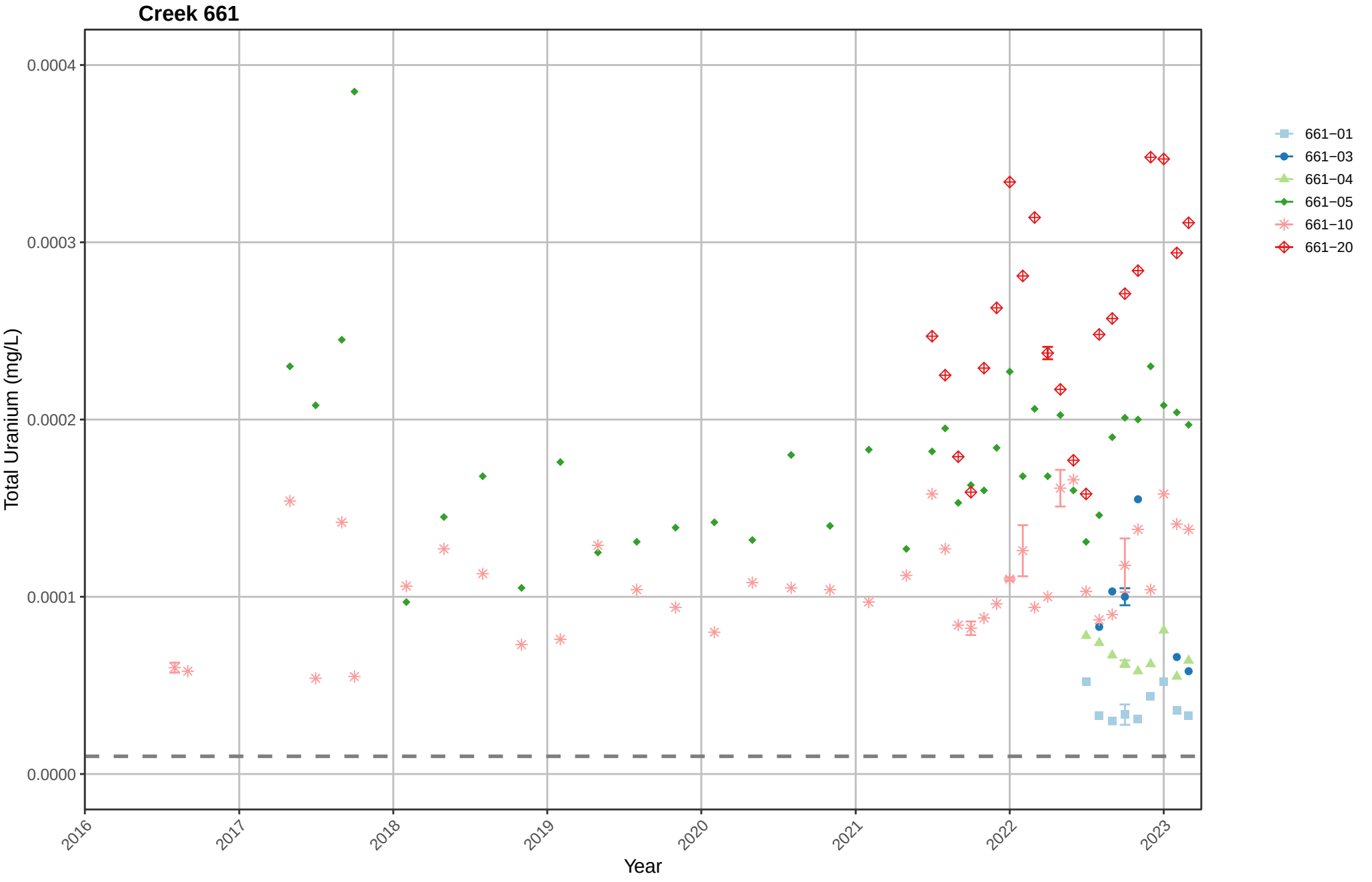
Appendix B−32.d: Monthly Mean Total Thallium at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL working long−term guideline for total uranium = 0.0085 mg/L.

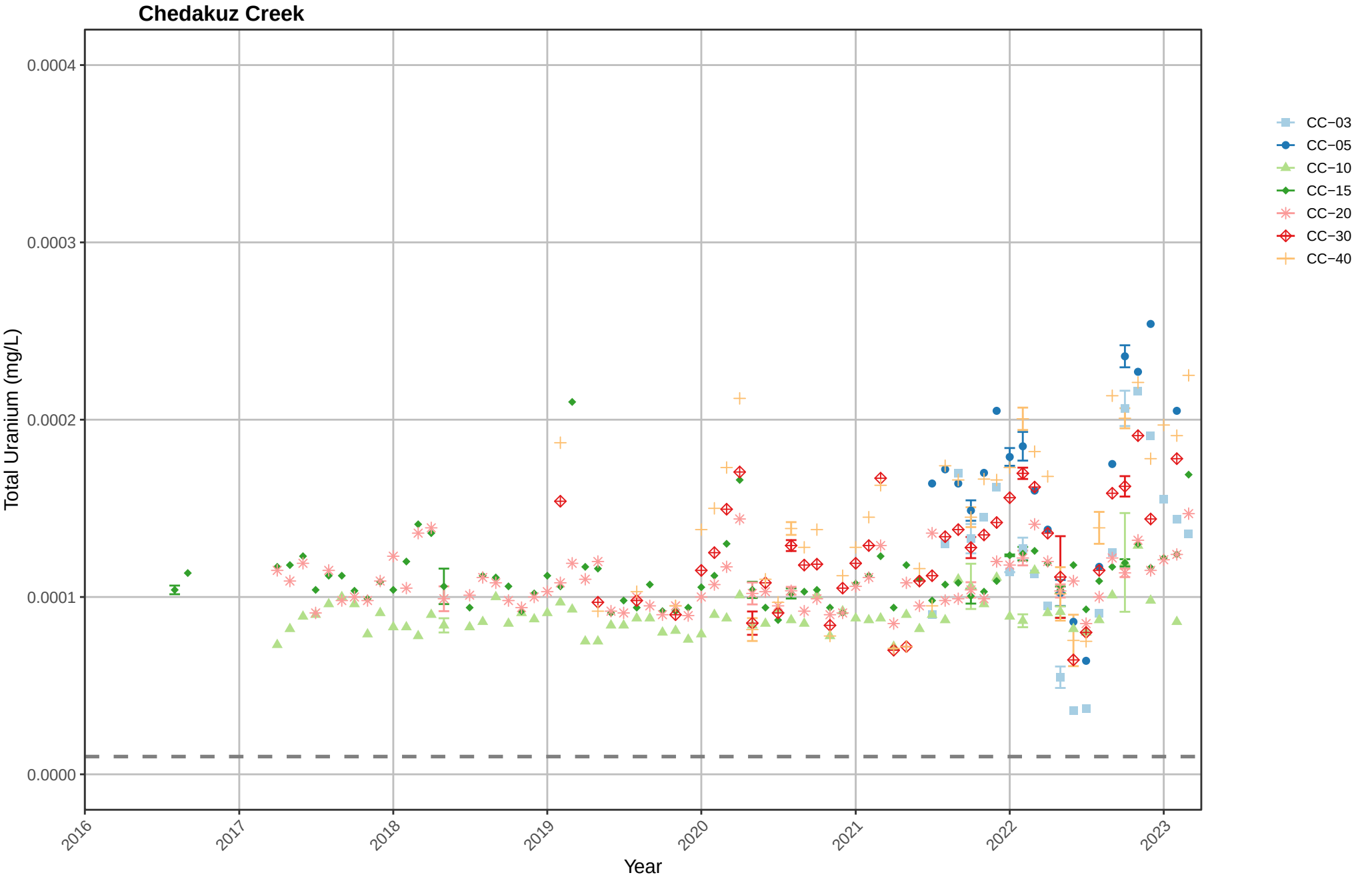
Appendix B−33.a: Monthly Mean Total Uranium at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL working long−term guideline for total uranium = 0.0085 mg/L.

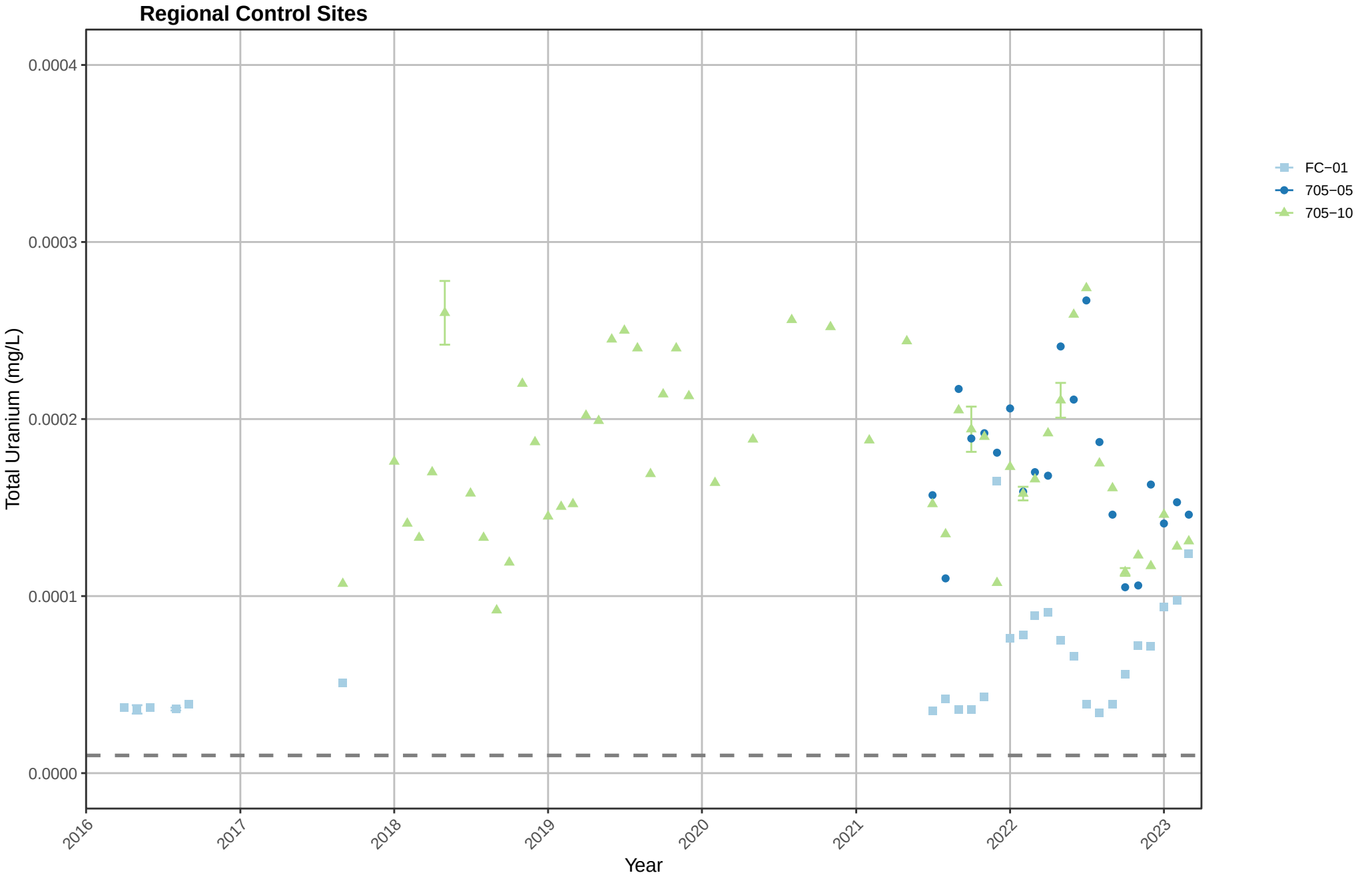
Appendix B−33.b: Monthly Mean Total Uranium at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL working long−term guideline for total uranium = 0.0085 mg/L.

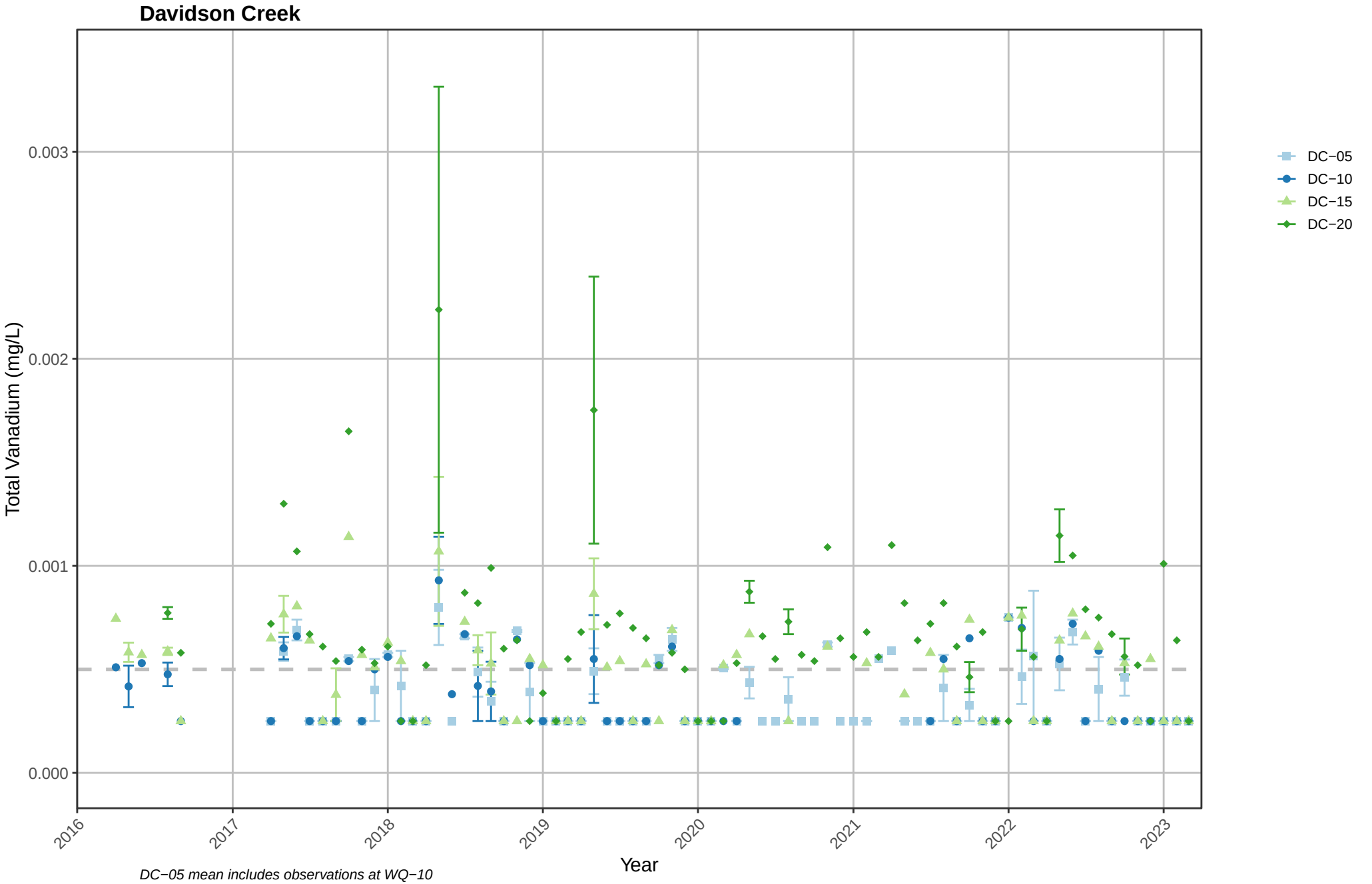
Appendix B−33.c: Monthly Mean Total Uranium at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

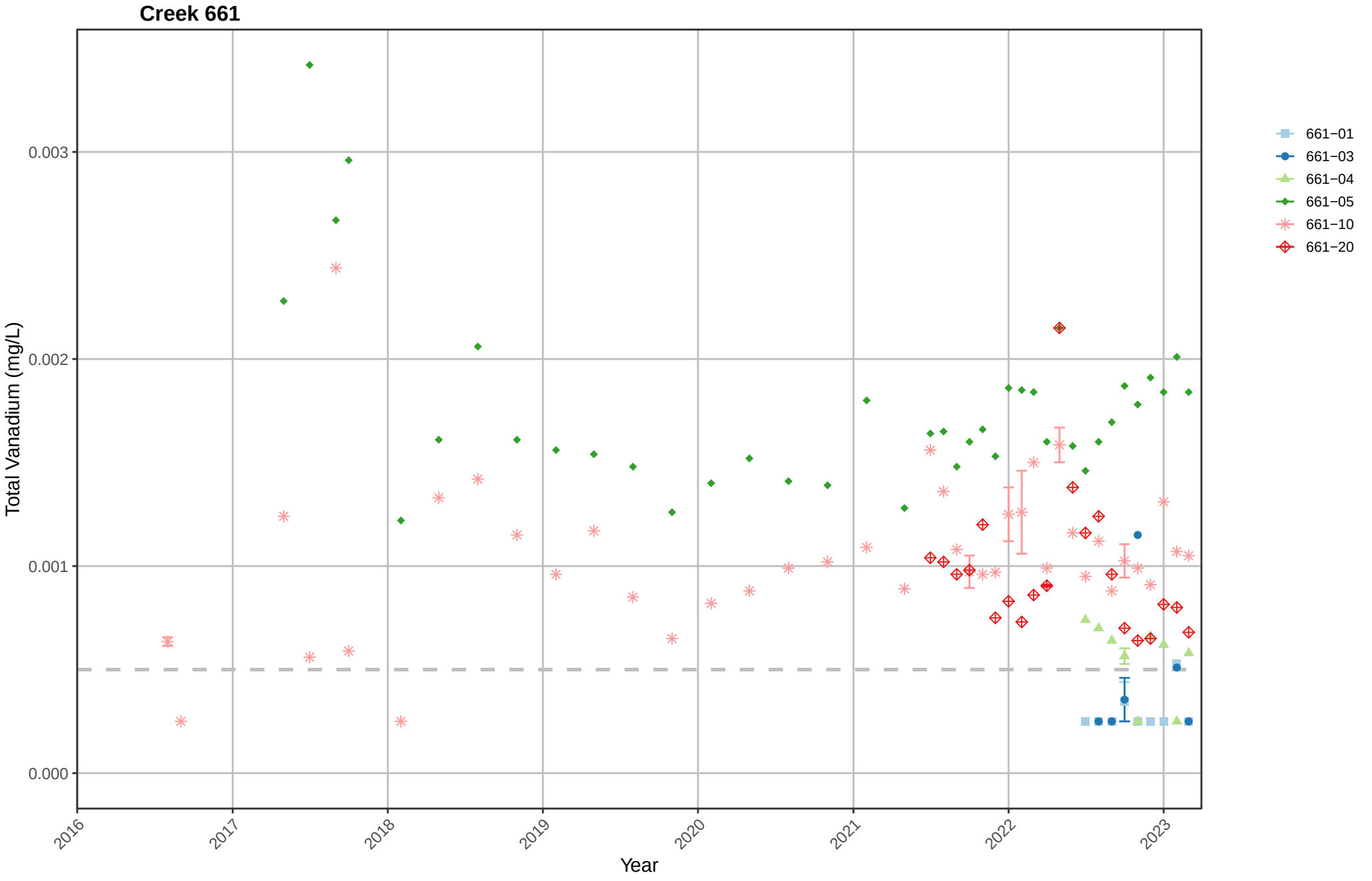
BC WQG−AL working long−term guideline for total uranium = 0.0085 mg/L.

Appendix B−33.d: Monthly Mean Total Uranium at Regional Control AEMP Sites, 2016 to March 31, 2023



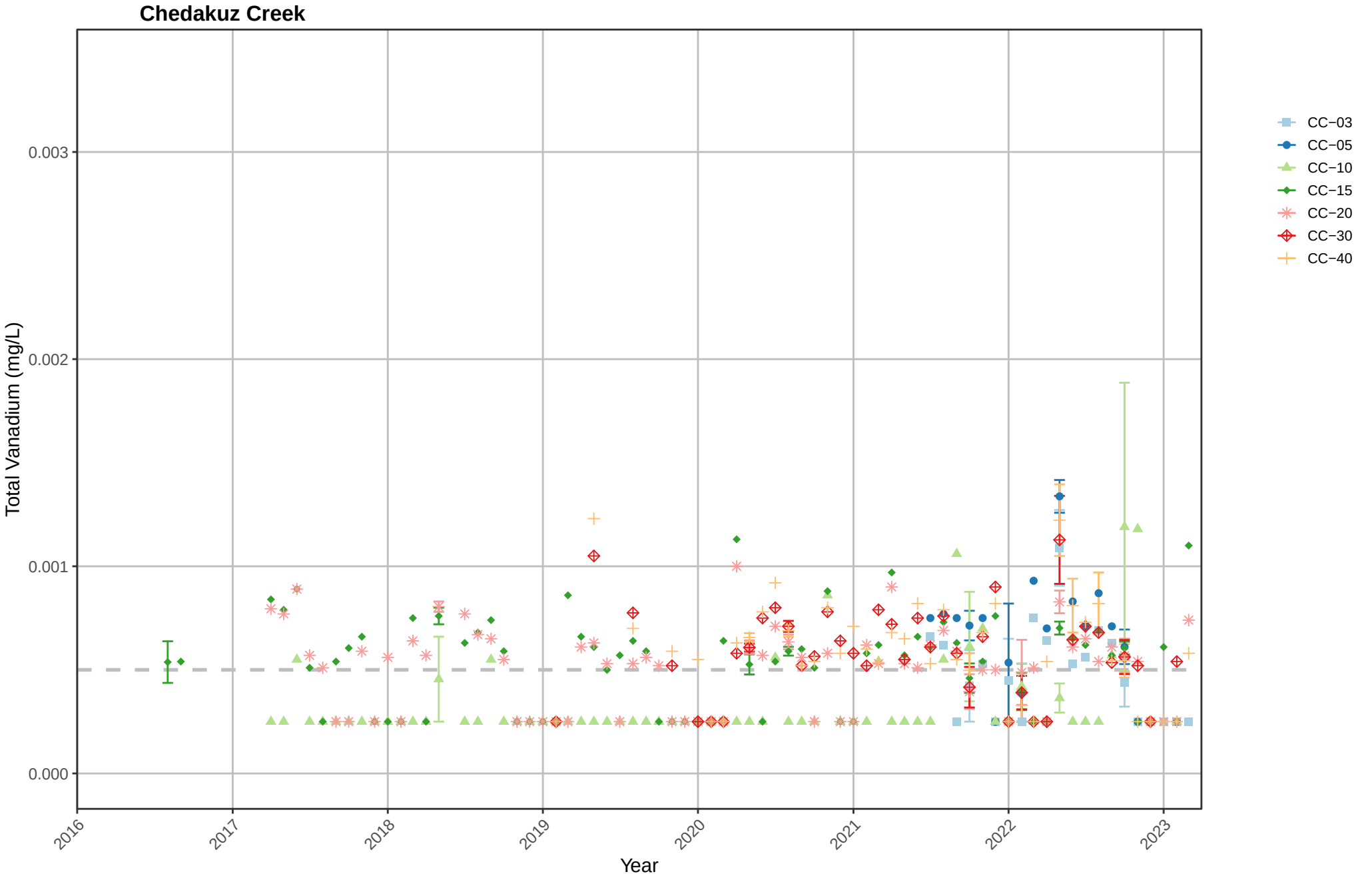
DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Appendix B−34.a: Monthly Mean Total Vanadium at Davidson Creek AEMP Sites, 2016 to March 31, 2023



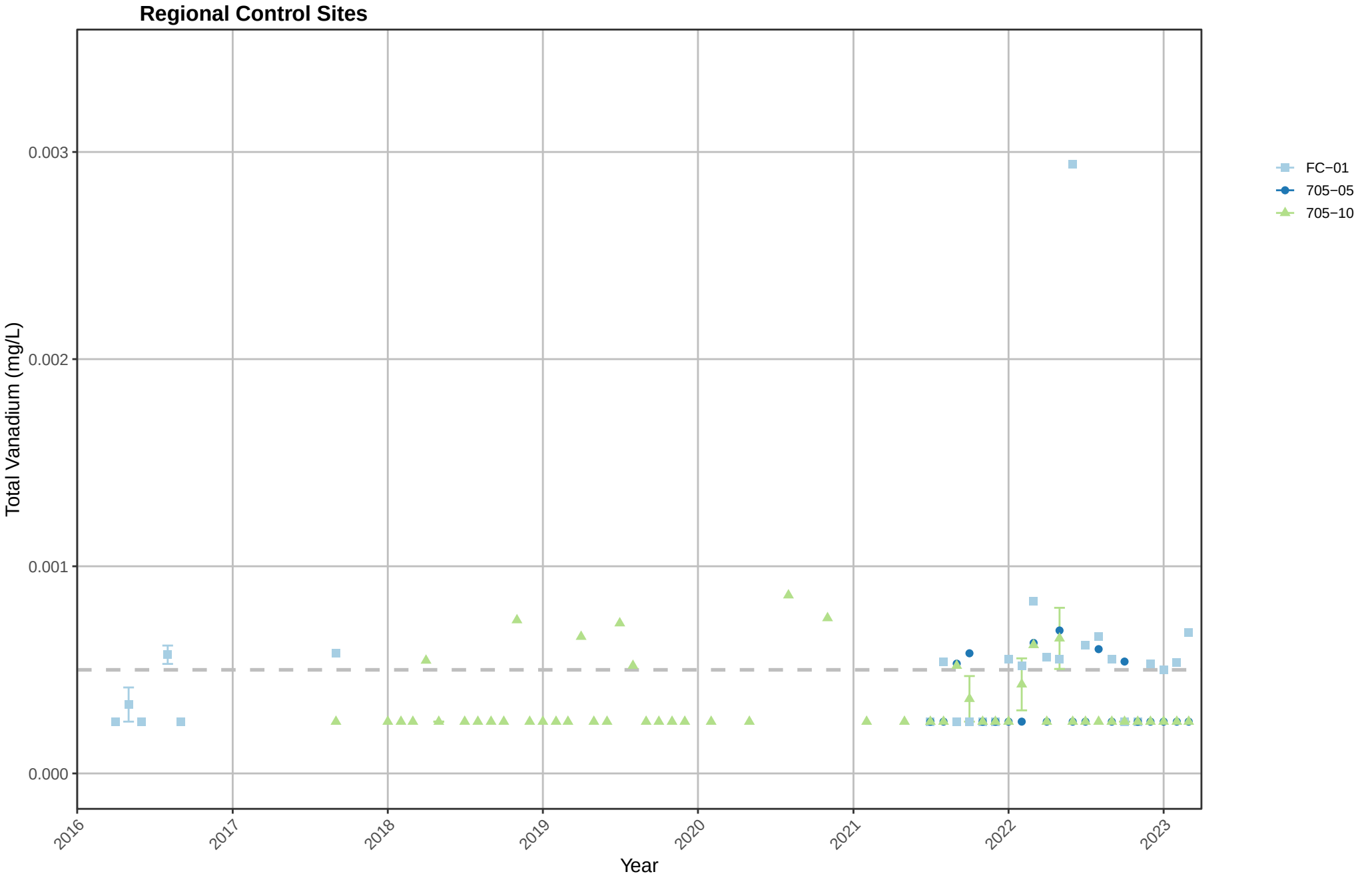
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Appendix B−34.b: Monthly Mean Total Vanadium at Creek 661 AEMP Sites, 2016 to March 31, 2023



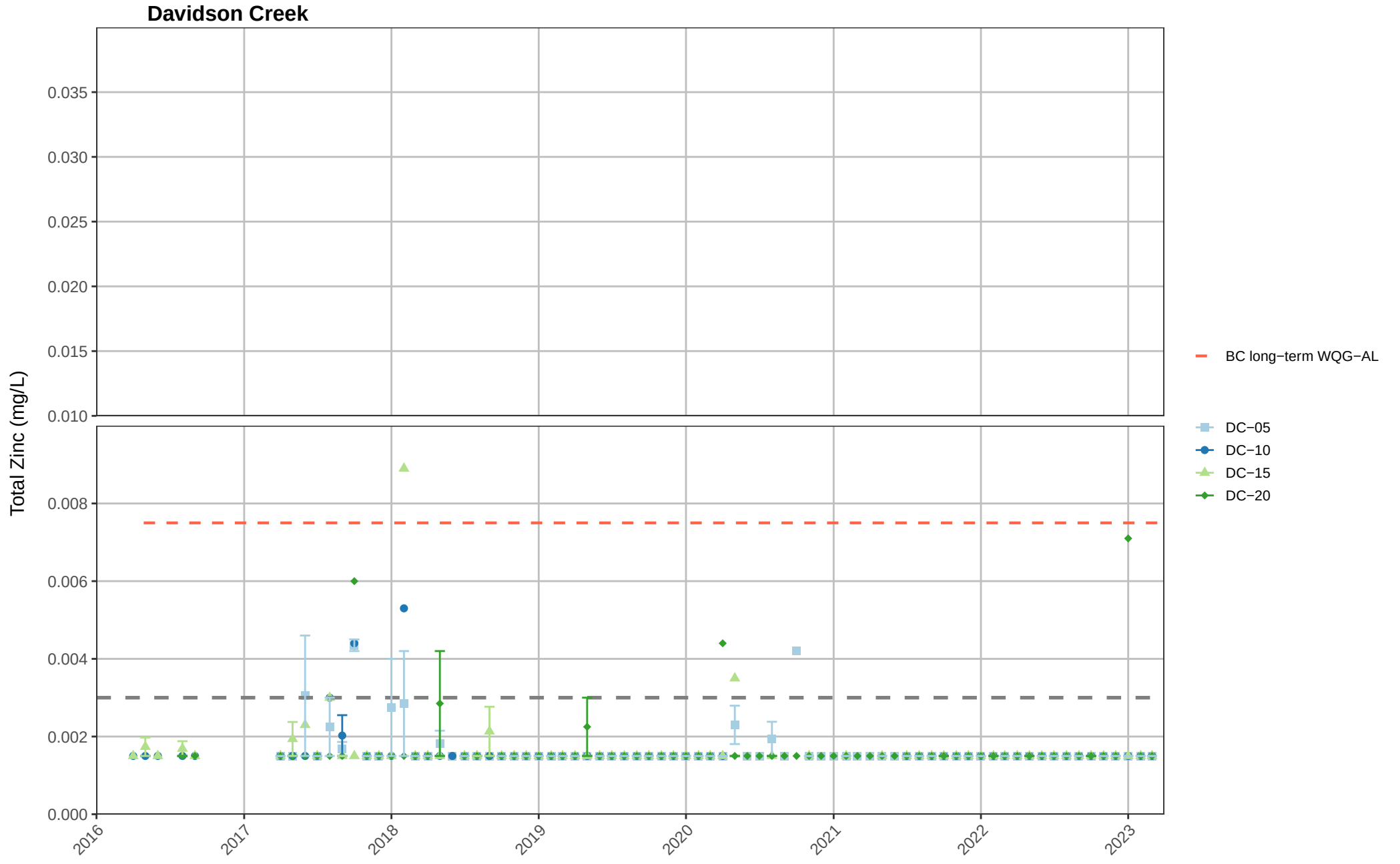
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

Appendix B−34.c: Monthly Mean Total Vanadium at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

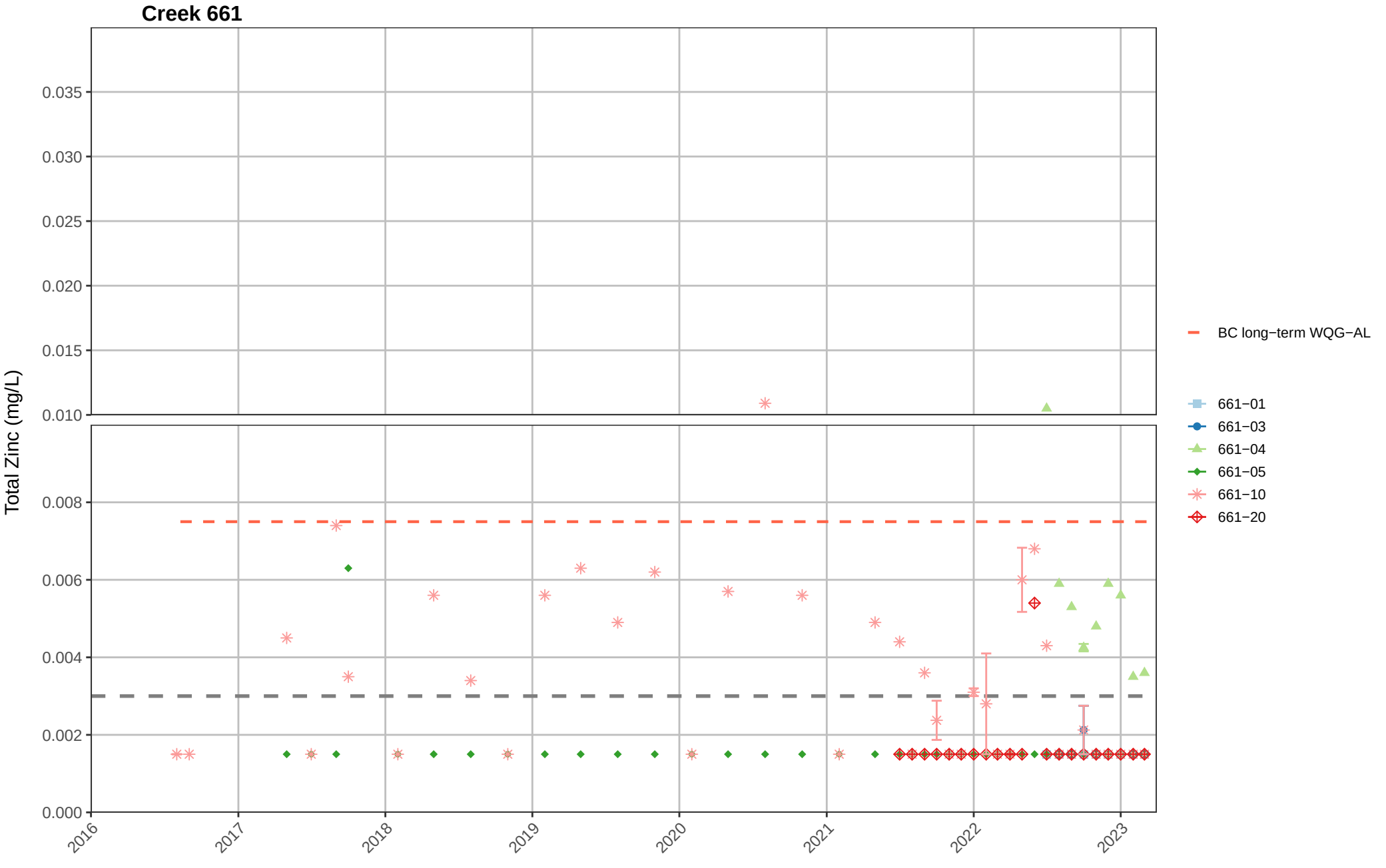
Appendix B−34.d: Monthly Mean Total Vanadium at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total zinc is hardness dependent.

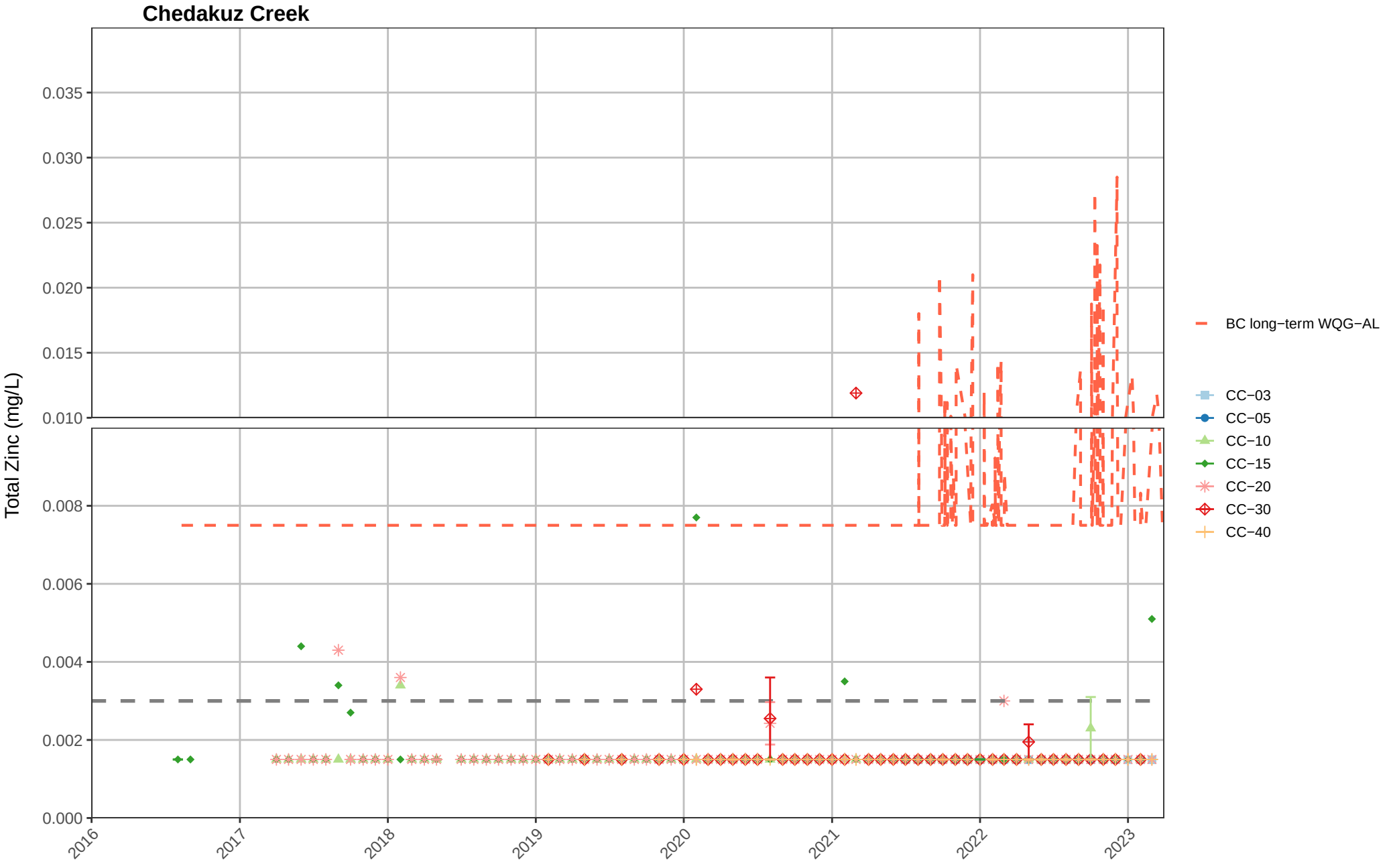
Appendix B−35.a: Monthly Mean Total Zinc at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total zinc is hardness dependent.

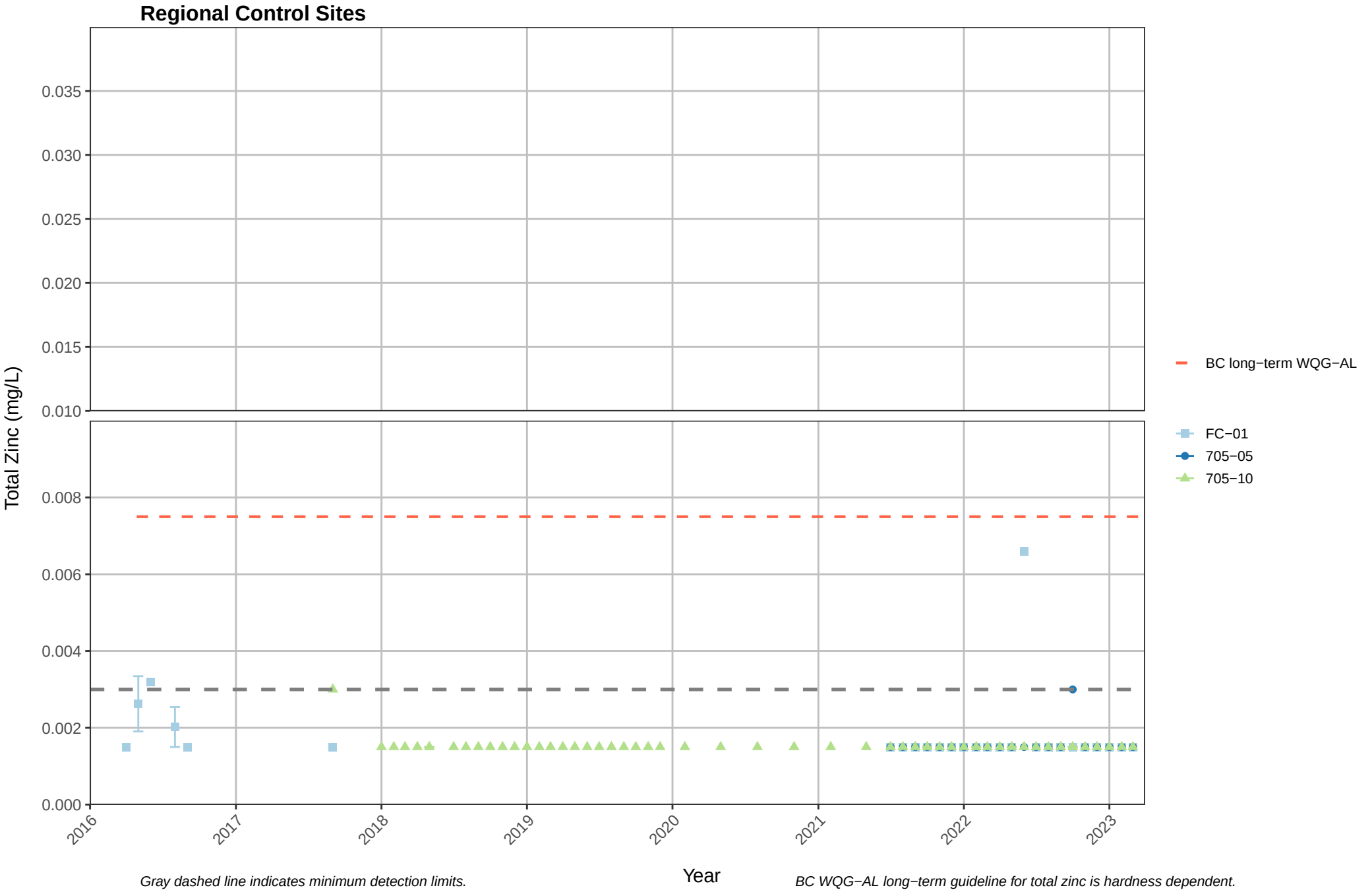
Appendix B−35.b: Monthly Mean Total Zinc at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total zinc is hardness dependent.

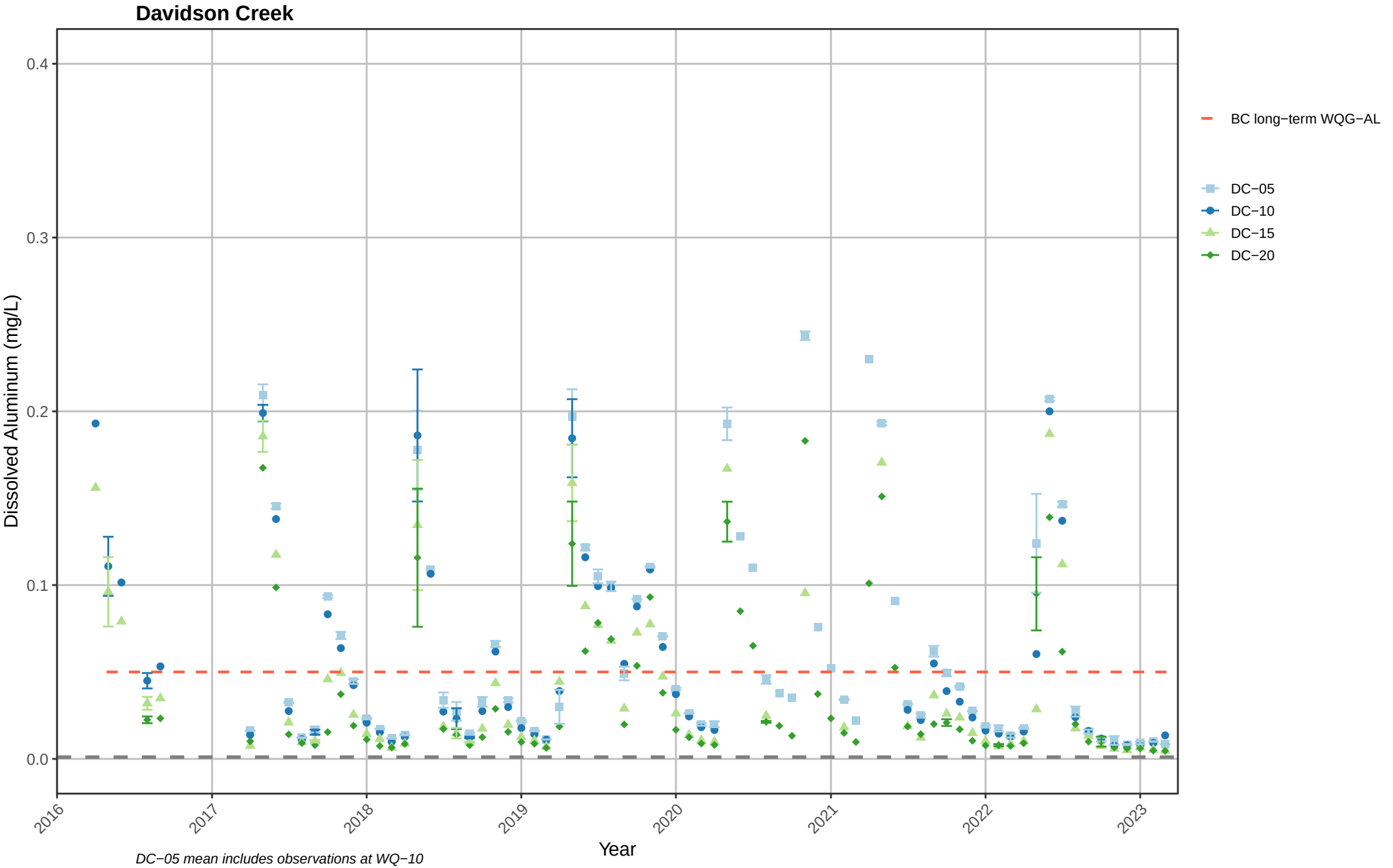
Appendix B−35.c: Monthly Mean Total Zinc at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for total zinc is hardness dependent.

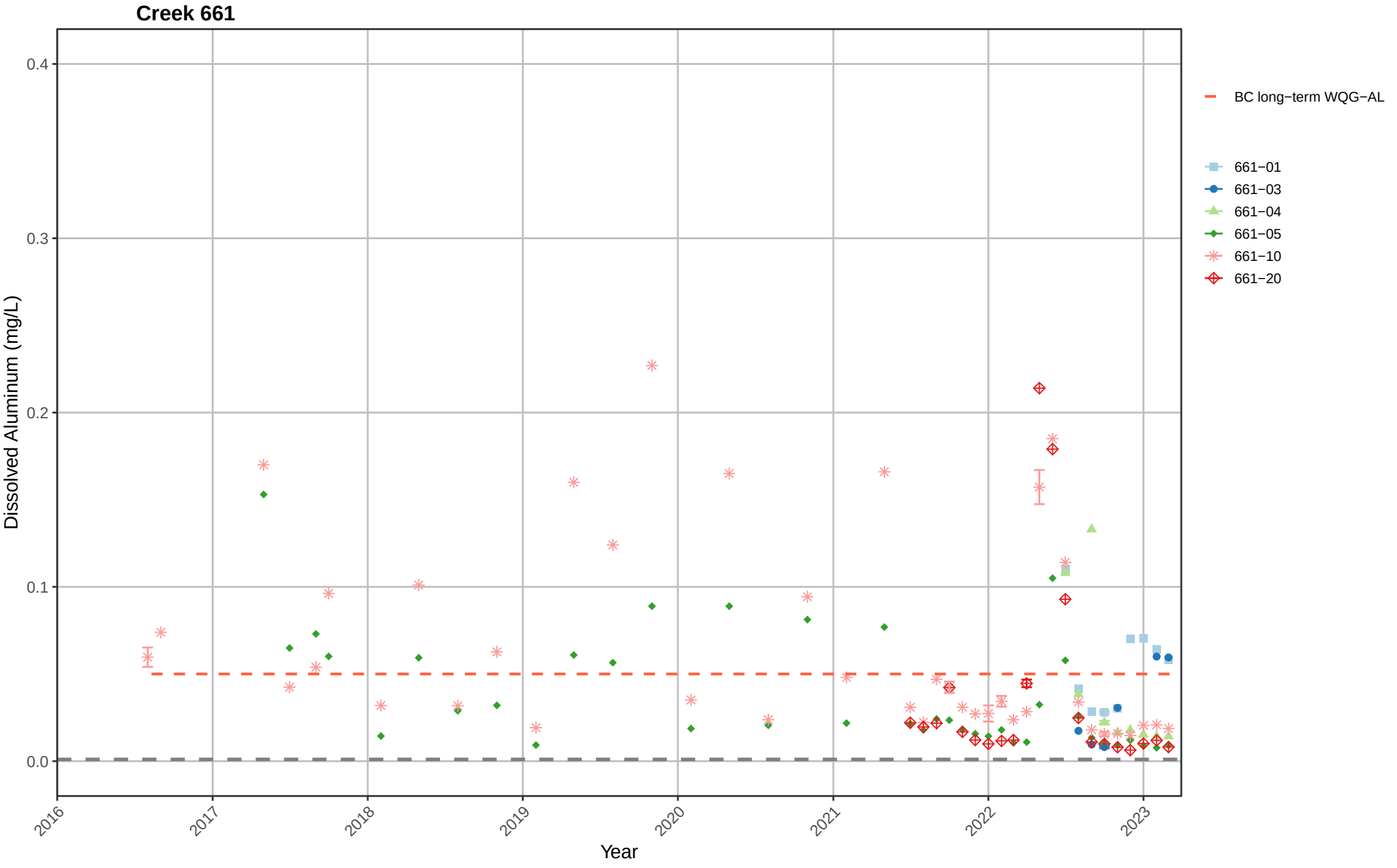
Appendix B−35.d: Monthly Mean Total Zinc at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limit.
Error bars represent standard error of the mean.
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for dissolved aluminum is pH dependent.
Proposed YDWL Standard for dissolved aluminum at DC−05 is
0.14 mg/L (April to July) / 0.05 mg/L (August to March).

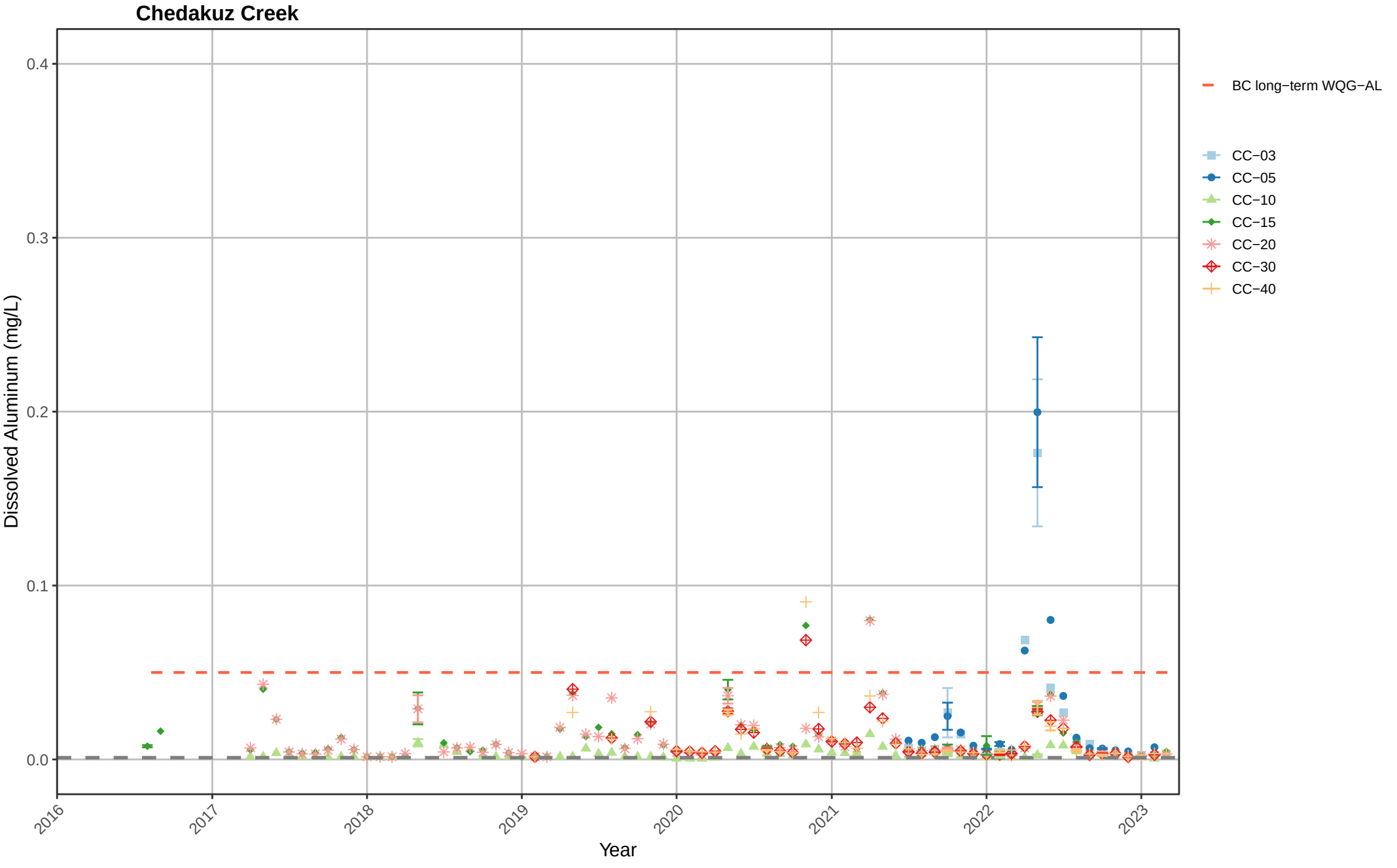
Appendix B−36.a: Monthly Mean Dissolved Aluminum at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limit.
Error bars represent standard error of the mean.
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for dissolved aluminum is pH dependent.

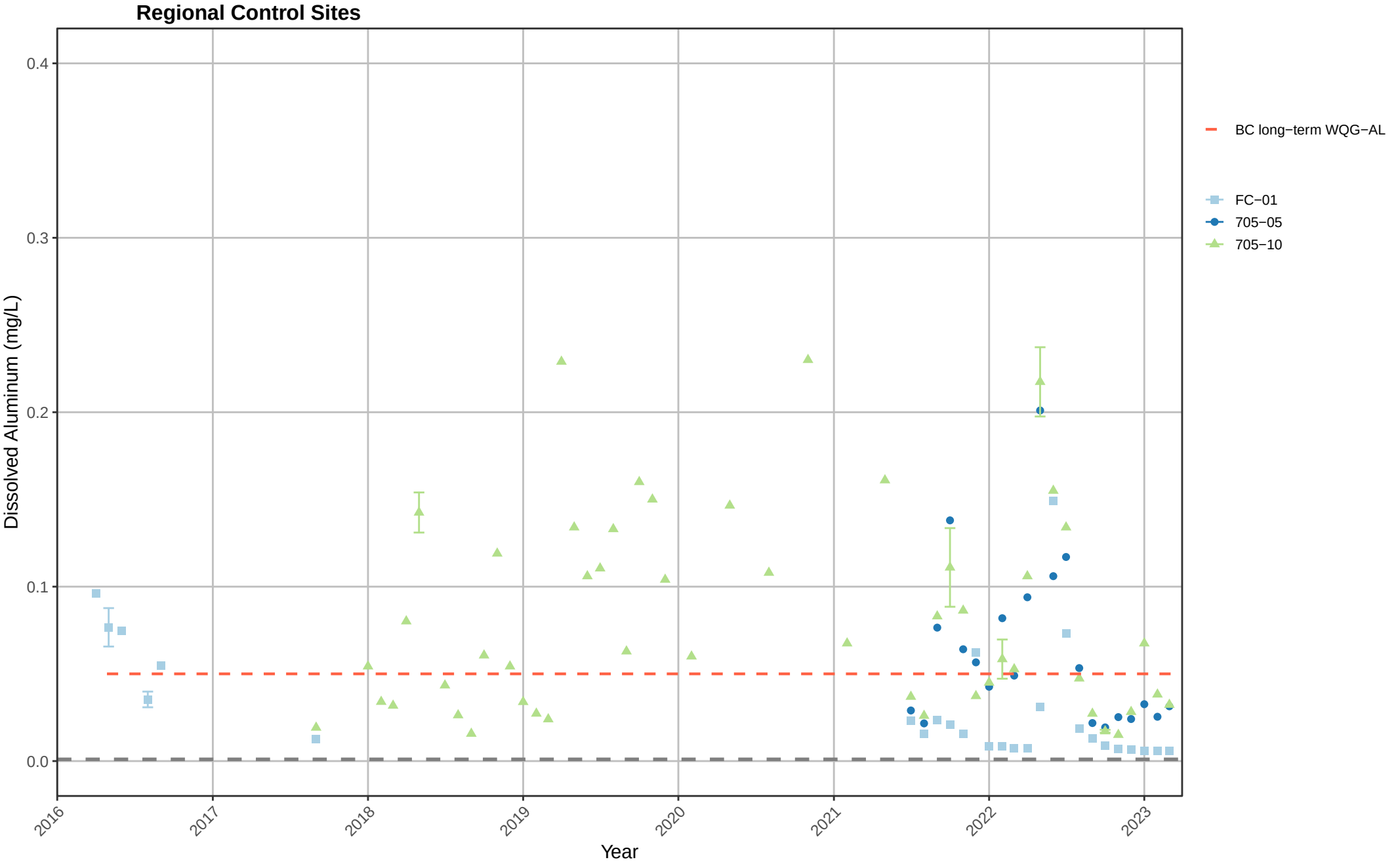
Appendix B−36.b: Monthly Mean Dissolved Aluminum at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limit.
Error bars represent standard error of the mean.
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for dissolved aluminum is pH dependent.
Proposed YDWL Standard for dissolved aluminum at CC−15 is
0.041 mg/L (April to July) / 0.029 mg/L (August to March)

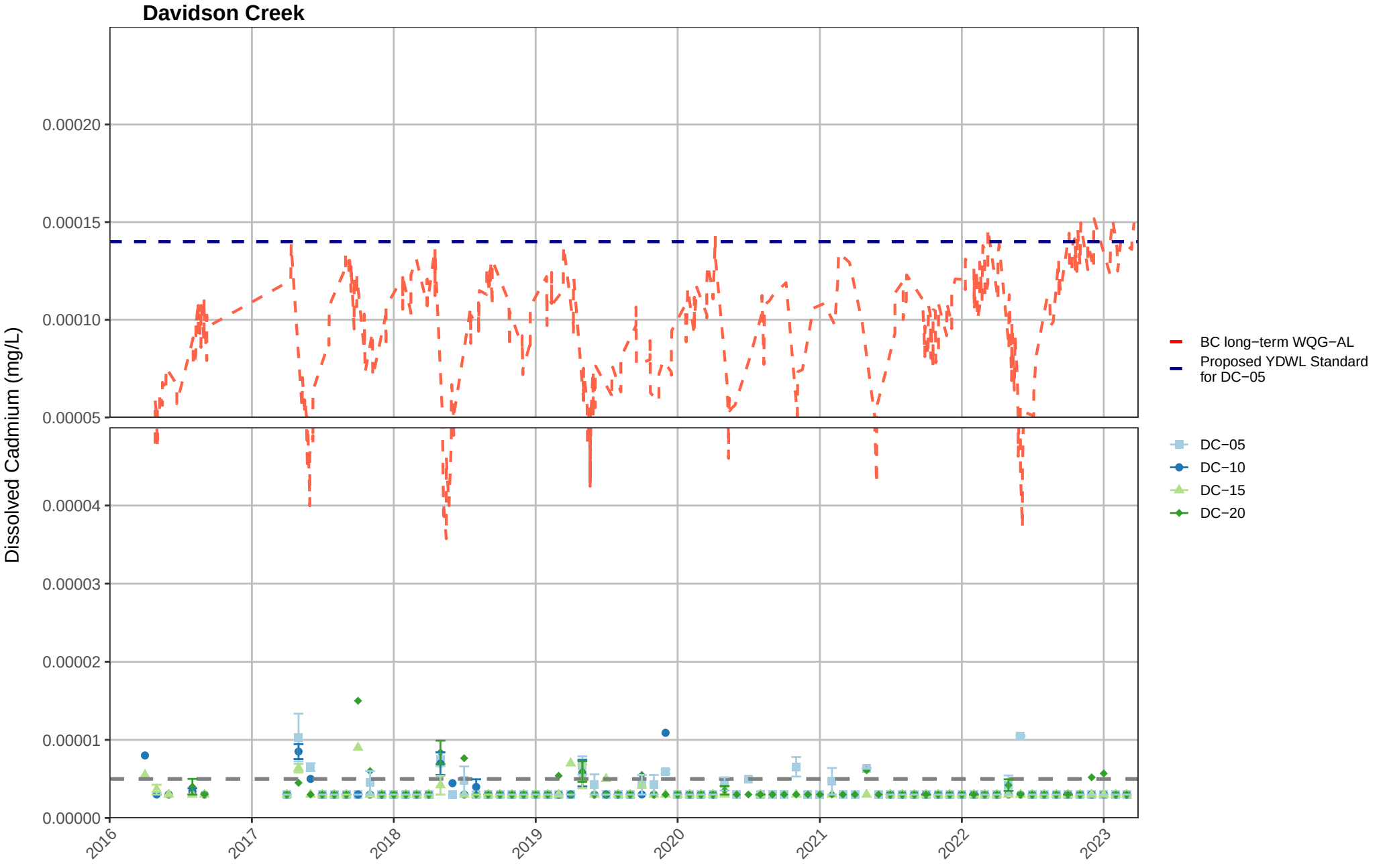
Appendix B−36.c: Monthly Mean Dissolved Aluminum at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limit.
Error bars represent standard error of the mean.
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for dissolved aluminum is pH dependent.

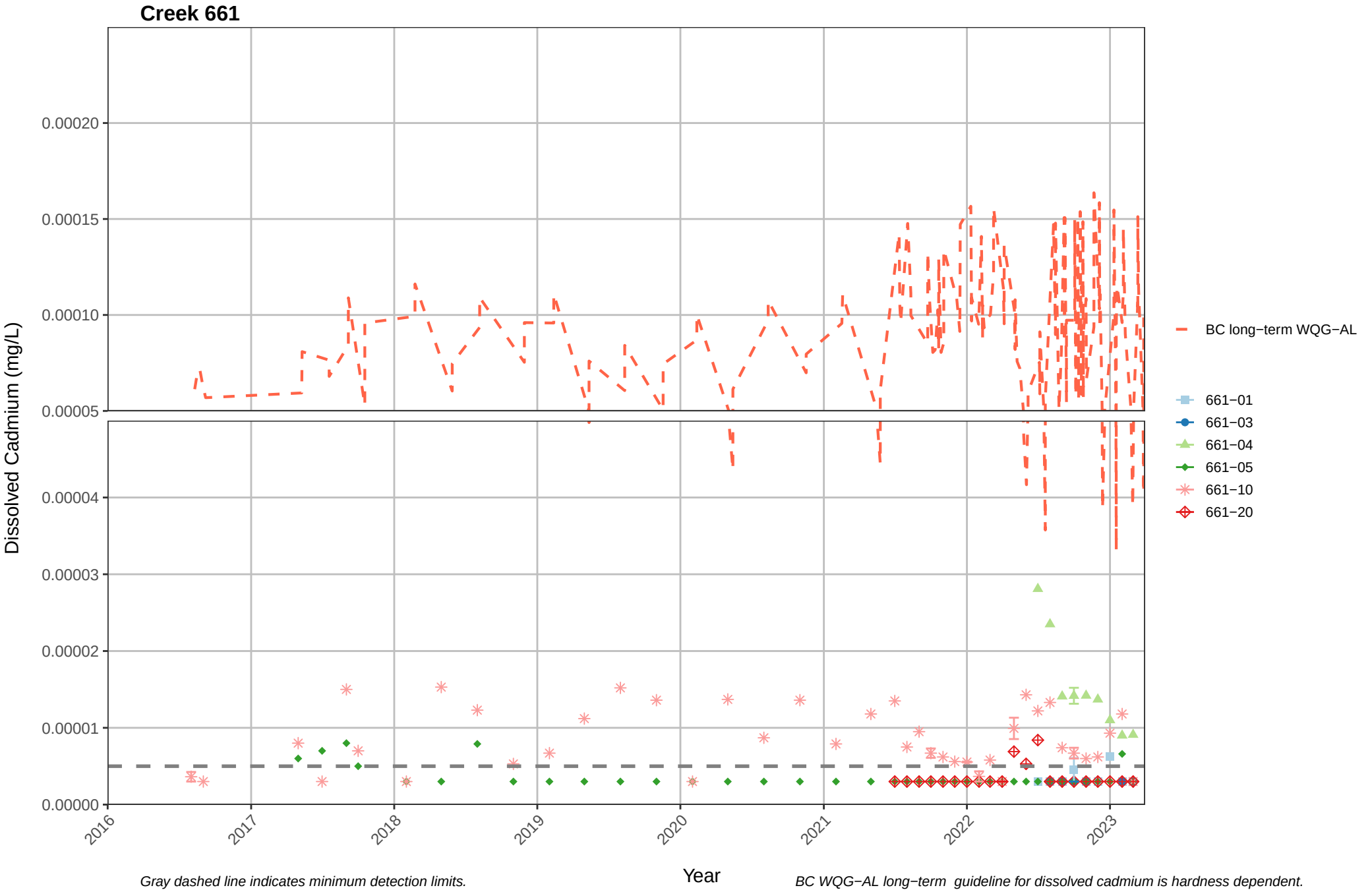
Appendix B−36.d: Monthly Mean Dissolved Aluminum at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for dissolved cadmium is hardness dependent.
Proposed YDWL Standard for dissolved cadmium at DC−05 is 0.00014 mg/L.

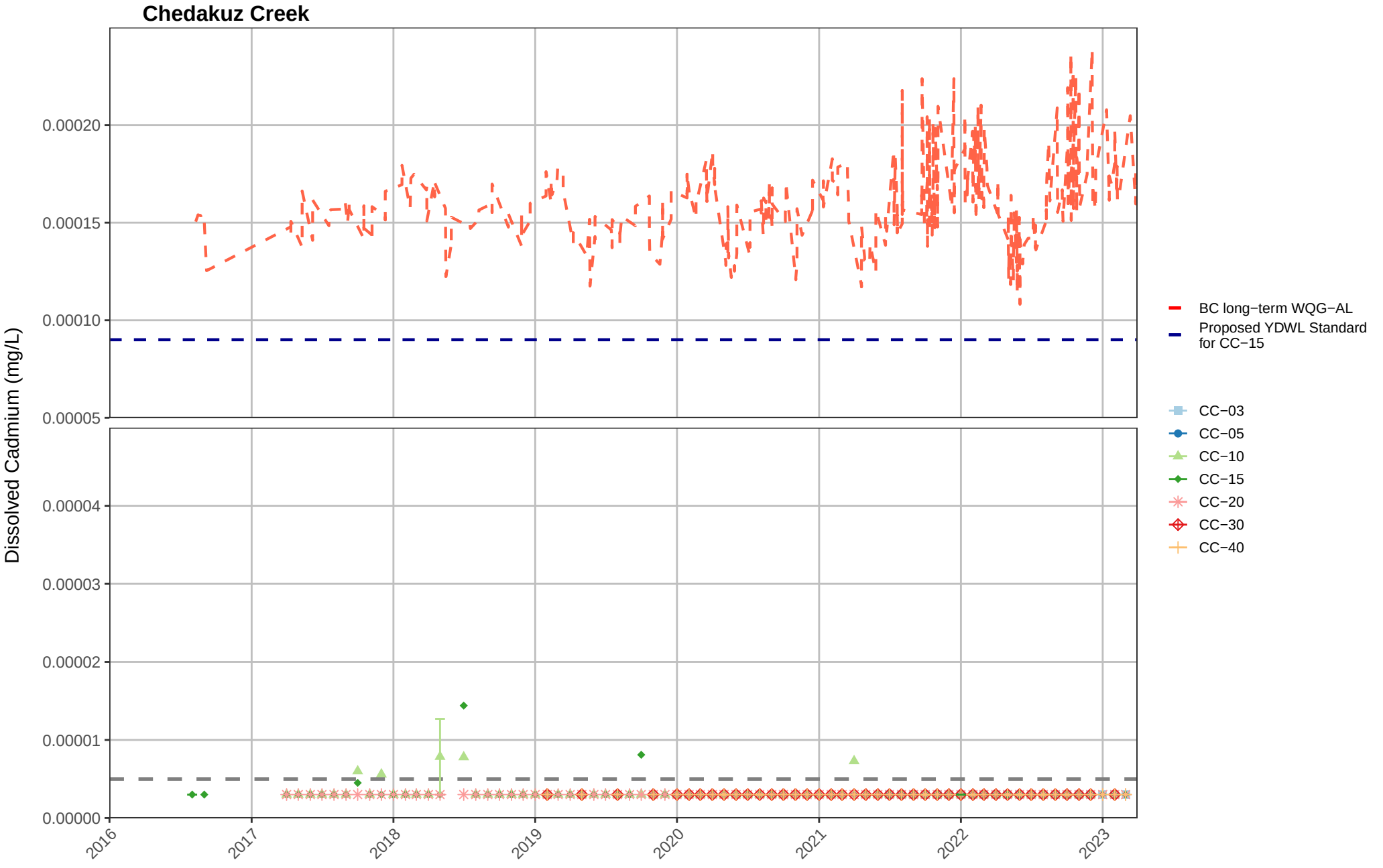
Appendix B−37.a: Monthly Mean Dissolved Cadmium at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for dissolved cadmium is hardness dependent.

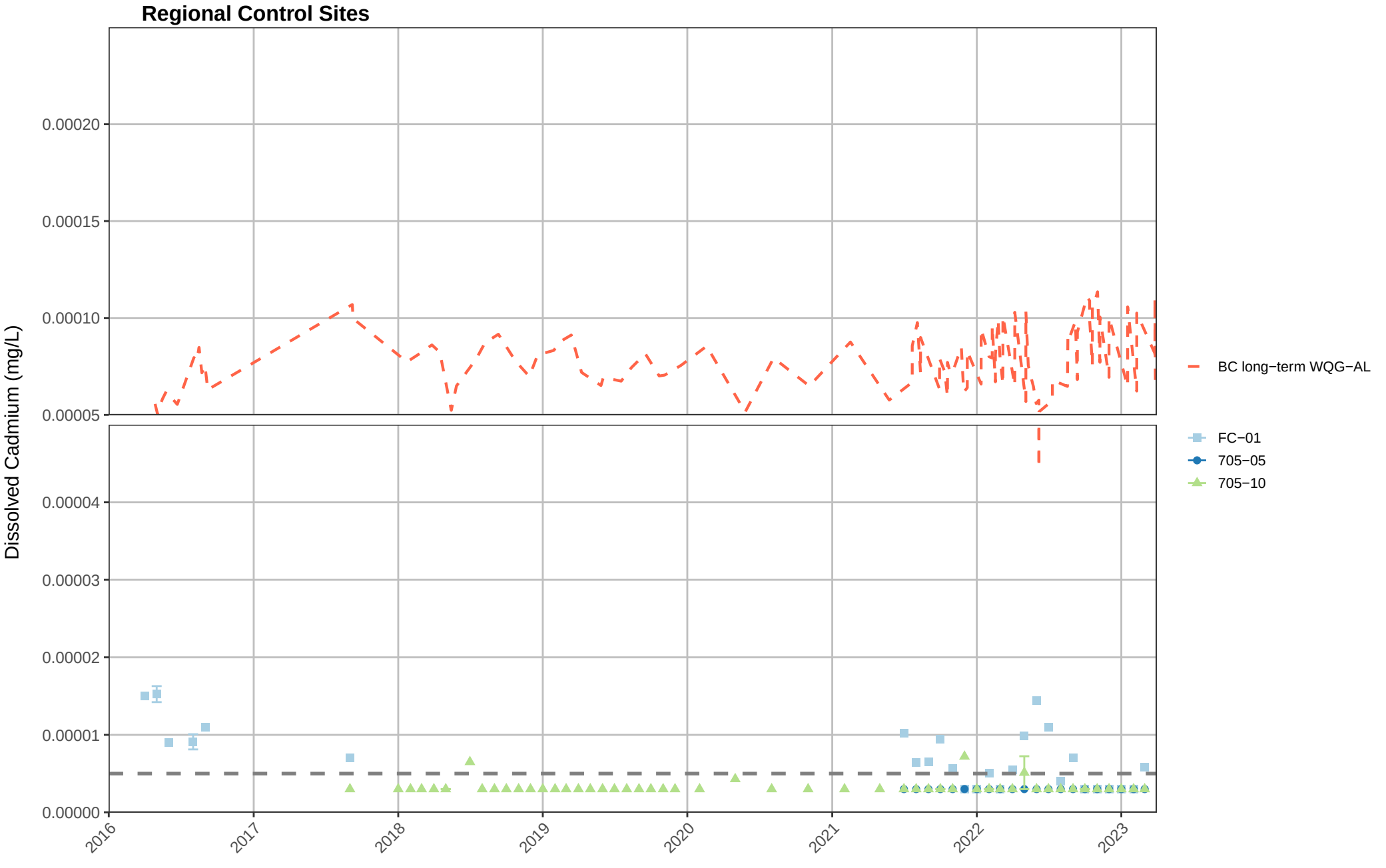
Appendix B−37.b: Monthly Mean Dissolved Cadmium at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for dissolved cadmium is hardness dependent.
Proposed YDWL Standard for dissolved cadmium at CC−15 is 0.00009 mg/L.

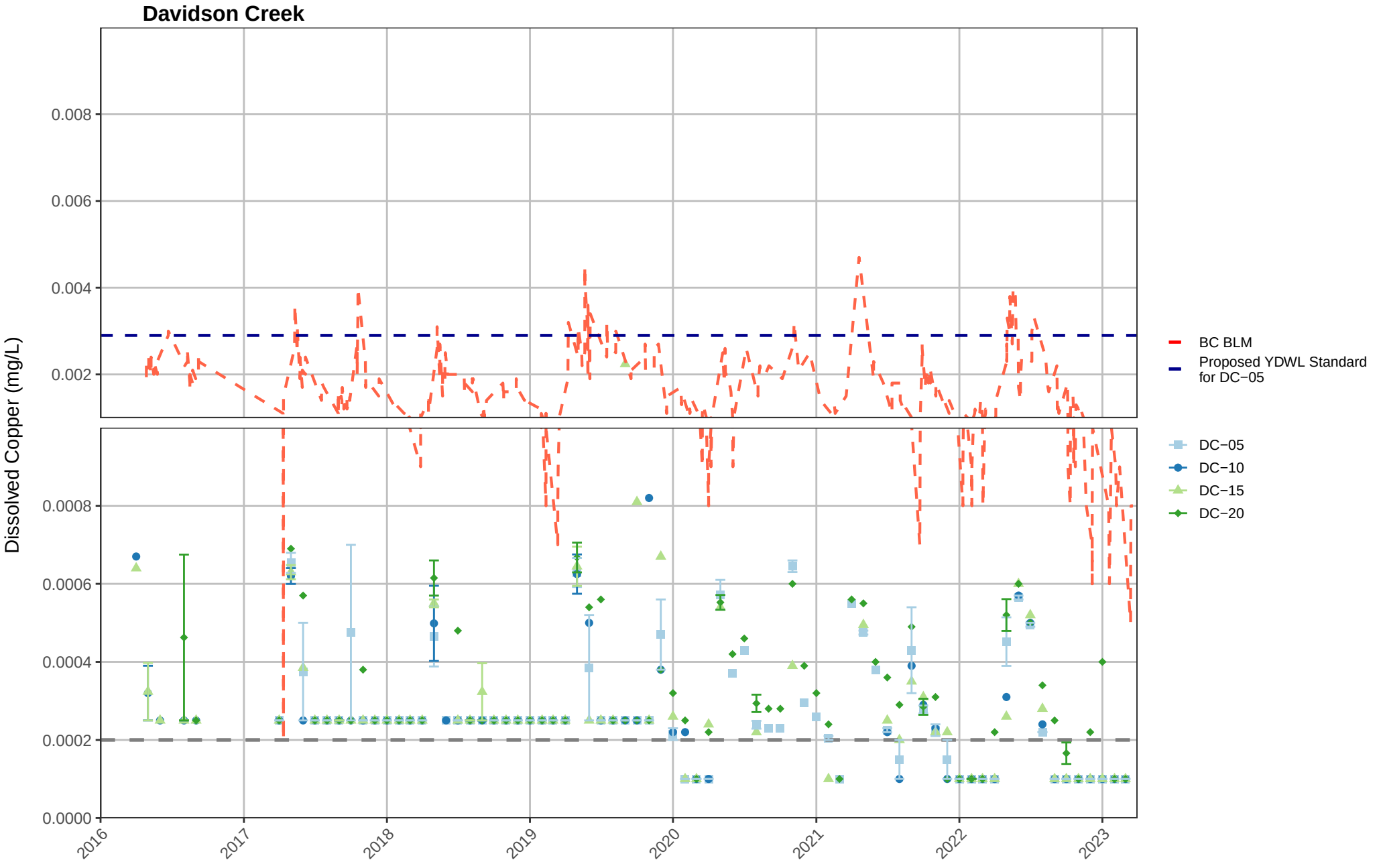
Appendix B−37.c: Monthly Mean Dissolved Cadmium at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term guideline for dissolved cadmium is hardness dependent.

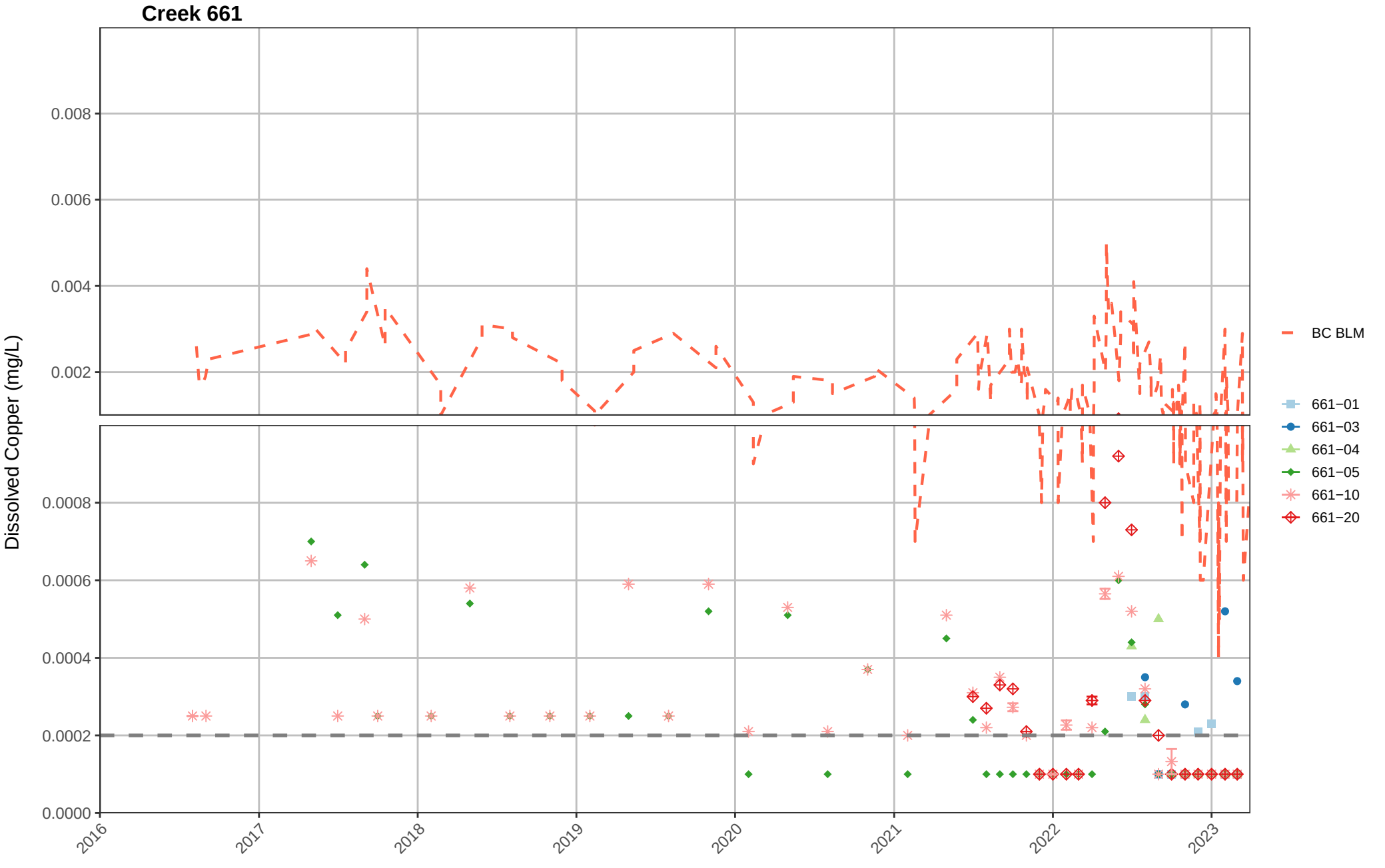
Appendix B−37.d: Monthly Mean Dissolved Cadmium at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

The dissolved copper long−term guideline is calculated using the BC BLM.
Proposed YDWL Standard for dissolved copper at DC−05 is 0.0029 mg/L.

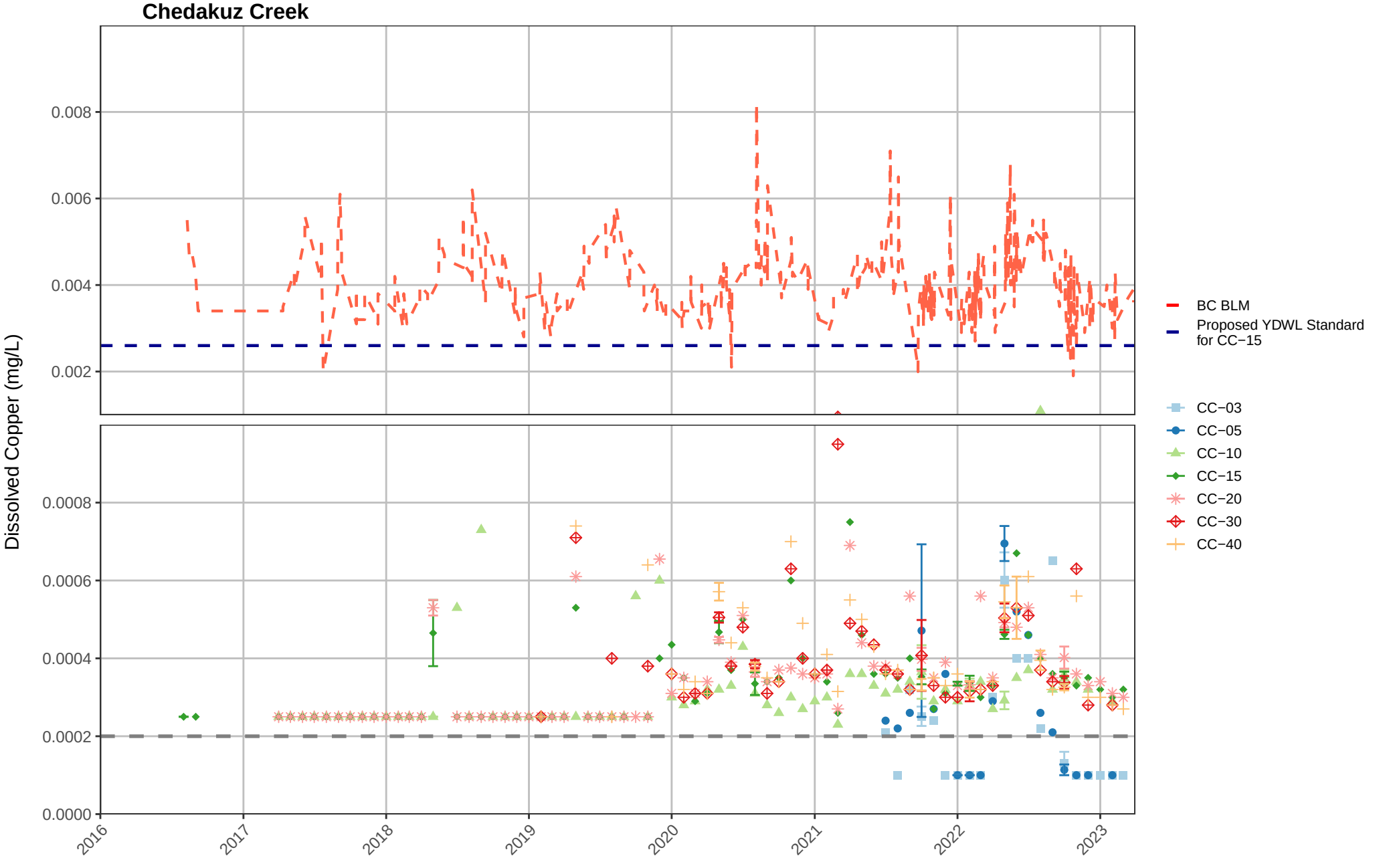
Appendix B−38.a: Monthly Mean Dissolved Copper at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

The dissolved copper long−term guideline is calculated using the BC BLM.

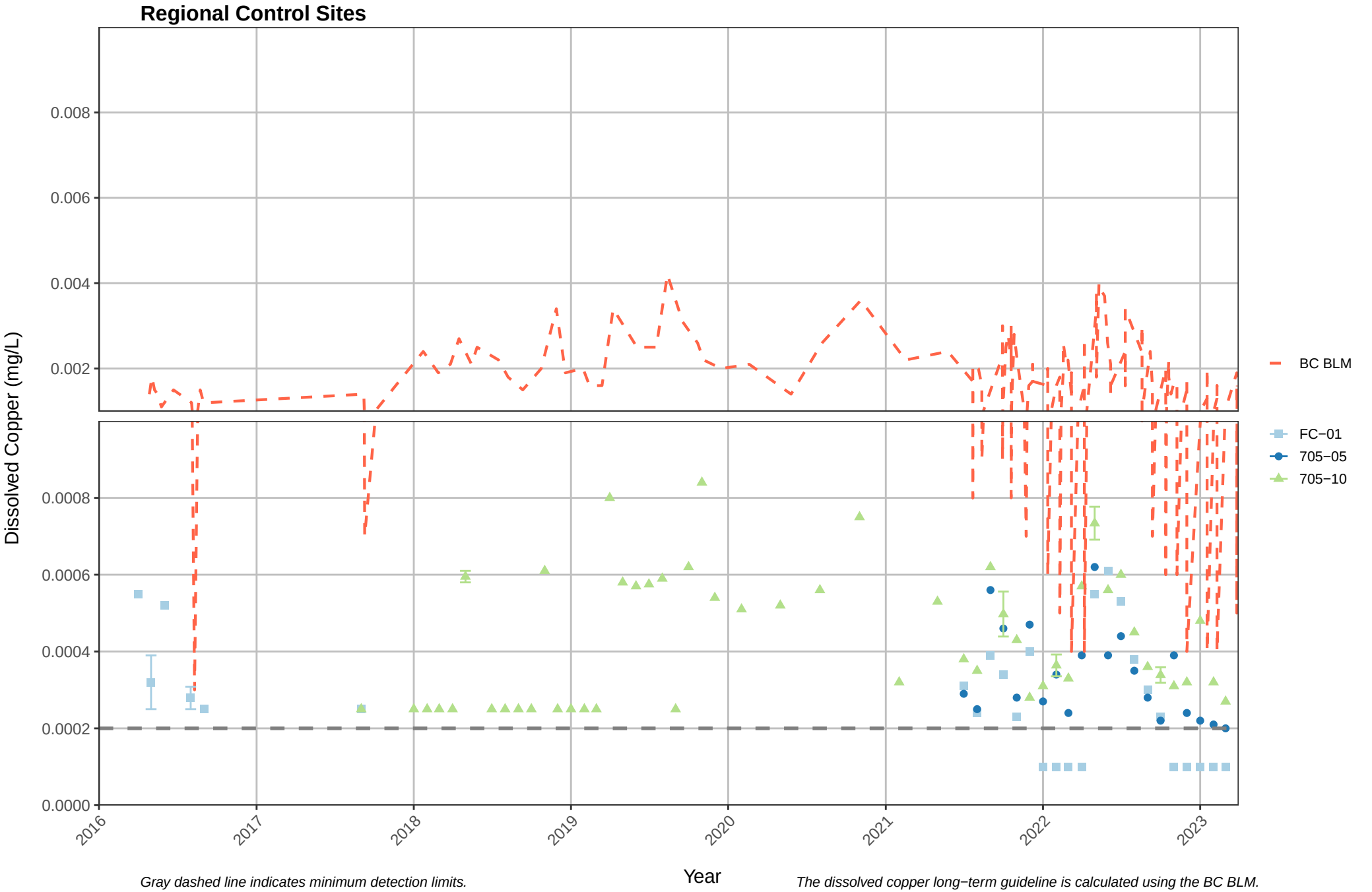
Appendix B−38.b: Monthly Mean Dissolved Copper at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

The dissolved copper long−term guideline is calculated using the BC BLM.
Proposed YDWL Standard for dissolved copper at CC−15 is 0.0026 mg/L.

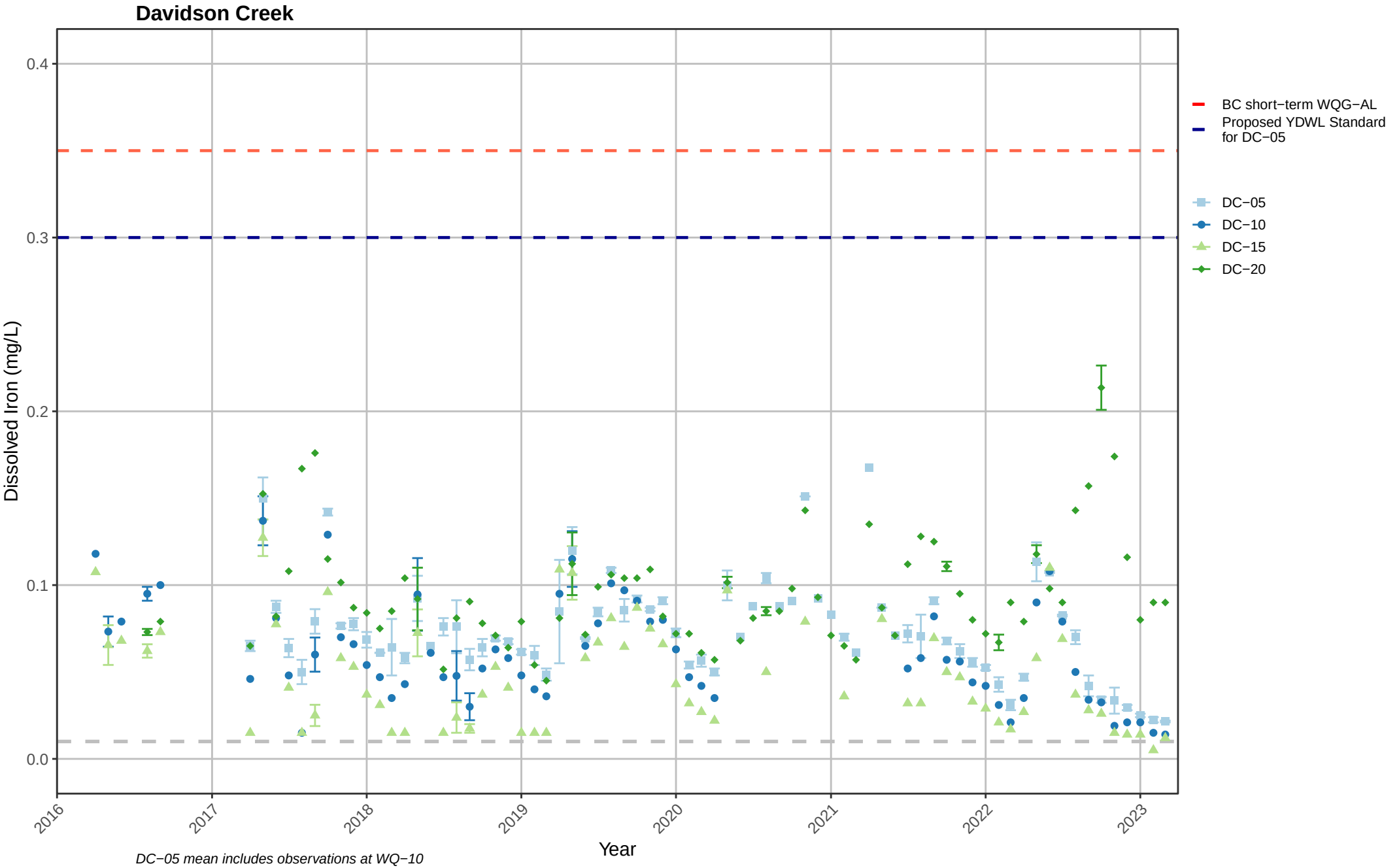
Appendix B−38.c: Monthly Mean Dissolved Copper at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

The dissolved copper long−term guideline is calculated using the BC BLM.

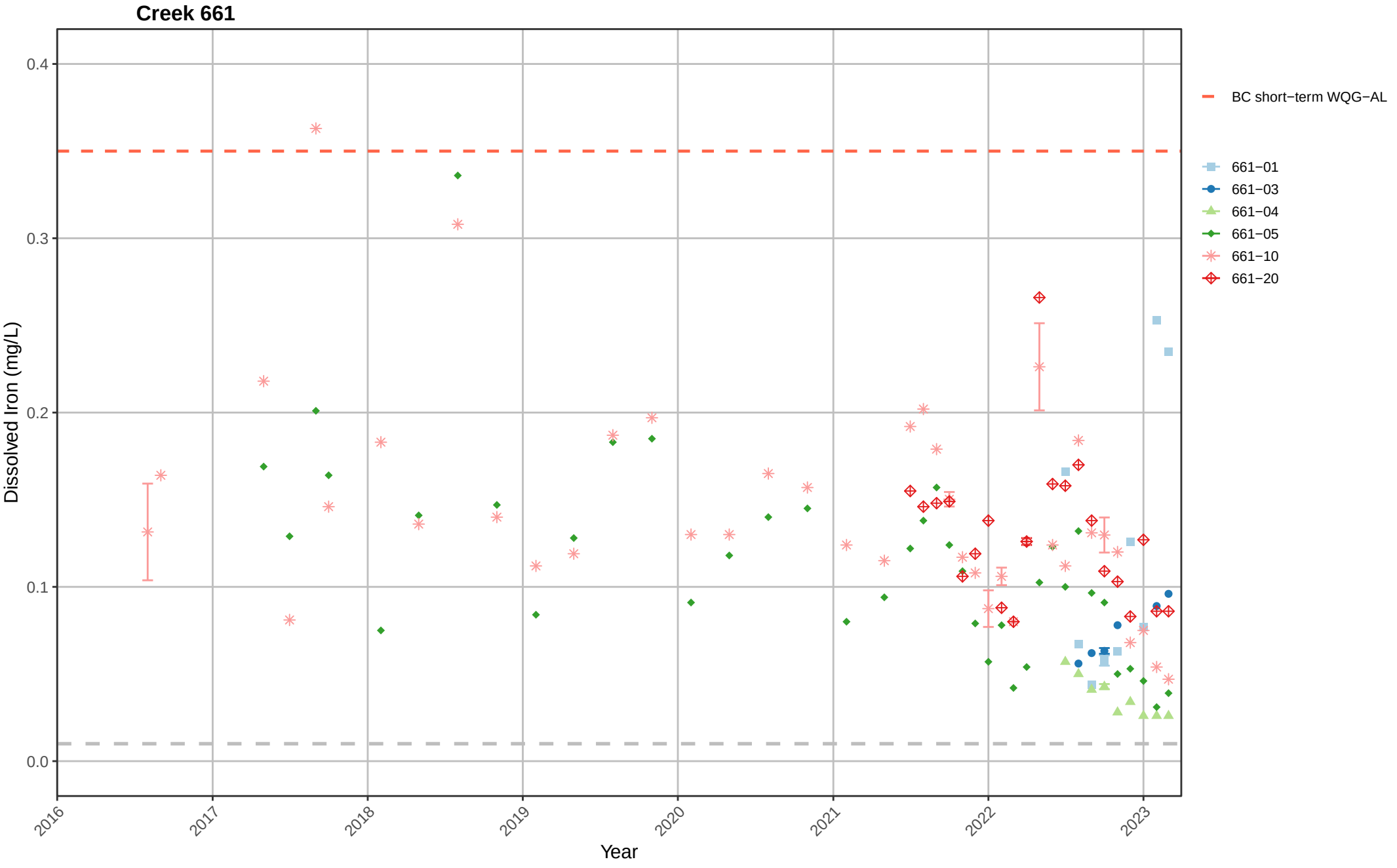
Appendix B−38.d: Monthly Mean Dissolved Copper at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL short−term guideline for dissolved iron = 0.35 mg/L.
Proposed YDWL Standard for dissolved iron at DC−05 is 0.3 mg/L.

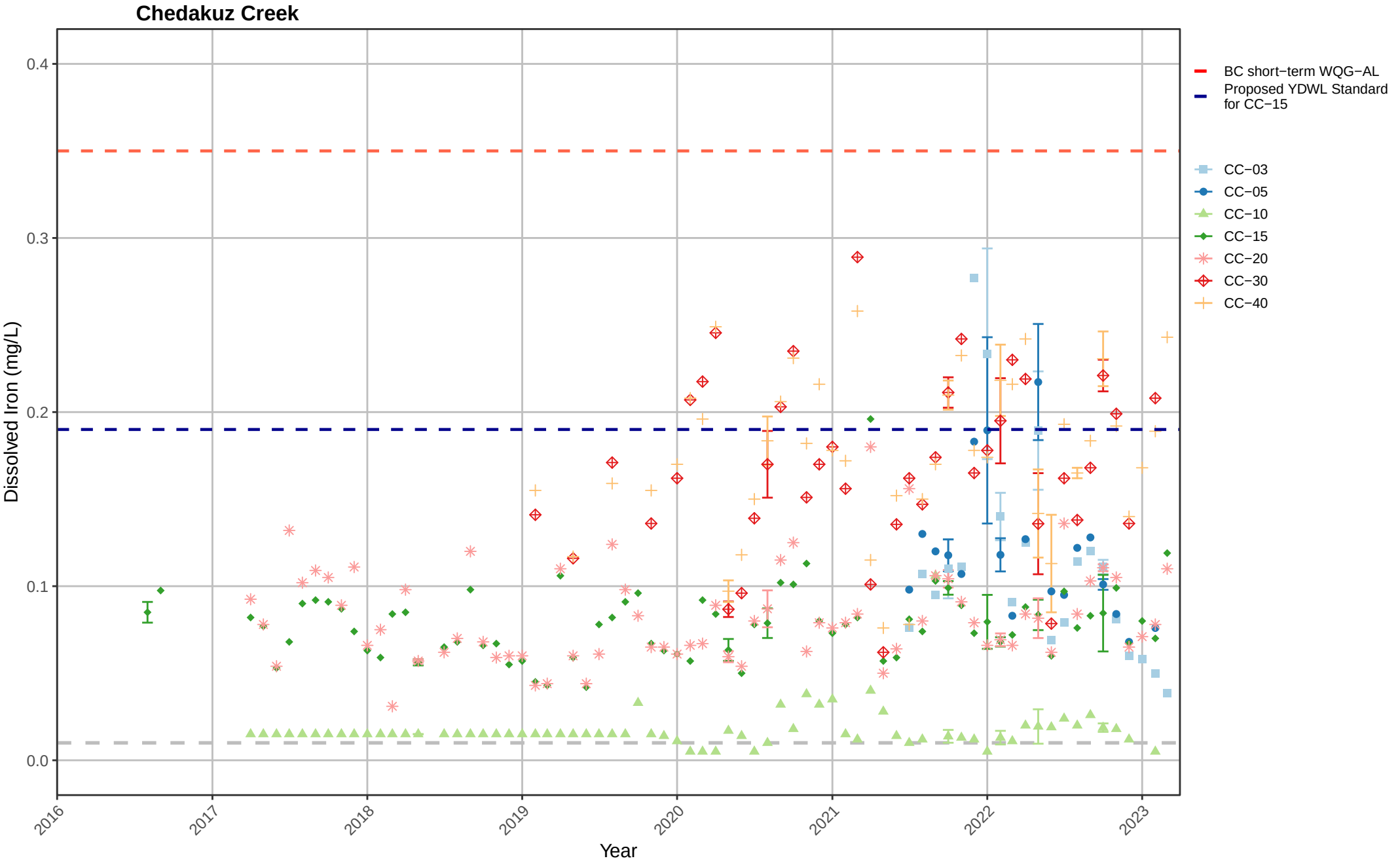
Appendix B−39.a: Monthly Mean Dissolved Iron at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL short−term guideline for dissolved iron = 0.35 mg/L.

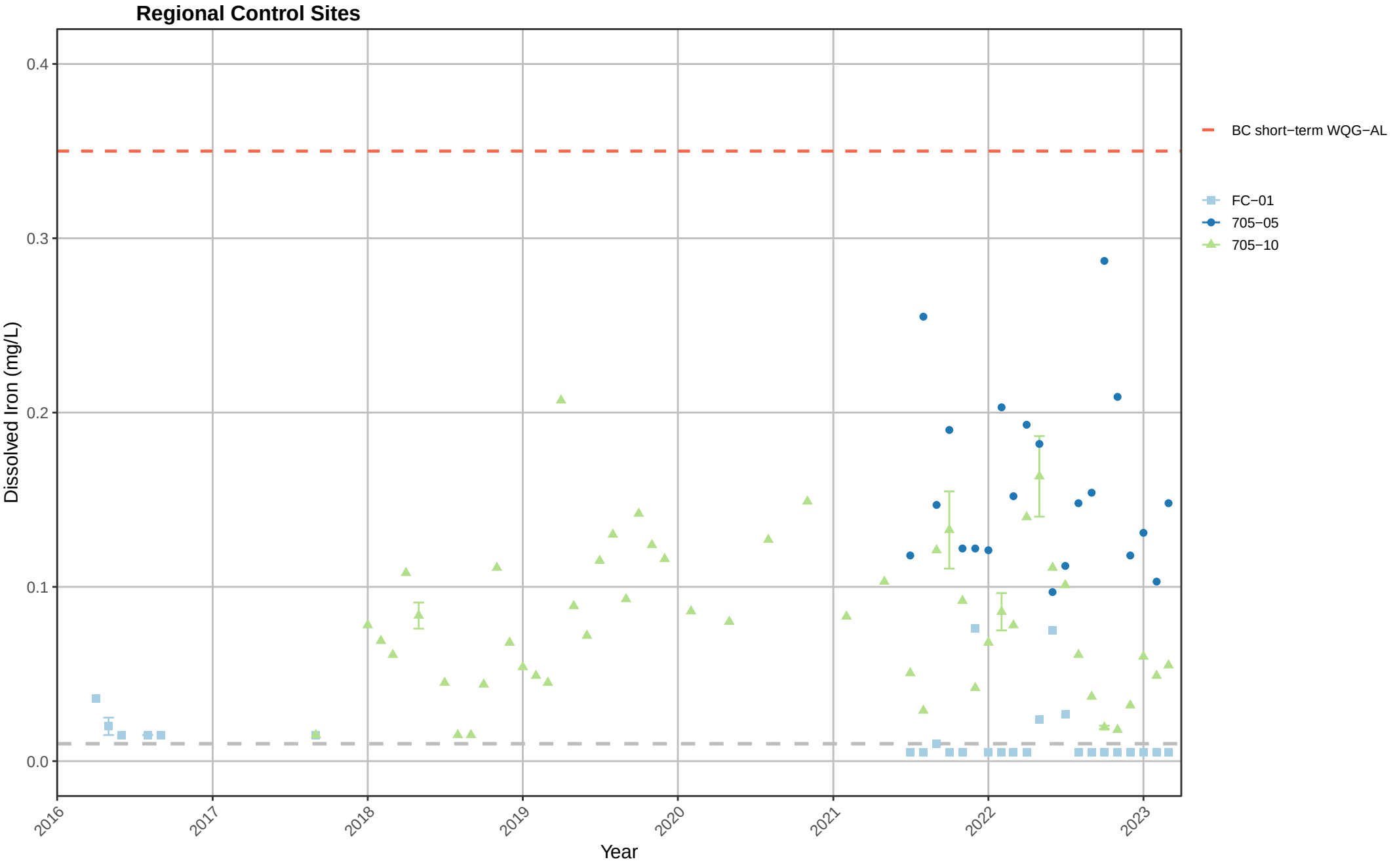
Appendix B−39.b: Monthly Mean Dissolved Iron at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL short−term guideline for dissolved iron = 0.35 mg/L.
Proposed YDWL Standard for dissolved iron at CC−15 is 0.19 mg/L.

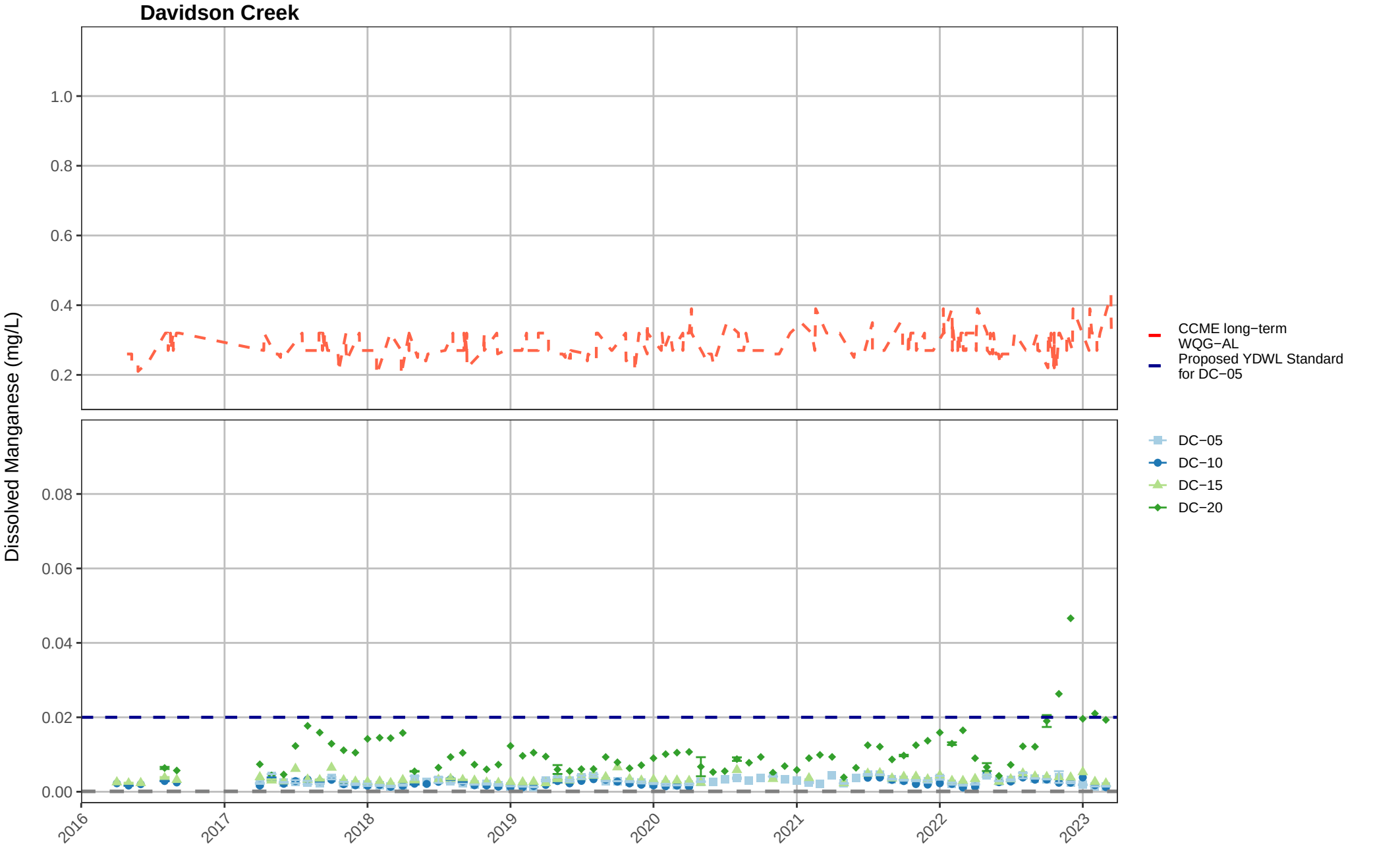
Appendix B−39.c: Monthly Mean Dissolved Iron at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL short−term guideline for dissolved iron = 0.35 mg/L.

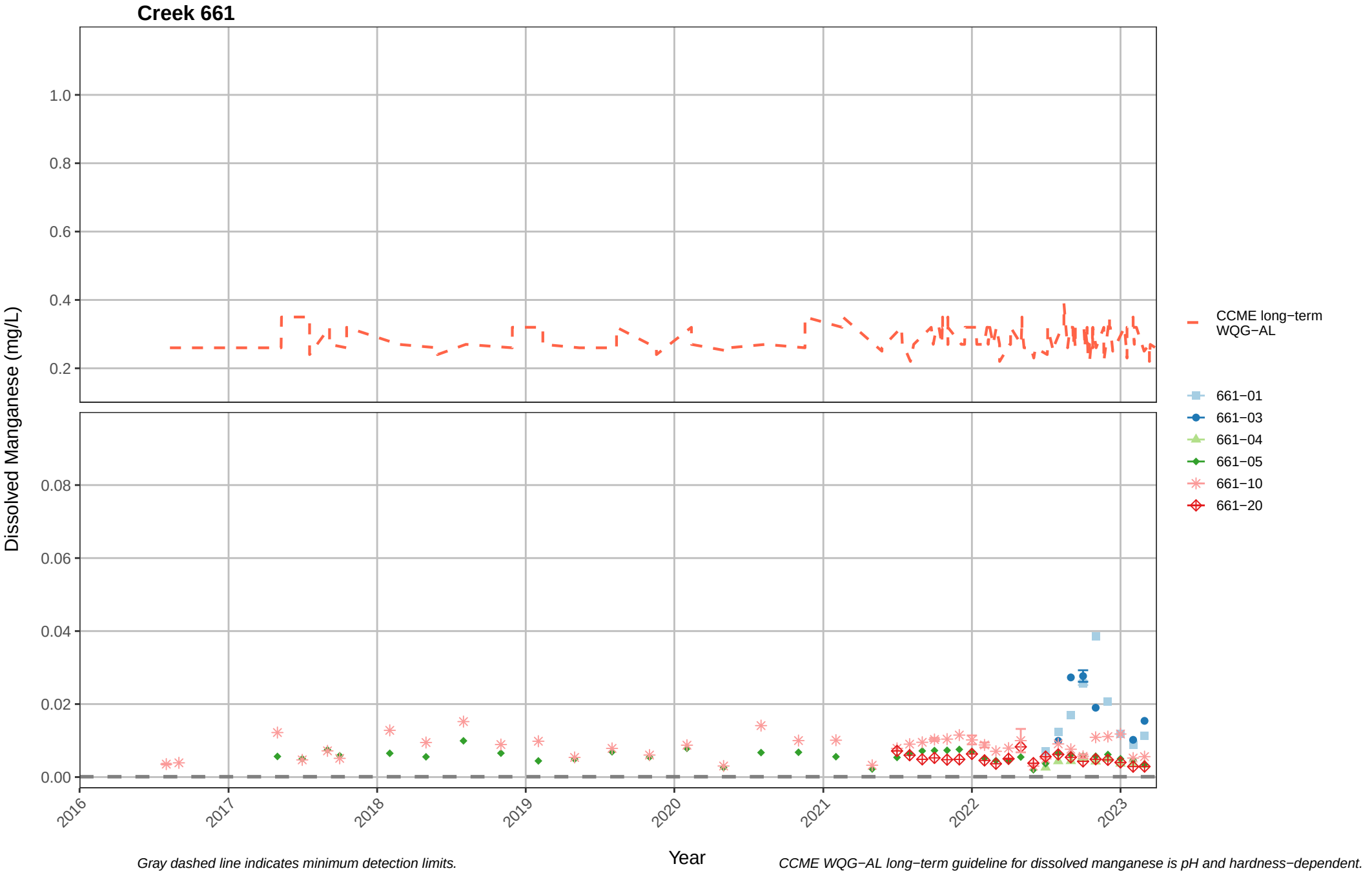
Appendix B−39.d: Monthly Mean Dissolved Iron at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for dissolved manganese is pH and hardness−dependent.
Proposed YDWL Standard for dissolved manganese at DC−05 is 0.02 mg/L.

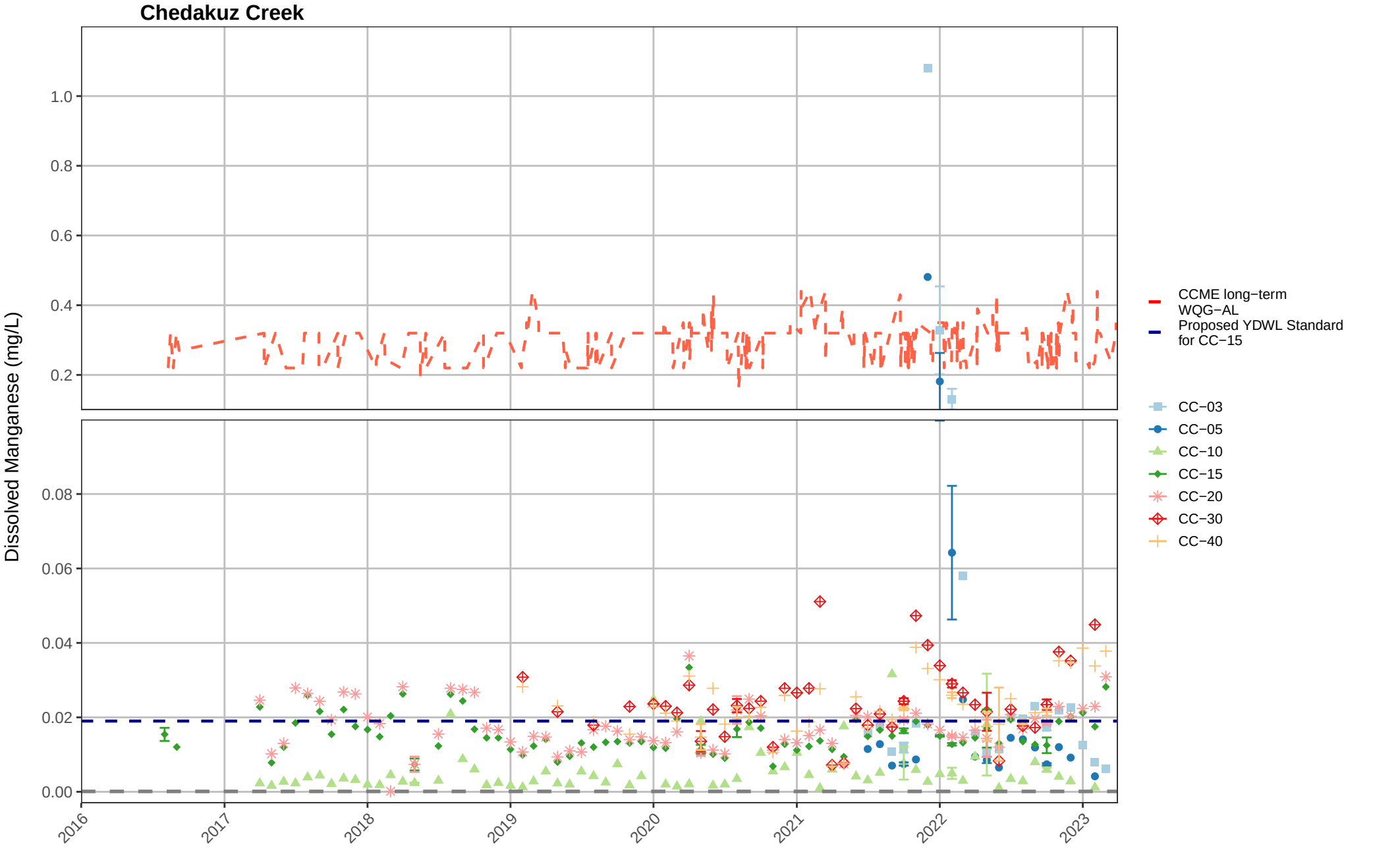
Appendix B−40.a: Monthly Mean Dissolved Manganese at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for dissolved manganese is pH and hardness−dependent.

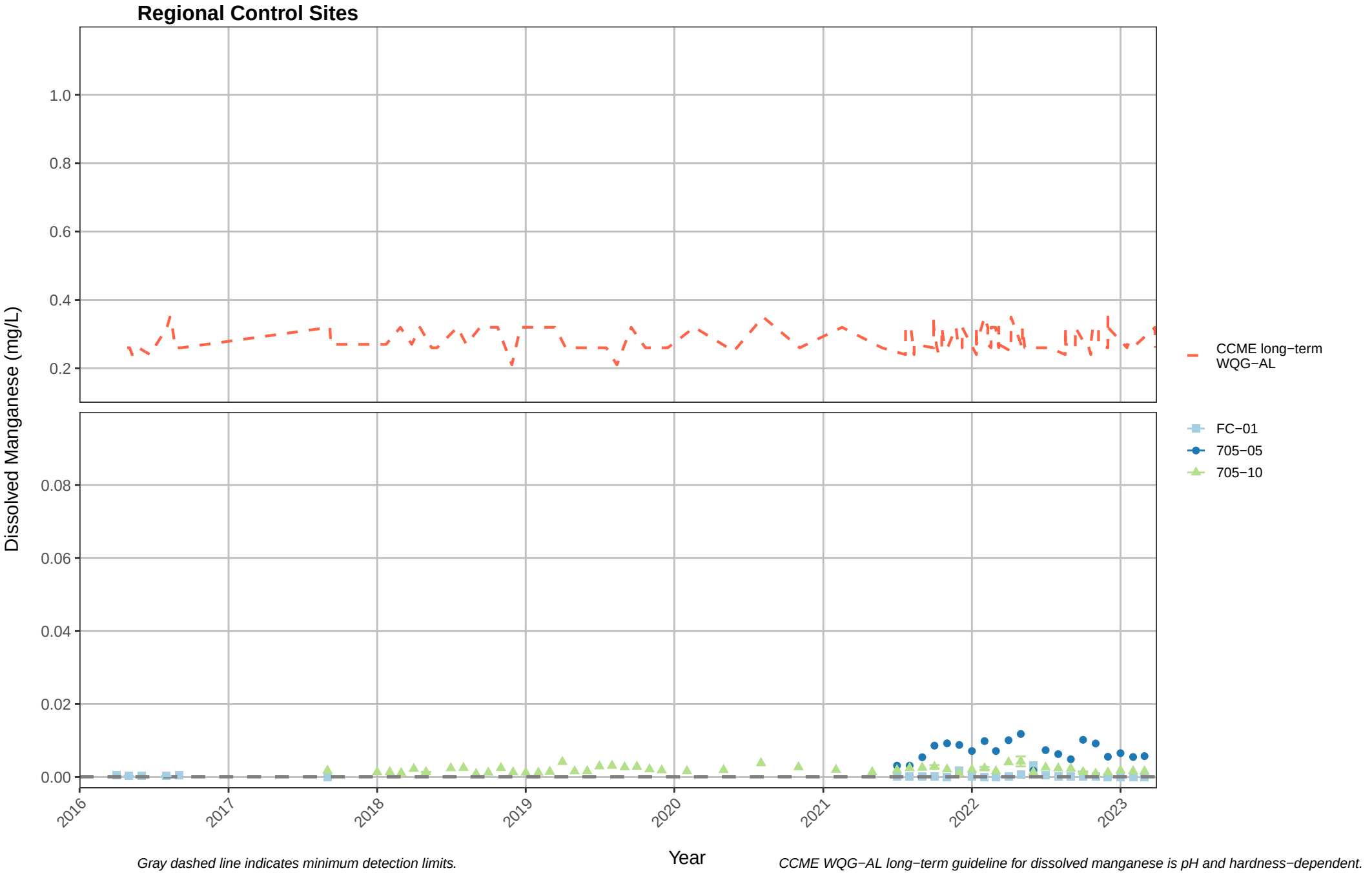
Appendix B−40.b: Monthly Mean Dissolved Manganese at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for dissolved manganese is pH and hardness−dependent.
Proposed YDWL Standard for dissolved manganese at CC−15 is 0.019 mg/L.

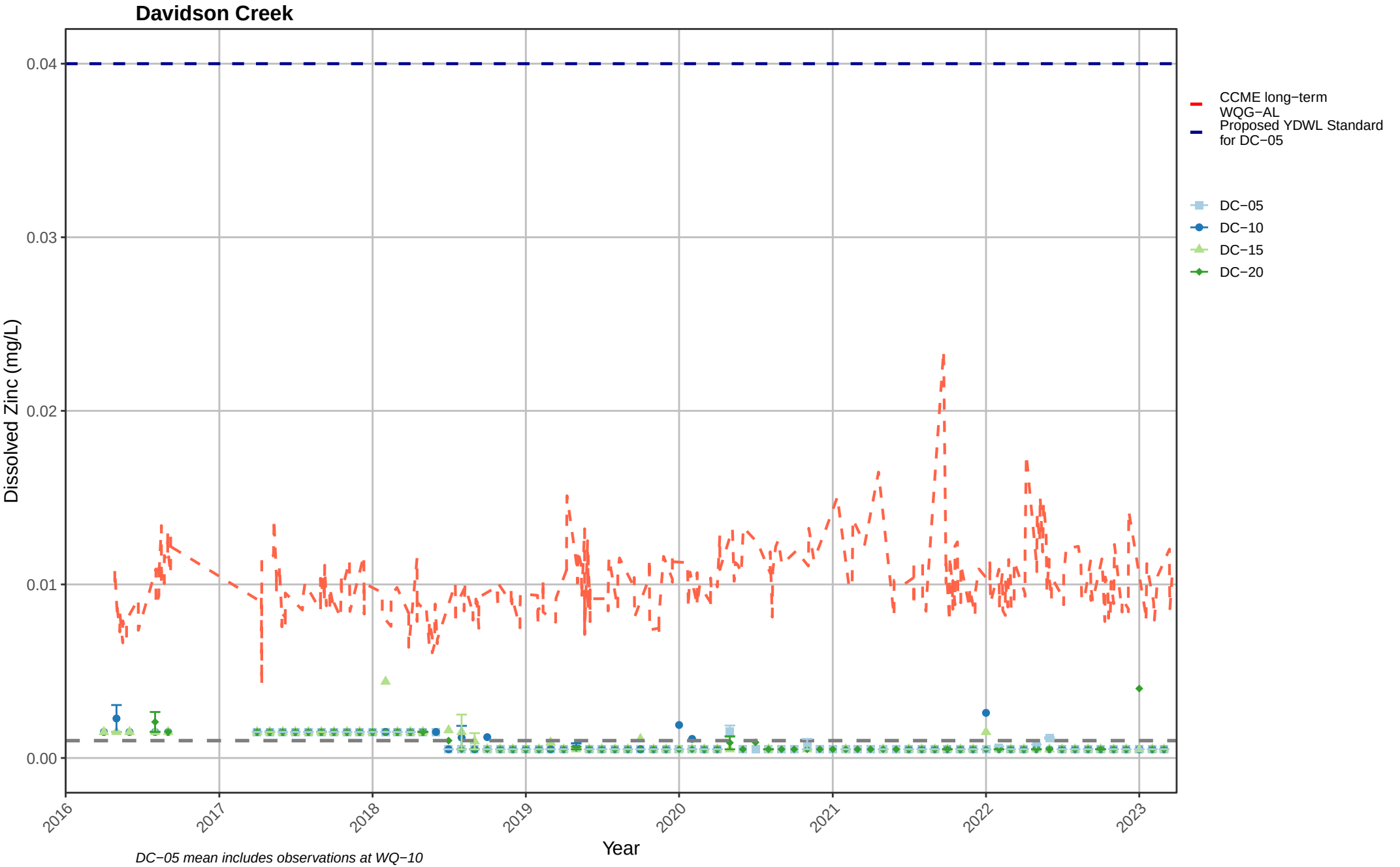
Appendix B−40.c: Monthly Mean Dissolved Manganese at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

CCME WQG−AL long−term guideline for dissolved manganese is pH and hardness−dependent.

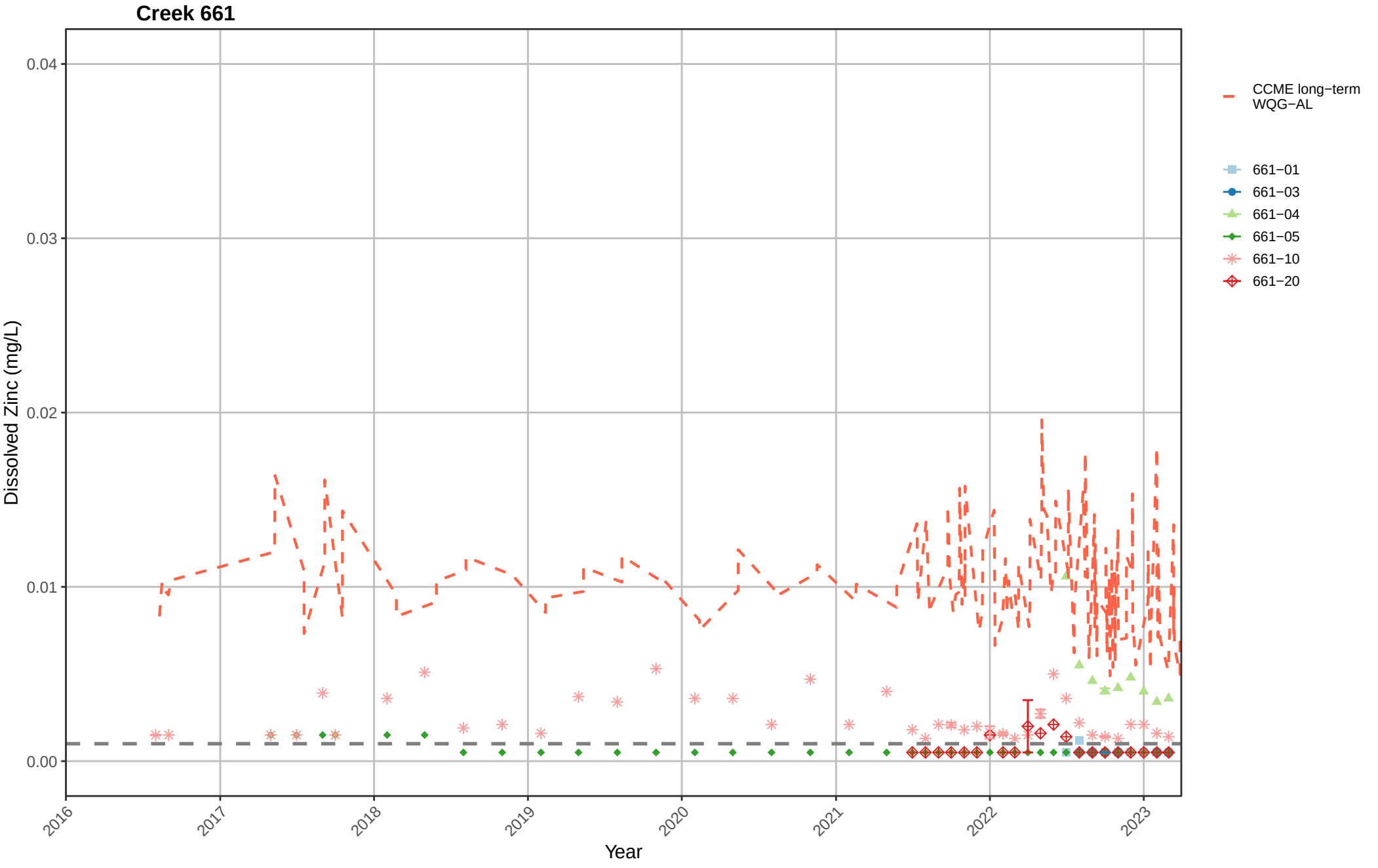
Appendix B−40.d: Monthly Mean Dissolved Manganese at Regional Control AEMP Sites, 2016 to March 31, 2023



DC−05 mean includes observations at WQ−10
Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term and short−term guideline for dissolved zinc is pH, hardness, and DOC dependent.
Proposed YDWL Standard for dissolved zinc at DC−05 is 0.04 mg/L.

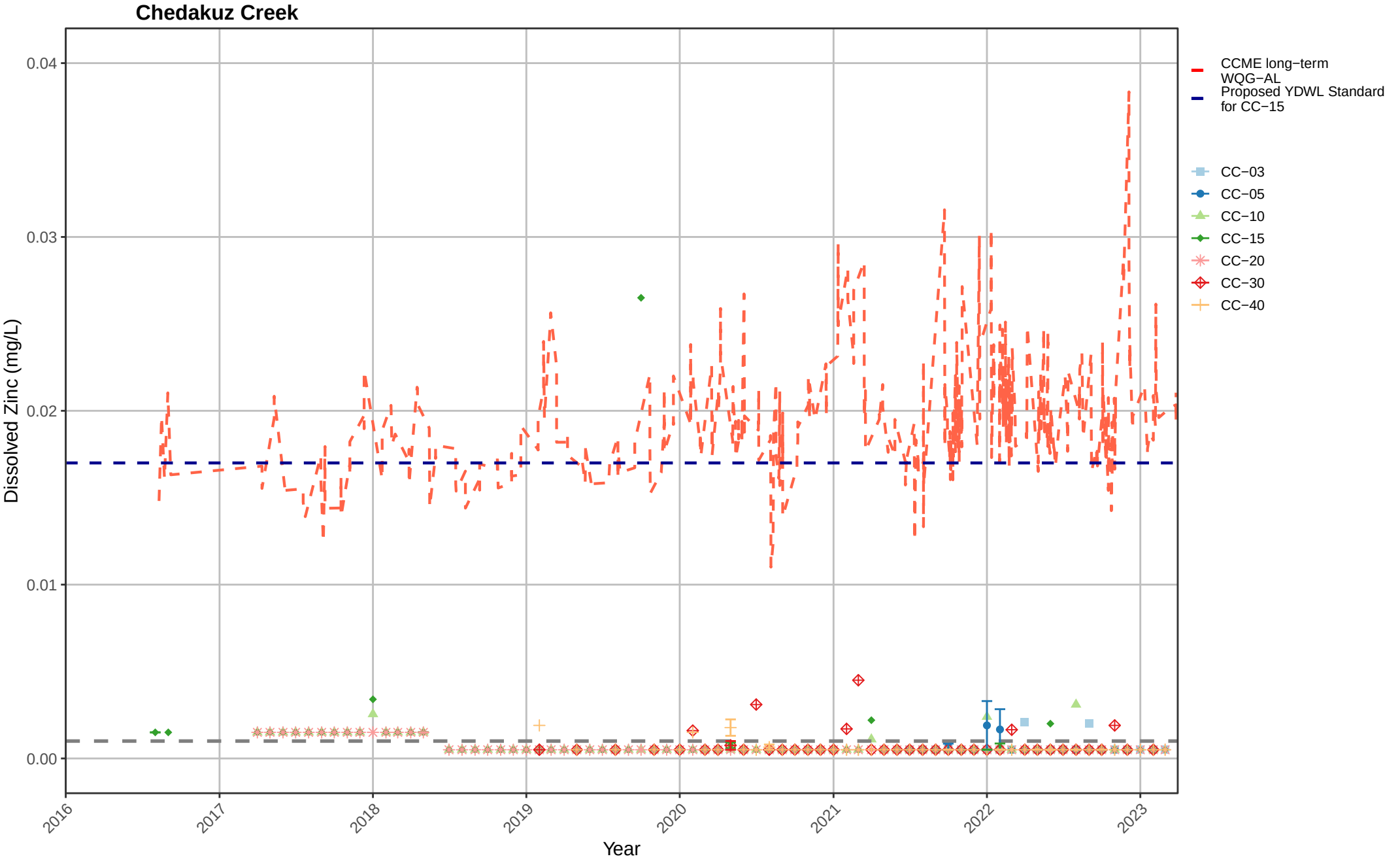
Appendix B−41.a: Monthly Mean Dissolved Zinc at Davidson Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term and short−term guideline for dissolved zinc is pH, hardness, and DOC dependent.

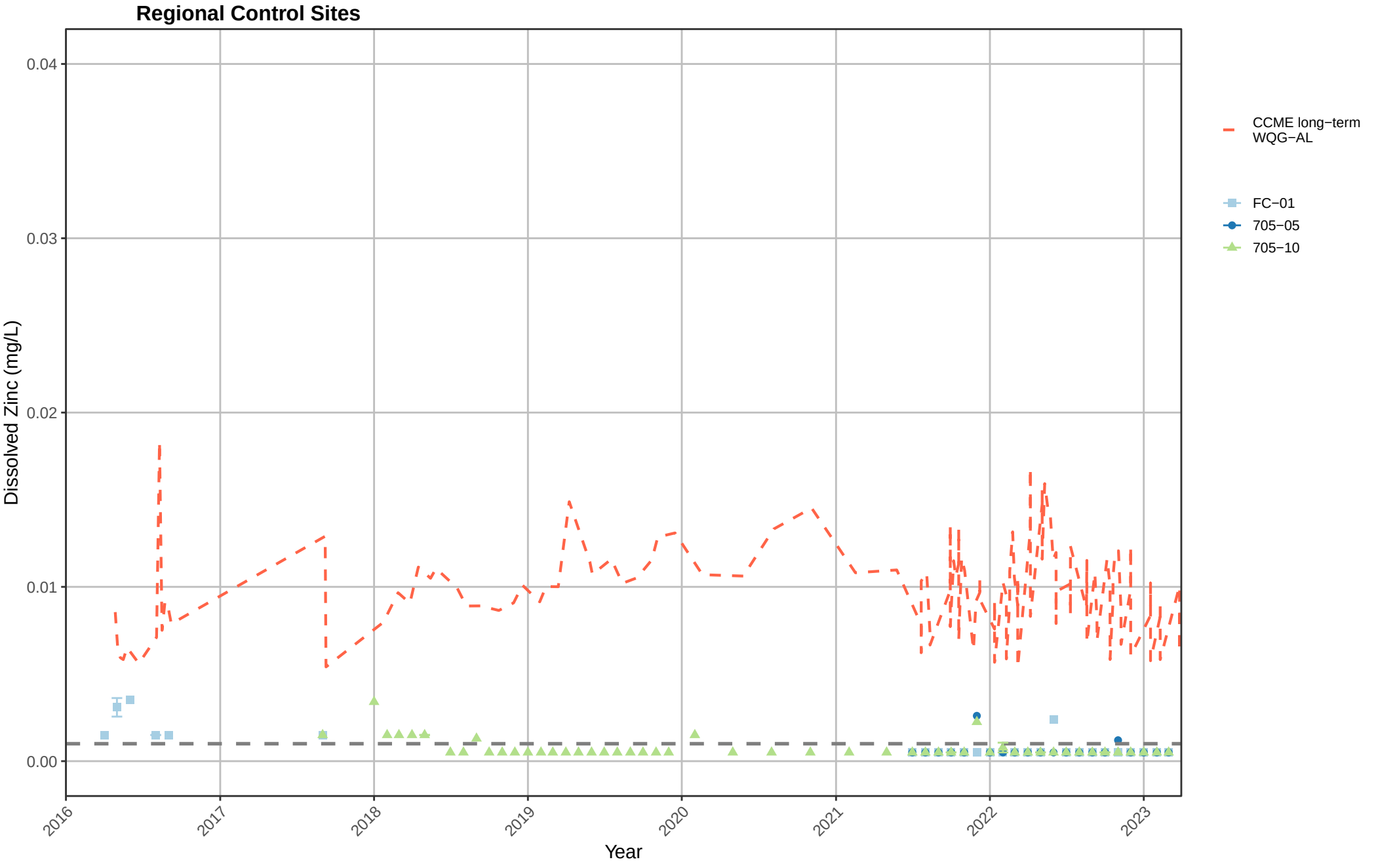
Appendix B−41.b: Monthly Mean Dissolved Zinc at Creek 661 AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term and short−term guideline for dissolved zinc is pH, hardness, and DOC dependent.
Proposed YDWL Standard for dissolved zinc at CC−15 is 0.017 mg/L.

Appendix B−41.c: Monthly Mean Dissolved Zinc at Chedakuz Creek AEMP Sites, 2016 to March 31, 2023



Gray dashed line indicates minimum detection limits.
Error bars represent standard error of the mean
Concentrations below the detection limit were plotted as half the detection limit.

BC WQG−AL long−term and short−term guideline for dissolved zinc is pH, hardness, and DOC dependent.

Appendix B−41.d: Monthly Mean Dissolved Zinc at Regional Control AEMP Sites, 2016 to March 31, 2023

Appendix C Stream Surface Water Quality Analysis

Appendix C-1	Mean Monthly Stream Water Quality (October 2022 to March 2023) and Comparison to the 95th Percentile Baseline (2016 to September 2022)
Appendix C-2	Results of Before-After-Control-Impact Analysis
Appendix C-3	Environmental Assessment Predicted Stream Water Quality at Davidson Creek and Creek 661 Sites
Appendix C-4	2022 Predicted Stream Water Quality at Davidson Creek and Creek 661 Sites
Appendix C-5	Mean Monthly Stream Water Quality (October 2022 to March 2023) and Comparison to the 95th Percentile Baseline + 20% (2016 to September 2022)
Appendix C-6	Comparison of Mean Monthly Water Quality (October 2022 to March 2023) to the 2022 Model Predictions

Appendix C-1a: Comparison of Early Works Construction and Baseline Water Quality at DC-05

Parameter	95th Percentile Baseline Concentration	2022 Mean Concentration			2023 Mean Concentration		
	October - March[1]	October	November	December	January	February	March
Physical Parameters and Dissolved Anions							
pH (pH units)	7.91	7.91	7.97	7.83	7.93	7.95	7.70
Total suspended solids	3.4	1.5	1.5	1.5	1.5	1.5	1.5
Total dissolved solids	73.8	71.8	77	85.5	82	80	76.5
Chloride	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.046	0.042	0.046	0.042	0.040	0.046	0.047
Sulphate	3.0	2.8	3.2	3.2	3.2	3.3	3.3
Nutrients							
Ammonia-N	0.0051	0.0038	0.0049	0.0050	0.0025	0.0025	0.0025
Nitrate-N	0.035	0.003	0.013	0.034	0.039	0.041	0.041
Nitrite-N	0.00050	0.00050	0.00050	0.00050	0.00050	0.00150	0.00050
Total Phosphorous	0.011	0.007	0.007	0.010	0.008	0.010	0.009
Orthophosphate	0.007	0.004	0.006	0.005	0.005	0.008	0.009
Cyanides							
Total Cyanide	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals							
Aluminum	0.139	0.020	0.012	0.013	0.013	0.017	0.011
Antimony	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006
Barium	0.0076	0.0085	0.0078	0.0083	0.0077	0.0076	0.0081
Beryllium	0.000050	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000007	0.000004	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00034	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00055	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.185	0.056	0.041	0.046	0.037	0.040	0.030
Lead	0.000057	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.00050	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.0095	0.0058	0.0039	0.0038	0.0025	0.0029	0.0020
Mercury	0.0000053	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00087	0.00096	0.00094	0.00096	0.00096	0.00097	0.00105
Nickel	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.000098	0.000067	0.000082	0.000075	0.000096	0.000082	0.000100
Silver	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.090	0.103	0.095	0.105	0.096	0.095	0.102
Thallium	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00026	0.00030	0.00030	0.00033	0.00034	0.00033	0.00039
Vanadium	0.0008	0.0005	0.0003	0.0003	0.0003	0.0003	0.0003
Zinc	0.0042	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals							
Aluminum	0.107	0.011	0.011	0.008	0.009	0.010	0.008
Cadmium	0.000006	0.000003	0.000003	0.0000025	0.000003	0.000003	0.0000030
Copper	0.00052	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.135	0.034	0.034	0.030	0.025	0.023	0.022
Manganese	0.0039	0.0034	0.0040	0.00250	0.0019	0.0015	0.00147
Zinc	0.00150	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L, unless otherwise noted and reported as half the detection limit for concentrations less than detection.

Highlighted cells indicate 2022 or 2023 mean is greater than the 95th percentile of the baseline concentration.

[1] *95th percentile concentration measured in baseline studies at the DC-05 site between October and March, 2016 to 2022.*

Appendix C-1b: Comparison of Early Works Construction and Baseline Water Quality at DC-10

Parameter	95th Percentile Baseline Concentration October - March[1]	2022 Mean Concentration			2023 Mean Concentration		
		October	November	December	January	February	March
Physical Parameters and Dissolved Anions							
pH (pH units)	7.91	7.97	7.90	7.79	7.95	7.95	7.53
Total suspended solids	1.5	1.5	1.5	3.7	1.5	1.5	1.5
Total dissolved solids	73.8	73	72.5	91	86	71	80
Chloride	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.046	0.041	0.045	0.041	0.038	0.045	0.047
Sulphate	3.0	2.8	3.3	3.3	3.3	3.3	3.4
Nutrients							
Ammonia-N	0.0084	0.0075	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate-N	0.037	0.003	0.027	0.033	0.043	0.050	0.038
Nitrite-N	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.009	0.006	0.005	0.008	0.008	0.009	0.009
Orthophosphate	0.006	0.004	0.006	0.006	0.007	0.007	0.007
Cyanides							
Total Cyanide	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals							
Aluminum	0.118	0.013	0.013	0.017	0.034	0.014	0.012
Antimony	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0006	0.0006	0.0005	0.0006	0.0005	0.0005	0.0005
Barium	0.0076	0.0090	0.0082	0.0090	0.0081	0.0079	0.0086
Beryllium	0.000050	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000006	0.000003	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00030	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00051	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.127	0.032	0.034	0.037	0.044	0.024	0.022
Lead	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.00050	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.0056	0.0041	0.0033	0.0041	0.0043	0.0021	0.0030
Mercury	0.0000030	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00085	0.00099	0.00091	0.00098	0.00095	0.00099	0.00102
Nickel	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.000090	0.000025	0.000025	0.000072	0.000065	0.000063	0.000070
Silver	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.097	0.107	0.094	0.110	0.095	0.095	0.099
Thallium	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00027	0.00029	0.00029	0.00034	0.00036	0.00034	0.00039
Vanadium	0.0007	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Zinc	0.0038	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals							
Aluminum	0.087	0.012	0.008	0.008	0.008	0.009	0.014
Cadmium	0.000003	0.000003	0.000003	0.0000025	0.000003	0.000003	0.0000030
Copper	0.00036	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.089	0.033	0.019	0.021	0.021	0.015	0.014
Manganese	0.0028	0.0033	0.0024	0.00242	0.0038	0.0017	0.00122
Zinc	0.00182	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L, unless otherwise noted and reported as half the detection limit for concentrations less than detection.

Highlighted cells indicate 2022 or 2023 mean is greater than the 95th percentile of the baseline concentration.

[1] *95th percentile concentration measured in baseline studies at the DC-05 site between October and March, 2016 to 2022.*

Appendix C-1c: Comparison of Early Works Construction and Baseline Water Quality at DC-15

Parameter	95th Percentile Baseline Concentration	2022 Mean Concentration			2023 Mean Concentration		
	October - March[1]	October	November	December	January	February	March
Physical Parameters and Dissolved Anions							
pH (pH units)	8.03	8.06	7.94	7.82	7.68	7.98	8.00
Total suspended solids	2.5	1.5	1.5	3.7	1.5	1.5	1.5
Total dissolved solids	83.3	77	81	96	90	78.5	82
Chloride	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.050	0.045	0.050	0.042	0.050	0.051	0.056
Sulphate	2.9	2.4	3.1	3.0	3.1	3.3	3.4
Nutrients							
Ammonia-N	0.0068	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate-N	0.041	0.003	0.022	0.034	0.035	0.037	0.044
Nitrite-N	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.020	0.006	0.004	0.007	0.008	0.008	0.009
Orthophosphate	0.005	0.004	0.005	0.005	0.006	0.006	0.006
Cyanides							
Total Cyanide	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals							
Aluminum	0.182	0.012	0.012	0.017	0.011	0.009	0.008
Antimony	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0006	0.0006	0.0005	0.0006	0.0005	0.0006	0.0006
Barium	0.0084	0.0093	0.0088	0.0099	0.0083	0.0086	0.0088
Beryllium	0.000050	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000007	0.000003	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00037	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00060	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.171	0.035	0.028	0.033	0.024	0.021	0.019
Lead	0.000063	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.00050	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.0139	0.0058	0.0053	0.0068	0.0061	0.0040	0.0032
Mercury	0.0000030	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00109	0.00095	0.00087	0.00090	0.00094	0.00096	0.00098
Nickel	0.00050	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.000078	0.000025	0.000025	0.000058	0.000054	0.000056	0.000063
Silver	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.104	0.110	0.102	0.116	0.105	0.108	0.106
Thallium	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00026	0.00025	0.00024	0.00027	0.00031	0.00029	0.00031
Vanadium	0.0008	0.0005	0.0003	0.0006	0.0003	0.0003	0.0003
Zinc	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals							
Aluminum	0.076	0.007	0.006	0.005	0.007	0.005	0.005
Cadmium	0.000005	0.000003	0.000003	0.0000025	0.000003	0.000003	0.0000030
Copper	0.00068	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.087	0.026	0.015	0.014	0.014	0.005	0.012
Manganese	0.0065	0.0040	0.0039	0.00384	0.0053	0.0027	0.00225
Zinc	0.00163	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L, unless otherwise noted and reported as half the detection limit for concentrations less than detection.

Highlighted cells indicate 2022 or 2023 mean is greater than the 95th percentile of the baseline concentration.

[1] *95th percentile concentration measured in baseline studies at the DC-05 site between October and March, 2016 to 2022.*

Appendix C-1d: Comparison of Early Works Construction and Baseline Water Quality at DC-20

Parameter	95th Percentile Baseline Concentration October - March[1]	2022 Mean Concentration			2023 Mean Concentration		
		October	November	December	January	February	March
Physical Parameters and Dissolved Anions							
pH (pH units)	7.98	8.06	7.91	7.69	7.99	7.85	7.89
Total suspended solids	4.9	1.5	1.5	1.5	1.5	1.5	1.5
Total dissolved solids	82	84.6	81	99	100.0	90	101
Chloride	0.25	0.25	0.25	0.25	0.25	0.25	0.52
Fluoride	0.052	0.048	0.051	0.051	0.052	0.050	0.058
Sulphate	2.9	2.2	2.7	3.3	2.9	3.1	3.1
Nutrients							
Ammonia-N	0.0027	0.0045	0.0025	0.0025	0.0025	0.0051	0.0025
Nitrate-N	0.030	0.003	0.003	0.011	0.035	0.025	0.037
Nitrite-N	0.00054	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.013	0.009	0.009	0.010	0.025	0.013	0.008
Orthophosphate	0.006	0.005	0.005	0.004	0.003	0.004	0.004
Cyanides							
Total Cyanide	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals							
Aluminum	0.148	0.019	0.026	0.011	0.113	0.070	0.010
Antimony	0.000050	0.000050	0.000050	0.000050	0.000200	0.000050	0.000050
Arsenic	0.0006	0.0006	0.0005	0.0004	0.0007	0.0006	0.0004
Barium	0.0095	0.0095	0.0101	0.0109	0.0117	0.0096	0.0087
Beryllium	0.000050	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000015	0.000003	0.0000025	0.0000025	0.000010	0.0000081	0.0000030
Chromium	0.00036	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00005	0.00005	0.00005	0.00005	0.00011	0.00005	0.00005
Copper	0.00064	0.00025	0.00025	0.00025	0.00055	0.00025	0.00025
Iron	0.199	0.244	0.246	0.172	0.468	0.265	0.132
Lead	0.000053	0.000025	0.000025	0.000025	0.000092	0.000025	0.000025
Lithium	0.00050	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.0198	0.0207	0.0300	0.0453	0.0408	0.0320	0.0207
Mercury	0.0000099	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00082	0.00085	0.00087	0.00086	0.00093	0.00090	0.00092
Nickel	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.000076	0.000039	0.000025	0.000056	0.000080	0.000055	0.000086
Silver	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.102	0.109	0.117	0.119	0.110	0.103	0.109
Thallium	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00024	0.00024	0.00031	0.00027	0.00033	0.00035	0.00036
Vanadium	0.0010	0.0006	0.0005	0.0003	0.0010	0.0006	0.0003
Zinc	0.0015	0.0015	0.0015	0.0015	0.0071	0.0015	0.0015
Dissolved Metals							
Aluminum	0.056	0.011	0.007	0.006	0.006	0.005	0.005
Cadmium	0.000006	0.000003	0.000003	0.0000052	0.000006	0.000003	0.0000030
Copper	0.00040	0.00018	0.00010	0.00022	0.00040	0.00010	0.00010
Iron	0.115	0.219	0.174	0.116	0.080	0.090	0.090
Manganese	0.0146	0.0181	0.0263	0.04660	0.0196	0.0210	0.01930
Zinc	0.00150	0.00050	0.0005	0.00050	0.00400	0.0005	0.00050

Notes:

Concentrations in mg/L, unless otherwise noted and reported as half the detection limit for concentrations less than detection.

Highlighted cells indicate 2022 or 2023 mean is greater than the 95th percentile of the baseline concentration.

[1] 95th percentile concentration measured in baseline studies at the DC-05 site between October and March, 2016 to 2022.

Appendix C-1e: Comparison of Early Works Construction and Baseline Water Quality at 661-05

Parameter	95th Percentile Baseline Concentration October - March[1]	2022 Mean Concentration			2023 Mean Concentration		
		October	November	December	January	February	March
Physical Parameters and Dissolved Anions							
pH (pH units)	7.96	7.94	7.88	7.74	7.61	7.86	7.89
Total suspended solids	6.3	1.5	1.5	4.5	1.5	3.2	1.5
Total dissolved solids	75	72.0	69	74	84.0	74	70
Chloride	0.41	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.065	0.054	0.059	0.065	0.058	0.061	0.065
Sulphate	1.7	1.0	1.3	1.3	1.2	1.5	1.5
Nutrients							
Ammonia-N	0.0142	0.0058	0.0025	0.0051	0.0025	0.0025	0.0025
Nitrate-N	0.060	0.013	0.054	0.059	0.051	0.057	0.057
Nitrite-N	0.00085	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.047	0.051	0.050	0.055	0.049	0.049	0.050
Orthophosphate	0.036	0.044	0.040	0.040	0.042	0.041	0.041
Cyanides							
Total Cyanide	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals							
Aluminum	0.300	0.031	0.039	0.058	0.035	0.038	0.032
Antimony	0.000144	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0015	0.0015	0.0013	0.0013	0.0013	0.0013	0.0012
Barium	0.0074	0.0048	0.0045	0.0051	0.0046	0.0047	0.0046
Beryllium	0.000050	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000013	0.000003	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00132	0.00073	0.00093	0.00089	0.00087	0.00093	0.00080
Cobalt	0.00013	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00051	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.426	0.160	0.151	0.170	0.113	0.114	0.098
Lead	0.000153	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.00050	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.0334	0.0107	0.0100	0.0119	0.0079	0.0085	0.0061
Mercury	0.0000053	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00093	0.00086	0.00082	0.00088	0.00091	0.00091	0.00085
Nickel	0.00038	0.00025	0.00059	0.00025	0.00025	0.00025	0.00025
Selenium	0.000145	0.000071	0.000078	0.000072	0.000078	0.000081	0.000076
Silver	0.0000141	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.085	0.088	0.082	0.085	0.084	0.084	0.079
Thallium	0.0000292	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00028	0.00020	0.00020	0.00023	0.00021	0.00020	0.00020
Vanadium	0.0022	0.0019	0.0018	0.0019	0.0018	0.0020	0.0018
Zinc	0.0032	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals							
Aluminum	0.084	0.011	0.009	0.012	0.009	0.008	0.009
Cadmium	0.000004	0.000003	0.000003	0.0000025	0.000003	0.000007	0.0000030
Copper	0.00042	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.171	0.091	0.050	0.053	0.046	0.031	0.039
Manganese	0.0077	0.0058	0.0057	0.00618	0.0050	0.0047	0.00346
Zinc	0.00150	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L, unless otherwise noted and reported as half the detection limit for concentrations less than detection.

Highlighted cells indicate 2022 or 2023 mean is greater than the 95th percentile of the baseline concentration.

[1] 95th percentile concentration measured in baseline studies at the DC-05 site between October and March, 2016 to 2022.

Appendix C-1f: Comparison of Early Works Construction and Baseline Water Quality at 661-10

Parameter	95th Percentile Baseline Concentration October - March[1]	2022 Mean Concentration			2023 Mean Concentration		
		October	November	December	January	February	March
Physical Parameters and Dissolved Anions							
pH (pH units)	7.82	7.82	7.85	7.41	7.69	7.65	7.85
Total suspended solids	3.0	2.03	1.5	1.5	1.5	1.5	1.5
Total dissolved solids	68	67.3	81	67	58.0	74	62
Chloride	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.054	0.047	0.049	0.049	0.047	0.053	0.061
Sulphate	2.3	1.0	1.3	1.6	1.5	2.1	2.2
Nutrients							
Ammonia-N	0.0149	0.0025	0.0025	0.0084	0.0062	0.0025	0.0025
Nitrate-N	0.052	0.003	0.003	0.051	0.045	0.037	0.043
Nitrite-N	0.00053	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.032	0.023	0.026	0.023	0.028	0.024	0.026
Orthophosphate	0.017	0.015	0.018	0.013	0.020	0.019	0.023
Cyanides							
Total Cyanide	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals							
Aluminum	0.240	0.054	0.053	0.036	0.064	0.046	0.037
Antimony	0.000053	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0010	0.0012	0.0010	0.0009	0.0010	0.0010	0.0010
Barium	0.0062	0.0051	0.0047	0.0051	0.0051	0.0047	0.0046
Beryllium	0.000050	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000019	0.000010	0.0000085	0.0000130	0.000010	0.0000082	0.0000057
Chromium	0.00057	0.00033	0.00025	0.00025	0.00060	0.00051	0.00025
Cobalt	0.00005	0.00007	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00065	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.267	0.240	0.220	0.112	0.145	0.104	0.093
Lead	0.000083	0.000043	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.00053	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.0235	0.0187	0.0204	0.0161	0.0171	0.0084	0.0079
Mercury	0.0000053	0.0000030	0.0000030	0.0000030	0.0000030	0.0000030	0.0000030
Molybdenum	0.00079	0.00071	0.00064	0.00072	0.00070	0.00068	0.00071
Nickel	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.000076	0.000025	0.000025	0.000025	0.000062	0.000025	0.000025
Silver	0.0000055	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.072	0.072	0.073	0.076	0.071	0.068	0.070
Thallium	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00012	0.00012	0.00014	0.00010	0.00016	0.00014	0.00014
Vanadium	0.0015	0.0010	0.0010	0.0009	0.0013	0.0011	0.0011
Zinc	0.0056	0.0021	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals							
Aluminum	0.103	0.016	0.016	0.015	0.021	0.021	0.019
Cadmium	0.000014	0.000007	0.000006	0.0000062	0.000009	0.000012	0.0000030
Copper	0.00038	0.00013	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.184	0.130	0.120	0.068	0.075	0.054	0.047
Manganese	0.0116	0.0057	0.0109	0.01110	0.0118	0.0052	0.00560
Zinc	0.00473	0.00140	0.0013	0.00210	0.00210	0.0016	0.00140

Notes:

Concentrations in mg/L, unless otherwise noted and reported as half the detection limit for concentrations less than detection.

Highlighted cells indicate 2022 or 2023 mean is greater than the 95th percentile of the baseline concentration.

[1] 95th percentile concentration measured in baseline studies at the DC-05 site between October and March, 2016 to 2022.

Appendix C-1g: Comparison of Early Works Construction and Baseline Water Quality at 661-20

Parameter	95th Percentile Baseline Concentration October - March[1]	2022 Mean Concentration			2023 Mean Concentration		
		October	November	December	January	February	March
Physical Parameters and Dissolved Anions							
pH (pH units)	8.10	8.10	8.06	7.77	8.01	8.03	8.10
Total suspended solids	10.4	1.5	1.5	3.6	1.5	1.5	1.5
Total dissolved solids	95	96.0	94	99	95.0	91	89
Chloride	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.064	0.058	0.058	0.060	0.056	0.060	0.068
Sulphate	2.5	1.6	2.3	2.3	2.5	2.6	2.6
Nutrients							
Ammonia-N	0.0025	0.0025	0.0025	0.0093	0.0074	0.0025	0.0025
Nitrate-N	0.046	0.003	0.029	0.045	0.078	0.049	0.052
Nitrite-N	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.037	0.024	0.022	0.027	0.029	0.025	0.024
Orthophosphate	0.021	0.017	0.019	0.017	0.023	0.021	0.023
Cyanides							
Total Cyanide	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals							
Aluminum	0.136	0.016	0.026	0.023	0.023	0.029	0.023
Antimony	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0010	0.0010	0.0009	0.0008	0.0009	0.0009	0.0009
Barium	0.0075	0.0067	0.0068	0.0073	0.0070	0.0064	0.0067
Beryllium	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000006	0.000003	0.0000030	0.0000030	0.000003	0.0000030	0.0000030
Chromium	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00010	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.319	0.149	0.178	0.131	0.185	0.151	0.128
Lead	0.000050	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.00148	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.0321	0.0071	0.0090	0.0092	0.0071	0.0062	0.0057
Mercury	0.0000030	0.0000030	0.0000030	0.0000030	0.0000030	0.0000030	0.0000030
Molybdenum	0.00103	0.00095	0.00091	0.00096	0.00093	0.00099	0.00097
Nickel	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.000133	0.000056	0.000056	0.000060	0.000094	0.000060	0.000073
Silver	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.106	0.103	0.096	0.102	0.097	0.091	0.094
Thallium	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00033	0.00027	0.00028	0.00035	0.00035	0.00029	0.00031
Vanadium	0.0011	0.0007	0.0006	0.0007	0.0008	0.0008	0.0007
Zinc	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals							
Aluminum	0.036	0.010	0.008	0.006	0.010	0.012	0.008
Cadmium	0.000003	0.000003	0.000003	0.0000030	0.000003	0.000003	0.0000030
Copper	0.00029	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.146	0.109	0.103	0.083	0.127	0.086	0.086
Manganese	0.0061	0.0043	0.0049	0.00472	0.0040	0.0029	0.00289
Zinc	0.00125	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L, unless otherwise noted and reported as half the detection limit for concentrations less than detection.

Highlighted cells indicate 2022 or 2023 mean is greater than the 95th percentile of the baseline concentration.

[1] 95th percentile concentration measured in baseline studies at the DC-05 site between October and March, 2016 to 2022.

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Appendix C

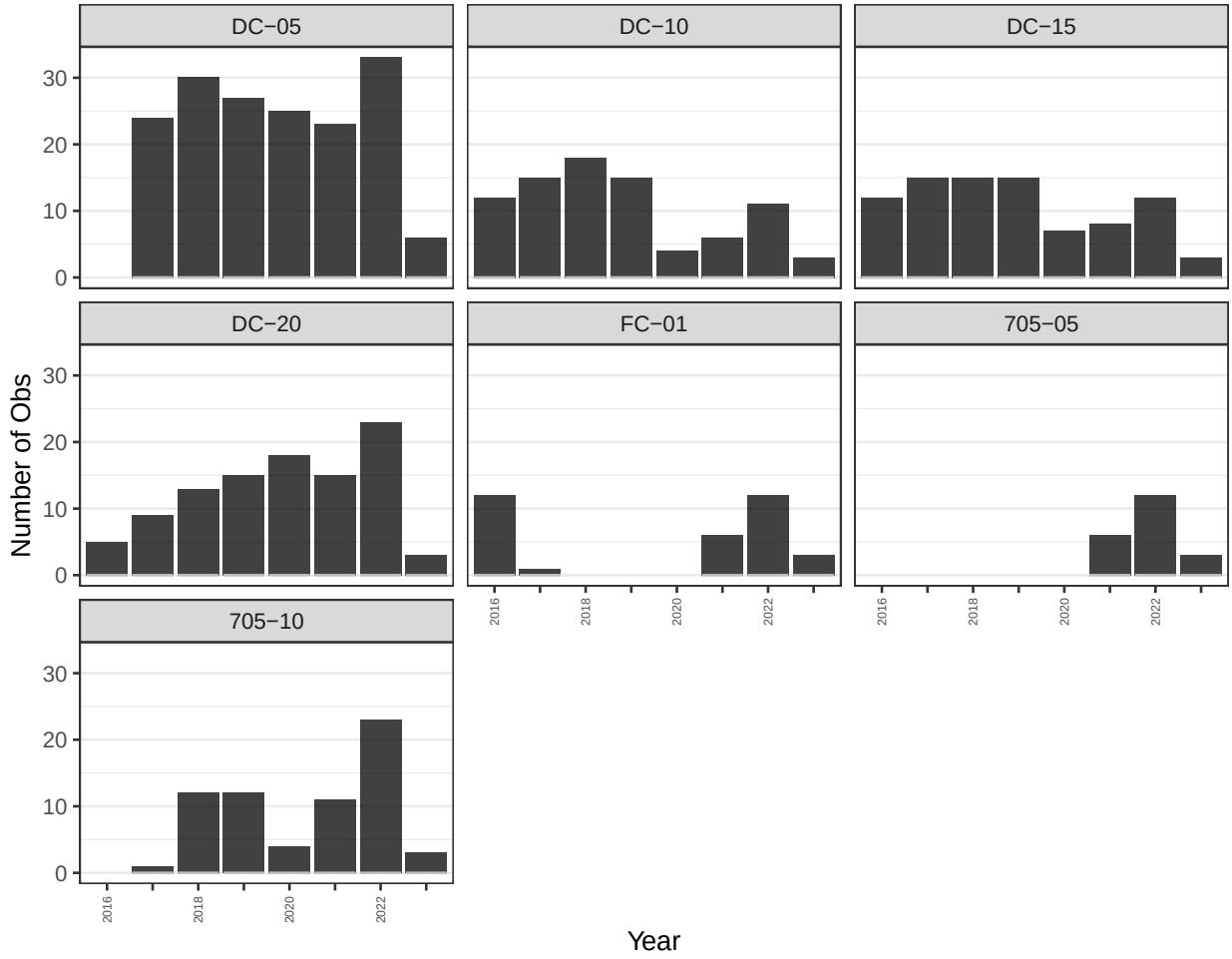
C-2.1 Water Quality

C-2.1.1 pH

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

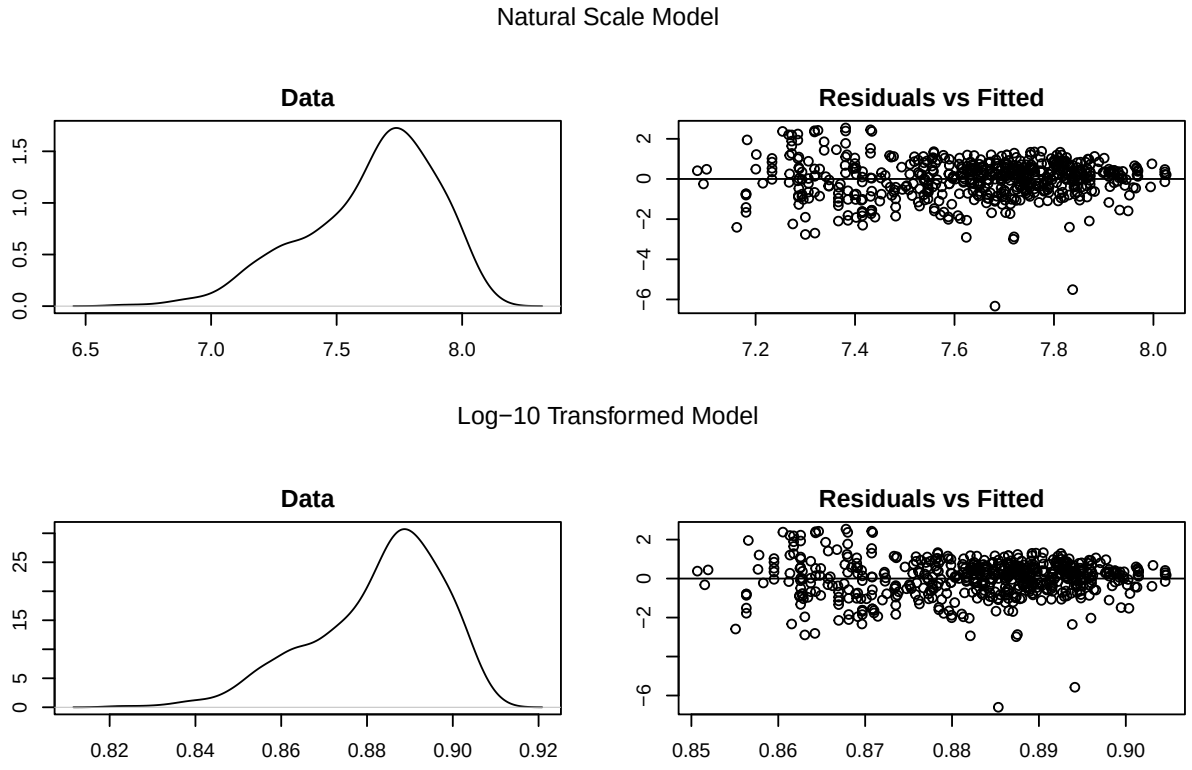
1.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	153	7.670	0
Davidson Creek	DC-05	after	15	7.930	0
Davidson Creek	DC-10	before	78	7.675	0
Davidson Creek	DC-10	after	6	7.920	0
Davidson Creek	DC-15	before	81	7.770	0
Davidson Creek	DC-15	after	6	7.960	0
Davidson Creek	DC-20	before	92	7.750	0
Davidson Creek	DC-20	after	9	7.990	0
Davidson Creek	FC-01	before	28	7.615	0
Davidson Creek	FC-01	after	6	7.805	0
Davidson Creek	705-05	before	15	7.390	0
Davidson Creek	705-05	after	6	7.430	0
Davidson Creek	705-10	before	57	7.560	0
Davidson Creek	705-10	after	9	7.625	0

1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	FC-01	2016	8	control	before	6.65	7.681	-6.332	0
Davidson Creek	DC-20	2021	9	monit	before	6.94	7.838	-5.511	0

Outliers on log scale:

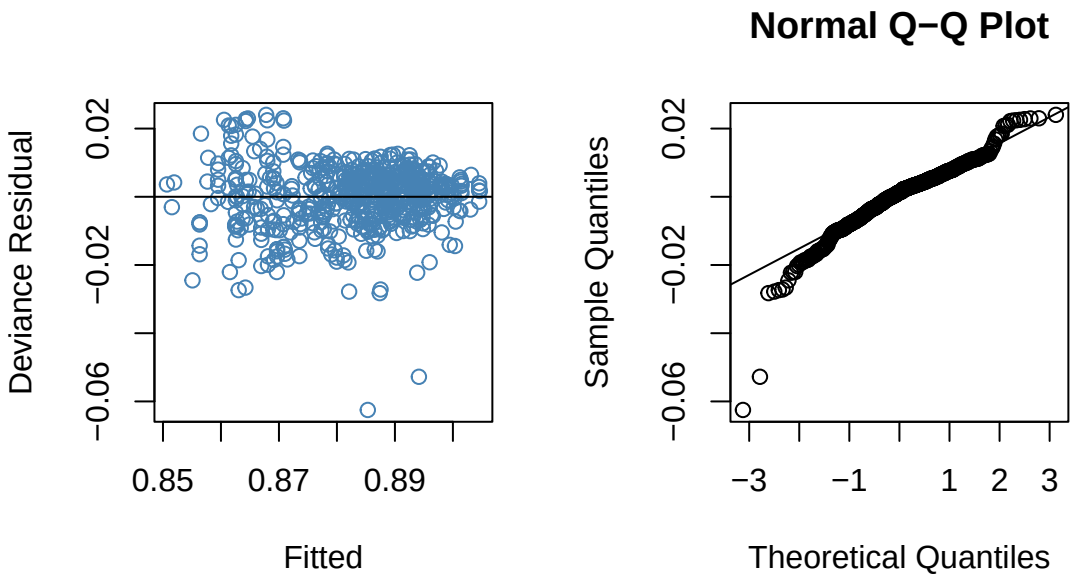
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	FC-01	2016	8	control	before	0.8228	0.8853	-6.603	0
Davidson Creek	DC-20	2021	9	monit	before	0.8414	0.8941	-5.575	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0008	0.0008	1	5.765	8.594	0.0275	
period	0.0022	0.0022	1	272.513	24.358	<0.001	
class:period	0.0004	0.0004	1	536.942	4.050	0.0447	0.49

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

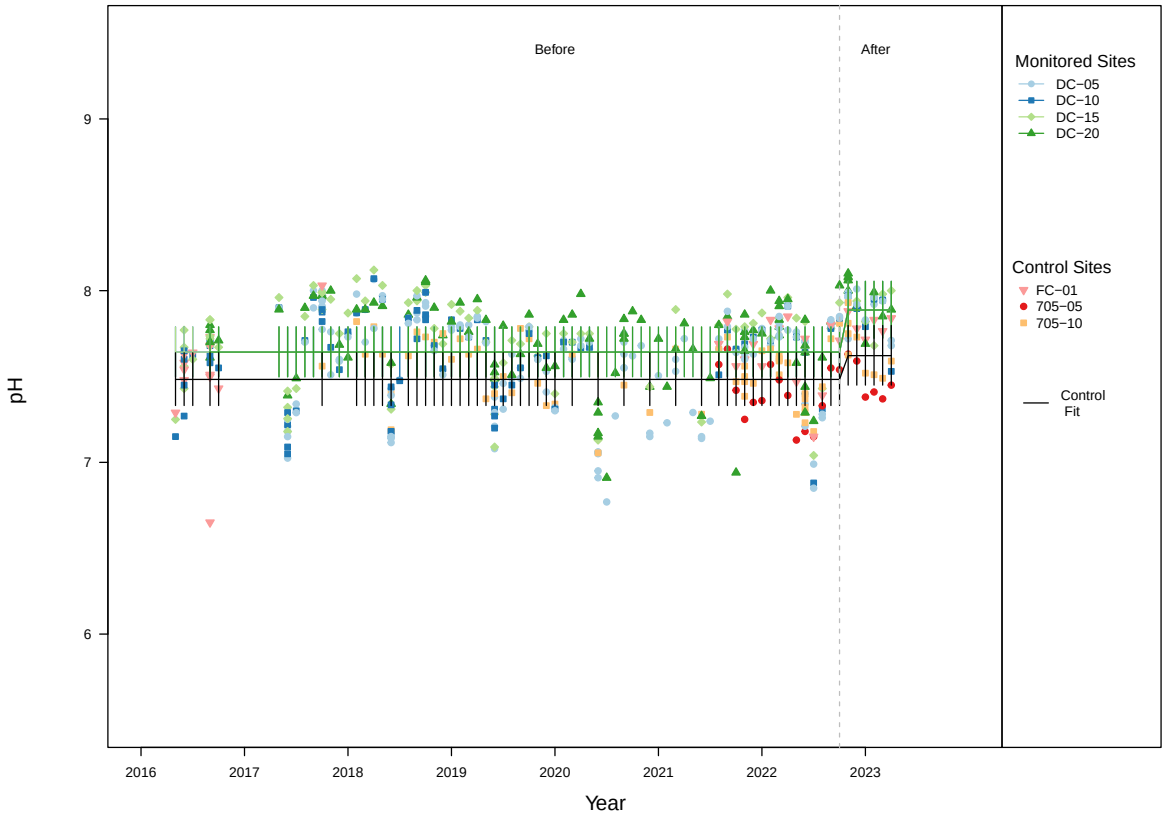
Monitored vs:	Estimate	Significance
control sites	0.0057	not significant

Conclusion:

The change in pH at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.49) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

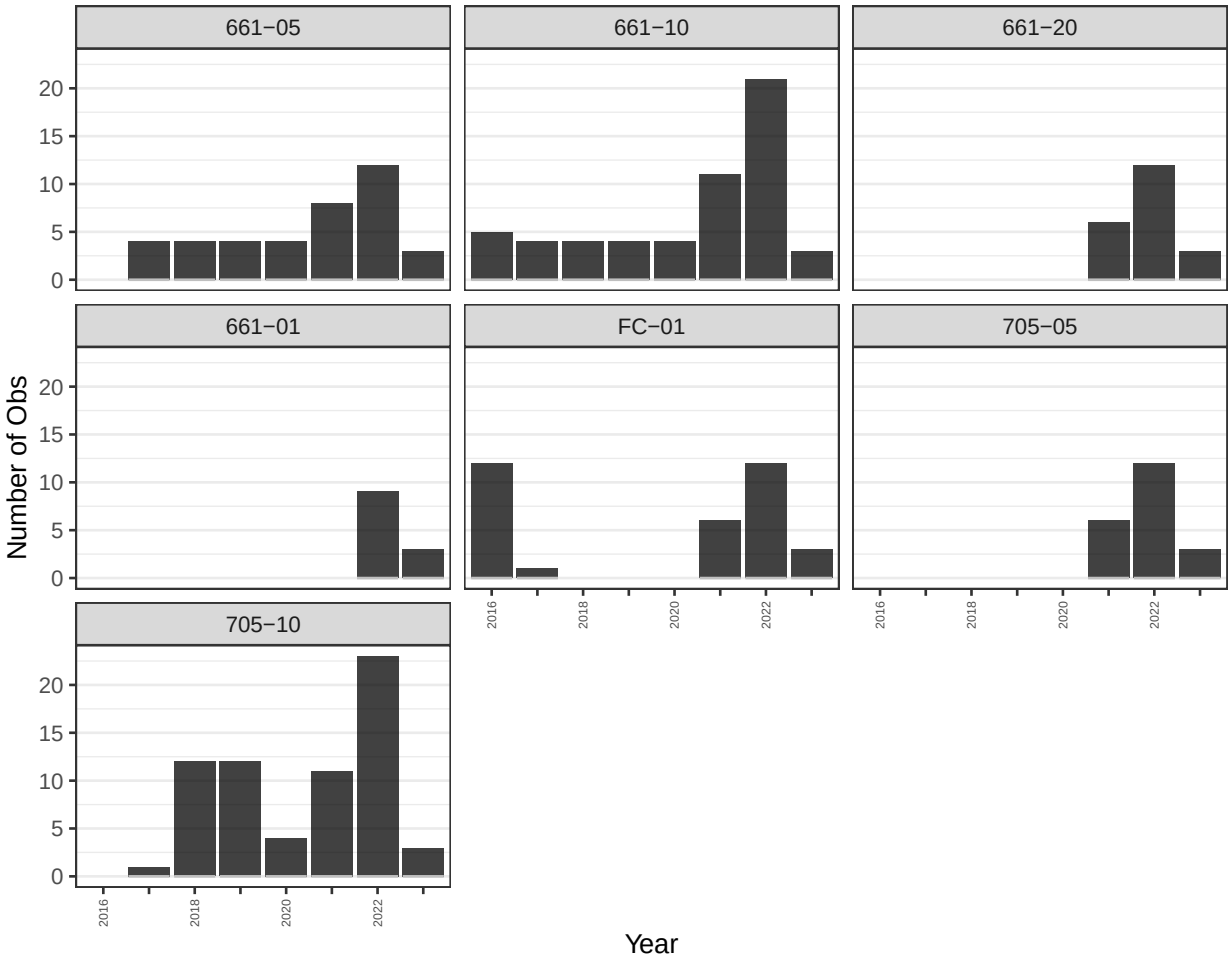
Final Summary Table

Variable	pH
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

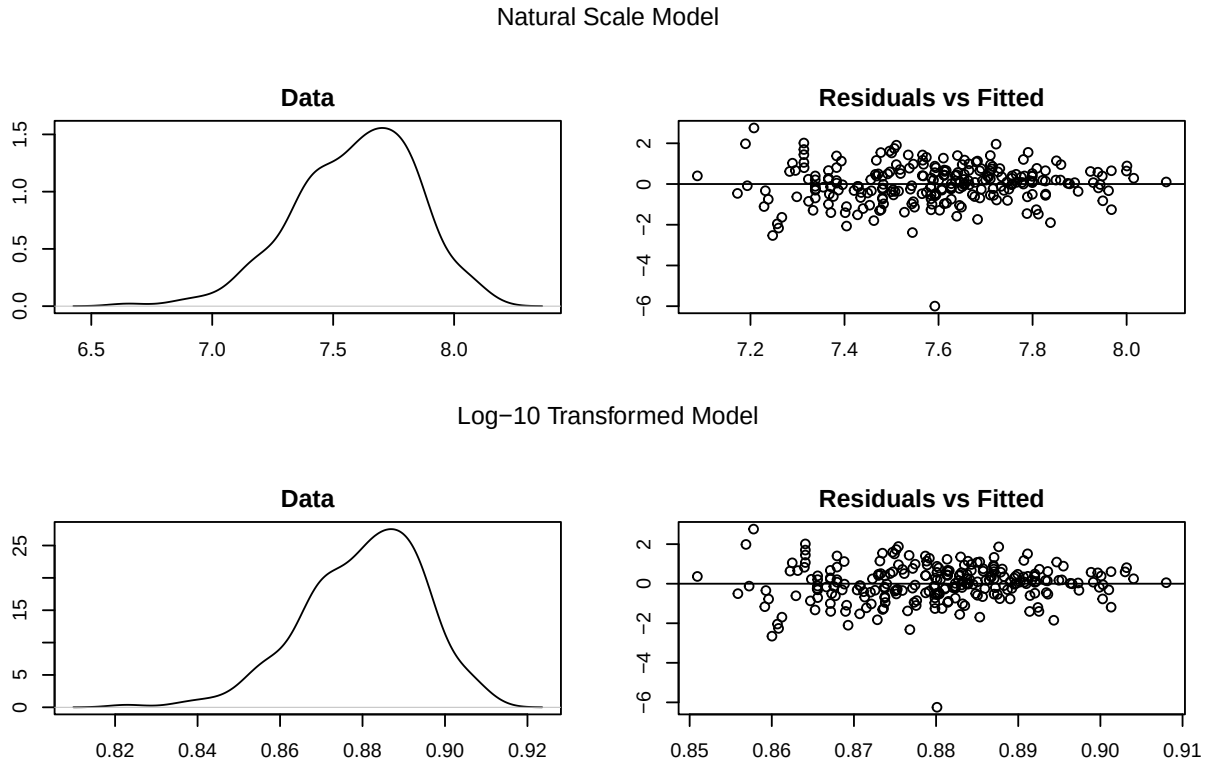
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	7.760	0
Creek 661	661-05	after	6	7.870	0
Creek 661	661-10	before	47	7.580	0
Creek 661	661-10	after	9	7.810	0
Creek 661	661-20	before	15	7.910	0
Creek 661	661-20	after	6	8.045	0
Creek 661	661-01	before	3	7.380	0
Creek 661	661-01	after	9	7.390	0
Creek 661	FC-01	before	28	7.615	0
Creek 661	FC-01	after	6	7.805	0
Creek 661	705-05	before	15	7.390	0
Creek 661	705-05	after	6	7.430	0
Creek 661	705-10	before	57	7.560	0
Creek 661	705-10	after	9	7.625	0

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	FC-01	2016	8	control	before	6.65	7.592	-5.997	0

Outliers on log scale:

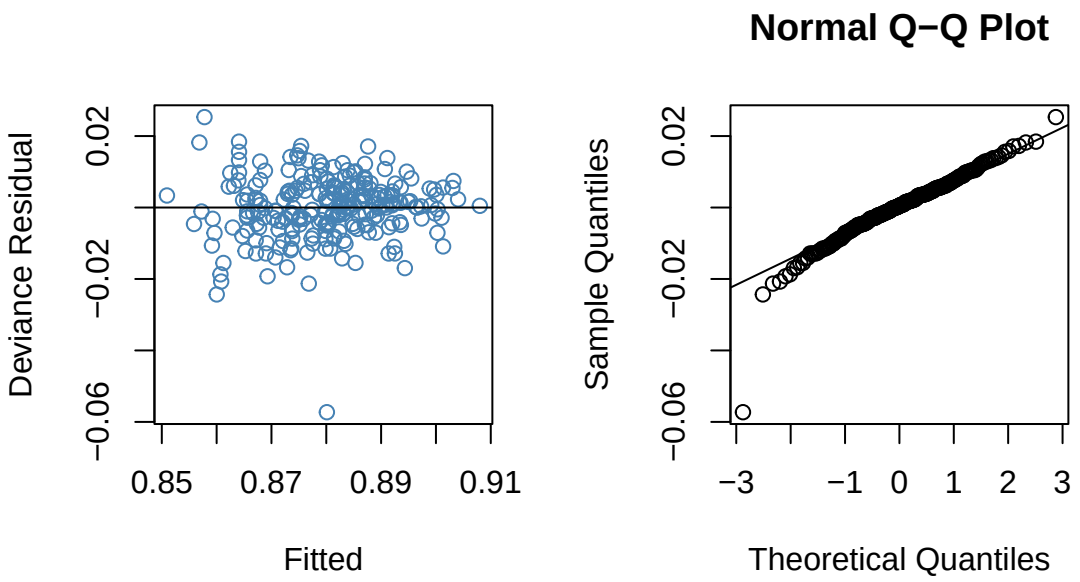
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	FC-01	2016	8	control	before	0.8228	0.8801	-6.247	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0003	0.0003	1	5.034	3.982	0.102	
period	0.0014	0.0014	1	153.900	17.023	<0.001	
class:period	0.0001	0.0001	1	224.704	1.241	0.266	0.419

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

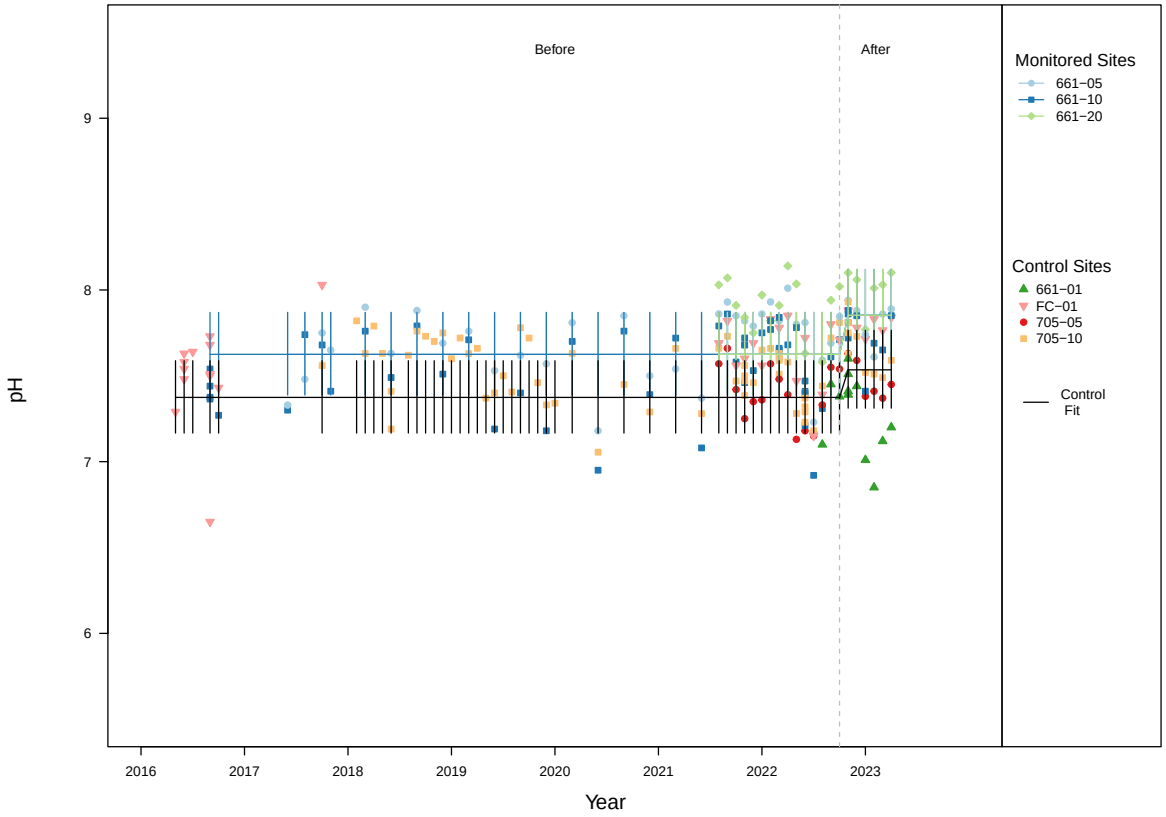
Monitored vs:	Estimate	Significance
control sites	0.0034	not significant

Conclusion:

The change in pH at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.419) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

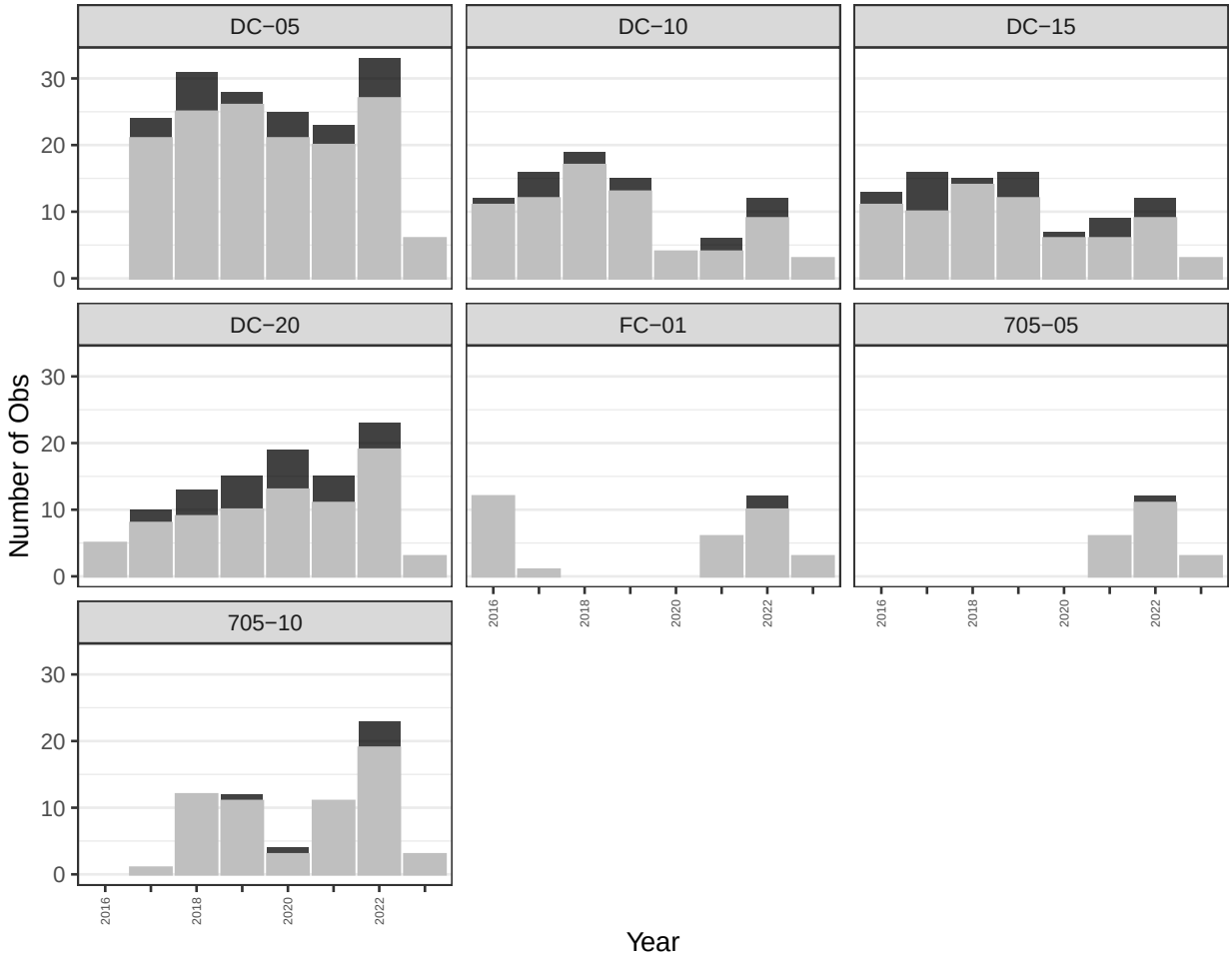
Final Summary Table

Variable	pH
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.2 Total Suspended Solids

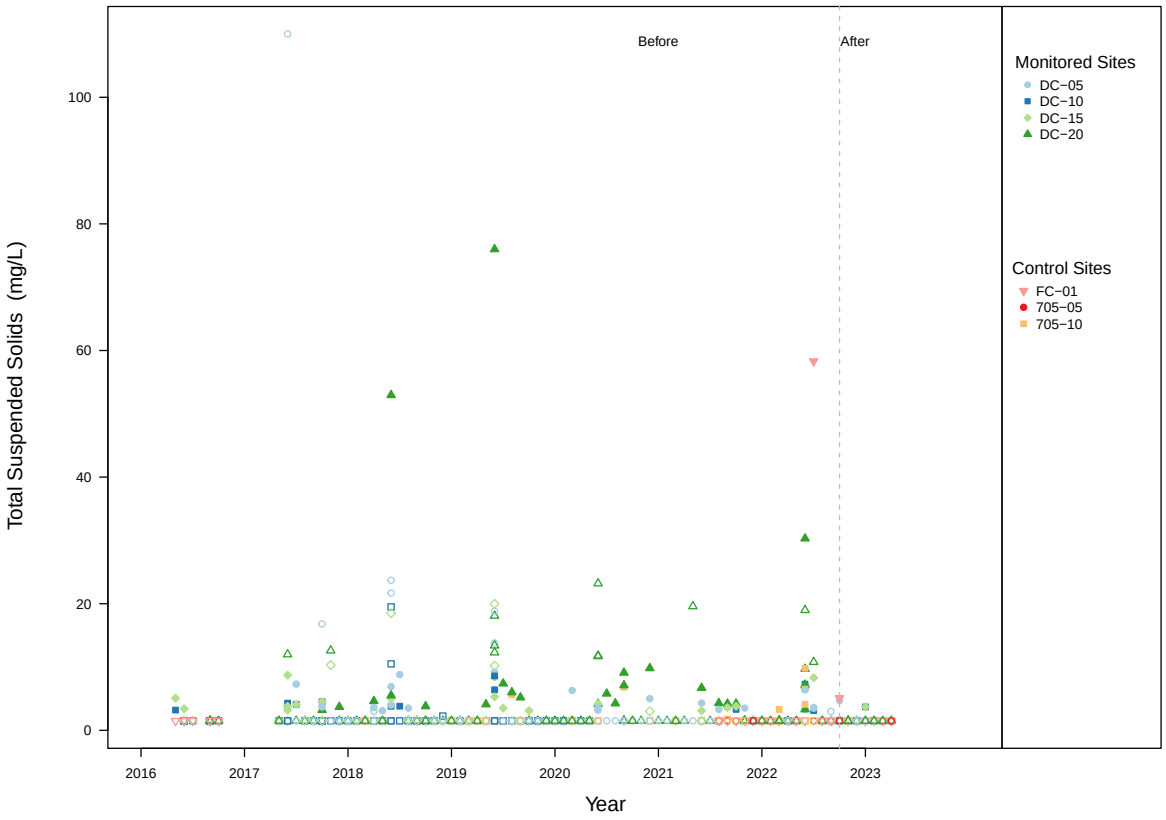
1 Davidson Creek

1.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



Note: Open symbols represent cases where the results were below the sample detection limit.

Final Summary Table

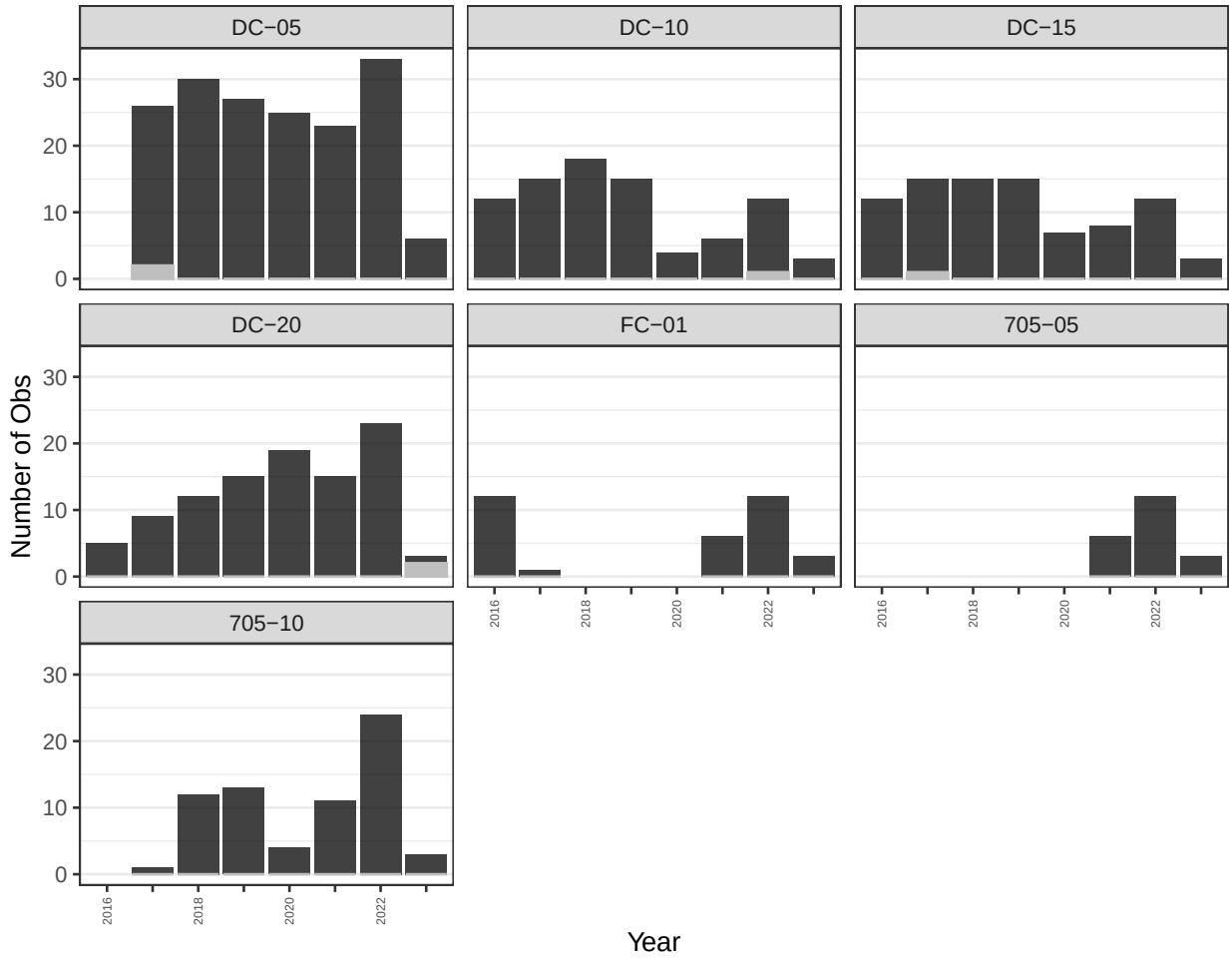
Variable	Total Suspended Solids
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

C-2.1.3 Total Dissolved Solids

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

Watershed	Site	Year	Class	Period	#Obs Removed
Davidson Creek	DC-20	2023	monit	after	3

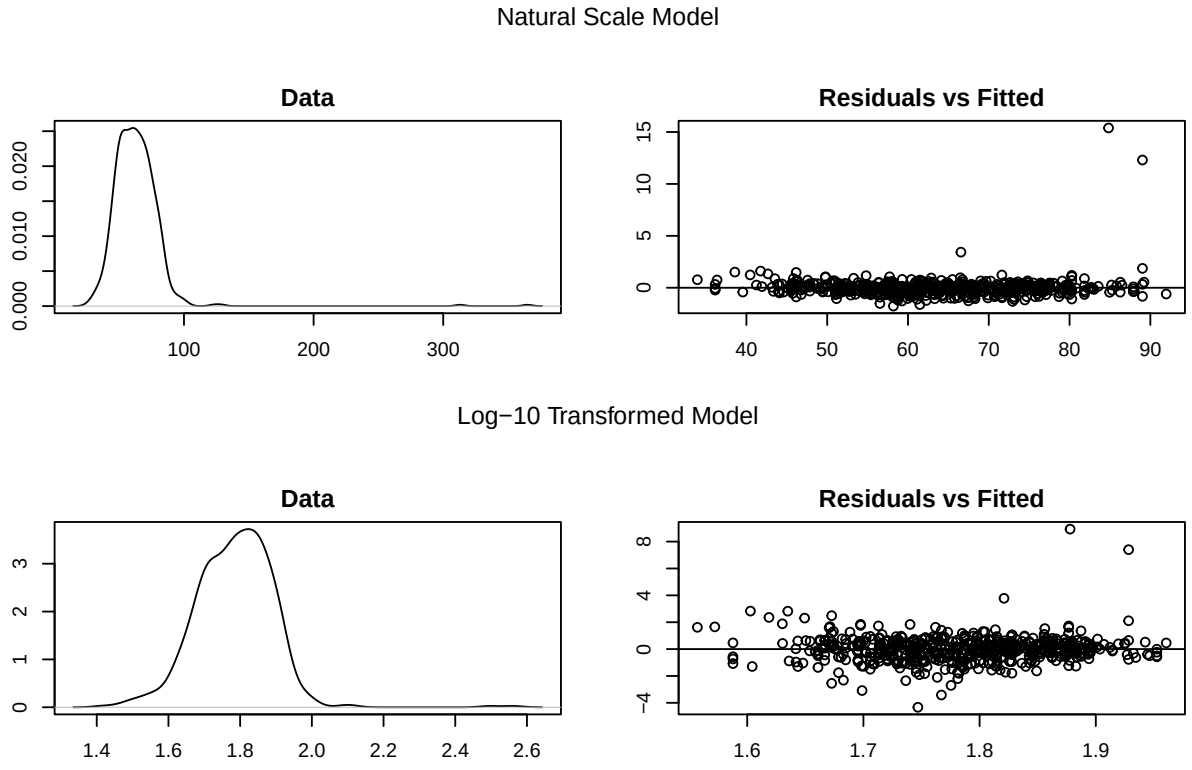
1.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	155	60.00	1.290
Davidson Creek	DC-05	after	15	78.00	0.000
Davidson Creek	DC-10	before	79	61.00	1.266
Davidson Creek	DC-10	after	6	76.50	0.000
Davidson Creek	DC-15	before	81	68.00	1.235
Davidson Creek	DC-15	after	6	81.50	0.000
Davidson Creek	DC-20	before	92	70.00	0.000
Davidson Creek	DC-20	after	6	84.00	0.000
Davidson Creek	FC-01	before	28	50.50	0.000
Davidson Creek	FC-01	after	6	57.25	0.000
Davidson Creek	705-05	before	15	50.00	0.000
Davidson Creek	705-05	after	6	41.50	0.000
Davidson Creek	705-10	before	58	56.75	0.000
Davidson Creek	705-10	after	10	60.25	0.000

1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-20	2017	7	monit	before	365	84.82	15.39	0
Davidson Creek	DC-15	2017	9	monit	before	313	89.02	12.30	0
Davidson Creek	DC-10	2022	2	monit	before	129	66.55	3.43	1

Outliers on log scale:

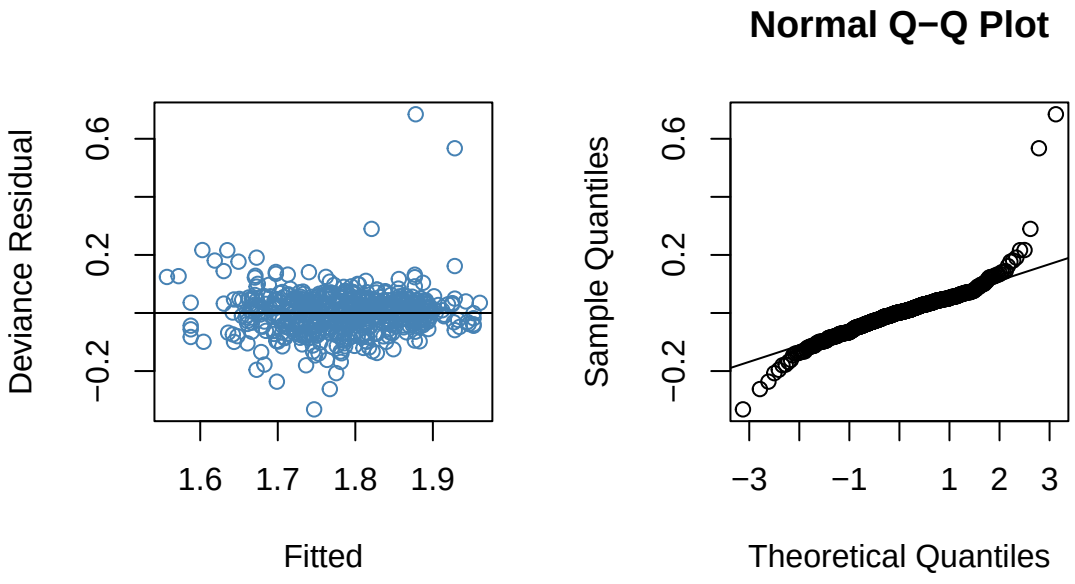
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-20	2017	7	monit	before	2.562	1.878	8.930	0
Davidson Creek	DC-15	2017	9	monit	before	2.495	1.928	7.401	0
Davidson Creek	DC-15	2018	5	monit	before	1.415	1.747	-4.330	0
Davidson Creek	DC-10	2022	2	monit	before	2.111	1.821	3.778	1
Davidson Creek	DC-20	2022	5	monit	before	1.505	1.767	-3.418	0
Davidson Creek	DC-05	2017	6	monit	before	1.462	1.699	-3.085	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.1376	0.1376	1	6.032	23.42	0.00284	
period	0.1017	0.1017	1	165.834	17.30	<0.001	
class:period	0.1053	0.1053	1	539.680	17.93	<0.001	0.138

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

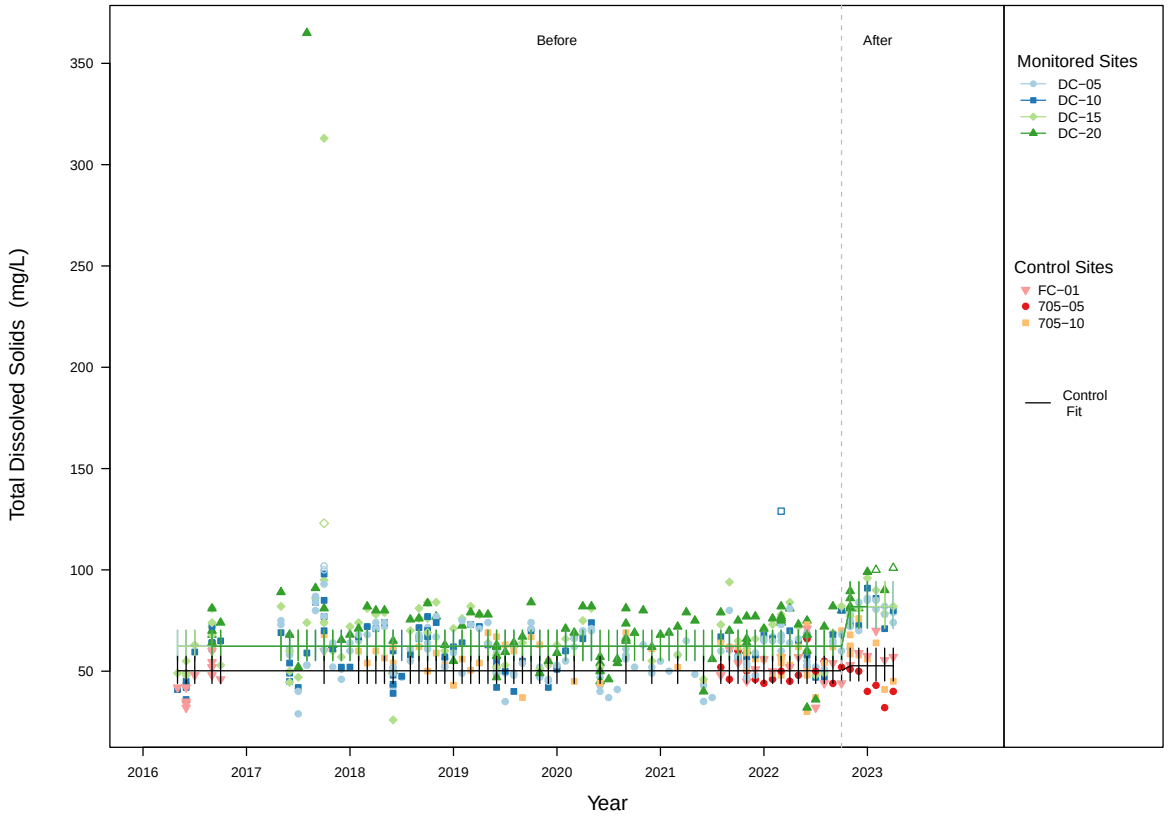
Monitored vs:	Estimate	Significance
control sites	0.0979	not significant

Conclusion:

The change in Total Dissolved Solids concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.138) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

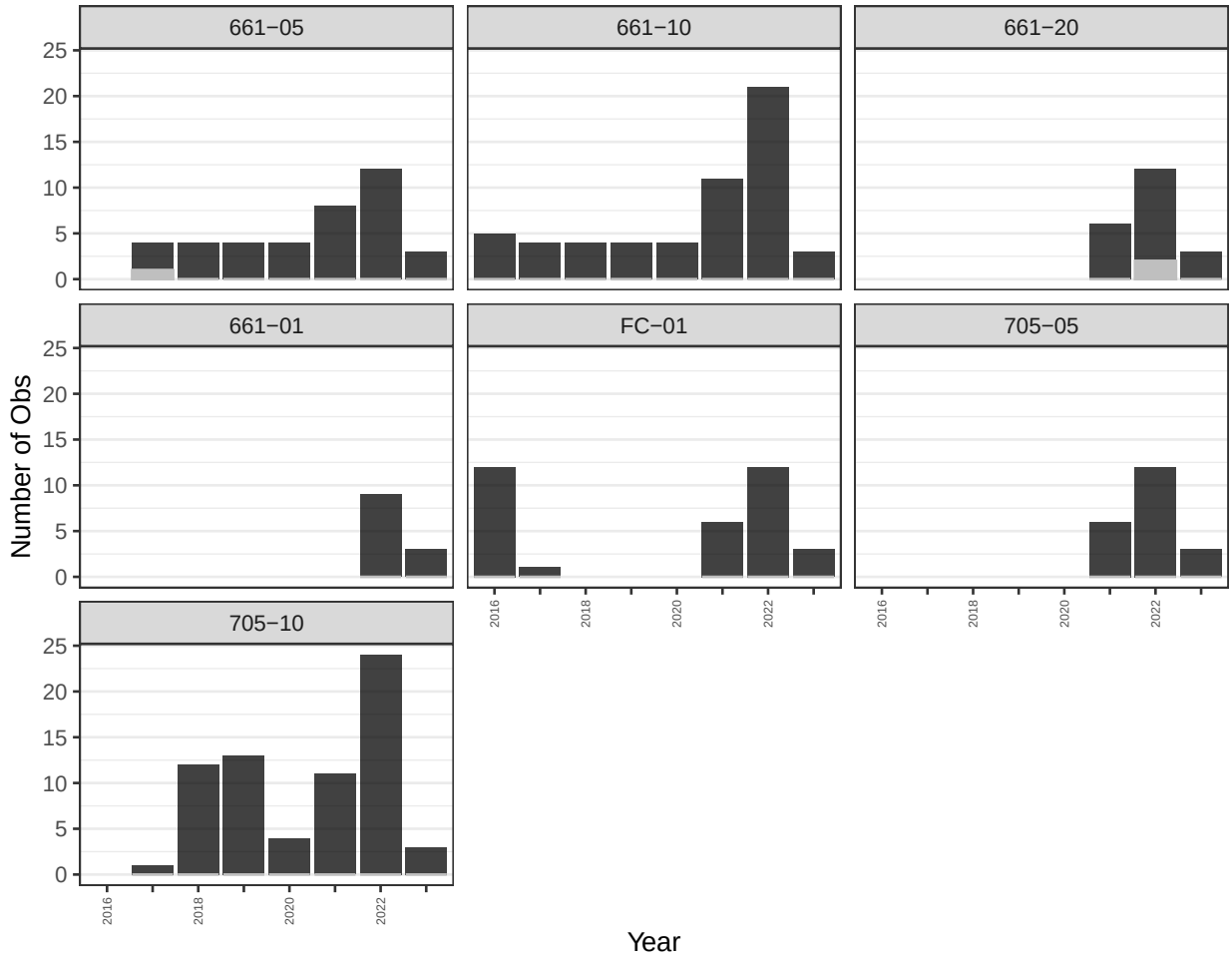
Final Summary Table

Variable	Total Dissolved Solids
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

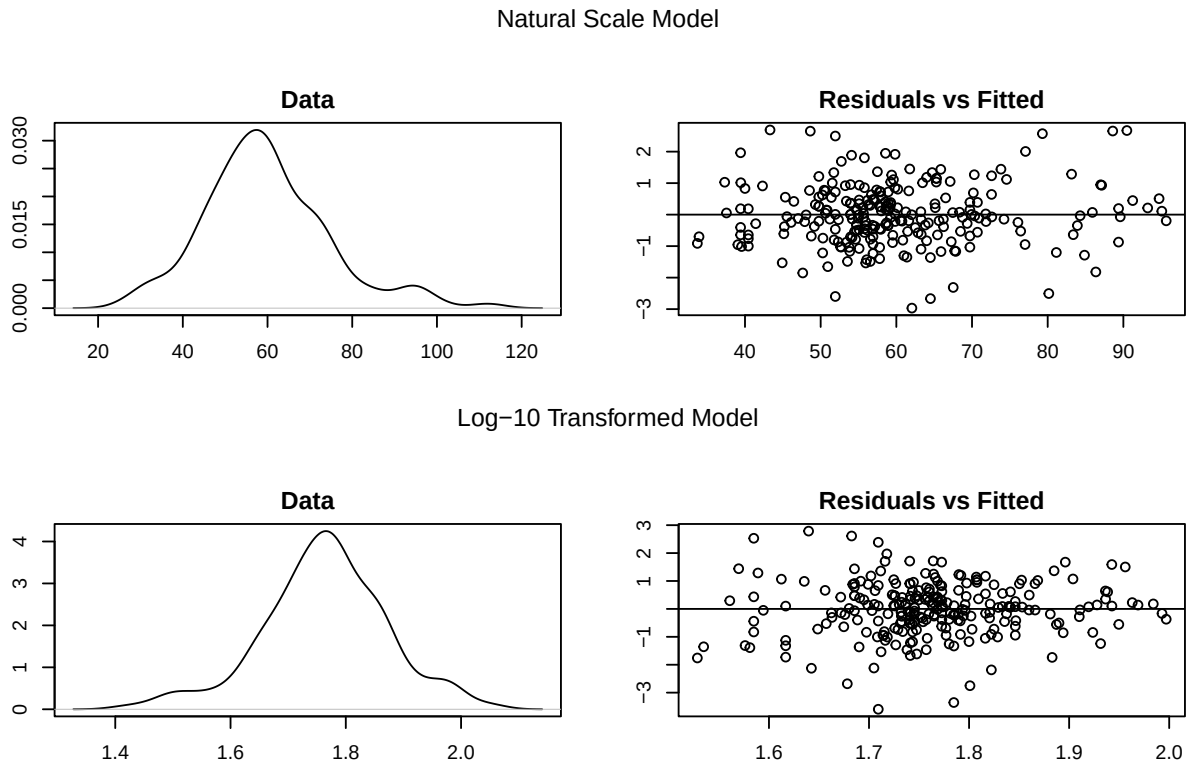
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	68.00	3.03
Creek 661	661-05	after	6	73.00	0.00
Creek 661	661-10	before	47	60.00	0.00
Creek 661	661-10	after	9	67.00	0.00
Creek 661	661-20	before	15	84.00	13.33
Creek 661	661-20	after	6	94.50	0.00
Creek 661	661-01	before	3	39.00	0.00
Creek 661	661-01	after	9	36.00	0.00
Creek 661	FC-01	before	28	50.50	0.00
Creek 661	FC-01	after	6	57.25	0.00
Creek 661	705-05	before	15	50.00	0.00
Creek 661	705-05	after	6	41.50	0.00
Creek 661	705-10	before	58	56.75	0.00
Creek 661	705-10	after	10	60.25	0.00

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

None

Outliers on log scale:

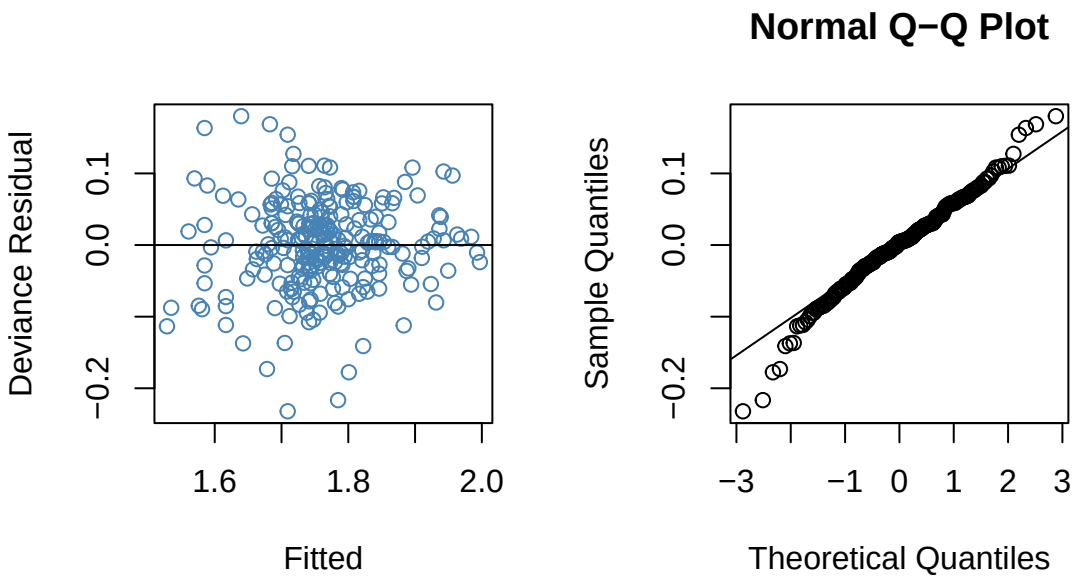
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	705-10	2022	5	control	before	1.477	1.709	-3.596	0
Creek 661	705-10	2019	8	control	before	1.568	1.785	-3.355	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0384	0.0384	1	5.03	9.205	0.0287	
period	0.0440	0.0440	1	135.59	10.557	0.0015	
class:period	0.0194	0.0194	1	227.29	4.651	0.0321	0.954

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

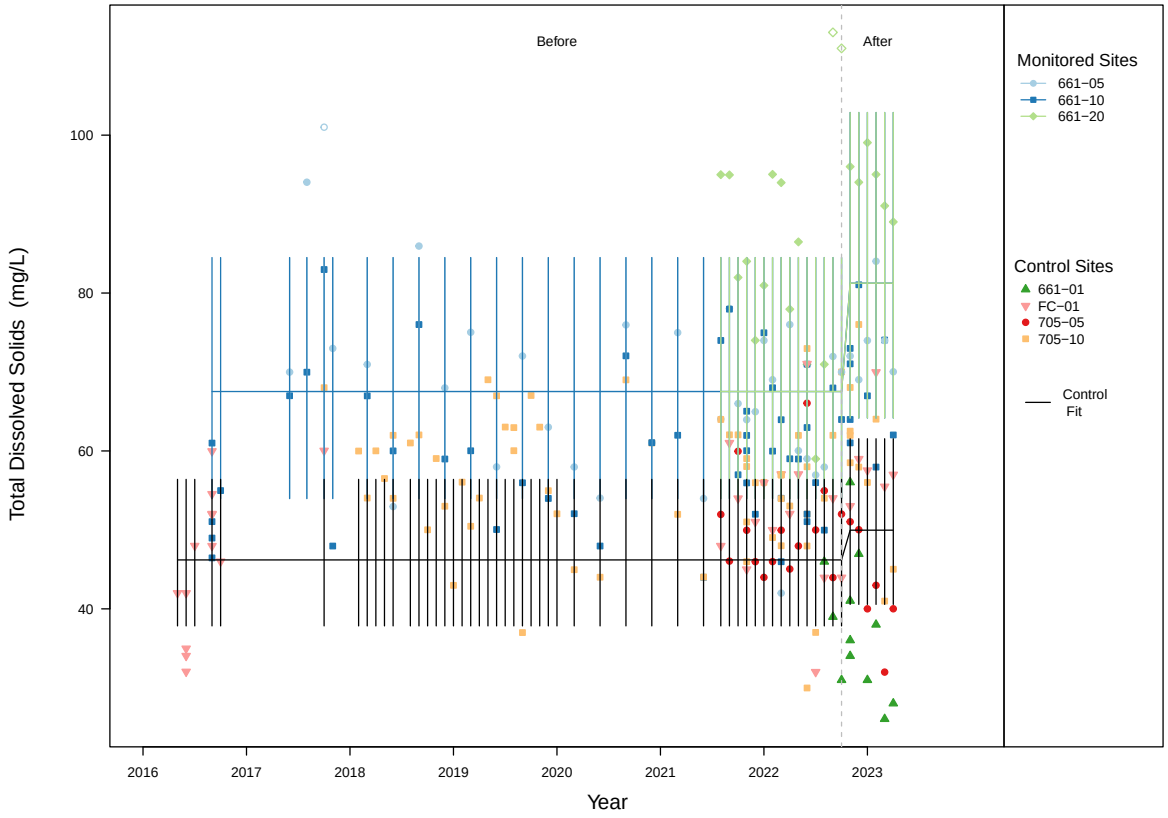
Monitored vs:	Estimate	Significance
control sites	0.0463	not significant

Conclusion:

The change in Total Dissolved Solids concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.954) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

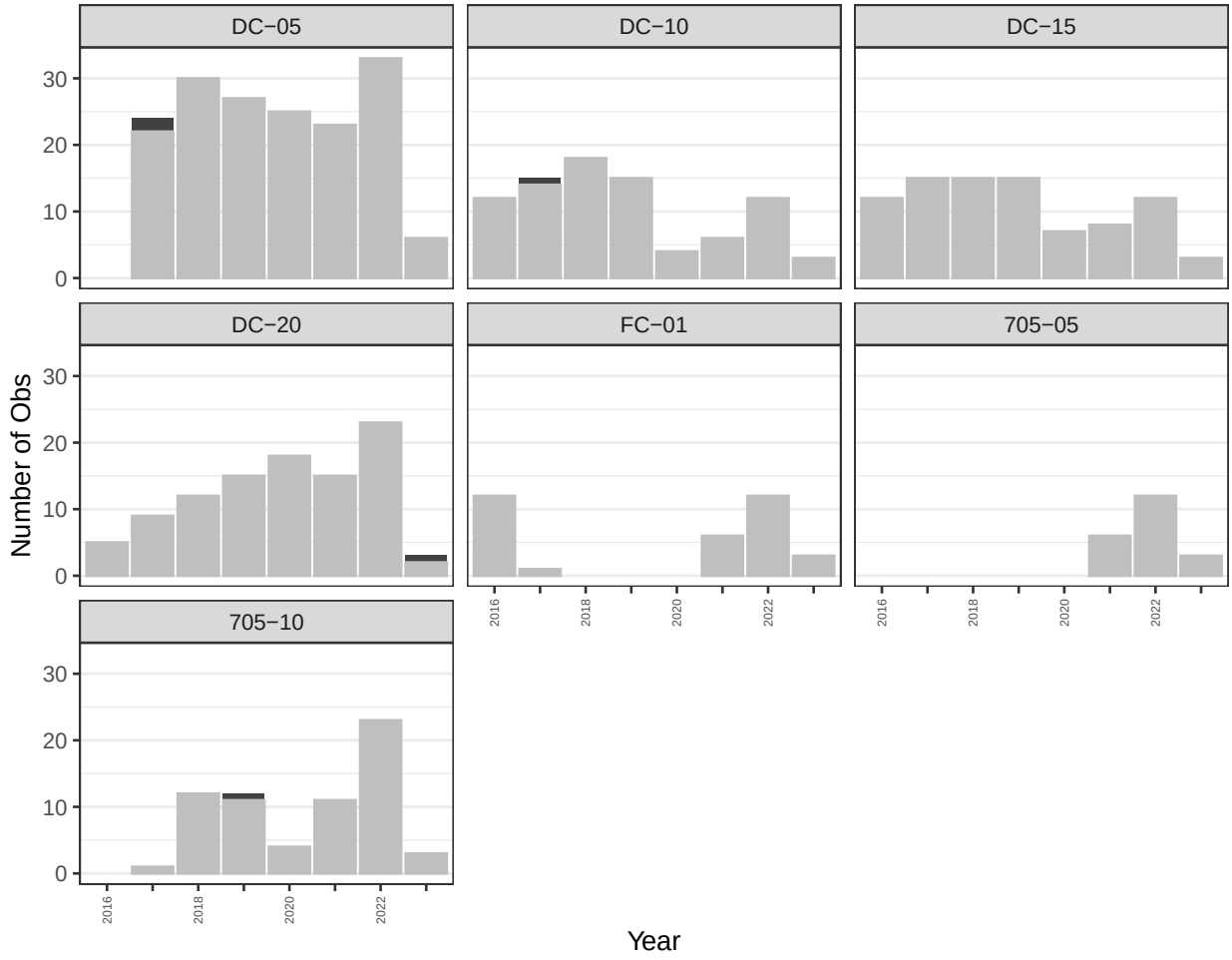
Final Summary Table

Variable	Total Dissolved Solids
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.4 Chloride

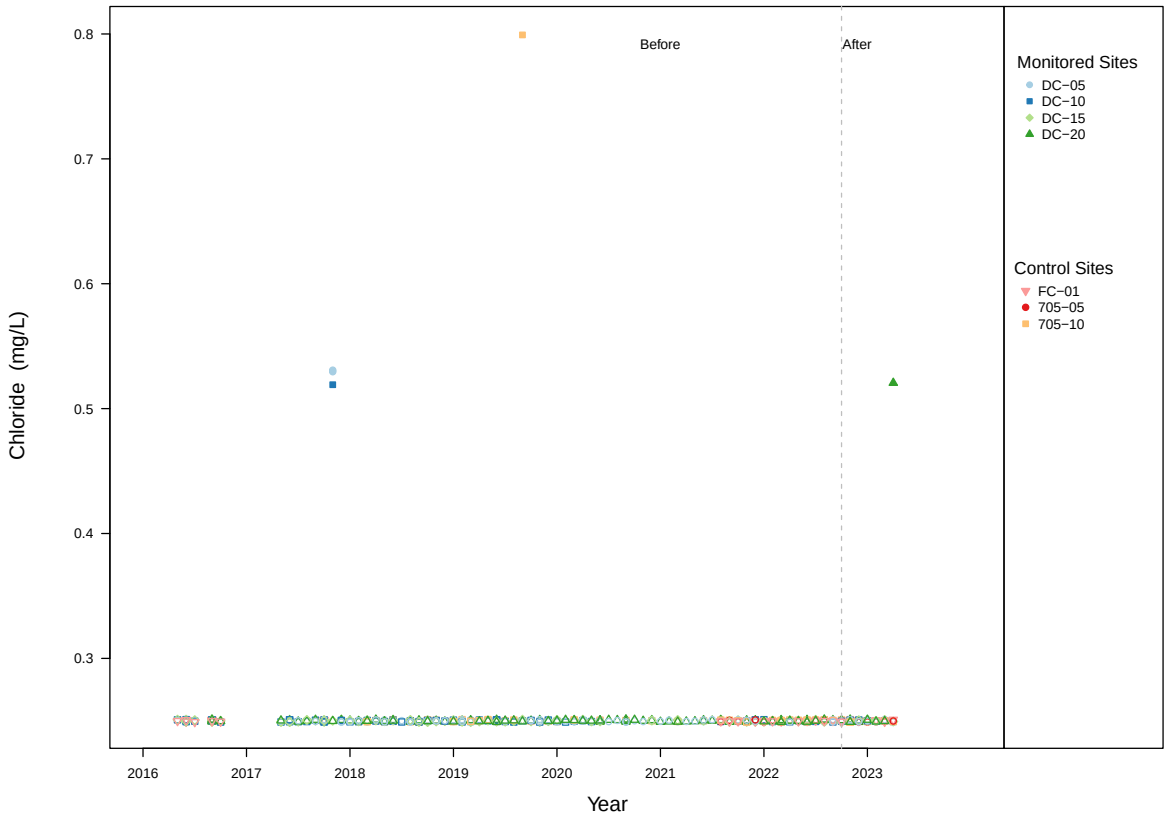
1 Davidson Creek

1.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



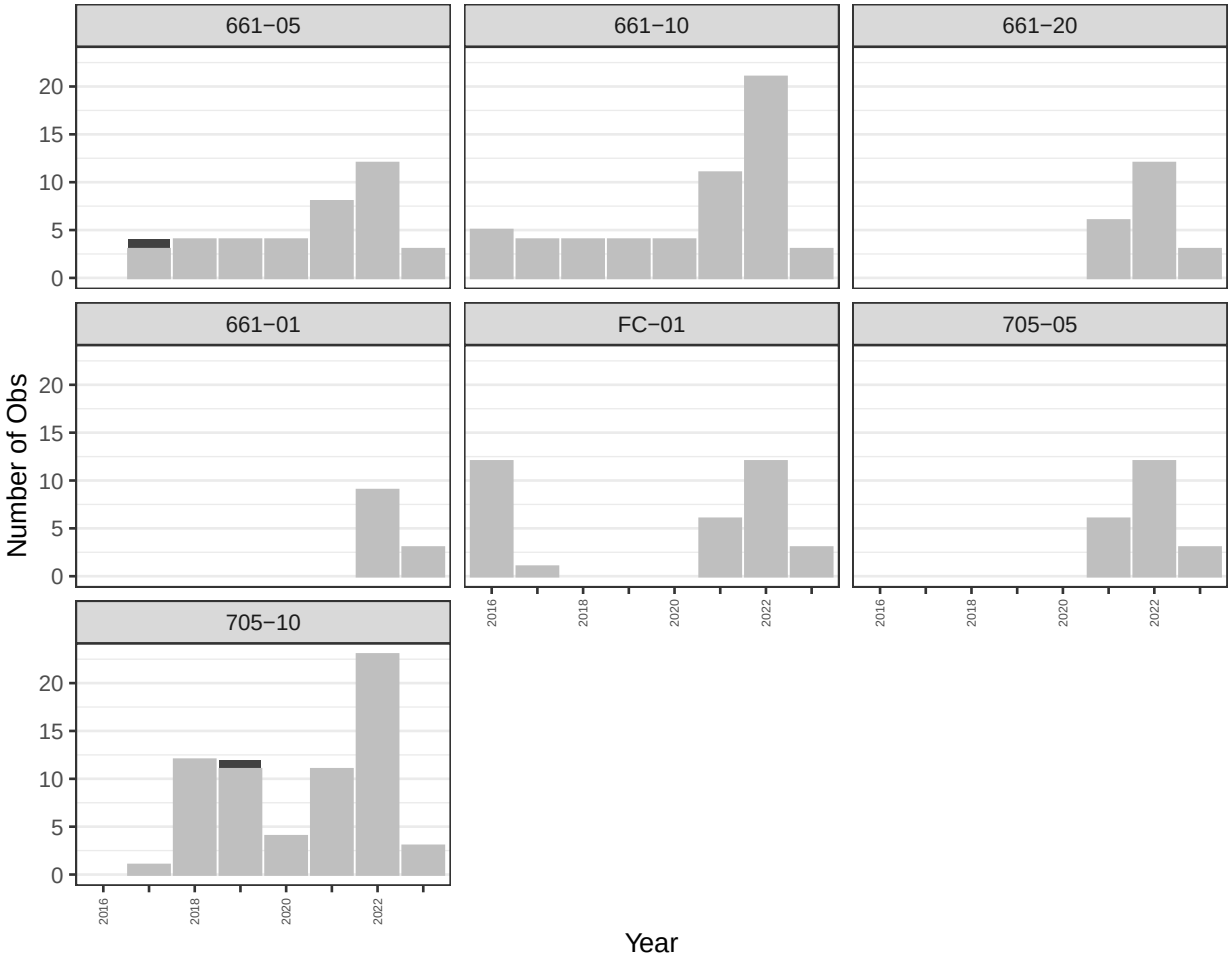
Note: Open symbols represent cases where the results were below the sample detection limit.

Final Summary Table

Variable	Chloride
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

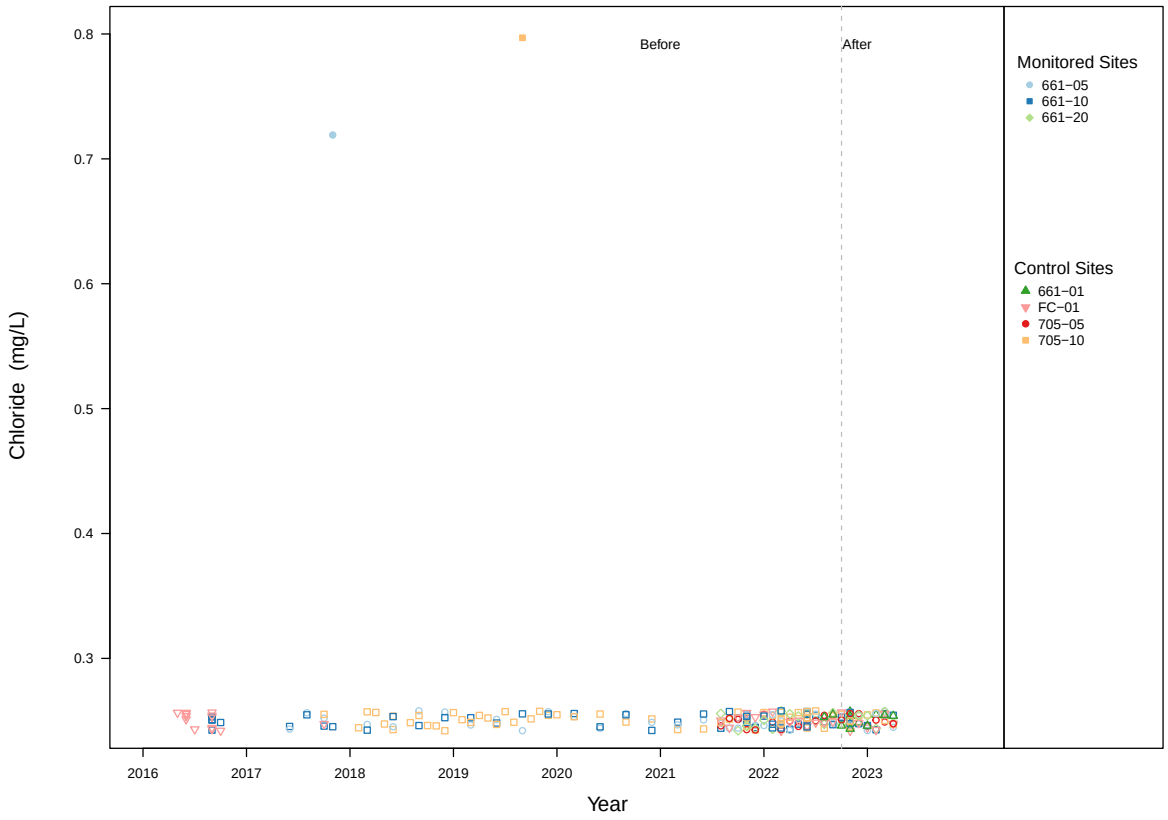
2 Creek 661

2.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



Note: Open symbols represent cases where the results were below the sample detection limit.

Final Summary Table

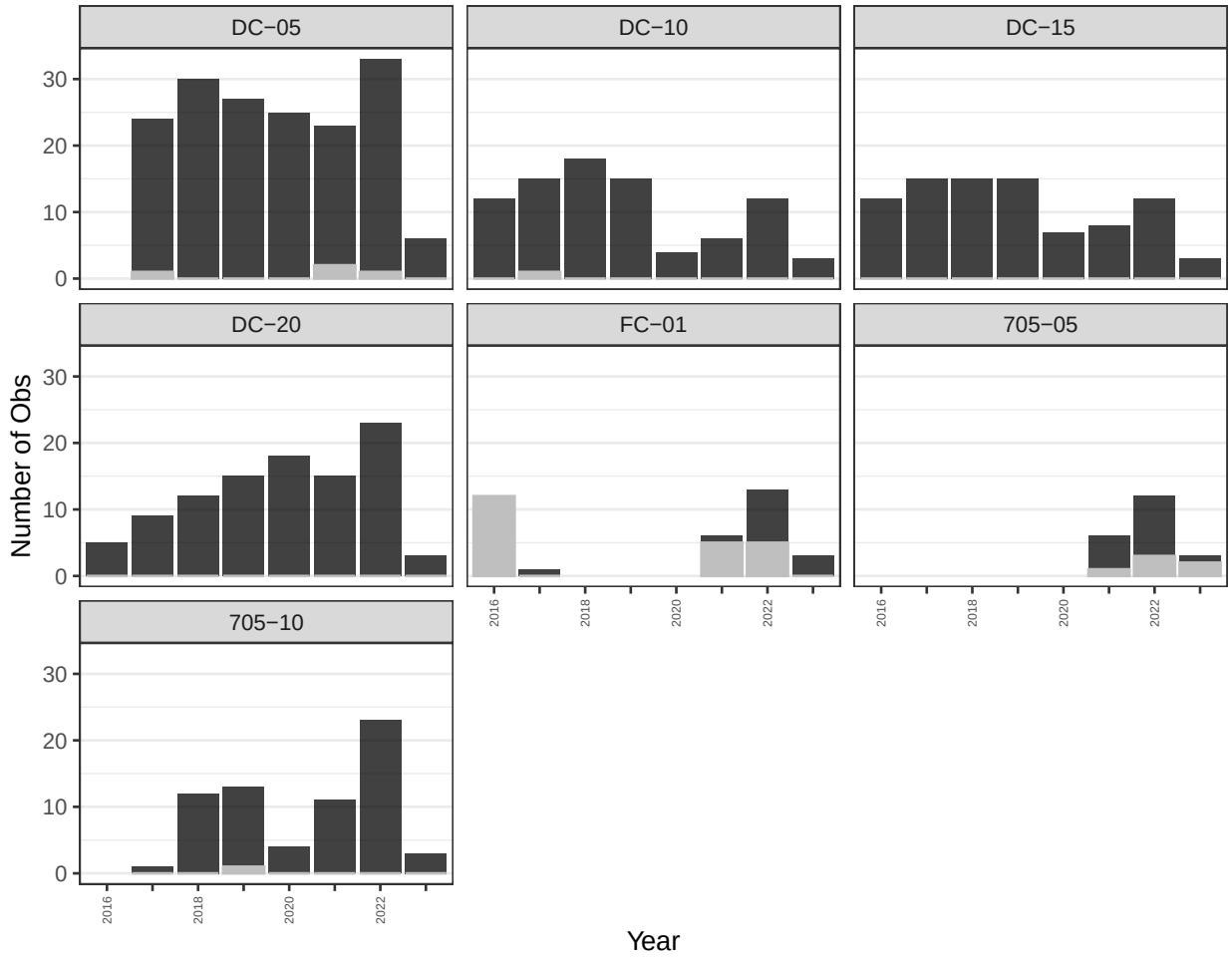
Variable	Chloride
Watershed	Creek 661
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

C-2.1.5 Fluoride

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

Watershed	Site	Year	Class	Period	#Obs Removed
Davidson Creek	FC-01	2016	control	before	12
Davidson Creek	FC-01	2021	control	before	6
Davidson Creek	705-05	2023	control	after	3

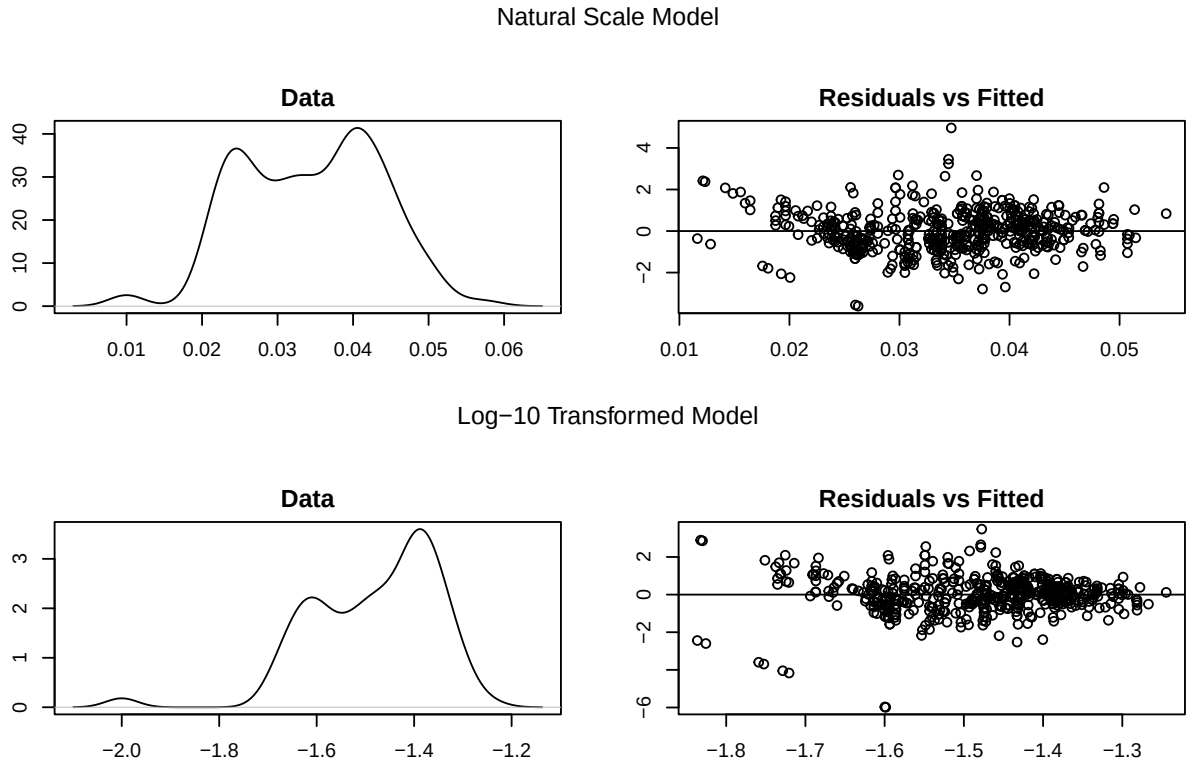
1.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	153	0.0340	2.614
Davidson Creek	DC-05	after	15	0.0430	0.000
Davidson Creek	DC-10	before	79	0.0340	1.266
Davidson Creek	DC-10	after	6	0.0427	0.000
Davidson Creek	DC-15	before	81	0.0390	0.000
Davidson Creek	DC-15	after	6	0.0500	0.000
Davidson Creek	DC-20	before	91	0.0420	0.000
Davidson Creek	DC-20	after	9	0.0500	0.000
Davidson Creek	FC-01	before	10	0.0220	30.000
Davidson Creek	FC-01	after	4	0.0205	50.000
Davidson Creek	705-05	before	9	0.0220	22.222
Davidson Creek	705-05	after	3	0.0250	33.333
Davidson Creek	705-10	before	58	0.0243	1.724
Davidson Creek	705-10	after	9	0.0280	0.000

1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-10	2017	10	monit	before	0.057	0.0347	4.962	0
Davidson Creek	DC-10	2017	5	monit	before	0.010	0.0262	-3.614	1
Davidson Creek	DC-05	2017	5	monit	before	0.010	0.0260	-3.560	1
Davidson Creek	DC-05	2017	10	monit	before	0.050	0.0345	3.459	0
Davidson Creek	DC-05	2017	10	monit	before	0.049	0.0345	3.236	0

Outliers on log scale:

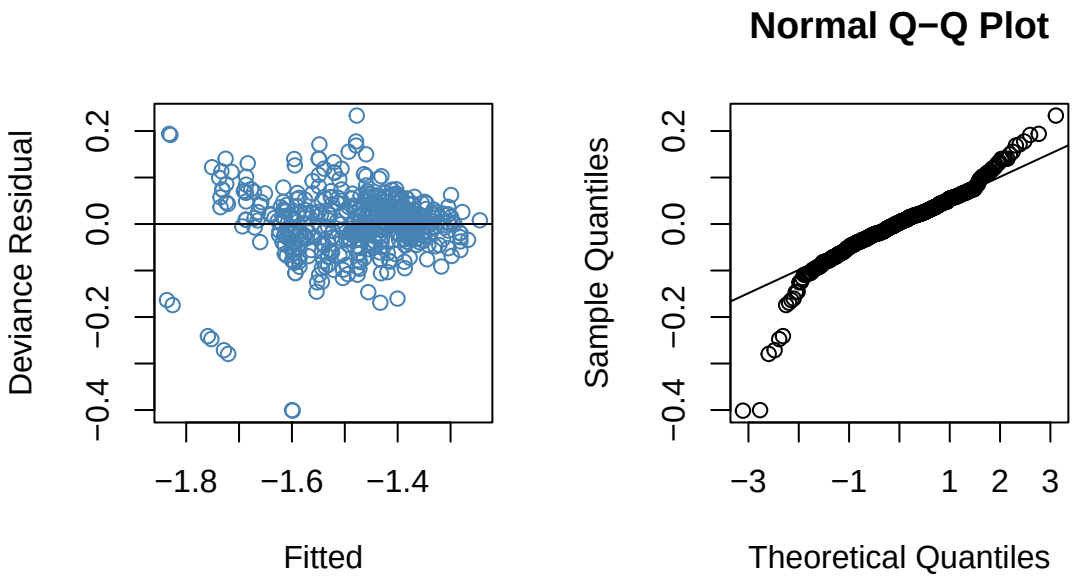
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-10	2017	5	monit	before	-2.000	-1.599	-5.987	1
Davidson Creek	DC-05	2017	5	monit	before	-2.000	-1.600	-5.970	1
Davidson Creek	FC-01	2022	10	control	after	-2.000	-1.721	-4.168	1
Davidson Creek	705-05	2022	12	control	after	-2.000	-1.729	-4.048	1
Davidson Creek	705-05	2022	7	control	before	-2.000	-1.752	-3.693	1
Davidson Creek	FC-01	2022	7	control	before	-2.000	-1.759	-3.595	1
Davidson Creek	DC-10	2017	10	monit	before	-1.244	-1.477	3.480	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.1655	0.1655	1	5.353	36.833	0.0014	
period	0.0116	0.0116	1	189.477	2.591	0.1090	
class:period	0.0394	0.0394	1	513.989	8.778	0.0032	0.0287

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

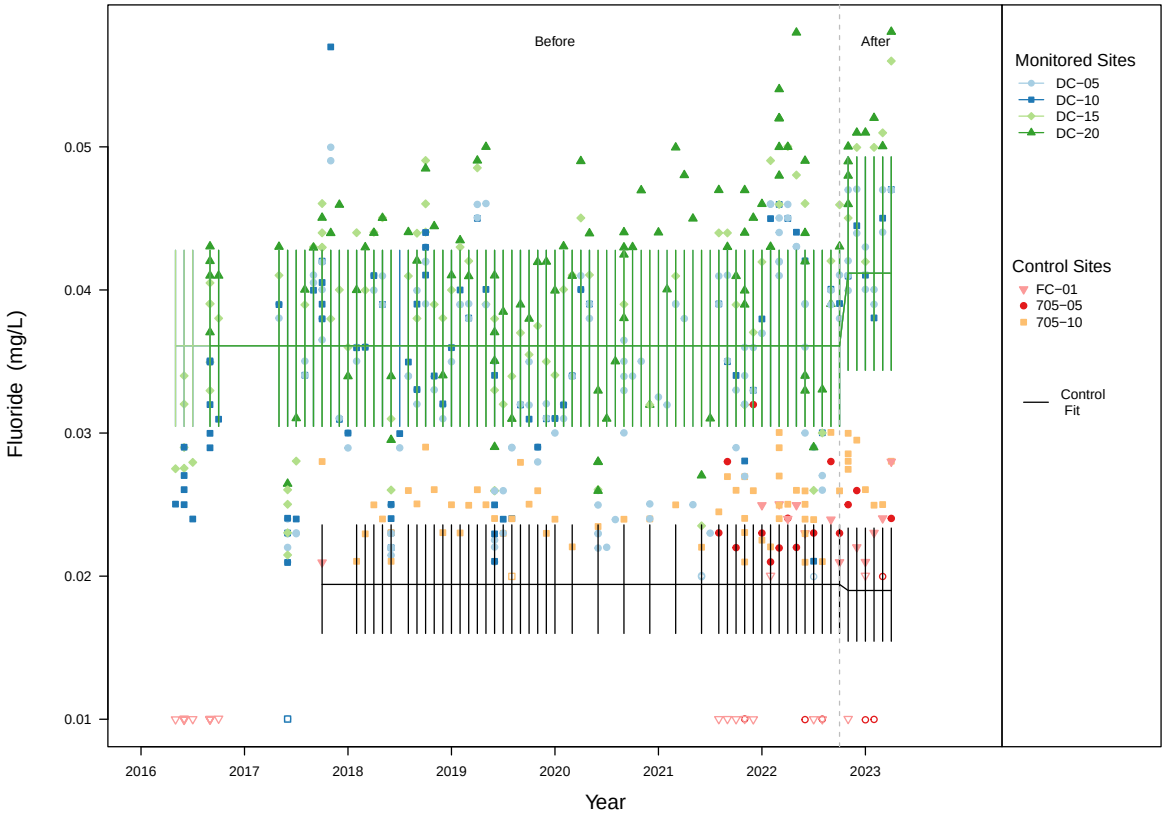
Monitored vs:	Estimate	Significance
control sites	0.0667	significant

Conclusion:

The change in Fluoride concentrations at the monitored sites from *before* to *after* was significantly (*adjusted p* = 0.0287) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

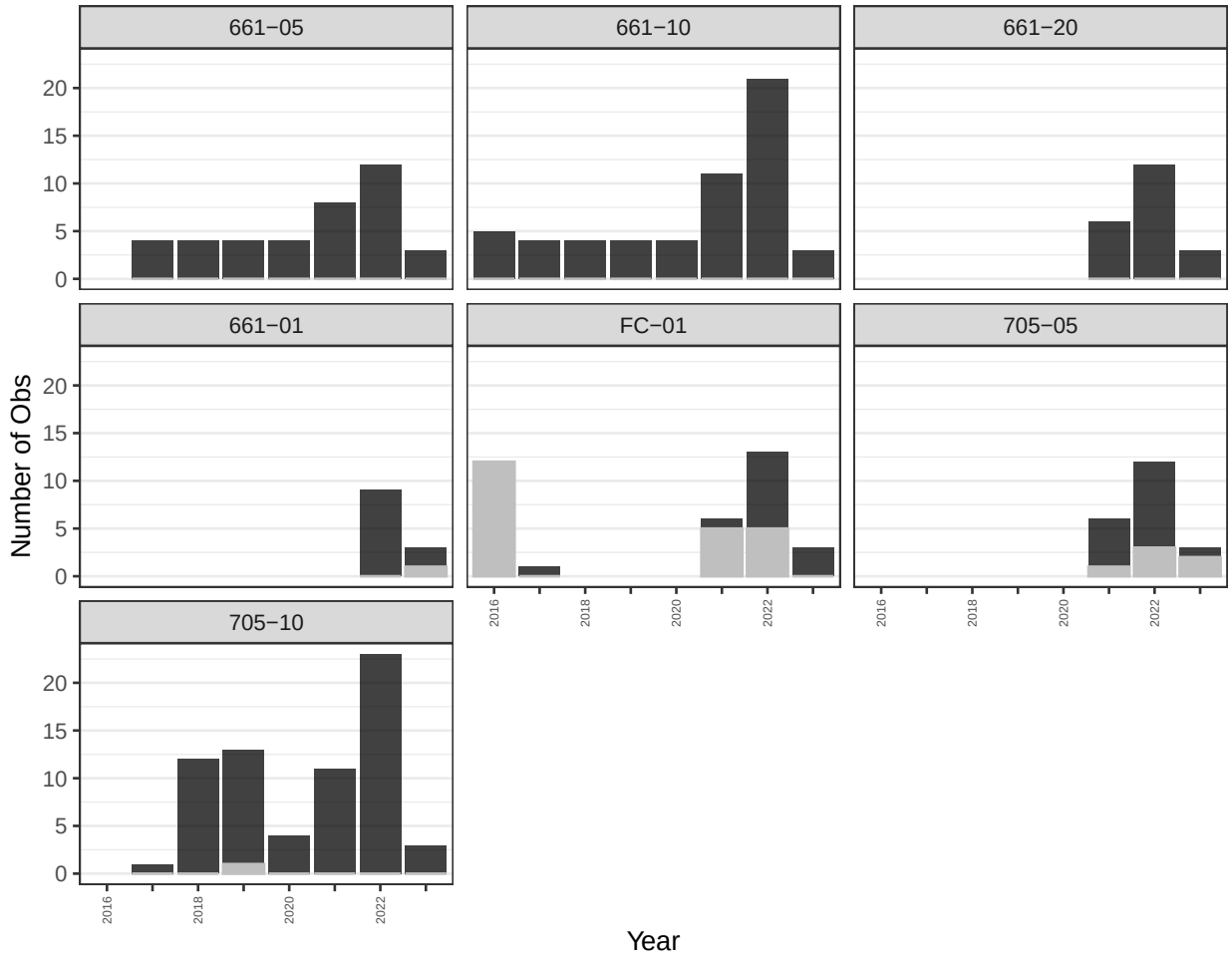
Final Summary Table

Variable	Fluoride
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	TRUE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

Watershed	Site	Year	Class	Period	#Obs Removed
Creek 661	FC-01	2016	control	before	12
Creek 661	FC-01	2021	control	before	6
Creek 661	705-05	2023	control	after	3

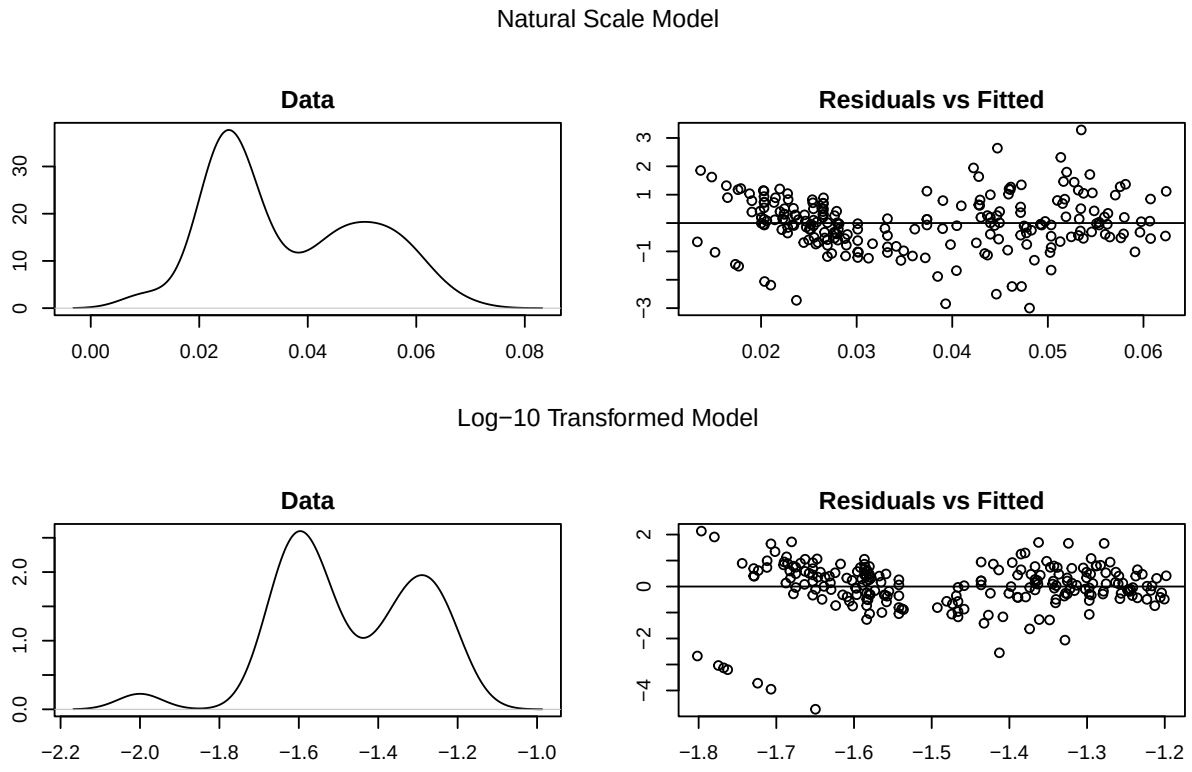
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	0.0510	0.000
Creek 661	661-05	after	6	0.0600	0.000
Creek 661	661-10	before	47	0.0430	0.000
Creek 661	661-10	after	9	0.0490	0.000
Creek 661	661-20	before	15	0.0550	0.000
Creek 661	661-20	after	6	0.0590	0.000
Creek 661	661-01	before	3	0.0280	0.000
Creek 661	661-01	after	9	0.0280	11.111
Creek 661	FC-01	before	10	0.0220	30.000
Creek 661	FC-01	after	4	0.0205	50.000
Creek 661	705-05	before	9	0.0220	22.222
Creek 661	705-05	after	3	0.0250	33.333
Creek 661	705-10	before	58	0.0243	1.724
Creek 661	705-10	after	9	0.0280	0.000

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	661-05	2019	2	monit	before	0.07	0.0535	3.282	0

Outliers on log scale:

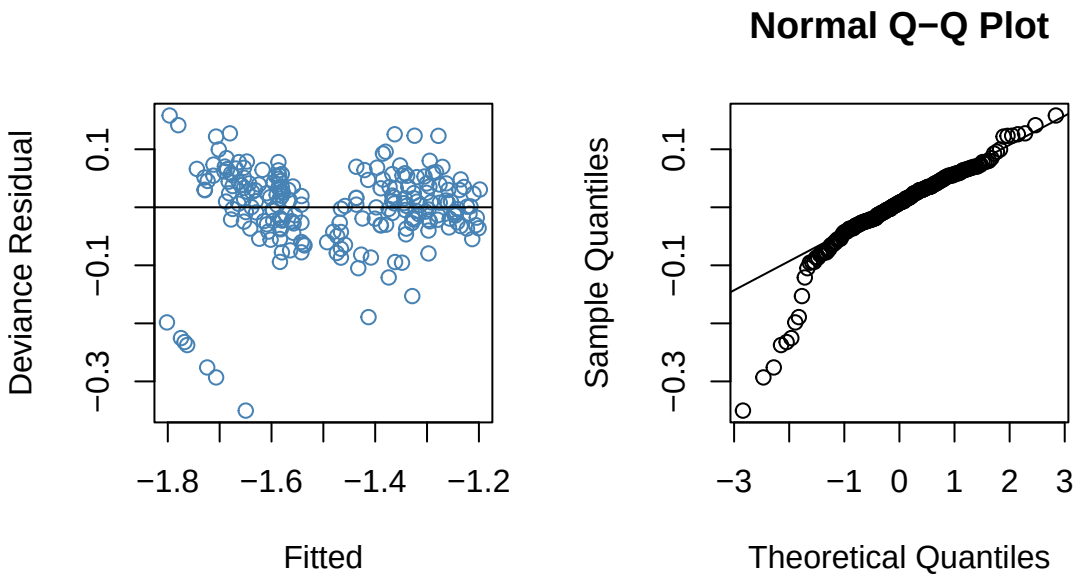
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	661-01	2023	1	control	after	-2	-1.650	-4.722	1
Creek 661	FC-01	2022	10	control	after	-2	-1.707	-3.951	1
Creek 661	705-05	2022	12	control	after	-2	-1.724	-3.720	1
Creek 661	705-05	2022	7	control	before	-2	-1.763	-3.200	1
Creek 661	FC-01	2022	7	control	before	-2	-1.768	-3.130	1
Creek 661	705-05	2022	5	control	before	-2	-1.775	-3.038	1

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.2834	0.2834	1	5.057	51.483	<0.001	
period	0.0195	0.0195	1	122.057	3.543	0.0622	
class:period	0.0333	0.0333	1	201.230	6.055	0.0147	0.419

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

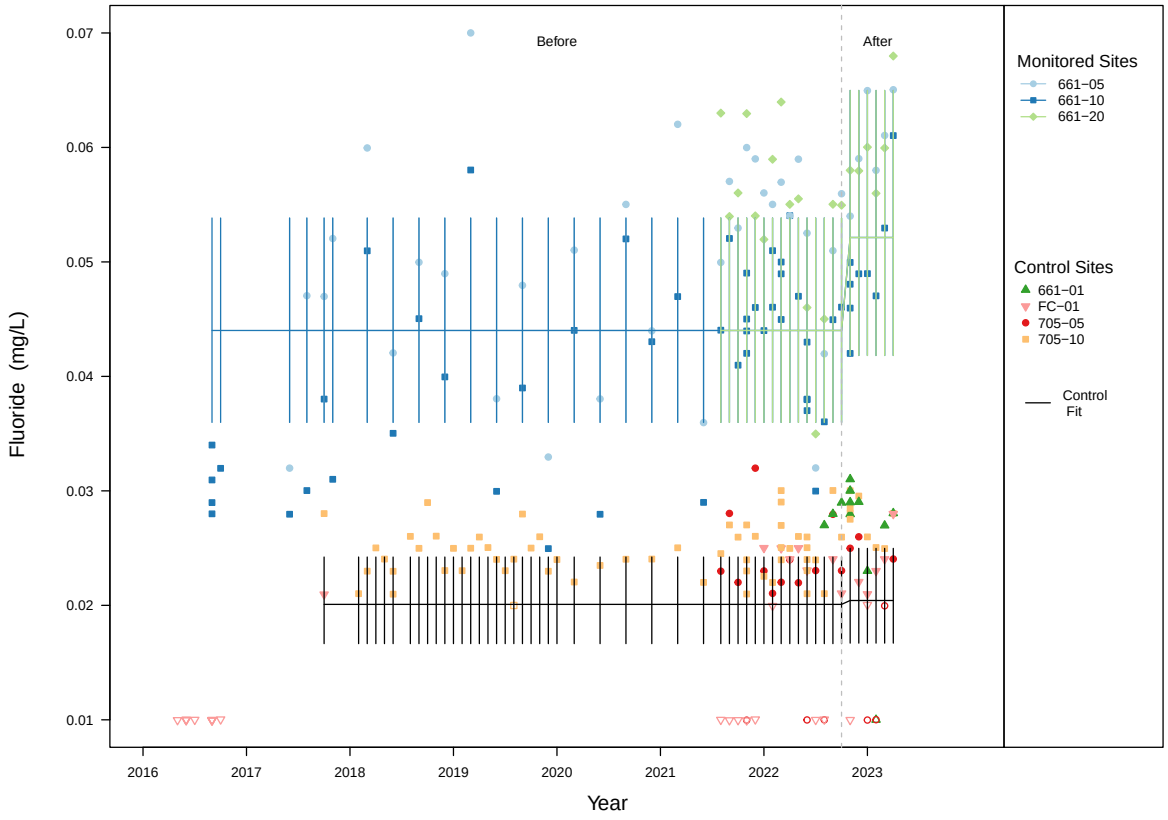
Monitored vs:	Estimate	Significance
control sites	0.0663	not significant

Conclusion:

The change in Fluoride concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.419) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

Final Summary Table

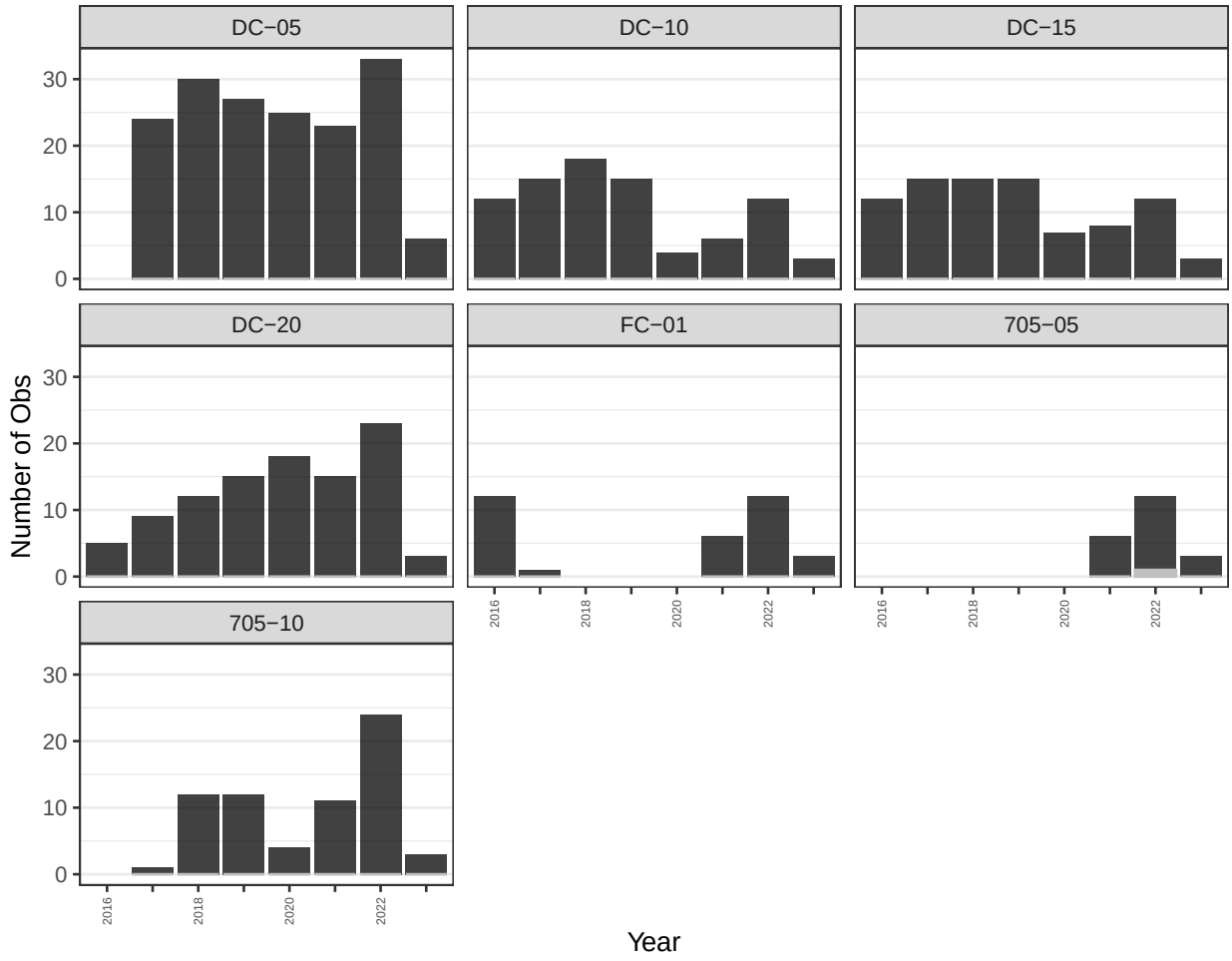
Variable	Fluoride
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.6 Sulphate

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

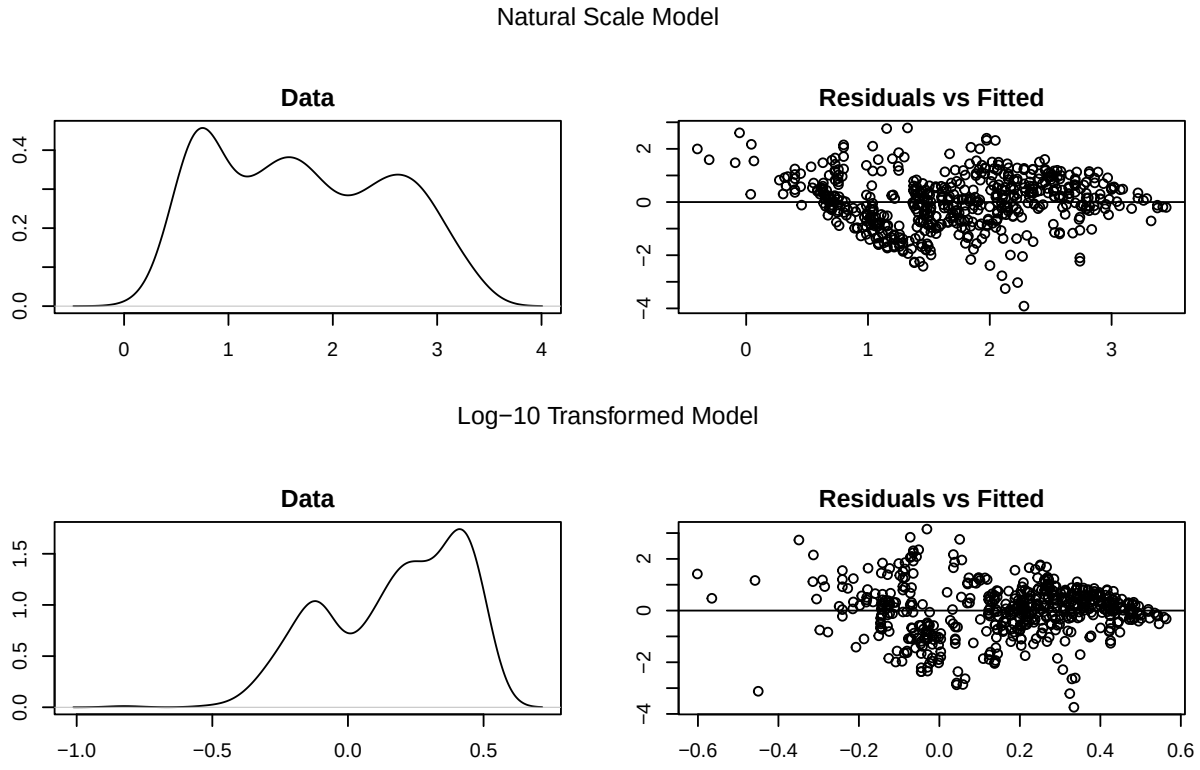
1.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	153	1.750	0.000
Davidson Creek	DC-05	after	15	3.230	0.000
Davidson Creek	DC-10	before	79	1.680	0.000
Davidson Creek	DC-10	after	6	3.303	0.000
Davidson Creek	DC-15	before	81	1.715	0.000
Davidson Creek	DC-15	after	6	3.095	0.000
Davidson Creek	DC-20	before	91	1.670	0.000
Davidson Creek	DC-20	after	9	2.730	0.000
Davidson Creek	FC-01	before	28	1.518	0.000
Davidson Creek	FC-01	after	6	2.695	0.000
Davidson Creek	705-05	before	15	0.560	6.667
Davidson Creek	705-05	after	6	0.775	0.000
Davidson Creek	705-10	before	58	1.030	0.000
Davidson Creek	705-10	after	9	1.500	0.000

1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-05	2021	4	monit	before	0.77	2.281	-3.914	0
Davidson Creek	DC-10	2016	4	monit	before	0.87	2.127	-3.256	0
Davidson Creek	DC-20	2021	4	monit	before	1.06	2.229	-3.028	0

Outliers on log scale:

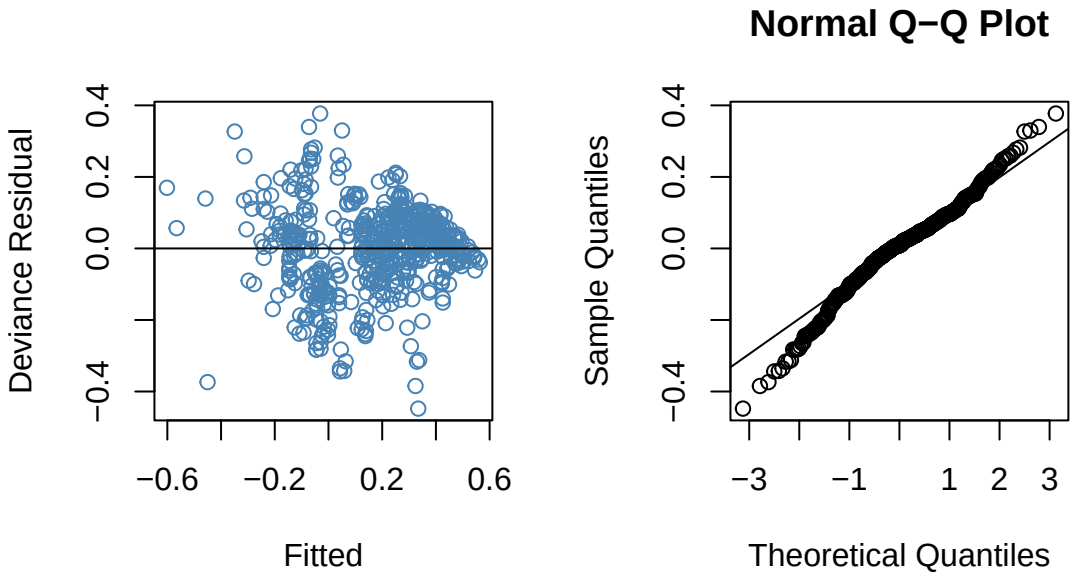
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-05	2021	4	monit	before	-0.1135	0.3343	-3.742	0
Davidson Creek	DC-10	2016	4	monit	before	-0.0605	0.3241	-3.213	0
Davidson Creek	FC-01	2022	5	control	before	0.3464	-0.0310	3.152	0
Davidson Creek	705-05	2022	7	control	before	-0.8239	-0.4502	-3.123	1

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0621	0.0621	1	5.106	4.333	0.0907	
period	0.4152	0.4152	1	228.606	28.985	<0.001	
class:period	0.1498	0.1498	1	536.744	10.460	0.0013	0.112

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

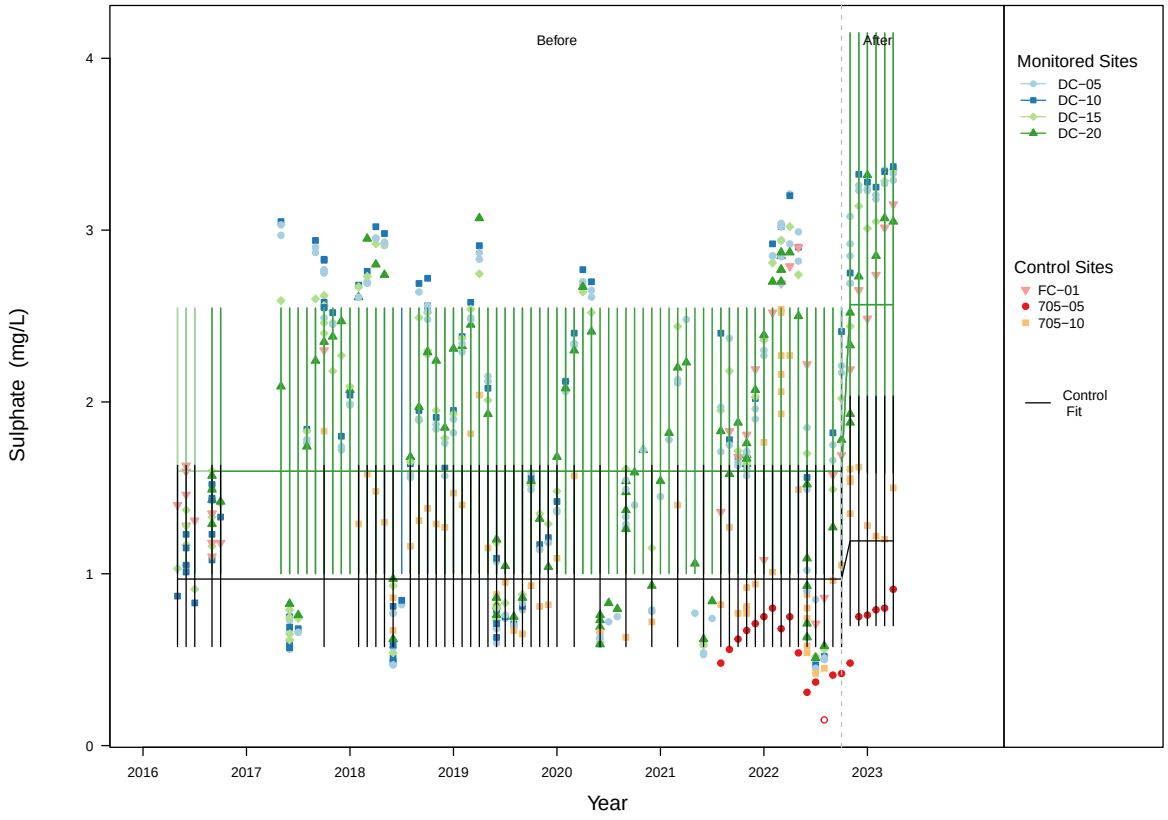
Monitored vs:	Estimate	Significance
control sites	0.1166	not significant

Conclusion:

The change in Sulphate concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.112) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

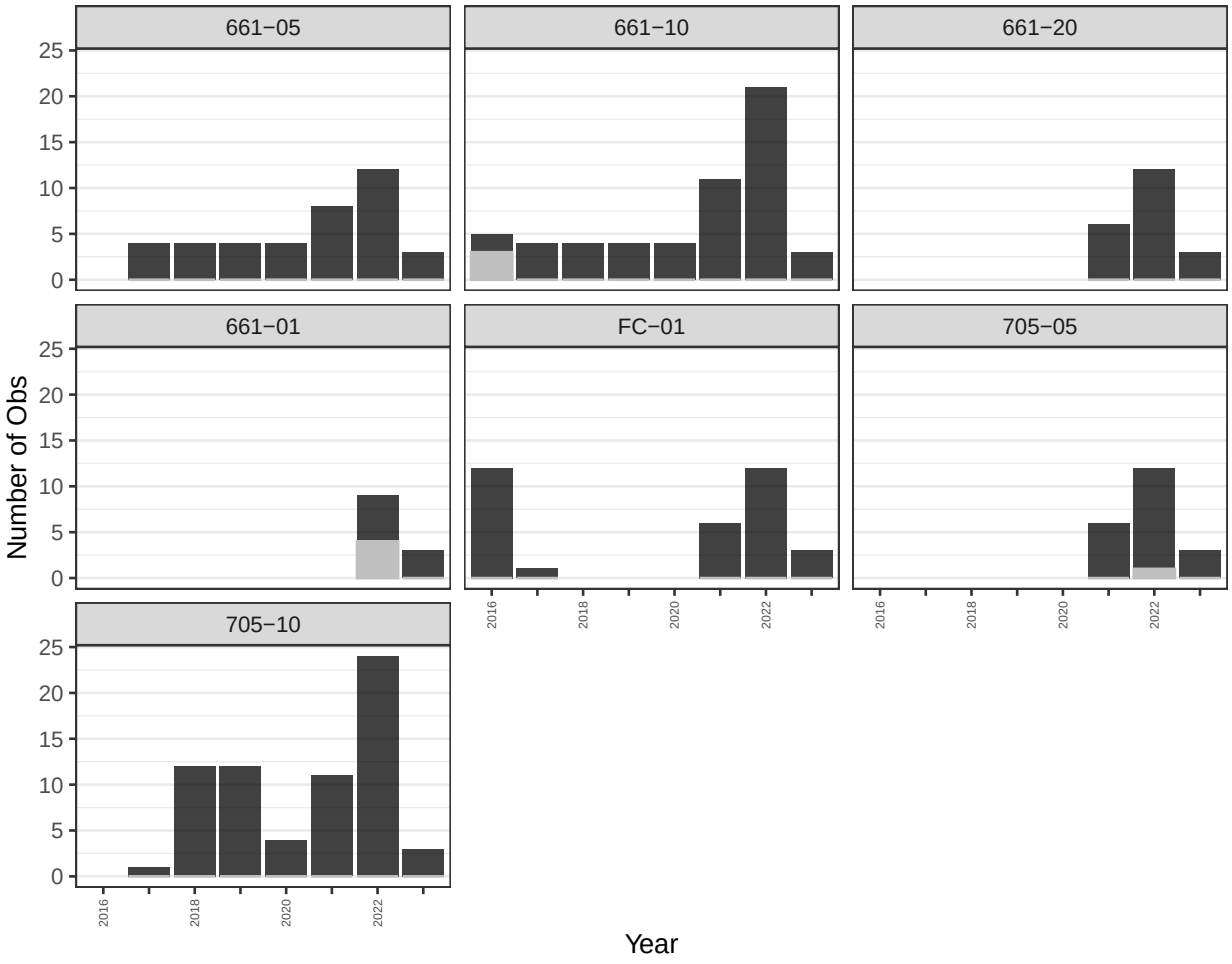
Final Summary Table

Variable	Sulphate
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

Watershed	Site	Year	Class	Period	#Obs Removed
Creek 661	661-10	2016	monit	before	5

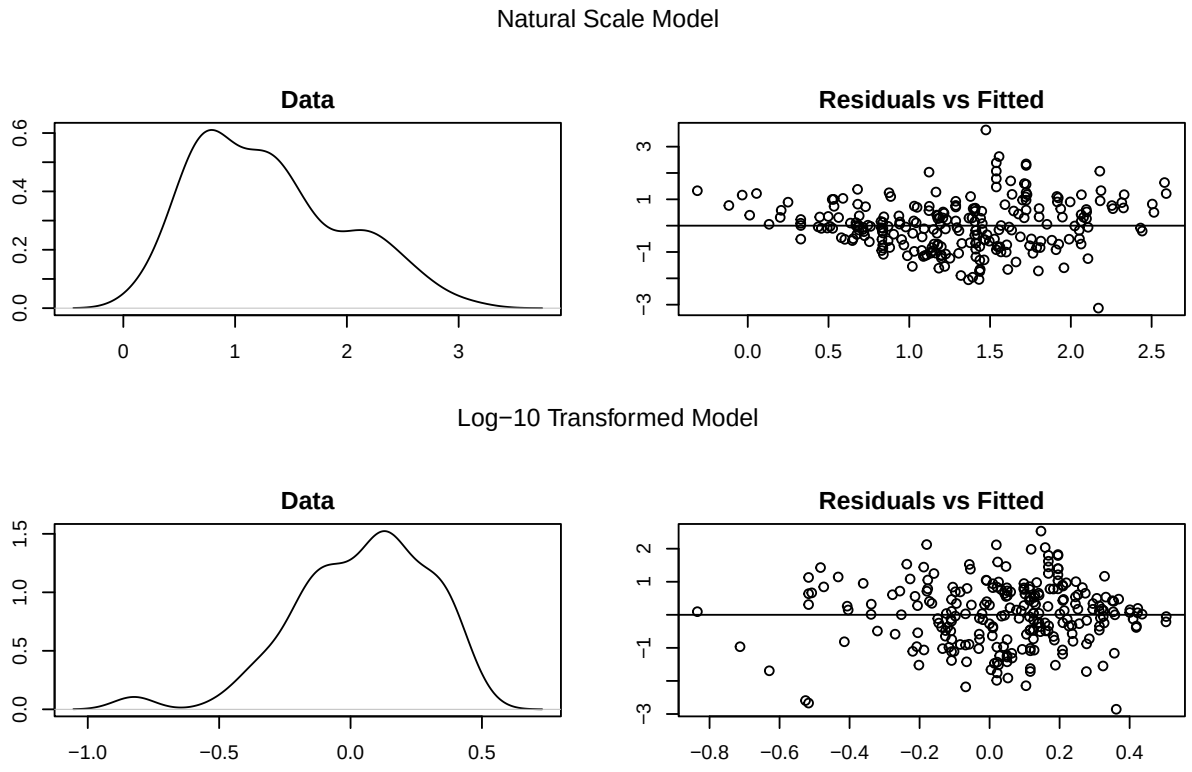
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	0.880	0.000
Creek 661	661-05	after	6	1.305	0.000
Creek 661	661-10	before	42	1.600	0.000
Creek 661	661-10	after	9	1.270	0.000
Creek 661	661-20	before	15	1.870	0.000
Creek 661	661-20	after	6	2.393	0.000
Creek 661	661-01	before	3	0.150	100.000
Creek 661	661-01	after	9	0.420	11.111
Creek 661	FC-01	before	28	1.518	0.000
Creek 661	FC-01	after	6	2.695	0.000
Creek 661	705-05	before	15	0.560	6.667
Creek 661	705-05	after	6	0.775	0.000
Creek 661	705-10	before	58	1.030	0.000
Creek 661	705-10	after	9	1.500	0.000

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	661-10	2021	9	monit	before	2.74	1.474	3.633	0
Creek 661	FC-01	2021	12	control	before	1.08	2.171	-3.131	0

Outliers on log scale:

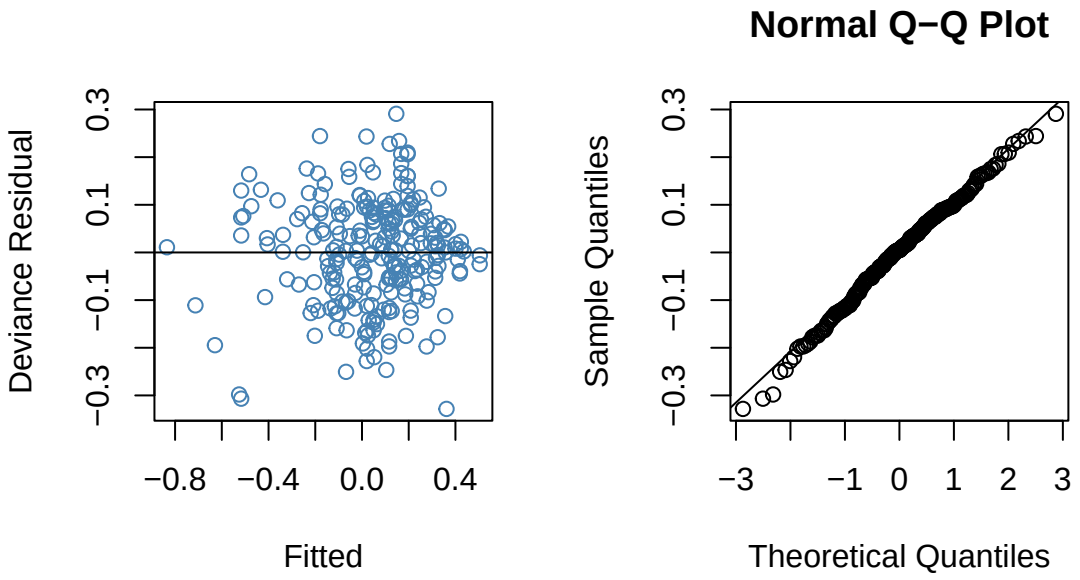
None

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0123	0.0123	1	5.007	0.9326	0.3780	
period	0.0261	0.0261	1	45.570	1.9794	0.1660	
class:period	0.0878	0.0878	1	222.502	6.6427	0.0106	0.07

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

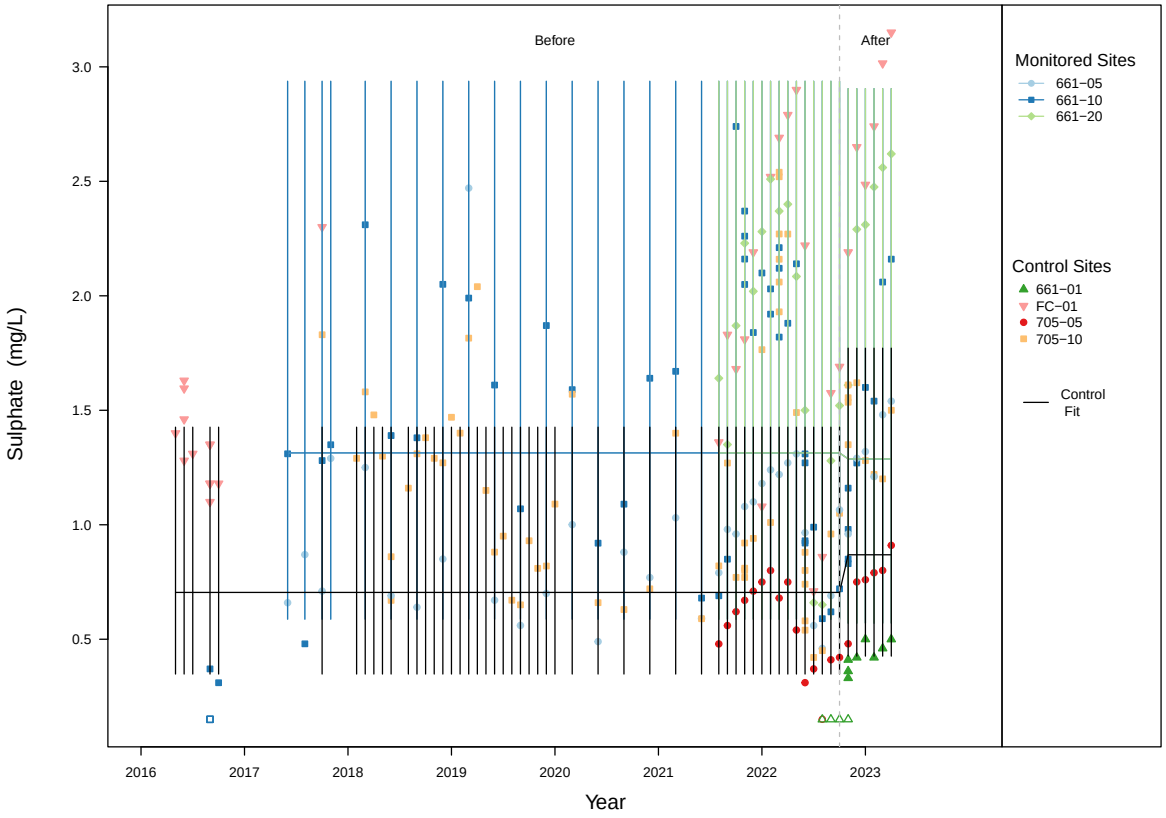
Monitored vs:	Estimate	Significance
control sites	-0.0998	not significant

Conclusion:

The change in Sulphate concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.07) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

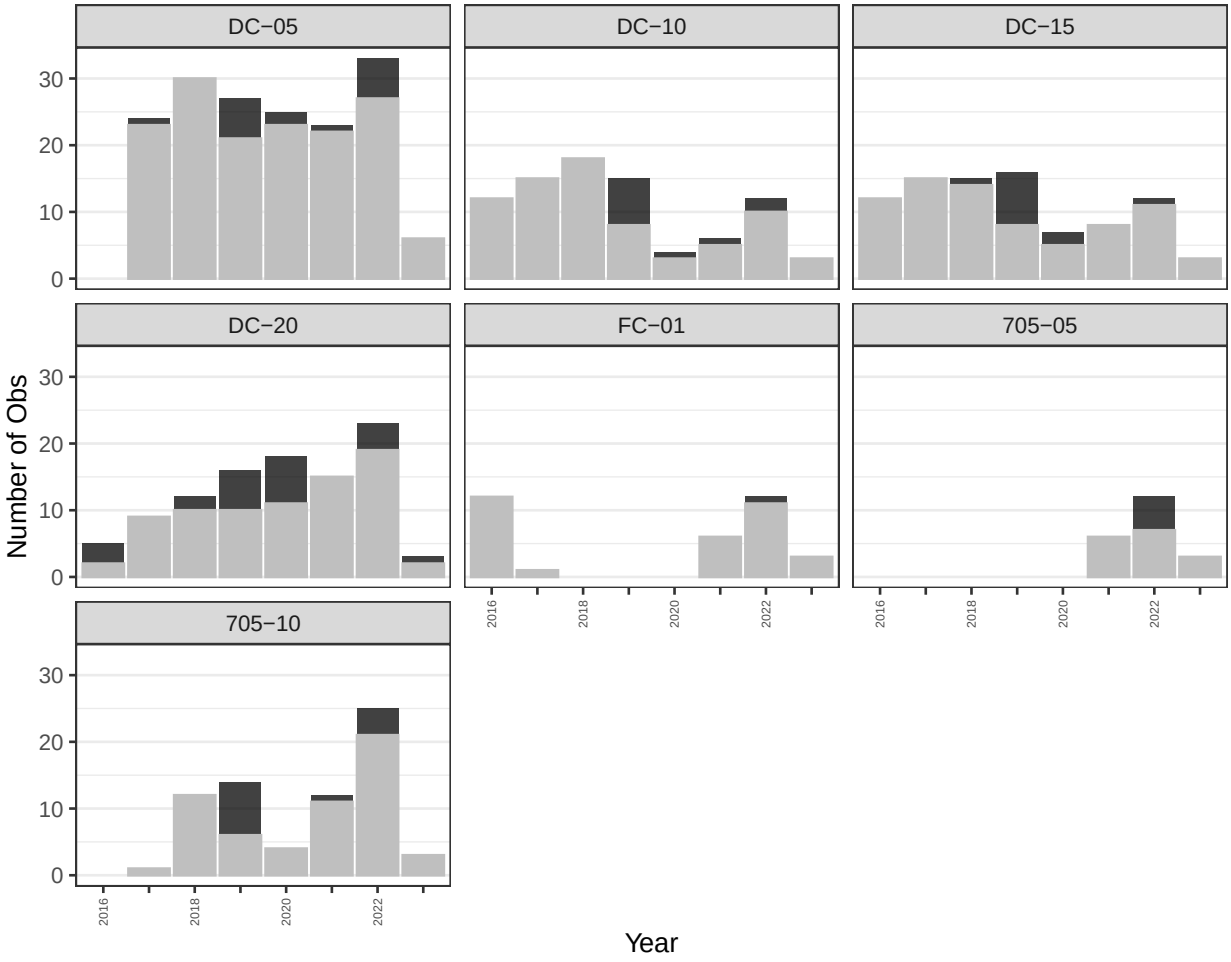
Final Summary Table

Variable	Sulphate
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.7 Ammonia-N

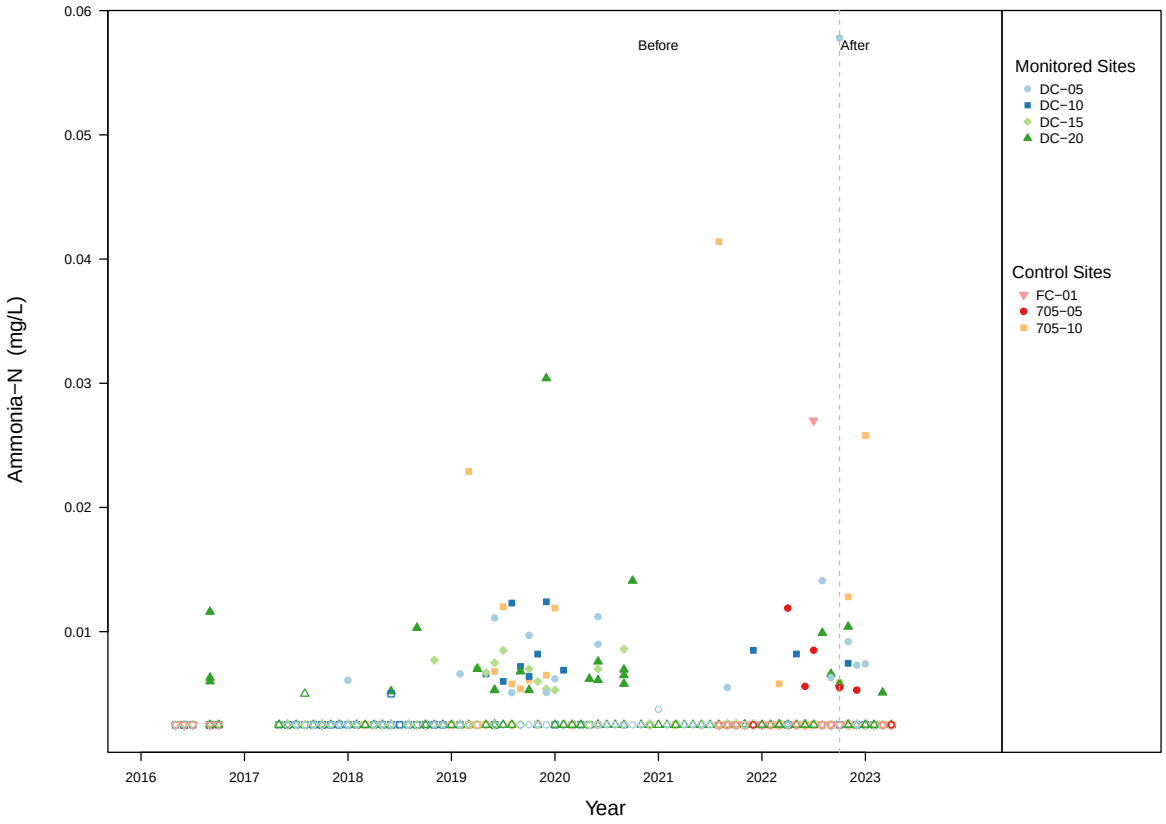
1 Davidson Creek

1.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



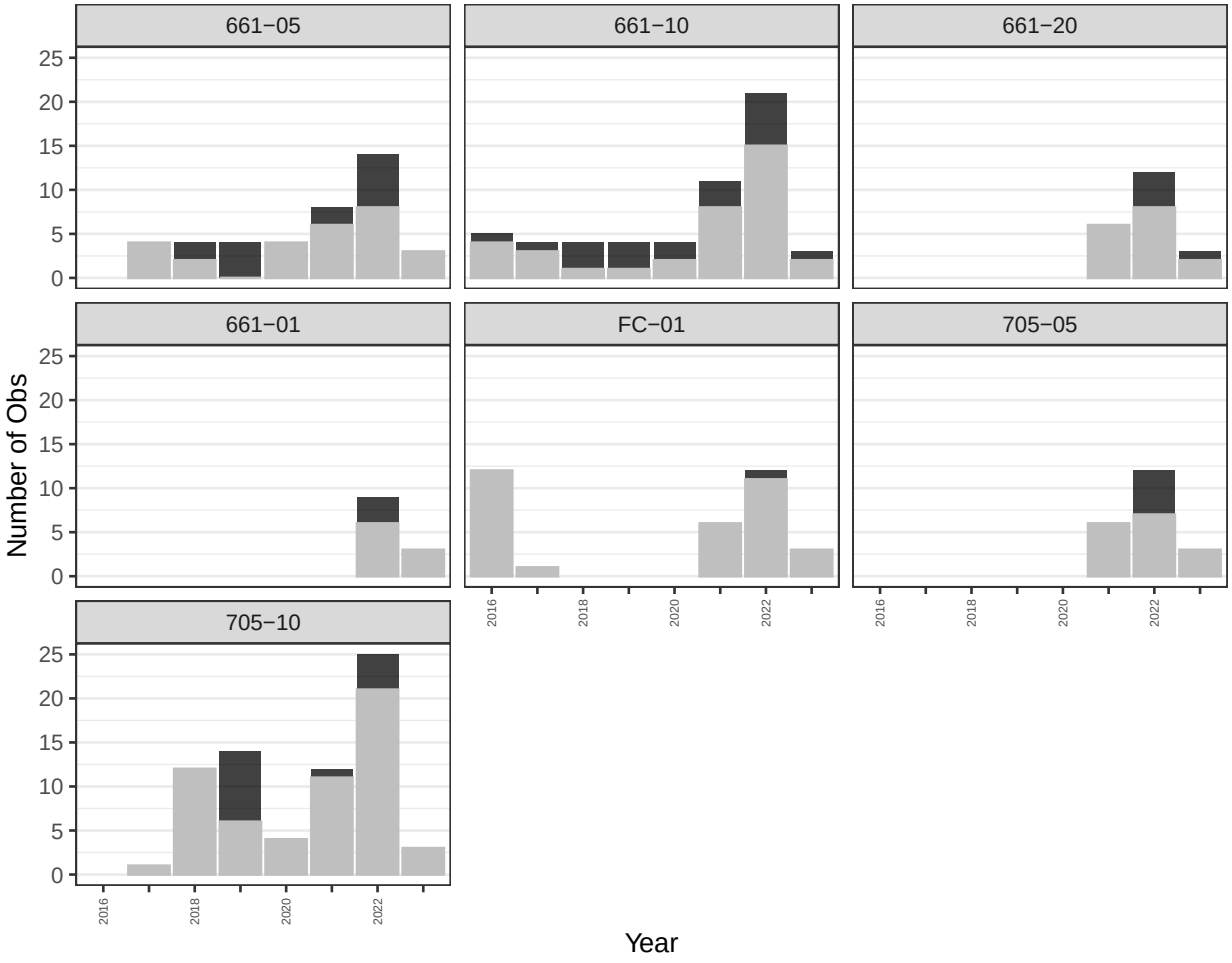
Note: Open symbols represent cases where the results were below the sample detection limit.

Final Summary Table

Variable	Ammonia-N
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

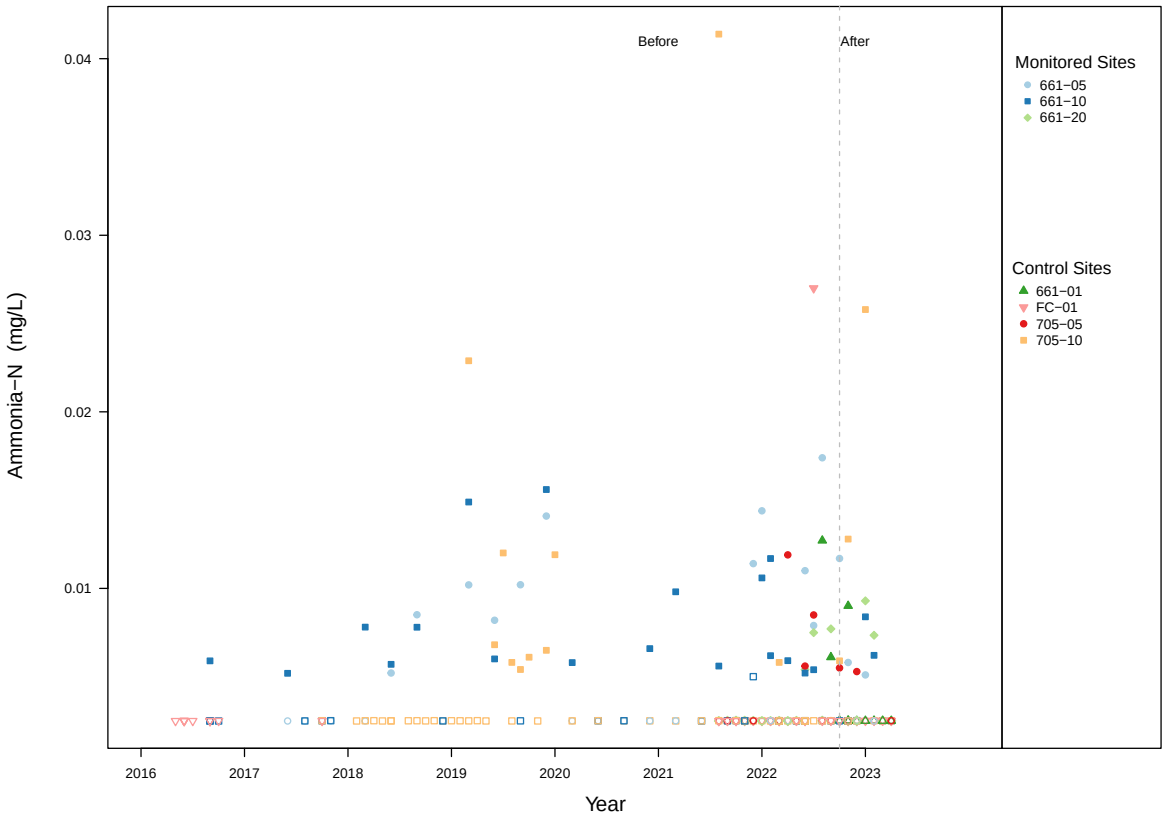
2 Creek 661

2.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



Note: Open symbols represent cases where the results were below the sample detection limit.

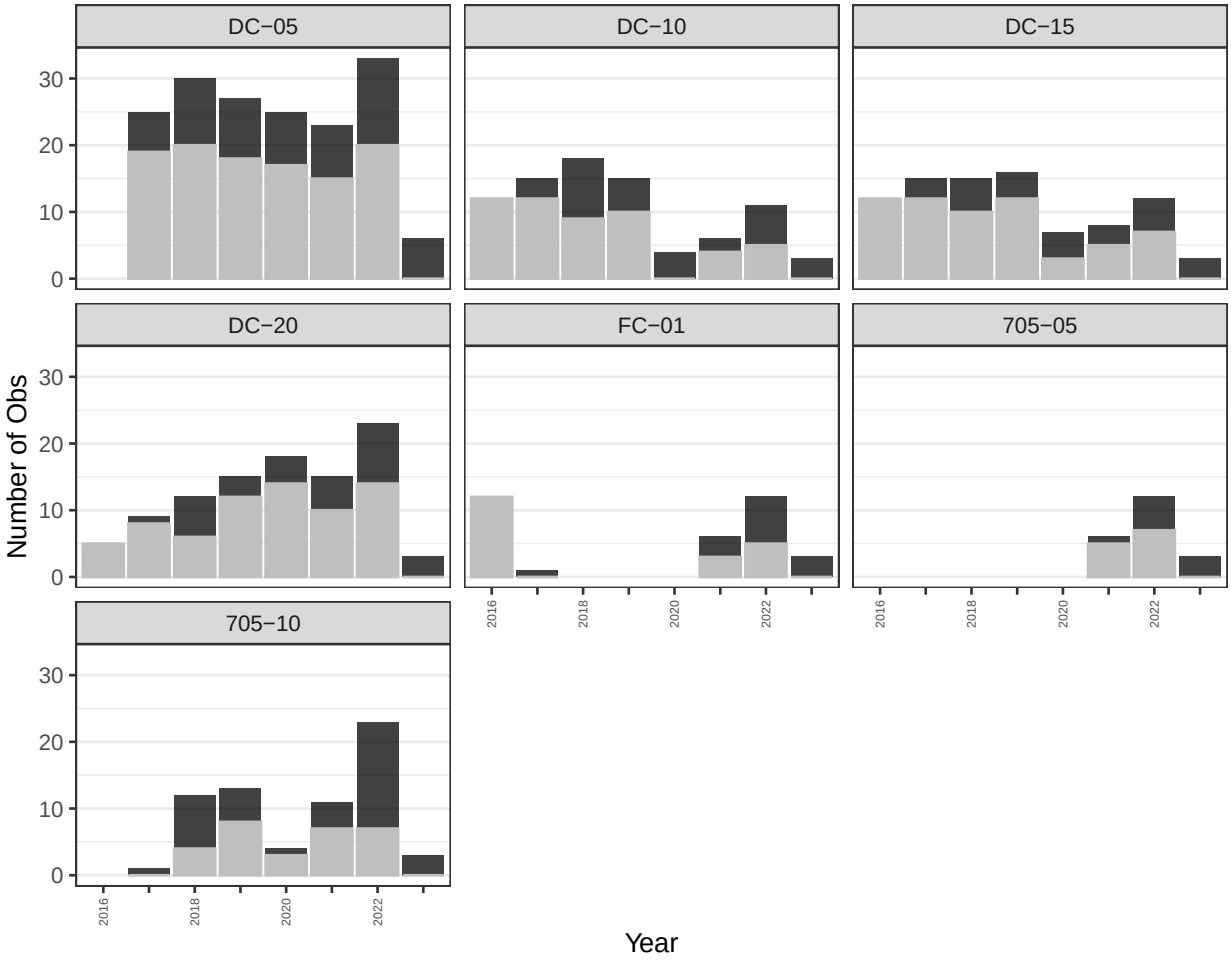
Final Summary Table

Variable	Ammonia-N
Watershed	Creek 661
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

C-2.1.8 Nitrate-N

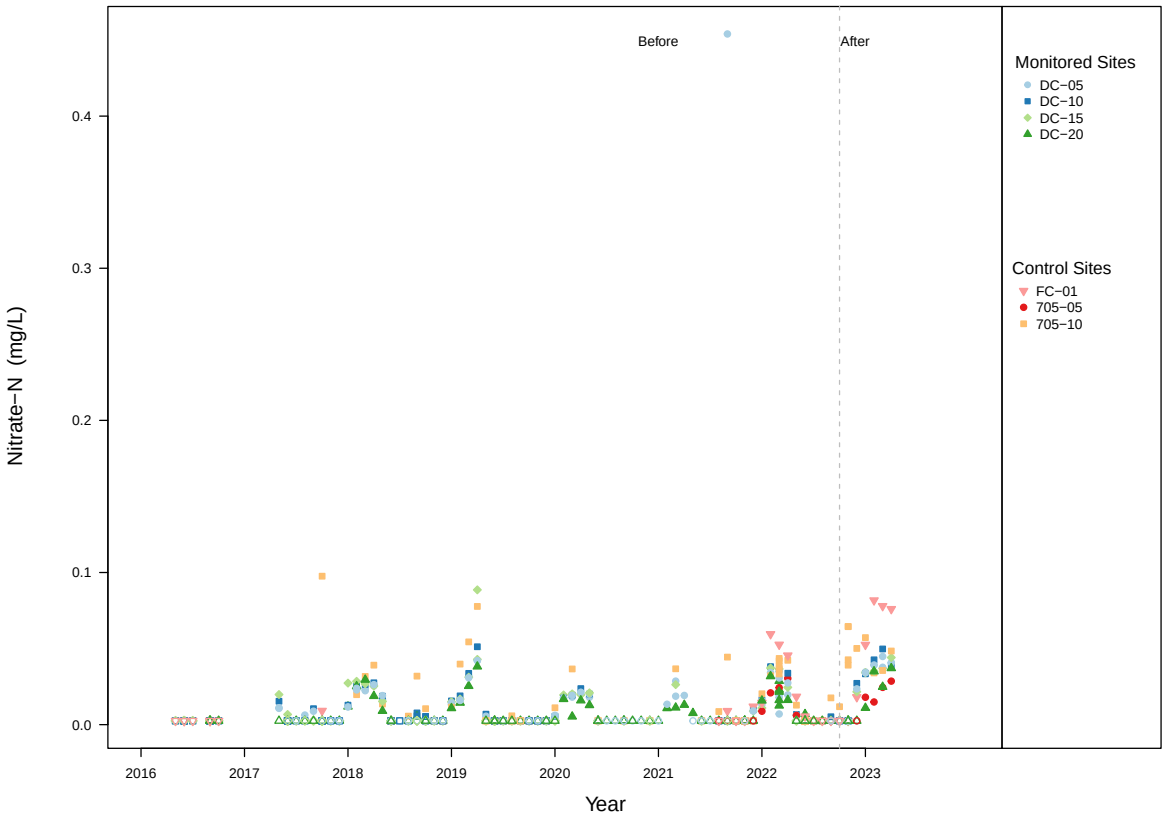
1 Davidson Creek

1.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



Note: Open symbols represent cases where the results were below the sample detection limit.

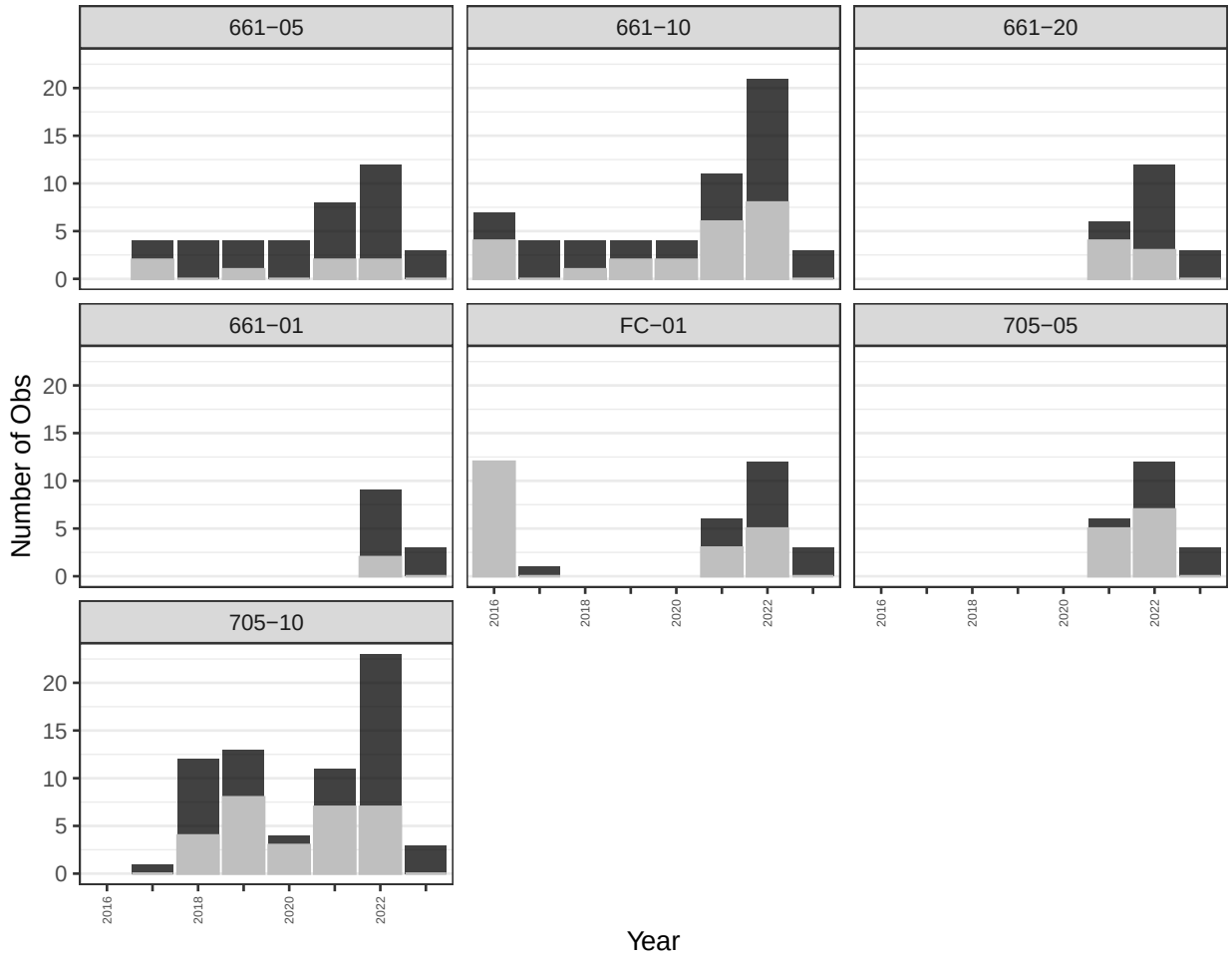
Final Summary Table

Variable	Nitrate-N
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

Watershed	Site	Year	Class	Period	#Obs Removed
Creek 661	661-10	2016	monit	before	7
Creek 661	661-10	2021	monit	before	11
Creek 661	661-20	2021	monit	before	6
Creek 661	FC-01	2016	control	before	12
Creek 661	705-05	2021	control	before	6
Creek 661	705-05	2022	control	before	12
Creek 661	705-05	2022	control	after	12
Creek 661	705-10	2019	control	before	13
Creek 661	705-10	2020	control	before	4
Creek 661	705-10	2021	control	before	11

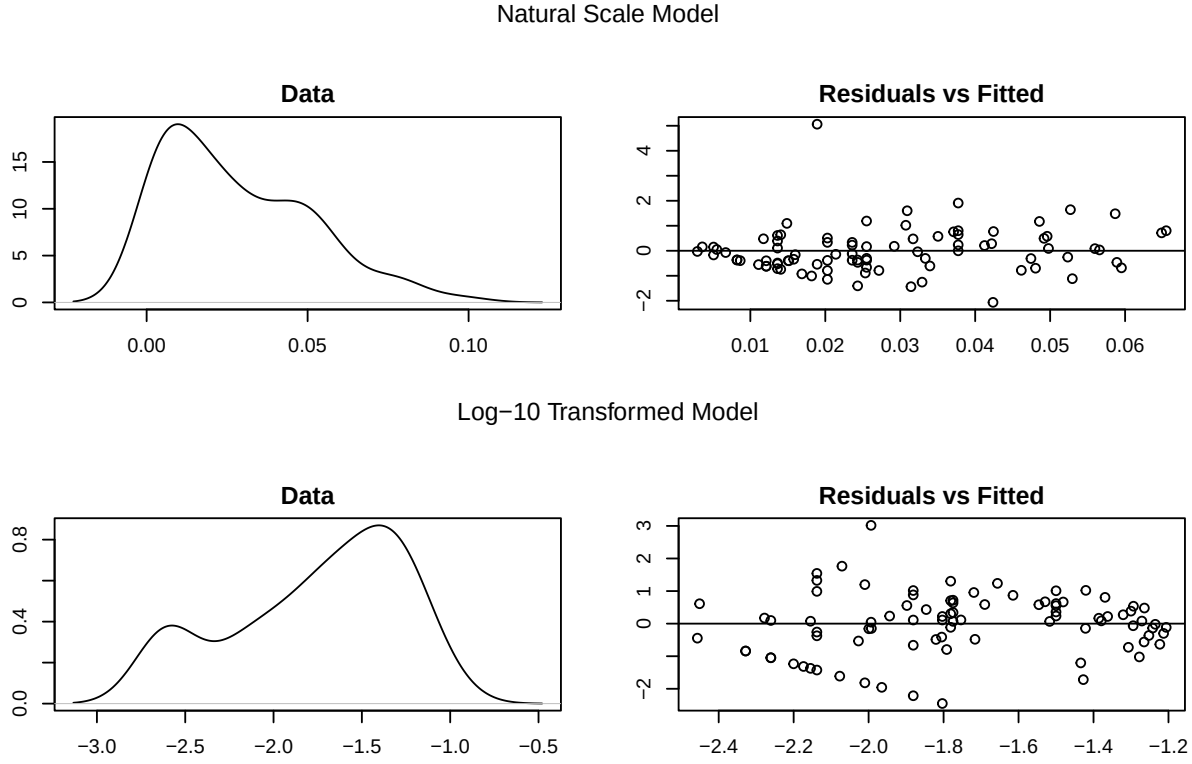
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	0.0192	21.21
Creek 661	661-05	after	6	0.0557	0.00
Creek 661	661-10	before	8	0.0082	12.50
Creek 661	661-10	after	3	0.0426	0.00
Creek 661	661-20	after	3	0.0517	0.00
Creek 661	661-01	before	3	0.0025	66.67
Creek 661	661-01	after	9	0.0440	0.00
Creek 661	FC-01	before	1	0.0091	0.00
Creek 661	FC-01	after	3	0.0780	0.00
Creek 661	705-05	after	3	0.0245	0.00
Creek 661	705-10	before	13	0.0115	30.77
Creek 661	705-10	after	3	0.0356	0.00

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	705-10	2017	9	control	before	0.0976	0.0189	5.062	0

Outliers on log scale:

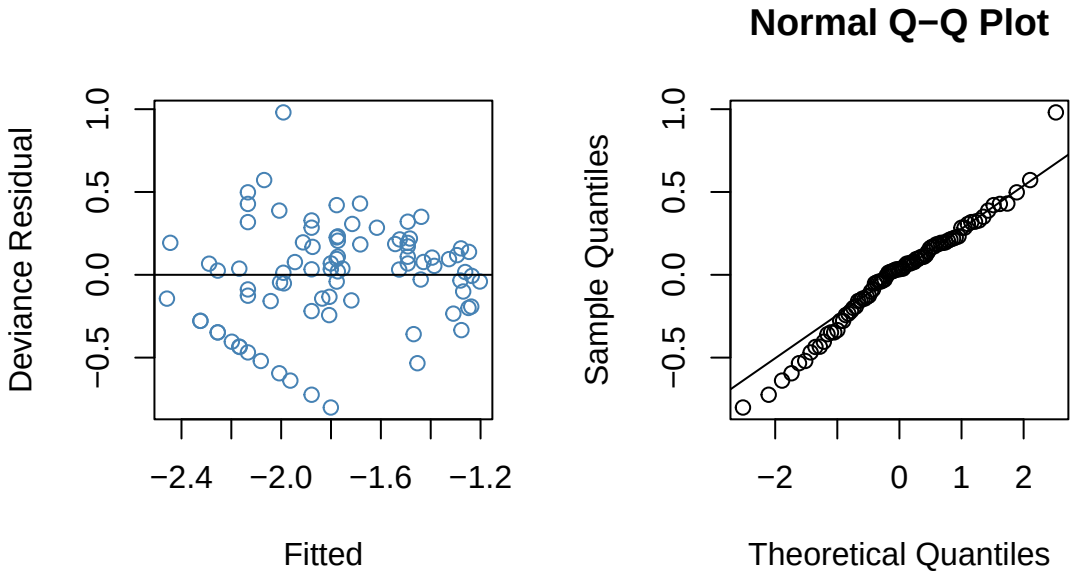
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	705-10	2017	9	control	before	-1.011	-1.994	3.017	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.1197	0.1197	1	2.043	1.0990	0.4020	
period	1.1214	1.1214	1	50.263	10.2970	0.0023	
class:period	0.0665	0.0665	1	50.349	0.6103	0.4380	0.954

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10 and control sites, with p value adjusted for multiple comparisons:

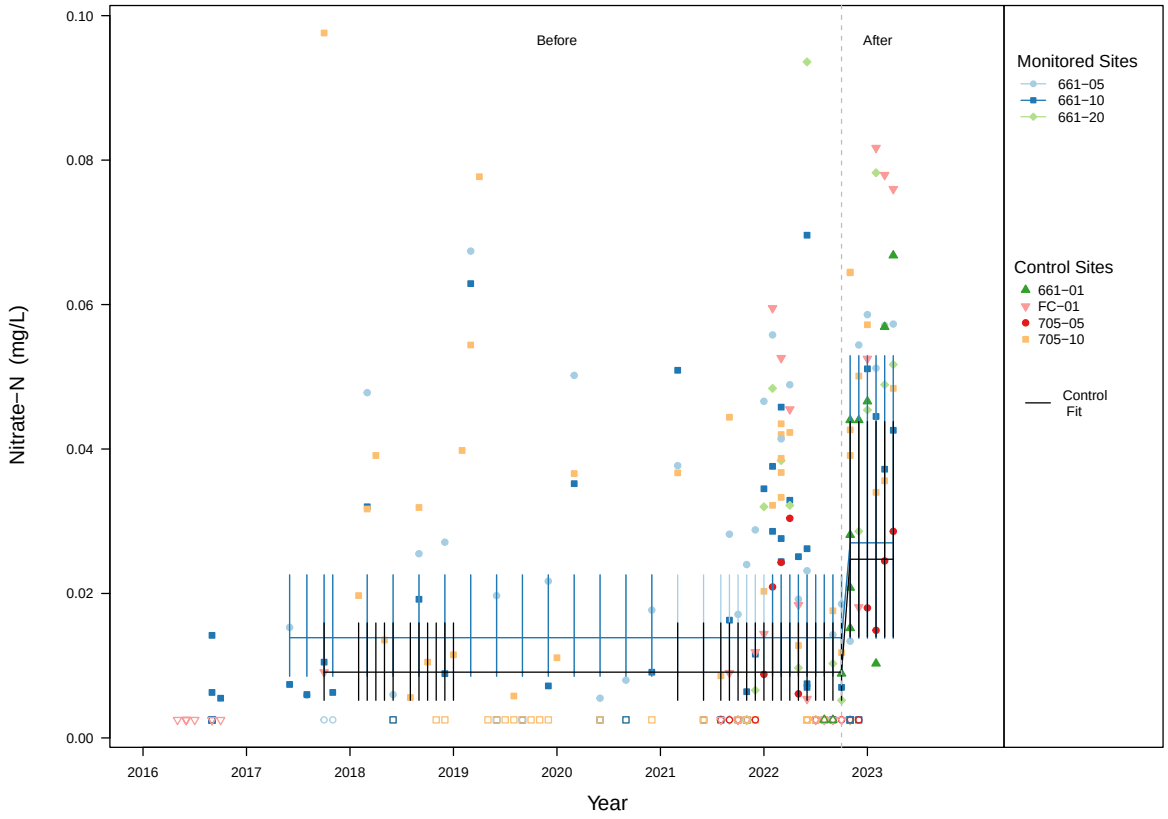
Monitored vs:	Estimate	Significance
control sites	-0.145	not significant

Conclusion:

The change in Nitrate-N concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.954) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

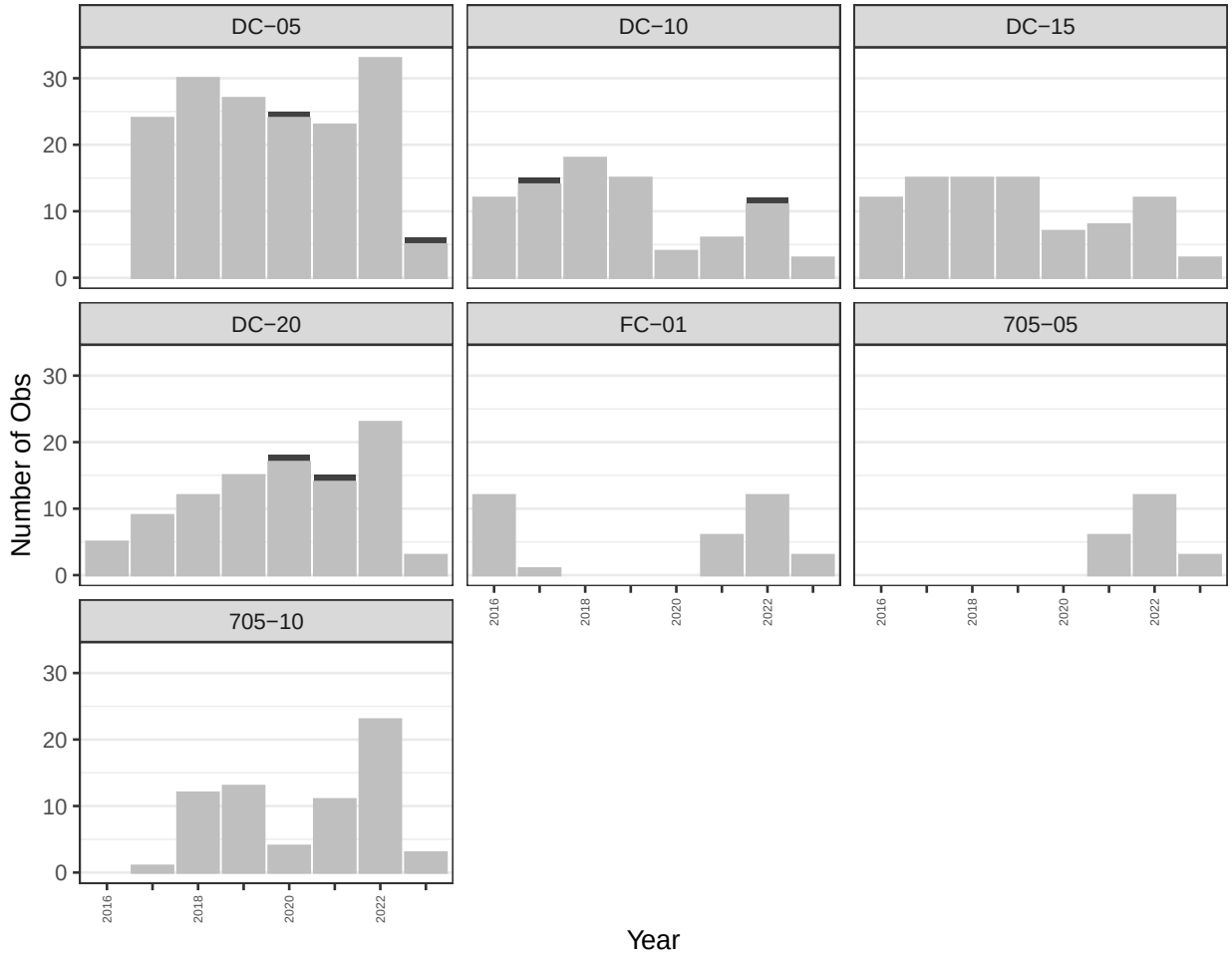
Final Summary Table

Variable	Nitrate-N
Watershed	Creek 661
Waterbody	Stream
Streams Removed	661-20
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.9 Nitrite-N

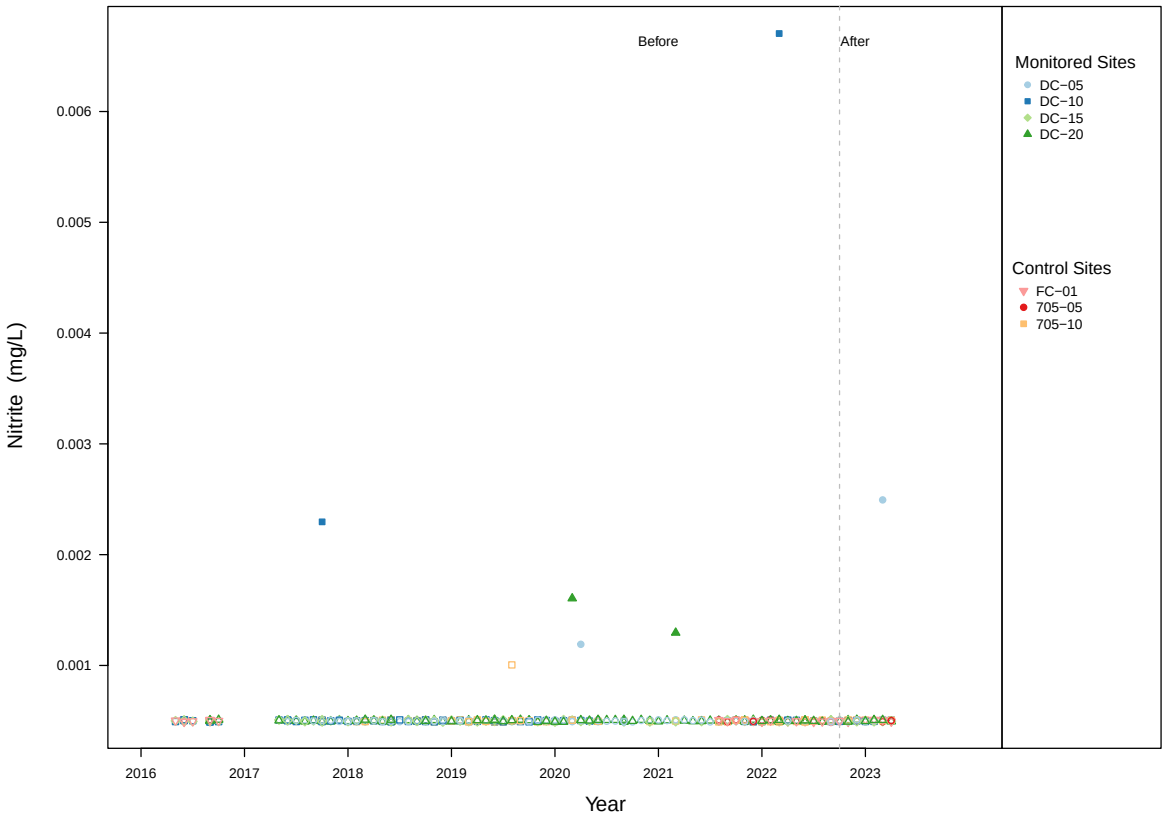
1 Davidson Creek

1.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



Note: Open symbols represent cases where the results were below the sample detection limit.

Final Summary Table

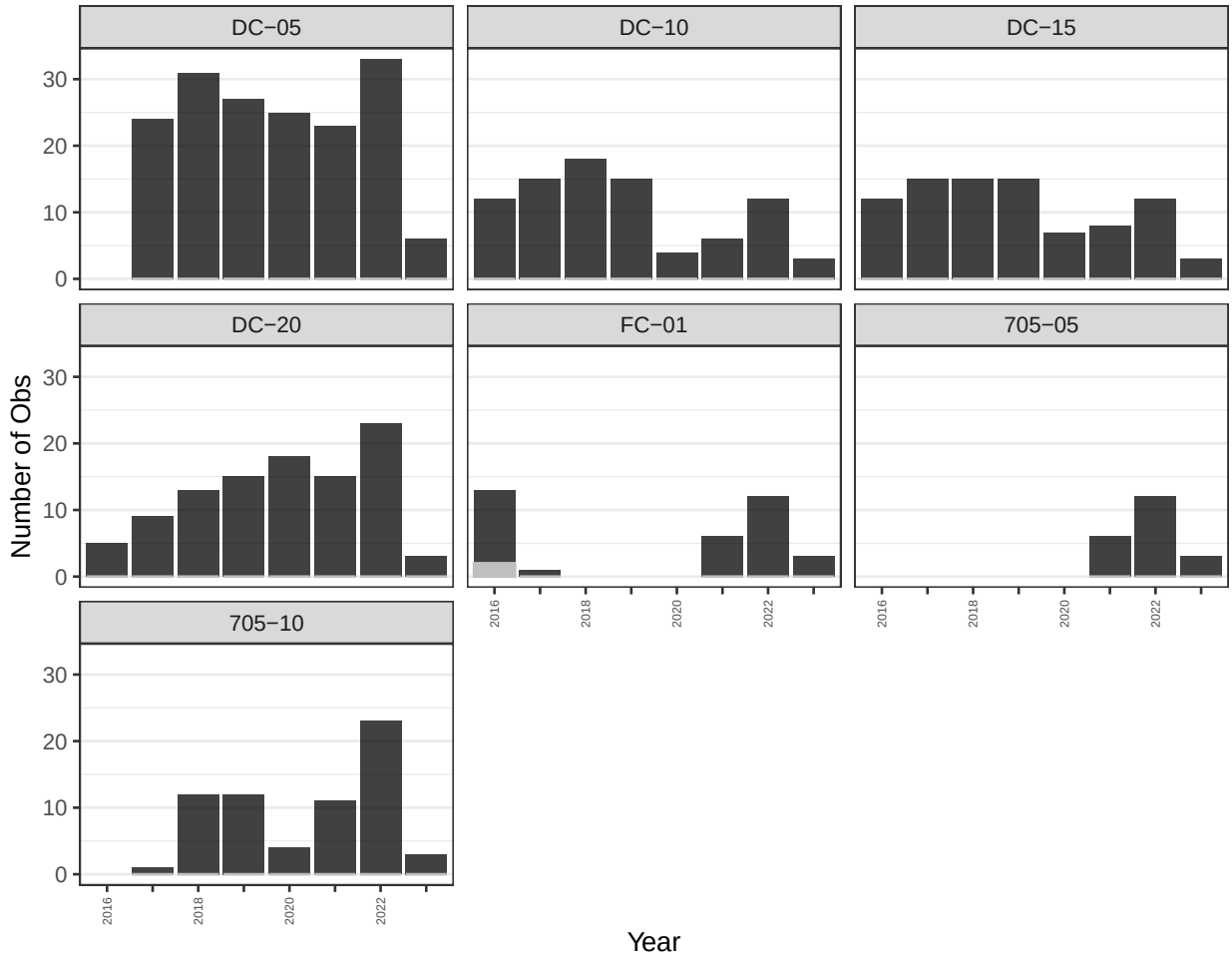
Variable	Nitrite
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

C-2.1.10 Total phosphorus

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

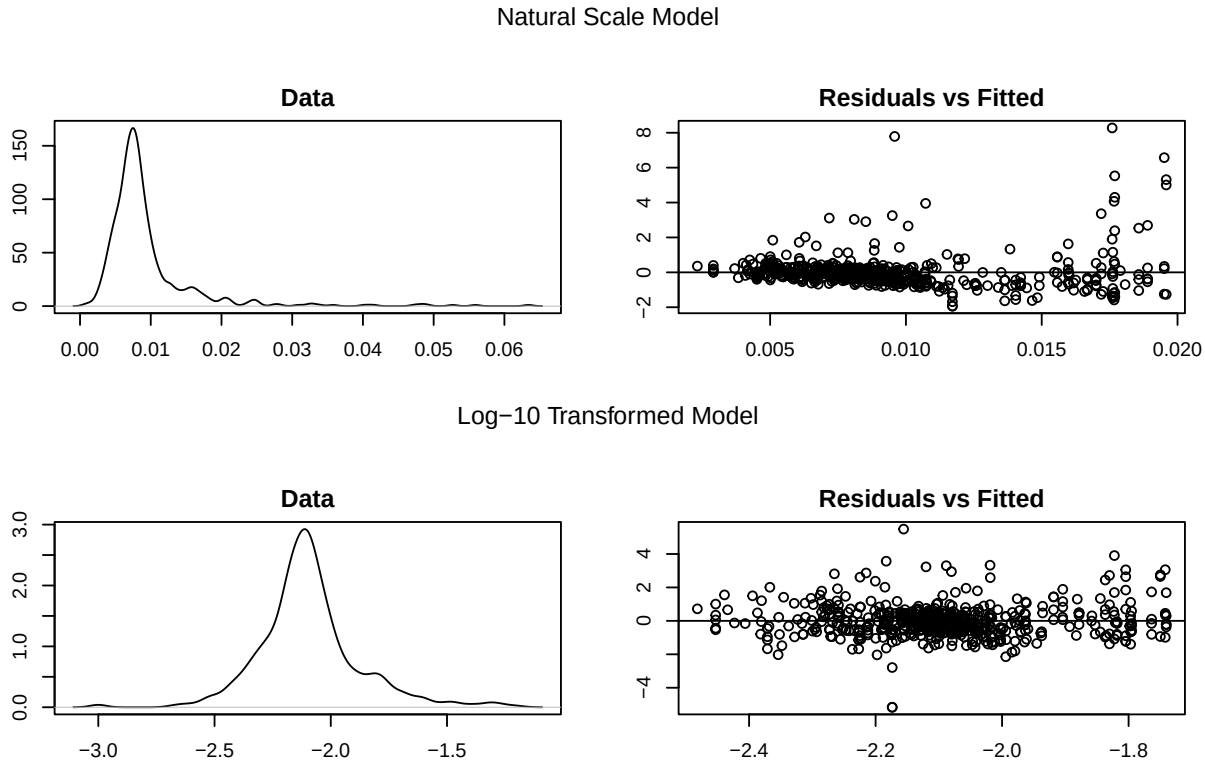
1.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	154	0.0084	0.000
Davidson Creek	DC-05	after	15	0.0083	0.000
Davidson Creek	DC-10	before	79	0.0077	0.000
Davidson Creek	DC-10	after	6	0.0076	0.000
Davidson Creek	DC-15	before	81	0.0074	0.000
Davidson Creek	DC-15	after	6	0.0074	0.000
Davidson Creek	DC-20	before	92	0.0087	0.000
Davidson Creek	DC-20	after	9	0.0094	0.000
Davidson Creek	FC-01	before	29	0.0042	6.897
Davidson Creek	FC-01	after	6	0.0065	0.000
Davidson Creek	705-05	before	15	0.0079	0.000
Davidson Creek	705-05	after	6	0.0064	0.000
Davidson Creek	705-10	before	57	0.0062	0.000
Davidson Creek	705-10	after	9	0.0033	0.000

1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-10	2019	5	monit	before	0.0634	0.0176	8.273	0
Davidson Creek	FC-01	2022	6	control	before	0.0527	0.0096	7.787	0
Davidson Creek	DC-20	2019	5	monit	before	0.0559	0.0195	6.572	0
Davidson Creek	DC-05	2018	5	monit	before	0.0483	0.0177	5.529	0
Davidson Creek	DC-20	2018	5	monit	before	0.0490	0.0196	5.313	0
Davidson Creek	DC-20	2018	5	monit	before	0.0473	0.0196	5.006	0
Davidson Creek	DC-05	2018	5	monit	before	0.0415	0.0177	4.300	0
Davidson Creek	DC-10	2018	5	monit	before	0.0402	0.0177	4.070	0
Davidson Creek	DC-20	2021	4	monit	before	0.0326	0.0107	3.951	0
Davidson Creek	DC-15	2019	5	monit	before	0.0358	0.0172	3.361	0
Davidson Creek	DC-20	2017	10	monit	before	0.0275	0.0095	3.251	0
Davidson Creek	DC-15	2017	10	monit	before	0.0244	0.0072	3.111	0
Davidson Creek	DC-15	2020	2	monit	before	0.0249	0.0081	3.035	0

Outliers on log scale:

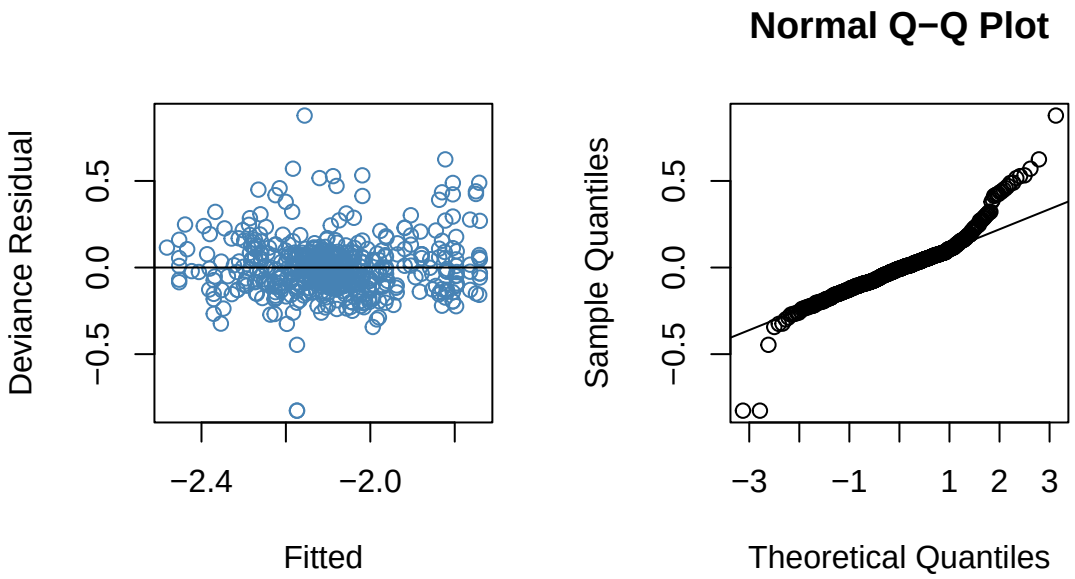
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	FC-01	2022	6	control	before	-1.278	-2.156	5.488	0
Davidson Creek	FC-01	2016	5	control	before	-3.000	-2.174	-5.168	1
Davidson Creek	FC-01	2016	5	control	before	-3.000	-2.174	-5.168	1
Davidson Creek	DC-10	2019	5	monit	before	-1.198	-1.822	3.906	0
Davidson Creek	DC-15	2017	10	monit	before	-1.613	-2.183	3.568	0
Davidson Creek	DC-20	2021	4	monit	before	-1.487	-2.019	3.329	0
Davidson Creek	DC-20	2017	10	monit	before	-1.561	-2.088	3.300	0
Davidson Creek	DC-15	2020	2	monit	before	-1.604	-2.120	3.230	0
Davidson Creek	DC-20	2019	5	monit	before	-1.253	-1.742	3.061	0
Davidson Creek	DC-05	2018	5	monit	before	-1.316	-1.804	3.055	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.3145	0.3145	1	6.347	12.301	0.0116	
period	0.1961	0.1961	1	203.648	7.668	0.0061	
class:period	0.0836	0.0836	1	541.274	3.270	0.0711	0.49

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

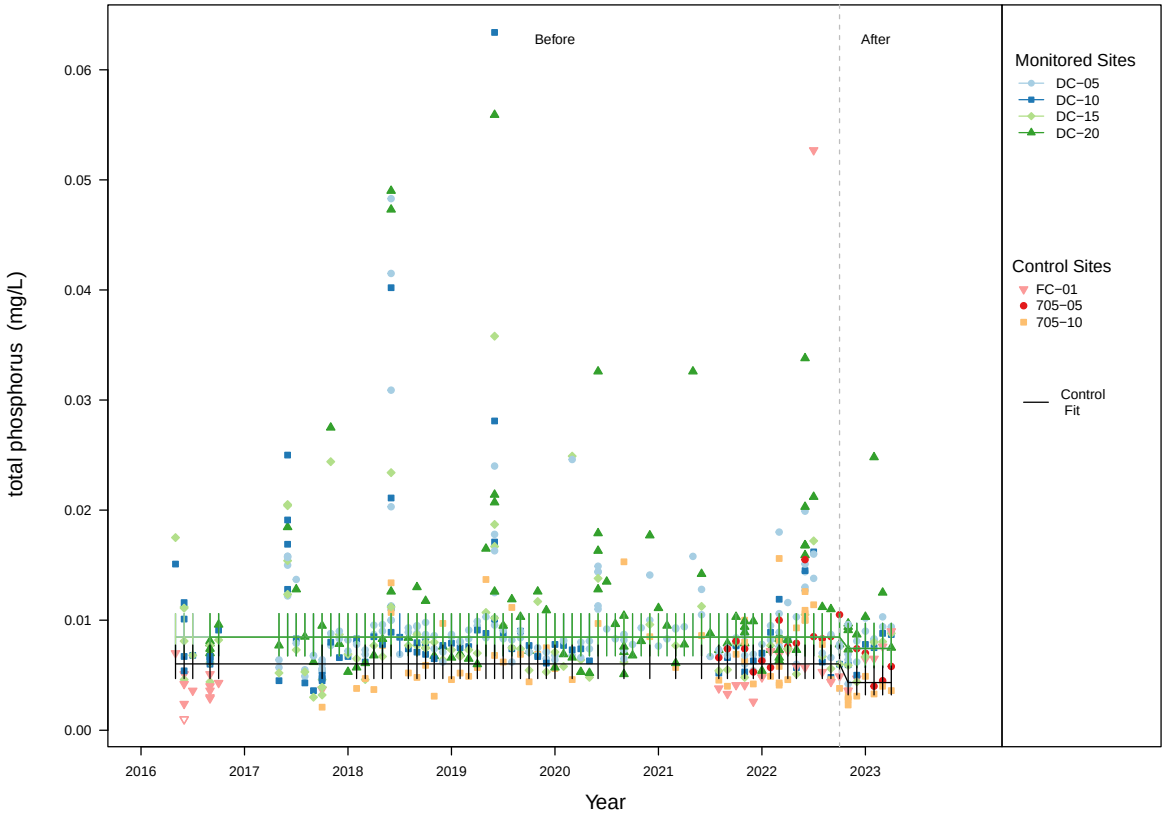
Monitored vs:	Estimate	Significance
control sites	0.087	not significant

Conclusion:

The change in total phosphorus concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.49) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

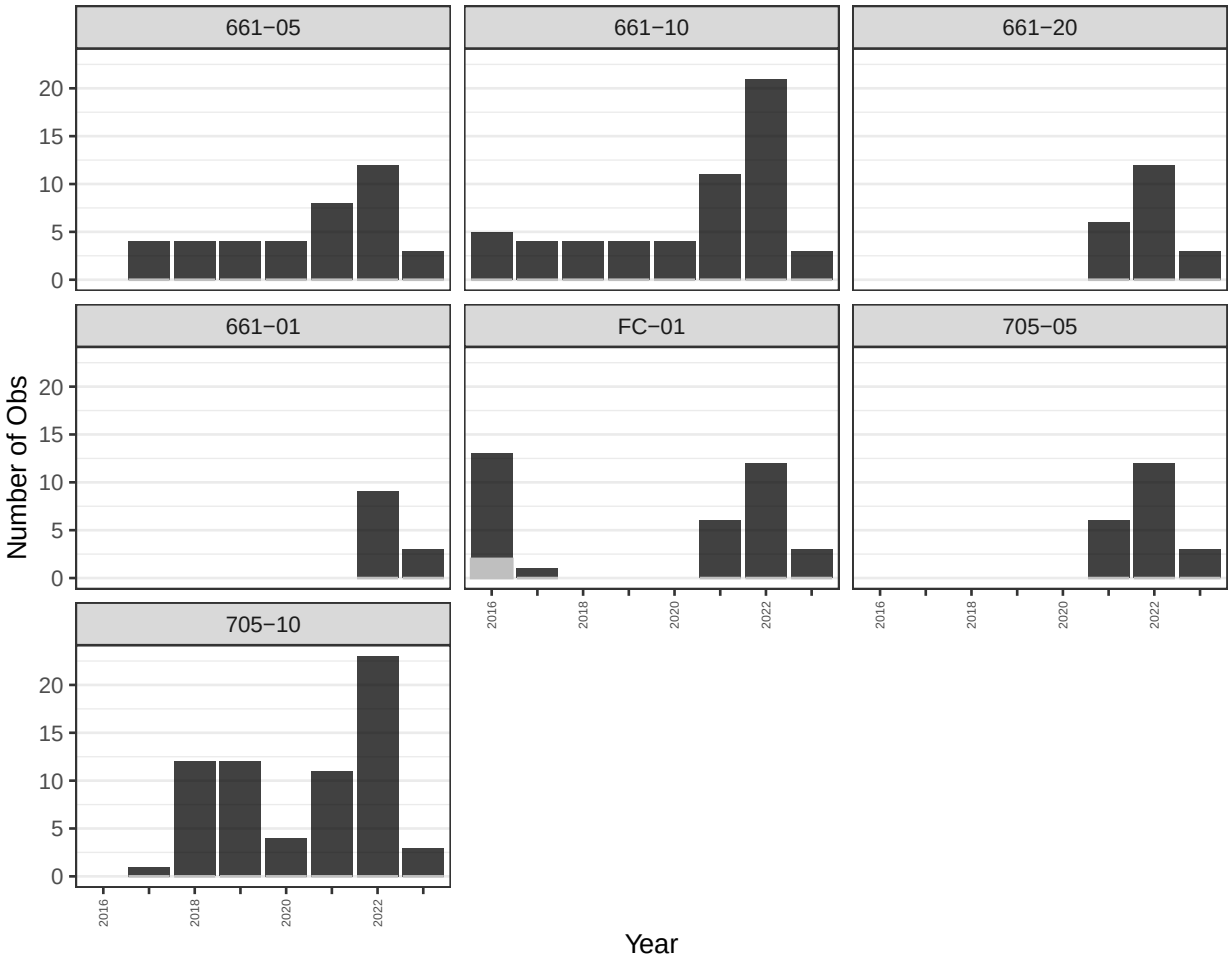
Final Summary Table

Variable	total phosphorus
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

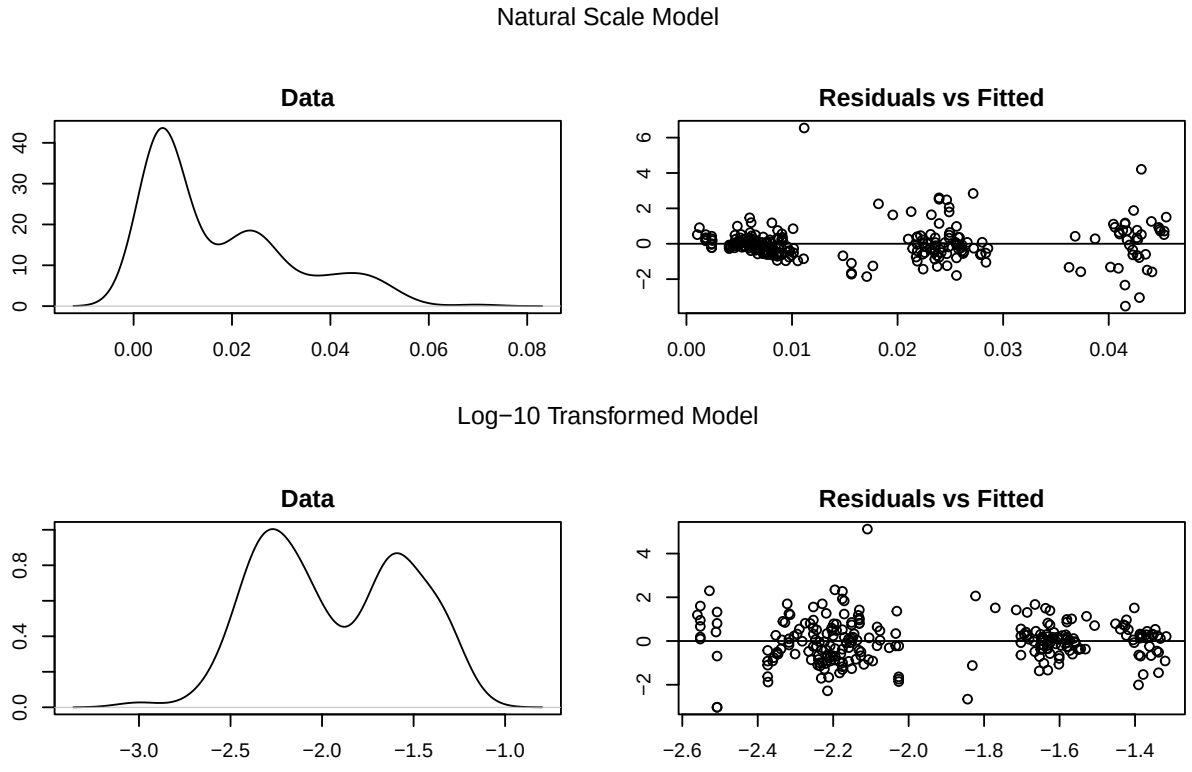
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	0.0415	0.000
Creek 661	661-05	after	6	0.0499	0.000
Creek 661	661-10	before	47	0.0227	0.000
Creek 661	661-10	after	9	0.0252	0.000
Creek 661	661-20	before	15	0.0254	0.000
Creek 661	661-20	after	6	0.0246	0.000
Creek 661	661-01	before	3	0.0062	0.000
Creek 661	661-01	after	9	0.0052	0.000
Creek 661	FC-01	before	29	0.0042	6.897
Creek 661	FC-01	after	6	0.0065	0.000
Creek 661	705-05	before	15	0.0079	0.000
Creek 661	705-05	after	6	0.0064	0.000
Creek 661	705-10	before	57	0.0062	0.000
Creek 661	705-10	after	9	0.0033	0.000

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	FC-01	2022	6	control	before	0.0527	0.0112	6.545	0
Creek 661	661-05	2018	8	monit	before	0.0698	0.0431	4.208	0
Creek 661	661-05	2022	7	monit	before	0.0192	0.0416	-3.525	0
Creek 661	661-05	2021	5	monit	before	0.0236	0.0429	-3.042	0

Outliers on log scale:

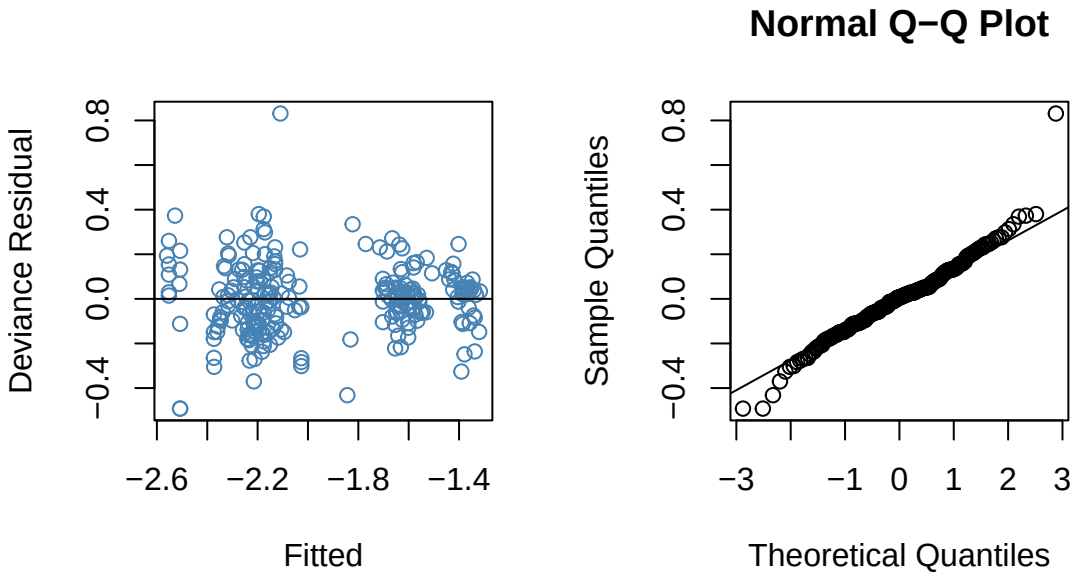
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	FC-01	2022	6	control	before	-1.278	-2.109	5.117	0
Creek 661	FC-01	2016	5	control	before	-3.000	-2.508	-3.030	1
Creek 661	FC-01	2016	5	control	before	-3.000	-2.508	-3.030	1

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	2.0199	2.0199	1	5.125	76.555	<0.001	
period	0.1078	0.1078	1	90.595	4.087	0.0462	
class:period	0.3309	0.3309	1	229.303	12.543	<0.001	0.871

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

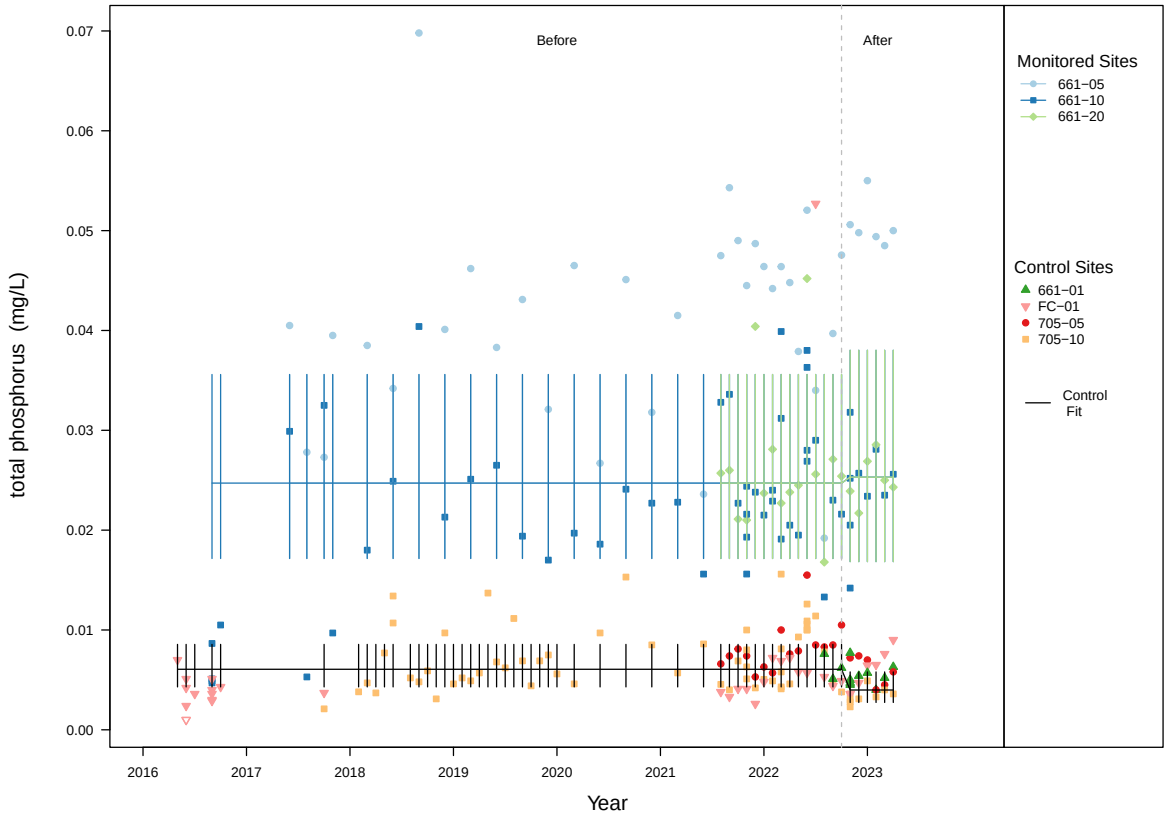
Monitored vs:	Estimate	Significance
control sites	0.1924	not significant

Conclusion:

The change in total phosphorus concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.871) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

Final Summary Table

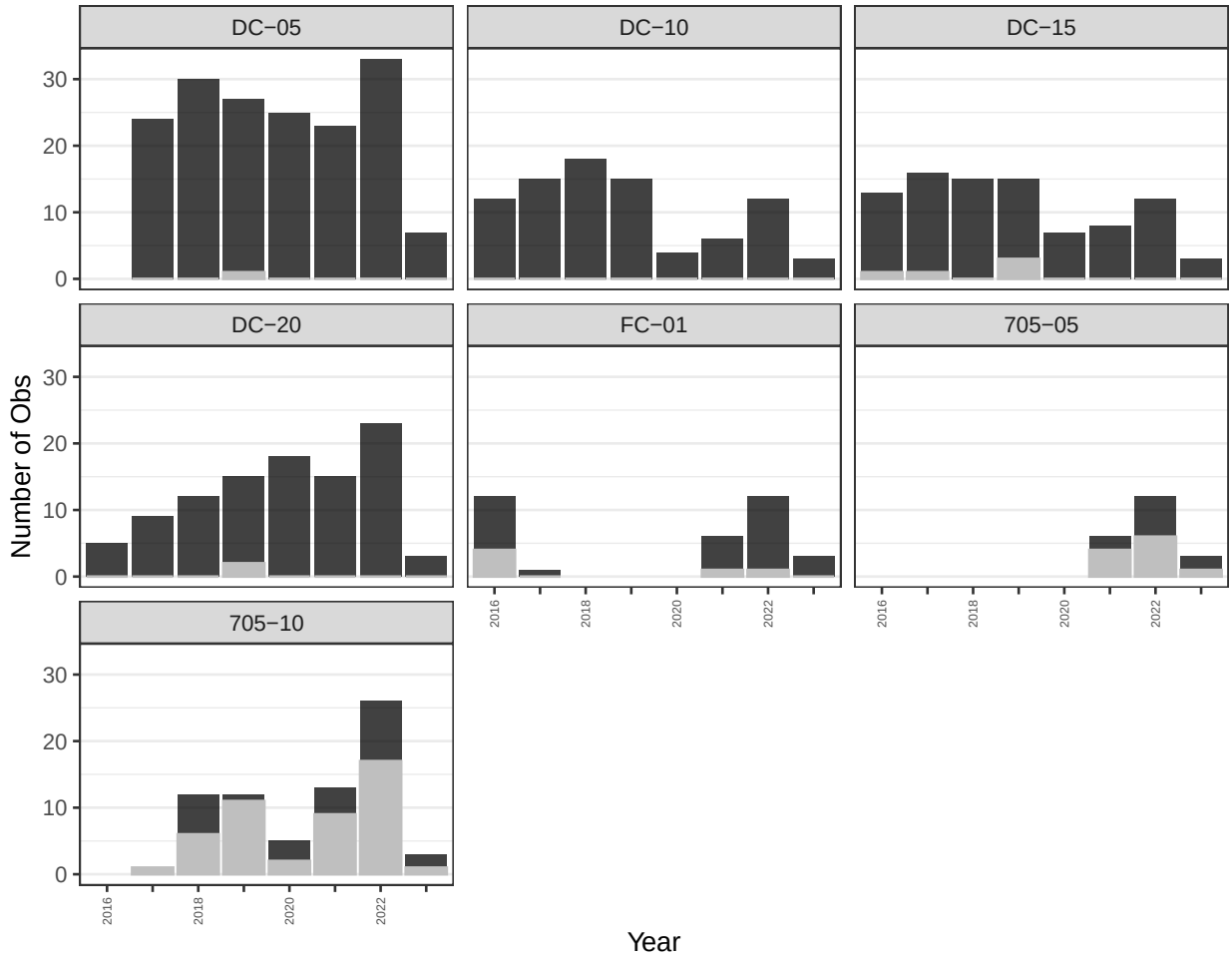
Variable	total phosphorus
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.11 Orthophosphate

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

Watershed	Site	Year	Class	Period	#Obs Removed
Davidson Creek	705-05	2021	control	before	6
Davidson Creek	705-10	2017	control	before	1
Davidson Creek	705-10	2019	control	before	12
Davidson Creek	705-10	2021	control	before	13
Davidson Creek	705-10	2022	control	before	26
Davidson Creek	705-10	2022	control	after	26

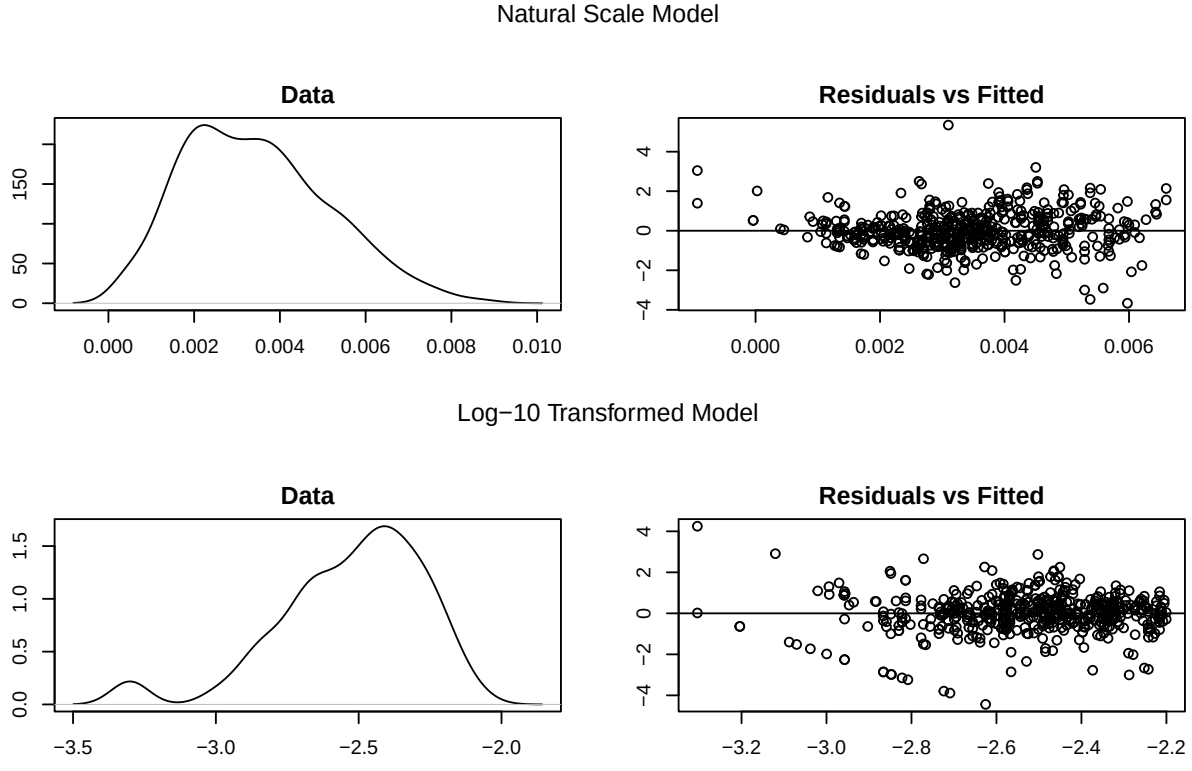
1.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	153	0.0036	0.6536
Davidson Creek	DC-05	after	16	0.0060	0.0000
Davidson Creek	DC-10	before	79	0.0031	0.0000
Davidson Creek	DC-10	after	6	0.0063	0.0000
Davidson Creek	DC-15	before	83	0.0031	6.0241
Davidson Creek	DC-15	after	6	0.0053	0.0000
Davidson Creek	DC-20	before	91	0.0033	2.1978
Davidson Creek	DC-20	after	9	0.0044	0.0000
Davidson Creek	FC-01	before	28	0.0020	21.4286
Davidson Creek	FC-01	after	6	0.0056	0.0000
Davidson Creek	705-05	after	3	0.0013	33.3333
Davidson Creek	705-10	before	17	0.0014	47.0588
Davidson Creek	705-10	after	3	0.0013	33.3333

1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-20	2021	10	monit	before	0.0086	0.0031	5.345	0
Davidson Creek	DC-05	2023	1	monit	after	0.0022	0.0060	-3.666	0
Davidson Creek	DC-05	2022	12	monit	after	0.0018	0.0054	-3.473	0
Davidson Creek	FC-01	2022	1	control	before	0.0078	0.0045	3.203	0
Davidson Creek	705-10	2020	5	control	before	0.0022	-0.0009	3.044	0

Outliers on log scale:

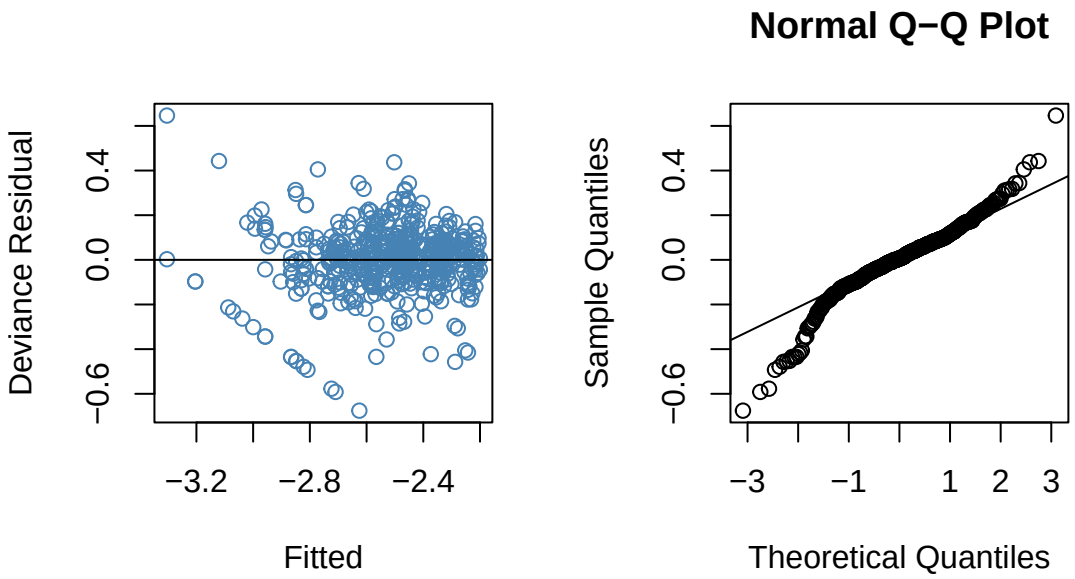
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	FC-01	2021	12	control	before	-3.301	-2.626	-4.441	1
Davidson Creek	705-10	2020	5	control	before	-2.658	-3.304	4.249	0
Davidson Creek	FC-01	2016	4	control	before	-3.301	-2.709	-3.889	1
Davidson Creek	FC-01	2016	8	control	before	-3.301	-2.724	-3.794	1
Davidson Creek	FC-01	2022	6	control	before	-3.301	-2.808	-3.238	1
Davidson Creek	DC-05	2019	5	monit	before	-3.301	-2.822	-3.148	1
Davidson Creek	DC-05	2022	12	monit	after	-2.745	-2.288	-3.004	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.2006	0.2006	1	5.121	8.667	0.0312	
period	0.2035	0.2035	1	248.544	8.794	0.0033	
class:period	0.0427	0.0427	1	479.154	1.847	0.1750	0.00917

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

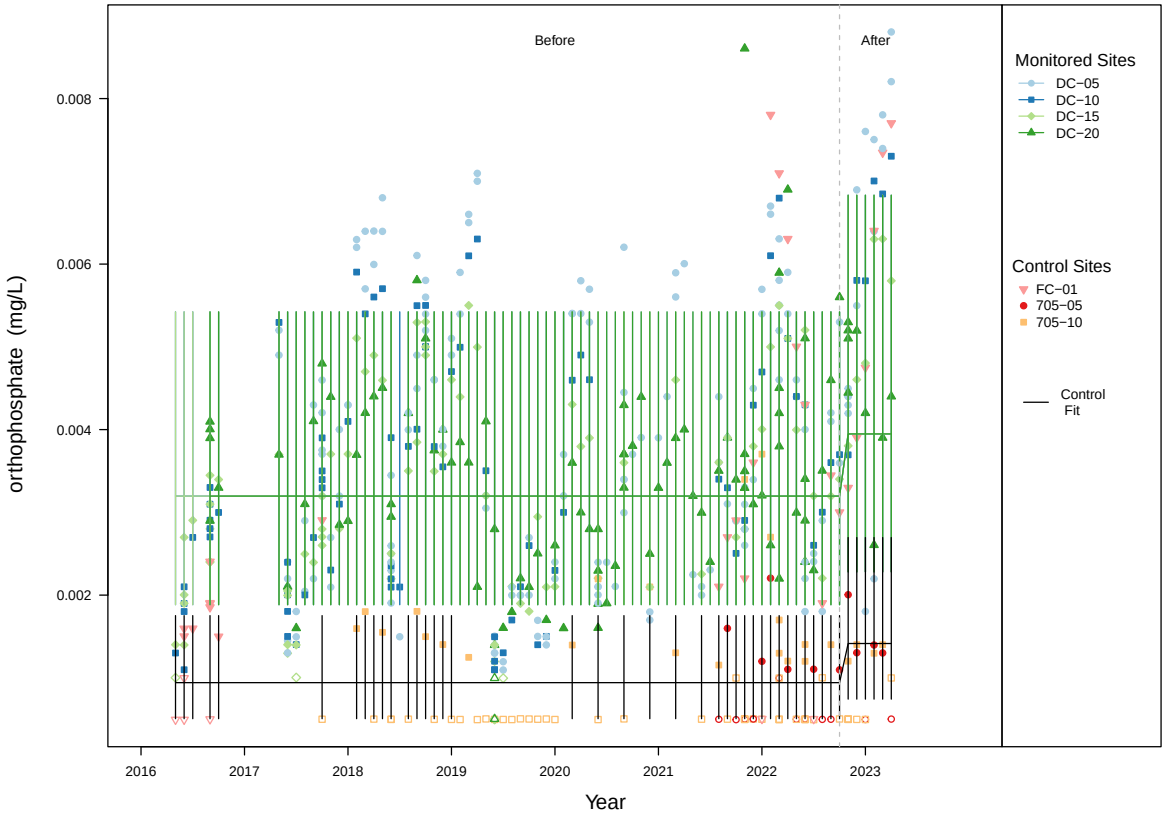
Monitored vs:	Estimate	Significance
control sites	-0.085	significant

Conclusion:

The change in orthophosphate concentrations at the monitored sites from *before* to *after* was significantly (*adjusted p* = 0.0092) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

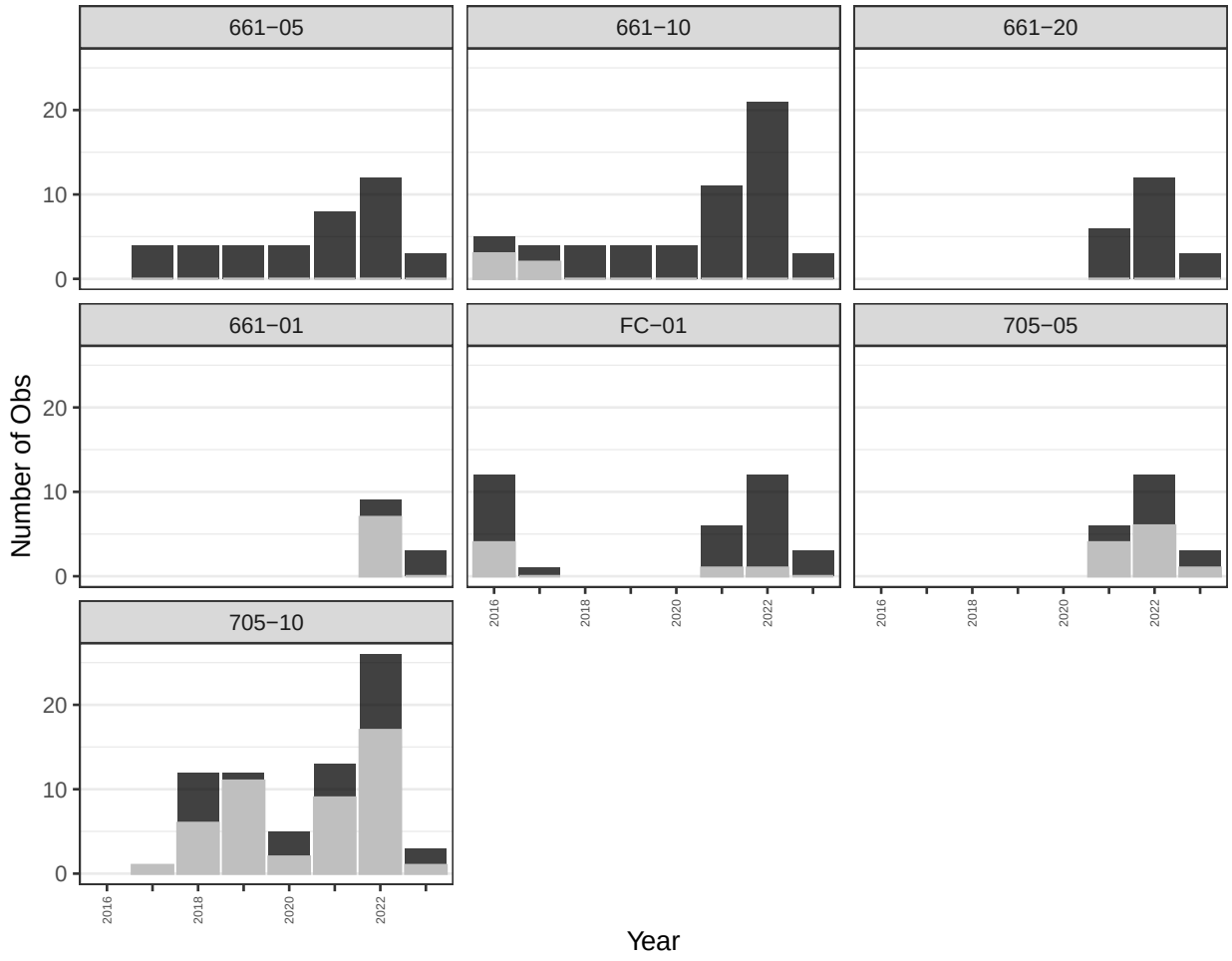
Final Summary Table

Variable	orthophosphate
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	TRUE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

Watershed	Site	Year	Class	Period	#Obs Removed
Creek 661	661-10	2016	monit	before	5
Creek 661	661-01	2022	control	before	9
Creek 661	661-01	2022	control	after	9
Creek 661	705-05	2021	control	before	6
Creek 661	705-10	2017	control	before	1
Creek 661	705-10	2019	control	before	12
Creek 661	705-10	2021	control	before	13
Creek 661	705-10	2022	control	before	26
Creek 661	705-10	2022	control	after	26

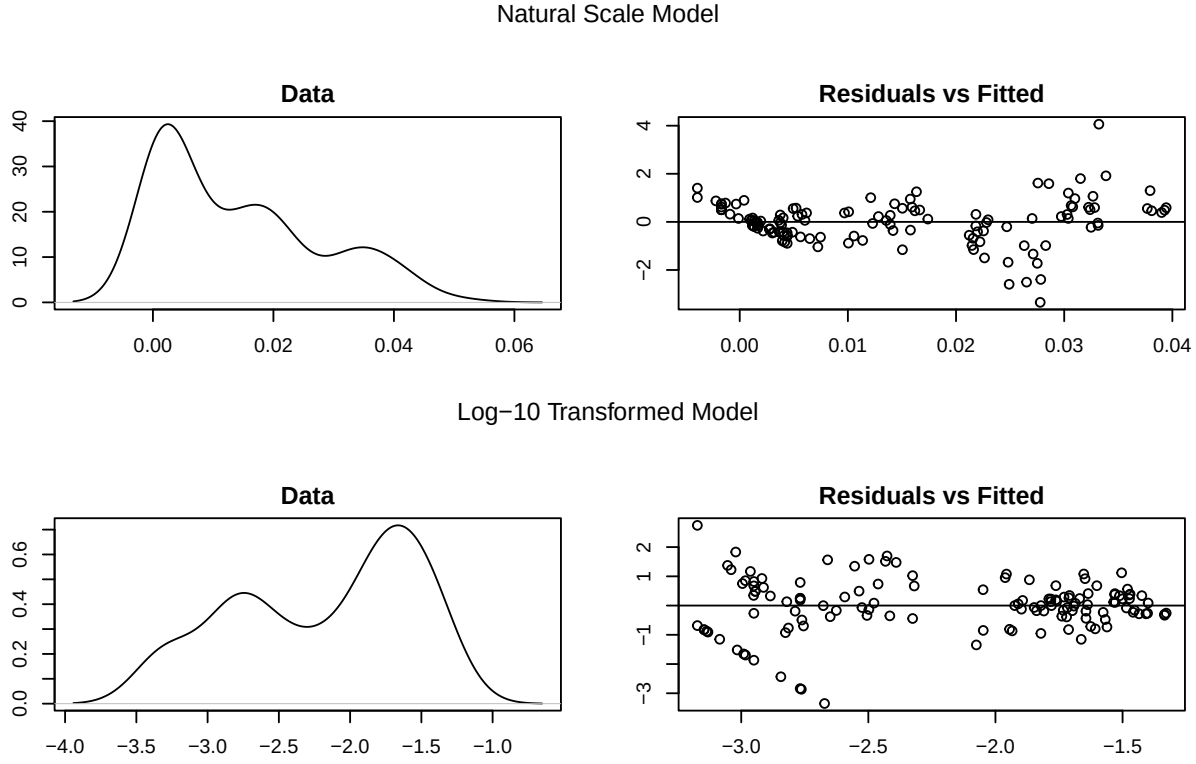
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	0.0315	0.00
Creek 661	661-05	after	6	0.0411	0.00
Creek 661	661-10	before	8	0.0120	0.00
Creek 661	661-10	after	3	0.0202	0.00
Creek 661	661-20	before	15	0.0165	0.00
Creek 661	661-20	after	6	0.0198	0.00
Creek 661	661-01	after	3	0.0015	0.00
Creek 661	FC-01	before	28	0.0020	21.43
Creek 661	FC-01	after	6	0.0056	0.00
Creek 661	705-05	after	3	0.0013	33.33
Creek 661	705-10	before	17	0.0014	47.06
Creek 661	705-10	after	3	0.0013	33.33

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	661-05	2018	8	monit	before	0.0509	0.0332	4.062	0
Creek 661	661-05	2021	5	monit	before	0.0132	0.0278	-3.347	0

Outliers on log scale:

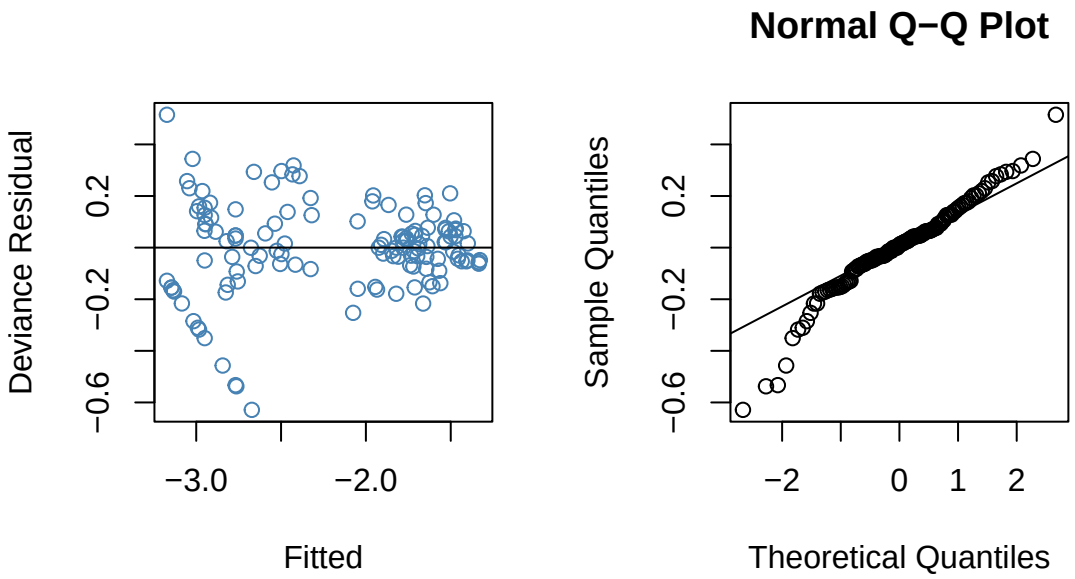
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	FC-01	2021	12	control	before	-3.301	-2.672	-3.35	1

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	1.1963	1.1963	1	4.821	33.951	0.0024	
period	0.1633	0.1633	1	45.648	4.633	0.0367	
class:period	0.0049	0.0049	1	112.104	0.138	0.7110	0.0321

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

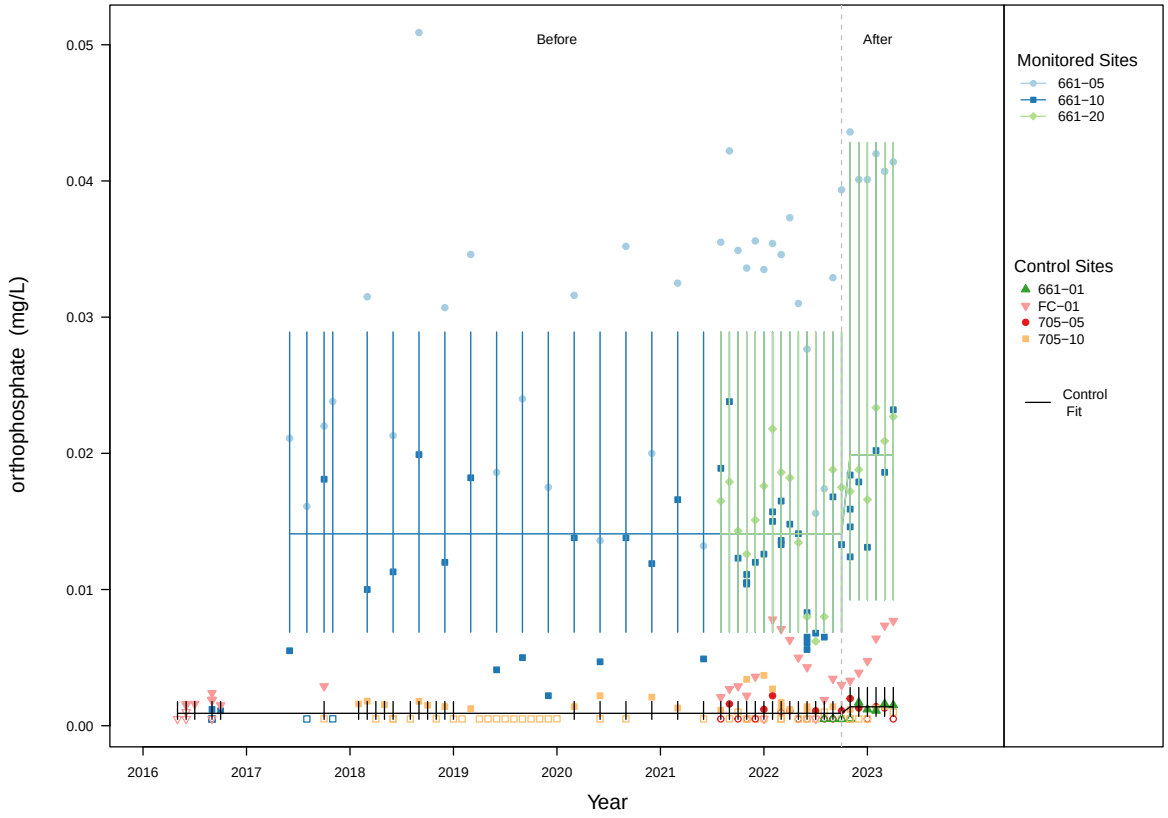
Monitored vs:	Estimate	Significance
control sites	-0.0336	significant

Conclusion:

The change in orthophosphate concentrations at the monitored sites from *before* to *after* was significantly (*adjusted p =* 0.0321) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

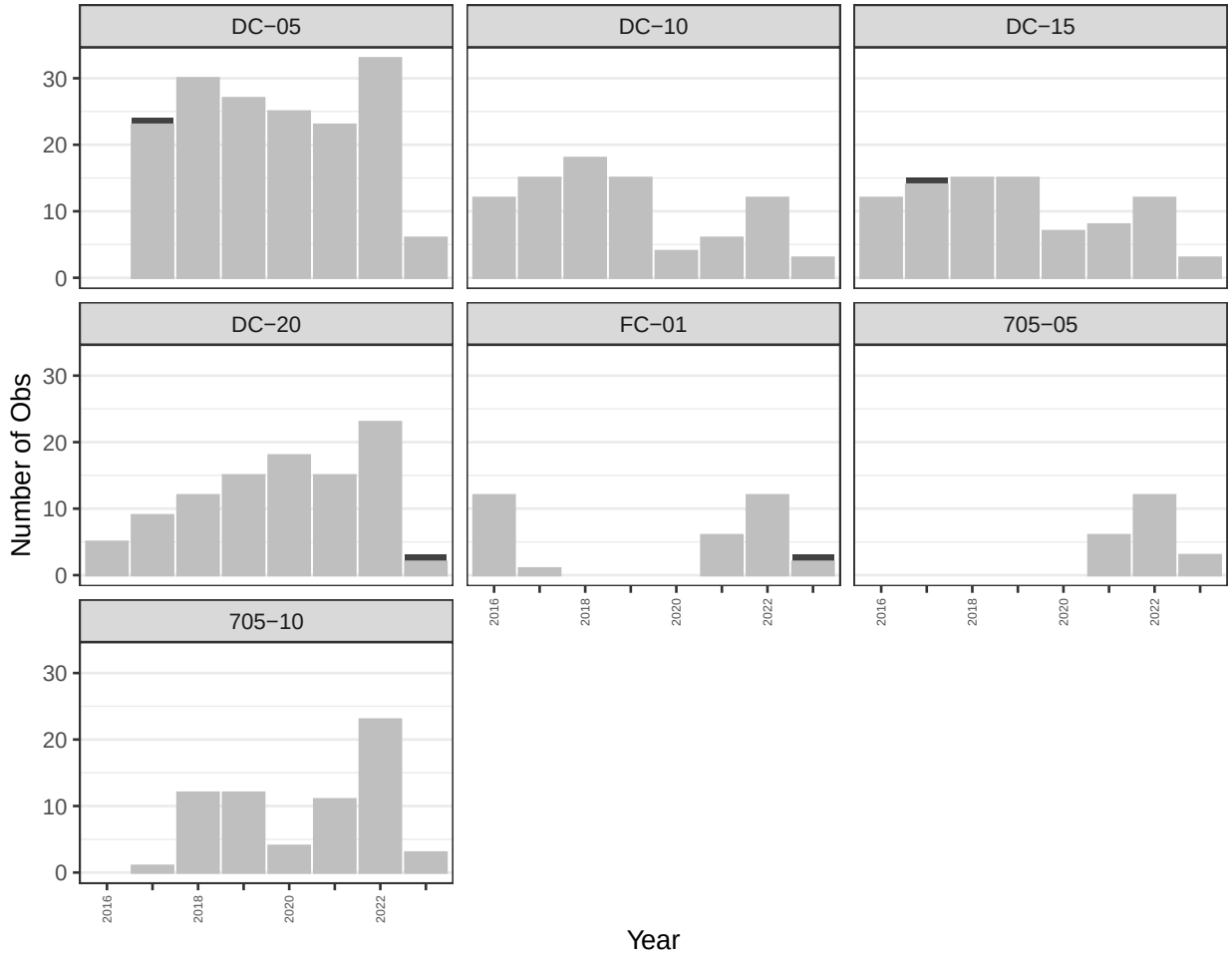
Final Summary Table

Variable	orthophosphate
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	TRUE

C-2.1.12 Total Antimony

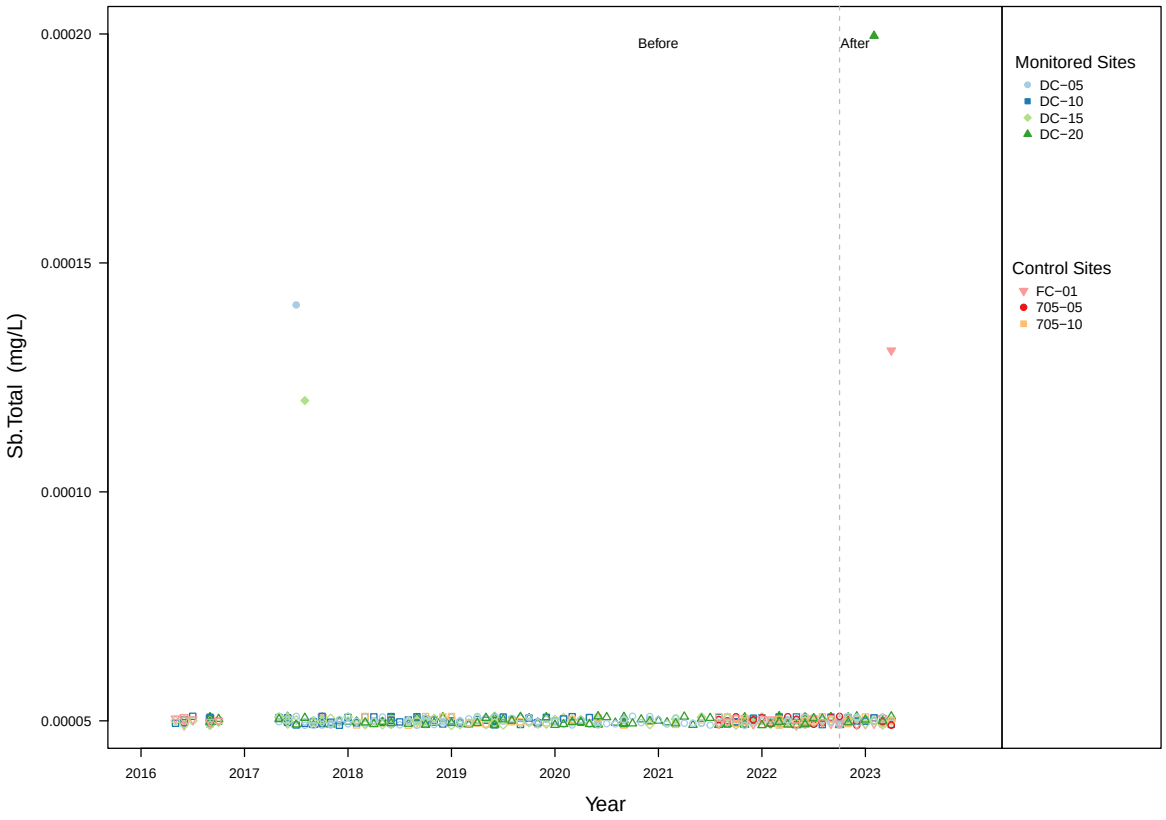
1 Davidson Creek

1.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



Note: Open symbols represent cases where the results were below the sample detection limit.

Final Summary Table

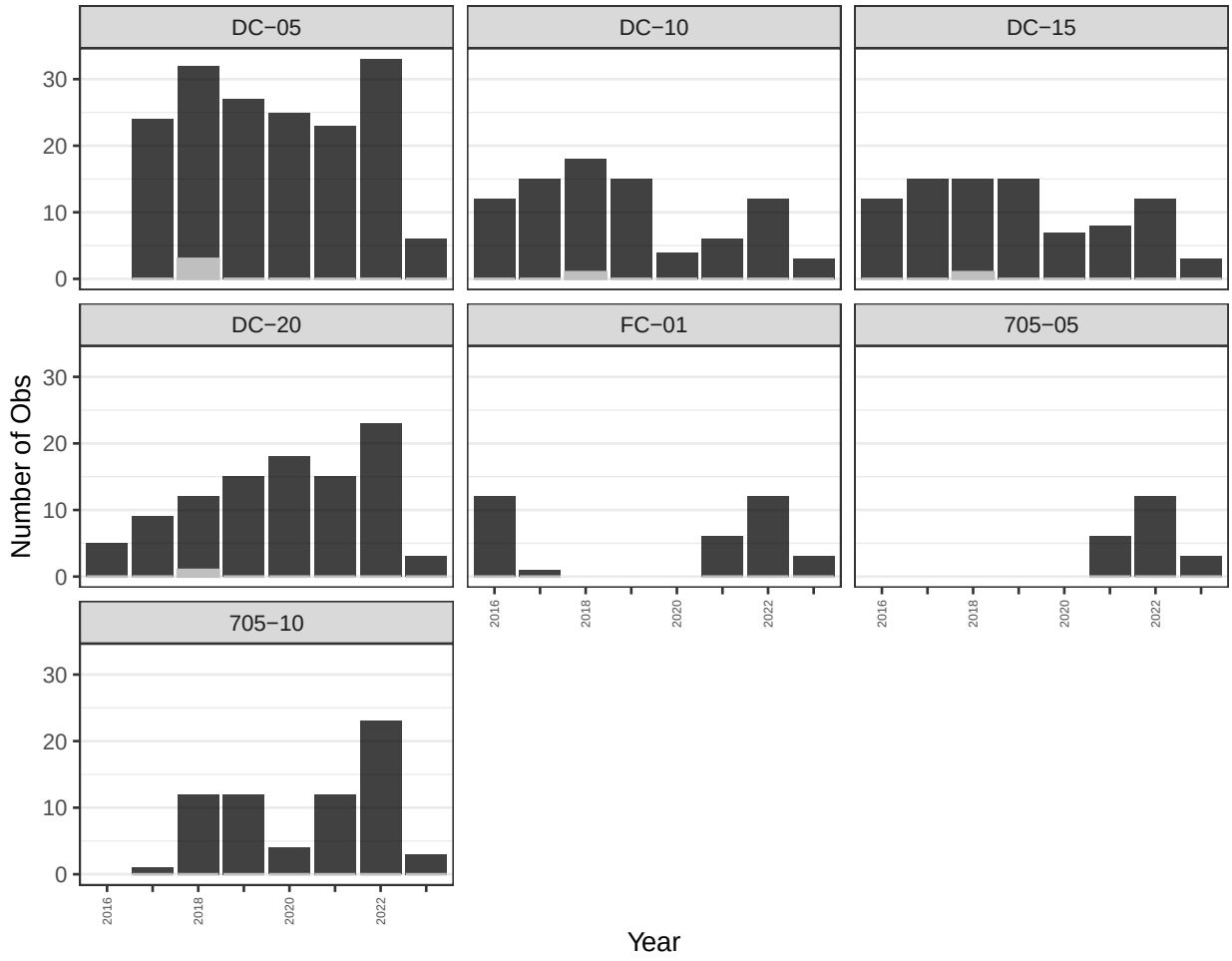
Variable	Sb.Total
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

C-2.1.13 Total Arsenic

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

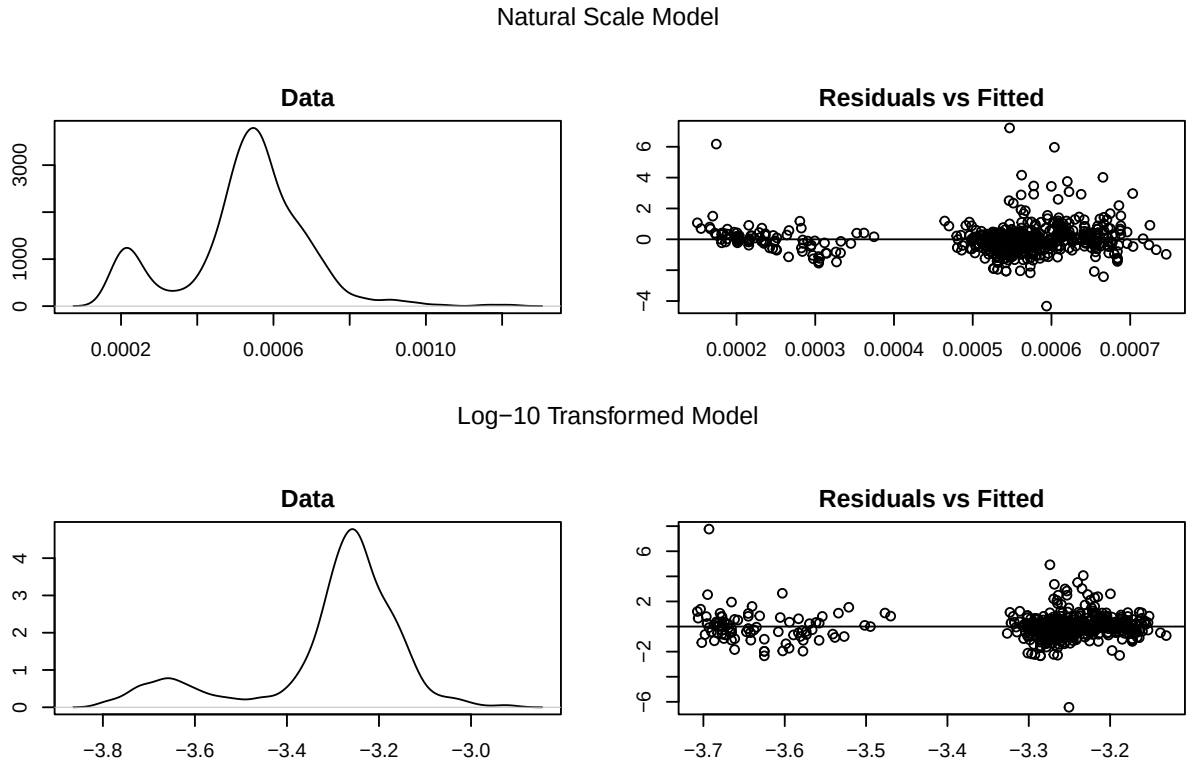
1.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	155	0.0006	1.935
Davidson Creek	DC-05	after	15	0.0006	0.000
Davidson Creek	DC-10	before	79	0.0006	1.266
Davidson Creek	DC-10	after	6	0.0005	0.000
Davidson Creek	DC-15	before	81	0.0006	1.235
Davidson Creek	DC-15	after	6	0.0006	0.000
Davidson Creek	DC-20	before	91	0.0005	1.099
Davidson Creek	DC-20	after	9	0.0006	0.000
Davidson Creek	FC-01	before	28	0.0006	0.000
Davidson Creek	FC-01	after	6	0.0008	0.000
Davidson Creek	705-05	before	15	0.0003	0.000
Davidson Creek	705-05	after	6	0.0003	0.000
Davidson Creek	705-10	before	58	0.0002	0.000
Davidson Creek	705-10	after	9	0.0002	0.000

1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-20	2019	5	monit	before	0.0012	0.0005	7.218	0
Davidson Creek	705-10	2021	12	control	before	0.0008	0.0002	6.173	0
Davidson Creek	DC-20	2017	10	monit	before	0.0012	0.0006	5.965	0
Davidson Creek	FC-01	2021	12	control	before	0.0002	0.0006	-4.330	0
Davidson Creek	DC-20	2018	5	monit	before	0.0010	0.0006	4.159	0
Davidson Creek	FC-01	2023	3	control	after	0.0010	0.0007	4.017	0
Davidson Creek	FC-01	2022	2	control	before	0.0010	0.0006	3.751	0
Davidson Creek	DC-05	2018	5	monit	before	0.0009	0.0006	3.458	0
Davidson Creek	FC-01	2022	3	control	before	0.0009	0.0006	3.433	0
Davidson Creek	FC-01	2022	4	control	before	0.0009	0.0006	3.085	0

Outliers on log scale:

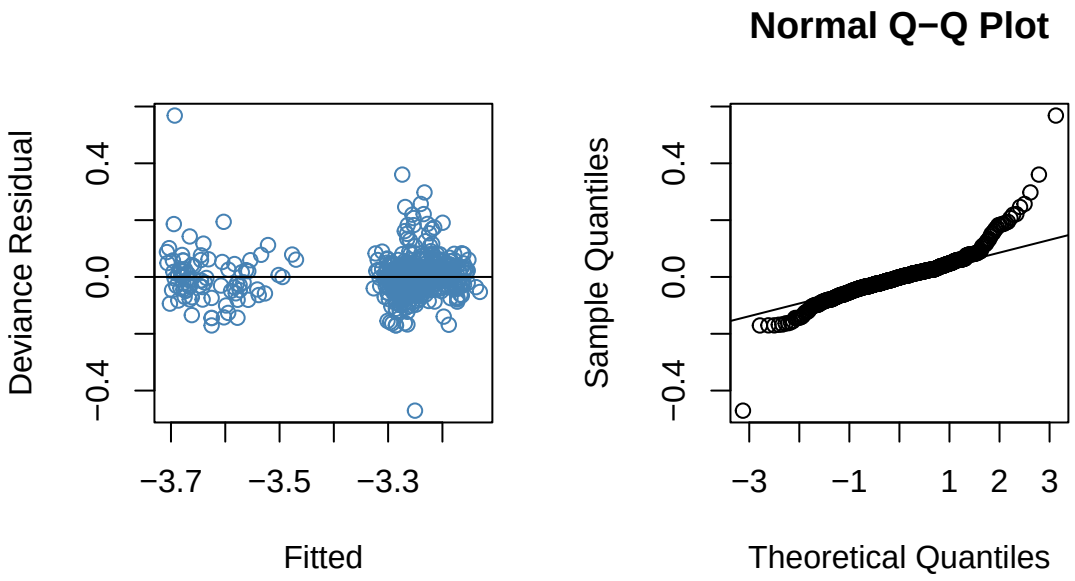
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	705-10	2021	12	control	before	-3.125	-3.693	7.764	0
Davidson Creek	FC-01	2021	12	control	before	-3.721	-3.251	-6.432	0
Davidson Creek	DC-20	2019	5	monit	before	-2.914	-3.274	4.924	0
Davidson Creek	DC-20	2017	10	monit	before	-2.936	-3.233	4.065	0
Davidson Creek	FC-01	2023	3	control	after	-2.983	-3.240	3.511	0
Davidson Creek	DC-20	2018	5	monit	before	-3.022	-3.268	3.365	0
Davidson Creek	FC-01	2022	2	control	before	-3.013	-3.235	3.024	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0220	0.0220	1	5.054	4.1079	0.0979	
period	0.0054	0.0054	1	102.143	1.0138	0.3160	
class:period	0.0003	0.0003	1	540.985	0.0505	0.8220	0.49

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

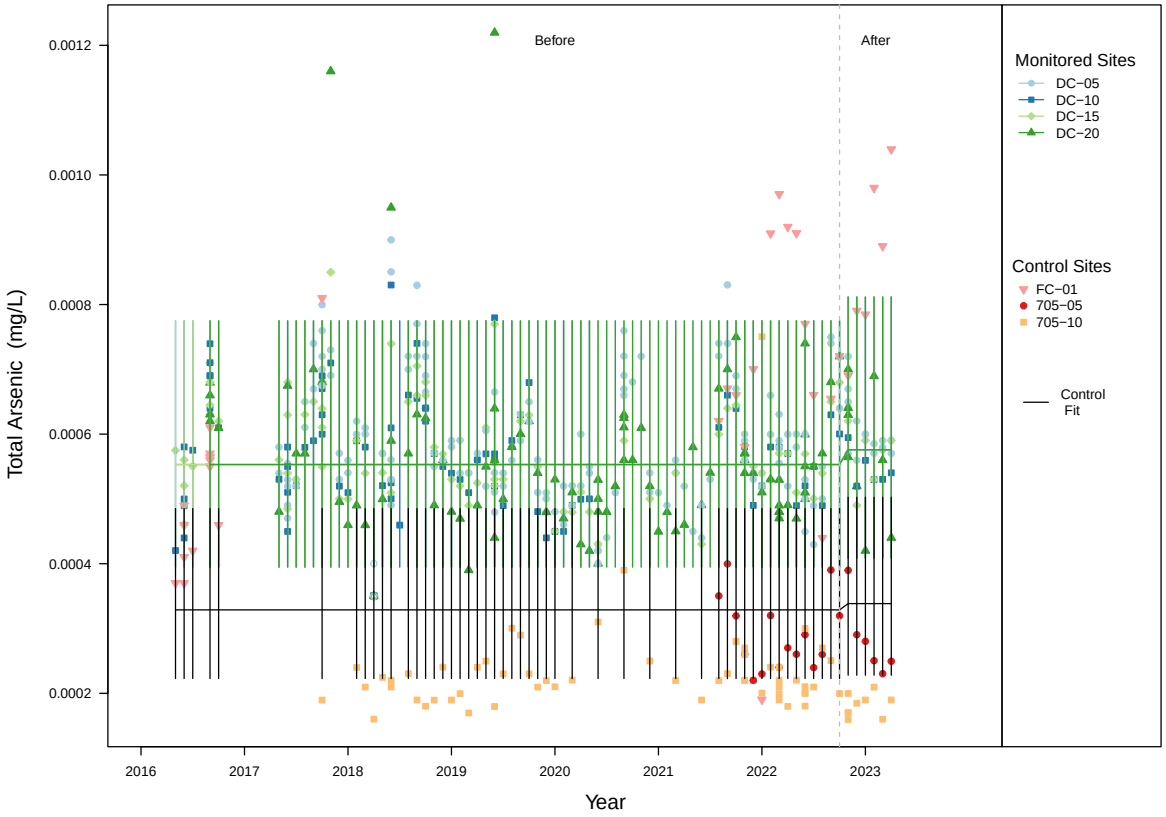
Monitored vs:	Estimate	Significance
control sites	0.005	not significant

Conclusion:

The change in Total Arsenic concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.49) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

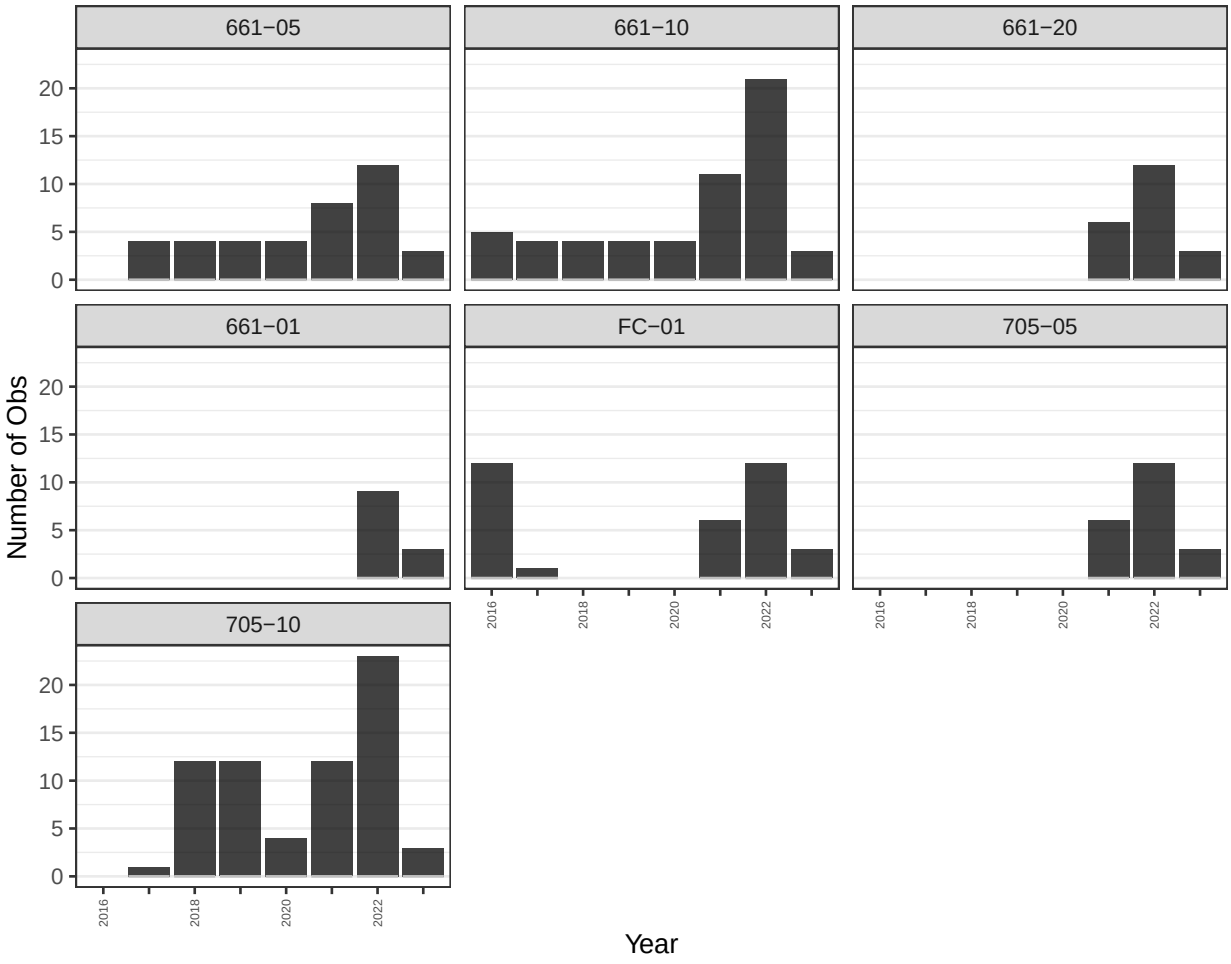
Final Summary Table

Variable	Total Arsenic
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

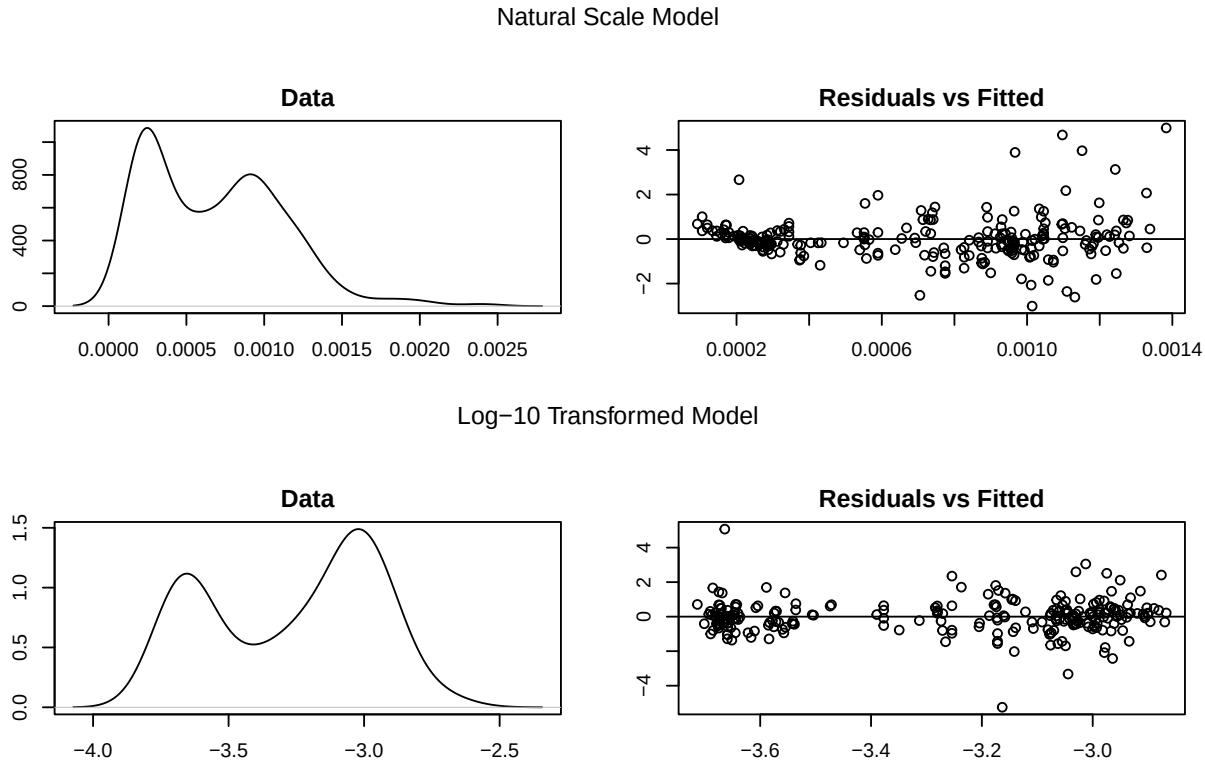
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	0.0012	0
Creek 661	661-05	after	6	0.0013	0
Creek 661	661-10	before	47	0.0009	0
Creek 661	661-10	after	9	0.0010	0
Creek 661	661-20	before	15	0.0010	0
Creek 661	661-20	after	6	0.0009	0
Creek 661	661-01	before	3	0.0007	0
Creek 661	661-01	after	9	0.0005	0
Creek 661	FC-01	before	28	0.0006	0
Creek 661	FC-01	after	6	0.0008	0
Creek 661	705-05	before	15	0.0003	0
Creek 661	705-05	after	6	0.0003	0
Creek 661	705-10	before	58	0.0002	0
Creek 661	705-10	after	9	0.0002	0

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	661-05	2018	8	monit	before	0.0024	0.0014	4.991	0
Creek 661	661-10	2017	9	monit	before	0.0021	0.0011	4.677	0
Creek 661	661-10	2018	8	monit	before	0.0020	0.0012	3.969	0
Creek 661	661-10	2021	7	monit	before	0.0018	0.0010	3.892	0
Creek 661	661-05	2017	10	monit	before	0.0019	0.0012	3.127	0
Creek 661	661-10	2017	7	monit	before	0.0004	0.0010	-3.014	0

Outliers on log scale:

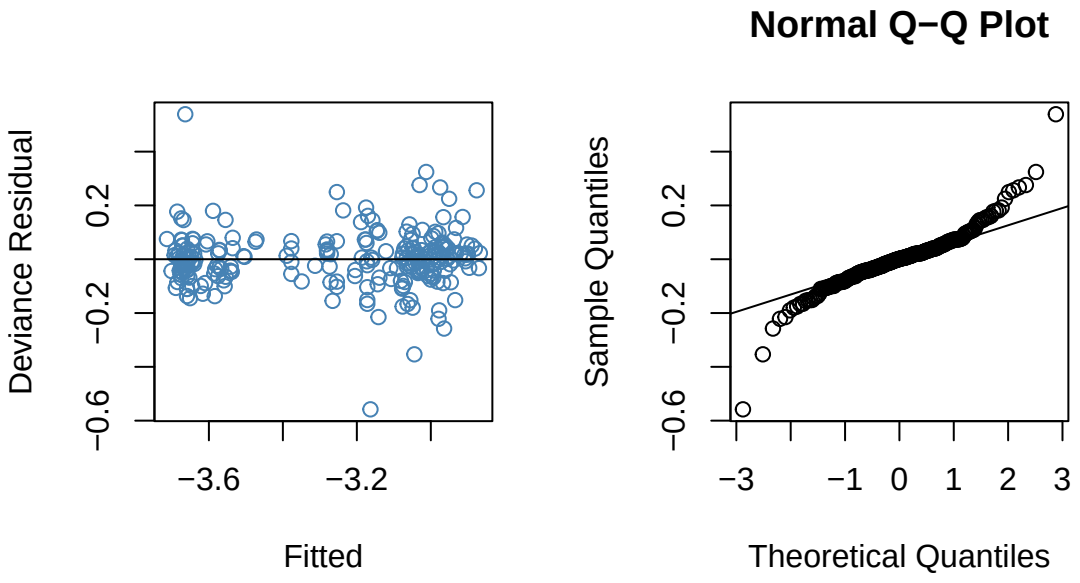
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	FC-01	2021	12	control	before	-3.721	-3.163	-5.251	0
Creek 661	705-10	2021	12	control	before	-3.125	-3.664	5.072	0
Creek 661	661-10	2017	7	monit	before	-3.398	-3.045	-3.326	0
Creek 661	661-10	2017	9	monit	before	-2.688	-3.013	3.051	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0953	0.0953	1	5.014	8.4406	0.0335	
period	0.0046	0.0046	1	133.418	0.4097	0.5230	
class:period	0.0340	0.0340	1	225.523	3.0127	0.0840	0.623

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

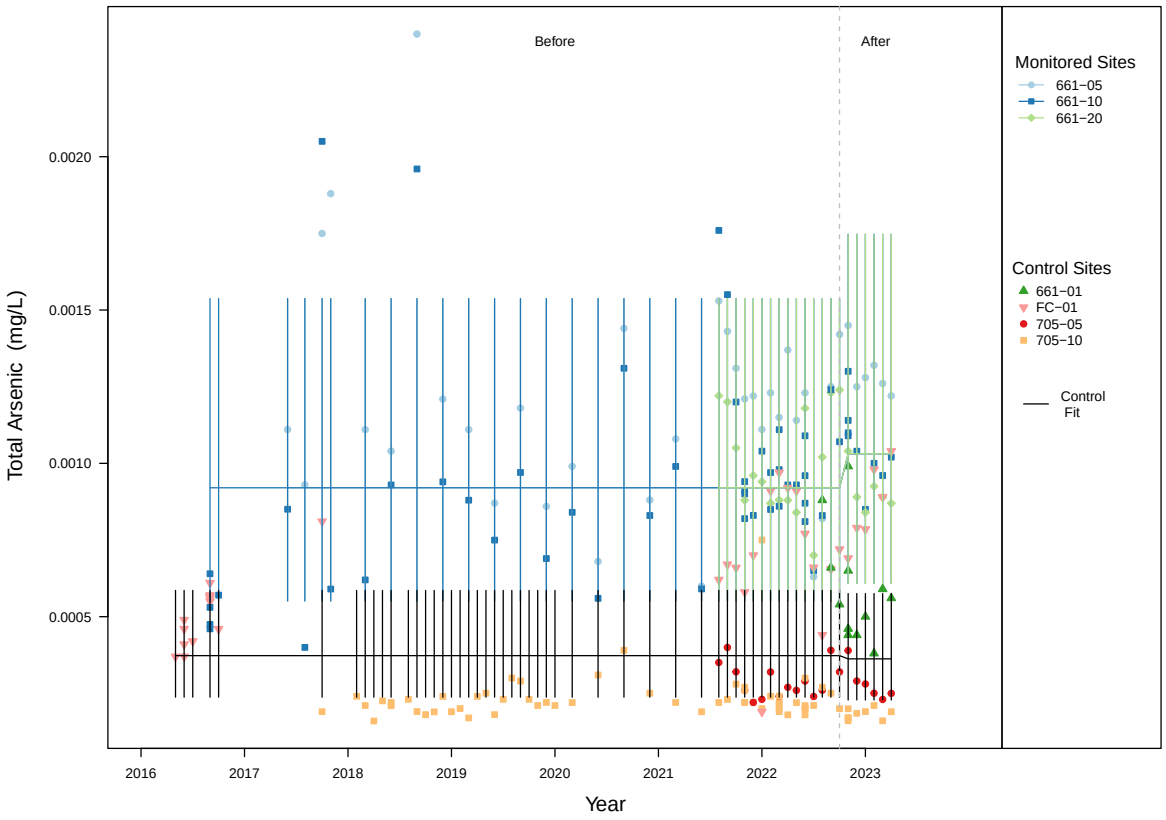
Monitored vs:	Estimate	Significance
control sites	0.0618	not significant

Conclusion:

The change in Total Arsenic concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p* = 0.623) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

Final Summary Table

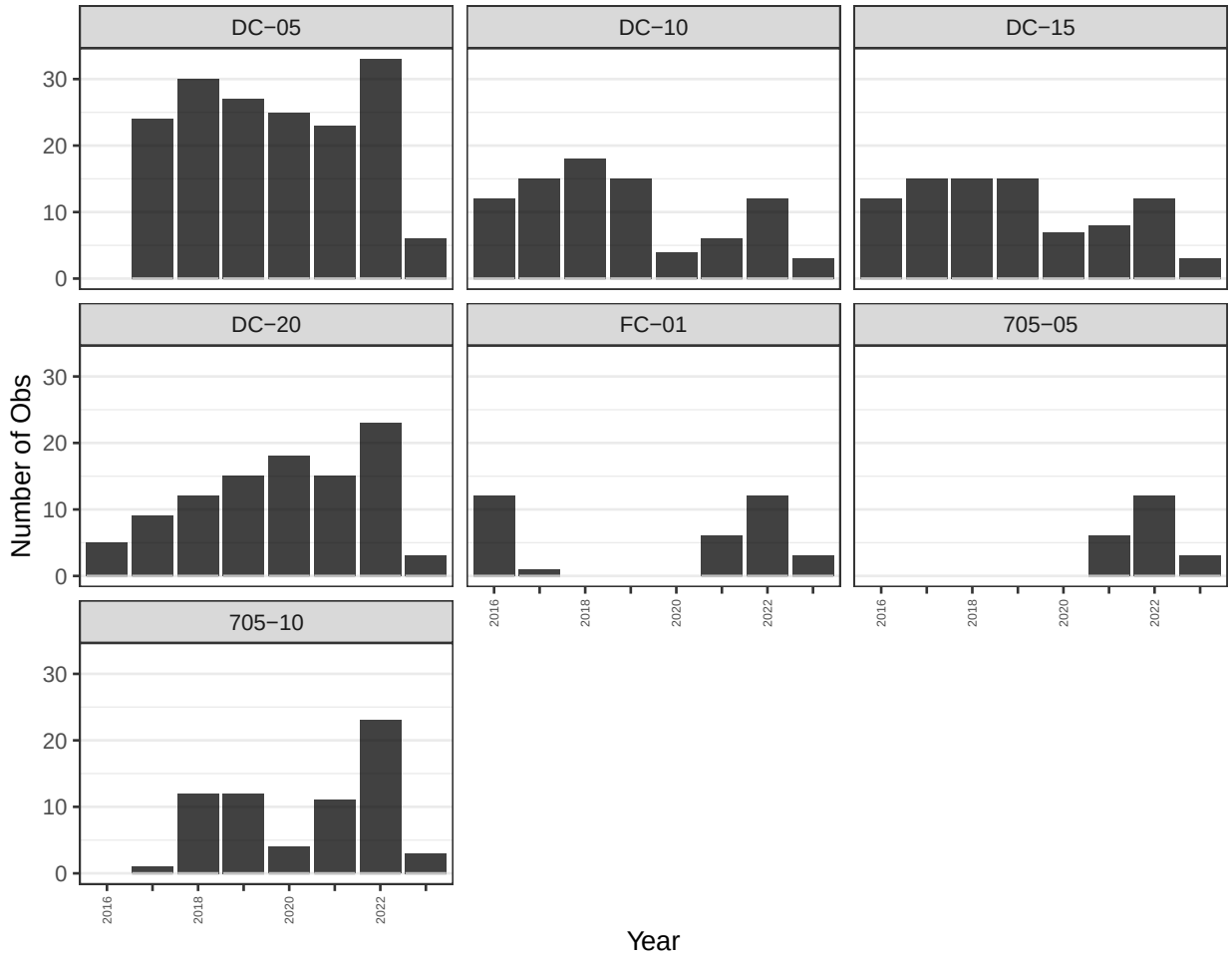
Variable	Total Arsenic
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.14 Total Barium

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

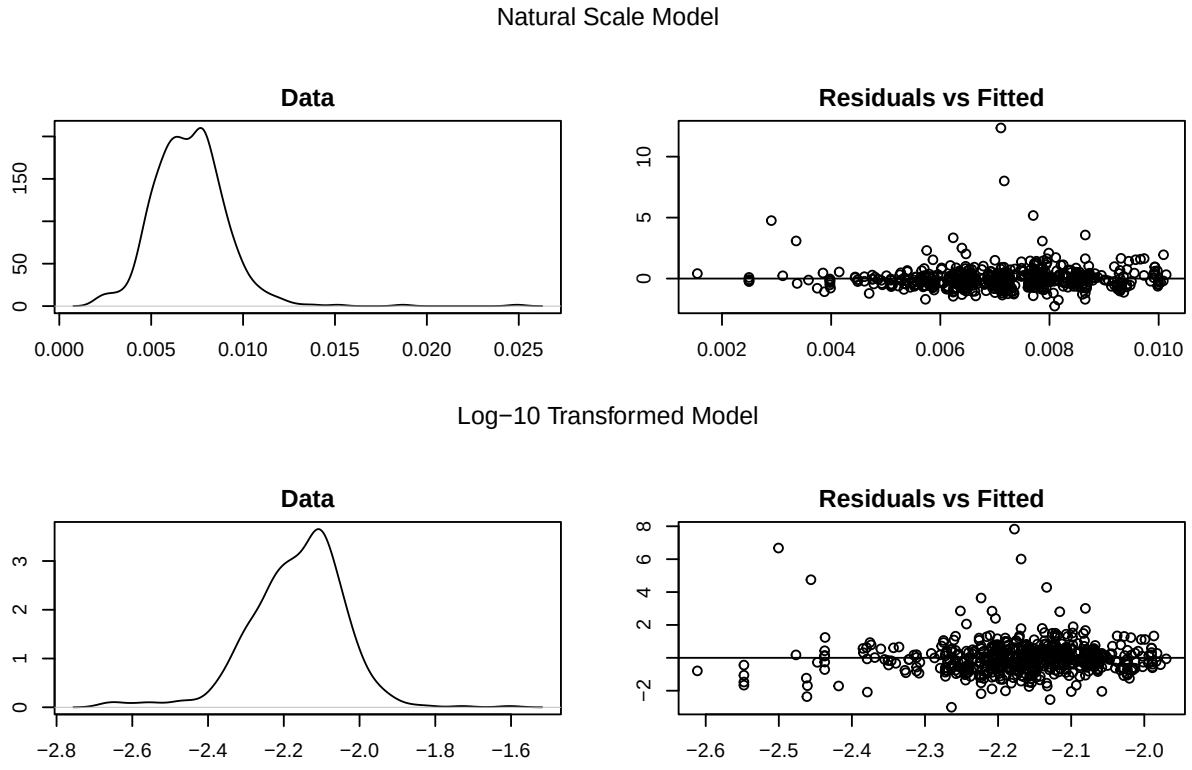
1.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	153	0.0063	0
Davidson Creek	DC-05	after	15	0.0080	0
Davidson Creek	DC-10	before	79	0.0067	0
Davidson Creek	DC-10	after	6	0.0084	0
Davidson Creek	DC-15	before	81	0.0074	0
Davidson Creek	DC-15	after	6	0.0088	0
Davidson Creek	DC-20	before	91	0.0078	0
Davidson Creek	DC-20	after	9	0.0096	0
Davidson Creek	FC-01	before	28	0.0036	0
Davidson Creek	FC-01	after	6	0.0045	0
Davidson Creek	705-05	before	15	0.0060	0
Davidson Creek	705-05	after	6	0.0061	0
Davidson Creek	705-10	before	57	0.0086	0
Davidson Creek	705-10	after	9	0.0106	0

1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-05	2020	4	monit	before	0.0249	0.0071	12.351	0
Davidson Creek	DC-20	2019	5	monit	before	0.0187	0.0072	8.004	0
Davidson Creek	DC-20	2018	5	monit	before	0.0152	0.0077	5.171	0
Davidson Creek	FC-01	2022	6	control	before	0.0098	0.0029	4.753	0
Davidson Creek	705-10	2022	5	control	before	0.0138	0.0087	3.571	0
Davidson Creek	DC-05	2018	5	monit	before	0.0111	0.0062	3.342	0
Davidson Creek	FC-01	2021	12	control	before	0.0078	0.0034	3.084	0
Davidson Creek	DC-20	2017	10	monit	before	0.0123	0.0079	3.076	0

Outliers on log scale:

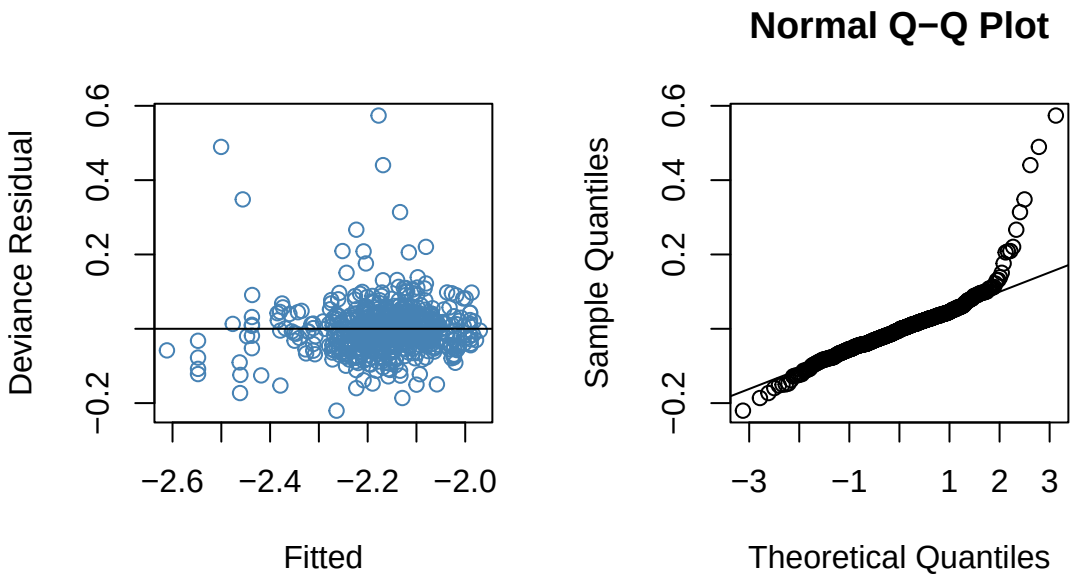
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-05	2020	4	monit	before	-1.604	-2.178	7.827	0
Davidson Creek	FC-01	2022	6	control	before	-2.011	-2.500	6.676	0
Davidson Creek	DC-20	2019	5	monit	before	-1.728	-2.168	6.007	0
Davidson Creek	FC-01	2021	12	control	before	-2.108	-2.456	4.749	0
Davidson Creek	DC-20	2018	5	monit	before	-1.820	-2.134	4.283	0
Davidson Creek	DC-05	2018	5	monit	before	-1.957	-2.223	3.637	0
Davidson Creek	705-10	2022	5	control	before	-1.860	-2.080	3.006	0
Davidson Creek	DC-05	2020	5	monit	before	-2.484	-2.264	-3.006	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0071	0.0071	1	5.085	1.321	0.302	
period	0.2251	0.2251	1	309.642	41.893	<0.001	
class:period	0.0238	0.0238	1	535.320	4.423	0.0359	0.322

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

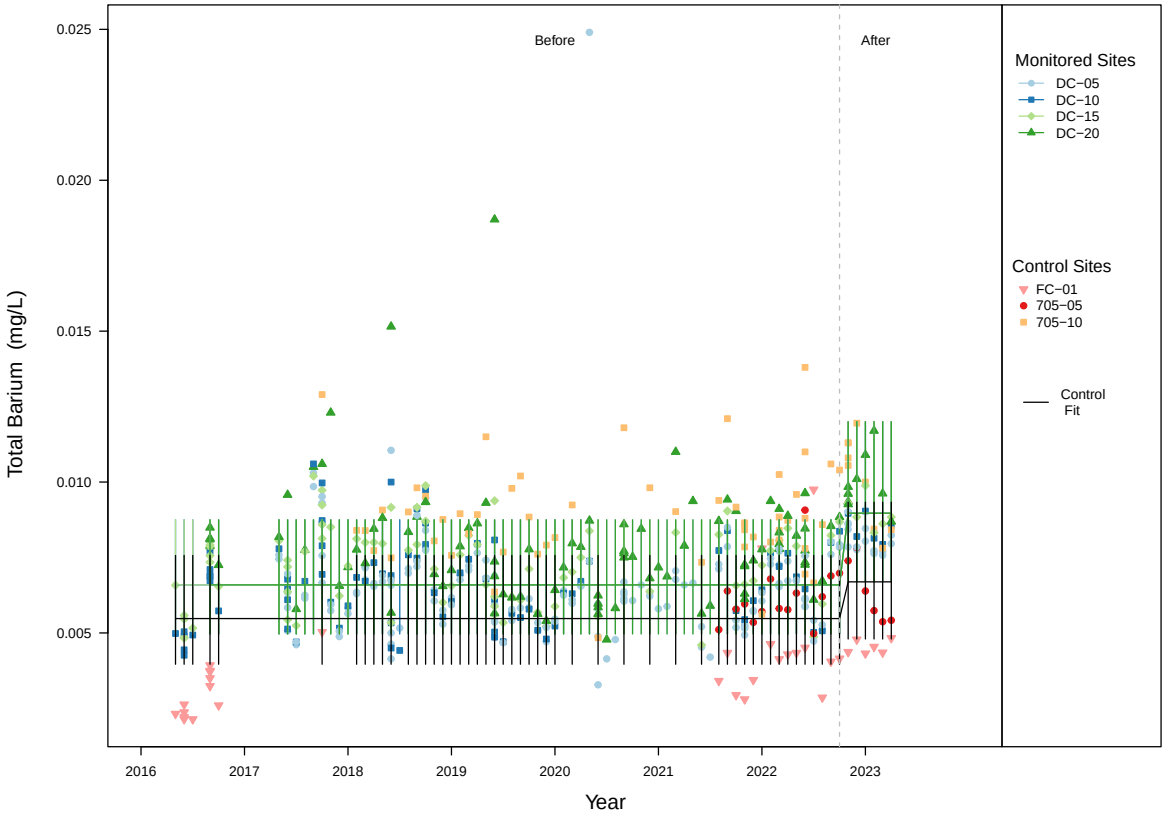
Monitored vs:	Estimate	Significance
control sites	0.0465	not significant

Conclusion:

The change in Total Barium concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.322) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale. Guideline is at 1 (mg/L).

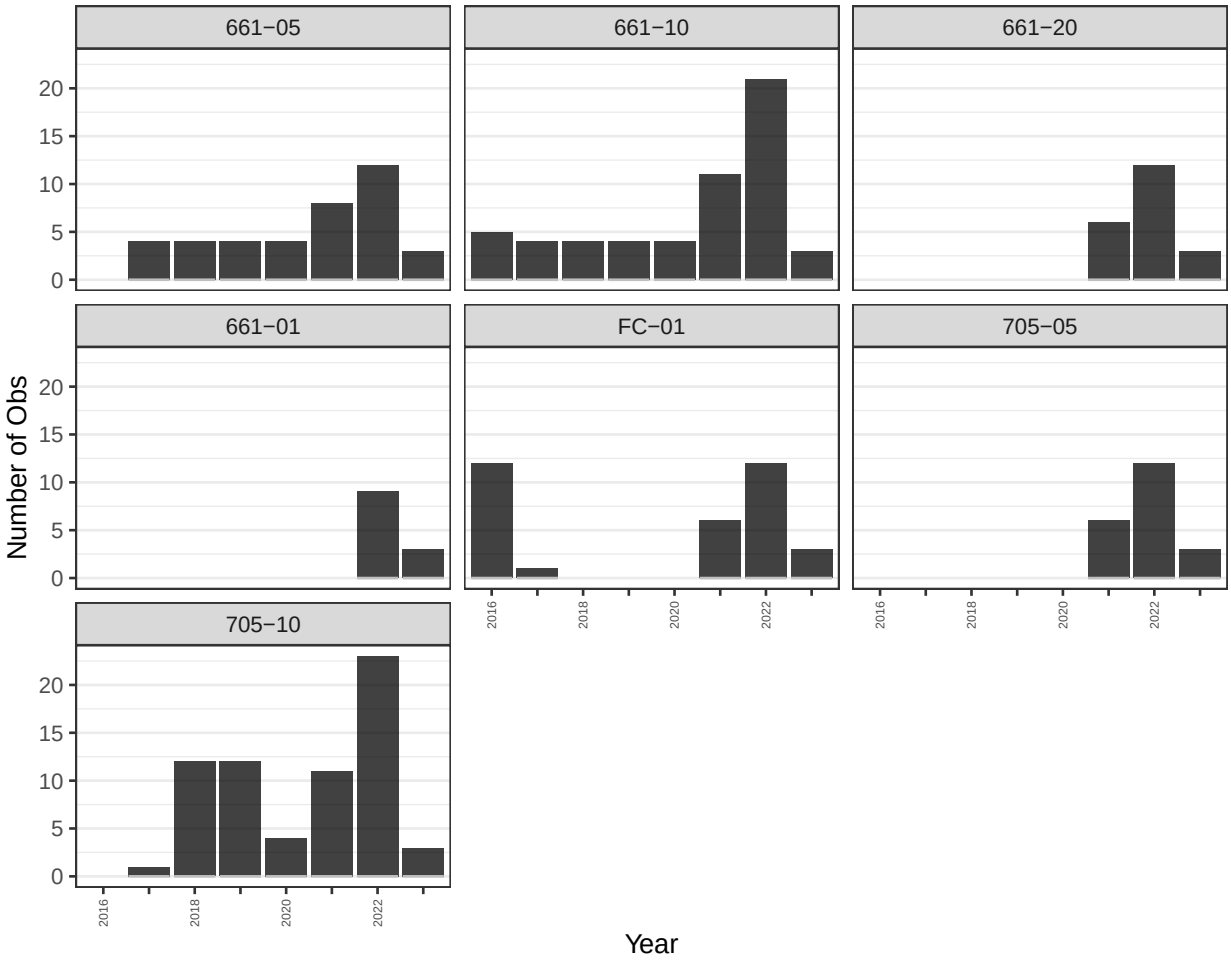
Final Summary Table

Variable	Total Barium
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

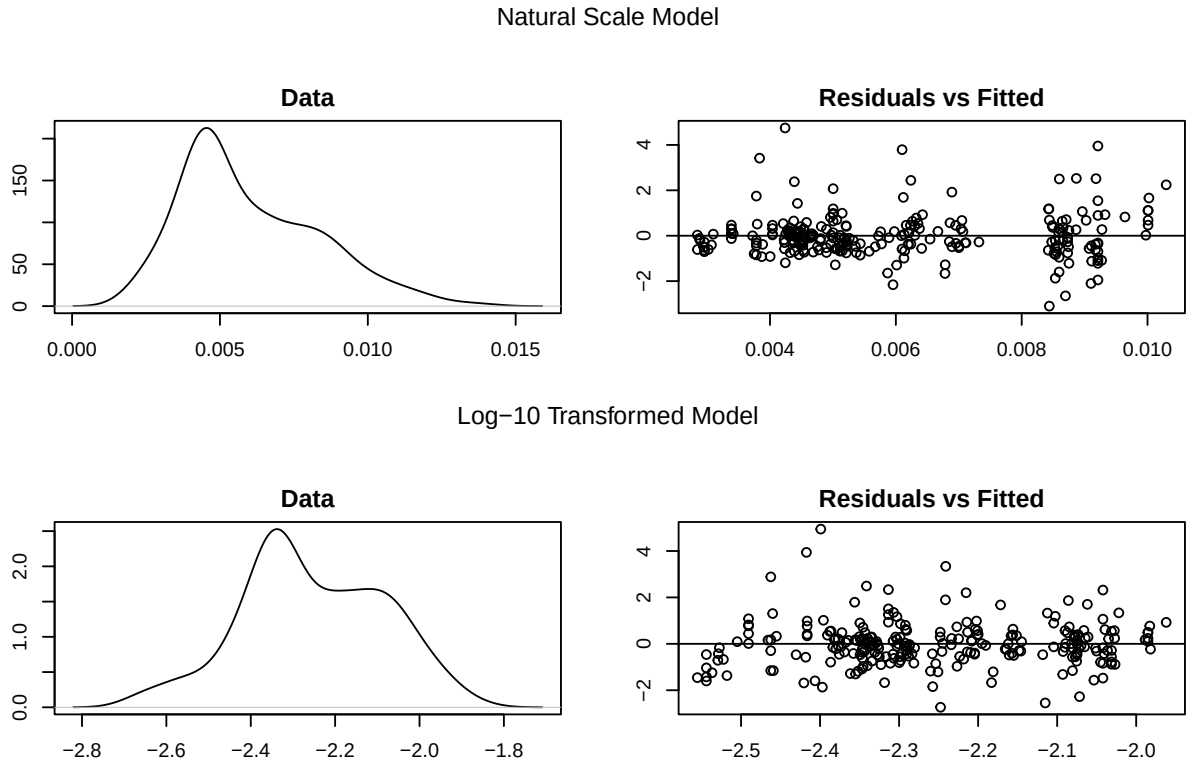
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	0.0047	0
Creek 661	661-05	after	6	0.0047	0
Creek 661	661-10	before	47	0.0044	0
Creek 661	661-10	after	9	0.0049	0
Creek 661	661-20	before	15	0.0066	0
Creek 661	661-20	after	6	0.0067	0
Creek 661	661-01	before	3	0.0032	0
Creek 661	661-01	after	9	0.0029	0
Creek 661	FC-01	before	28	0.0036	0
Creek 661	FC-01	after	6	0.0045	0
Creek 661	705-05	before	15	0.0060	0
Creek 661	705-05	after	6	0.0061	0
Creek 661	705-10	before	57	0.0086	0
Creek 661	705-10	after	9	0.0106	0

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	FC-01	2022	6	control	before	0.0098	0.0042	4.747	0
Creek 661	705-10	2022	5	control	before	0.0138	0.0092	3.953	0
Creek 661	661-05	2017	10	monit	before	0.0105	0.0061	3.791	0
Creek 661	FC-01	2021	12	control	before	0.0078	0.0038	3.416	0
Creek 661	705-10	2020	5	control	before	0.0048	0.0084	-3.101	0

Outliers on log scale:

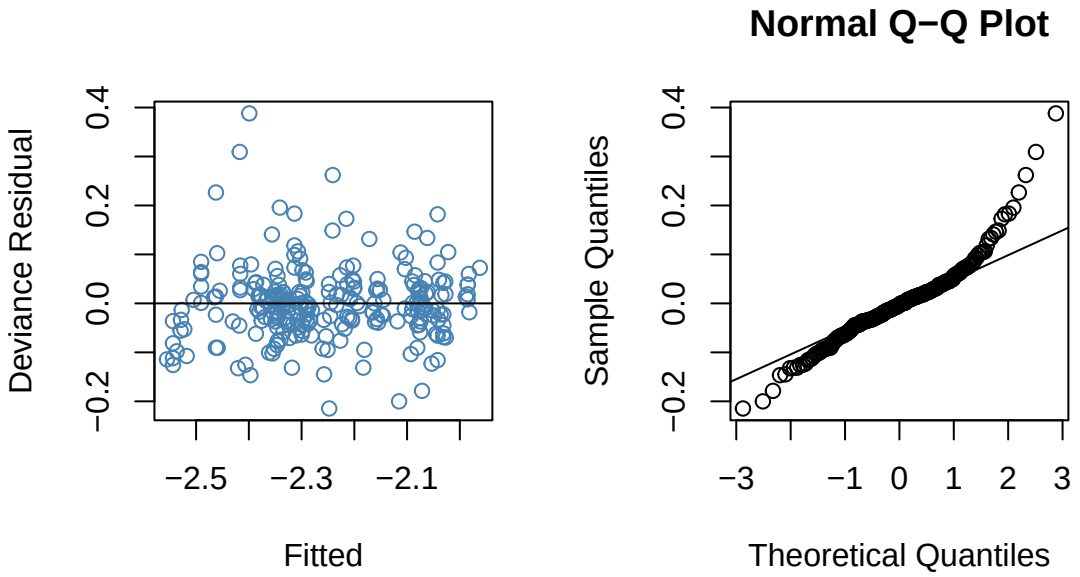
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	FC-01	2022	6	control	before	-2.011	-2.399	4.943	0
Creek 661	FC-01	2021	12	control	before	-2.108	-2.417	3.940	0
Creek 661	661-05	2017	10	monit	before	-1.979	-2.241	3.339	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0000	0.0000	1	5.01	0.0062	0.9400	
period	0.0216	0.0216	1	117.99	3.5082	0.0635	
class:period	0.0101	0.0101	1	224.33	1.6344	0.2020	0.106

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

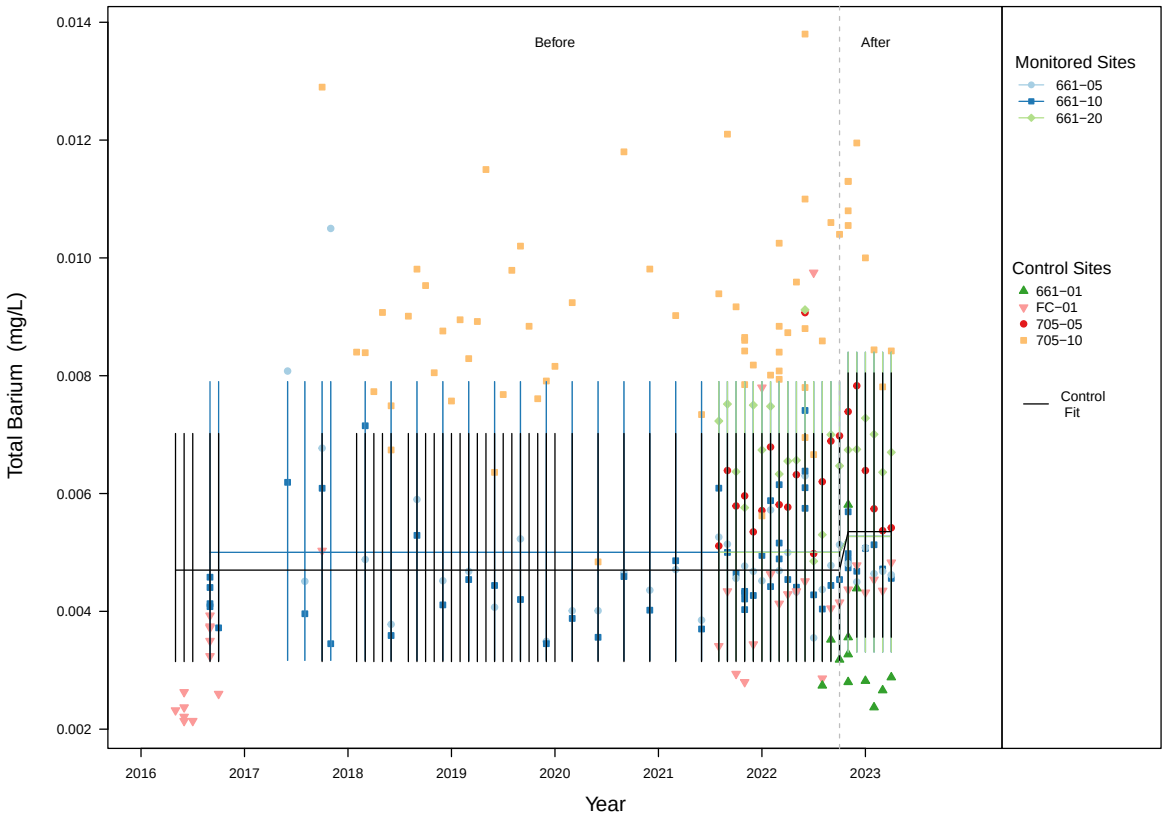
Monitored vs:	Estimate	Significance
control sites	-0.0336	not significant

Conclusion:

The change in Total Barium concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p* = 0.106) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale. Guideline is at 1 (mg/L).

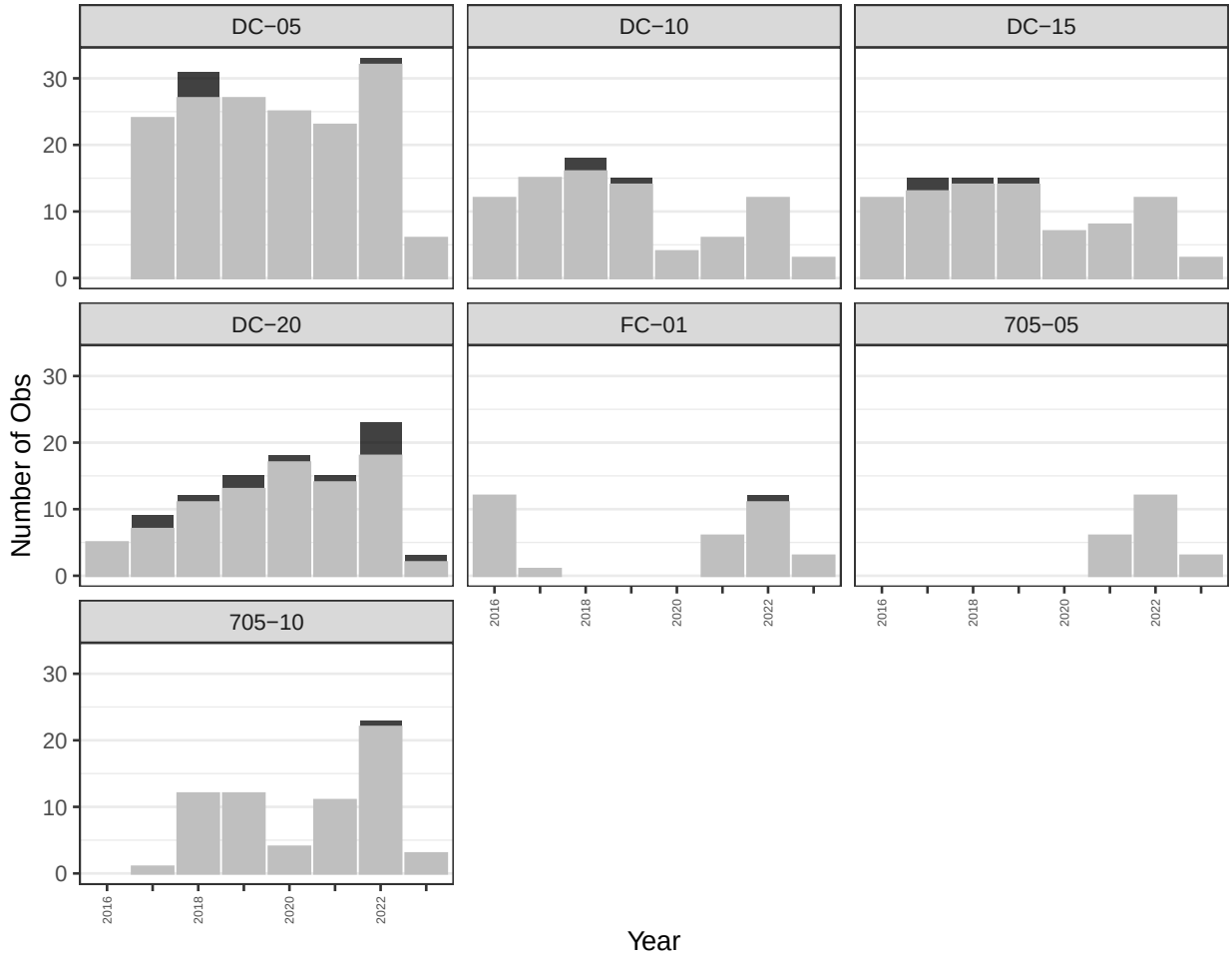
Final Summary Table

Variable	Total Barium
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.15 Total Cobalt

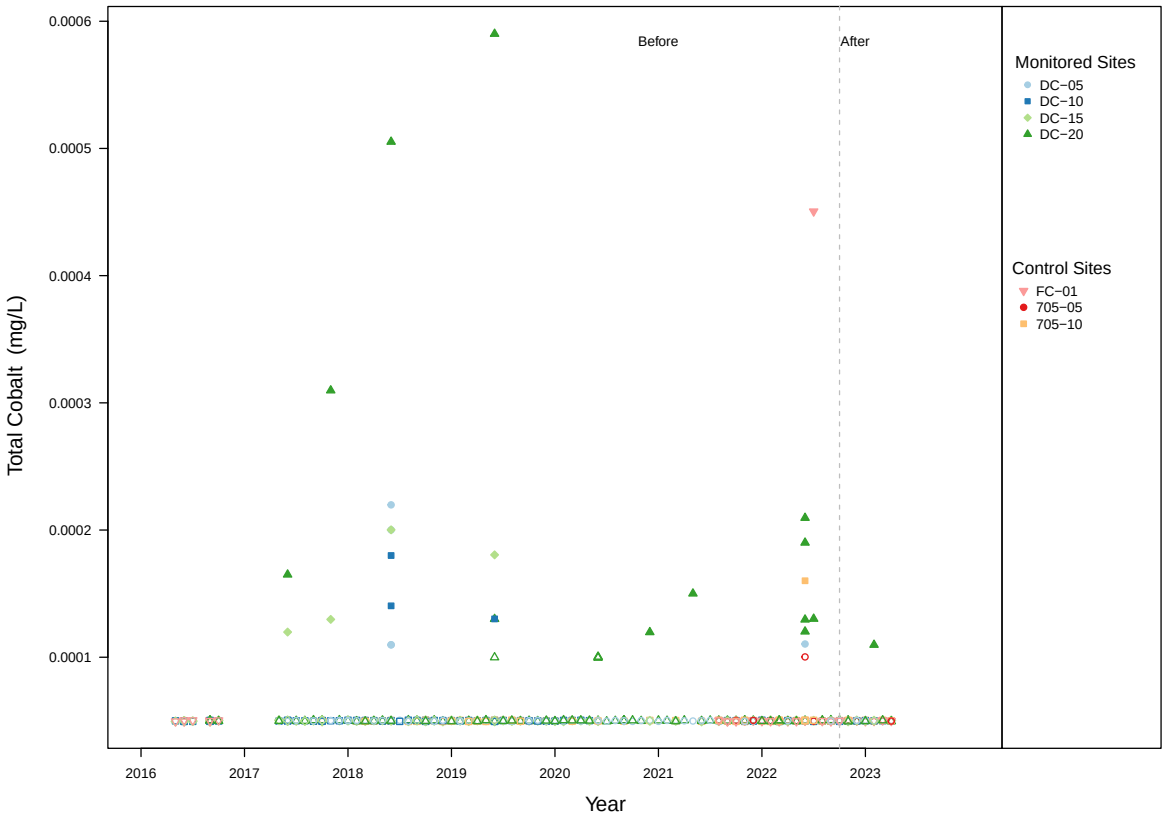
1 Davidson Creek

1.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



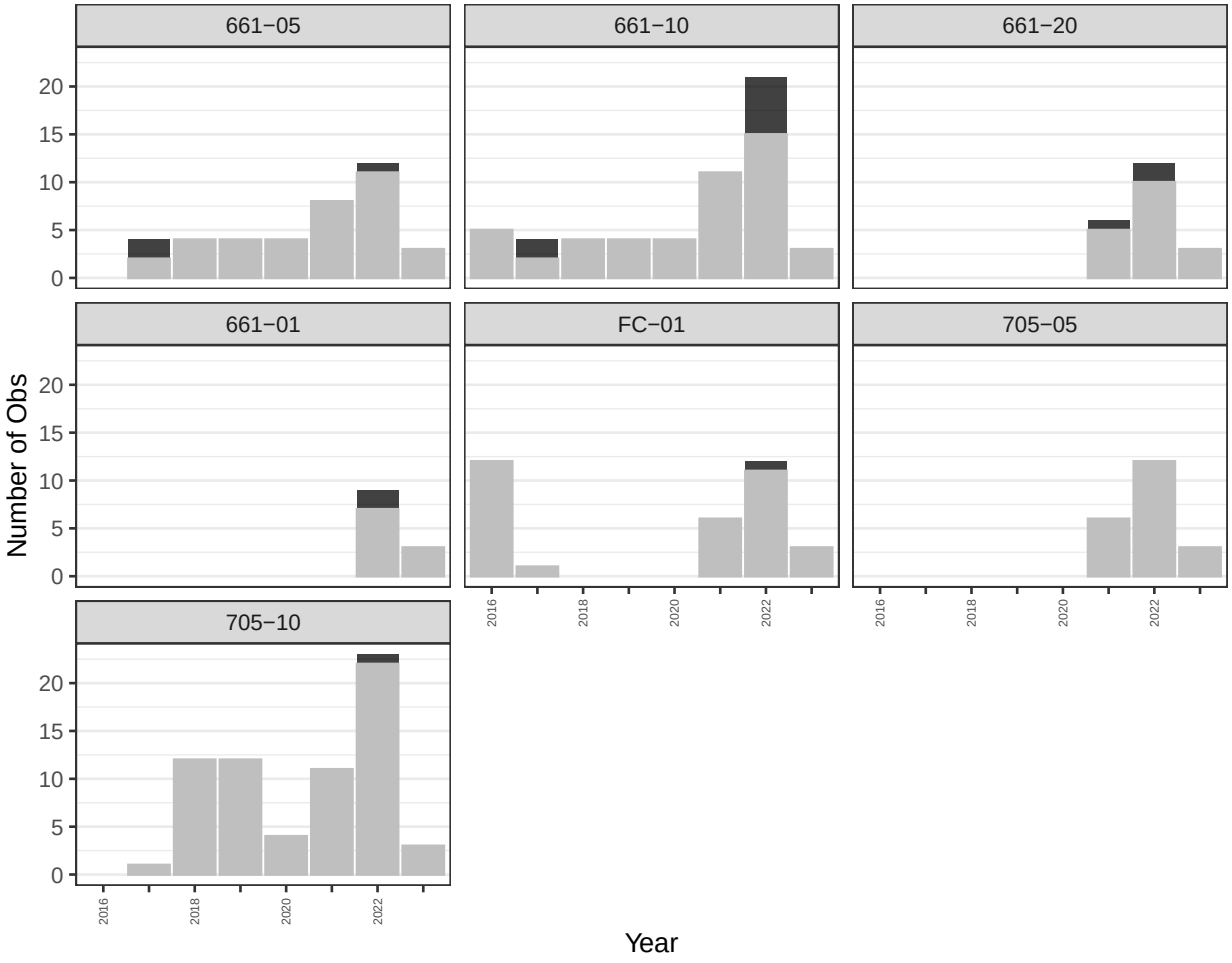
Note: Open symbols represent cases where the results were below the sample detection limit.

Final Summary Table

Variable	Total Cobalt
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

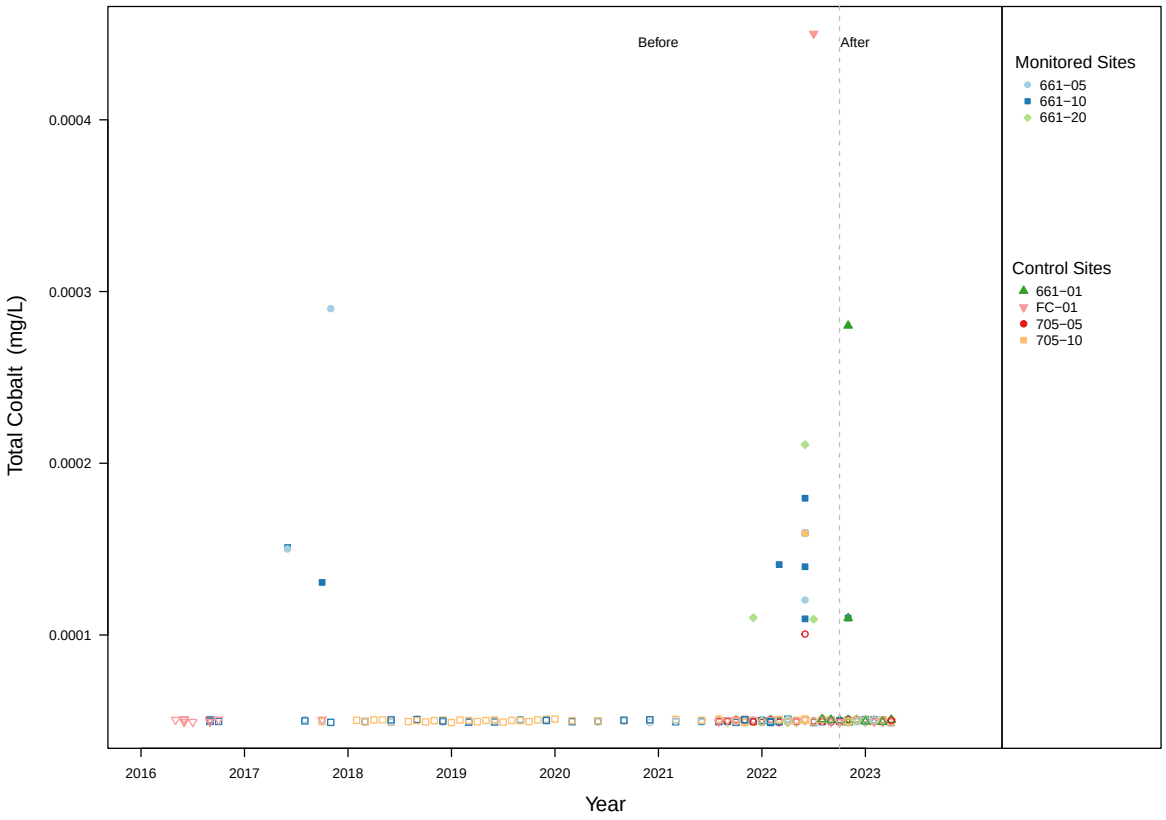
2 Creek 661

2.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



Note: Open symbols represent cases where the results were below the sample detection limit.

Final Summary Table

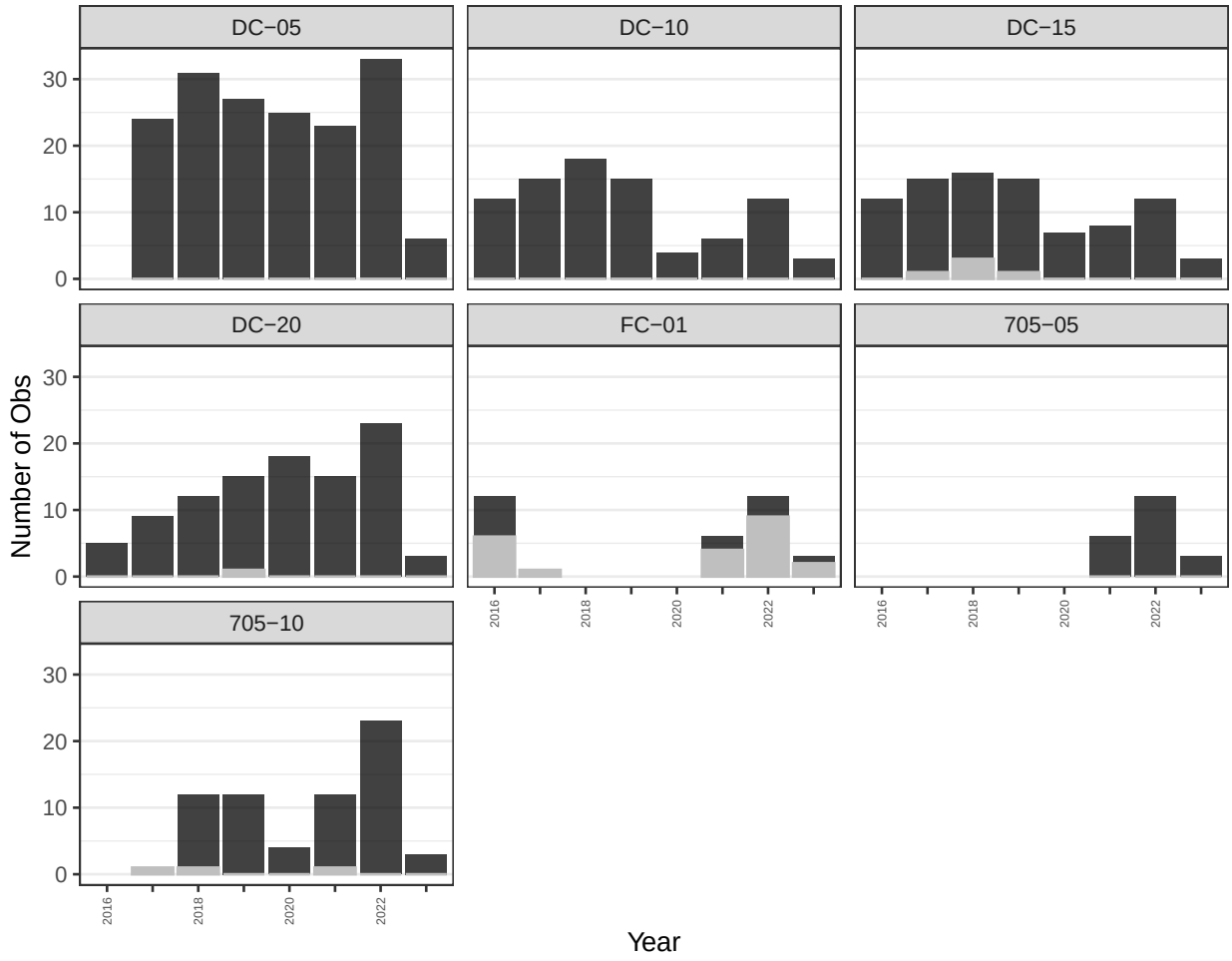
Variable	Total Cobalt
Watershed	Creek 661
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

C-2.1.16 Total Iron

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

Watershed	Site	Year	Class	Period	#Obs Removed
Davidson Creek	FC-01	2017	control	before	1
Davidson Creek	FC-01	2021	control	before	6
Davidson Creek	FC-01	2022	control	before	12
Davidson Creek	FC-01	2022	control	after	12
Davidson Creek	FC-01	2023	control	after	3
Davidson Creek	705-10	2017	control	before	1

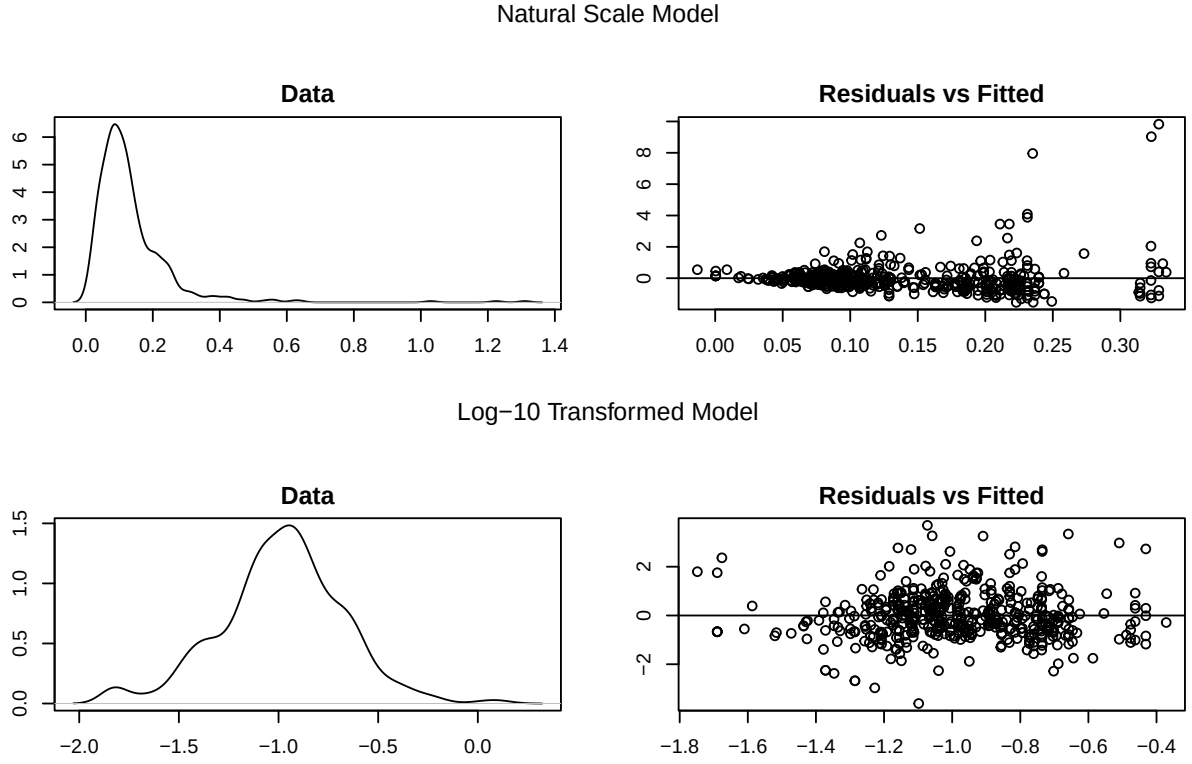
1.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	154	0.1040	0.000
Davidson Creek	DC-05	after	15	0.0420	0.000
Davidson Creek	DC-10	before	79	0.0915	0.000
Davidson Creek	DC-10	after	6	0.0330	0.000
Davidson Creek	DC-15	before	82	0.0720	6.098
Davidson Creek	DC-15	after	6	0.0260	0.000
Davidson Creek	DC-20	before	91	0.1470	1.099
Davidson Creek	DC-20	after	9	0.2395	0.000
Davidson Creek	FC-01	before	12	0.0230	50.000
Davidson Creek	705-05	before	15	0.2100	0.000
Davidson Creek	705-05	after	6	0.1860	0.000
Davidson Creek	705-10	before	28	0.1090	3.571

1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-20	2019	5	monit	before	1.310	0.3285	9.825	0
Davidson Creek	DC-20	2018	5	monit	before	1.225	0.3230	9.029	0
Davidson Creek	DC-20	2017	10	monit	before	1.030	0.2351	7.957	0
Davidson Creek	DC-05	2018	5	monit	before	0.640	0.2312	4.092	0
Davidson Creek	DC-05	2018	5	monit	before	0.619	0.2312	3.882	0
Davidson Creek	DC-10	2018	5	monit	before	0.563	0.2178	3.456	0
Davidson Creek	DC-15	2018	5	monit	before	0.556	0.2109	3.455	0
Davidson Creek	DC-20	2023	1	monit	after	0.468	0.1515	3.168	0

Outliers on log scale:

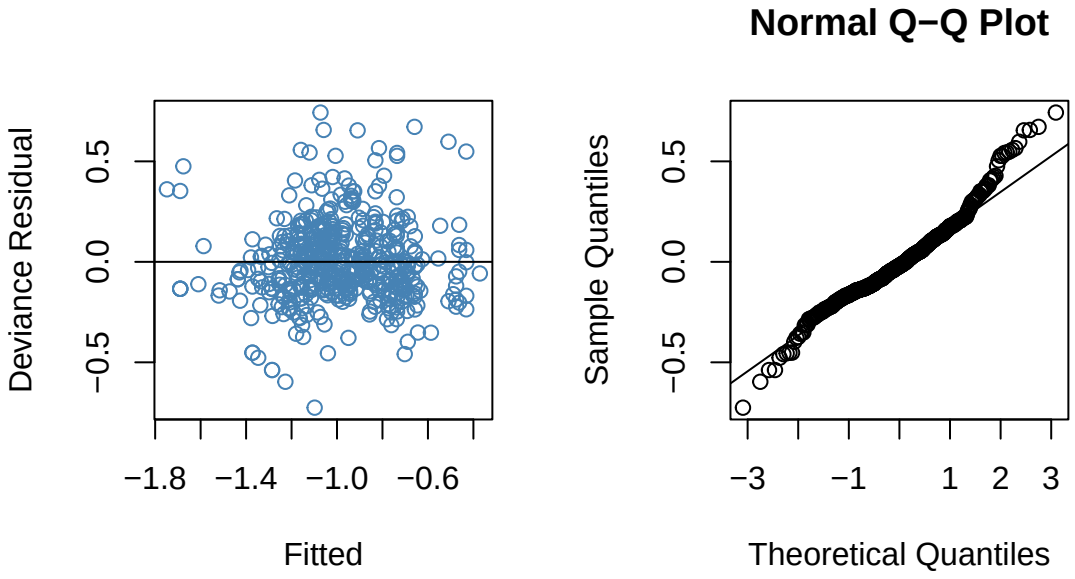
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-20	2023	1	monit	after	-0.3298	-1.0727	3.696	0
Davidson Creek	705-10	2018	9	control	before	-1.8239	-1.0983	-3.609	1
Davidson Creek	DC-20	2017	10	monit	before	0.0128	-0.6590	3.342	0
Davidson Creek	DC-15	2017	10	monit	before	-0.4023	-1.0587	3.265	0
Davidson Creek	DC-15	2018	5	monit	before	-0.2549	-0.9094	3.255	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0006	0.0006	1	5.255	0.0142	0.9100	
period	0.1078	0.1078	1	237.256	2.6676	0.1040	
class:period	0.3154	0.3154	1	485.659	7.8028	0.0054	0.49

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

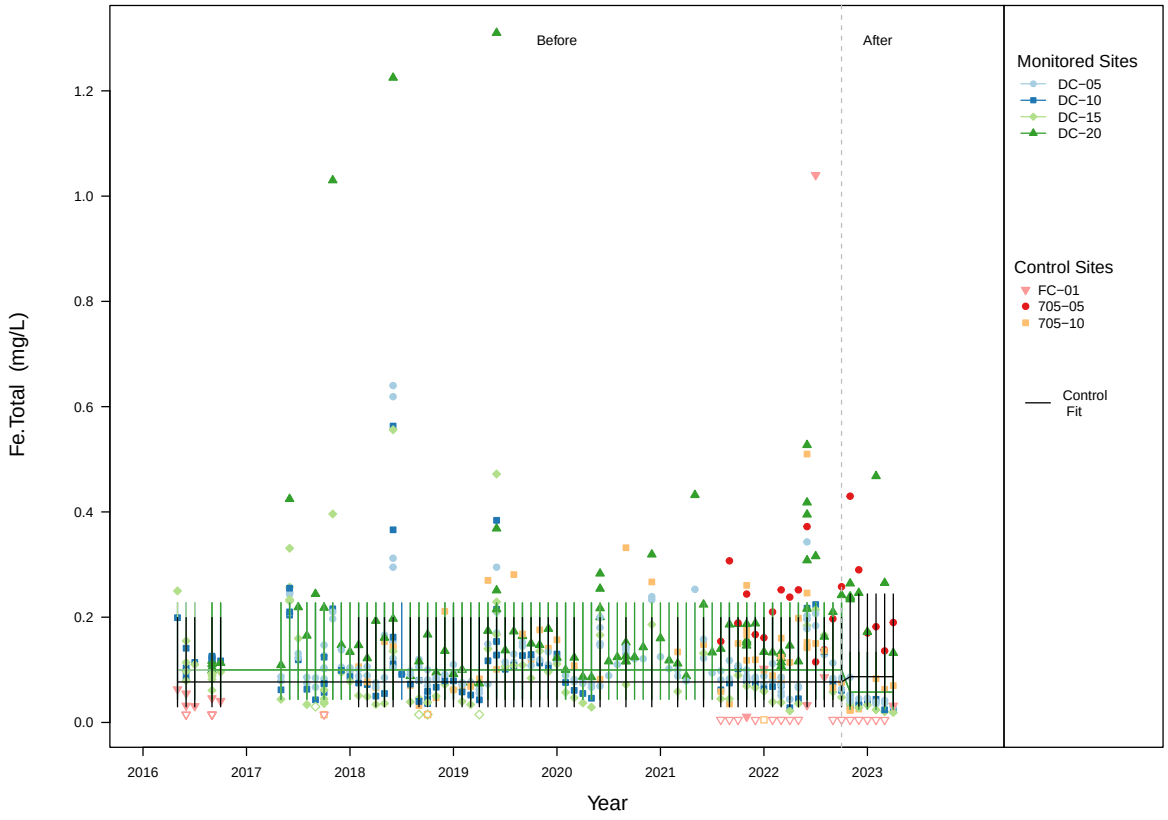
Monitored vs:	Estimate	Significance
control sites	-0.2921	not significant

Conclusion:

The change in Fe.Total concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p* = 0.49) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

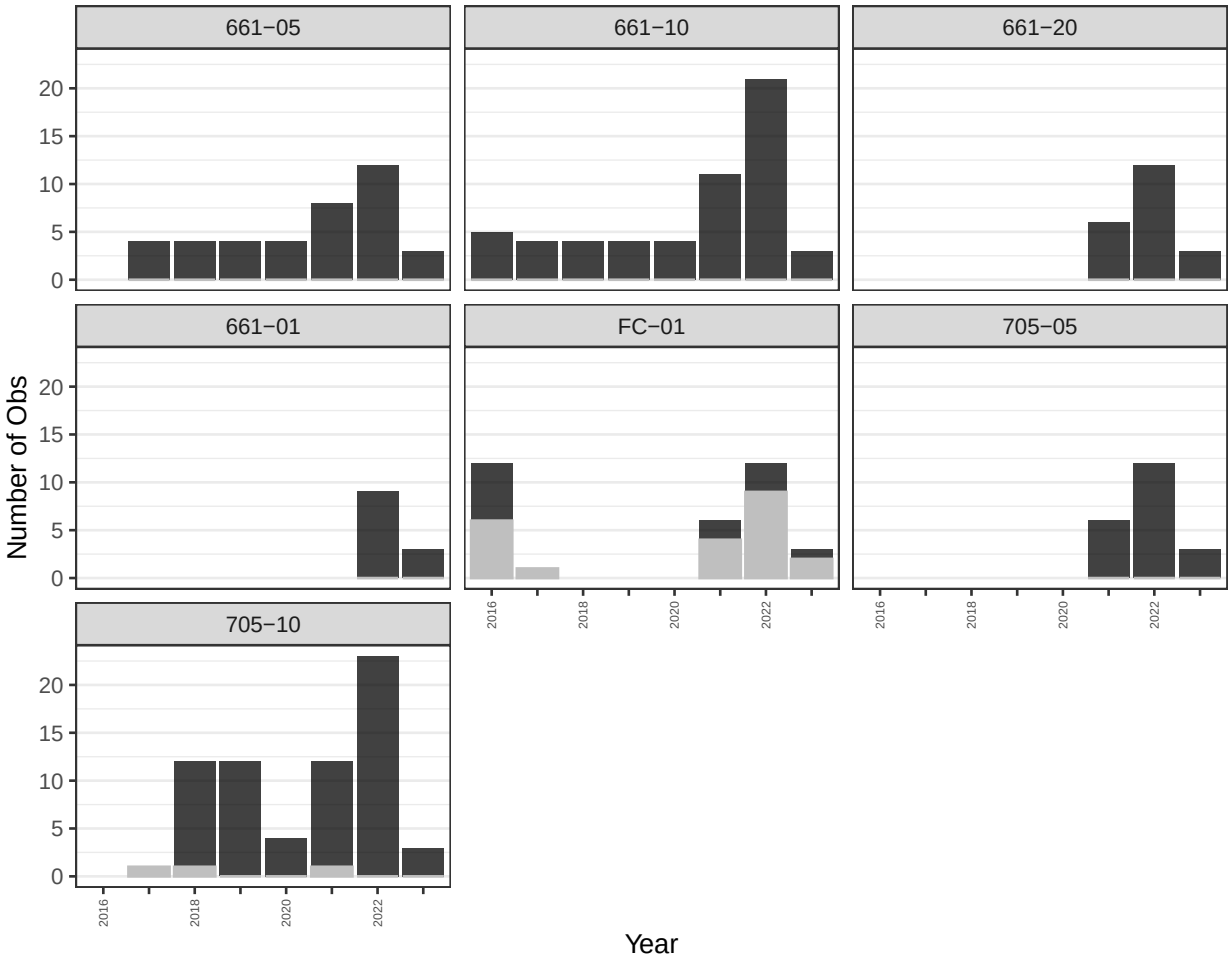
Final Summary Table

Variable	Fe.Total
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

Watershed	Site	Year	Class	Period	#Obs Removed
Creek 661	FC-01	2017	control	before	1
Creek 661	FC-01	2021	control	before	6
Creek 661	FC-01	2022	control	before	12
Creek 661	FC-01	2022	control	after	12
Creek 661	FC-01	2023	control	after	3
Creek 661	705-10	2017	control	before	1

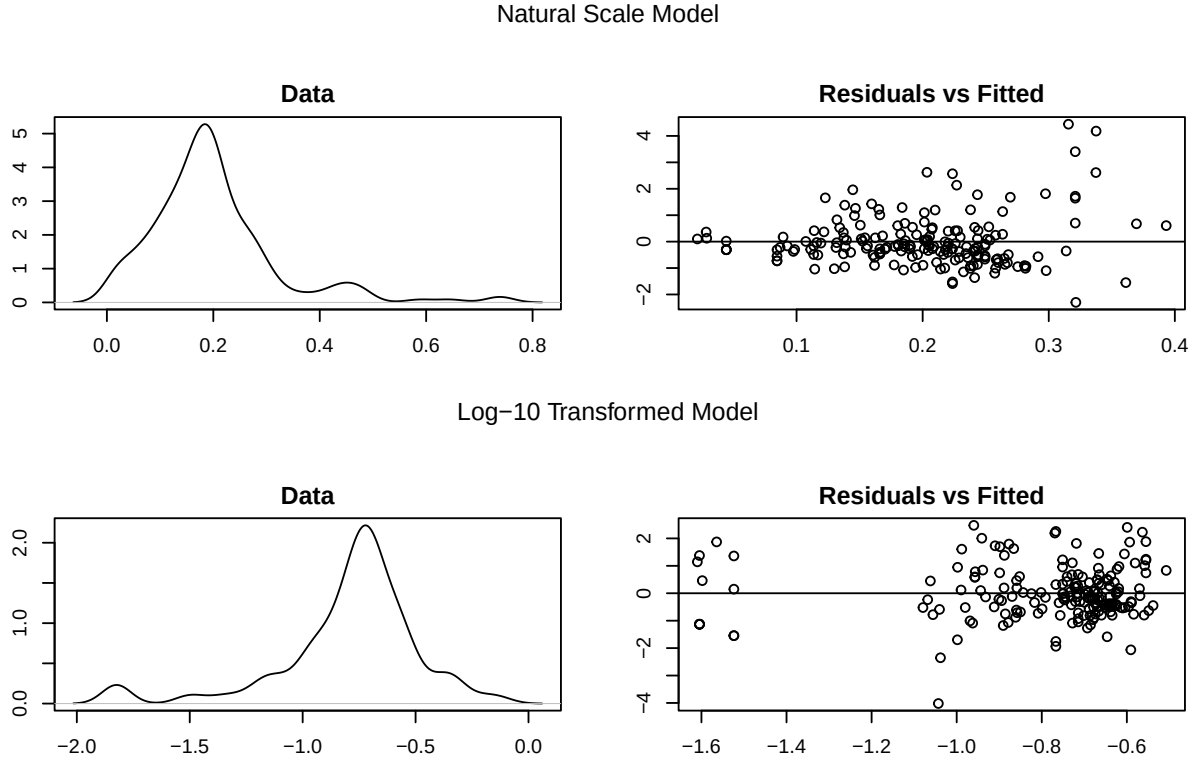
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	0.1930	0.000
Creek 661	661-05	after	6	0.1325	0.000
Creek 661	661-10	before	47	0.2100	0.000
Creek 661	661-10	after	9	0.1760	0.000
Creek 661	661-20	before	15	0.1975	0.000
Creek 661	661-20	after	6	0.1500	0.000
Creek 661	661-01	before	3	0.0930	0.000
Creek 661	661-01	after	9	0.1490	0.000
Creek 661	FC-01	before	12	0.0230	50.000
Creek 661	705-05	before	15	0.2100	0.000
Creek 661	705-05	after	6	0.1860	0.000
Creek 661	705-10	before	28	0.1090	3.571

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	661-20	2022	5	monit	before	0.740	0.3156	4.444	0
Creek 661	661-05	2017	10	monit	before	0.737	0.3376	4.183	0
Creek 661	661-10	2022	5	monit	before	0.646	0.3210	3.403	0

Outliers on log scale:

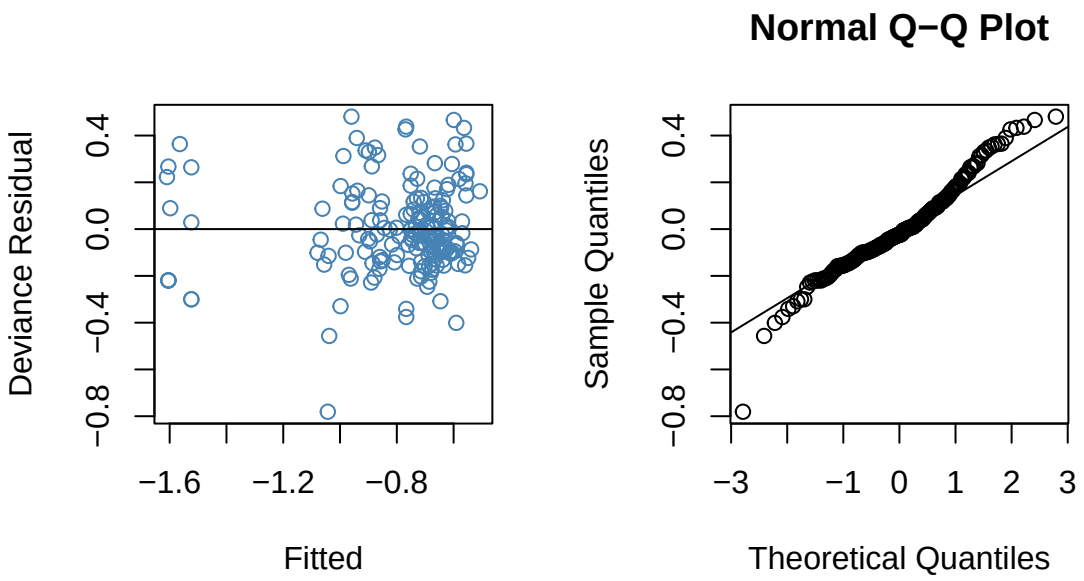
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	705-10	2018	9	control	before	-1.824	-1.043	-4.02	1

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0467	0.0467	1	4.997	1.2374	0.3170	
period	0.0164	0.0164	1	80.693	0.4335	0.5120	
class:period	0.2498	0.2498	1	173.018	6.6207	0.0109	0.49

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

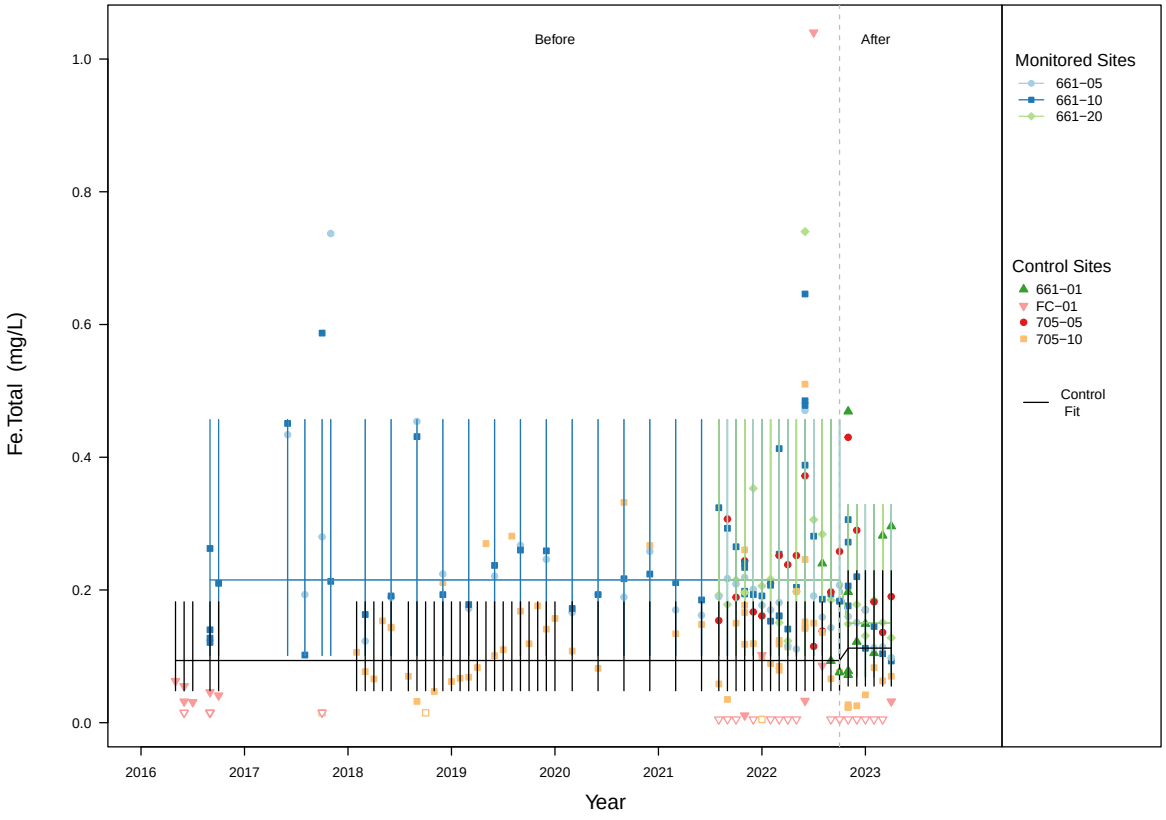
Monitored vs:	Estimate	Significance
control sites	-0.2338	not significant

Conclusion:

The change in Fe.Total concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.49) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

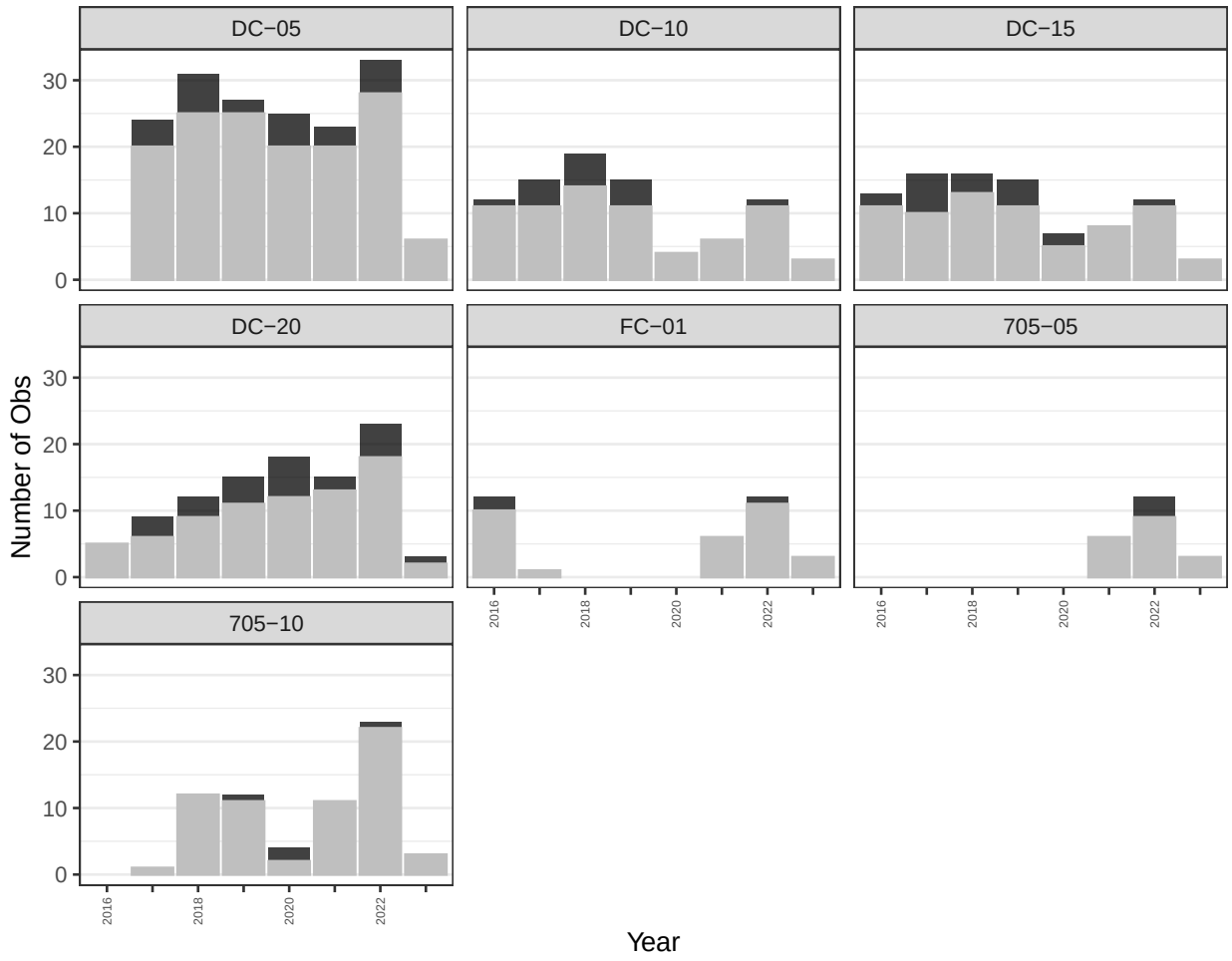
Final Summary Table

Variable	Fe.Total
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.17 Total Lead

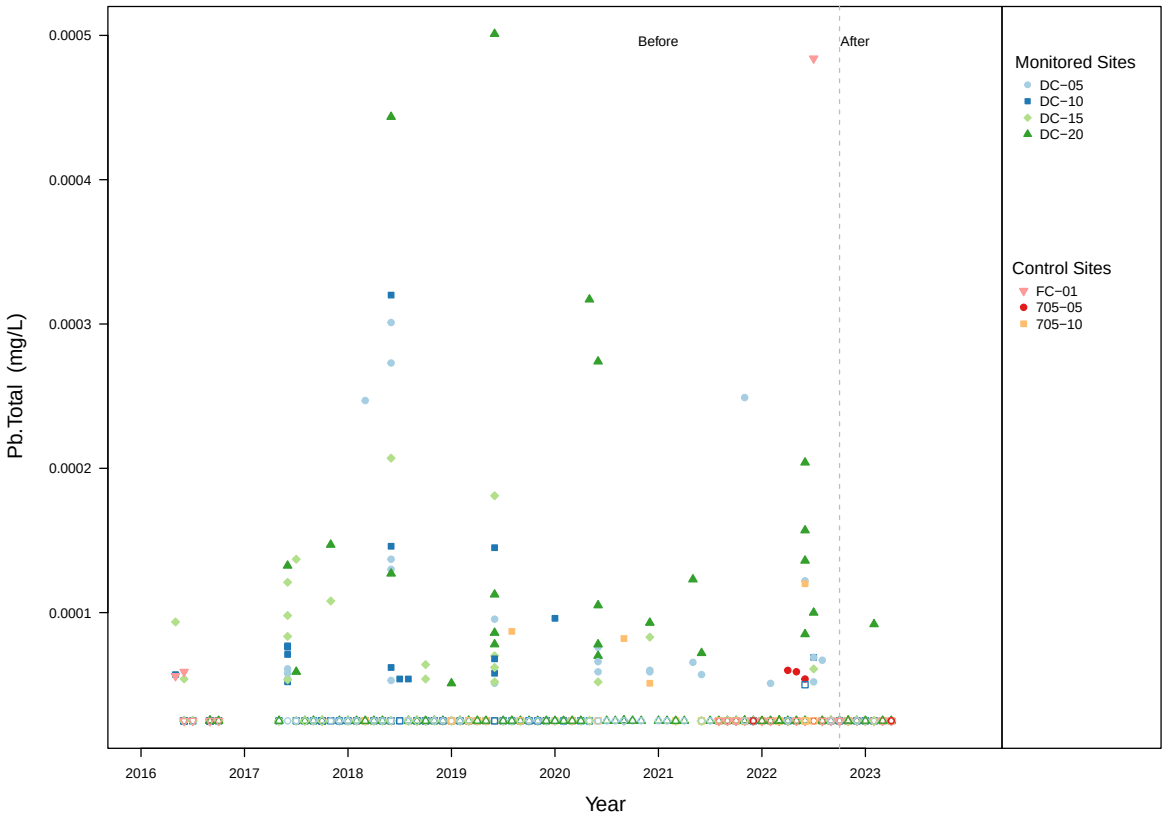
1 Davidson Creek

1.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



Note: Open symbols represent cases where the results were below the sample detection limit.

Final Summary Table

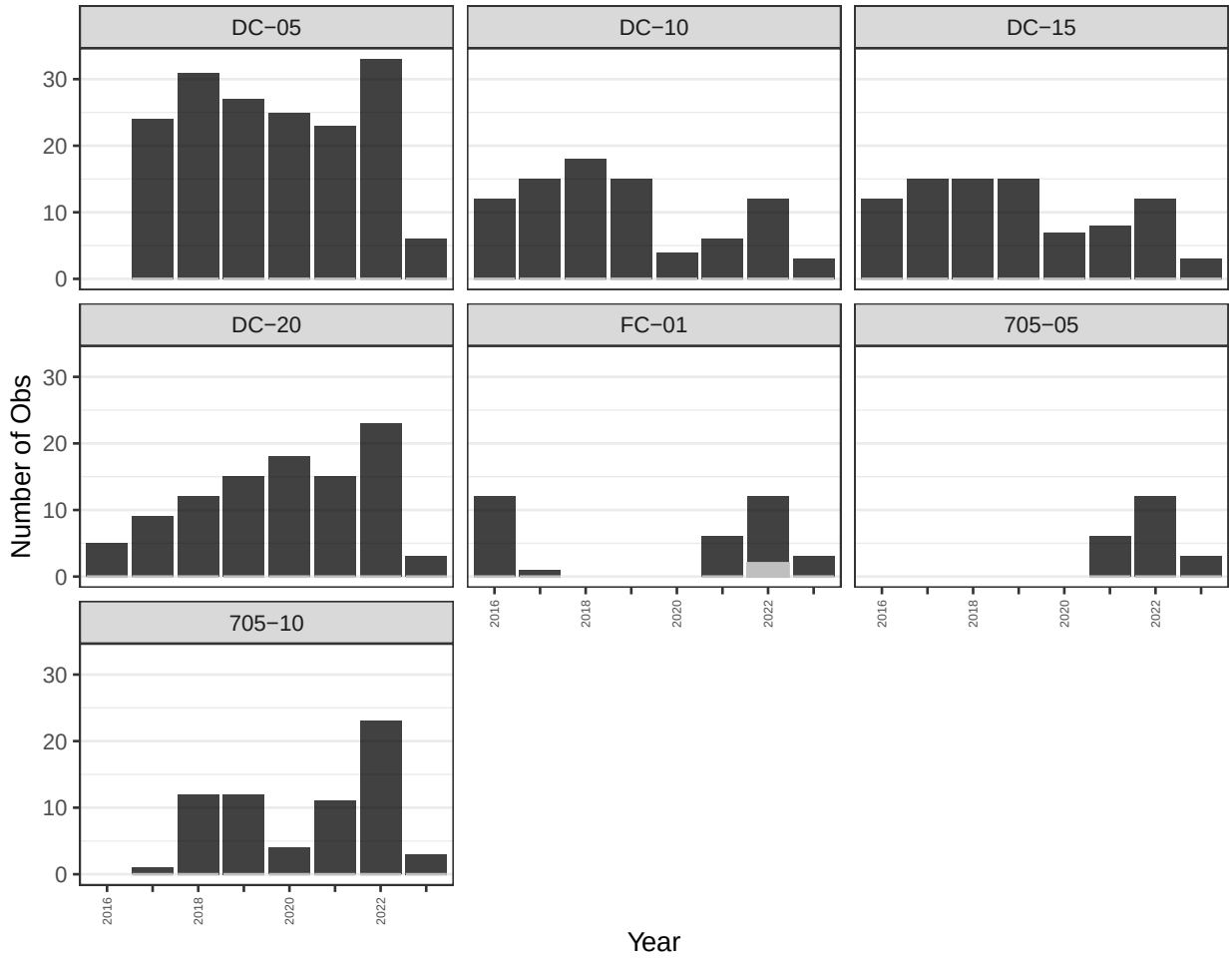
Variable	Pb.Total
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

C-2.1.18 Total Manganese

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

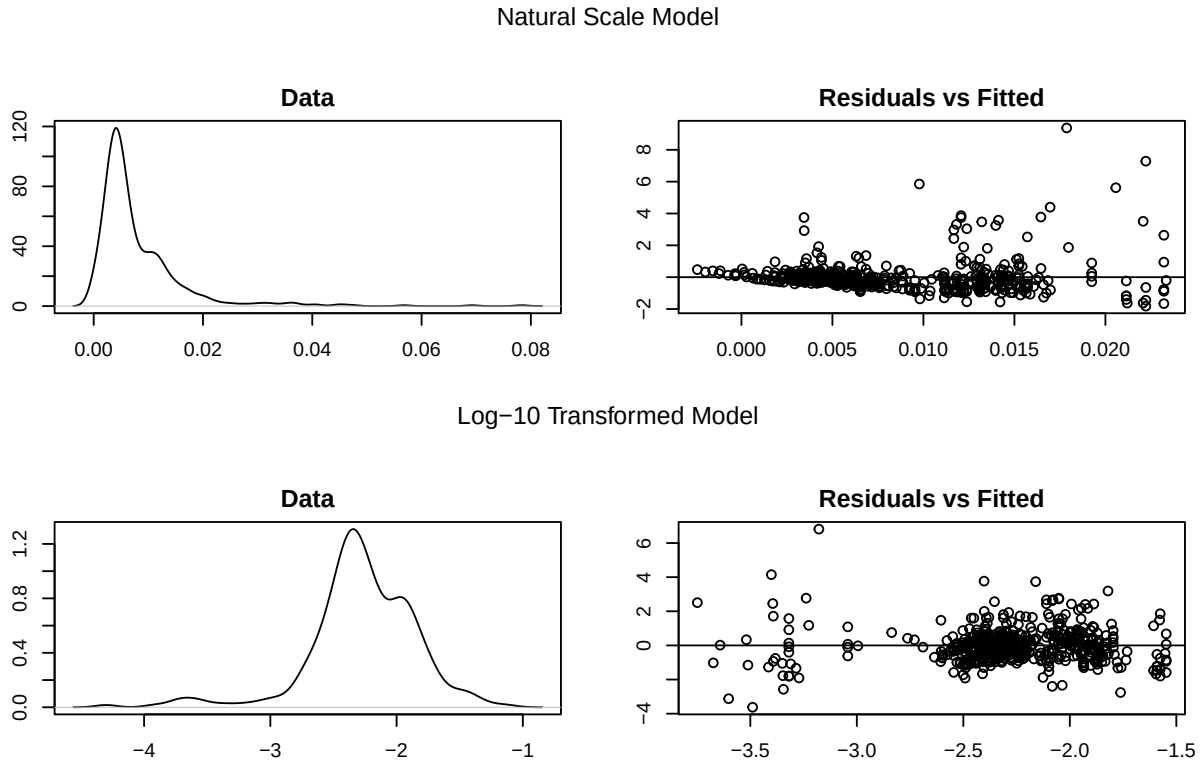
1.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	154	0.0049	0.000
Davidson Creek	DC-05	after	15	0.0033	0.000
Davidson Creek	DC-10	before	79	0.0043	0.000
Davidson Creek	DC-10	after	6	0.0037	0.000
Davidson Creek	DC-15	before	81	0.0059	0.000
Davidson Creek	DC-15	after	6	0.0055	0.000
Davidson Creek	DC-20	before	91	0.0125	0.000
Davidson Creek	DC-20	after	9	0.0250	0.000
Davidson Creek	FC-01	before	28	0.0005	3.571
Davidson Creek	FC-01	after	6	0.0002	16.667
Davidson Creek	705-05	before	15	0.0111	0.000
Davidson Creek	705-05	after	6	0.0080	0.000
Davidson Creek	705-10	before	57	0.0039	0.000
Davidson Creek	705-10	after	9	0.0019	0.000

1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-20	2017	10	monit	before	0.0783	0.0179	9.373	0
Davidson Creek	DC-20	2019	5	monit	before	0.0692	0.0222	7.287	0
Davidson Creek	DC-15	2017	10	monit	before	0.0475	0.0098	5.851	0
Davidson Creek	705-05	2022	5	control	before	0.0568	0.0206	5.620	0
Davidson Creek	DC-20	2022	12	monit	after	0.0453	0.0170	4.396	0
Davidson Creek	DC-05	2018	5	monit	before	0.0370	0.0121	3.867	0
Davidson Creek	DC-20	2023	1	monit	after	0.0408	0.0165	3.776	0
Davidson Creek	705-10	2020	8	control	before	0.0276	0.0034	3.748	0
Davidson Creek	DC-05	2018	5	monit	before	0.0362	0.0121	3.743	0
Davidson Creek	DC-15	2019	5	monit	before	0.0372	0.0141	3.579	0
Davidson Creek	DC-20	2018	5	monit	before	0.0447	0.0221	3.509	0
Davidson Creek	DC-05	2022	5	monit	before	0.0356	0.0132	3.474	0
Davidson Creek	DC-10	2019	5	monit	before	0.0332	0.0118	3.316	0
Davidson Creek	DC-15	2018	5	monit	before	0.0349	0.0140	3.245	0
Davidson Creek	705-10	2022	5	control	before	0.0320	0.0124	3.043	0

Outliers on log scale:

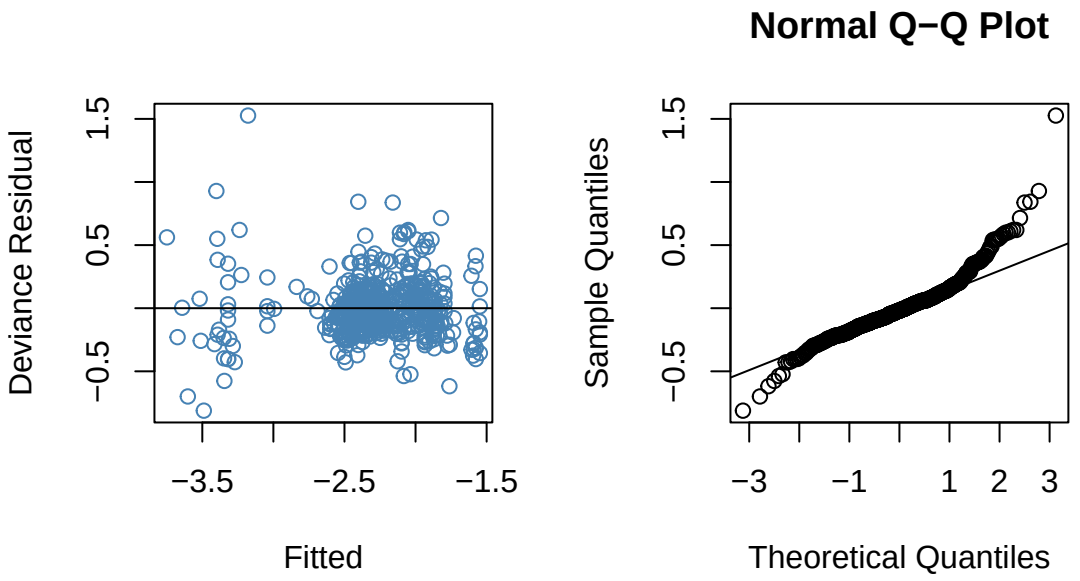
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	FC-01	2022	6	control	before	-1.652	-3.178	6.815	0
Davidson Creek	FC-01	2021	12	control	before	-2.472	-3.401	4.146	0
Davidson Creek	705-10	2020	8	control	before	-1.559	-2.403	3.766	0
Davidson Creek	DC-15	2017	10	monit	before	-1.323	-2.160	3.737	0
Davidson Creek	FC-01	2022	3	control	before	-4.301	-3.489	-3.624	1
Davidson Creek	DC-20	2017	10	monit	before	-1.106	-1.821	3.190	0
Davidson Creek	FC-01	2022	12	control	after	-4.301	-3.602	-3.122	1

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0836	0.0836	1	5.046	1.667	0.253	
period	0.3900	0.3900	1	90.314	7.774	0.00646	
class:period	0.7884	0.7884	1	541.480	15.714	<0.001	0.0321

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

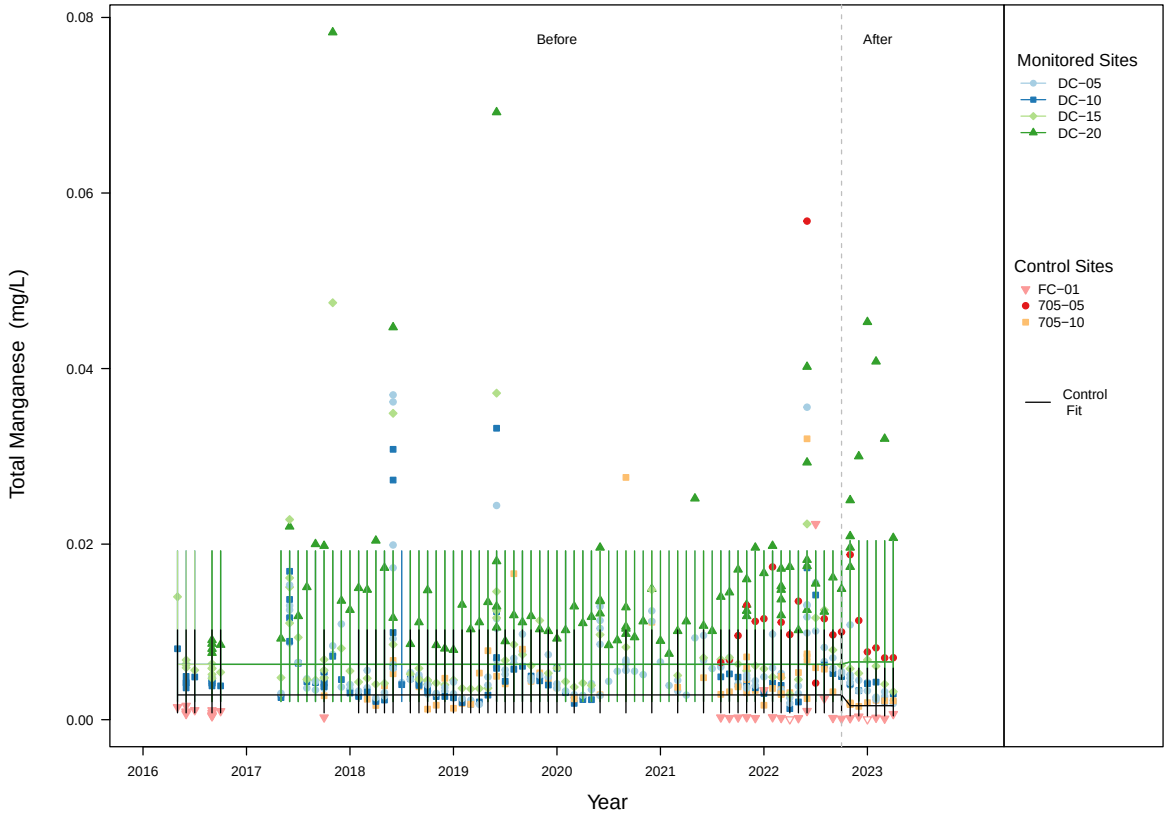
Monitored vs:	Estimate	Significance
control sites	0.2672	significant

Conclusion:

The change in Total Manganese concentrations at the monitored sites from *before* to *after* was significantly (*adjusted p* = 0.0321) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

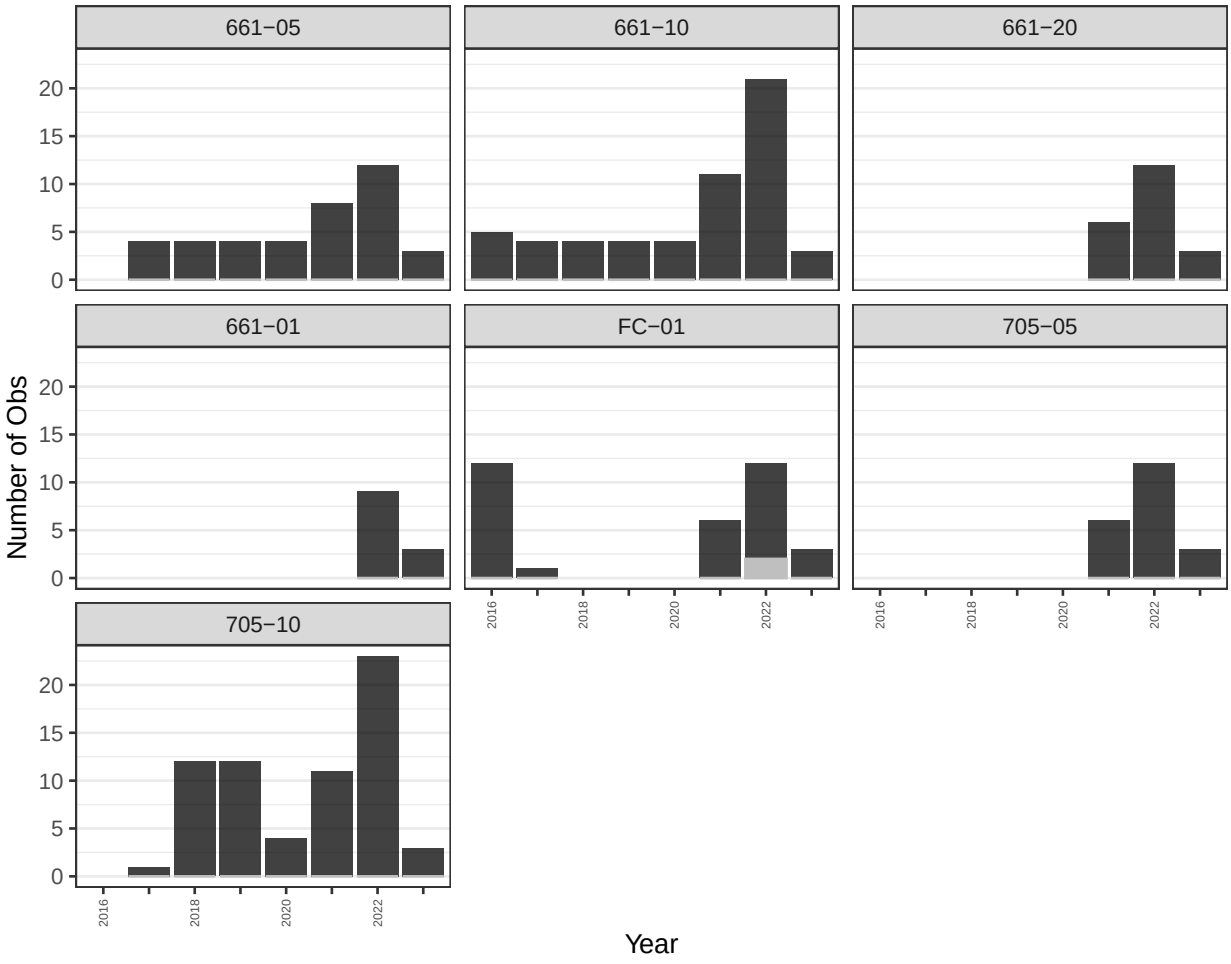
Final Summary Table

Variable	Total Manganese
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	TRUE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

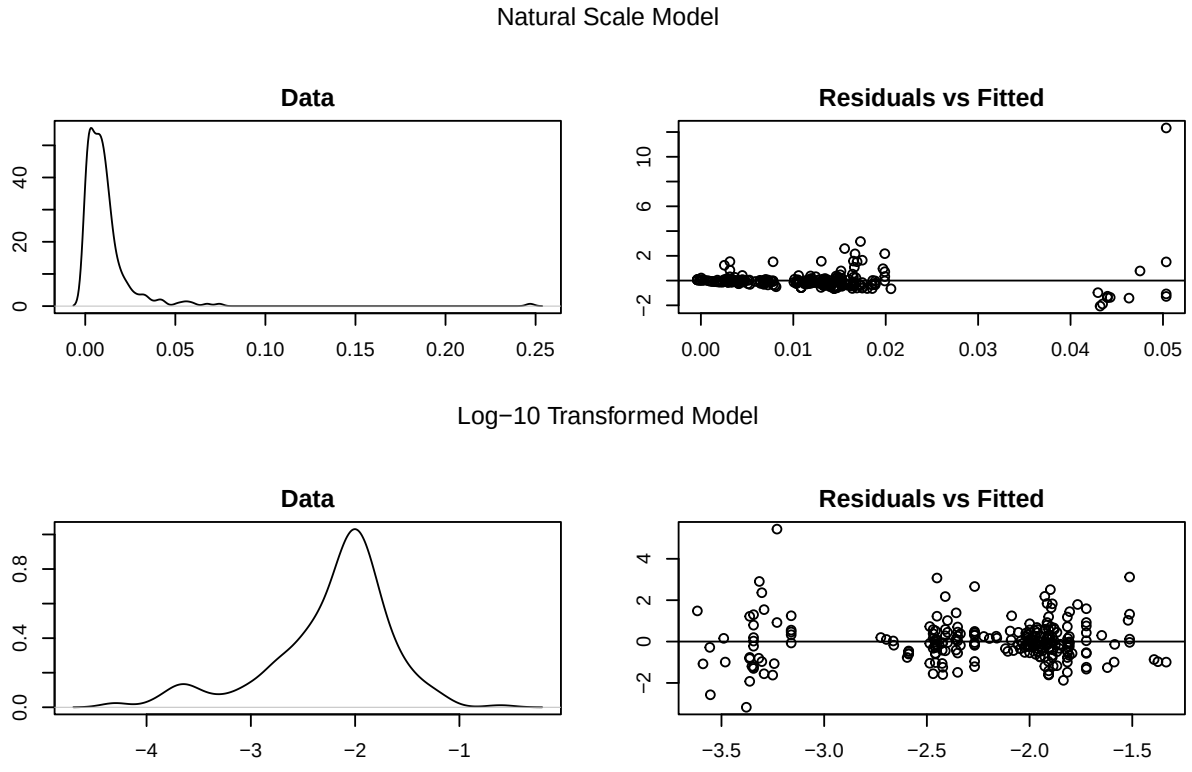
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	0.0103	0.000
Creek 661	661-05	after	6	0.0093	0.000
Creek 661	661-10	before	47	0.0136	0.000
Creek 661	661-10	after	9	0.0149	0.000
Creek 661	661-20	before	15	0.0112	0.000
Creek 661	661-20	after	6	0.0071	0.000
Creek 661	661-01	before	3	0.0226	0.000
Creek 661	661-01	after	9	0.0299	0.000
Creek 661	FC-01	before	28	0.0005	3.571
Creek 661	FC-01	after	6	0.0002	16.667
Creek 661	705-05	before	15	0.0111	0.000
Creek 661	705-05	after	6	0.0080	0.000
Creek 661	705-10	before	57	0.0039	0.000
Creek 661	705-10	after	9	0.0019	0.000

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	661-01	2022	10	control	after	0.2470	0.0503	12.329	0
Creek 661	661-05	2017	10	monit	before	0.0676	0.0173	3.155	0

Outliers on log scale:

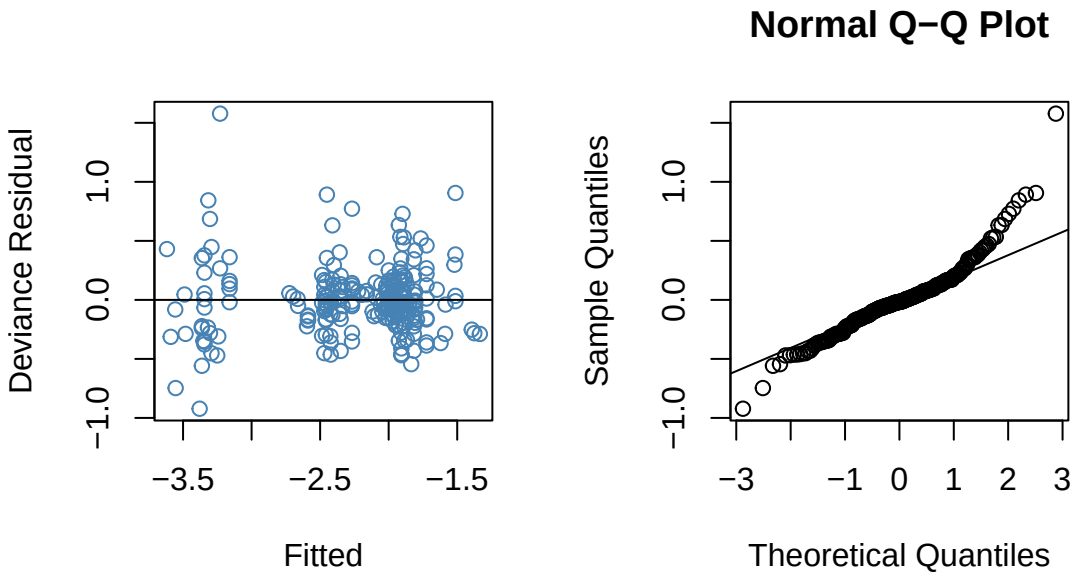
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	FC-01	2022	6	control	before	-1.6517	-3.230	5.436	0
Creek 661	FC-01	2022	3	control	before	-4.3010	-3.379	-3.176	1
Creek 661	661-01	2022	10	control	after	-0.6073	-1.513	3.119	0
Creek 661	705-10	2020	8	control	before	-1.5591	-2.451	3.071	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0523	0.0523	1	5.013	0.6202	0.4670	
period	0.7464	0.7464	1	215.006	8.8555	0.0033	
class:period	0.2172	0.2172	1	230.494	2.5772	0.1100	0.69

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

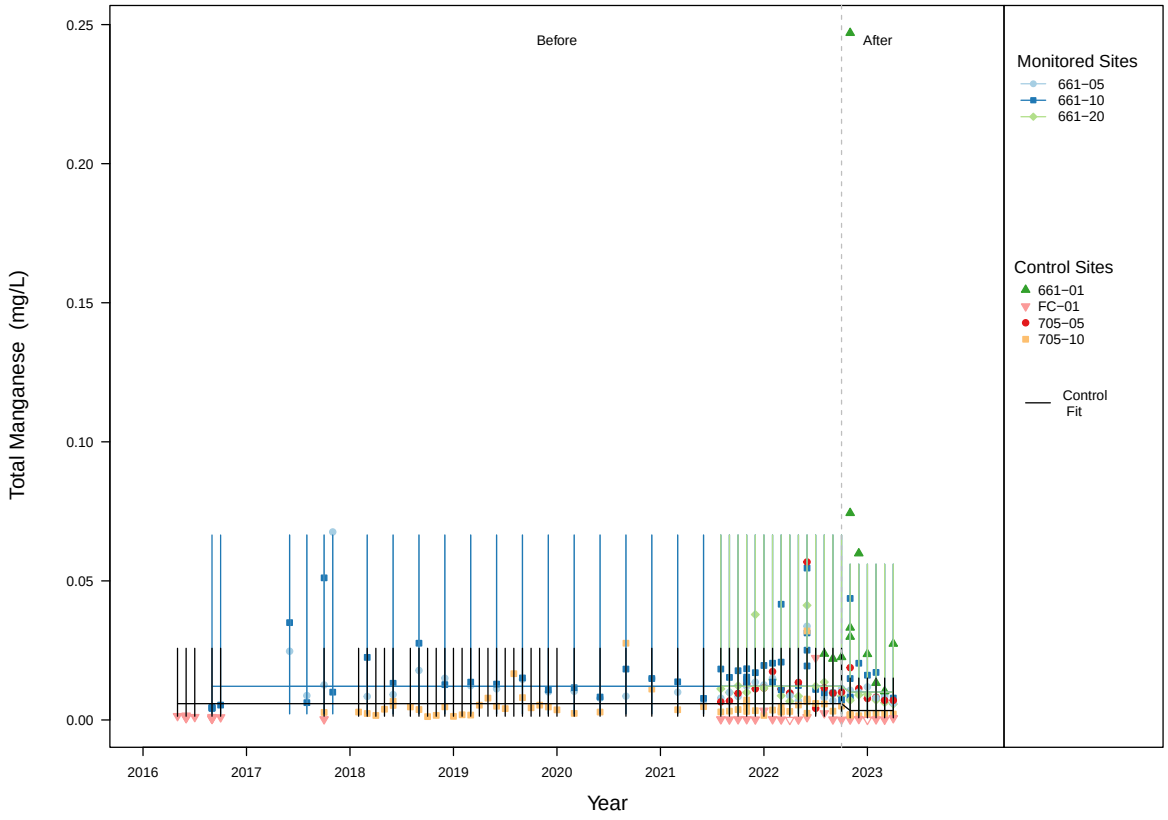
Monitored vs:	Estimate	Significance
control sites	0.1555	not significant

Conclusion:

The change in Total Manganese concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p* = 0.69) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

Final Summary Table

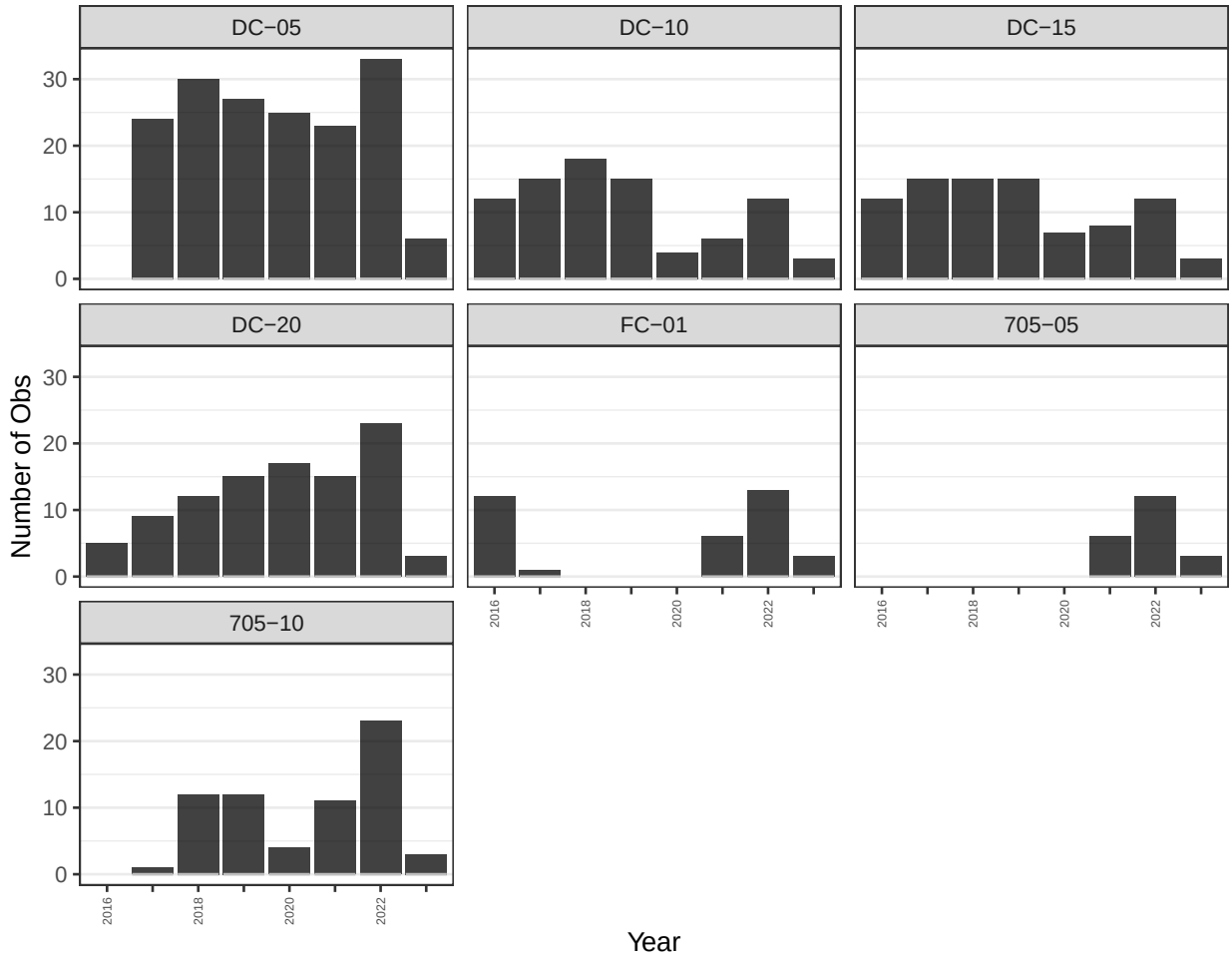
Variable	Total Manganese
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.19 Total Molybdenum

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

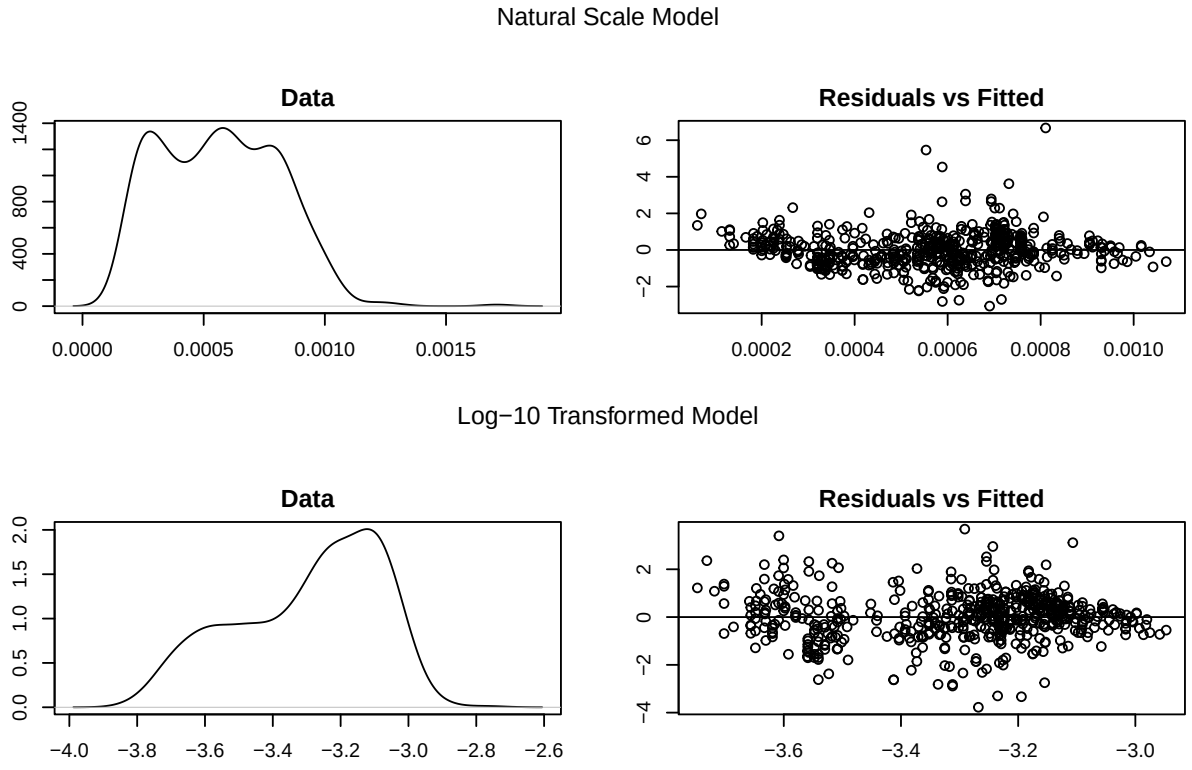
1.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	153	0.0006	0
Davidson Creek	DC-05	after	15	0.0010	0
Davidson Creek	DC-10	before	79	0.0006	0
Davidson Creek	DC-10	after	6	0.0010	0
Davidson Creek	DC-15	before	81	0.0006	0
Davidson Creek	DC-15	after	6	0.0009	0
Davidson Creek	DC-20	before	90	0.0006	0
Davidson Creek	DC-20	after	9	0.0009	0
Davidson Creek	FC-01	before	28	0.0004	0
Davidson Creek	FC-01	after	7	0.0009	0
Davidson Creek	705-05	before	15	0.0005	0
Davidson Creek	705-05	after	6	0.0006	0
Davidson Creek	705-10	before	57	0.0004	0
Davidson Creek	705-10	after	9	0.0005	0

1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-15	2020	3	monit	before	0.0017	0.0008	6.668	0
Davidson Creek	705-10	2020	2	control	before	0.0013	0.0006	5.461	0
Davidson Creek	DC-15	2021	10	monit	before	0.0012	0.0006	4.535	0
Davidson Creek	DC-20	2022	4	monit	before	0.0012	0.0007	3.621	0
Davidson Creek	DC-05	2021	4	monit	before	0.0003	0.0007	-3.068	0
Davidson Creek	DC-05	2020	4	monit	before	0.0010	0.0006	3.051	0

Outliers on log scale:

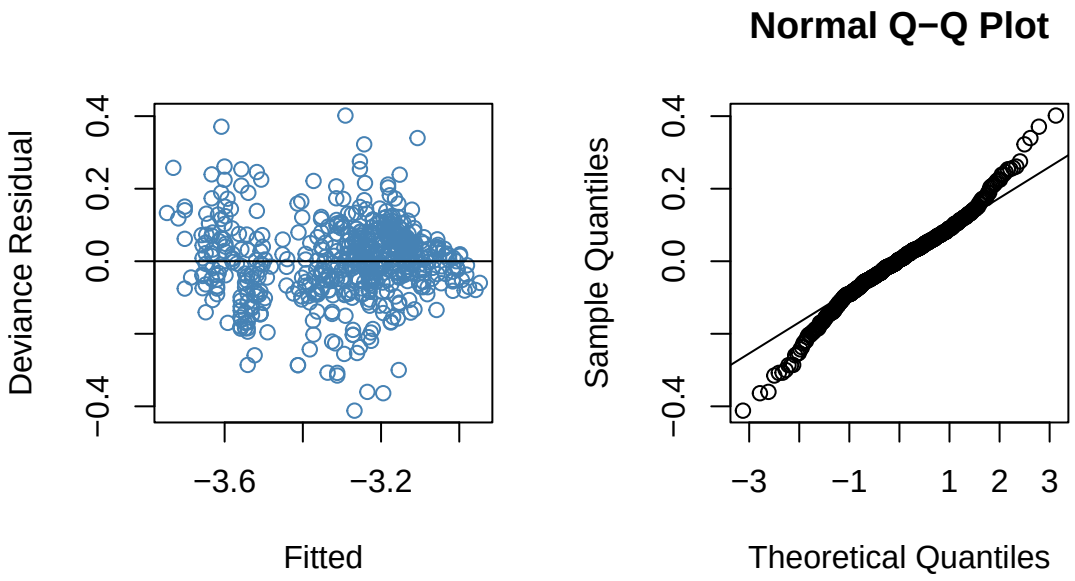
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-10	2016	4	monit	before	-3.680	-3.268	-3.775	0
Davidson Creek	705-10	2020	2	control	before	-2.889	-3.291	3.681	0
Davidson Creek	FC-01	2022	5	control	before	-3.237	-3.608	3.399	0
Davidson Creek	DC-05	2021	4	monit	before	-3.558	-3.194	-3.334	0
Davidson Creek	DC-15	2016	4	monit	before	-3.595	-3.235	-3.300	0
Davidson Creek	DC-15	2020	3	monit	before	-2.767	-3.107	3.113	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.2958	0.2958	1	8.139	24.838	0.00102	
period	0.7594	0.7594	1	256.103	63.767	<0.001	
class:period	0.0585	0.0585	1	539.422	4.912	0.0271	0.751

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

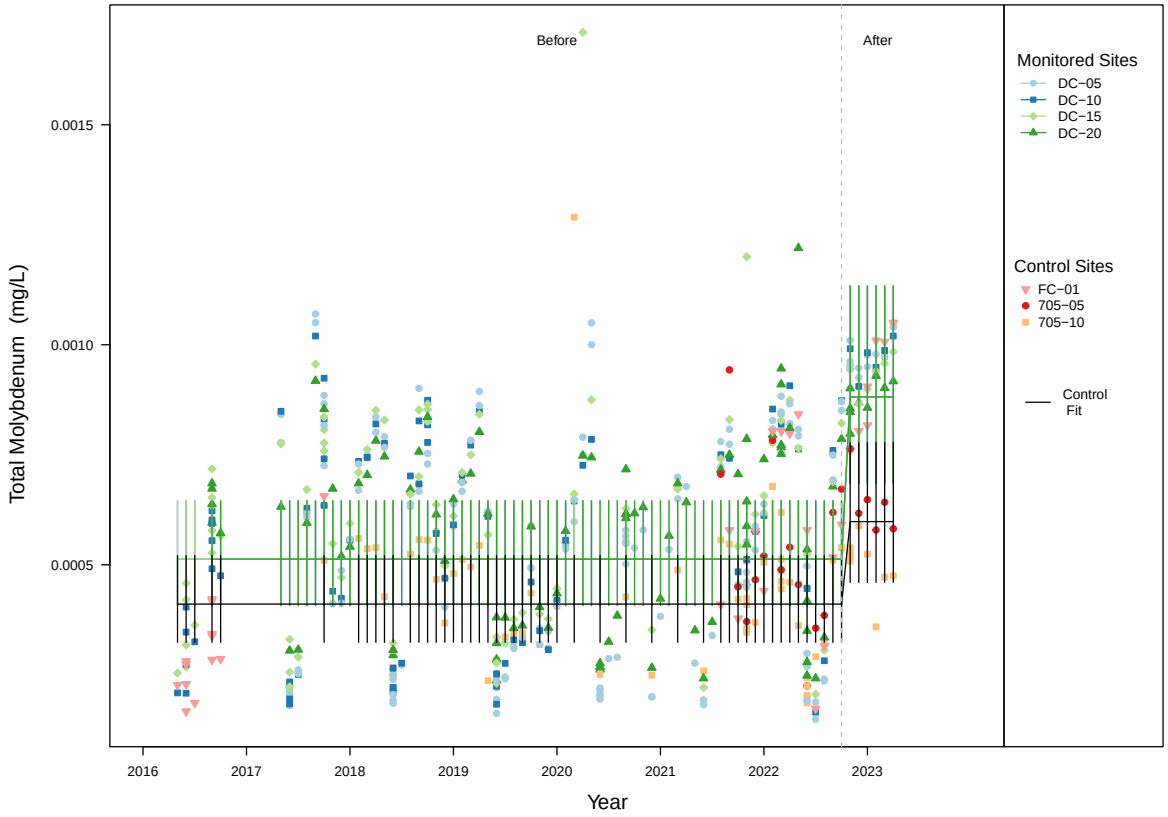
Monitored vs:	Estimate	Significance
control sites	0.072	not significant

Conclusion:

The change in Total Molybdenum concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.751) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale. Guideline is at 0.073 (mg/L).

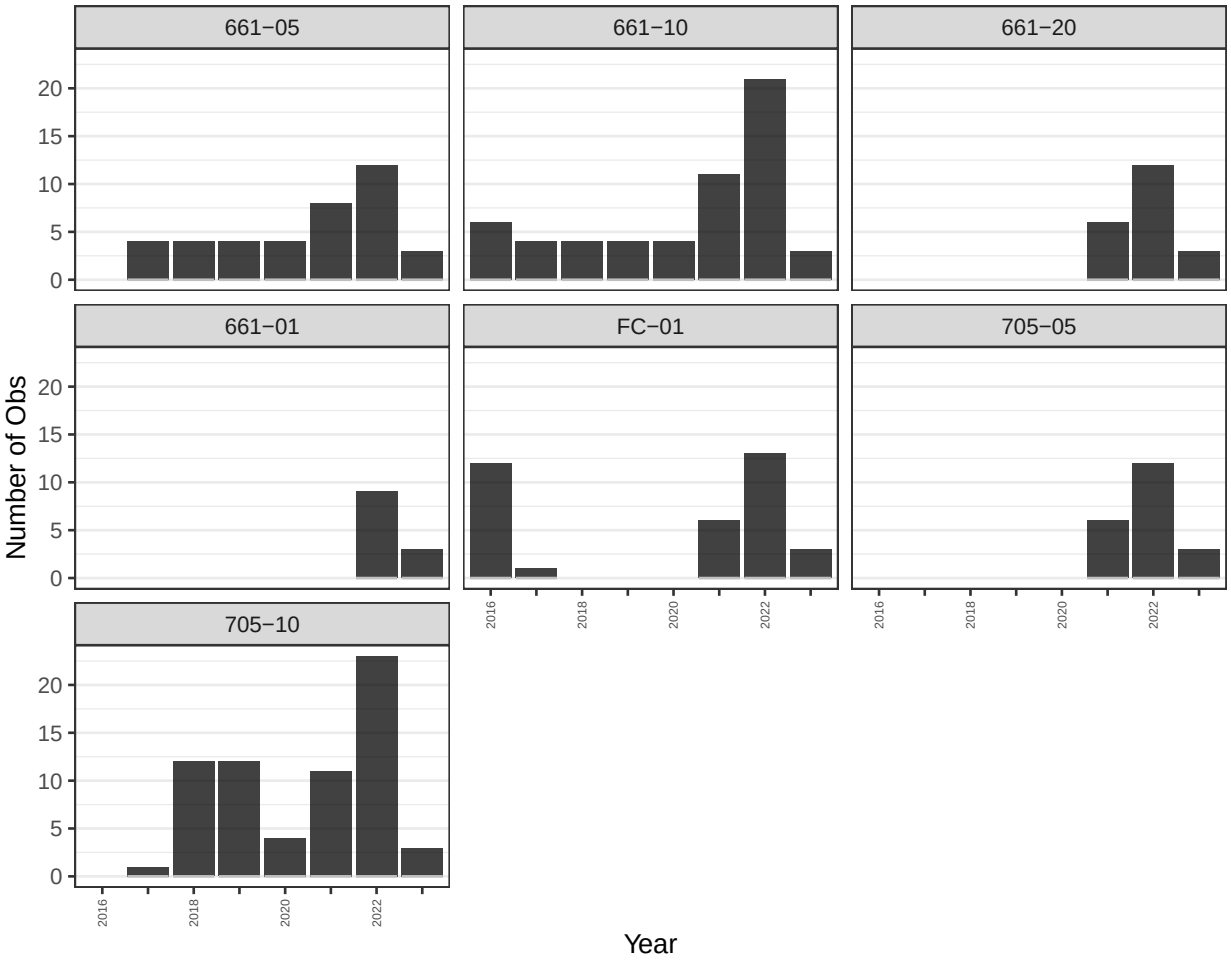
Final Summary Table

Variable	Total Molybdenum
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

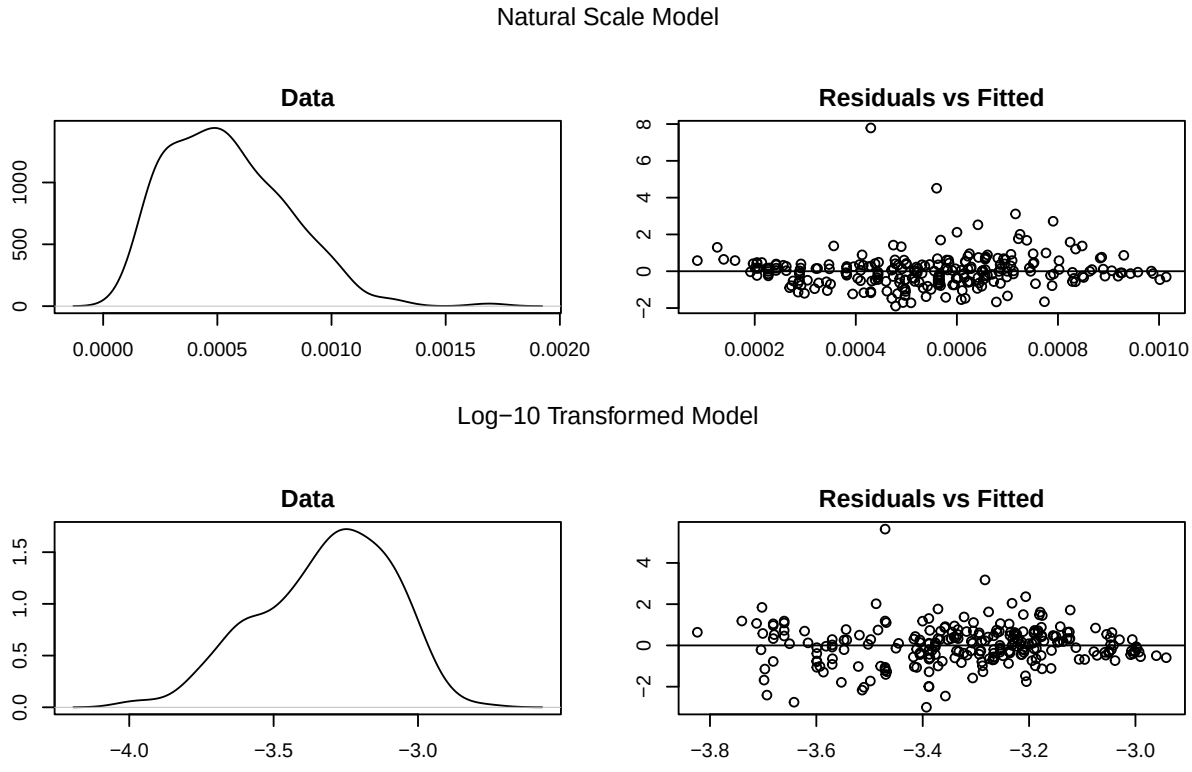
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	0.0007	0
Creek 661	661-05	after	6	0.0009	0
Creek 661	661-10	before	48	0.0004	0
Creek 661	661-10	after	9	0.0007	0
Creek 661	661-20	before	15	0.0009	0
Creek 661	661-20	after	6	0.0010	0
Creek 661	661-01	before	3	0.0003	0
Creek 661	661-01	after	9	0.0002	0
Creek 661	FC-01	before	28	0.0004	0
Creek 661	FC-01	after	7	0.0009	0
Creek 661	705-05	before	15	0.0005	0
Creek 661	705-05	after	6	0.0006	0
Creek 661	705-10	before	57	0.0004	0
Creek 661	705-10	after	9	0.0005	0

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	661-10	2016	8	monit	before	0.0017	0.0004	7.787	0
Creek 661	705-10	2020	2	control	before	0.0013	0.0006	4.511	0
Creek 661	661-05	2017	7	monit	before	0.0012	0.0007	3.114	0

Outliers on log scale:

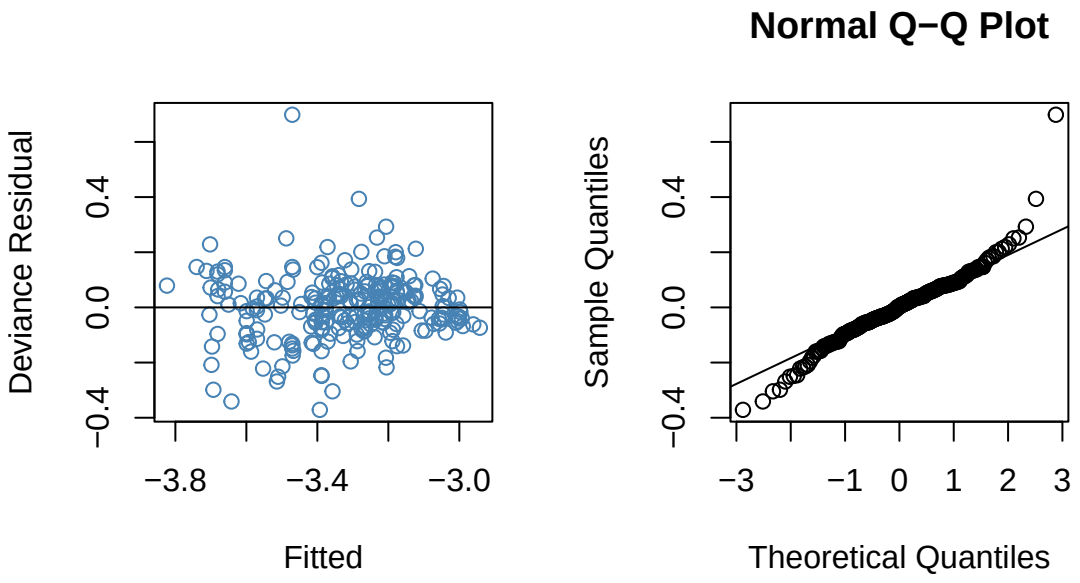
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	661-10	2016	8	monit	before	-2.772	-3.471	5.638	0
Creek 661	705-10	2020	2	control	before	-2.889	-3.283	3.176	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0357	0.0357	1	5.016	2.3263	0.188	
period	0.3928	0.3928	1	179.455	25.5863	<0.001	
class:period	0.0109	0.0109	1	225.668	0.7093	0.401	0.751

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

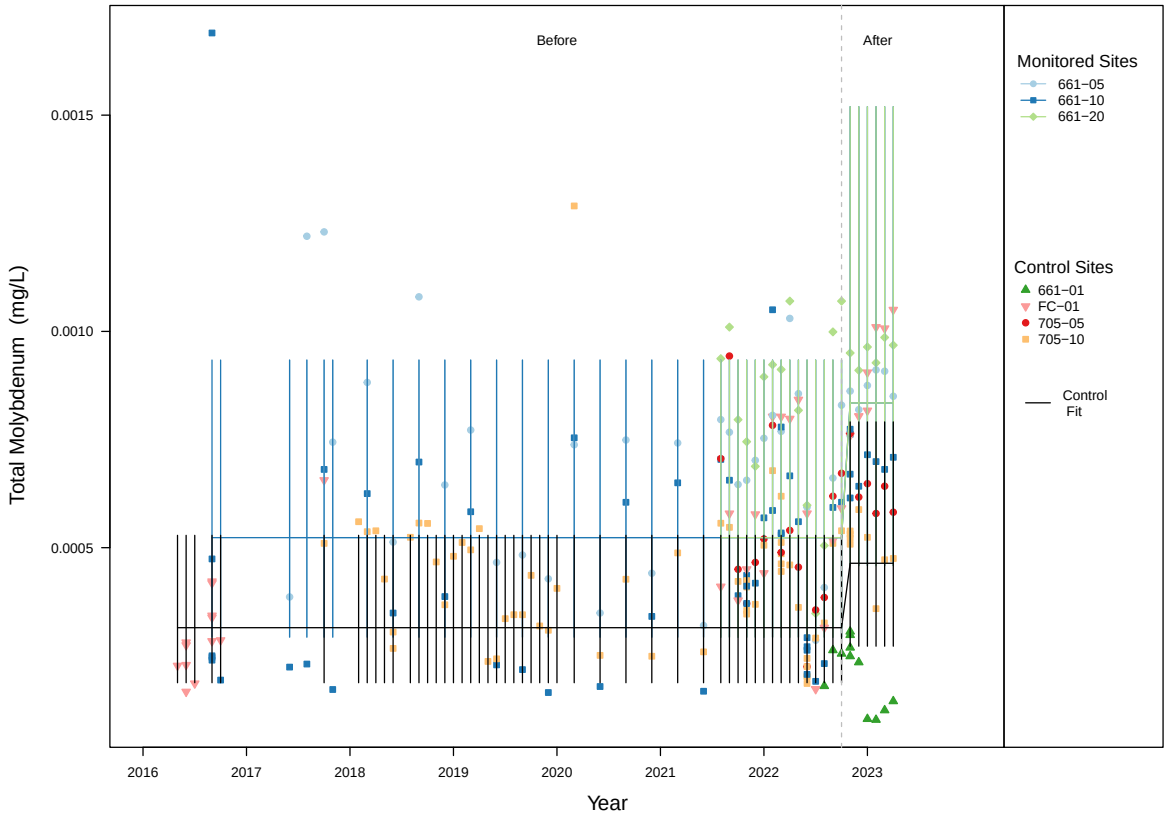
Monitored vs:	Estimate	Significance
control sites	0.0347	not significant

Conclusion:

The change in Total Molybdenum concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.751) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale. Guideline is at 0.073 (mg/L).

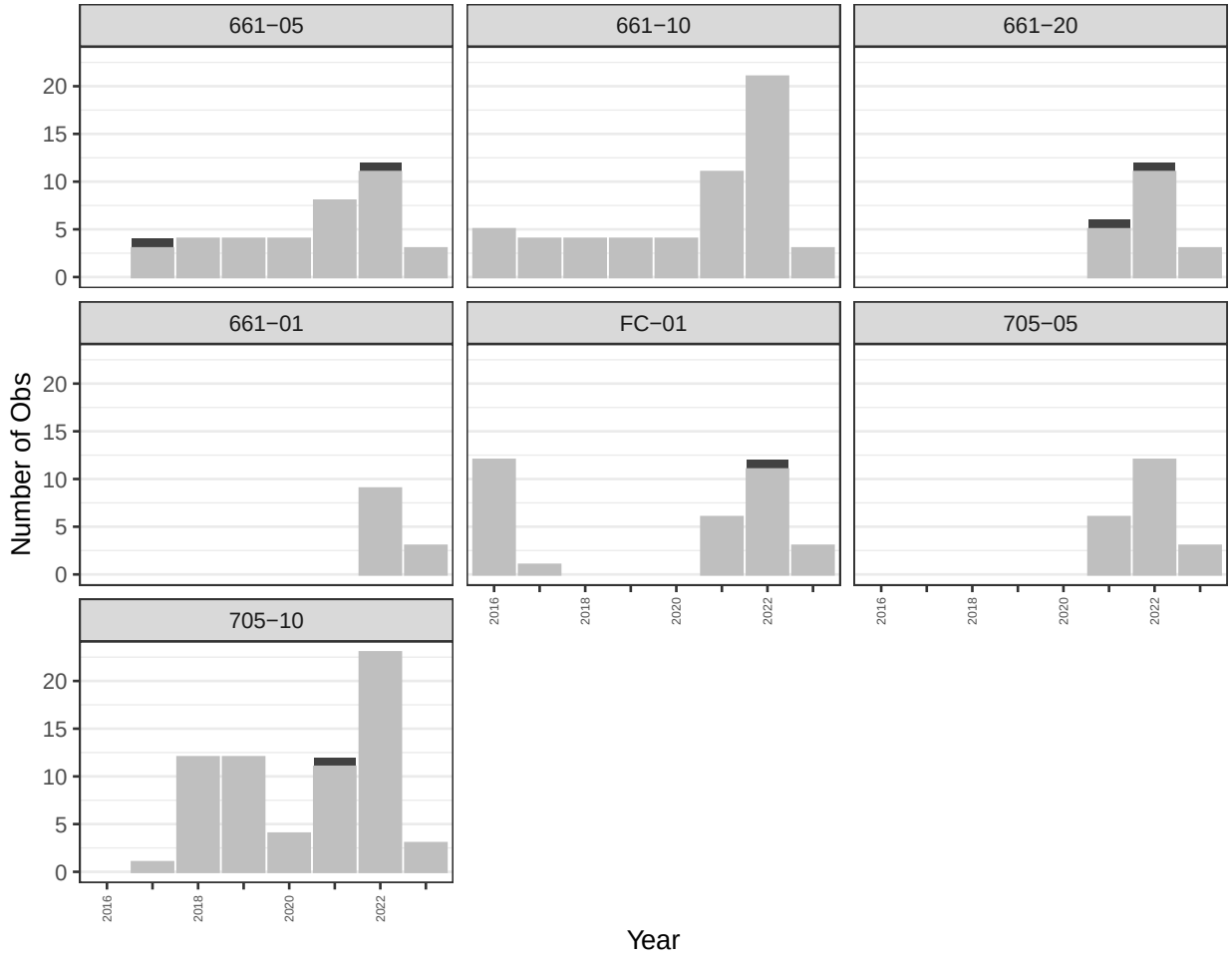
Final Summary Table

Variable	Total Molybdenum
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.20 Total Nickel

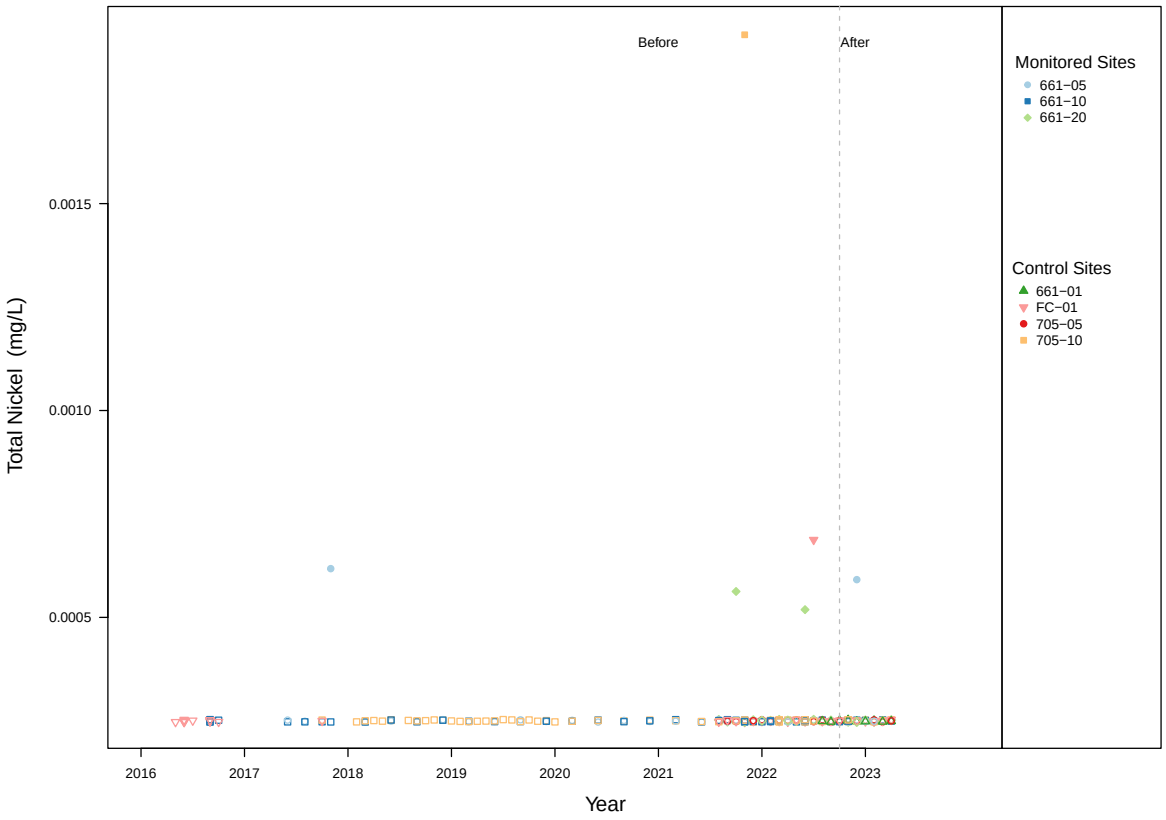
1 Creek 661

1.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



Note: Open symbols represent cases where the results were below the sample detection limit.

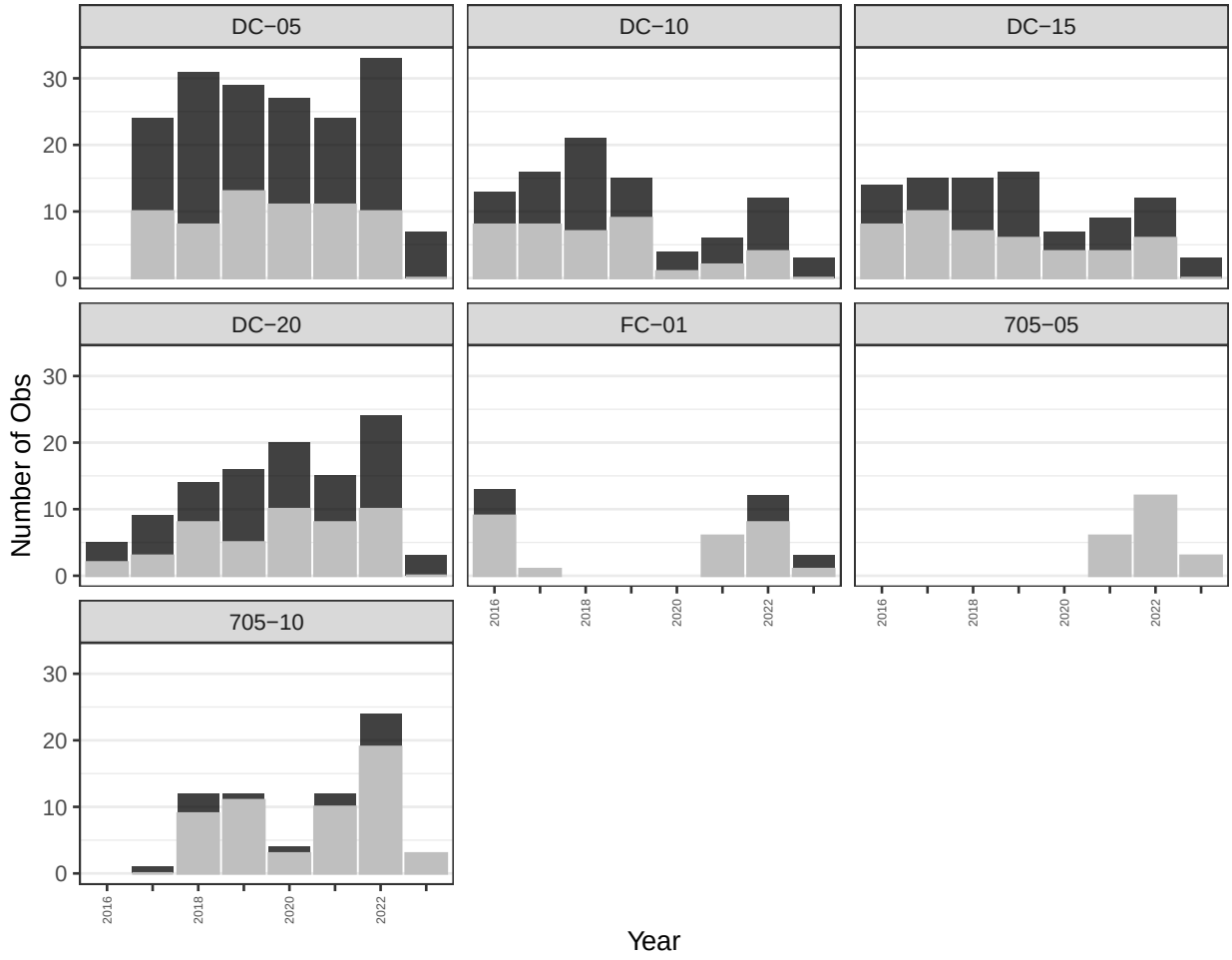
Final Summary Table

Variable	Total Nickel
Watershed	Creek 661
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

C-2.1.21 Total Selenium

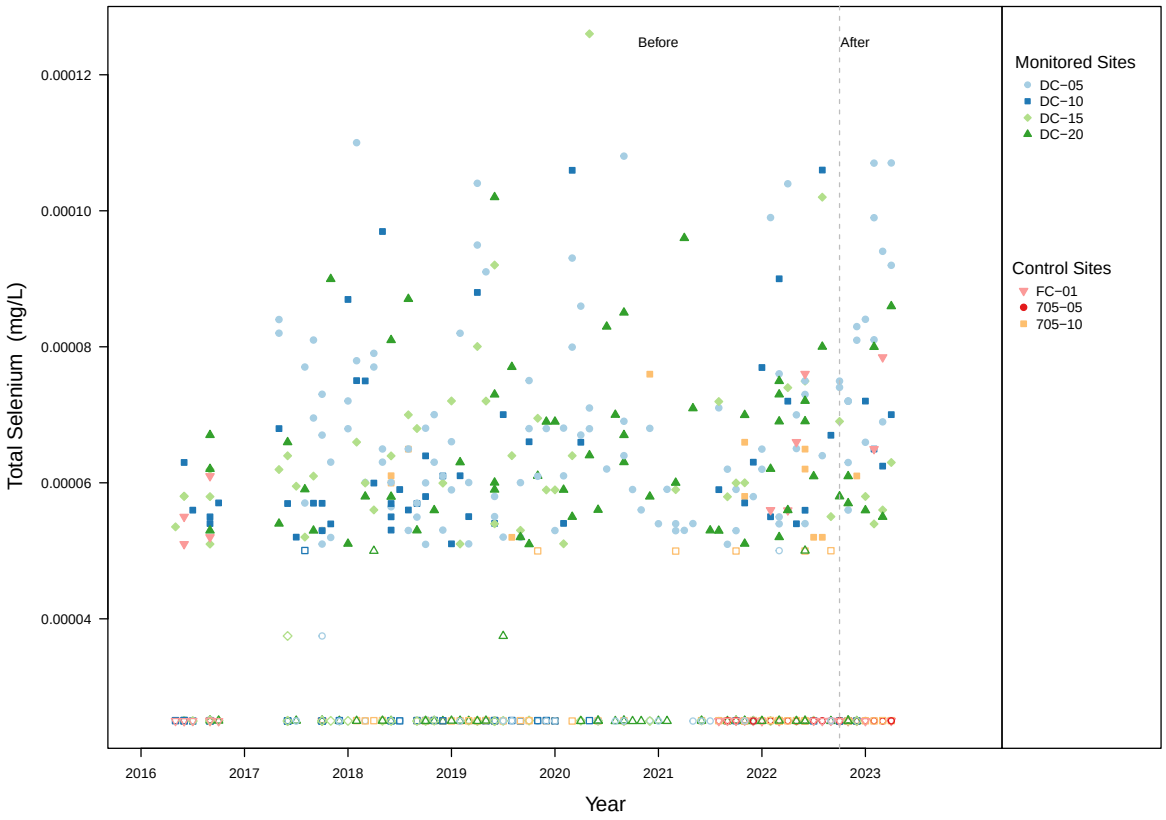
1 Davidson Creek

1.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



Note: Open symbols represent cases where the results were below the sample detection limit.

Final Summary Table

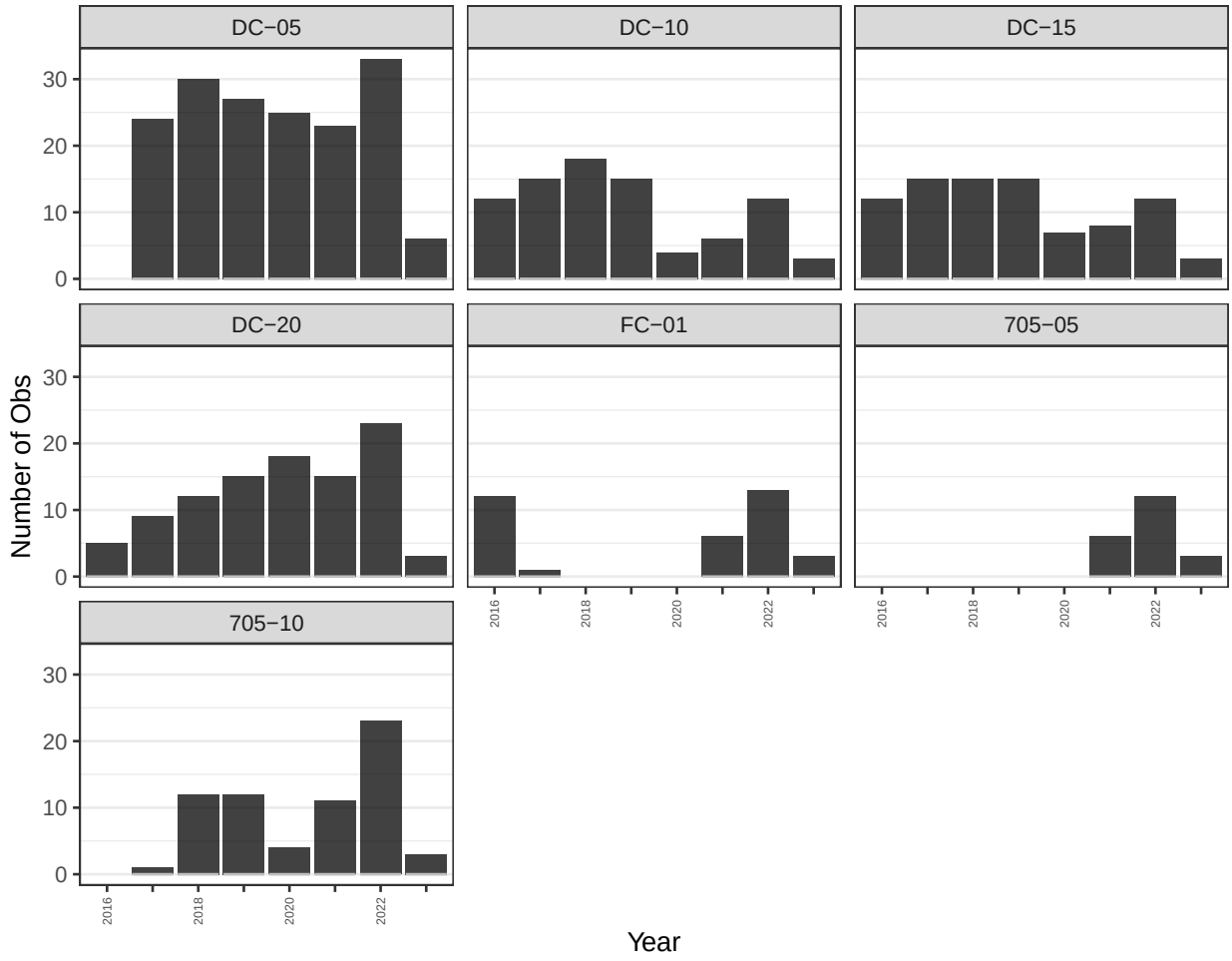
Variable	Total Selenium
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

C-2.1.22 Total Strontium

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

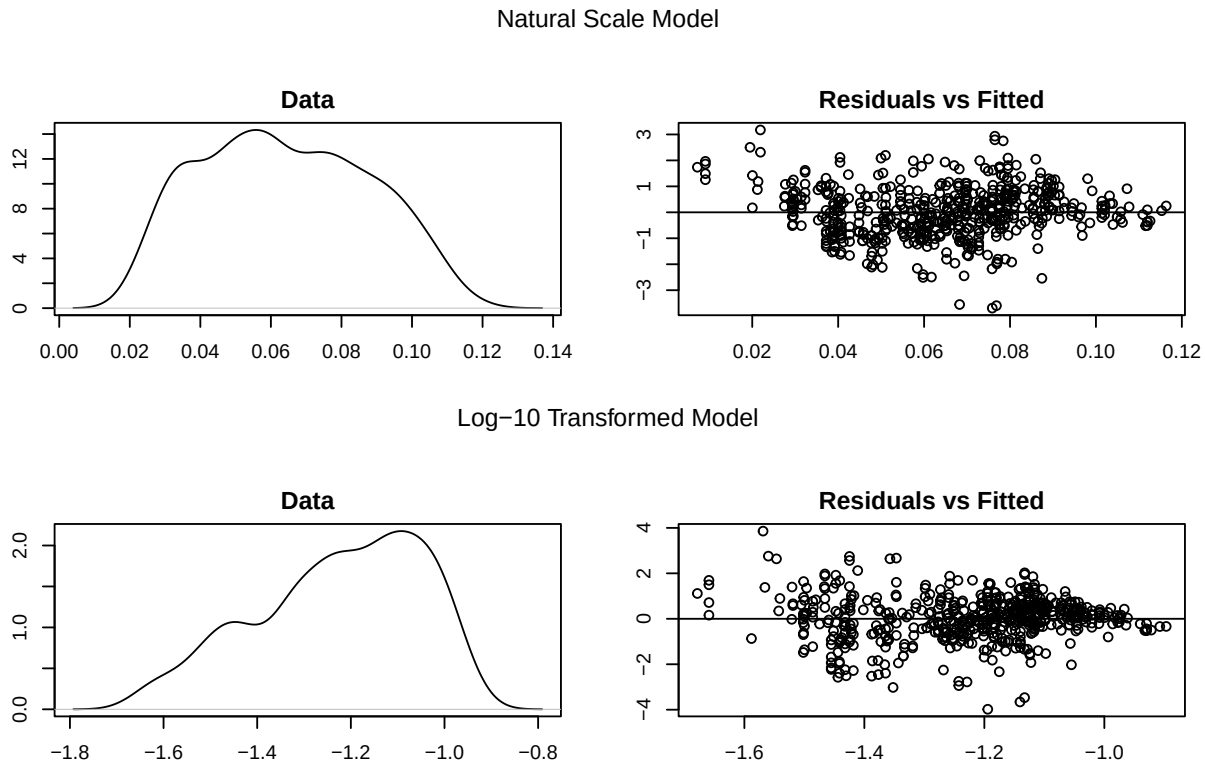
1.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	153	0.0616	0
Davidson Creek	DC-05	after	15	0.1010	0
Davidson Creek	DC-10	before	79	0.0634	0
Davidson Creek	DC-10	after	6	0.0971	0
Davidson Creek	DC-15	before	81	0.0723	0
Davidson Creek	DC-15	after	6	0.1067	0
Davidson Creek	DC-20	before	91	0.0746	0
Davidson Creek	DC-20	after	9	0.1090	0
Davidson Creek	FC-01	before	28	0.0400	0
Davidson Creek	FC-01	after	7	0.0594	0
Davidson Creek	705-05	before	15	0.0490	0
Davidson Creek	705-05	after	6	0.0522	0
Davidson Creek	705-10	before	57	0.0557	0
Davidson Creek	705-10	after	9	0.0709	0

1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-15	2016	4	monit	before	0.0362	0.0759	-3.690	0
Davidson Creek	DC-05	2021	4	monit	before	0.0382	0.0768	-3.595	0
Davidson Creek	DC-10	2016	4	monit	before	0.0301	0.0683	-3.550	0
Davidson Creek	FC-01	2022	5	control	before	0.0560	0.0219	3.172	0

Outliers on log scale:

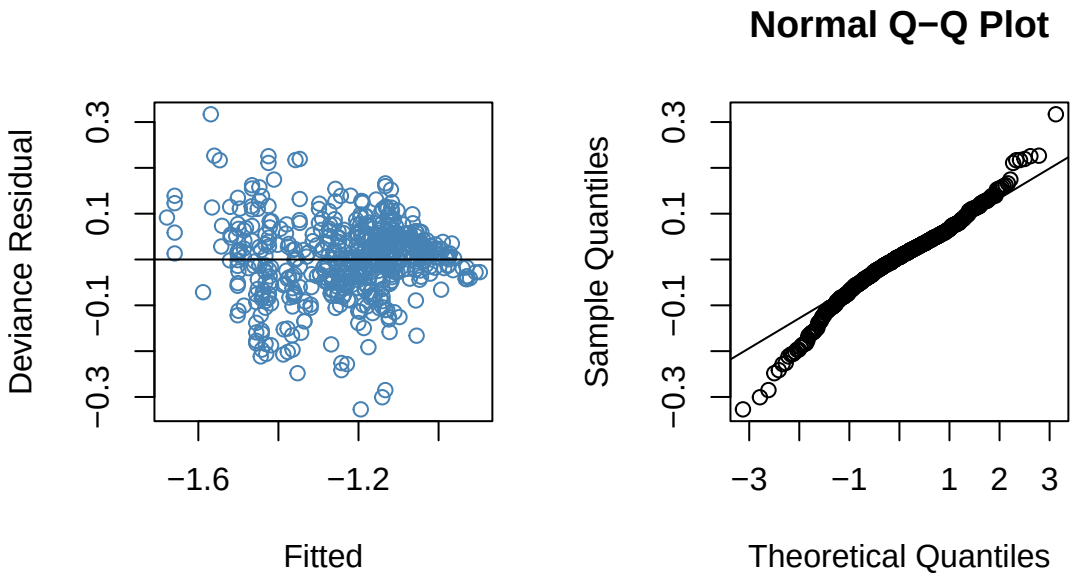
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-10	2016	4	monit	before	-1.521	-1.194	-3.981	0
Davidson Creek	FC-01	2022	5	control	before	-1.252	-1.569	3.858	0
Davidson Creek	DC-15	2016	4	monit	before	-1.441	-1.141	-3.659	0
Davidson Creek	DC-05	2021	4	monit	before	-1.418	-1.133	-3.468	0
Davidson Creek	FC-01	2016	4	control	before	-1.600	-1.352	-3.020	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.1776	0.1776	1	5.637	26.30	0.0026	
period	0.4783	0.4783	1	349.947	70.83	<0.001	
class:period	0.1235	0.1235	1	537.583	18.29	<0.001	0.229

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

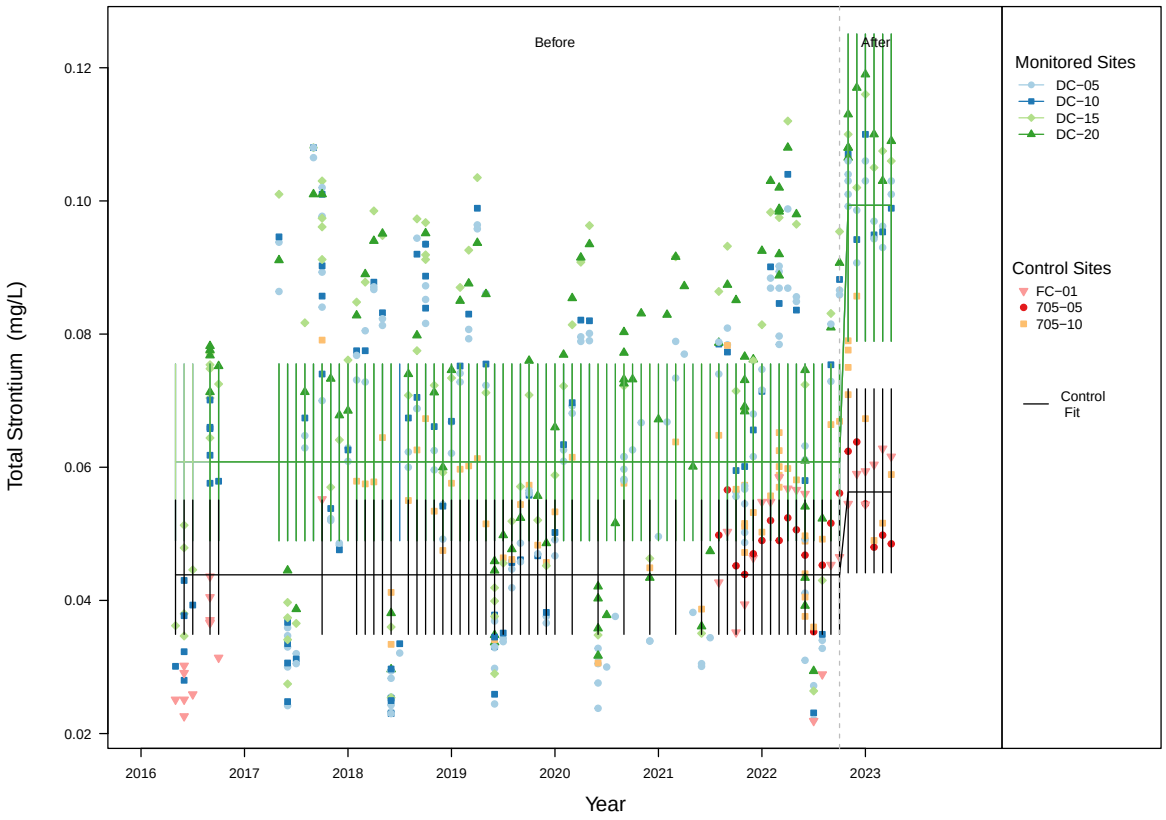
Monitored vs:	Estimate	Significance
control sites	0.1047	not significant

Conclusion:

The change in Total Strontium concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p* = 0.229) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

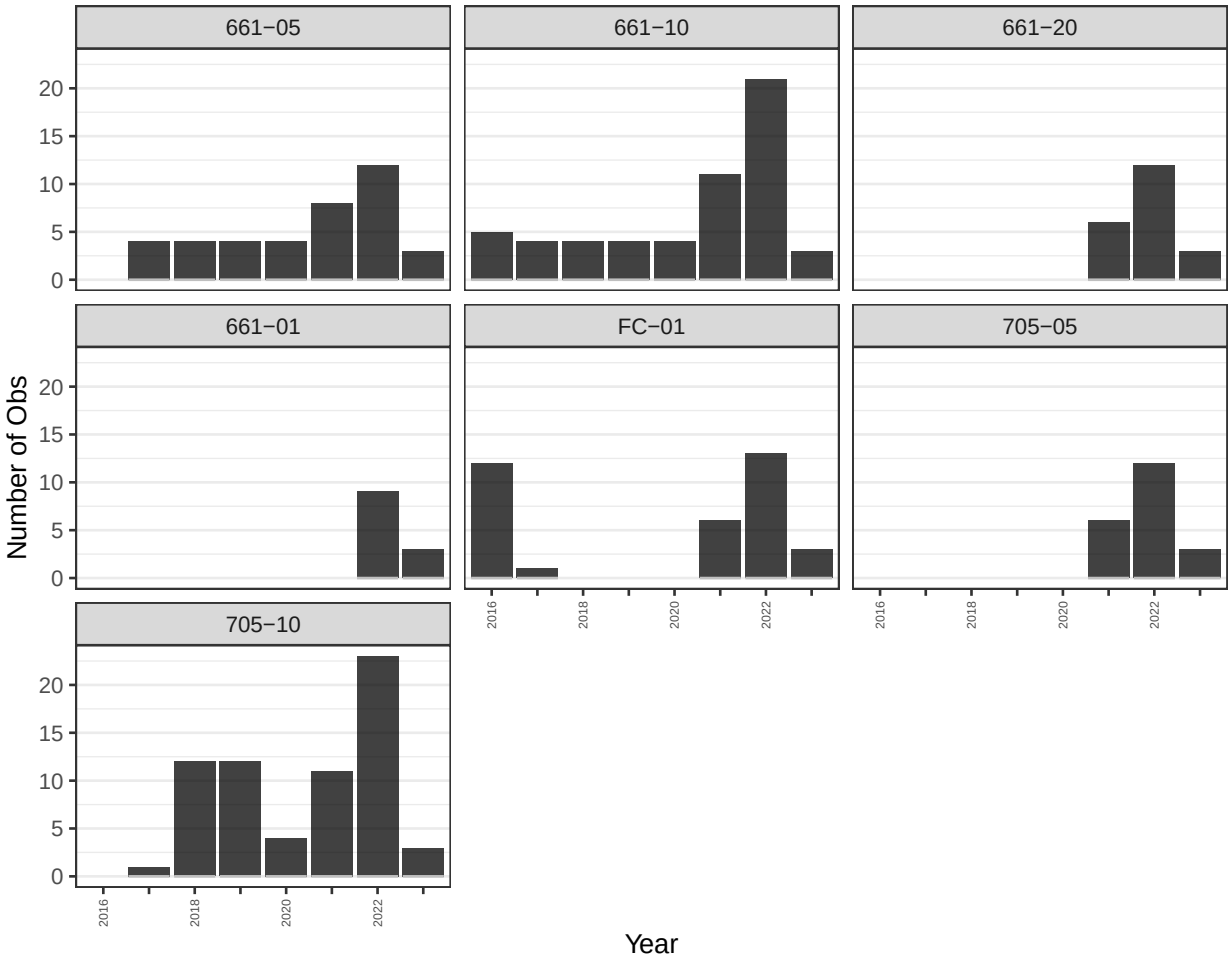
Final Summary Table

Variable	Total Strontium
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

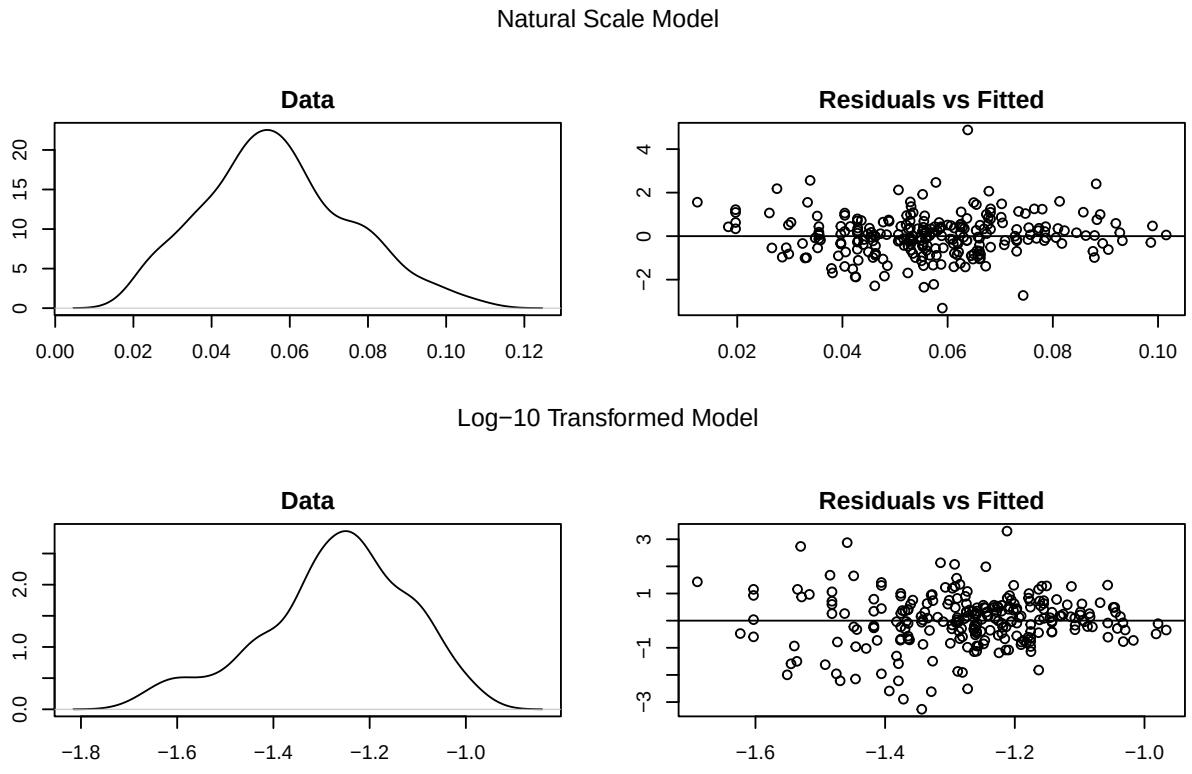
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	0.0739	0
Creek 661	661-05	after	6	0.0842	0
Creek 661	661-10	before	47	0.0517	0
Creek 661	661-10	after	9	0.0713	0
Creek 661	661-20	before	15	0.0865	0
Creek 661	661-20	after	6	0.0966	0
Creek 661	661-01	before	3	0.0342	0
Creek 661	661-01	after	9	0.0344	0
Creek 661	FC-01	before	28	0.0400	0
Creek 661	FC-01	after	7	0.0594	0
Creek 661	705-05	before	15	0.0490	0
Creek 661	705-05	after	6	0.0522	0
Creek 661	705-10	before	57	0.0557	0
Creek 661	705-10	after	9	0.0709	0

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	661-10	2018	2	monit	before	0.1060	0.0638	4.880	0
Creek 661	661-20	2022	6	monit	before	0.0304	0.0590	-3.309	0

Outliers on log scale:

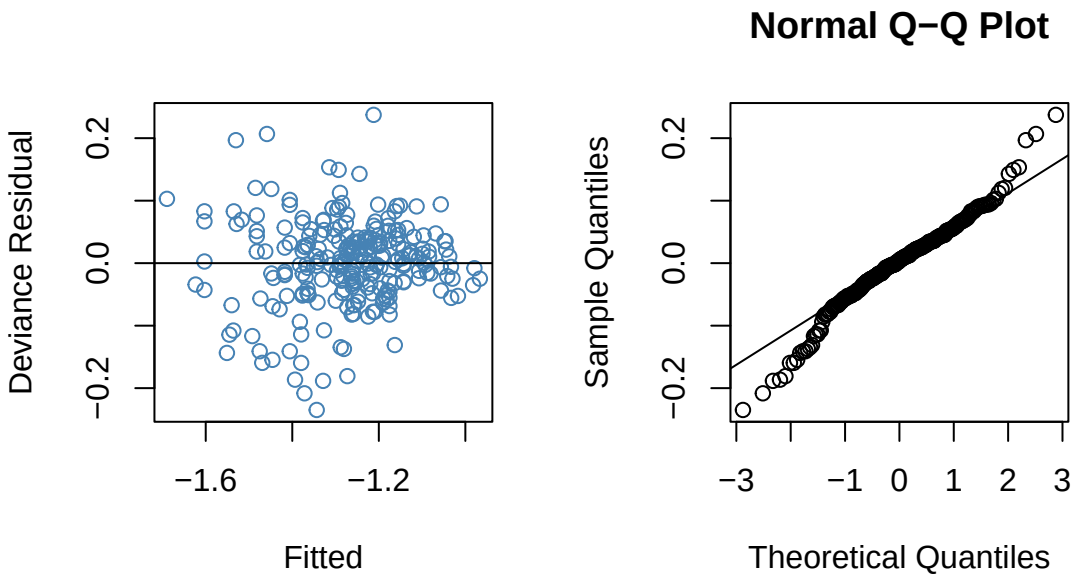
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	661-10	2018	2	monit	before	-0.9747	-1.212	3.299	0
Creek 661	661-10	2017	10	monit	before	-1.5784	-1.343	-3.265	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0240	0.0240	1	5.015	4.628	0.0839	
period	0.2085	0.2085	1	195.712	40.284	<0.001	
class:period	0.0164	0.0164	1	224.482	3.164	0.0766	0.751

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

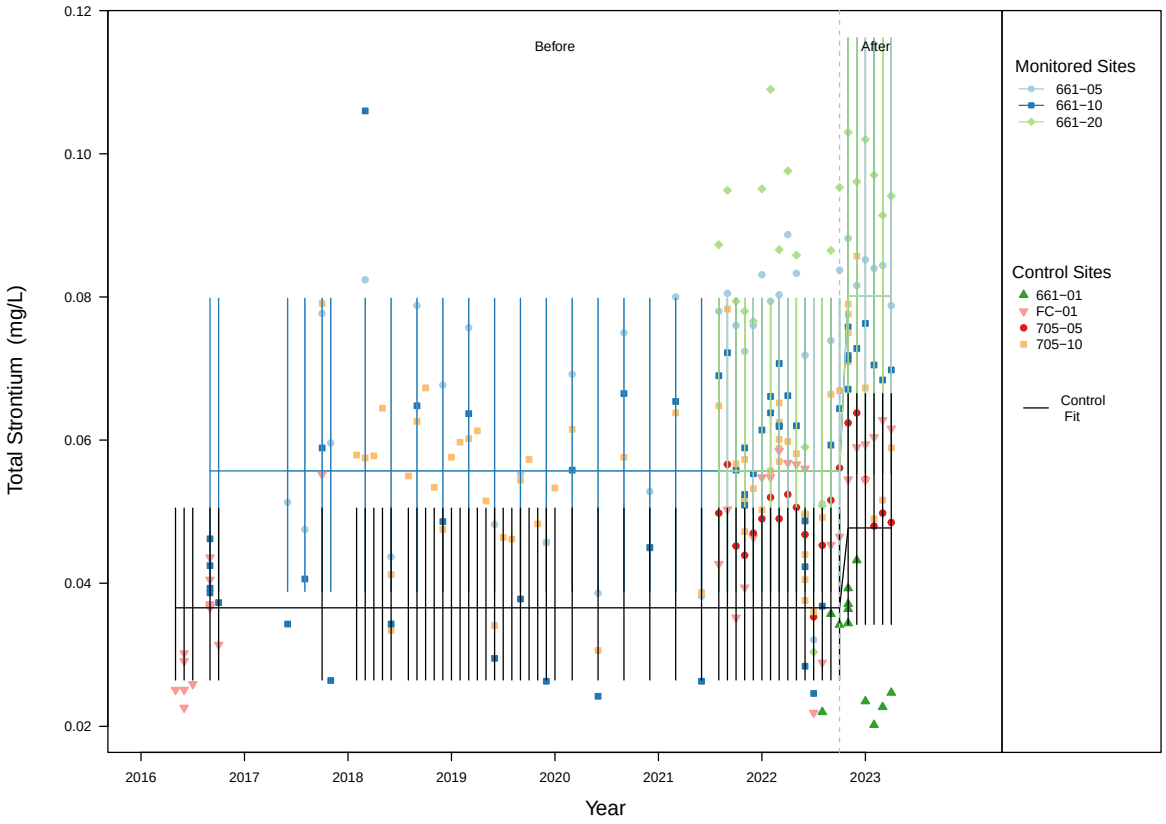
Monitored vs:	Estimate	Significance
control sites	0.0426	not significant

Conclusion:

The change in Total Strontium concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p* = 0.751) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

Final Summary Table

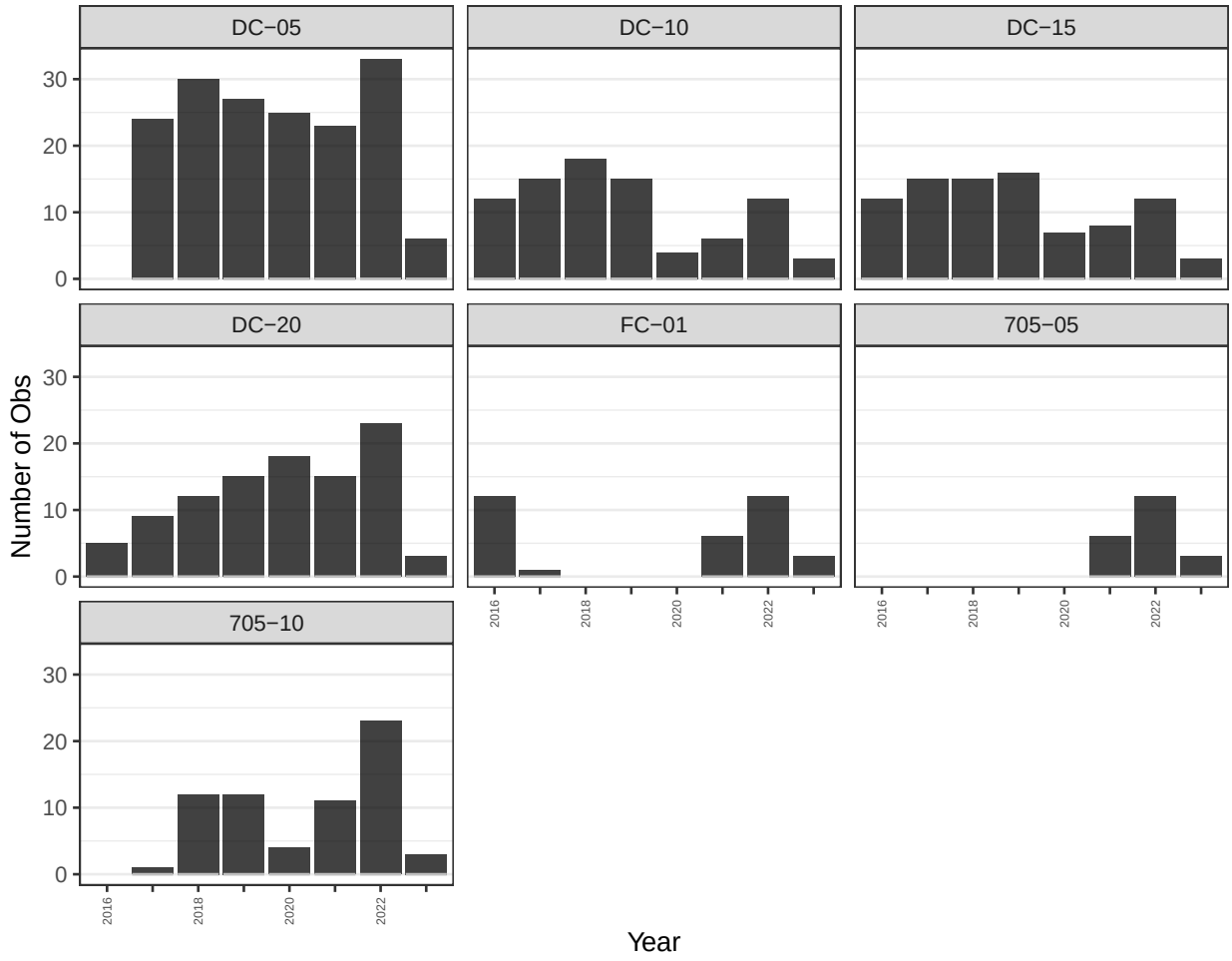
Variable	Total Strontium
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.23 Total Uranium

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

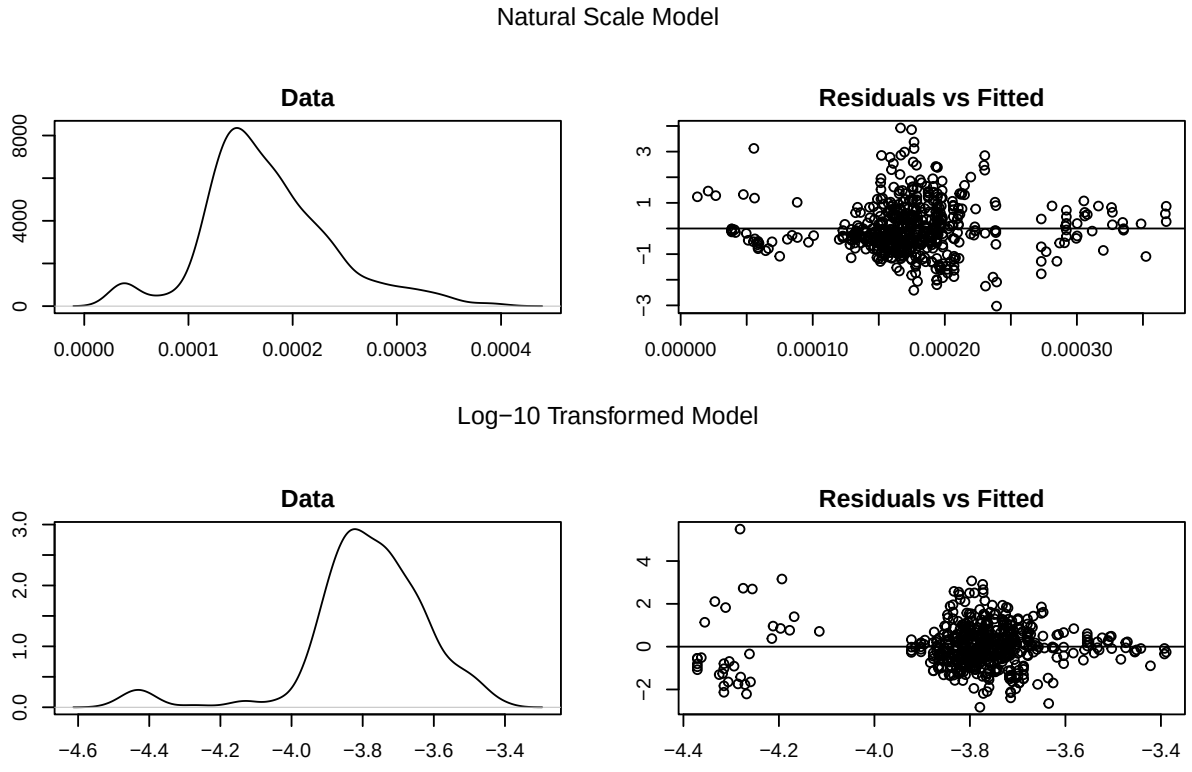
1.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	153	0.0002	0
Davidson Creek	DC-05	after	15	0.0003	0
Davidson Creek	DC-10	before	79	0.0002	0
Davidson Creek	DC-10	after	6	0.0003	0
Davidson Creek	DC-15	before	82	0.0002	0
Davidson Creek	DC-15	after	6	0.0003	0
Davidson Creek	DC-20	before	91	0.0001	0
Davidson Creek	DC-20	after	9	0.0003	0
Davidson Creek	FC-01	before	28	0.0000	0
Davidson Creek	FC-01	after	6	0.0001	0
Davidson Creek	705-05	before	15	0.0002	0
Davidson Creek	705-05	after	6	0.0001	0
Davidson Creek	705-10	before	57	0.0002	0
Davidson Creek	705-10	after	9	0.0001	0

1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-20	2019	5	monit	before	0.0003	0.0002	3.923	0
Davidson Creek	DC-20	2018	5	monit	before	0.0003	0.0002	3.856	0
Davidson Creek	DC-05	2017	8	monit	before	0.0003	0.0002	3.374	0
Davidson Creek	FC-01	2021	12	control	before	0.0002	0.0001	3.125	0
Davidson Creek	DC-05	2017	8	monit	before	0.0003	0.0002	3.118	0
Davidson Creek	705-10	2018	3	control	before	0.0001	0.0002	-3.028	0

Outliers on log scale:

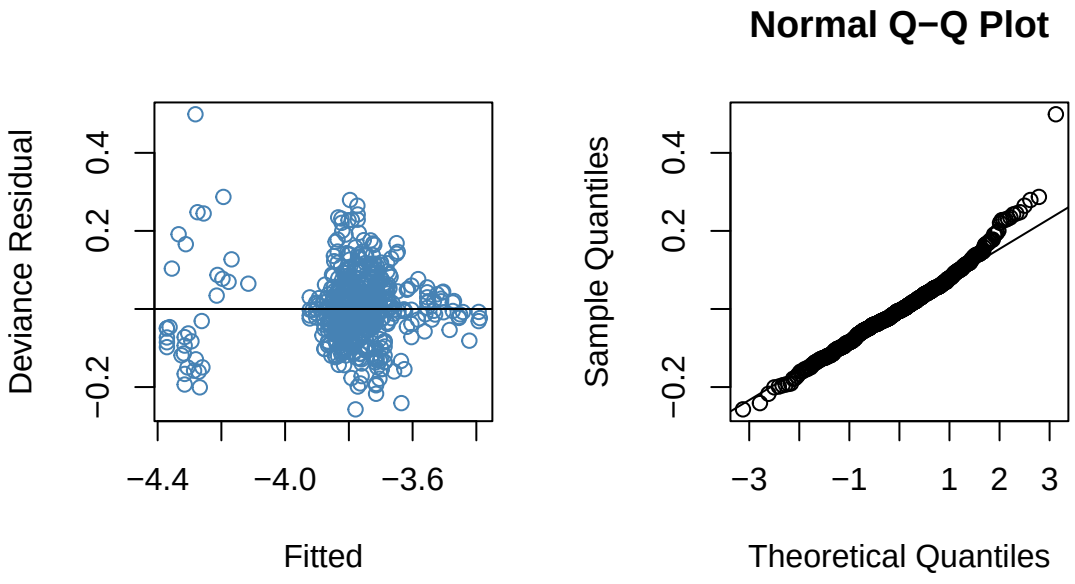
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	FC-01	2021	12	control	before	-3.783	-4.281	5.491	0
Davidson Creek	FC-01	2023	3	control	after	-3.907	-4.194	3.160	0
Davidson Creek	DC-20	2019	5	monit	before	-3.517	-3.796	3.073	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0416	0.0416	1	5.056	5.043	0.0741	
period	0.1850	0.1850	1	161.766	22.420	<0.001	
class:period	1.0144	1.0144	1	537.295	122.916	<0.001	1e-04

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

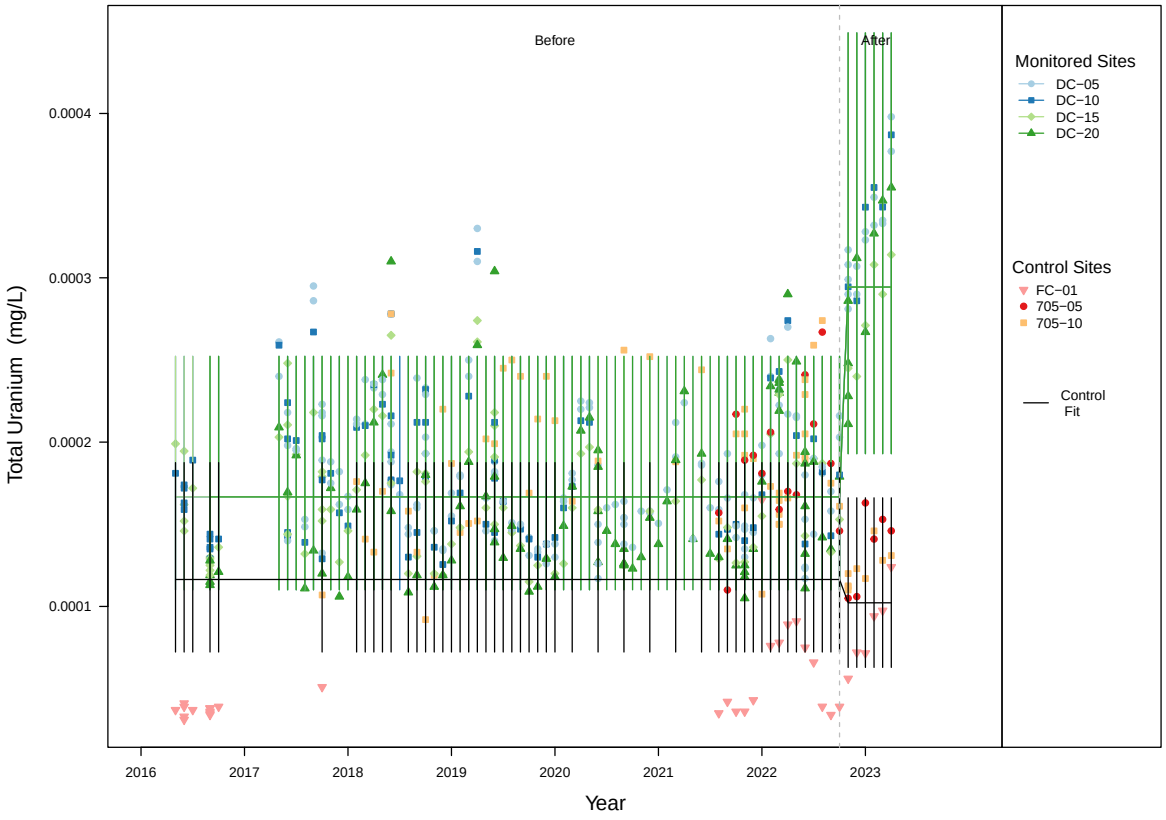
Monitored vs:	Estimate	Significance
control sites	0.3035	significant

Conclusion:

The change in Total Uranium concentrations at the monitored sites from *before* to *after* was significantly (*adjusted p* = 10^{-4}) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale. Guidelines are at 0.0085 (mg/L) and 0.015 (mg/L).

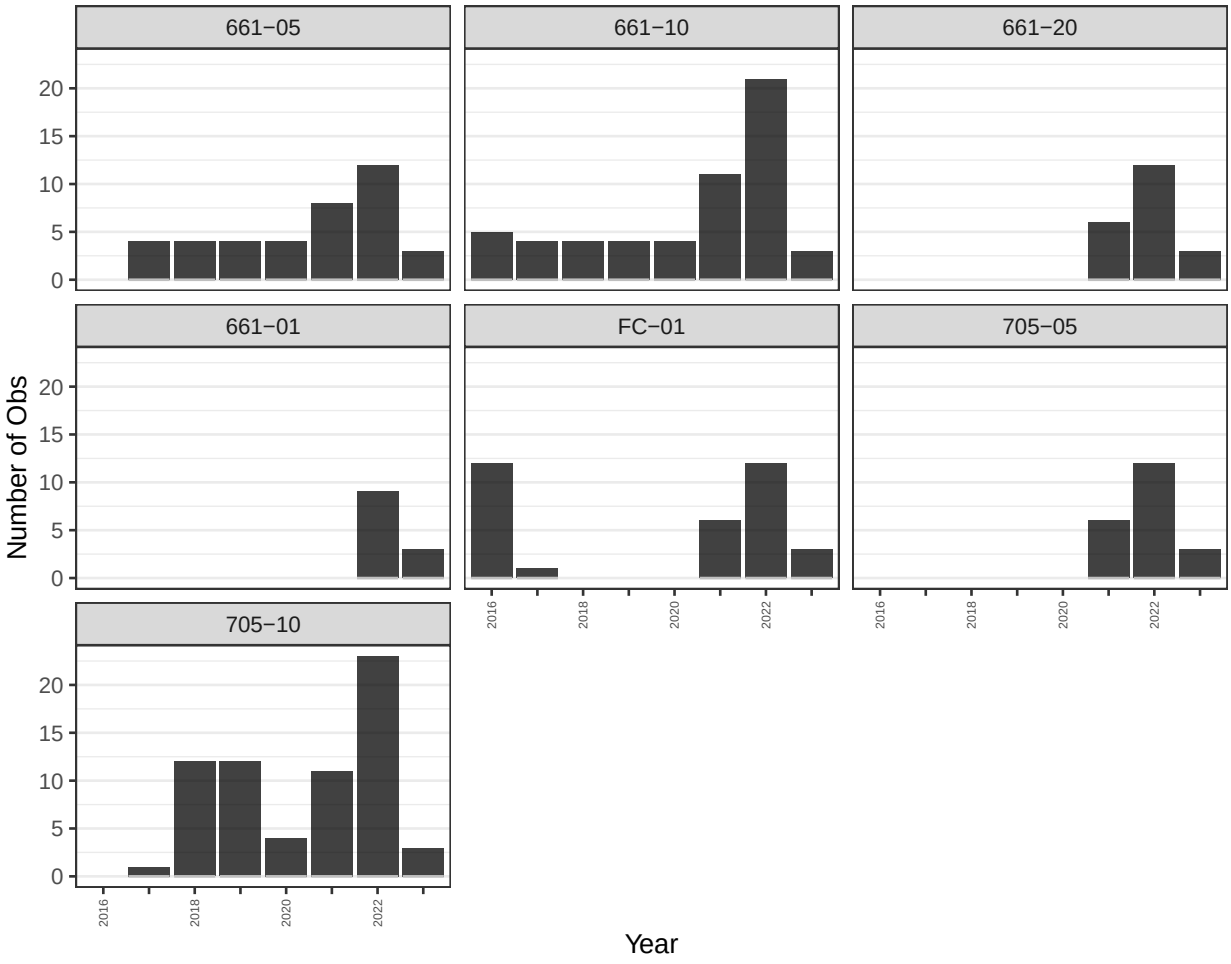
Final Summary Table

Variable	Total Uranium
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	TRUE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

None

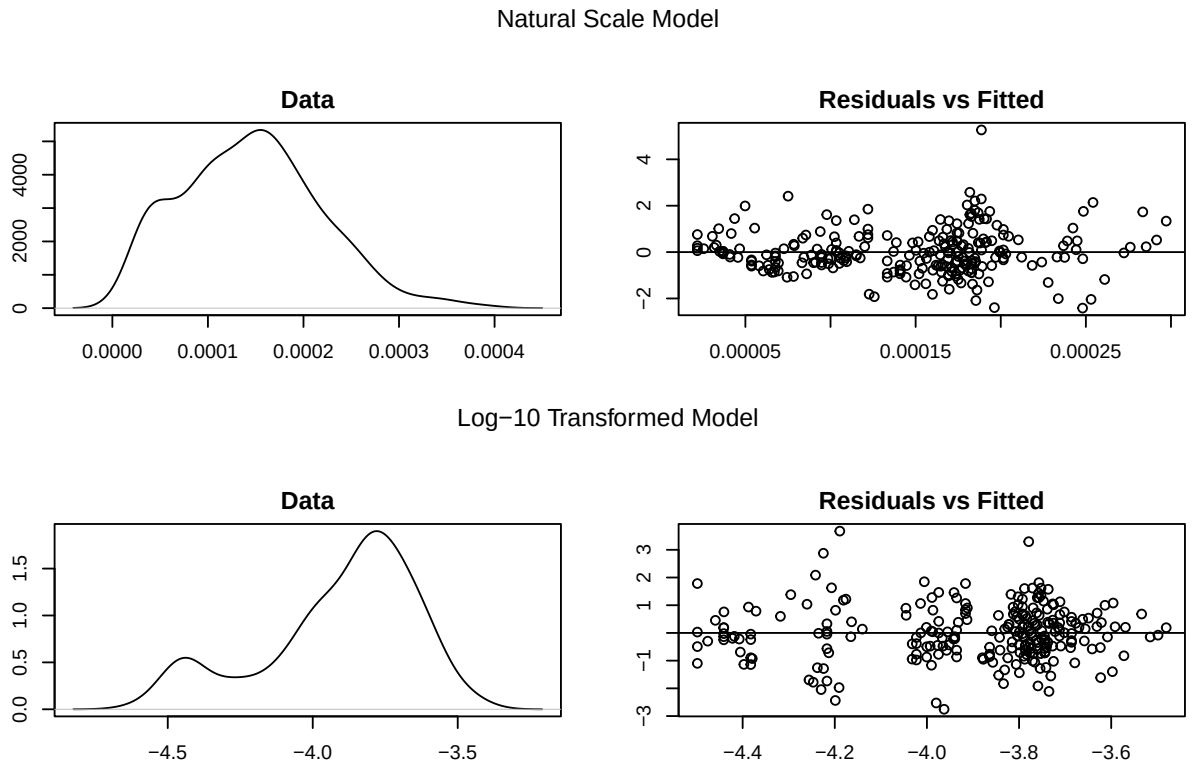
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	0.0002	0
Creek 661	661-05	after	6	0.0002	0
Creek 661	661-10	before	47	0.0001	0
Creek 661	661-10	after	9	0.0001	0
Creek 661	661-20	before	15	0.0002	0
Creek 661	661-20	after	6	0.0003	0
Creek 661	661-01	before	3	0.0000	0
Creek 661	661-01	after	9	0.0000	0
Creek 661	FC-01	before	28	0.0000	0
Creek 661	FC-01	after	6	0.0001	0
Creek 661	705-05	before	15	0.0002	0
Creek 661	705-05	after	6	0.0001	0
Creek 661	705-10	before	57	0.0002	0
Creek 661	705-10	after	9	0.0001	0

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	661-05	2017	10	monit	before	0.0004	0.0002	5.266	0

Outliers on log scale:

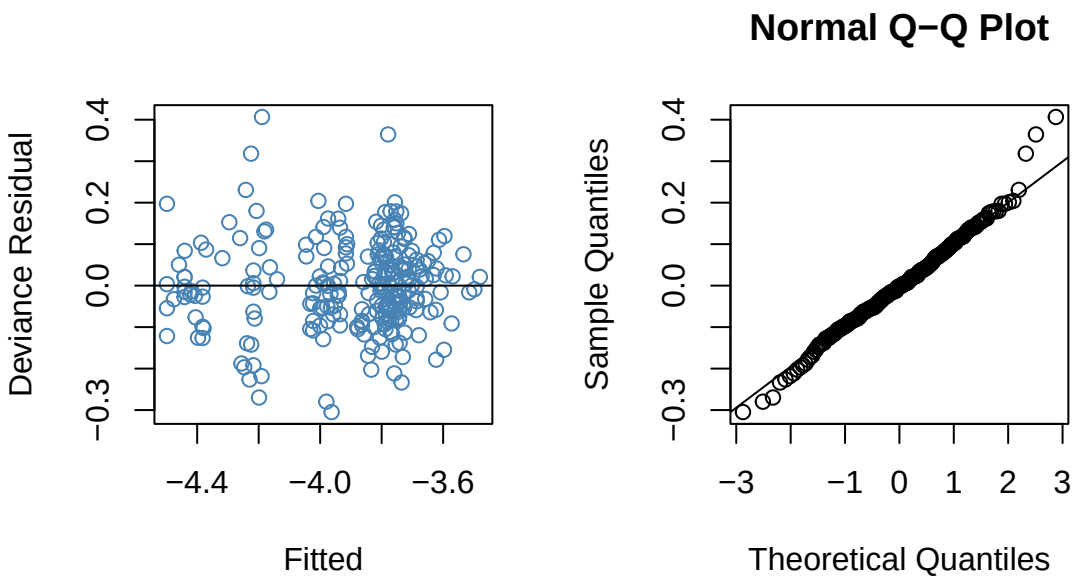
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	FC-01	2021	12	control	before	-3.783	-4.189	3.674	0
Creek 661	661-05	2017	10	monit	before	-3.414	-3.779	3.294	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0267	0.0267	1	5.008	2.184	0.199	
period	0.0131	0.0131	1	117.706	1.069	0.303	
class:period	0.2236	0.2236	1	224.209	18.265	<0.001	0.0775

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

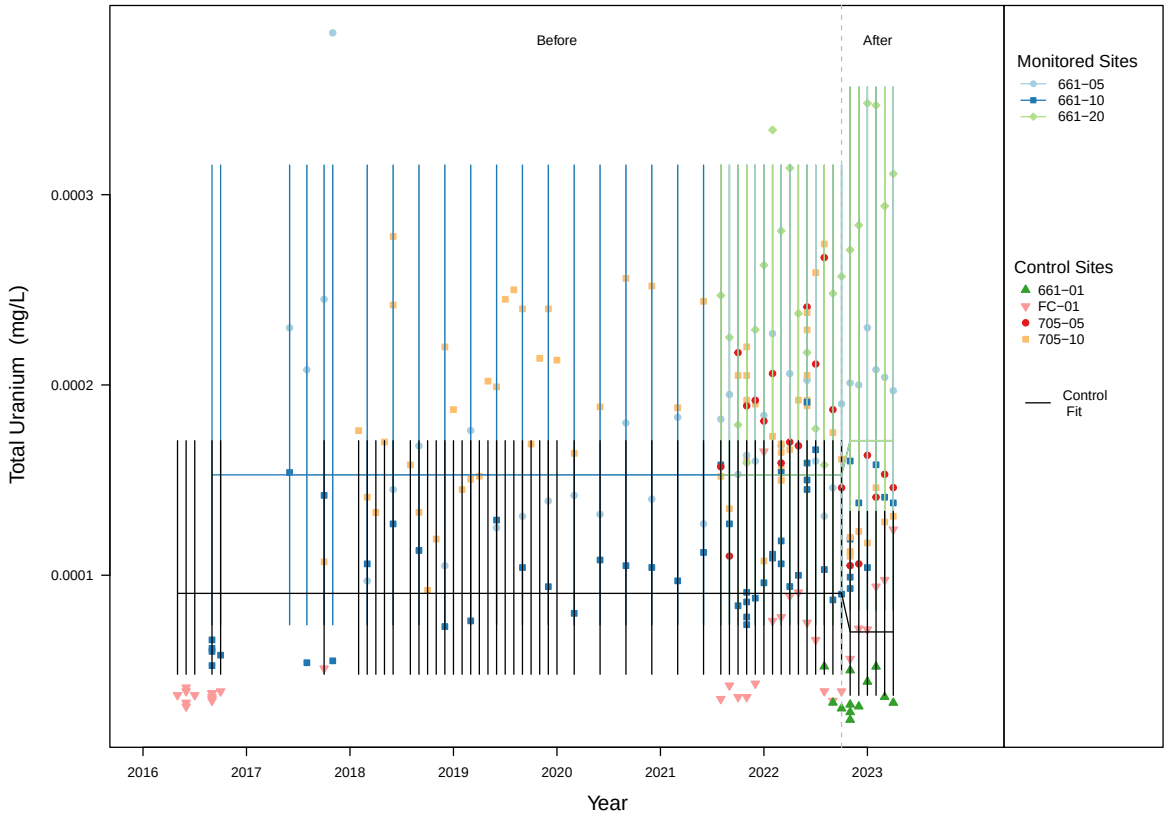
Monitored vs:	Estimate	Significance
control sites	0.1586	not significant

Conclusion:

The change in Total Uranium concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p* = 0.0775) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale. Guidelines are at 0.0085 (mg/L) and 0.015 (mg/L).

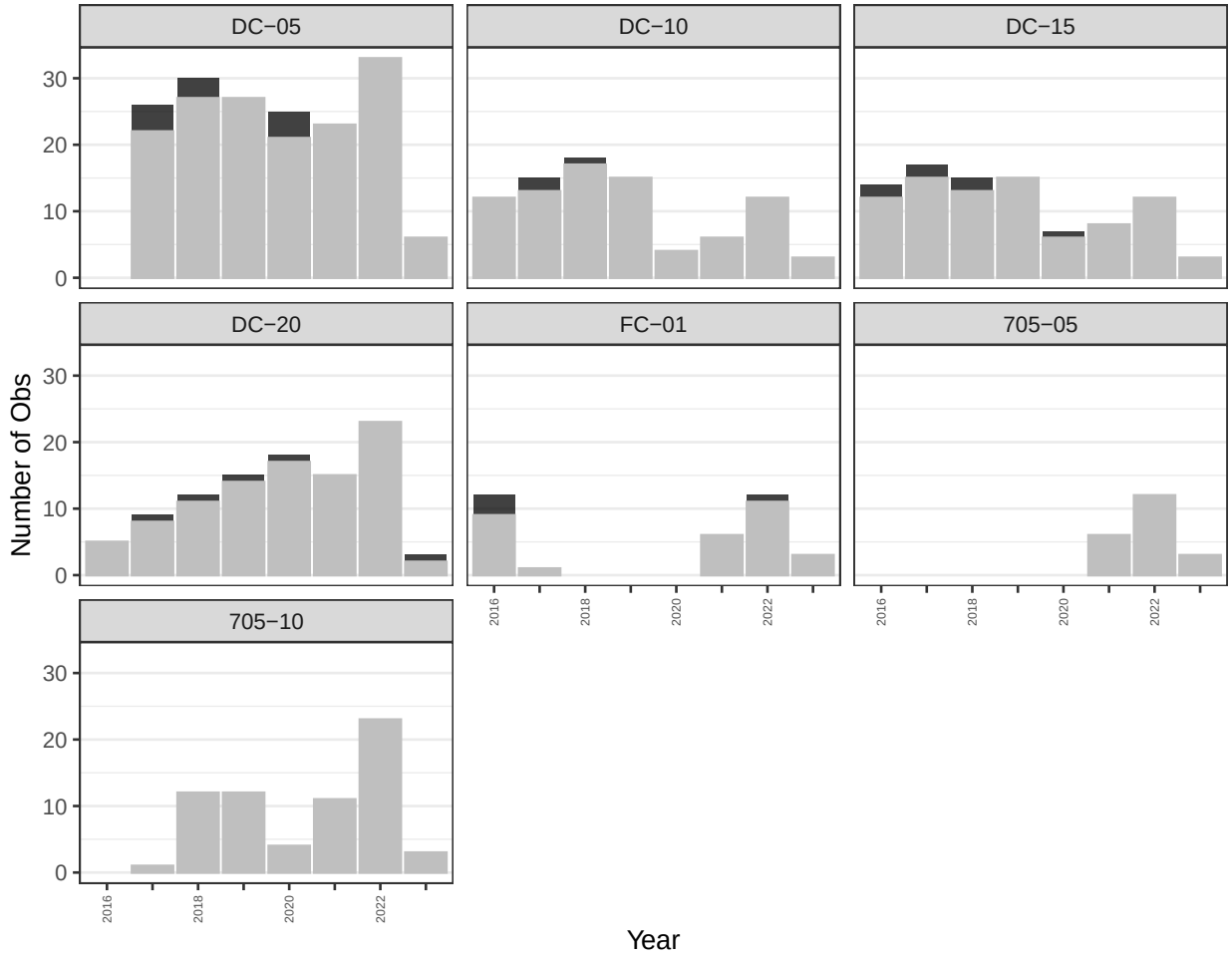
Final Summary Table

Variable	Total Uranium
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.24 Total Zinc

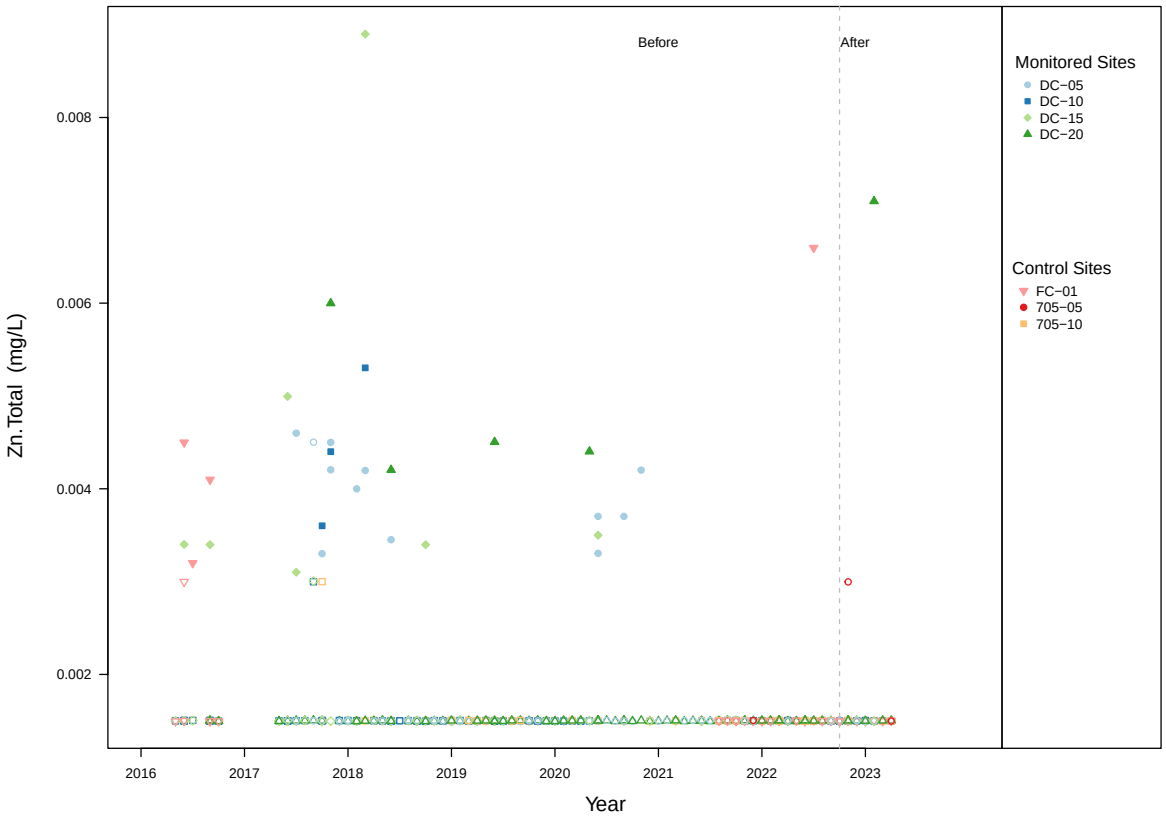
1 Davidson Creek

1.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



Note: Open symbols represent cases where the results were below the sample detection limit.

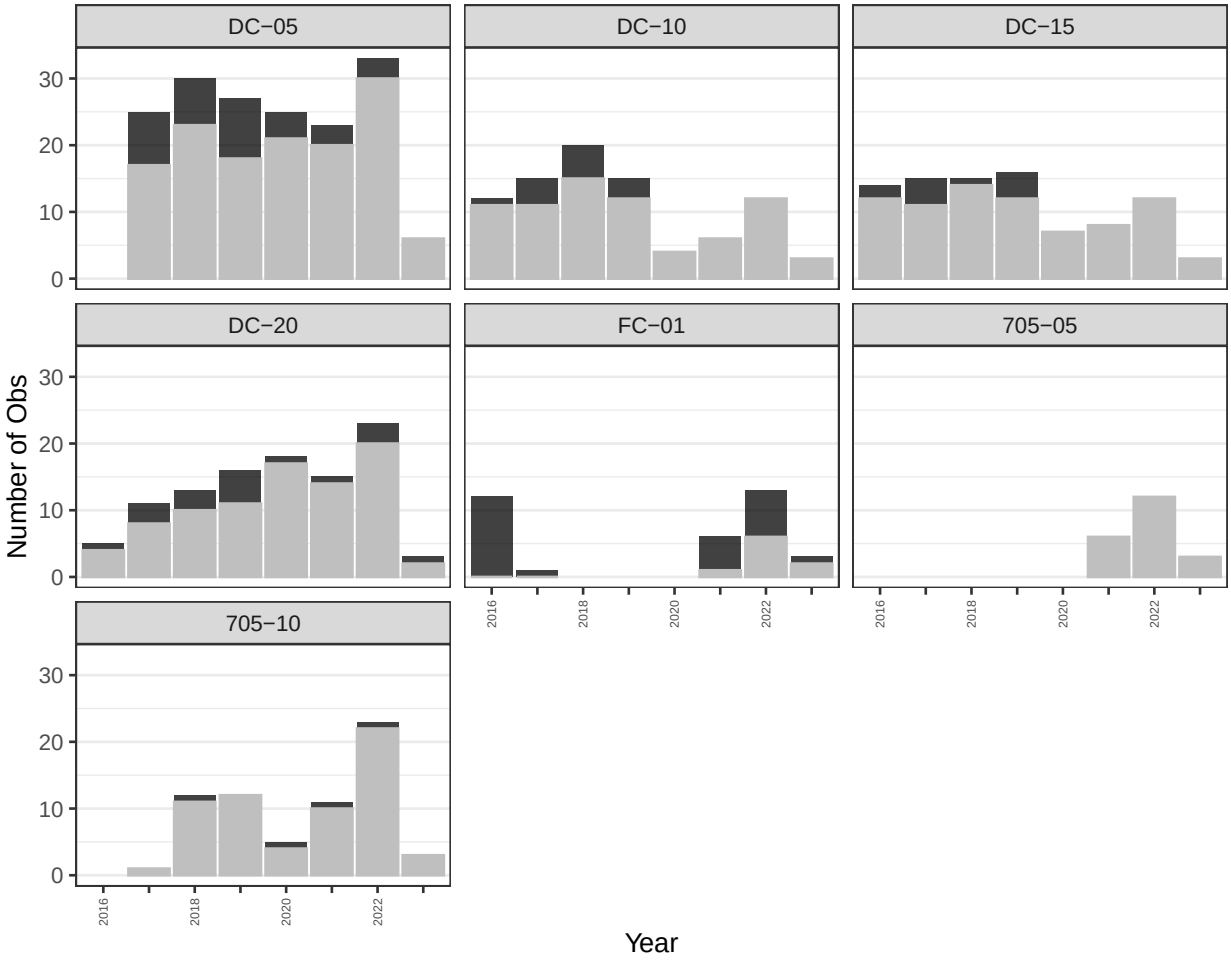
Final Summary Table

Variable	Zn.Total
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

C-2.1.25 Dissolved Cadmium

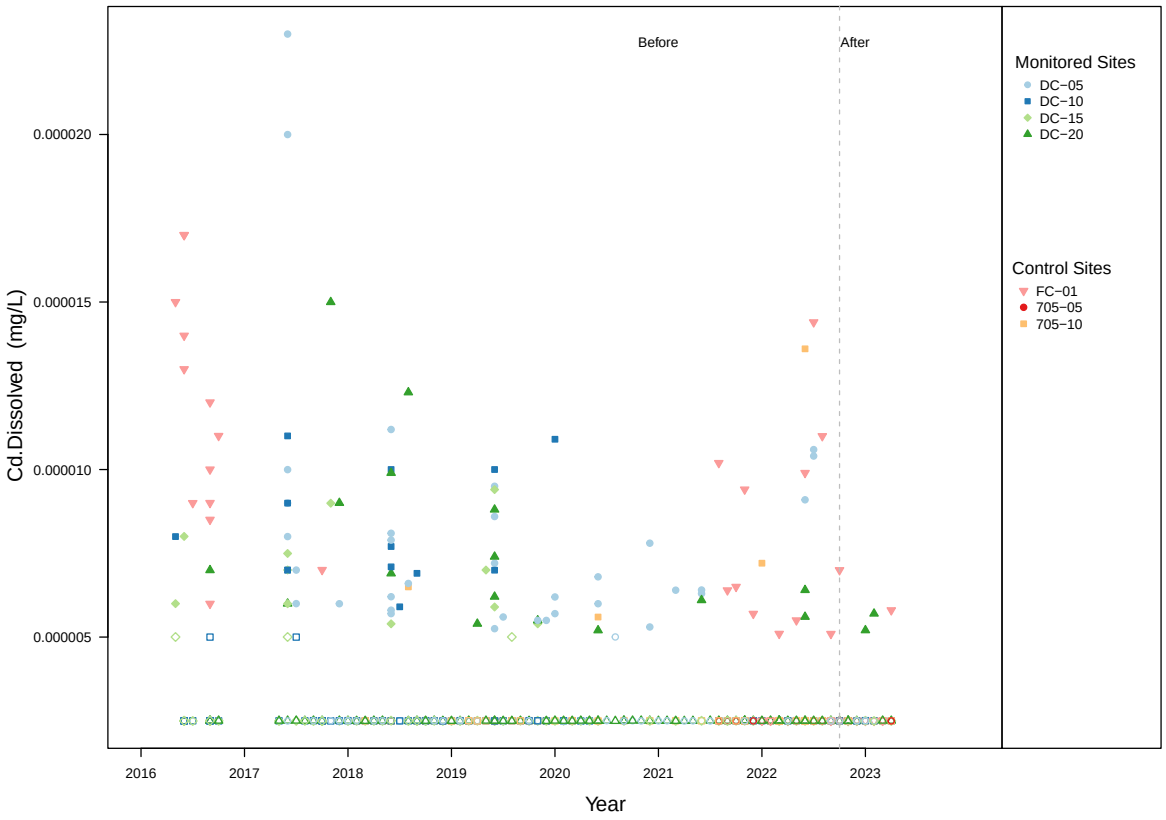
1 Davidson Creek

1.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



Note: Open symbols represent cases where the results were below the sample detection limit.

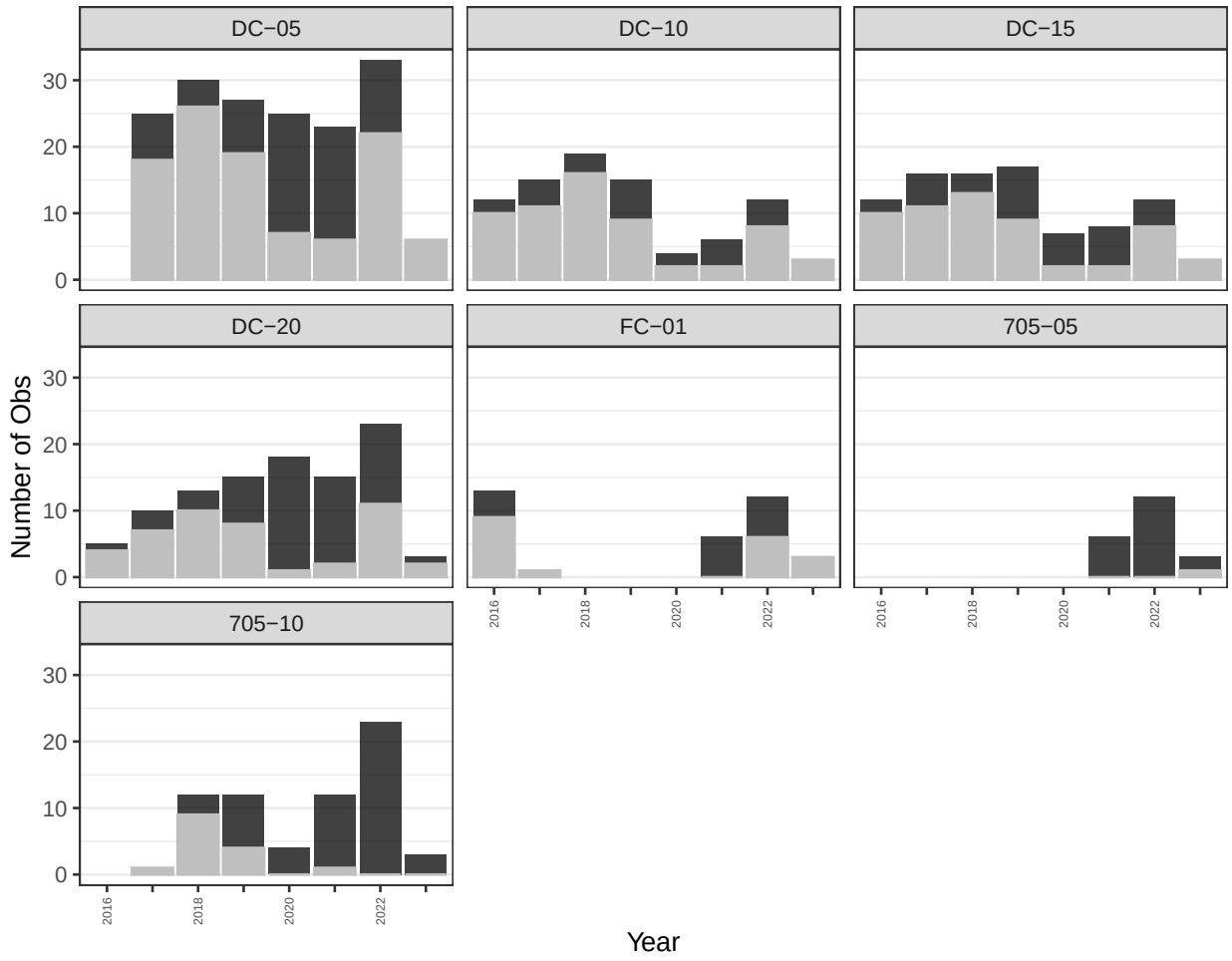
Final Summary Table

Variable	Cd.Dissolved
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

C-2.1.26 Dissolved Copper

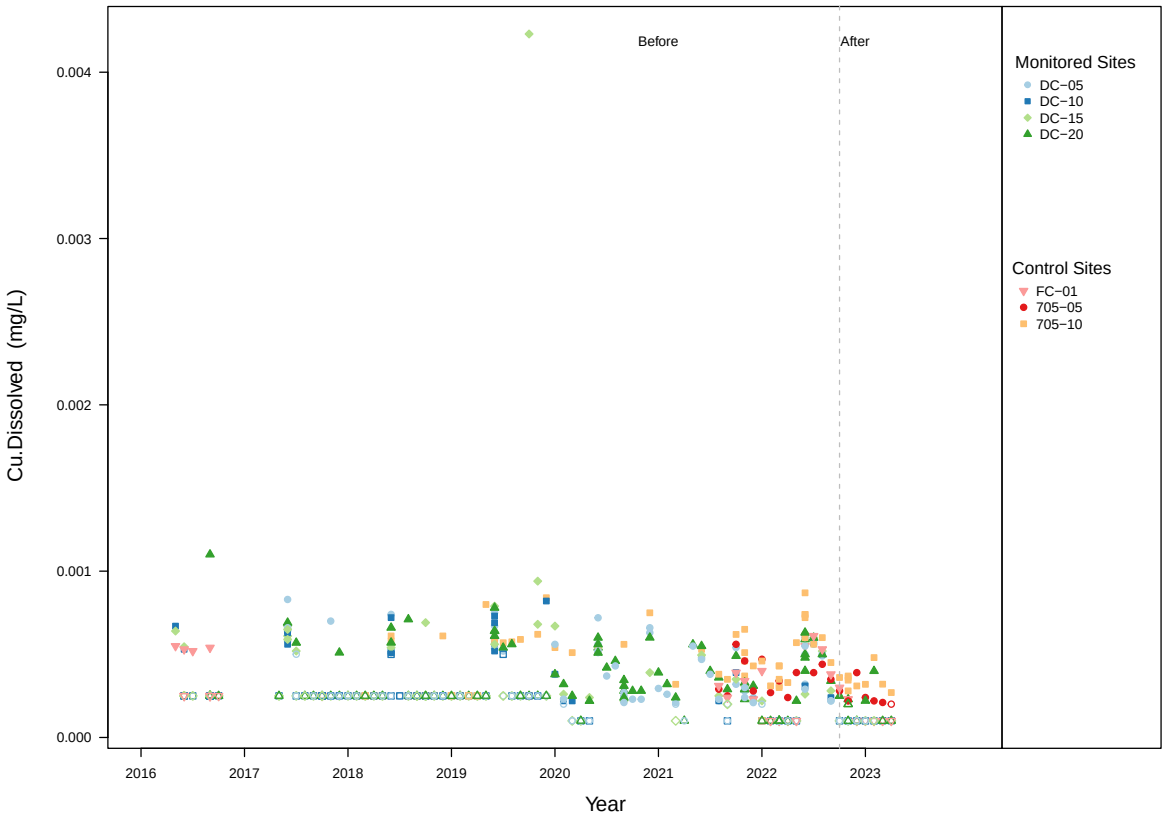
1 Davidson Creek

1.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



Note: Open symbols represent cases where the results were below the sample detection limit.

Final Summary Table

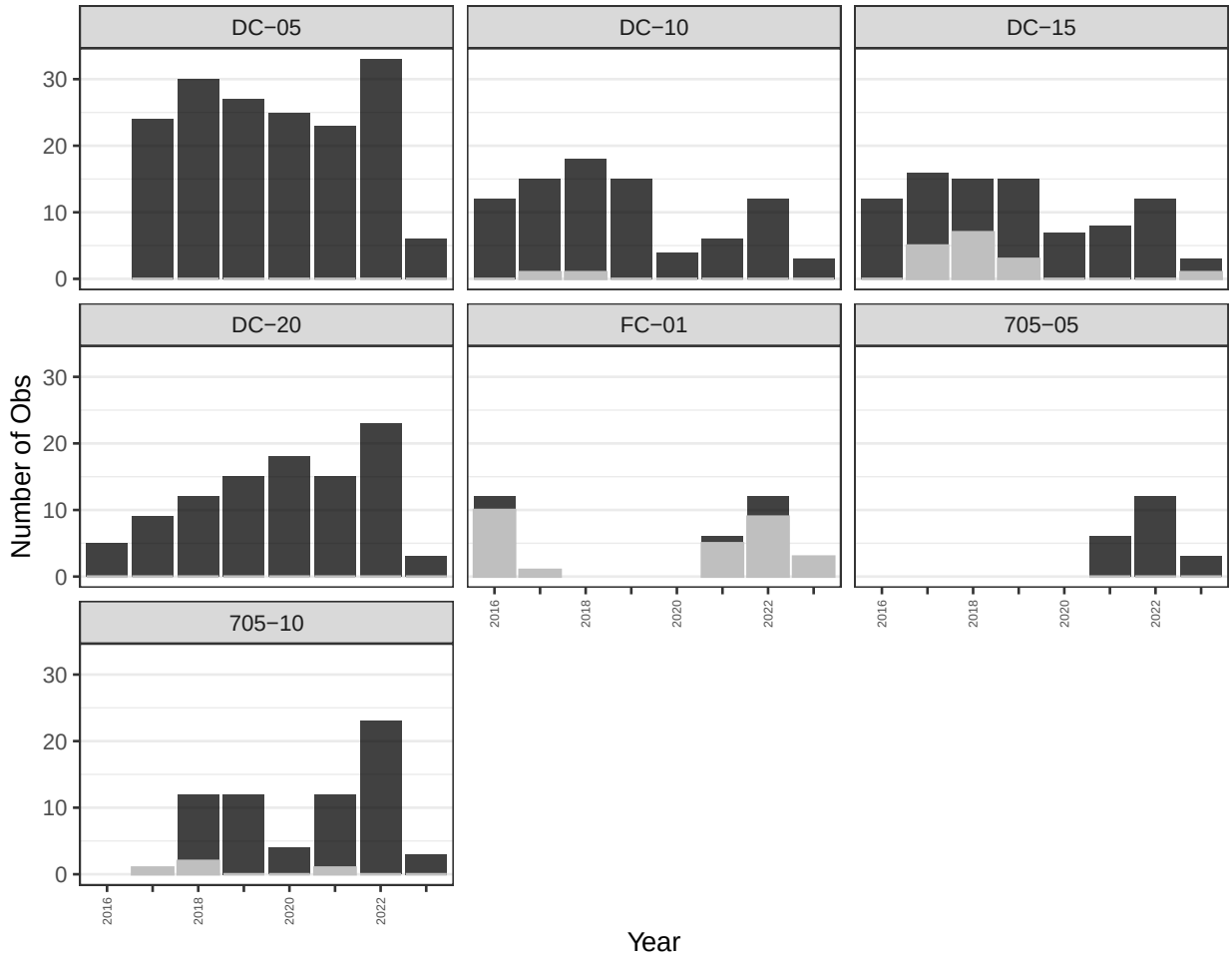
Variable	Cu.Dissolved
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

C-2.1.27 Dissolved Iron

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

Watershed	Site	Year	Class	Period	#Obs Removed
Davidson Creek	FC-01	2016	control	before	12
Davidson Creek	FC-01	2017	control	before	1
Davidson Creek	FC-01	2021	control	before	6
Davidson Creek	FC-01	2022	control	before	12
Davidson Creek	FC-01	2022	control	after	12
Davidson Creek	FC-01	2023	control	after	3
Davidson Creek	705-10	2017	control	before	1

1.2 Sample Sizes for Modelling

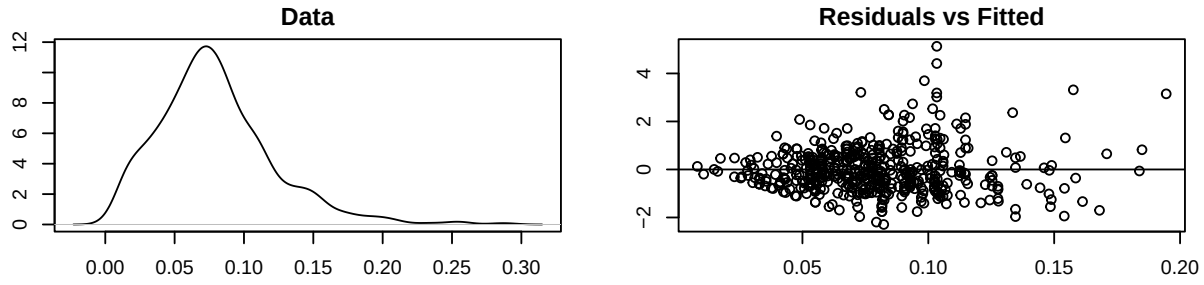
The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	153	0.0740	0.000
Davidson Creek	DC-05	after	15	0.0280	0.000
Davidson Creek	DC-10	before	79	0.0630	2.532
Davidson Creek	DC-10	after	6	0.0200	0.000
Davidson Creek	DC-15	before	82	0.0500	18.293
Davidson Creek	DC-15	after	6	0.0140	16.667
Davidson Creek	DC-20	before	91	0.0870	0.000
Davidson Creek	DC-20	after	9	0.1740	0.000
Davidson Creek	705-05	before	15	0.1480	0.000
Davidson Creek	705-05	after	6	0.1395	0.000
Davidson Creek	705-10	before	28	0.0830	7.143

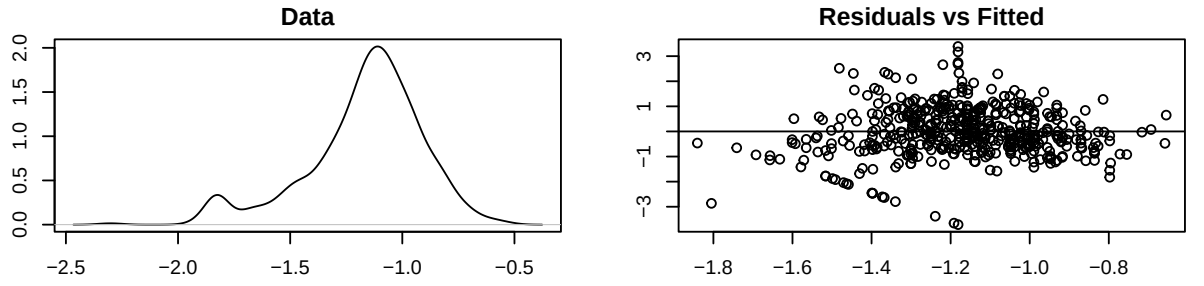
1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.

Natural Scale Model



Log−10 Transformed Model



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-20	2022	10	monit	after	0.2540	0.1034	5.129	0
Davidson Creek	DC-20	2022	10	monit	after	0.2330	0.1034	4.414	0
Davidson Creek	705-10	2019	4	control	before	0.2070	0.0984	3.696	0
Davidson Creek	705-05	2021	8	control	before	0.2550	0.1576	3.317	0
Davidson Creek	DC-05	2021	4	monit	before	0.1675	0.0732	3.211	0
Davidson Creek	DC-20	2022	10	monit	after	0.1970	0.1034	3.188	0
Davidson Creek	705-05	2022	10	control	after	0.2870	0.1945	3.150	0
Davidson Creek	DC-20	2022	10	monit	after	0.1920	0.1034	3.018	0

Outliers on log scale:

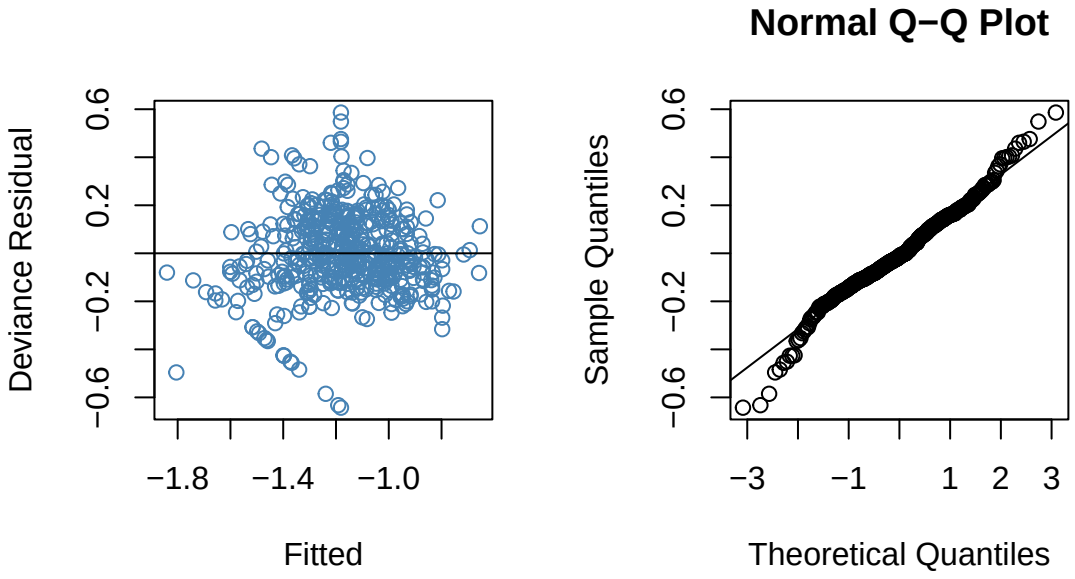
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	705-10	2018	8	control	before	-1.8239	-1.181	-3.713	1
Davidson Creek	DC-10	2017	8	monit	before	-1.8239	-1.191	-3.654	1
Davidson Creek	DC-20	2022	10	monit	after	-0.5952	-1.181	3.386	0
Davidson Creek	705-10	2018	9	control	before	-1.8239	-1.239	-3.380	1
Davidson Creek	DC-20	2022	10	monit	after	-0.6326	-1.181	3.170	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.2007	0.2007	1	4.482	6.696	0.0544	
period	0.0756	0.0756	1	238.300	2.523	0.114	
class:period	0.3643	0.3643	1	470.989	12.158	<0.001	0.201

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

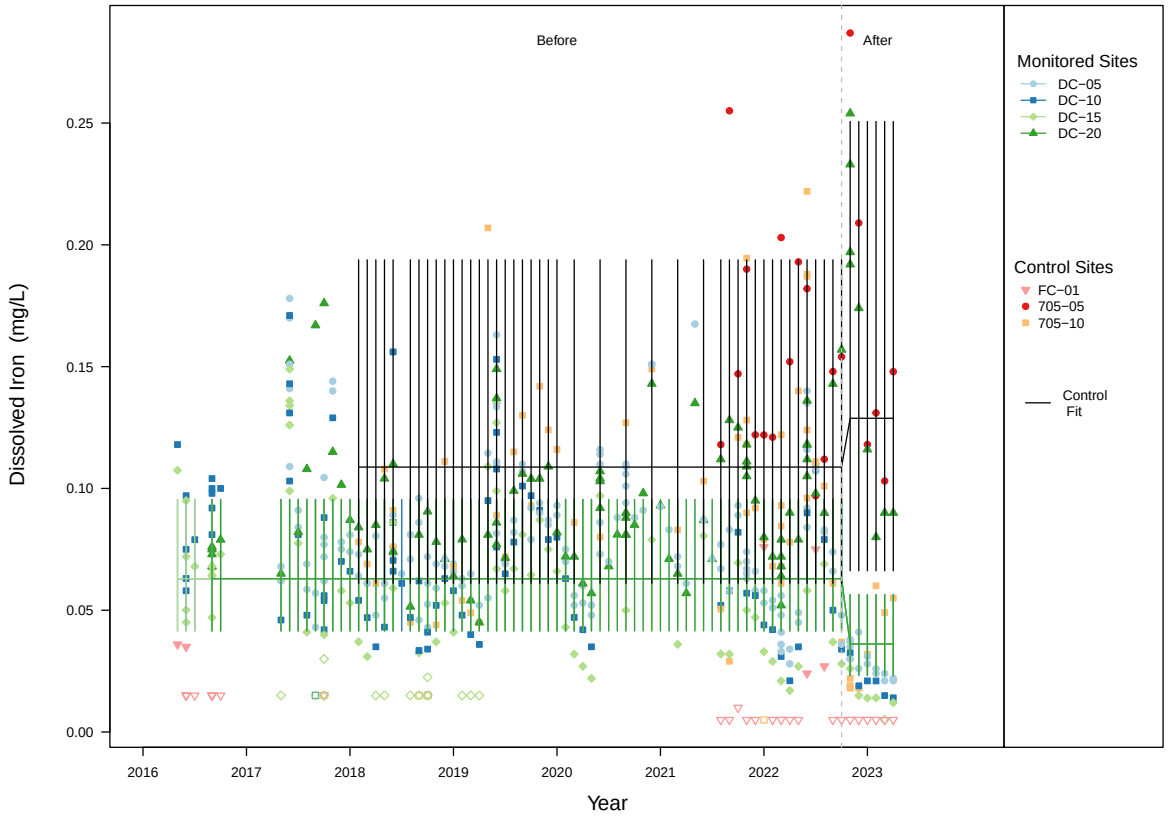
Monitored vs:	Estimate	Significance
control sites	-0.3142	not significant

Conclusion:

The change in Dissolved Iron concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.201) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

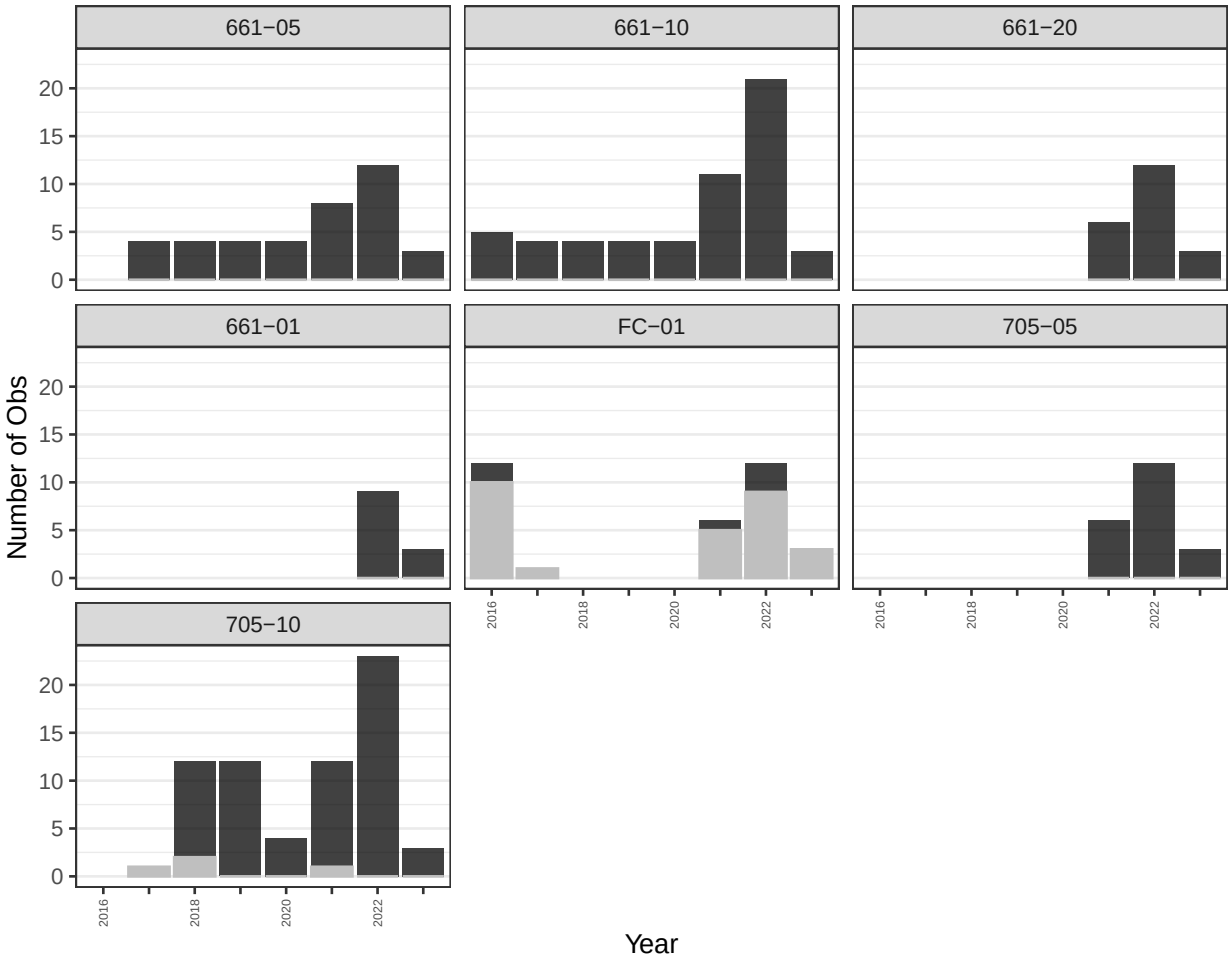
Final Summary Table

Variable	Dissolved Iron
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

Watershed	Site	Year	Class	Period	#Obs Removed
Creek 661	FC-01	2016	control	before	12
Creek 661	FC-01	2017	control	before	1
Creek 661	FC-01	2021	control	before	6
Creek 661	FC-01	2022	control	before	12
Creek 661	FC-01	2022	control	after	12
Creek 661	FC-01	2023	control	after	3
Creek 661	705-10	2017	control	before	1

2.2 Sample Sizes for Modelling

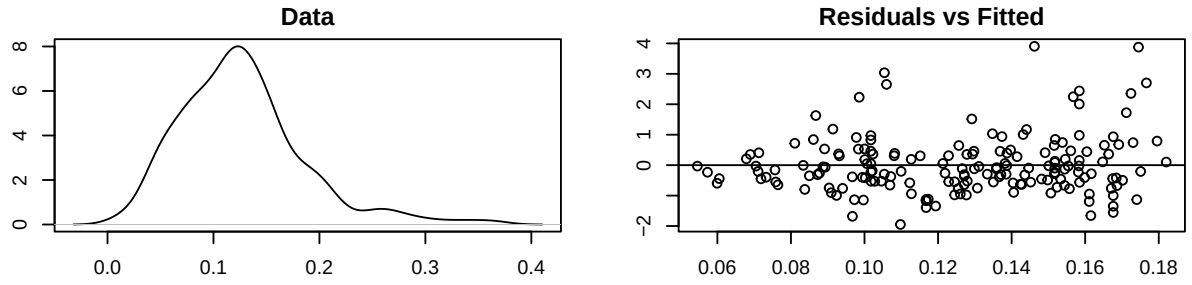
The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	0.1230	0.000
Creek 661	661-05	after	6	0.0480	0.000
Creek 661	661-10	before	47	0.1400	0.000
Creek 661	661-10	after	9	0.1040	0.000
Creek 661	661-20	before	15	0.1460	0.000
Creek 661	661-20	after	6	0.0945	0.000
Creek 661	661-01	before	3	0.0670	0.000
Creek 661	661-01	after	9	0.0630	0.000
Creek 661	705-05	before	15	0.1480	0.000
Creek 661	705-05	after	6	0.1395	0.000
Creek 661	705-10	before	28	0.0830	7.143

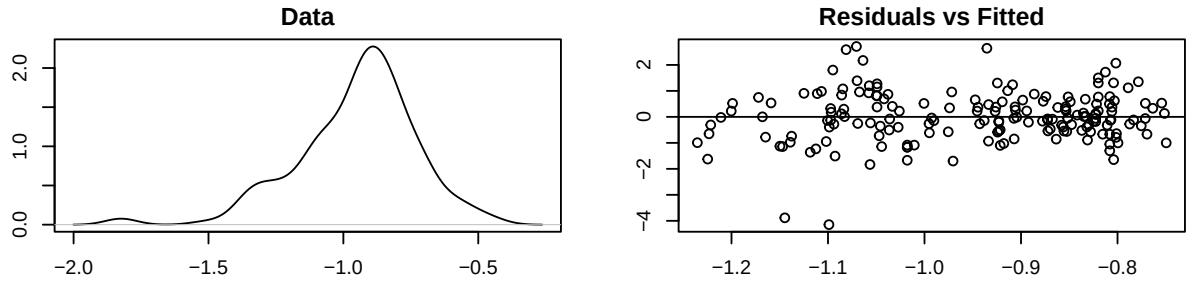
2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.

Natural Scale Model



Log−10 Transformed Model



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	661-05	2018	8	monit	before	0.336	0.1462	3.904	0
Creek 661	661-10	2017	9	monit	before	0.363	0.1745	3.877	0
Creek 661	661-01	2023	2	control	after	0.253	0.1054	3.036	0

Outliers on log scale:

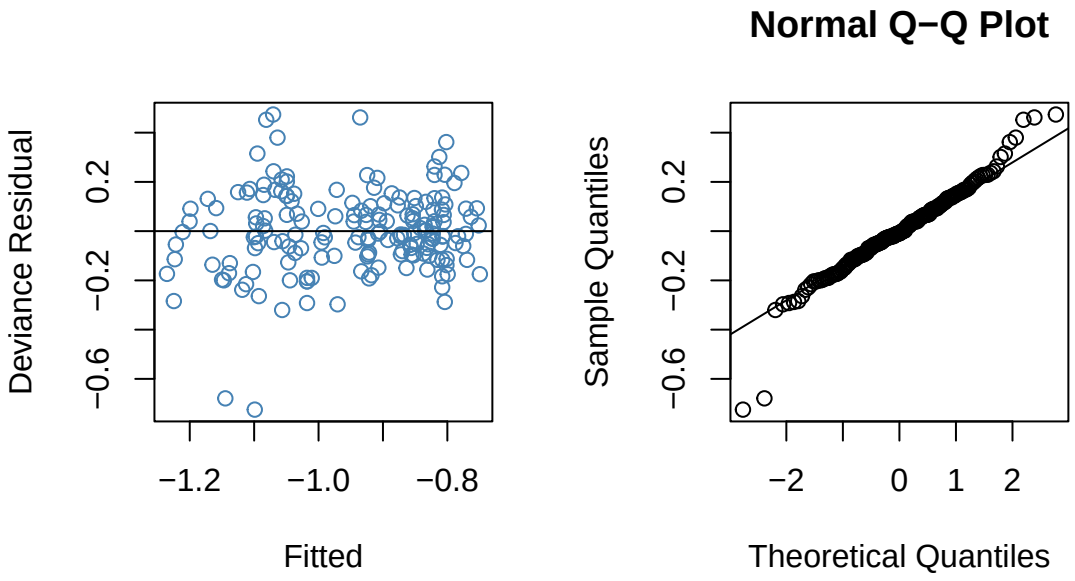
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	705-10	2018	8	control	before	-1.824	-1.099	-4.147	1
Creek 661	705-10	2018	9	control	before	-1.824	-1.145	-3.885	1

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0000	0.0000	1	4.014	0.0003	0.987	
period	0.0769	0.0769	1	65.876	2.5177	0.117	
class:period	0.3024	0.3024	1	156.345	9.8971	0.002	0.49

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

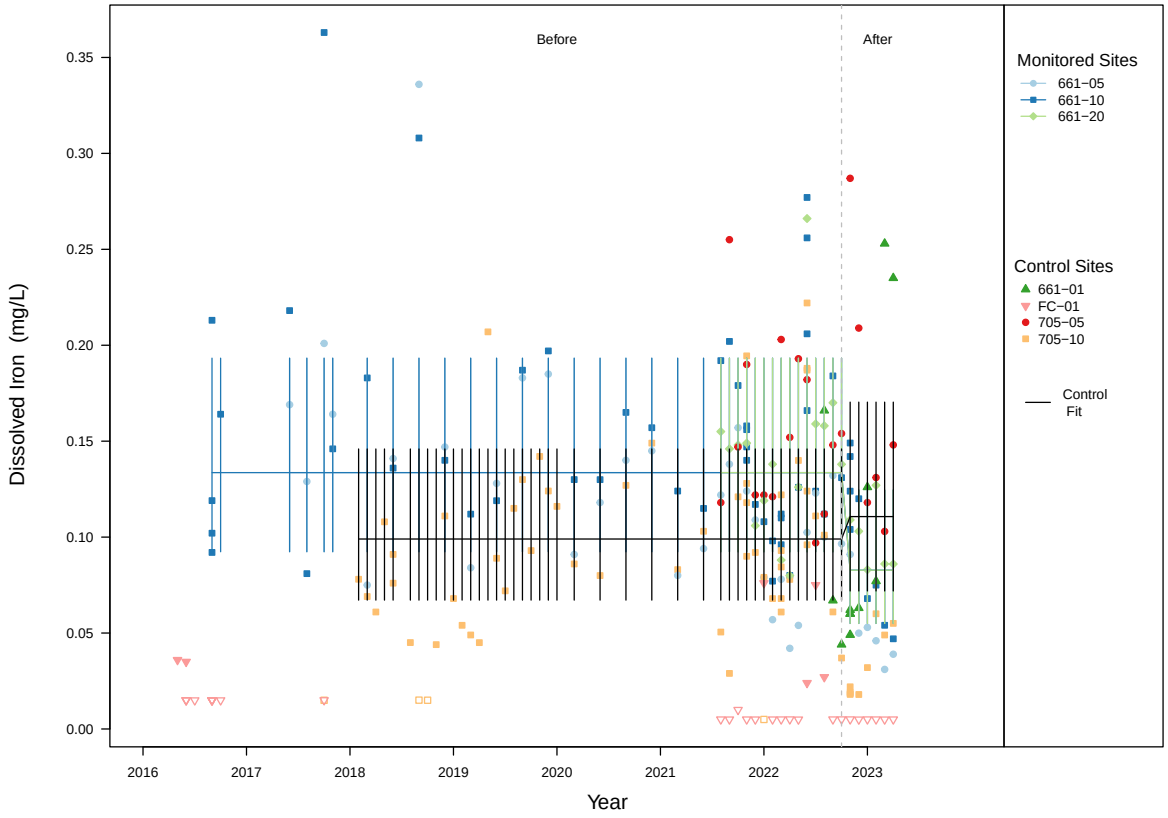
Monitored vs:	Estimate	Significance
control sites	-0.2565	not significant

Conclusion:

The change in Dissolved Iron concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.49) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

Final Summary Table

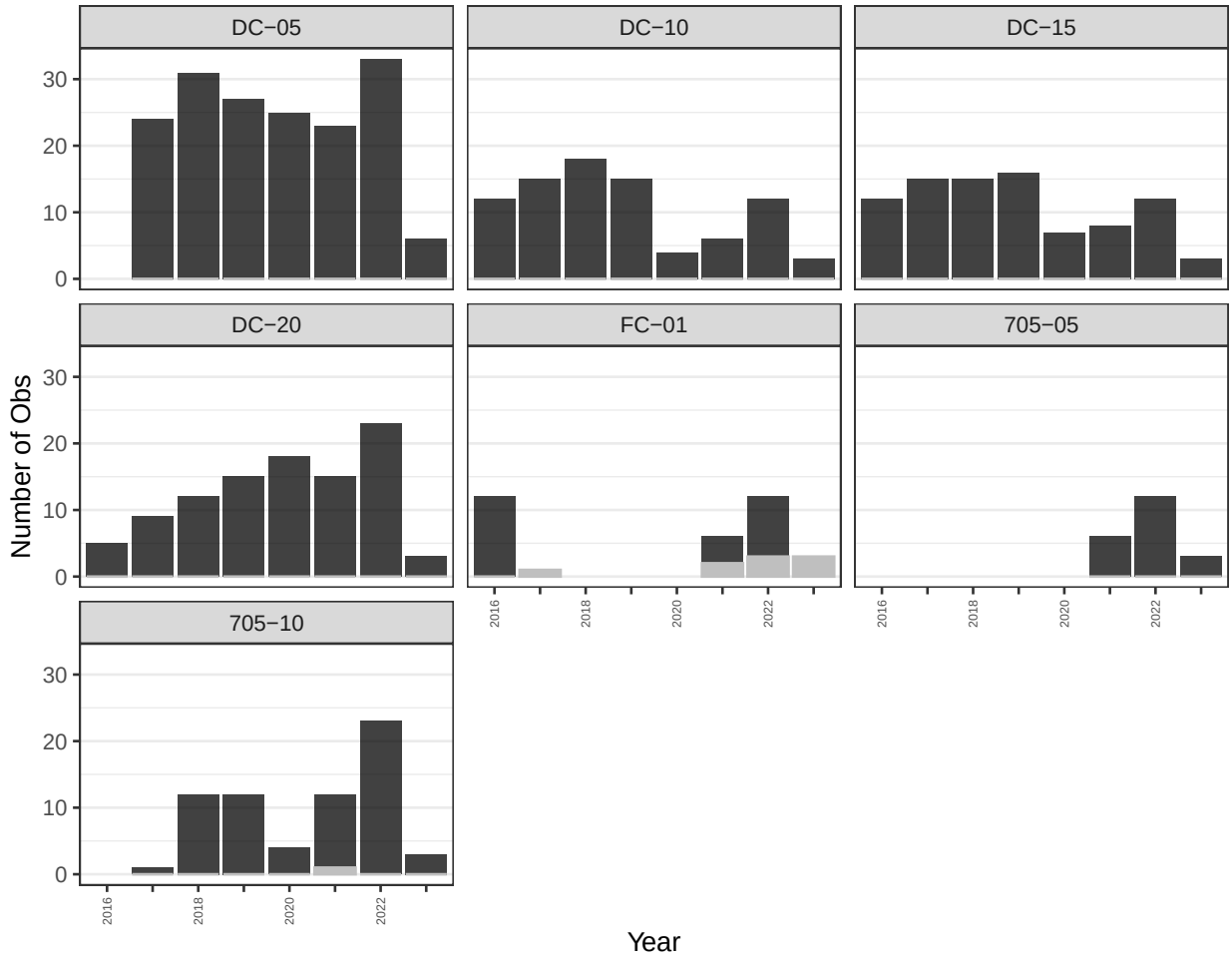
Variable	Dissolved Iron
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.28 Dissolved Manganese

1 Davidson Creek

1.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

Watershed	Site	Year	Class	Period	#Obs Removed
Davidson Creek	FC-01	2017	control	before	1
Davidson Creek	FC-01	2023	control	after	3

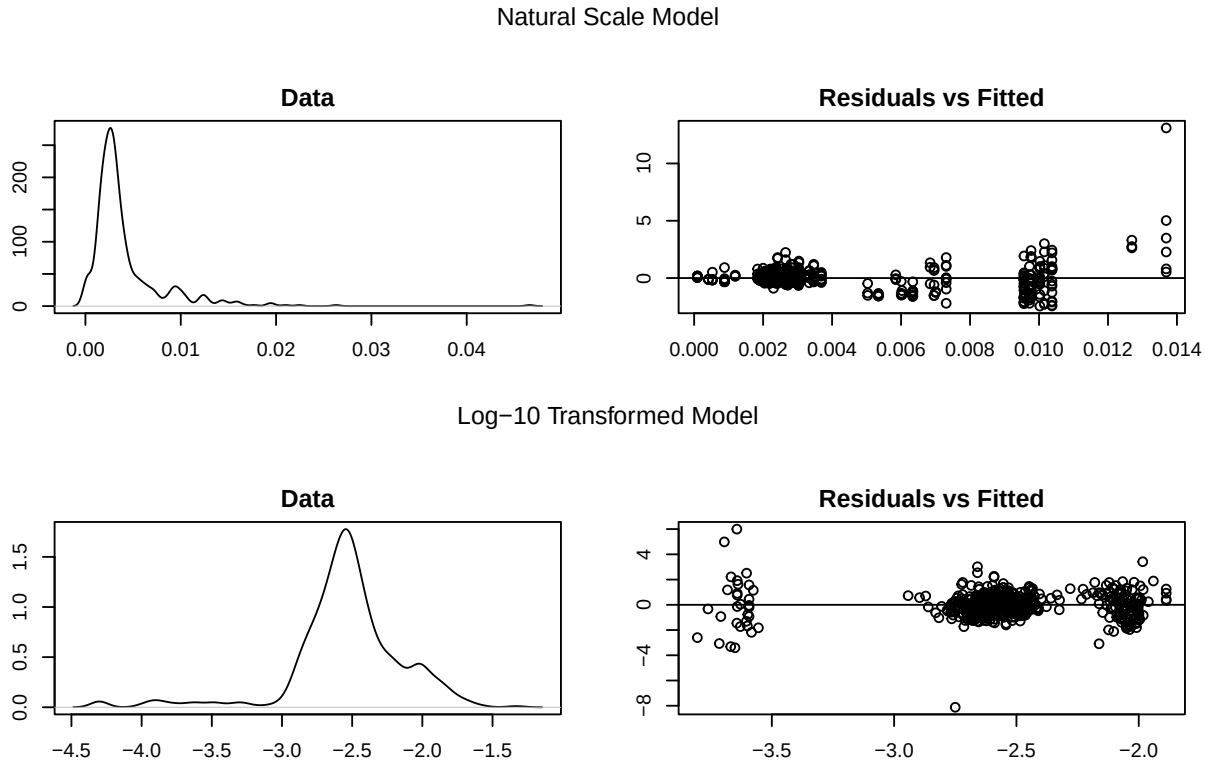
1.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Davidson Creek	DC-05	before	154	0.0028	0.000
Davidson Creek	DC-05	after	15	0.0024	0.000
Davidson Creek	DC-10	before	79	0.0023	0.000
Davidson Creek	DC-10	after	6	0.0024	0.000
Davidson Creek	DC-15	before	82	0.0031	0.000
Davidson Creek	DC-15	after	6	0.0039	0.000
Davidson Creek	DC-20	before	91	0.0090	0.000
Davidson Creek	DC-20	after	9	0.0196	0.000
Davidson Creek	FC-01	before	27	0.0002	14.815
Davidson Creek	FC-01	after	3	0.0001	33.333
Davidson Creek	705-05	before	15	0.0071	0.000
Davidson Creek	705-05	after	6	0.0061	0.000
Davidson Creek	705-10	before	58	0.0021	1.724
Davidson Creek	705-10	after	9	0.0014	0.000

1.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	DC-20	2022	12	monit	after	0.0466	0.0137	13.095	0
Davidson Creek	DC-20	2022	11	monit	after	0.0263	0.0137	5.018	0
Davidson Creek	DC-20	2022	10	monit	after	0.0225	0.0137	3.486	0
Davidson Creek	DC-20	2023	2	monit	after	0.0210	0.0127	3.306	0
Davidson Creek	DC-20	2017	8	monit	before	0.0177	0.0102	3.002	0

Outliers on log scale:

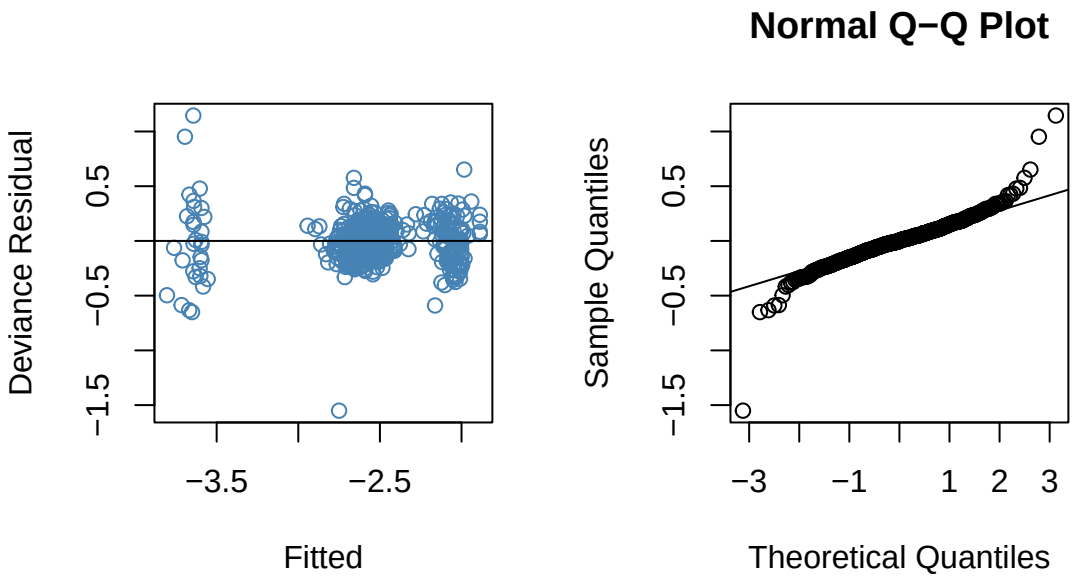
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Davidson Creek	705-10	2021	12	control	before	-4.301	-2.750	-8.121	1
Davidson Creek	FC-01	2022	6	control	before	-2.498	-3.643	5.999	0
Davidson Creek	FC-01	2021	12	control	before	-2.742	-3.694	4.985	0
Davidson Creek	DC-20	2022	12	monit	after	-1.332	-1.984	3.414	0
Davidson Creek	FC-01	2021	11	control	before	-4.301	-3.651	-3.405	1
Davidson Creek	FC-01	2022	2	control	before	-4.301	-3.668	-3.314	1
Davidson Creek	705-05	2022	6	control	before	-2.752	-2.162	-3.089	0
Davidson Creek	FC-01	2022	3	control	before	-4.301	-3.715	-3.070	1
Davidson Creek	705-10	2022	5	control	before	-2.083	-2.659	3.018	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

1.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0608	0.0608	1	5.035	1.6669	0.253	
period	0.0184	0.0184	1	122.376	0.5054	0.478	
class:period	0.5177	0.5177	1	540.026	14.1964	<0.001	0.07

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in DC-05, DC-10, DC-15, DC-20 and control sites, with p value adjusted for multiple comparisons:

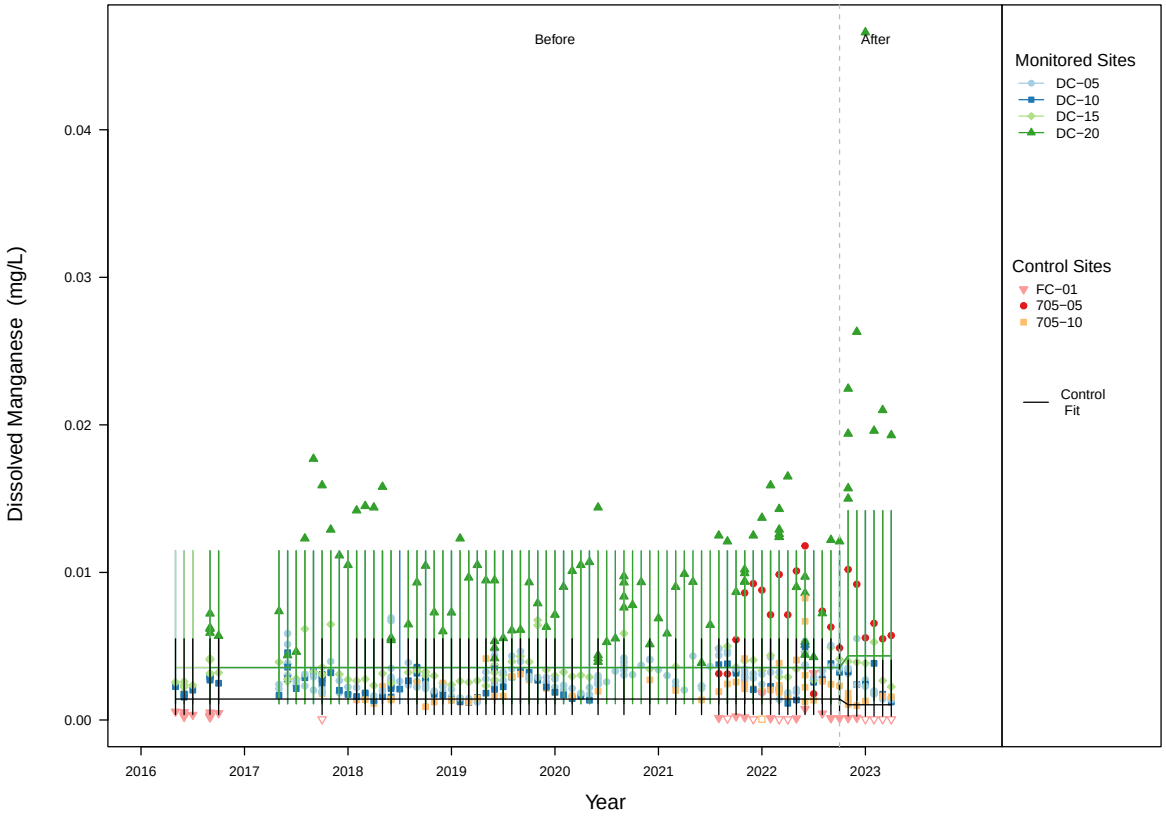
Monitored vs:	Estimate	Significance
control sites	0.2267	not significant

Conclusion:

The change in Dissolved Manganese concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.07) different from the change at the control sites, according to the test on the BACI term (*class:period*).

1.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

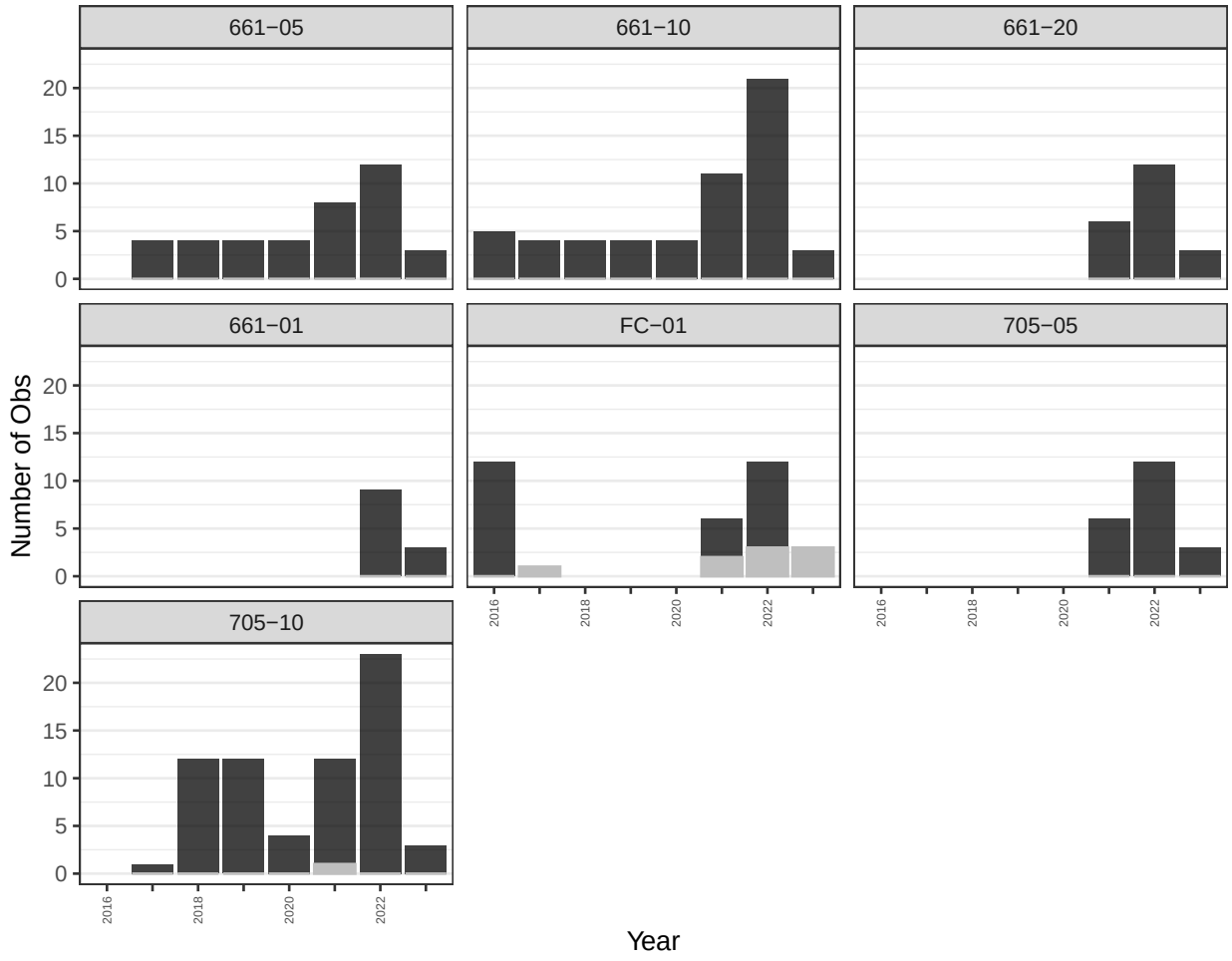
Final Summary Table

Variable	Dissolved Manganese
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

2 Creek 661

2.1 Censored Data

The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Observations at or below the analytical detection limit were considered censored. Data were excluded from the analysis if greater than 70% of observations from a site in a sampling year were censored. If more than 10% of observations from a site in a sampling year were censored, data were flagged to caution interpretation of results. The following observations were excluded:

Watershed	Site	Year	Class	Period	#Obs Removed
Creek 661	FC-01	2017	control	before	1
Creek 661	FC-01	2023	control	after	3

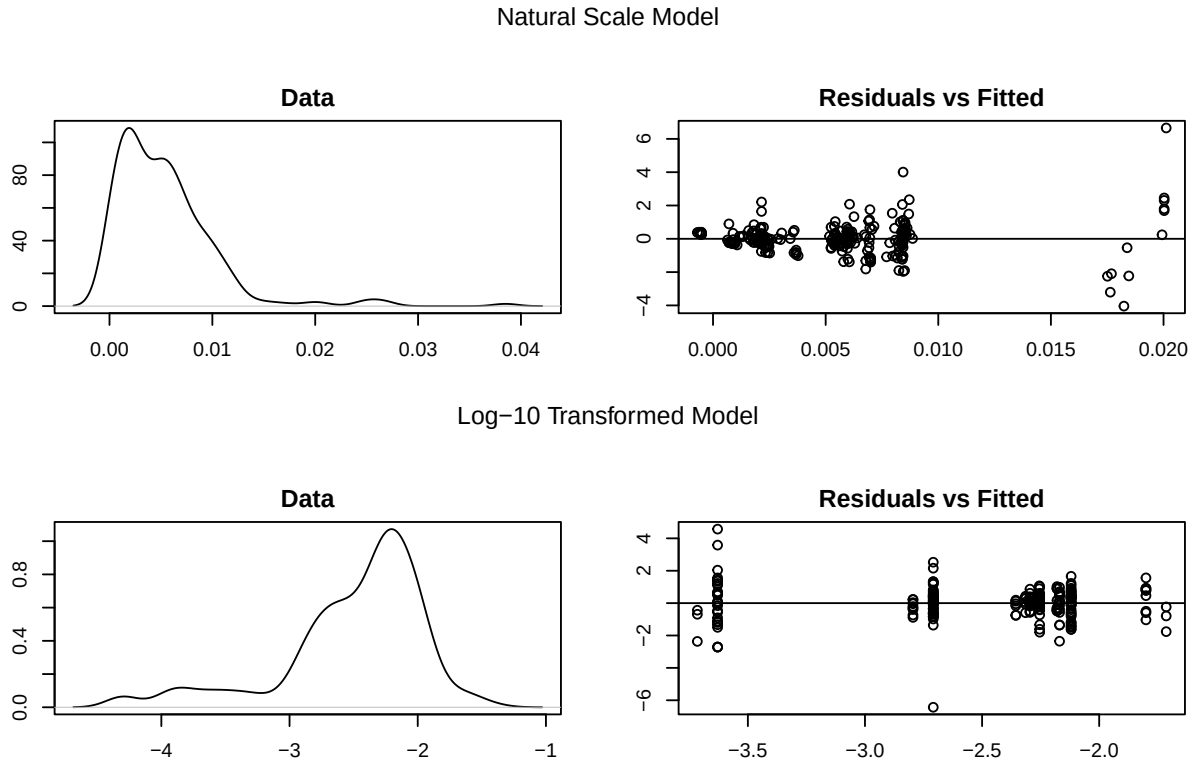
2.2 Sample Sizes for Modelling

The remaining sample sizes per site and period are summarised in the table below.

Watershed	Site	Period	N	Median	% Censored
Creek 661	661-05	before	33	0.0058	0.000
Creek 661	661-05	after	6	0.0054	0.000
Creek 661	661-10	before	47	0.0087	0.000
Creek 661	661-10	after	9	0.0056	0.000
Creek 661	661-20	before	15	0.0053	0.000
Creek 661	661-20	after	6	0.0042	0.000
Creek 661	661-01	before	3	0.0123	0.000
Creek 661	661-01	after	9	0.0247	0.000
Creek 661	FC-01	before	27	0.0002	14.815
Creek 661	FC-01	after	3	0.0001	33.333
Creek 661	705-05	before	15	0.0071	0.000
Creek 661	705-05	after	6	0.0061	0.000
Creek 661	705-10	before	58	0.0021	1.724
Creek 661	705-10	after	9	0.0014	0.000

2.3 Initial Model Fit

Initially a model was fit to all sites to assess the need for transformations.



Outliers

The following is a summary of outliers identified (if any) using preliminary regression models. All data points were plotted in the summary figures. The analysis needs to be interpreted with care and in conjunction with graphical displays if large outliers are present.

Outliers on natural scale:

Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	661-01	2022	11	control	after	0.0385	0.0201	6.656	0
Creek 661	661-01	2022	7	control	before	0.0071	0.0182	-4.042	0
Creek 661	661-10	2022	5	monit	before	0.0195	0.0084	4.006	0
Creek 661	661-01	2023	2	control	after	0.0088	0.0176	-3.207	0

Outliers on log scale:

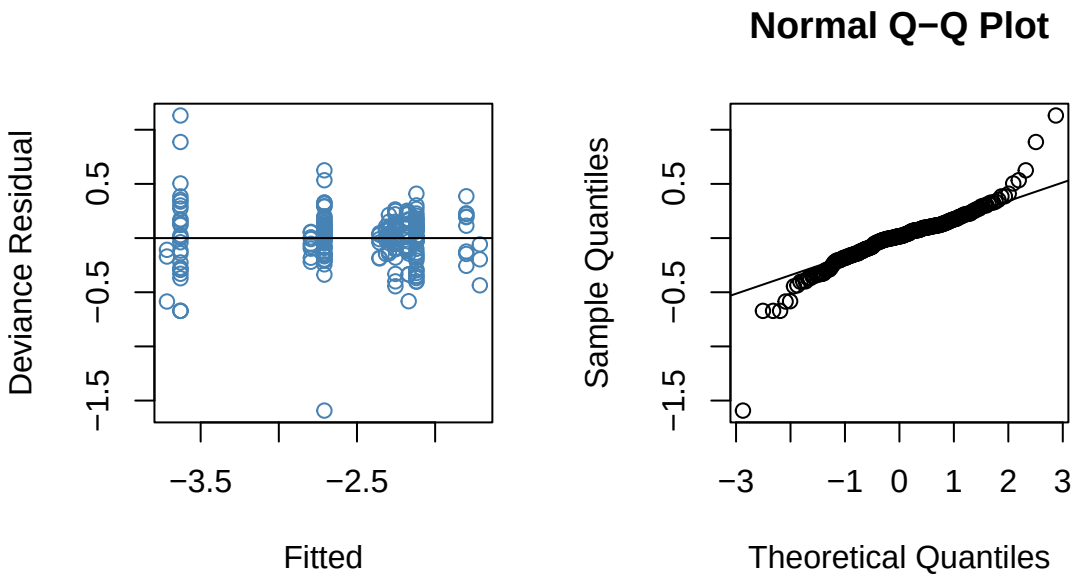
Watershed	Site	Year	Month	Class	Period	Value	Fitted	Std. Resid	DL flag
Creek 661	705-10	2021	12	control	before	-4.301	-2.708	-6.431	1
Creek 661	FC-01	2022	6	control	before	-2.498	-3.629	4.570	0
Creek 661	FC-01	2021	12	control	before	-2.742	-3.629	3.582	0

Based on examination of the residuals, the log-10 transformed data were selected for analysis.

2.4 Before-After Control-Impact Linear Modeling

Models were fit separately to compare each monitored site with control sites.

Plot of Standardized Residuals and Fitted Values



Results of the ANOVA test on the fixed effects of the model:

	Sum Sq.	Mean Sq.	NumDF	DenDF	F value	*p*	*p adjusted*
class	0.0301	0.0301	1	5.01	0.4911	0.515	
period	0.1608	0.1608	1	66.86	2.6234	0.110	
class:period	0.0057	0.0057	1	235.20	0.0936	0.760	0.49

Summary of BACI contrasts for relative difference between changes from the *before* to *after* in 661-05, 661-10, 661-20 and control sites, with p value adjusted for multiple comparisons:

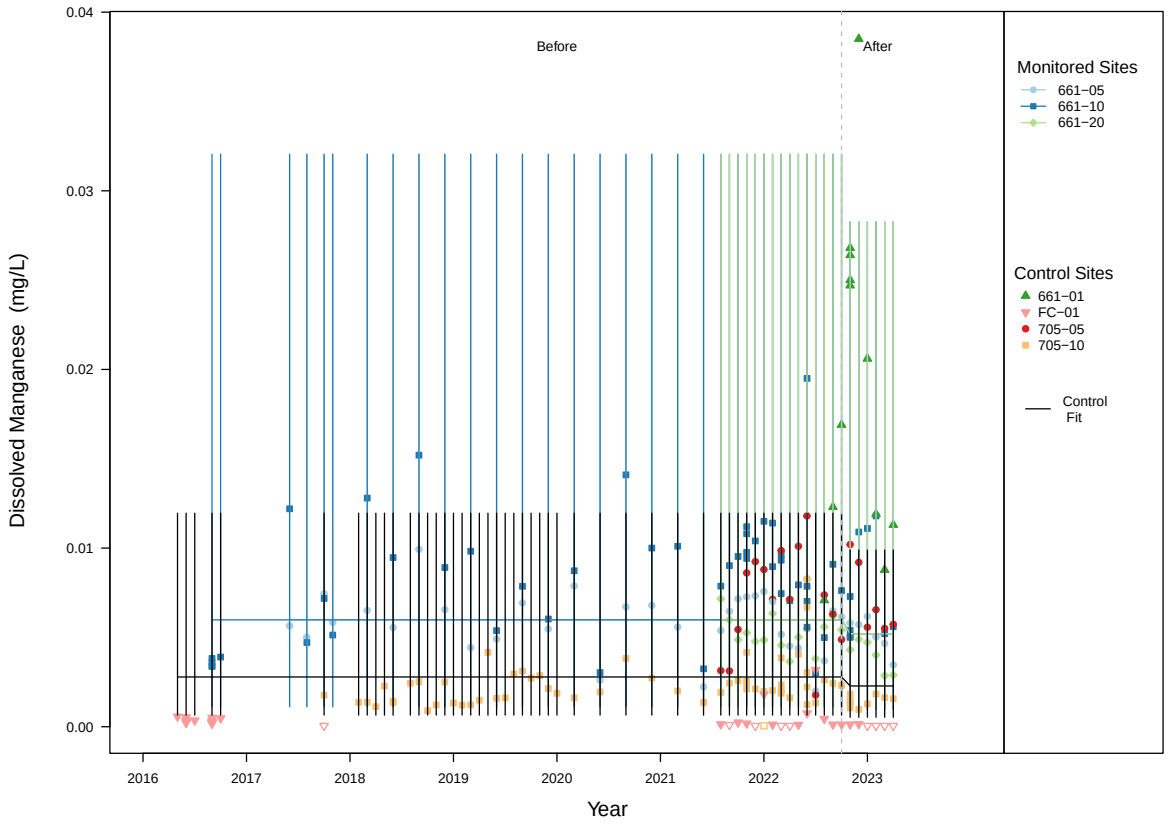
Monitored vs:	Estimate	Significance
control sites	0.026	not significant

Conclusion:

The change in Dissolved Manganese concentrations at the monitored sites from *before* to *after* was not significantly (*adjusted p =* 0.49) different from the change at the control sites, according to the test on the BACI term (*class:period*).

2.5 Model Summary

The overall performance of the model is shown in the plot below. All the observations are plotted along with the model estimates. The model fitted values and 95% confidence intervals are indicated as lines and errors.



Note: Open symbols represent cases where the results were below the sample detection limit. Fitted values are based on the class by period from the model. Error bars indicate 95% confidence intervals. Modelled log-transformed values were converted back to natural scale.

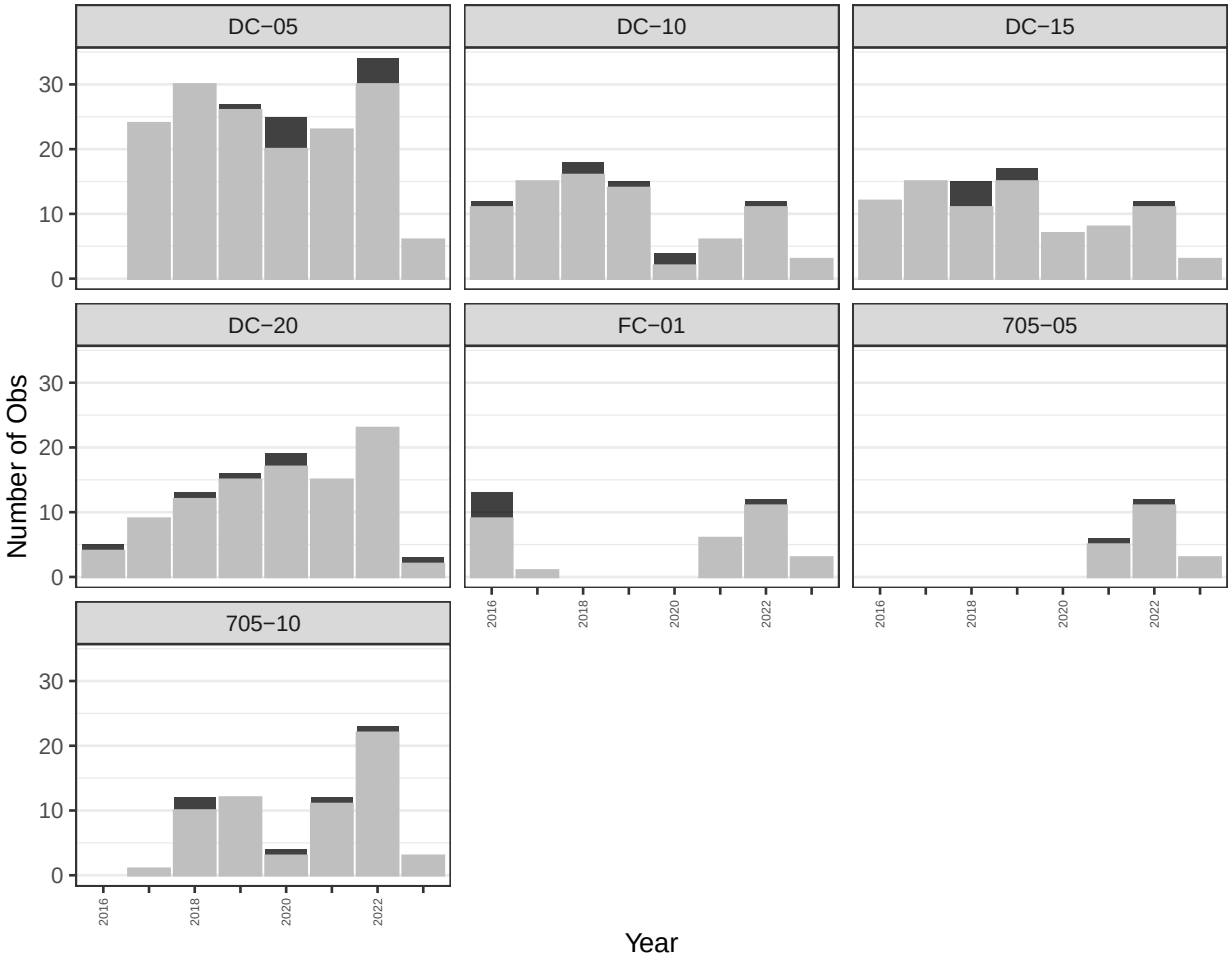
Final Summary Table

Variable	Dissolved Manganese
Watershed	Creek 661
Waterbody	Stream
Streams Removed	None
Data Transformation	Log-10 transformed
Model Type	Linear Mixed Effects Regression
Is BACI significant	FALSE

C-2.1.29 Dissolved Zinc

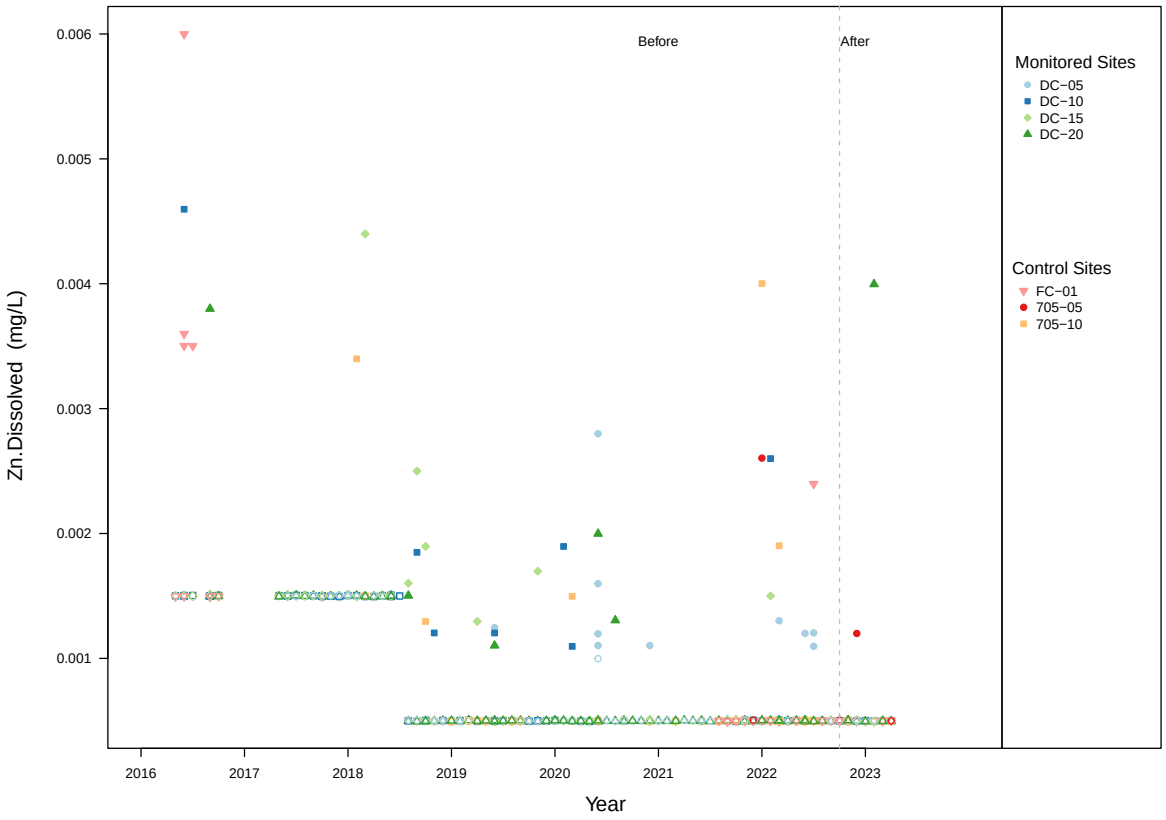
1 Davidson Creek

1.1 Censored Data The following charts indicate the number of measurements taken in each year from each stream that were below the detection limit (light gray) or above the detection limit (dark gray).



Conclusion:

Statistical analyses were not conducted of the censoring or availability of observations. Below is a summary figure of all observations in the dataset.



Note: Open symbols represent cases where the results were below the sample detection limit.

Final Summary Table

Variable	Zn.Dissolved
Watershed	Davidson Creek
Waterbody	Stream
Streams Removed	All Excluded
Data Transformation	N/A
Model Type	N/A
Benchmark	None
Significant BACI term	N/A

Appendix C-3a: Comparison of Average Monthly Water Quality and Predictions for DC-15 in Davidson Creek

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	0.52	0.54	0.55	0.54	0.56	0.53	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.07	0.07	0.07	0.07	0.07	0.09	0.045	0.050	0.042	0.050	0.051	0.056
Sulphate	19	19	18	19	19	30	2.4	3.1	3.0	3.1	3.3	3.4
Nutrients												
Ammonia-N	0.24	0.24	0.23	0.23	0.23	0.24	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate-N	0.7	0.6	0.5	0.1	0.0	0.2	0.003	0.022	0.034	0.035	0.037	0.044
Nitrite-N	0.002	0.002	0.004	0.003	0.003	0.003	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.022	0.021	0.022	0.022	0.022	0.066	0.006	0.004	0.007	0.008	0.008	0.009
Orthophosphate	0.019	0.006	0.006	0.006	0.006	0.052	0.004	0.005	0.005	0.006	0.006	0.006
Cyanides												
Total Cyanide	0.0034	0.0034	0.0034	0.0034	0.0034	0.0033	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0014	0.0014	0.0012	0.0020	0.0014	0.0016	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals												
Aluminum	0.05	0.05	0.060	0.05	0.05	0.043	0.012	0.012	0.017	0.011	0.009	0.008
Antimony	0.0001	0.0001	0.0001	0.0001	0.0001	0.0006	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0005	0.0005	0.0005	0.0005	0.0005	0.0007	0.0006	0.0005	0.0006	0.0005	0.0006	0.0006
Barium	0.0072	0.0073	0.0077	0.0076	0.0074	0.0090	0.0093	0.0088	0.0099	0.0083	0.0086	0.0088
Beryllium	0.000057	0.000055	0.000051	0.000050	0.000050	0.000050	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.002	0.002	0.002	0.002	0.002	0.003	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000010	0.000010	0.000014	0.000010	0.000010	0.000010	0.000003	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00023	0.00024	0.00021	0.00019	0.00019	0.00019	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00026	0.00027	0.00025	0.00026	0.00026	0.00026	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00044	0.00045	0.00048	0.00047	0.00047	0.00048	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.115	0.122	0.13	0.085	0.085	0.08	0.035	0.028	0.033	0.024	0.021	0.019
Lead	0.00030	0.00022	0.00009	0.00007	0.00008	0.00007	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.001	0.001	0.001	0.001	0.001	0.003	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.068	0.070	0.068	0.069	0.069	0.063	0.0058	0.0053	0.0068	0.0061	0.0040	0.0032
Mercury	0.000003	0.000003	0.000003	0.000003	0.000003	0.000004	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.0008	0.0008	0.0008	0.0008	0.0008	0.0021	0.00095	0.00087	0.00090	0.00094	0.00096	0.00098
Nickel	0.00035	0.00034	0.00029	0.00028	0.00028	0.00029	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.00028	0.00029	0.00028	0.00028	0.00028	0.00028	0.000025	0.000025	0.000058	0.000054	0.000056	0.000063
Silver	0.000028	0.000027	0.000025	0.000025	0.000025	0.000025	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.10	0.10	0.10	0.10	0.10	0.13	0.110	0.102	0.116	0.105	0.108	0.106
Thallium	0.000026	0.000026	0.000025	0.000025	0.000025	0.000025	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00016	0.00016	0.00016	0.00019	0.00018	0.00019	0.00025	0.00024	0.00027	0.00031	0.00029	0.00031
Vanadium	0.0007	0.0005	0.0003	0.0002	0.0002	0.0003	0.0005	0.0003	0.0006	0.0003	0.0003	0.0003
Zinc	0.0057	0.0061	0.0059	0.0058	0.0063	0.0056	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.024	0.022	0.021	0.022	0.022	0.019	0.007	0.006	0.005	0.007	0.005	0.005
Cadmium	0.000010	0.000009	0.000009	0.000009	0.000009	0.000009	0.000003	0.000003	0.0000025	0.000003	0.000003	0.0000030
Copper	0.00029	0.00031	0.00031	0.00031	0.00031	0.00031	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.07	0.069	0.052	0.04	0.038	0.036	0.026	0.015	0.014	0.014	0.005	0.012
Manganese	0.20	0.215	0.192	0.18	0.191	0.183	0.0040	0.0039	0.00384	0.0053	0.0027	0.00225
Zinc	0.0053	0.0055	0.0052	0.0053	0.0059	0.0052	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L.

[1] *95th percentile concentration predicted in environmental assessment at WQ26 in Construction and Operations phases (ERM 2016b).*

Appendix C-3b: Comparison of Average Monthly Water Quality and Predictions for DC-20 in Davidson Creek

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	0.48	0.50	0.53	0.51	0.53	0.49	0.25	0.25	0.25	0.25	0.25	0.52
Fluoride	0.06	0.06	0.07	0.07	0.07	0.08	0.045	0.050	0.042	0.052	0.050	0.058
Sulphate	16	16	16	16	16	26	2.4	3.1	3.0	2.9	3.1	3.1
Nutrients												
Ammonia-N	0.20	0.20	0.20	0.20	0.20	0.20	0.0025	0.0025	0.0025	0.0025	0.0051	0.0025
Nitrate-N	0.6	0.5	0.4	0.0	0.0	0.2	0.003	0.022	0.034	0.035	0.025	0.037
Nitrite-N	0.002	0.002	0.004	0.003	0.003	0.002	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.019	0.019	0.020	0.021	0.020	0.059	0.006	0.004	0.007	0.025	0.013	0.008
Orthophosphate	0.023	0.006	0.005	0.006	0.005	0.044	0.004	0.005	0.005	0.003	0.004	0.004
Cyanides												
Total Cyanide	0.0032	0.0033	0.0033	0.0033	0.0033	0.0032	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0017	0.0017	0.0015	0.0021	0.0016	0.0019	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals												
Aluminum	0.04	0.05	0.064	0.05	0.05	0.039	0.012	0.012	0.017	0.113	0.070	0.010
Antimony	0.0001	0.0001	0.0001	0.0001	0.0001	0.0005	0.000050	0.000050	0.000050	0.000200	0.000050	0.000050
Arsenic	0.0005	0.0005	0.0005	0.0005	0.0005	0.0006	0.0006	0.0005	0.0006	0.0007	0.0006	0.0004
Barium	0.0074	0.0075	0.0081	0.0081	0.0080	0.0091	0.0093	0.0088	0.0099	0.0117	0.0096	0.0087
Beryllium	0.000055	0.000053	0.000051	0.000050	0.000050	0.000050	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.002	0.001	0.001	0.001	0.001	0.002	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000010	0.000009	0.000016	0.000010	0.000017	0.000009	0.000003	0.0000025	0.0000025	0.000010	0.0000081	0.0000030
Chromium	0.00021	0.00022	0.00021	0.00018	0.00022	0.00019	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00022	0.00023	0.00023	0.00023	0.00022	0.00023	0.00005	0.00005	0.00005	0.00011	0.00005	0.00005
Copper	0.00036	0.00040	0.00045	0.00043	0.00047	0.00044	0.00025	0.00025	0.00025	0.00055	0.00025	0.00025
Iron	0.127	0.136	0.15	0.097	0.094	0.09	0.035	0.028	0.033	0.468	0.265	0.132
Lead	0.00022	0.00016	0.00008	0.00007	0.00007	0.00007	0.000025	0.000025	0.000025	0.000092	0.000025	0.000025
Lithium	0.001	0.001	0.001	0.001	0.001	0.003	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.060	0.062	0.062	0.064	0.062	0.056	0.0058	0.0053	0.0068	0.0408	0.0320	0.0207
Mercury	0.000003	0.000003	0.000003	0.000003	0.000003	0.000004	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.0007	0.0007	0.0008	0.0008	0.0008	0.0019	0.00095	0.00087	0.00090	0.00093	0.00090	0.00092
Nickel	0.00027	0.00029	0.00028	0.00025	0.00027	0.00028	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.00029	0.00029	0.00029	0.00028	0.00028	0.00028	0.000025	0.000025	0.000058	0.000080	0.000055	0.000086
Silver	0.000027	0.000026	0.000025	0.000025	0.000025	0.000025	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.09	0.09	0.10	0.10	0.10	0.13	0.110	0.102	0.116	0.110	0.103	0.109
Thallium	0.000026	0.000026	0.000025	0.000025	0.000025	0.000025	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00016	0.00016	0.00017	0.00020	0.00019	0.00022	0.00025	0.00024	0.00027	0.00033	0.00035	0.00036
Vanadium	0.0006	0.0004	0.0003	0.0002	0.0002	0.0003	0.0005	0.0003	0.0006	0.0010	0.0006	0.0003
Zinc	0.0049	0.0060	0.0059	0.0067	0.0102	0.0055	0.0015	0.0015	0.0015	0.0071	0.0015	0.0015
Dissolved Metals												
Aluminum	0.021	0.020	0.019	0.019	0.019	0.017	0.007	0.006	0.005	0.006	0.005	0.005
Cadmium	0.000009	0.000009	0.000009	0.000010	0.000009	0.000008	0.000003	0.000003	0.0000025	0.000006	0.000003	0.0000030
Copper	0.00024	0.00026	0.00029	0.00028	0.00035	0.00028	0.00010	0.00010	0.00010	0.00040	0.00010	0.00010
Iron	0.09	0.082	0.058	0.04	0.042	0.041	0.026	0.015	0.014	0.080	0.090	0.090
Manganese	0.17	0.178	0.162	0.16	0.160	0.152	0.0040	0.0039	0.00384	0.0196	0.0210	0.01930
Zinc	0.0046	0.0048	0.0051	0.0054	0.0075	0.0051	0.00050	0.0005	0.00050	0.00400	0.0005	0.00050

Notes:
Concentrations in mg/L.

[1] *95th percentile concentration predicted in environmental assessment at WQ7 in Construction and Operations phases (ERM 2016b).*

Appendix C-3c: Comparison of Average Monthly Water Quality and Predictions for 661-10 in Creek 661

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	0.52	0.70	0.69	0.50	0.61	0.57	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.068	0.059	0.069	0.069	0.075	0.075	0.054	0.059	0.065	0.047	0.053	0.061
Sulphate	46.1	60.3	39.8	37.9	40.4	44.7	1.0	1.3	1.3	1.5	2.1	2.2
Nutrients												
Ammonia-N	0.662	0.8786	0.538	0.537	0.5732	0.637	0.0058	0.0025	0.0051	0.0062	0.0025	0.0025
Nitrate-N	0.014	0.038	0.067	0.053	0.046	0.040	0.013	0.054	0.059	0.045	0.037	0.043
Nitrite-N	0.0017	0.0017	0.0114	0.0036	0.0050	0.0018	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.040	0.044	0.030	0.044	0.055	0.045	0.051	0.050	0.055	0.028	0.024	0.026
Orthophosphate	0.026	0.022	0.017	0.019	0.020	0.019	0.044	0.040	0.040	0.020	0.019	0.023
Cyanides												
Total Cyanide	0.0044	0.0050	0.0040	0.0040	0.0041	0.0043	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0027	0.0028	0.0027	0.0027	0.0027	0.0027	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals												
Aluminum	0.047	0.052	0.054	0.054	0.091	0.047	0.031	0.039	0.058	0.064	0.046	0.037
Antimony	0.00014	0.00018	0.00014	0.00012	0.00013	0.00015	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0010	0.0012	0.0008	0.0012	0.0012	0.0012	0.0015	0.0013	0.0013	0.0010	0.0010	0.0010
Barium	0.0053	0.0060	0.0065	0.0056	0.0059	0.0054	0.0048	0.0045	0.0051	0.0051	0.0047	0.0046
Beryllium	0.000062	0.000060	0.000052	0.000050	0.000050	0.000050	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0045	0.0026	0.0023	0.0023	0.0014	0.0023	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000010	0.000023	0.000027	0.000033	0.000022	0.000020	0.000003	0.0000025	0.0000025	0.000010	0.0000082	0.0000057
Chromium	0.00073	0.00087	0.00053	0.00083	0.00104	0.00095	0.00073	0.00093	0.00089	0.00060	0.00051	0.00025
Cobalt	0.000684	0.00090	0.000560	0.000540	0.00061	0.000656	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00023	0.00038	0.00028	0.00351	0.00030	0.00017	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.11	0.13	0.17	0.13	0.19	0.12	0.160	0.151	0.170	0.145	0.104	0.093
Lead	0.000427	0.000435	0.000160	0.000415	0.000112	0.000082	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.0006	0.0006	0.0005	0.0007	0.0005	0.0005	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.147	0.199	0.136	0.120	0.141	0.148	0.0107	0.0100	0.0119	0.0171	0.0084	0.0079
Mercury	0.0000056	0.0000034	0.0000033	0.0000033	0.0000033	0.0000033	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00130	0.00156	0.00132	0.00133	0.00135	0.00144	0.00086	0.00082	0.00088	0.00070	0.00068	0.00071
Nickel	0.00026	0.00032	0.00024	0.00019	0.00021	0.00020	0.00025	0.00059	0.00025	0.00025	0.00025	0.00025
Selenium	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.000071	0.000078	0.000072	0.000062	0.000025	0.000025
Silver	0.000029	0.000029	0.000026	0.000025	0.000025	0.000025	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.099	0.109	0.112	0.105	0.104	0.106	0.088	0.082	0.085	0.071	0.068	0.070
Thallium	0.000027	0.000027	0.000025	0.000025	0.000025	0.000025	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.000257	0.000297	0.000234	0.000276	0.000301	0.000295	0.00020	0.00020	0.00023	0.00016	0.00014	0.00014
Vanadium	0.00181	0.00161	0.00073	0.00150	0.00169	0.00153	0.0019	0.0018	0.0019	0.0013	0.0011	0.0011
Zinc	0.0121	0.0169	0.0098	0.0157	0.0122	0.0134	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.030	0.039	0.04	0.034	0.028	0.03	0.011	0.009	0.012	0.021	0.021	0.019
Cadmium	0.000010	0.000019	0.000021	0.000020	0.000017	0.000016	0.000003	0.000003	0.0000025	0.000009	0.000012	0.0000030
Copper	0.00022	0.00034	0.00028	0.00021	0.00020	0.00017	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.07	0.08	0.10	0.07	0.06	0.05	0.091	0.050	0.053	0.075	0.054	0.047
Manganese	0.144	0.190	0.131	0.117	0.124	0.138	0.0058	0.0057	0.00618	0.0118	0.0052	0.00560
Zinc	0.0121	0.0164	0.00950	0.0139	0.0119	0.01232	0.00050	0.0005	0.00050	0.00210	0.0016	0.00140

Notes:

Concentrations in mg/L.

[1] *95th percentile concentration predicted in environmental assessment at WQ5_US in Construction and Operations phases (ERM 2016b).*

Appendix C-3d: Comparison of Average Monthly Water Quality and Predictions for 661-20 in Creek 661

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	0.33	0.37	0.39	0.39	0.40	0.39	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.051	0.055	0.057	0.056	0.057	0.057	0.047	0.049	0.049	0.056	0.060	0.068
Sulphate	7.3	8.2	9.1	9.9	10.8	10.3	0.9	1.3	1.6	2.5	2.6	2.6
Nutrients												
Ammonia-N	0.100	0.1119	0.123	0.136	0.1504	0.142	0.0025	0.0025	0.0084	0.0074	0.0025	0.0025
Nitrate-N	0.019	0.065	0.069	0.068	0.069	0.068	0.003	0.003	0.051	0.078	0.049	0.052
Nitrite-N	0.0015	0.0015	0.0031	0.0018	0.0019	0.0015	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.0190	0.017	0.012	0.0124	0.014	0.012	0.023	0.026	0.023	0.029	0.025	0.024
Orthophosphate	0.0184	0.0159	0.0145	0.0147	0.0148	0.0147	0.015	0.018	0.013	0.023	0.021	0.023
Cyanides												
Total Cyanide	0.0028	0.0028	0.0028	0.0029	0.0029	0.0029	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0025	0.0025	0.0025	0.0025	0.0026	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals												
Aluminum	0.054	0.087	0.089	0.090	0.092	0.091	0.048	0.053	0.036	0.023	0.029	0.023
Antimony	0.000045	0.000066	0.000070	0.000072	0.000075	0.000073	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.00052	0.00072	0.00064	0.00067	0.00068	0.00067	0.0011	0.0010	0.0009	0.0009	0.0009	0.0009
Barium	0.0045	0.0061	0.0062	0.0062	0.0062	0.0062	0.0050	0.0047	0.0051	0.0070	0.0064	0.0067
Beryllium	0.000053	0.000053	0.000050	0.000050	0.000050	0.000050	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0038	0.0027	0.0027	0.0027	0.0028	0.0028	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000008	0.000050	0.000052	0.000053	0.000053	0.000053	0.000008	0.0000085	0.0000130	0.000003	0.0000030	0.0000030
Chromium	0.00031	0.00044	0.00034	0.00037	0.00040	0.00038	0.00031	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.000121	0.000145	0.000158	0.000171	0.000186	0.000177	0.00006	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00016	0.00045	0.00046	0.00089	0.00047	0.00047	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.12	0.21	0.21	0.22	0.22	0.22	0.227	0.220	0.112	0.185	0.151	0.128
Lead	0.000132	0.000288	0.000221	0.000256	0.000229	0.000227	0.000039	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.025	0.087	0.093	0.096	0.100	0.098	0.0165	0.0204	0.0161	0.0071	0.0062	0.0057
Mercury	0.0000038	0.0000027	0.0000026	0.0000026	0.0000026	0.0000026	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00038	0.00034	0.00033	0.00033	0.00033	0.00033	0.00070	0.00064	0.00072	0.00093	0.00099	0.00097
Nickel	0.00014	0.00026	0.00027	0.00027	0.00028	0.00027	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.000025	0.000025	0.000025	0.000094	0.000060	0.000073
Silver	0.000026	0.000026	0.000025	0.000025	0.000025	0.000025	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.056	0.057	0.058	0.056	0.056	0.056	0.072	0.073	0.076	0.097	0.091	0.094
Thallium	0.000026	0.000026	0.000025	0.000025	0.000025	0.000025	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.000076	0.000086	0.000078	0.000081	0.000084	0.000083	0.00012	0.00014	0.00010	0.00035	0.00029	0.00031
Vanadium	0.00069	0.00059	0.00030	0.00036	0.00038	0.00035	0.0010	0.0010	0.0009	0.0008	0.0008	0.0007
Zinc	0.0029	0.0082	0.00853	0.0090	0.0092	0.00900	0.0020	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.042	0.072	0.07	0.074	0.076	0.08	0.015	0.016	0.015	0.010	0.012	0.008
Cadmium	0.000008	0.000036	0.000038	0.000038	0.000039	0.000039	0.000007	0.000006	0.0000062	0.000003	0.000003	0.0000030
Copper	0.00010	0.00044	0.00046	0.00046	0.00047	0.00047	0.00013	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.10	0.13	0.13	0.13	0.13	0.13	0.129	0.120	0.068	0.127	0.086	0.086
Manganese	0.024	0.030	0.033	0.036	0.039	0.037	0.0055	0.0109	0.01110	0.0040	0.0029	0.00289
Zinc	0.0029	0.0059	0.00615	0.0065	0.0067	0.00654	0.00138	0.0013	0.00210	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L.

[1] 95th percentile concentration predicted in environmental assessment at WQ5_DS in Construction and Operations phases (ERM 2016b).

Appendix C-4a: Comparison of Average Monthly Water Quality and Predictions for DC-05 in Davidson Creek

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	1.04	1.05	1.02	0.98	0.79	0.67	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.36	0.31	0.28	0.28	0.22	0.23	0.042	0.046	0.042	0.040	0.046	0.047
Sulphate	107	92	70	76	69	59	2.8	3.2	3.2	3.2	3.3	3.3
Nutrients												
Ammonia-N	0.42	0.44	0.37	0.39	0.36	0.40	0.0038	0.0049	0.0050	0.0025	0.0025	0.0025
Nitrate-N	2.2	2.3	2.1	1.9	1.6	1.6	0.003	0.013	0.034	0.039	0.041	0.041
Nitrite-N	0.018	0.019	0.016	0.014	0.013	0.013	0.00050	0.00050	0.00050	0.00050	0.00150	0.00050
Total Phosphorous	0.034	0.038	0.035	0.034	0.035	0.036	0.007	0.007	0.010	0.008	0.010	0.009
Orthophosphate	0.021	0.029	0.028	0.034	0.030	0.030	0.004	0.006	0.005	0.005	0.008	0.009
Cyanides												
Total Cyanide	0.0034	0.0031	0.0032	0.0031	0.0030	0.0031	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0034	0.0031	0.0032	0.0031	0.0030	0.0031	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals												
Aluminum	0.19	0.14	0.12	0.10	0.08	0.08	0.020	0.012	0.013	0.013	0.017	0.011
Antimony	0.0071	0.0069	0.0059	0.0068	0.0065	0.0065	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0015	0.0015	0.0014	0.0019	0.0017	0.0016	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006
Barium	0.0094	0.0092	0.0083	0.0089	0.0088	0.0085	0.0085	0.0078	0.0083	0.0077	0.0076	0.0081
Beryllium	0.000077	0.000077	0.000092	0.000084	0.000082	0.000087	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.022	0.024	0.026	0.025	0.025	0.024	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000049	0.000051	0.000054	0.000054	0.000050	0.000048	0.000004	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00067	0.00068	0.00068	0.00095	0.00085	0.00084	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00064	0.00063	0.00062	0.00076	0.00074	0.00068	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00045	0.00045	0.00053	0.00052	0.00051	0.00048	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.154	0.132	0.12	0.109	0.106	0.10	0.056	0.041	0.046	0.037	0.040	0.030
Lead	0.00020	0.00021	0.00019	0.00018	0.00017	0.00018	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.032	0.026	0.020	0.021	0.018	0.016	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.14	0.13	0.113	0.09	0.07	0.064	0.0058	0.0039	0.0038	0.0025	0.0029	0.0020
Mercury	0.000014	0.000014	0.000015	0.000014	0.000014	0.000015	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.0020	0.0020	0.0022	0.0025	0.0027	0.0026	0.00096	0.00094	0.00096	0.00096	0.00097	0.00105
Nickel	0.00098	0.00089	0.00083	0.00095	0.00090	0.00091	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.00015	0.00016	0.00018	0.00015	0.00016	0.00018	0.000067	0.000082	0.000075	0.000096	0.000082	0.000100
Silver	0.000026	0.000028	0.000027	0.000029	0.000024	0.000023	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.21	0.18	0.15	0.17	0.15	0.14	0.103	0.095	0.105	0.096	0.095	0.102
Thallium	0.000064	0.000071	0.000067	0.000069	0.000056	0.000053	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00027	0.00026	0.00031	0.00026	0.00027	0.00031	0.00030	0.00030	0.00033	0.00034	0.00033	0.00039
Vanadium	0.0095	0.0077	0.0058	0.0062	0.0053	0.0047	0.0005	0.0003	0.0003	0.0003	0.0003	0.0003
Zinc	0.0037	0.0040	0.0042	0.0046	0.0042	0.0039	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.093	0.11	0.070	0.039	0.03	0.021	0.011	0.011	0.008	0.009	0.010	0.008
Cadmium	0.000048	0.000050	0.000053	0.000055	0.000051	0.000049	0.000003	0.000003	0.0000025	0.000003	0.000003	0.0000030
Copper	0.00045	0.00045	0.00053	0.00052	0.00049	0.00046	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.11	0.091	0.091	0.09	0.082	0.078	0.034	0.034	0.030	0.025	0.023	0.022
Manganese	0.14	0.13	0.11	0.09	0.07	0.06	0.0034	0.0040	0.00250	0.0019	0.0015	0.00147
Zinc	0.0033	0.0035	0.0038	0.0041	0.0036	0.0032	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L.

Shaded cells indicate the mean monthly concentration is greater than the predicted concentration for that month.

[1] Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ28 in the water quality prediction model v.13e (Lorax 2022).

Appendix C-4b: Comparison of Average Monthly Water Quality and Predictions for DC-10 in Davidson Creek

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	1.0	1.0	1.0	1.0	0.8	0.7	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.36	0.31	0.28	0.28	0.22	0.23	0.041	0.045	0.041	0.038	0.045	0.047
Sulphate	107	91.6	69.6	76	68.9	59.0	2.8	3.3	3.3	3.3	3.3	3.4
Nutrients												
Ammonia-N	0.42	0.44	0.37	0.39	0.36	0.39	0.0075	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate-N	2.2	2.3	2.1	1.9	1.6	1.6	0.003	0.027	0.033	0.043	0.050	0.038
Nitrite-N	0.018	0.019	0.016	0.014	0.013	0.013	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.031	0.035	0.031	0.031	0.031	0.032	0.006	0.005	0.008	0.008	0.009	0.009
Orthophosphate	0.020	0.027	0.026	0.032	0.028	0.029	0.004	0.006	0.006	0.007	0.007	0.007
Cyanides												
Total Cyanide	0.0033	0.0031	0.0032	0.0031	0.0030	0.0031	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0033	0.0031	0.0032	0.0031	0.0030	0.0031	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals												
Aluminum	0.19	0.14	0.109	0.094	0.074	0.071	0.013	0.013	0.017	0.034	0.014	0.012
Antimony	0.0070	0.0069	0.0059	0.0068	0.0065	0.0064	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0014	0.0014	0.0013	0.0017	0.0015	0.0015	0.0006	0.0005	0.0006	0.0005	0.0005	0.0005
Barium	0.0093	0.0090	0.0083	0.0089	0.0087	0.0085	0.0090	0.0082	0.0090	0.0081	0.0079	0.0086
Beryllium	0.000077	0.000077	0.000092	0.000083	0.000081	0.000087	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.022	0.024	0.024	0.024	0.022	0.022	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000049	0.000050	0.000054	0.000054	0.000050	0.000048	0.000003	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00064	0.00064	0.00062	0.00086	0.00077	0.00075	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00063	0.00063	0.00062	0.00076	0.00073	0.00068	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00045	0.00045	0.00053	0.00052	0.00051	0.00048	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.15	0.13	0.11	0.11	0.11	0.10	0.032	0.034	0.037	0.044	0.024	0.022
Lead	0.00020	0.00021	0.00019	0.00018	0.00017	0.00018	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.032	0.026	0.020	0.021	0.018	0.016	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.14	0.13	0.099	0.09	0.07	0.059	0.0041	0.0033	0.0041	0.0043	0.0021	0.0030
Mercury	0.000014	0.000014	0.000015	0.000014	0.000014	0.000015	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.0020	0.0020	0.0022	0.0024	0.0027	0.0026	0.00099	0.00091	0.00098	0.00095	0.00099	0.00102
Nickel	0.00098	0.00089	0.00083	0.00095	0.00090	0.00091	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.00015	0.00016	0.00018	0.00015	0.00016	0.00018	0.000025	0.000025	0.000072	0.000065	0.000063	0.000070
Silver	0.000026	0.000028	0.000027	0.000029	0.000024	0.000023	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.21	0.18	0.15	0.17	0.15	0.14	0.107	0.094	0.110	0.095	0.095	0.099
Thallium	0.000064	0.000071	0.000067	0.000069	0.000056	0.000053	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00027	0.00026	0.00031	0.00026	0.00027	0.00031	0.00029	0.00029	0.00034	0.00036	0.00034	0.00039
Vanadium	0.0094	0.0077	0.0058	0.0062	0.0053	0.0047	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Zinc	0.0037	0.0040	0.0042	0.0045	0.0042	0.0038	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.088	0.11	0.064	0.037	0.02	0.018	0.012	0.008	0.008	0.008	0.009	0.014
Cadmium	0.000048	0.000050	0.000053	0.000054	0.000051	0.000048	0.000003	0.000003	0.0000025	0.000003	0.000003	0.0000030
Copper	0.00045	0.00045	0.00053	0.00052	0.00049	0.00046	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.10	0.089	0.091	0.08	0.082	0.078	0.033	0.019	0.021	0.021	0.015	0.014
Manganese	0.14	0.13	0.098	0.09	0.07	0.058	0.0033	0.0024	0.00242	0.0038	0.0017	0.00122
Zinc	0.0033	0.0035	0.0038	0.0041	0.0036	0.0031	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L.

Shaded cells indicate the mean monthly concentration is greater than the predicted concentration for that month.

[1] Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ27 in the water quality prediction model v.13e (Lorax 2022).

Appendix C-4c: Comparison of Average Monthly Water Quality and Predictions for DC-15 in Davidson Creek

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	0.88	0.90	0.80	0.78	0.65	0.56	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.31	0.26	0.22	0.22	0.18	0.19	0.045	0.050	0.042	0.050	0.051	0.056
Sulphate	87	72	51	58	54	44	2.4	3.1	3.0	3.1	3.3	3.4
Nutrients												
Ammonia-N	0.35	0.36	0.29	0.28	0.28	0.30	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate-N	1.9	2.0	1.6	1.4	1.3	1.2	0.003	0.022	0.034	0.035	0.037	0.044
Nitrite-N	0.015	0.016	0.012	0.011	0.010	0.010	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.029	0.029	0.026	0.025	0.026	0.027	0.006	0.004	0.007	0.008	0.008	0.009
Orthophosphate	0.018	0.025	0.024	0.028	0.024	0.027	0.004	0.005	0.005	0.006	0.006	0.006
Cyanides												
Total Cyanide	0.0032	0.0030	0.0029	0.0029	0.0029	0.0029	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0032	0.0030	0.0029	0.0029	0.0029	0.0028	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals												
Aluminum	0.17	0.13	0.092	0.08	0.06	0.060	0.012	0.012	0.017	0.011	0.009	0.008
Antimony	0.0058	0.0059	0.0045	0.0050	0.0049	0.0046	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0013	0.0012	0.0012	0.0015	0.0013	0.0013	0.0006	0.0005	0.0006	0.0005	0.0006	0.0006
Barium	0.0091	0.0085	0.0077	0.0086	0.0085	0.0083	0.0093	0.0088	0.0099	0.0083	0.0086	0.0088
Beryllium	0.000073	0.000073	0.000080	0.000077	0.000075	0.000079	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.020	0.020	0.019	0.019	0.019	0.019	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000042	0.000044	0.000038	0.000040	0.000039	0.000036	0.000003	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00059	0.00057	0.00053	0.00072	0.00064	0.00062	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00050	0.00053	0.00048	0.00057	0.00055	0.00053	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00048	0.00043	0.00044	0.00045	0.00044	0.00042	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.147	0.122	0.10	0.092	0.089	0.08	0.035	0.028	0.033	0.024	0.021	0.019
Lead	0.00017	0.00018	0.00015	0.00015	0.00014	0.00014	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.025	0.021	0.015	0.016	0.013	0.011	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.117	0.105	0.081	0.066	0.058	0.048	0.0058	0.0053	0.0068	0.0061	0.0040	0.0032
Mercury	0.000012	0.000012	0.000011	0.000011	0.000011	0.000011	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.0018	0.0018	0.0017	0.0020	0.0022	0.0021	0.00095	0.00087	0.00090	0.00094	0.00096	0.00098
Nickel	0.00083	0.00079	0.00069	0.00077	0.00075	0.00074	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.00013	0.00014	0.00014	0.00013	0.00014	0.00015	0.000025	0.000025	0.000058	0.000054	0.000056	0.000063
Silver	0.000023	0.000024	0.000022	0.000022	0.000019	0.000019	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.18	0.15	0.12	0.14	0.13	0.13	0.110	0.102	0.116	0.105	0.108	0.106
Thallium	0.000055	0.000058	0.000052	0.000052	0.000042	0.000042	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00024	0.00023	0.00025	0.00023	0.00025	0.00029	0.00025	0.00024	0.00027	0.00031	0.00029	0.00031
Vanadium	0.0073	0.0062	0.0046	0.0046	0.0040	0.0035	0.0005	0.0003	0.0006	0.0003	0.0003	0.0003
Zinc	0.0034	0.0037	0.0035	0.0037	0.0038	0.0032	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.073	0.078	0.047	0.026	0.014	0.011	0.007	0.006	0.005	0.007	0.005	0.005
Cadmium	0.000041	0.000044	0.000038	0.000041	0.000040	0.000036	0.000003	0.000003	0.0000025	0.000003	0.000003	0.0000030
Copper	0.00041	0.00043	0.00044	0.00045	0.00042	0.00040	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.10	0.083	0.078	0.07	0.067	0.060	0.026	0.015	0.014	0.014	0.005	0.012
Manganese	0.12	0.104	0.080	0.06	0.057	0.047	0.0040	0.0039	0.00384	0.0053	0.0027	0.00225
Zinc	0.0030	0.0030	0.0031	0.0032	0.0032	0.0026	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L.

Shaded cells indicate the mean monthly concentration is greater than the predicted concentration for that month.

[a] *Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ26 in the water quality prediction model v.13e (Lorax 2022).*

Appendix C-4d: Comparison of Average Monthly Water Quality and Predictions for DC-20 in Davidson Creek

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	0.81	0.79	0.66	0.68	0.56	0.49	0.25	0.25	0.25	0.25	0.25	0.52
Fluoride	0.27	0.23	0.18	0.19	0.15	0.16	0.045	0.050	0.042	0.052	0.050	0.058
Sulphate	74	61	41	48	45	35	2.4	3.1	3.0	2.9	3.1	3.1
Nutrients												
Ammonia-N	0.30	0.31	0.24	0.23	0.23	0.24	0.0025	0.0025	0.0025	0.0025	0.0051	0.0025
Nitrate-N	1.7	1.7	1.2	1.1	1.1	1.0	0.003	0.022	0.034	0.035	0.025	0.037
Nitrite-N	0.013	0.014	0.010	0.009	0.009	0.008	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.027	0.026	0.023	0.022	0.023	0.024	0.006	0.004	0.007	0.025	0.013	0.008
Orthophosphate	0.017	0.022	0.020	0.025	0.021	0.025	0.004	0.005	0.005	0.003	0.004	0.004
Cyanides												
Total Cyanide	0.0032	0.0029	0.0028	0.0028	0.0028	0.0028	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0032	0.0029	0.0028	0.0028	0.0028	0.0028	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals												
Aluminum	0.15	0.12	0.082	0.07	0.06	0.053	0.012	0.012	0.017	0.113	0.070	0.010
Antimony	0.0048	0.0051	0.0037	0.0039	0.0039	0.0034	0.000050	0.000050	0.000050	0.000200	0.000050	0.000050
Arsenic	0.0013	0.0011	0.0010	0.0013	0.0012	0.0011	0.0006	0.0005	0.0006	0.0007	0.0006	0.0004
Barium	0.0089	0.0083	0.0078	0.0084	0.0085	0.0083	0.0093	0.0088	0.0099	0.0117	0.0096	0.0087
Beryllium	0.000069	0.000070	0.000072	0.000071	0.000070	0.000068	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.018	0.018	0.016	0.017	0.017	0.016	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000037	0.000039	0.000032	0.000032	0.000034	0.000028	0.000003	0.0000025	0.0000025	0.000010	0.0000081	0.0000030
Chromium	0.00056	0.00052	0.00048	0.00064	0.00056	0.00053	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00043	0.00047	0.00040	0.00046	0.00043	0.00042	0.00005	0.00005	0.00005	0.00011	0.00005	0.00005
Copper	0.00044	0.00041	0.00039	0.00040	0.00039	0.00037	0.00025	0.00025	0.00025	0.00055	0.00025	0.00025
Iron	0.147	0.126	0.11	0.097	0.096	0.09	0.035	0.028	0.033	0.468	0.265	0.132
Lead	0.00015	0.00016	0.00013	0.00013	0.00012	0.00012	0.000025	0.000025	0.000025	0.000092	0.000025	0.000025
Lithium	0.022	0.017	0.012	0.013	0.010	0.009	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.102	0.090	0.071	0.055	0.050	0.043	0.0058	0.0053	0.0068	0.0408	0.0320	0.0207
Mercury	0.000010	0.000011	0.000009	0.000009	0.000010	0.000009	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.0016	0.0016	0.0015	0.0017	0.0018	0.0018	0.00095	0.00087	0.00090	0.00093	0.00090	0.00092
Nickel	0.00071	0.00072	0.00060	0.00065	0.00066	0.00060	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.00012	0.00013	0.00012	0.00011	0.00012	0.00012	0.000025	0.000025	0.000058	0.000080	0.000055	0.000086
Silver	0.000021	0.000020	0.000020	0.000019	0.000016	0.000016	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.16	0.14	0.11	0.13	0.12	0.12	0.110	0.102	0.116	0.110	0.103	0.109
Thallium	0.000048	0.000049	0.000044	0.000042	0.000034	0.000035	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00021	0.00021	0.00022	0.00022	0.00024	0.00028	0.00025	0.00024	0.00027	0.00033	0.00035	0.00036
Vanadium	0.0063	0.0052	0.0037	0.0038	0.0031	0.0027	0.0005	0.0003	0.0006	0.0010	0.0006	0.0003
Zinc	0.0032	0.0034	0.0032	0.0032	0.0032	0.0028	0.0015	0.0015	0.0015	0.0071	0.0015	0.0015
Dissolved Metals												
Aluminum	0.054	0.071	0.038	0.017	0.012	0.009	0.007	0.006	0.005	0.006	0.005	0.005
Cadmium	0.000036	0.000038	0.000032	0.000032	0.000031	0.000028	0.000003	0.000003	0.0000025	0.000006	0.000003	0.0000030
Copper	0.00039	0.00041	0.00039	0.00040	0.00038	0.00036	0.00010	0.00010	0.00010	0.00040	0.00010	0.00010
Iron	0.10	0.086	0.078	0.07	0.068	0.060	0.026	0.015	0.014	0.080	0.090	0.090
Manganese	0.10	0.089	0.070	0.05	0.049	0.042	0.0040	0.0039	0.00384	0.0196	0.0210	0.01930
Zinc	0.0027	0.0027	0.0027	0.0029	0.0028	0.0023	0.00050	0.0005	0.00050	0.00400	0.0005	0.00050

Notes:

Concentrations in mg/L.

Shaded cells indicate the mean monthly concentration is greater than the predicted concentration for that month.

[a] *Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ26 in the water quality prediction model v.13e (Lorax 2022).*

Appendix C-4e: Comparison of Average Monthly Water Quality and Predictions for 661-05 in Creek 661

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	0.27	0.28	0.32	0.42	0.27	0.32	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.053	0.054	0.076	0.070	0.061	0.061	0.054	0.059	0.065	0.058	0.061	0.065
Sulphate	3.0	3.4	4.7	3.4	3.3	3.1	1.0	1.3	1.3	1.2	1.5	1.5
Nutrients												
Ammonia-N	0.011	0.0086	0.011	0.011	0.0086	0.010	0.0058	0.0025	0.0051	0.0025	0.0025	0.0025
Nitrate-N	0.074	0.083	0.078	0.174	0.090	0.179	0.013	0.054	0.059	0.051	0.057	0.057
Nitrite-N	0.0022	0.0020	0.0021	0.0021	0.0011	0.0024	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.010	0.019	0.019	0.019	0.020	0.023	0.051	0.050	0.055	0.049	0.049	0.050
Orthophosphate	0.003	0.003	0.003	0.006	0.004	0.008	0.044	0.040	0.040	0.042	0.041	0.041
Cyanides												
Total Cyanide	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals												
Aluminum	0.073	0.076	0.070	0.057	0.042	0.088	0.031	0.039	0.058	0.035	0.038	0.032
Antimony	0.00039	0.00044	0.00034	0.00035	0.00034	0.00034	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0008	0.0010	0.0007	0.0007	0.0012	0.0012	0.0015	0.0013	0.0013	0.0013	0.0013	0.0012
Barium	0.0041	0.0044	0.0055	0.0072	0.0048	0.0063	0.0048	0.0045	0.0051	0.0046	0.0047	0.0046
Beryllium	0.000068	0.000070	0.000066	0.000065	0.000065	0.000065	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0068	0.0051	0.0029	0.0021	0.0065	0.0054	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000016	0.000023	0.000026	0.000110	0.000014	0.000014	0.000003	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00015	0.00034	0.00015	0.00015	0.00030	0.00029	0.00073	0.00093	0.00089	0.00087	0.00093	0.00080
Cobalt	0.000087	0.00010	0.000090	0.000107	0.00010	0.000095	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00025	0.00041	0.00044	0.00054	0.00029	0.00046	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.12	0.17	0.19	0.37	0.17	0.17	0.160	0.151	0.170	0.113	0.114	0.098
Lead	0.000036	0.000037	0.000076	0.000354	0.000034	0.000153	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.0012	0.0013	0.0011	0.0011	0.0011	0.0011	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.013	0.021	0.022	0.027	0.020	0.019	0.0107	0.0100	0.0119	0.0079	0.0085	0.0061
Mercury	0.0000040	0.0000063	0.0000045	0.0000037	0.0000037	0.0000037	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00039	0.00043	0.00039	0.00037	0.00080	0.00056	0.00086	0.00082	0.00088	0.00091	0.00091	0.00085
Nickel	0.00019	0.00035	0.00028	0.00029	0.00032	0.00036	0.00025	0.00059	0.00025	0.00025	0.00025	0.00025
Selenium	0.00031	0.00021	0.00019	0.00031	0.00004	0.00005	0.000071	0.000078	0.000072	0.000078	0.000081	0.000076
Silver	0.000027	0.000021	0.000026	0.000026	0.000007	0.000017	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.045	0.049	0.061	0.073	0.067	0.058	0.088	0.082	0.085	0.084	0.084	0.079
Thallium	0.000031	0.000022	0.000031	0.000030	0.000011	0.000021	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.000070	0.000084	0.000056	0.000067	0.000096	0.000087	0.00020	0.00020	0.00023	0.00021	0.00020	0.00020
Vanadium	0.00041	0.00065	0.00059	0.00037	0.00098	0.00062	0.0019	0.0018	0.0019	0.0018	0.0020	0.0018
Zinc	0.0029	0.0021	0.0012	0.0280	0.0018	0.0024	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.058	0.062	0.22	0.047	0.032	0.07	0.011	0.009	0.012	0.009	0.008	0.009
Cadmium	0.000016	0.000019	0.000015	0.000063	0.000009	0.000012	0.000003	0.000003	0.0000025	0.000003	0.000007	0.0000030
Copper	0.00010	0.00028	0.00044	0.00054	0.00029	0.00046	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.10	0.12	0.11	0.18	0.13	0.14	0.091	0.050	0.053	0.046	0.031	0.039
Manganese	0.013	0.014	0.015	0.025	0.016	0.017	0.0058	0.0057	0.00618	0.0050	0.0047	0.00346
Zinc	0.0019	0.0024	0.00061	0.0127	0.0039	0.00339	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L.

Shaded cells indicate the mean monthly concentration is greater than the predicted concentration for that month.

[1] *Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ3 in the water quality prediction model v.13e (Lorax 2022).*

Appendix C-4f: Comparison of Average Monthly Water Quality and Predictions for 661-10 in Creek 661

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	0.27	0.27	0.32	0.42	0.27	0.32	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.053	0.053	0.078	0.073	0.064	0.063	0.047	0.049	0.049	0.047	0.053	0.061
Sulphate	3.0	3.3	4.9	3.7	3.6	3.3	0.9	1.3	1.6	1.5	2.1	2.2
Nutrients												
Ammonia-N	0.011	0.0085	0.011	0.011	0.0088	0.010	0.0025	0.0025	0.0084	0.0062	0.0025	0.0025
Nitrate-N	0.072	0.075	0.086	0.185	0.101	0.191	0.003	0.003	0.051	0.045	0.037	0.043
Nitrite-N	0.0022	0.0019	0.0022	0.0022	0.0012	0.0026	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.0099	0.019	0.019	0.0188	0.020	0.023	0.023	0.026	0.023	0.028	0.024	0.026
Orthophosphate	0.0035	0.0027	0.0027	0.0060	0.0040	0.0079	0.015	0.018	0.013	0.020	0.019	0.023
Cyanides												
Total Cyanide	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals												
Aluminum	0.074	0.076	0.070	0.057	0.042	0.088	0.048	0.053	0.036	0.064	0.046	0.037
Antimony	0.000050	0.000049	0.000049	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.00082	0.00098	0.00074	0.00074	0.00126	0.00130	0.0011	0.0010	0.0009	0.0010	0.0010	0.0010
Barium	0.0041	0.0044	0.0055	0.0072	0.0049	0.0063	0.0050	0.0047	0.0051	0.0051	0.0047	0.0046
Beryllium	0.000068	0.000068	0.000068	0.000068	0.000068	0.000069	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0068	0.0049	0.0032	0.0024	0.0068	0.0057	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000016	0.000022	0.000027	0.000111	0.000015	0.000016	0.000008	0.0000085	0.0000130	0.000010	0.0000082	0.0000057
Chromium	0.00015	0.00034	0.00015	0.00015	0.00030	0.00029	0.00031	0.00025	0.00025	0.00060	0.00051	0.00025
Cobalt	0.000086	0.000097	0.000097	0.000116	0.000106	0.000105	0.00006	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00025	0.00040	0.00045	0.00054	0.00030	0.00047	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.12	0.17	0.19	0.37	0.17	0.17	0.227	0.220	0.112	0.145	0.104	0.093
Lead	0.000035	0.000036	0.000077	0.000354	0.000036	0.000155	0.000039	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.013	0.020	0.023	0.029	0.021	0.021	0.0165	0.0204	0.0161	0.0171	0.0084	0.0079
Mercury	0.0000039	0.0000061	0.0000047	0.0000040	0.0000040	0.0000040	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00038	0.00041	0.00042	0.00041	0.00083	0.00059	0.00070	0.00064	0.00072	0.00070	0.00068	0.00071
Nickel	0.00019	0.00034	0.00029	0.00030	0.00034	0.00037	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.00031	0.00020	0.00019	0.00031	0.00004	0.00006	0.000025	0.000025	0.000025	0.000062	0.000025	0.000025
Silver	0.000027	0.000021	0.000027	0.000027	0.000007	0.000017	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.045	0.049	0.061	0.073	0.068	0.058	0.072	0.073	0.076	0.071	0.068	0.070
Thallium	0.000031	0.000022	0.000031	0.000031	0.000012	0.000022	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.000070	0.000081	0.000058	0.000070	0.000099	0.000090	0.00012	0.00014	0.00010	0.00016	0.00014	0.00014
Vanadium	0.00040	0.00062	0.00061	0.00040	0.00101	0.00065	0.0010	0.0010	0.0009	0.0013	0.0011	0.0011
Zinc	0.0028	0.0020	0.00122	0.0280	0.0019	0.00242	0.0020	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.058	0.062	0.22	0.047	0.032	0.07	0.015	0.016	0.015	0.021	0.021	0.019
Cadmium	0.000016	0.000019	0.000016	0.000064	0.000011	0.000013	0.000007	0.000006	0.0000062	0.000009	0.000012	0.0000030
Copper	0.00010	0.00027	0.00045	0.00054	0.00030	0.00047	0.00013	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.10	0.12	0.11	0.18	0.13	0.14	0.129	0.120	0.068	0.075	0.054	0.047
Manganese	0.012	0.014	0.016	0.026	0.018	0.018	0.0055	0.0109	0.01110	0.0118	0.0052	0.00560
Zinc	0.0019	0.0023	0.00066	0.0128	0.0039	0.00345	0.00138	0.0013	0.00210	0.00210	0.0016	0.00140

Notes:

Concentrations in mg/L.

Shaded cells indicate the mean monthly concentration is greater than the predicted concentration for that month.

[1] Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ5 in the water quality prediction model v.13e (Lorax 2022).

Appendix C-4g: Comparison of Average Monthly Water Quality and Predictions for 661-20 in Creek 661

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	0.26	0.26	0.31	0.41	0.26	0.31	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.044	0.044	0.069	0.064	0.055	0.054	0.058	0.058	0.060	0.056	0.060	0.068
Sulphate	1.8	2.1	3.7	2.5	2.5	2.1	1.6	2.3	2.3	2.5	2.6	2.6
Nutrients												
Ammonia-N	0.010	0.0078	0.010	0.010	0.0081	0.009	0.0025	0.0025	0.0093	0.0074	0.0025	0.0025
Nitrate-N	0.026	0.028	0.038	0.140	0.056	0.144	0.003	0.029	0.045	0.078	0.049	0.052
Nitrite-N	0.0017	0.0015	0.0017	0.0017	0.0007	0.0021	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.0100	0.019	0.019	0.0189	0.020	0.023	0.024	0.022	0.027	0.029	0.025	0.024
Orthophosphate	0.0035	0.0027	0.0027	0.0060	0.0040	0.0080	0.017	0.019	0.017	0.023	0.021	0.023
Cyanides												
Total Cyanide	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Cyanide, Weak Acid Dissociable	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Total Metals												
Aluminum	0.074	0.077	0.071	0.057	0.042	0.089	0.016	0.026	0.023	0.023	0.029	0.023
Antimony	0.000128	0.000143	0.000133	0.000160	0.000161	0.000146	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.00052	0.00067	0.00043	0.00043	0.00097	0.00100	0.0010	0.0009	0.0008	0.0009	0.0009	0.0009
Barium	0.0039	0.0041	0.0052	0.0070	0.0047	0.0061	0.0067	0.0068	0.0073	0.0070	0.0064	0.0067
Beryllium	0.000055	0.000055	0.000055	0.000056	0.000056	0.000055	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0055	0.0035	0.0018	0.0011	0.0056	0.0044	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000010	0.000017	0.000022	0.000107	0.000010	0.000010	0.000003	0.0000030	0.0000030	0.000003	0.0000030	0.0000030
Chromium	0.00015	0.00034	0.00015	0.00015	0.00030	0.00029	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.000046	0.000057	0.000057	0.000077	0.000067	0.000065	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00021	0.00037	0.00041	0.00051	0.00027	0.00044	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.12	0.17	0.19	0.37	0.17	0.17	0.149	0.178	0.131	0.185	0.151	0.128
Lead	0.000028	0.000028	0.000070	0.000351	0.000028	0.000149	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.008	0.014	0.017	0.023	0.016	0.015	0.0071	0.0090	0.0092	0.0071	0.0062	0.0057
Mercury	0.0000029	0.0000051	0.0000037	0.0000030	0.0000030	0.0000029	0.0000030	0.0000030	0.0000030	0.0000030	0.0000030	0.0000030
Molybdenum	0.00023	0.00025	0.00027	0.00026	0.00069	0.00044	0.00095	0.00091	0.00096	0.00093	0.00099	0.00097
Nickel	0.00013	0.00028	0.00022	0.00024	0.00028	0.00031	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.00030	0.00019	0.00018	0.00030	0.00003	0.00004	0.000056	0.000056	0.000060	0.000094	0.000060	0.000073
Silver	0.000025	0.000020	0.000025	0.000025	0.000006	0.000016	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.042	0.045	0.058	0.070	0.065	0.055	0.103	0.096	0.102	0.097	0.091	0.094
Thallium	0.000027	0.000017	0.000027	0.000027	0.000007	0.000017	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.000056	0.000067	0.000044	0.000056	0.000086	0.000076	0.00027	0.00028	0.00035	0.00035	0.00029	0.00031
Vanadium	0.00026	0.00048	0.00047	0.00026	0.00088	0.00051	0.0007	0.0006	0.0007	0.0008	0.0008	0.0007
Zinc	0.0026	0.0018	0.00094	0.0281	0.0016	0.00216	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.058	0.062	0.22	0.047	0.032	0.08	0.010	0.008	0.006	0.010	0.012	0.008
Cadmium	0.000010	0.000013	0.000010	0.000059	0.000005	0.000008	0.000003	0.000003	0.0000030	0.000003	0.000003	0.0000030
Copper	0.00007	0.00024	0.00041	0.00051	0.00027	0.00044	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.10	0.12	0.11	0.18	0.13	0.14	0.109	0.103	0.083	0.127	0.086	0.086
Manganese	0.007	0.008	0.011	0.021	0.012	0.012	0.0043	0.0049	0.00472	0.0040	0.0029	0.00289
Zinc	0.0016	0.0021	0.00037	0.0127	0.0037	0.00320	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L.

Shaded cells indicate the mean monthly concentration is greater than the predicted concentration for that month.

[1] Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQCk661 in the water quality prediction model v.13e (Lorax 2022a).

Appendix C-5a: Baseline Water Quality at DC-05

Parameter	95th Percentile plus 20% Baseline Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Physical Parameters and Dissolved Anions												
pH (pH units)	9.32	9.22	9.34	9.52	9.44	9.60	7.91	7.97	7.83	7.93	7.95	7.70
Total suspended solids	2.88	4.11	1.8	1.8	4.104	3.384	1.5	1.5	1.5	1.5	1.5	1.5
Total dissolved solids	85.8	69.2	78.7	86.6	87.6	93.8	71.8	77	85.5	82.0	80	76.5
Chloride	0.64	0.30	0.30	0.30	0.30	0.30	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.059	0.042	0.044	0.055	0.053	0.055	0.042	0.046	0.042	0.040	0.046	0.047
Sulphate	2.9	2.3	2.7	3.4	3.6	3.7	2.8	3.2	3.2	3.2	3.3	3.3
Nutrients												
Ammonia-N	0.0030	0.0047	0.0074	0.0060	0.0030	0.0030	0.0038	0.0049	0.0050	0.0025	0.0025	0.0025
Nitrate-N	0.003	0.007	0.018	0.044	0.040	0.051	0.003	0.013	0.034	0.039	0.041	0.041
Nitrite-N	0.00060	0.00060	0.00060	0.00060	0.00060	0.00110	0.00050	0.00050	0.00050	0.00050	0.00150	0.00050
Total Phosphorous	0.011	0.015	0.010	0.011	0.025	0.013	0.007	0.007	0.010	0.008	0.010	0.009
Total Metals												
Aluminum	0.163	0.389	0.126	0.067	0.062	0.042	0.020	0.012	0.013	0.013	0.017	0.011
Antimony	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0009	0.0007	0.0007	0.0008	0.0007	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006
Barium	0.0078	0.0075	0.0075	0.0089	0.0093	0.0094	0.0085	0.0078	0.0083	0.0077	0.0076	0.0081
Beryllium	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000007	0.0000100	0.0000051	0.000004	0.0000057	0.0000036	0.000004	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00037	0.00050	0.00040	0.00035	0.00038	0.00038	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00061	0.00086	0.00066	0.00030	0.00030	0.00030	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.243	0.284	0.149	0.130	0.123	0.094	0.056	0.041	0.046	0.037	0.040	0.030
Lead	0.000151	0.000071	0.000030	0.000049	0.000137	0.000030	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.00060	0.00060	0.0006	0.00060	0.00060	0.0006	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.0095	0.0142	0.0071	0.0098	0.0065	0.0033	0.0058	0.0039	0.0038	0.0025	0.0029	0.0020
Mercury	0.0000030	0.0000118	0.0000065	0.0000036	0.0000036	0.0000036	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00069	0.00068	0.00077	0.00098	0.00103	0.00106	0.00096	0.00094	0.00096	0.00096	0.00097	0.00105
Nickel	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.000079	0.000082	0.000084	0.000127	0.000102	0.000125	0.000067	0.000082	0.000075	0.000096	0.000082	0.000100
Silver	0.0000060	0.0000060	0.0000060	0.0000096	0.0000060	0.0000060	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.077	0.078	0.088	0.105	0.108	0.117	0.103	0.095	0.105	0.096	0.095	0.102
Thallium	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00022	0.00021	0.00023	0.00030	0.00029	0.00039	0.00030	0.00030	0.00033	0.00034	0.00033	0.00039
Vanadium	0.0007	0.0008	0.0007	0.0009	0.0009	0.0009	0.0005	0.0003	0.0003	0.0003	0.0003	0.0003
Zinc	0.0052	0.0018	0.0018	0.0036	0.0031	0.0018	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.112	0.293	0.088	0.057	0.041	0.026	0.011	0.011	0.008	0.009	0.010	0.008
Cadmium	0.000005	0.000008	0.0000072	0.000004	0.000005	0.0000036	0.000003	0.000003	0.0000025	0.000003	0.000003	0.0000030
Copper	0.00058	0.00078	0.00059	0.00031	0.00030	0.00030	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.170	0.181	0.111	0.096	0.084	0.087	0.034	0.034	0.030	0.025	0.023	0.022
Manganese	0.0046	0.0049	0.00394	0.0046	0.0034	0.00235	0.0034	0.0040	0.00250	0.0019	0.0015	0.00147
Zinc	0.00180	0.0018	0.00180	0.00180	0.0018	0.00180	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L, unless otherwise noted.

Shaded cells indicate the mean monthly concentration is greater than the mean baseline for that month.

[1] 95th percentile concentration measured in baseline studies at the DC-05 site between 2016 and September 30, 2022.

Appendix C-5b: Baseline Water Quality at DC-10

Parameter	95th Percentile plus 20% Baseline Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Physical Parameters and Dissolved Anions												
pH (pH units)	9.23	9.26	9.39	9.43	9.45	9.66	7.97	7.90	7.79	7.95	7.95	7.53
Total suspended solids	1.8	2.6	1.8	1.8	1.8	1.8	1.5	1.5	3.7	1.5	1.5	1.5
Total dissolved solids	86.46	69.42	80.52	80.22	144.72	86.22	73.0	72.5	91	86.0	71	80
Chloride	0.58	0.30	0.30	0.30	0.30	0.30	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.064	0.039	0.045	0.053	0.054	0.054	0.041	0.045	0.041	0.038	0.045	0.047
Sulphate	2.9	2.4	2.8	3.5	3.6	3.8	2.8	3.3	3.3	3.3	3.3	3.4
Nutrients												
Ammonia-N	0.0088	0.0142	0.0030	0.0075	0.0030	0.0030	0.0075	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate-N	0.003	0.010	0.019	0.043	0.040	0.058	0.003	0.027	0.033	0.043	0.050	0.038
Nitrite-N	0.00060	0.00060	0.00060	0.00060	0.00692	0.00060	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.009	0.009	0.009	0.011	0.014	0.011	0.006	0.005	0.008	0.008	0.009	0.009
Total Metals												
Aluminum	0.149	0.140	0.109	0.050	0.035	0.032	0.013	0.013	0.017	0.034	0.014	0.012
Antimony	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0008	0.0007	0.0006	0.0007	0.0007	0.0007	0.0006	0.0005	0.0006	0.0005	0.0005	0.0005
Barium	0.0075	0.0072	0.0076	0.0091	0.0089	0.0095	0.0090	0.0082	0.0090	0.0081	0.0079	0.0086
Beryllium	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000007	0.0000030	0.0000277	0.000004	0.0000036	0.0000036	0.000003	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00048	0.00033	0.00033	0.00033	0.00030	0.00030	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00006	0.00006	0.00006	0.00006	0.00006	0.00006	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00074	0.00030	0.00030	0.00030	0.00030	0.00030	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.241	0.123	0.148	0.091	0.086	0.065	0.032	0.034	0.037	0.044	0.024	0.022
Lead	0.000030	0.000030	0.000102	0.000030	0.000030	0.000030	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.00060	0.00060	0.0006	0.00060	0.00060	0.0006	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.0082	0.0054	0.0065	0.0048	0.0046	0.0027	0.0041	0.0033	0.0041	0.0043	0.0021	0.0030
Mercury	0.0000030	0.0000058	0.0000030	0.0000036	0.0000036	0.0000036	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00067	0.00067	0.00073	0.00100	0.00098	0.00108	0.00099	0.00091	0.00098	0.00095	0.00099	0.00102
Nickel	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.000068	0.000075	0.000103	0.000087	0.000124	0.000103	0.000025	0.000025	0.000072	0.000065	0.000063	0.000070
Silver	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.078	0.077	0.085	0.106	0.101	0.124	0.107	0.094	0.110	0.095	0.095	0.099
Thallium	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00021	0.00019	0.00020	0.00028	0.00029	0.00037	0.00029	0.00029	0.00034	0.00036	0.00034	0.00039
Vanadium	0.0008	0.0008	0.0006	0.0009	0.0008	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Zinc	0.0048	0.0018	0.0018	0.0018	0.0057	0.0018	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.104	0.123	0.073	0.042	0.028	0.021	0.012	0.008	0.008	0.008	0.009	0.014
Cadmium	0.000003	0.000003	0.0000116	0.000004	0.000004	0.0000036	0.000003	0.000003	0.0000025	0.000003	0.000003	0.0000030
Copper	0.00034	0.00088	0.00043	0.00030	0.00030	0.00030	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.148	0.093	0.093	0.074	0.056	0.049	0.033	0.019	0.021	0.021	0.015	0.014
Manganese	0.0038	0.0026	0.00229	0.0026	0.0025	0.00193	0.0033	0.0024	0.00242	0.0038	0.0017	0.00122
Zinc	0.00175	0.0016	0.00162	0.00299	0.0017	0.00162	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L, unless otherwise noted.

Shaded cells indicate the mean monthly concentration is greater than the mean baseline for that month.

[1] *95th percentile concentration measured in baseline studies at the DC-10 site between 2016 and September 30, 2022.*

Appendix C-5c: Baseline Water Quality at DC-15

Parameter	95th Percentile plus 20% Baseline Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Physical Parameters and Dissolved Anions												
pH (pH units)	9.51	9.36	9.50	9.65	9.52	9.72	8.06	7.94	7.82	7.68	7.98	8.00
Total suspended solids	10.8	3.2	1.8	1.8	1.8	1.8	1.5	1.5	3.7	1.5	1.5	1.5
Total dissolved solids	96.66	77.76	86.22	90.84	98.16	99.72	77.0	81	96	90.0	78.5	82
Chloride	0.30	0.30	0.30	0.30	0.30	0.30	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.047	0.048	0.050	0.058	0.054	0.060	0.045	0.050	0.042	0.050	0.051	0.056
Sulphate	2.6	2.7	2.8	3.3	3.5	3.6	2.4	3.1	3.0	3.1	3.3	3.4
Nutrients												
Ammonia-N	0.0089	0.0058	0.0059	0.0030	0.0030	0.0053	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate-N	0.003	0.009	0.031	0.043	0.043	0.072	0.003	0.022	0.034	0.035	0.037	0.044
Nitrite-N	0.00060	0.00060	0.00060	0.00060	0.00060	0.00060	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.027	0.011	0.009	0.009	0.026	0.009	0.006	0.004	0.007	0.008	0.008	0.009
Total Metals												
Aluminum	0.272	0.229	0.084	0.035	0.039	0.020	0.012	0.012	0.017	0.011	0.009	0.008
Antimony	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0010	0.0007	0.0006	0.0007	0.0007	0.0007	0.0006	0.0005	0.0006	0.0005	0.0006	0.0006
Barium	0.0100	0.0080	0.0087	0.0097	0.0100	0.0101	0.0093	0.0088	0.0099	0.0083	0.0086	0.0088
Beryllium	0.000060	0.000060	0.000060	0.000060	0.000060	0.000060	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000020	0.0000080	0.0000063	0.000004	0.0000036	0.0000036	0.000003	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00054	0.00043	0.00031	0.00030	0.00030	0.00035	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00014	0.00006	0.00006	0.00006	0.00006	0.00006	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00071	0.00030	0.00066	0.00030	0.02982	0.00030	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.428	0.202	0.127	0.067	0.068	0.044	0.035	0.028	0.033	0.024	0.021	0.019
Lead	0.000115	0.000086	0.000030	0.000030	0.000030	0.000030	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.00060	0.00060	0.0006	0.00060	0.00060	0.0006	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.0505	0.0162	0.0070	0.0057	0.0060	0.0050	0.0058	0.0053	0.0068	0.0061	0.0040	0.0032
Mercury	0.0000132	0.0000030	0.0000030	0.0000036	0.0000036	0.0000036	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00134	0.00071	0.00078	0.00092	0.00098	0.00190	0.00095	0.00087	0.00090	0.00094	0.00096	0.00098
Nickel	0.00070	0.00030	0.00030	0.00030	0.00830	0.00030	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.000082	0.000072	0.000084	0.000077	0.000076	0.000086	0.000025	0.000025	0.000058	0.000054	0.000056	0.000063
Silver	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.086	0.088	0.097	0.116	0.116	0.133	0.110	0.102	0.116	0.105	0.108	0.106
Thallium	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00019	0.00018	0.00018	0.00024	0.00027	0.00032	0.00025	0.00024	0.00027	0.00031	0.00029	0.00031
Vanadium	0.0013	0.0008	0.0007	0.0009	0.0009	0.0006	0.0005	0.0003	0.0006	0.0003	0.0003	0.0003
Zinc	0.0018	0.0018	0.0018	0.0018	0.0089	0.0018	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.082	0.110	0.053	0.029	0.021	0.012	0.007	0.006	0.005	0.007	0.005	0.005
Cadmium	0.000010	0.000003	0.0000030	0.000004	0.000004	0.0000036	0.000003	0.000003	0.0000025	0.000003	0.000003	0.0000030
Copper	0.00107	0.00043	0.00073	0.00031	0.00030	0.00030	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.114	0.094	0.077	0.051	0.042	0.031	0.026	0.015	0.014	0.014	0.005	0.012
Manganese	0.0080	0.0047	0.00395	0.0051	0.0042	0.00361	0.0040	0.0039	0.00384	0.0053	0.0027	0.00225
Zinc	0.00199	0.0016	0.00162	0.00180	0.0043	0.00169	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L, unless otherwise noted.

Shaded cells indicate the mean monthly concentration is greater than the mean baseline for that month.

[1] 95th percentile concentration measured in baseline studies at the DC-15 site between 2016 and September 30, 2022.

Appendix C-5d: Baseline Water Quality at 661-05

Parameter	95th Percentile plus 20% Baseline Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Physical Parameters and Dissolved Anions												
pH (pH units)	9.37	9.33	9.43	9.52	9.46	9.61	7.94	7.88	7.74	7.61	7.86	7.89
Total suspended solids	9.3	1.8	1.8	1.8	6.1	1.8	1.5	1.5	4.5	1.5	3.2	1.5
Total dissolved solids	87.06	81.06	88.8	82.8	90	91.2	72.0	69	74	84.0	74	70
Chloride	0.84	0.30	0.30	0.30	0.30	0.30	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.072	0.069	0.067	0.066	0.082	0.065	0.054	0.059	0.065	0.058	0.061	0.065
Sulphate	1.5	1.3	1.4	1.5	2.7	1.5	1.0	1.3	1.3	1.2	1.5	1.5
Nutrients												
Ammonia-N	0.0030	0.0164	0.0173	0.0030	0.0104	0.0030	0.0058	0.0025	0.0051	0.0025	0.0025	0.0025
Nitrate-N	0.028	0.034	0.056	0.067	0.077	0.059	0.013	0.054	0.059	0.051	0.057	0.057
Nitrite-N	0.00060	0.00060	0.00060	0.00060	0.00156	0.00060	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.053	0.057	0.056	0.053	0.056	0.054	0.051	0.050	0.055	0.049	0.049	0.050
Total Metals												
Aluminum	0.671	0.172	0.067	0.072	0.065	0.050	0.031	0.039	0.058	0.035	0.038	0.032
Antimony	0.000060	0.000182	0.000060	0.000060	0.000137	0.000132	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0022	0.0015	0.0013	0.0015	0.0014	0.0016	0.0015	0.0013	0.0013	0.0013	0.0013	0.0012
Barium	0.0123	0.0056	0.0054	0.0069	0.0058	0.0060	0.0048	0.0045	0.0051	0.0046	0.0047	0.0046
Beryllium	0.000058	0.000060	0.000012	0.000012	0.000060	0.000012	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000021	0.0000113	0.0000030	0.000004	0.0000036	0.0000036	0.000003	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00243	0.00087	0.00092	0.00102	0.00093	0.00108	0.00073	0.00093	0.00089	0.00087	0.00093	0.00080
Cobalt	0.00033	0.00006	0.00006	0.00006	0.00006	0.00006	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00114	0.00030	0.00030	0.00030	0.00030	0.00030	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.853	0.307	0.212	0.204	0.215	0.138	0.160	0.151	0.170	0.113	0.114	0.098
Lead	0.000334	0.000090	0.000030	0.000030	0.000066	0.000030	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.00060	0.00060	0.0006	0.00060	0.00060	0.0006	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.0778	0.0180	0.0151	0.0180	0.0145	0.0104	0.0107	0.0100	0.0119	0.0079	0.0085	0.0061
Mercury	0.0000030	0.0000068	0.0000030	0.0000036	0.0000036	0.0000036	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00089	0.00083	0.00090	0.00097	0.00103	0.00124	0.00086	0.00082	0.00088	0.00091	0.00091	0.00085
Nickel	0.00072	0.00030	0.00030	0.00030	0.00030	0.00030	0.00025	0.00059	0.00025	0.00025	0.00025	0.00025
Selenium	0.000200	0.000147	0.000094	0.000085	0.000116	0.000096	0.000071	0.000078	0.000072	0.000078	0.000081	0.000076
Silver	0.0000140	0.0000193	0.0000060	0.0000060	0.0000060	0.0000060	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.086	0.090	0.100	0.095	0.098	0.106	0.088	0.082	0.085	0.084	0.084	0.079
Thallium	0.0000060	0.0000764	0.0000060	0.0000060	0.0000060	0.0000060	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00045	0.00019	0.00022	0.00027	0.00022	0.00025	0.00020	0.00020	0.00023	0.00021	0.00020	0.00020
Vanadium	0.0035	0.0020	0.0018	0.0022	0.0022	0.0022	0.0019	0.0018	0.0019	0.0018	0.0020	0.0018
Zinc	0.0073	0.0018	0.0018	0.0018	0.0018	0.0018	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.070	0.105	0.019	0.017	0.025	0.013	0.011	0.009	0.012	0.009	0.008	0.009
Cadmium	0.000006	0.000003	0.0000030	0.000004	0.000004	0.0000036	0.000003	0.000003	0.0000025	0.000003	0.000007	0.0000030
Copper	0.00029	0.00060	0.00012	0.00012	0.00030	0.00012	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.194	0.215	0.095	0.068	0.108	0.050	0.091	0.050	0.053	0.046	0.031	0.039
Manganese	0.0086	0.0087	0.00908	0.0084	0.0091	0.00541	0.0058	0.0057	0.00618	0.0050	0.0047	0.00346
Zinc	0.00174	0.0006	0.00060	0.00060	0.0016	0.00060	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L, unless otherwise noted.

Shaded cells indicate the mean monthly concentration is greater than the mean baseline for that month.

[1] 95th percentile concentration measured in baseline studies at the 661-05 site between 2016 and September 30, 2022.

Appendix C-5e: Baseline Water Quality at 661-10

Parameter	95th Percentile plus 20% Baseline Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Physical Parameters and Dissolved Anions												
pH (pH units)	9.25	9.03	9.30	9.38	9.38	9.22	7.82	7.85	7.41	7.69	7.65	7.85
Total suspended solids	3.2	1.8	3.84	1.8	3.1	1.8	2.025	1.5	1.5	1.5	1.5	1.5
Total dissolved solids	77.28	72.84	90	81.12	79.32	70.8	67.3	81	67	58.0	74	62
Chloride	0.30	0.30	0.30	0.30	0.30	0.30	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.058	0.055	0.053	0.061	0.067	0.065	0.047	0.049	0.049	0.047	0.053	0.061
Sulphate	2.8	2.4	2.5	2.4	2.7	2.3	1.0	1.3	1.6	1.5	2.1	2.2
Nutrients												
Ammonia-N	0.0030	0.0171	0.0127	0.0137	0.0160	0.0071	0.0025	0.0025	0.0084	0.0062	0.0025	0.0025
Nitrate-N	0.008	0.013	0.041	0.045	0.071	0.039	0.003	0.003	0.051	0.045	0.037	0.043
Nitrite-N	0.00060	0.00111	0.00060	0.00060	0.00060	0.00060	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.029	0.028	0.026	0.029	0.045	0.025	0.023	0.026	0.023	0.028	0.024	0.026
Total Metals												
Aluminum	0.178	0.296	0.073	0.107	0.241	0.056	0.054	0.053	0.036	0.064	0.046	0.037
Antimony	0.000108	0.000060	0.000060	0.000060	0.000060	0.000060	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0011	0.0011	0.0012	0.0012	0.0013	0.0011	0.0012	0.0010	0.0009	0.0010	0.0010	0.0010
Barium	0.0052	0.0051	0.0059	0.0070	0.0082	0.0054	0.0051	0.0047	0.0051	0.0051	0.0047	0.0046
Beryllium	0.000050	0.000060	0.000012	0.000012	0.000060	0.000012	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0060	0.0060	0.0060	0.0060	0.0060	0.0060	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000014	0.0000221	0.0000130	0.000018	0.0000204	0.0000084	0.000010	0.0000085	0.0000130	0.000010	0.0000082	0.0000057
Chromium	0.00030	0.00058	0.00030	0.00030	0.00076	0.00030	0.00033	0.00025	0.00025	0.00060	0.00051	0.00025
Cobalt	0.00006	0.00006	0.00006	0.00006	0.00014	0.00006	0.00007	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00030	0.00070	0.00030	0.00030	0.00144	0.00030	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.287	0.305	0.229	0.245	0.438	0.169	0.240	0.220	0.112	0.145	0.104	0.093
Lead	0.000030	0.000091	0.000030	0.000030	0.000161	0.000030	0.000043	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.00118	0.00060	0.0006	0.00060	0.00060	0.0006	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.0214	0.0200	0.0235	0.0241	0.0430	0.0111	0.0187	0.0204	0.0161	0.0171	0.0084	0.0079
Mercury	0.0000030	0.0000071	0.0000030	0.0000036	0.0000036	0.0000036	0.0000030	0.0000030	0.0000030	0.0000030	0.0000030	0.0000030
Molybdenum	0.00052	0.00050	0.00068	0.00123	0.00093	0.00080	0.00071	0.00064	0.00072	0.00070	0.00068	0.00071
Nickel	0.00030	0.00030	0.00030	0.00030	0.00030	0.00030	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.000087	0.000085	0.000030	0.000030	0.000091	0.000030	0.000025	0.000025	0.000025	0.000062	0.000025	0.000025
Silver	0.0000060	0.0000152	0.0000060	0.0000060	0.0000060	0.0000060	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.069	0.065	0.074	0.079	0.114	0.079	0.072	0.073	0.076	0.071	0.068	0.070
Thallium	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000060	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00011	0.00012	0.00012	0.00013	0.00017	0.00011	0.00012	0.00014	0.00010	0.00016	0.00014	0.00014
Vanadium	0.0014	0.0014	0.0012	0.0016	0.0018	0.0018	0.0010	0.0010	0.0009	0.0013	0.0011	0.0011
Zinc	0.0042	0.0073	0.0018	0.0038	0.0066	0.0018	0.0021	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.105	0.249	0.033	0.038	0.054	0.029	0.016	0.016	0.015	0.021	0.021	0.019
Cadmium	0.000010	0.000016	0.0000067	0.000007	0.000009	0.0000070	0.000007	0.000006	0.0000062	0.000009	0.000012	0.0000030
Copper	0.00035	0.00067	0.00012	0.00012	0.00030	0.00012	0.00013	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.189	0.229	0.130	0.116	0.201	0.096	0.130	0.120	0.068	0.075	0.054	0.047
Manganese	0.0133	0.0124	0.01380	0.0135	0.0144	0.00847	0.0057	0.0109	0.01110	0.0118	0.0052	0.00560
Zinc	0.00274	0.0063	0.00240	0.00236	0.0043	0.00156	0.00140	0.0013	0.00210	0.00210	0.0016	0.00140

Notes:

Concentrations in mg/L, unless otherwise noted.

Shaded cells indicate the mean monthly concentration is greater than the mean baseline for that month.

[1] 95th percentile concentration measured in baseline studies at the 661-10 site between 2016 and September 30, 2022.

Appendix C-6a: Comparison of Average Monthly Water Quality and Predictions for DC-05 in Davidson Creek

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	1.04	1.05	1.02	0.98	0.79	0.67	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.36	0.31	0.28	0.28	0.22	0.23	0.042	0.046	0.042	0.040	0.046	0.047
Sulphate	107	92	70	76	69	59	2.8	3.2	3.2	3.2	3.3	3.3
Nutrients												
Ammonia-N	0.42	0.44	0.37	0.39	0.36	0.40	0.0038	0.0049	0.0050	0.0025	0.0025	0.0025
Nitrate-N	2.2	2.3	2.1	1.9	1.6	1.6	0.003	0.013	0.034	0.039	0.041	0.041
Nitrite-N	0.018	0.019	0.016	0.014	0.013	0.013	0.00050	0.00050	0.00050	0.00050	0.00150	0.00050
Total Phosphorous	0.034	0.038	0.035	0.034	0.035	0.036	0.007	0.007	0.010	0.008	0.010	0.009
Total Metals												
Aluminum	0.19	0.14	0.12	0.10	0.08	0.08	0.020	0.012	0.013	0.013	0.017	0.011
Antimony	0.0071	0.0069	0.0059	0.0068	0.0065	0.0065	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0015	0.0015	0.0014	0.0019	0.0017	0.0016	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006
Barium	0.0094	0.0092	0.0083	0.0089	0.0088	0.0085	0.0085	0.0078	0.0083	0.0077	0.0076	0.0081
Beryllium	0.000077	0.000077	0.000092	0.000084	0.000082	0.000087	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.022	0.024	0.026	0.025	0.025	0.024	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000049	0.000051	0.000054	0.000054	0.000050	0.000048	0.000004	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00067	0.00068	0.00068	0.00095	0.00085	0.00084	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00064	0.00063	0.00062	0.00076	0.00074	0.00068	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00045	0.00045	0.00053	0.00052	0.00051	0.00048	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.154	0.132	0.12	0.109	0.106	0.10	0.056	0.041	0.046	0.037	0.040	0.030
Lead	0.00020	0.00021	0.00019	0.00018	0.00017	0.00018	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.032	0.026	0.020	0.021	0.018	0.016	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.14	0.13	0.113	0.09	0.07	0.064	0.0058	0.0039	0.0038	0.0025	0.0029	0.0020
Mercury	0.000014	0.000014	0.000015	0.000014	0.000014	0.000015	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.0020	0.0020	0.0022	0.0025	0.0027	0.0026	0.00096	0.00094	0.00096	0.00096	0.00097	0.00105
Nickel	0.00098	0.00089	0.00083	0.00095	0.00090	0.00091	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.00015	0.00016	0.00018	0.00015	0.00016	0.00018	0.000067	0.000082	0.000075	0.000096	0.000082	0.000100
Silver	0.000026	0.000028	0.000027	0.000029	0.000024	0.000023	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.21	0.18	0.15	0.17	0.15	0.14	0.103	0.095	0.105	0.096	0.095	0.102
Thallium	0.000064	0.000071	0.000067	0.000069	0.000056	0.000053	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00027	0.00026	0.00031	0.00026	0.00027	0.00031	0.00030	0.00030	0.00033	0.00034	0.00033	0.00039
Vanadium	0.0095	0.0077	0.0058	0.0062	0.0053	0.0047	0.0005	0.0003	0.0003	0.0003	0.0003	0.0003
Zinc	0.0037	0.0040	0.0042	0.0046	0.0042	0.0039	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.093	0.11	0.070	0.039	0.03	0.021	0.011	0.011	0.008	0.009	0.010	0.008
Cadmium	0.000048	0.000050	0.000053	0.000055	0.000051	0.000049	0.000003	0.000003	0.0000025	0.000003	0.000003	0.0000030
Copper	0.00045	0.00045	0.00053	0.00052	0.00049	0.00046	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.11	0.091	0.091	0.09	0.082	0.078	0.034	0.034	0.030	0.025	0.023	0.022
Manganese	0.14	0.13	0.11	0.09	0.07	0.06	0.0034	0.0040	0.00250	0.0019	0.0015	0.00147
Zinc	0.0033	0.0035	0.0038	0.0041	0.0036	0.0032	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L.

Shaded cells indicate the mean monthly concentration is greater than the predicted concentration for that month.

[1] *Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ28 in the water quality prediction model v.13e (Lorax 2022).*

Appendix C-6b: Comparison of Average Monthly Water Quality and Predictions for DC-10 in Davidson Creek

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	1.0	1.0	1.0	1.0	0.8	0.7	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.36	0.31	0.28	0.28	0.22	0.23	0.041	0.045	0.041	0.038	0.045	0.047
Sulphate	107	91.6	69.6	76	68.9	59.0	2.8	3.3	3.3	3.3	3.3	3.4
Nutrients												
Ammonia-N	0.42	0.44	0.37	0.39	0.36	0.39	0.0075	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate-N	2.2	2.3	2.1	1.9	1.6	1.6	0.003	0.027	0.033	0.043	0.050	0.038
Nitrite-N	0.018	0.019	0.016	0.014	0.013	0.013	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Metals												
Aluminum	0.19	0.14	0.109	0.094	0.074	0.071	0.013	0.013	0.017	0.034	0.014	0.012
Antimony	0.0070	0.0069	0.0059	0.0068	0.0065	0.0064	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0014	0.0014	0.0013	0.0017	0.0015	0.0015	0.0006	0.0005	0.0006	0.0005	0.0005	0.0005
Barium	0.0093	0.0090	0.0083	0.0089	0.0087	0.0085	0.0090	0.0082	0.0090	0.0081	0.0079	0.0086
Beryllium	0.000077	0.000077	0.000092	0.000083	0.000081	0.000087	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.022	0.024	0.024	0.024	0.022	0.022	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000049	0.000050	0.000054	0.000054	0.000050	0.000048	0.000003	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00064	0.00064	0.00062	0.00086	0.00077	0.00075	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00063	0.00063	0.00062	0.00076	0.00073	0.00068	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00045	0.00045	0.00053	0.00052	0.00051	0.00048	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.15	0.13	0.11	0.11	0.11	0.10	0.032	0.034	0.037	0.044	0.024	0.022
Lead	0.00020	0.00021	0.00019	0.00018	0.00017	0.00018	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.032	0.026	0.020	0.021	0.018	0.016	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.14	0.13	0.099	0.09	0.07	0.059	0.0041	0.0033	0.0041	0.0043	0.0021	0.0030
Mercury	0.000014	0.000014	0.000015	0.000014	0.000014	0.000015	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.0020	0.0020	0.0022	0.0024	0.0027	0.0026	0.00099	0.00091	0.00098	0.00095	0.00099	0.00102
Nickel	0.00098	0.00089	0.00083	0.00095	0.00090	0.00091	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.00015	0.00016	0.00018	0.00015	0.00016	0.00018	0.000025	0.000025	0.000072	0.000065	0.000063	0.000070
Silver	0.000026	0.000028	0.000027	0.000029	0.000024	0.000023	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.21	0.18	0.15	0.17	0.15	0.14	0.107	0.094	0.110	0.095	0.095	0.099
Thallium	0.000064	0.000071	0.000067	0.000069	0.000056	0.000053	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00027	0.00026	0.00031	0.00026	0.00027	0.00031	0.00029	0.00029	0.00034	0.00036	0.00034	0.00039
Vanadium	0.0094	0.0077	0.0058	0.0062	0.0053	0.0047	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003
Zinc	0.0037	0.0040	0.0042	0.0045	0.0042	0.0038	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.088	0.11	0.064	0.037	0.02	0.018	0.012	0.008	0.008	0.008	0.009	0.014
Cadmium	0.000048	0.000050	0.000053	0.000054	0.000051	0.000048	0.000003	0.000003	0.0000025	0.000003	0.000003	0.0000030
Copper	0.00045	0.00045	0.00053	0.00052	0.00049	0.00046	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.10	0.089	0.091	0.08	0.082	0.078	0.033	0.019	0.021	0.021	0.015	0.014
Manganese	0.14	0.13	0.098	0.09	0.07	0.058	0.0033	0.0024	0.00242	0.0038	0.0017	0.00122
Zinc	0.0033	0.0035	0.0038	0.0041	0.0036	0.0031	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L.

Shaded cells indicate the mean monthly concentration is greater than the predicted concentration for that month.

[1] Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ27 in the water quality prediction model v.13e (Lorax 2022).

Appendix C-6c: Comparison of Average Monthly Water Quality and Predictions for DC-15 in Davidson Creek

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	0.88	0.90	0.80	0.78	0.65	0.56	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.31	0.26	0.22	0.22	0.18	0.19	0.045	0.050	0.042	0.050	0.051	0.056
Sulphate	87	72	51	58	54	44	2.4	3.1	3.0	3.1	3.3	3.4
Nutrients												
Ammonia-N	0.35	0.36	0.29	0.28	0.28	0.30	0.0025	0.0025	0.0025	0.0025	0.0025	0.0025
Nitrate-N	1.9	2.0	1.6	1.4	1.3	1.2	0.003	0.022	0.034	0.035	0.037	0.044
Nitrite-N	0.015	0.016	0.012	0.011	0.010	0.010	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.029	0.029	0.026	0.025	0.026	0.027	0.006	0.004	0.007	0.008	0.008	0.009
Total Metals												
Aluminum	0.17	0.13	0.092	0.08	0.06	0.060	0.012	0.012	0.017	0.011	0.009	0.008
Antimony	0.0058	0.0059	0.0045	0.0050	0.0049	0.0046	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0013	0.0012	0.0012	0.0015	0.0013	0.0013	0.0006	0.0005	0.0006	0.0005	0.0006	0.0006
Barium	0.0091	0.0085	0.0077	0.0086	0.0085	0.0083	0.0093	0.0088	0.0099	0.0083	0.0086	0.0088
Beryllium	0.000073	0.000073	0.000080	0.000077	0.000075	0.000079	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.020	0.020	0.019	0.019	0.019	0.019	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000042	0.000044	0.000038	0.000040	0.000039	0.000036	0.000003	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00059	0.00057	0.00053	0.00072	0.00064	0.00062	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Cobalt	0.00050	0.00053	0.00048	0.00057	0.00055	0.00053	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00048	0.00043	0.00044	0.00045	0.00044	0.00042	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.147	0.122	0.10	0.092	0.089	0.08	0.035	0.028	0.033	0.024	0.021	0.019
Lead	0.00017	0.00018	0.00015	0.00015	0.00014	0.00014	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.025	0.021	0.015	0.016	0.013	0.011	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.117	0.105	0.081	0.066	0.058	0.048	0.0058	0.0053	0.0068	0.0061	0.0040	0.0032
Mercury	0.000012	0.000012	0.000011	0.000011	0.000011	0.000011	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.0018	0.0018	0.0017	0.0020	0.0022	0.0021	0.00095	0.00087	0.00090	0.00094	0.00096	0.00098
Nickel	0.00083	0.00079	0.00069	0.00077	0.00075	0.00074	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.00013	0.00014	0.00014	0.00013	0.00014	0.00015	0.000025	0.000025	0.000058	0.000054	0.000056	0.000063
Silver	0.000023	0.000024	0.000022	0.000022	0.000019	0.000019	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.18	0.15	0.12	0.14	0.13	0.13	0.110	0.102	0.116	0.105	0.108	0.106
Thallium	0.000055	0.000058	0.000052	0.000052	0.000042	0.000042	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.00024	0.00023	0.00025	0.00023	0.00025	0.00029	0.00025	0.00024	0.00027	0.00031	0.00029	0.00031
Vanadium	0.0073	0.0062	0.0046	0.0046	0.0040	0.0035	0.0005	0.0003	0.0006	0.0003	0.0003	0.0003
Zinc	0.0034	0.0037	0.0035	0.0037	0.0038	0.0032	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.073	0.078	0.047	0.026	0.014	0.011	0.007	0.006	0.005	0.007	0.005	0.005
Cadmium	0.000041	0.000044	0.000038	0.000041	0.000040	0.000036	0.000003	0.000003	0.0000025	0.000003	0.000003	0.0000030
Copper	0.00041	0.00043	0.00044	0.00045	0.00042	0.00040	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.10	0.083	0.078	0.07	0.067	0.060	0.026	0.015	0.014	0.014	0.005	0.012
Manganese	0.12	0.104	0.080	0.06	0.057	0.047	0.0040	0.0039	0.00384	0.0053	0.0027	0.00225
Zinc	0.0030	0.0030	0.0031	0.0032	0.0032	0.0026	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L.

Shaded cells indicate the mean monthly concentration is greater than the predicted concentration for that month.

[a] *Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ26 in the water quality prediction model v.13e (Lorax 2022).*

Appendix C-6d: Comparison of Average Monthly Water Quality and Predictions for 661-05 in Creek 661

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	0.27	0.28	0.32	0.42	0.27	0.32	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.053	0.054	0.076	0.070	0.061	0.061	0.054	0.059	0.065	0.058	0.061	0.065
Sulphate	3.0	3.4	4.7	3.4	3.3	3.1	1.0	1.3	1.3	1.2	1.5	1.5
Nutrients												
Ammonia-N	0.011	0.0086	0.011	0.011	0.0086	0.010	0.0058	0.0025	0.0051	0.0025	0.0025	0.0025
Nitrate-N	0.074	0.083	0.078	0.174	0.090	0.179	0.013	0.054	0.059	0.051	0.057	0.057
Nitrite-N	0.0022	0.0020	0.0021	0.0021	0.0011	0.0024	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.010	0.019	0.019	0.019	0.020	0.023	0.051	0.050	0.055	0.049	0.049	0.050
Total Metals												
Aluminum	0.073	0.076	0.070	0.057	0.042	0.088	0.031	0.039	0.058	0.035	0.038	0.032
Antimony	0.00039	0.00044	0.00034	0.00035	0.00034	0.00034	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.0008	0.0010	0.0007	0.0007	0.0012	0.0012	0.0015	0.0013	0.0013	0.0013	0.0013	0.0012
Barium	0.0041	0.0044	0.0055	0.0072	0.0048	0.0063	0.0048	0.0045	0.0051	0.0046	0.0047	0.0046
Beryllium	0.000068	0.000070	0.000066	0.000065	0.000065	0.000065	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0068	0.0051	0.0029	0.0021	0.0065	0.0054	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000016	0.000023	0.000026	0.000110	0.000014	0.000014	0.000003	0.0000025	0.0000025	0.000003	0.0000030	0.0000030
Chromium	0.00015	0.00034	0.00015	0.00015	0.00030	0.00029	0.00073	0.00093	0.00089	0.00087	0.00093	0.00080
Cobalt	0.000087	0.00010	0.000090	0.000107	0.00010	0.000095	0.00005	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00025	0.00041	0.00044	0.00054	0.00029	0.00046	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.12	0.17	0.19	0.37	0.17	0.17	0.160	0.151	0.170	0.113	0.114	0.098
Lead	0.000036	0.000037	0.000076	0.000354	0.000034	0.000153	0.000025	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.0012	0.0013	0.0011	0.0011	0.0011	0.0011	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.013	0.021	0.022	0.027	0.020	0.019	0.0107	0.0100	0.0119	0.0079	0.0085	0.0061
Mercury	0.0000040	0.0000063	0.0000045	0.0000037	0.0000037	0.0000037	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00039	0.00043	0.00039	0.00037	0.00080	0.00056	0.00086	0.00082	0.00088	0.00091	0.00091	0.00085
Nickel	0.00019	0.00035	0.00028	0.00029	0.00032	0.00036	0.00025	0.00059	0.00025	0.00025	0.00025	0.00025
Selenium	0.00031	0.00021	0.00019	0.00031	0.00004	0.00005	0.000071	0.000078	0.000072	0.000078	0.000081	0.000076
Silver	0.000027	0.000021	0.000026	0.000026	0.000007	0.000017	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.045	0.049	0.061	0.073	0.067	0.058	0.088	0.082	0.085	0.084	0.084	0.079
Thallium	0.000031	0.000022	0.000031	0.000030	0.000011	0.000021	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.000070	0.000084	0.000056	0.000067	0.000096	0.000087	0.00020	0.00020	0.00023	0.00021	0.00020	0.00020
Vanadium	0.00041	0.00065	0.00059	0.00037	0.00098	0.00062	0.0019	0.0018	0.0019	0.0018	0.0020	0.0018
Zinc	0.0029	0.0021	0.0012	0.0280	0.0018	0.0024	0.0015	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.058	0.062	0.22	0.047	0.032	0.07	0.011	0.009	0.012	0.009	0.008	0.009
Cadmium	0.000016	0.000019	0.000015	0.000063	0.000009	0.000012	0.000003	0.000003	0.0000025	0.000003	0.000007	0.0000030
Copper	0.00010	0.00028	0.00044	0.00054	0.00029	0.00046	0.00010	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.10	0.12	0.11	0.18	0.13	0.14	0.091	0.050	0.053	0.046	0.031	0.039
Manganese	0.013	0.014	0.015	0.025	0.016	0.017	0.0058	0.0057	0.00618	0.0050	0.0047	0.00346
Zinc	0.0019	0.0024	0.00061	0.0127	0.0039	0.00339	0.00050	0.0005	0.00050	0.00050	0.0005	0.00050

Notes:

Concentrations in mg/L.

Shaded cells indicate the mean monthly concentration is greater than the predicted concentration for that month.

[1] Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ3 in the water quality prediction model v.13e (Lorax 2022).

Appendix C-6e: Comparison of Average Monthly Water Quality and Predictions for 661-10 in Creek 661

Parameter	Predicted Concentration[1]						2022 Mean Concentration			2023 Mean Concentration		
	October	November	December	January	February	March	October	November	December	January	February	March
Dissolved Anions												
Chloride	0.27	0.27	0.32	0.42	0.27	0.32	0.25	0.25	0.25	0.25	0.25	0.25
Fluoride	0.053	0.053	0.078	0.073	0.064	0.063	0.047	0.049	0.049	0.047	0.053	0.061
Sulphate	3.0	3.3	4.9	3.7	3.6	3.3	0.9	1.3	1.6	1.5	2.1	2.2
Nutrients												
Ammonia-N	0.011	0.0085	0.011	0.011	0.0088	0.010	0.0025	0.0025	0.0084	0.0062	0.0025	0.0025
Nitrate-N	0.072	0.075	0.086	0.185	0.101	0.191	0.003	0.003	0.051	0.045	0.037	0.043
Nitrite-N	0.0022	0.0019	0.0022	0.0022	0.0012	0.0026	0.00050	0.00050	0.00050	0.00050	0.00050	0.00050
Total Phosphorous	0.0099	0.019	0.019	0.0188	0.020	0.023	0.023	0.026	0.023	0.028	0.024	0.026
Total Metals												
Aluminum	0.074	0.076	0.070	0.057	0.042	0.088	0.048	0.053	0.036	0.064	0.046	0.037
Antimony	0.000050	0.000049	0.000049	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050	0.000050
Arsenic	0.00082	0.00098	0.00074	0.00074	0.00126	0.00130	0.0011	0.0010	0.0009	0.0010	0.0010	0.0010
Barium	0.0041	0.0044	0.0055	0.0072	0.0049	0.0063	0.0050	0.0047	0.0051	0.0051	0.0047	0.0046
Beryllium	0.000068	0.000068	0.000068	0.000068	0.000068	0.000069	0.000010	0.000010	0.000010	0.000010	0.000010	0.000010
Boron	0.0068	0.0049	0.0032	0.0024	0.0068	0.0057	0.0050	0.0050	0.0050	0.0050	0.0050	0.0050
Cadmium	0.000016	0.000022	0.000027	0.000111	0.000015	0.000016	0.000008	0.0000085	0.0000130	0.000010	0.0000082	0.0000057
Chromium	0.00015	0.00034	0.00015	0.00015	0.00030	0.00029	0.00031	0.00025	0.00025	0.00060	0.00051	0.00025
Cobalt	0.000086	0.000097	0.000097	0.000116	0.000106	0.000105	0.00006	0.00005	0.00005	0.00005	0.00005	0.00005
Copper	0.00025	0.00040	0.00045	0.00054	0.00030	0.00047	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Iron	0.12	0.17	0.19	0.37	0.17	0.17	0.227	0.220	0.112	0.145	0.104	0.093
Lead	0.000035	0.000036	0.000077	0.000354	0.000036	0.000155	0.000039	0.000025	0.000025	0.000025	0.000025	0.000025
Lithium	0.0012	0.0012	0.0012	0.0012	0.0012	0.0012	0.00050	0.00050	0.0005	0.00050	0.00050	0.0005
Manganese	0.013	0.020	0.023	0.029	0.021	0.021	0.0165	0.0204	0.0161	0.0171	0.0084	0.0079
Mercury	0.0000039	0.0000061	0.0000047	0.0000040	0.0000040	0.0000040	0.0000025	0.0000025	0.0000025	0.0000030	0.0000030	0.0000030
Molybdenum	0.00038	0.00041	0.00042	0.00041	0.00083	0.00059	0.00070	0.00064	0.00072	0.00070	0.00068	0.00071
Nickel	0.00019	0.00034	0.00029	0.00030	0.00034	0.00037	0.00025	0.00025	0.00025	0.00025	0.00025	0.00025
Selenium	0.00031	0.00020	0.00019	0.00031	0.00004	0.00006	0.000025	0.000025	0.000025	0.000062	0.000025	0.000025
Silver	0.000027	0.000021	0.000027	0.000027	0.000007	0.000017	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Strontium	0.045	0.049	0.061	0.073	0.068	0.058	0.072	0.073	0.076	0.071	0.068	0.070
Thallium	0.000031	0.000022	0.000031	0.000031	0.000012	0.000022	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050	0.0000050
Uranium	0.000070	0.000081	0.000058	0.000070	0.000099	0.000090	0.00012	0.00014	0.00010	0.00016	0.00014	0.00014
Vanadium	0.00040	0.00062	0.00061	0.00040	0.00101	0.00065	0.0010	0.0010	0.0009	0.0013	0.0011	0.0011
Zinc	0.0028	0.0020	0.00122	0.0280	0.0019	0.00242	0.0020	0.0015	0.0015	0.0015	0.0015	0.0015
Dissolved Metals												
Aluminum	0.058	0.062	0.22	0.047	0.032	0.07	0.015	0.016	0.015	0.021	0.021	0.019
Cadmium	0.000016	0.000019	0.000016	0.000064	0.000011	0.000013	0.000007	0.000006	0.0000062	0.000009	0.000012	0.0000030
Copper	0.00010	0.00027	0.00045	0.00054	0.00030	0.00047	0.00013	0.00010	0.00010	0.00010	0.00010	0.00010
Iron	0.10	0.12	0.11	0.18	0.13	0.14	0.129	0.120	0.068	0.075	0.054	0.047
Manganese	0.012	0.014	0.016	0.026	0.018	0.018	0.0055	0.0109	0.01110	0.0118	0.0052	0.00560
Zinc	0.0019	0.0023	0.00066	0.0128	0.0039	0.00345	0.00138	0.0013	0.00210	0.00210	0.0016	0.00140

Notes:

Concentrations in mg/L.

Shaded cells indicate the mean monthly concentration is greater than the predicted concentration for that month.

[1] Maximum monthly base case (95th percentile) predicted concentration predicted in base case in Construction and Operations phases at WQ5 in the water quality prediction model v.13e (Lorax 2022).

Appendix 5: 2022 Wildlife Mitigation and Monitoring Program Compliance Report



ARTEMIS GOLD INC | Blackwater Mine

Blackwater Gold Project

2022 Wildlife Mitigation and Monitoring Program Compliance Report

June 2023

Project No.: 0679295-16

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June 2023

Blackwater Gold Project

2022 Wildlife Mitigation and Monitoring Program Compliance Report

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ACRONYMS AND ABBREVIATIONS

Alpine	High-elevation land above the tree-line: alpine vegetation on zonal sites is dominated by low shrubs, herbs, bryophytes and lichens. Although treeless by definition, patches of stunted (krummholz) trees may occur. Much of the alpine is covered by rock and ice rather than vegetation.
APLIC	Avian Power Line Interaction Committee
Application/EIS	Environmental Assessment
Artemis	Artemis Gold Inc.
ARU	Automated Recording Units
BC	British Columbia
BC CDC	British Columbia Conservation Data Centre - collects and disseminates information on plants, animals and ecosystems (ecological communities) at risk at the provincial level, and is tied to Nature Serve, an international, non-profit organization of cooperating Conservation Data Centres and Natural Heritage Programs all using the BGC zone same methods to gather and exchange information on the threatened elements of biodiversity.
BC MFLNRO	British Columbia Ministry of Forests, Land, and Natural Resource Operations, changed to Ministry of Forests
BC MOF	British Columbia Ministry of Forests, formerly Ministry of Forests, Land, and Natural Resource Operations
BC *Wildlife Act* (1996)	The main provincial law for protecting wildlife, endangered species, and wildlife habitat. The Act has a number of provisions for protecting, managing, and purchasing habitat areas as well as protecting endangered and threatened species. The Act is administered by the Ministry of Environment.
BEC	Biogeoclimatic Ecosystem Classification: a standard, hierarchical classification system for mapping terrestrial ecosystems in British Columbia. Divided into zones and subzones.
Biogeoclimatic zone (BGC zone)	Biogeoclimatic zone; a provincial ecological classification which forms the basis of the BEC system and is defined as “a geographic area having similar patterns of energy flow, vegetation, and soils as a result of a broadly homogenous macroclimate”.
Blue listed	A list of ecological communities, and indigenous species and subspecies of special concern in British Columbia, maintained by the BC Ministry of Environment.
BW Gold	Blackwater Gold LTD.
CMMP	Caribou Mitigation and Management Plan
COSEWIC	Committee on the Status of Endangered Wildlife in Canada: a federal committee of experts that assesses and designates the level of threat to wildlife and vegetation species in Canada.
DS	Decision Statement
EAC	Environmental Assessment Certificate

ECCC	Environment and Climate Change Canada
Ecosystem (terrestrial)	A volume of earth-space that is composed of non-living parts (climate, geologic materials, groundwater, and soils) and living or biotic parts, which are all constantly in a state of motion, transformation, and development. No size or scale is inferred.
EIS	Environmental Impact Statement
ESSF	Engelmann Spruce – Subalpine Fir BEC zone
FSR	Forest Service Road
GPS	Global Positioning System
ha	Hectare: 10,000 m^2 or 0.01 km^2 or 2.47 acres
Habitat	Land and water surface used by wildlife, which may include biotic and abiotic aspects such as vegetation, exposed bedrock, water and topography.
km	Kilometre
LDN	Lhoosk'uz Dené Nation
LPU	Local Population Unit
LSA	Local Study Area, 27,589 ha in size
Migration	The regular seasonal or daily movement of animal populations to and from different areas, often considerable distances apart. Migration often occurs in corridors between preferred habitat types.
Migratory Birds Convention Act (1994)	A federal government commitment established in 1917 to protect most migrating birds found in Canada. The Act fulfilled the terms of the Migratory Birds Convention of 1916 between Canada and the United States of America (USA). The Canadian government has the authority to pass and enforce regulations to protect those species of migratory birds which are included in the Convention.
Model	An idealized representation of reality developed to describe, analyze or understand the behaviour of some aspect of it a mathematical representation of the relationship under study.
MT	Mitigation Table (November 2020), defines mitigations required and approved by the BC Environmental Assessment Office
New Gold	New Gold Inc.
Parkland	Subalpine area characterized by forest clumps interspersed with open subalpine meadows and shrub thickets. Vegetation cover may vary in the proportion of treed patches, meadows, and shrub thickets. The term parkland can also be used for lower elevation forest that are open due to restricted moisture availability, such as occurs in the Ponderosa Pine zone.
RIC	Resource Inventory Committee: a body of the BC government that develops survey standards for BC wildlife and ecosystems.
RISC	Resource Information Standards Committee, formerly the Resource Inventory Committee
RSA	Regional Study Area – 274,098 ha in size

SAC	Species Accumulation Curve: a calculation showing the rate of newly detected species with additional sampling, used to estimate the number of species present in a regional community.
SARA	*Species at Risk Act* (2002b): A Canadian federal statute which is designed to meet one of Canada's commitments under the International Convention on Biological Diversity. The goal of the Act is to protect endangered or threatened organisms and their habitats. It also manages species which are not yet threatened, but whose existence or habitat is in jeopardy.
SBS	Sub-Boreal Spruce BEC Zone
TEM	Terrestrial Ecosystem Mapping
The Project	Blackwater Project
TK	Traditional Knowledge
Topography	The configuration of a surface, including its relief and the position of its natural and man-made features.
TSF	Tailings Storage Facility
UFN	Ulkatcho First Nation
Upland Bird	Interior forest breeding birds
USA	United States of America
UWR	Ungulate Winter Range: an area identified by the BC Ministry of Environment as "an area that contains habitat that is necessary to meet the winter habitat requirements of an ungulate species".
VRPC	Variable Radius Point Count
Wetland	Sites dominated by hydrophytic vegetation where soils are water-saturated for a sufficient length of time such that excess water and resulting low soil oxygen levels are principal determinants of vegetation and soil development (MacKenzie and Moran 2004).
WHA	Wildlife Habitat Area
WMMP	Wildlife Mitigation and Monitoring Plan
WMU	Wildlife Management Unit – The BC government divides the province into regions (i.e., WMU) for purposes of managing wildlife harvest.

1. INTRODUCTION

The Blackwater Gold Project (the Project) is a proposed gold and silver open pit mine located in central British Columbia (BC), 160 kilometres (km) southwest of Prince George, BC. The Project is located within the traditional territories of Lhoosk'uz Dené Nation, Ulkatcho First Nation, Skin Tyee Nation and Tsilhqot'in Nation. The Kluskus and Kluskus-Ootsa Forest Service Roads and Project transmission line cross the traditional territories of Nadleh Whut'en First Nation, Saik'uz First Nation, and Stellat'en First Nation (collectively, the Carrier Sekani First Nations) as well as the traditional territories of the Nazko First Nation, Nee-Tahi-Buhn Band, Cheslatta Carrier Nation, and Yekooche First Nation.

Mineral tenures, assets, and rights for the Project were transferred from New Gold Inc. (New Gold) to Artemis Gold Inc. (Artemis) in August 2020. Artemis transferred the Project certificate to their subsidiary BW Gold who currently runs the Project. Project construction is estimated to last two years and includes the establishment of a tailings storage facility (TSF), ore processing facilities, waste rock, overburden and soil stockpiles, borrow areas and quarries, water management infrastructure, water treatment plants, accommodation camps, and ancillary facilities. A 135-km, 230 kilovolt overland transmission line will supply electrical power to the Project from the Glenannan substation BC Hydro grid.

In 2022, the Project was completing required management plans and authorizations in advance of early works and construction of the Project (scheduled to start in 2023). Early works in 2022 included limited site preparation activities, including tree clearing and earth works for new structures, geotechnical drilling, and other planning and field-investigations required for construction.

A Wildlife Mitigation and Monitoring Plan (WMMP) was developed to manage potential Project-related adverse effects on wildlife and wildlife habitat during the Construction, Operations, Closure, and Post-closure phases (ERM 2022a). The WMMP incorporates requirements from the Environmental Assessment Certificate #M19-01 (EAC), the federal Decision Statement (DS), and the master Mitigation Table (MT) which was approved by the BC Environmental Assessment Office in November 2020 to address EAC condition 43. This report presents the results of the wildlife monitoring activities completed in 2022, following the WMMP. A concordance table tracking requirements from the DS and EAC is in Appendix A.

As defined by the WMMP and relevant Project conditions, an annual report will be prepared and will:

- summarize and present the results of the follow up programs and monitoring of mitigation measures during the previous year, during Construction and Operation of the Project;
- include a table of concordance indicating where Environmental Approval Certificate (EAC) and Decision Statement (DS) conditions have been addressed (see Appendix A);
- be sent to the EAO and Aboriginal Groups by March 31 the year following the reporting year;
- subsequently, be sent to Environment and Climate Change Canada (ECCC) and Indigenous groups for review and comment by June 30 of the year following the reporting year (DS condition 2.12); and
- be delivered in its final version to the Canadian Environmental Assessment Agency by September 30 of the year following the reporting year (DS condition 2.13).

This is the first year the annual WMMP compliance report has been completed and as such, some of the monitoring activities have not yet been initiated.

1.1 Study Areas

Wildlife monitoring activities were undertaken in two study areas: the Local Study Area (LSA) and the Regional Study Area (RSA).

The LSA (Figure 1.1-1) is 27,589 hectares (ha) in size and includes a buffer extending at least to the height of land or 1 to 1.5 km around the outer limits of the proposed infrastructure and linear developments (the mine site including the access road, freshwater pipeline, and airstrip, and transmission line). The LSA has been established to include the area in which most direct and indirect Project effects are expected to occur.

The RSA (Figure 1.1-1) is 274,098 ha in size and was delineated to reflect the area anticipated to provide habitat for wildlife species that interact with Project infrastructure during a season or lifetime. The RSA extends roughly 15 km from the designated Project area and is used to provide context for the evaluation Project-specific effects and potential cumulative effects. Species information such as home range sizes, habitat use, and seasonal movement patterns were considered when selecting the RSA boundary. Other ecological factors such as height of land (which can act as a barrier to movement) and watershed boundaries were also considered when delineating the RSA.

Ecologically, the RSA is composed of primarily coniferous forest, with mixed areas of young forest plantations, mature and old growth forest, and small portions of sub-alpine and alpine mountain. Most of the RSA is represented by the biogeoclimatic ecosystem classification (BEC) units of Engelmann Spruce – Subalpine Fir (ESSF) and Sub-boreal Spruce (Figure 1.1-1). The LSA is less diverse, comprised of primarily coniferous forest in the ESSF BEC zone.

1.2 Monitoring Requirements and Objectives

The objectives of the WMMP compliance report are:

- Summarize and present the results of the follow-up programs carried out the previous year, as outlined in the WMMP (ERM 2022a),
- Summarize and present the results of the monitoring of mitigation measures carried out the previous year, as outlined in the WMMP (ERM 2022a),
- Provide analysis of monitoring results to test impact predictions from the Environmental Impact Statement (EIS; New Gold 2015, ERM 2017), and
- Provide an overview of adaptive management actions carried out the previous year, along with the reasoning and outcome for each action.

The WMMP compliance report is separated into site-specific programs, which include data from multiple wildlife groups, and species-specific monitoring programs which include monitoring of a single wildlife species or group (e.g., waterbirds). Table 1.2-1 summarizes the programs and their corresponding section in the WMMP compliance report.

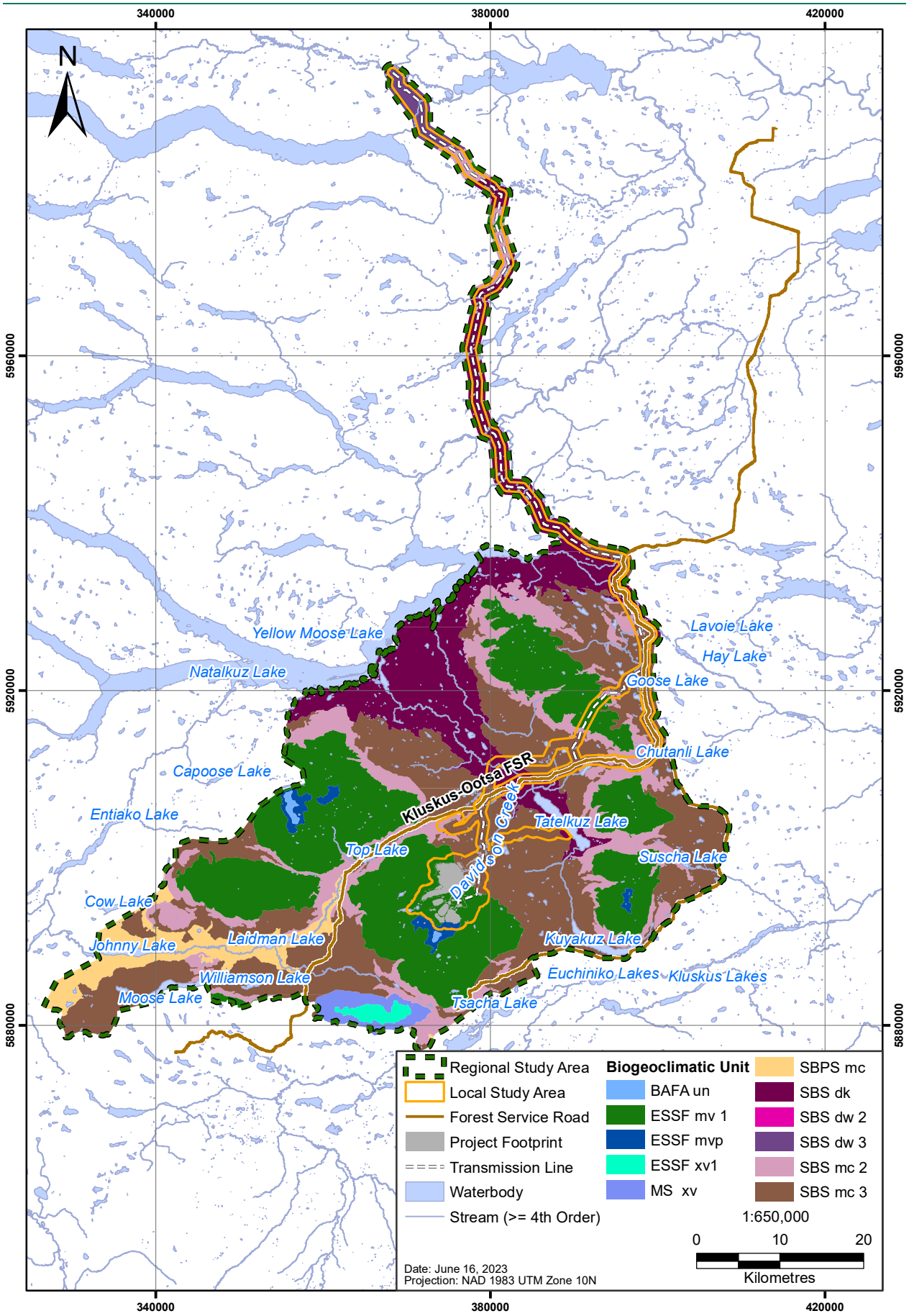


Figure 1.1-1: Local and Regional Study Areas of the Blackwater Project

Table 1.2-1: Monitoring Programs in the WMMP Compliance Report

Program Category	Program Name	Section
Site-Specific	Wildlife Pre-clearing Surveys and Mitigation	2.1
	Habitat Loss Monitoring	2.2
	Interactions, Incidents, and Mortalities	2.3
	Facility Water Structure Monitoring	2.4
	Transmission Line Monitoring	2.5
Species-Specific Monitoring	Moose	3.1
	Caribou	3.2
	Grizzly Bear	3.3
	Furbearers	3.4
	Bats	3.5
	Raptors	3.6
	Waterbirds	3.7
	Upland Birds	3.8
	Amphibians	3.9

2. SITE-SPECIFIC PROGRAMS

2.1 Pre-Clearing Surveys and Mitigation

DS conditions addressed: 4.1, 8.9, 8.10, 8.14

EAC conditions addressed: 23.c, 23.h.ii

Clearing and construction activities may occur during multiple Project phases and at different spatial scales (e.g., primary site construction or annual brush clearing in localized areas). Clearing is planned to occur outside sensitive timing windows for wildlife, where possible, with pre-clearing surveys and mitigation if clearing must occur during sensitive timing windows.

Pre-clearing surveys are required for wildlife when species' sensitive periods overlap the planned clearing period, as part of the provincial EAC condition 23.c. Sensitive periods for wildlife requiring the completion of pre-clearing surveys have been identified for grizzly bear, furbearers (wolverine (*Gulo gulo*), American marten (*Martes americana)*, fisher (*Pekani pennanti),* black bear *(Ursus americanus*)), bats, birds (raptors, waterbirds, and forest and grassland birds), amphibians (western toad [*Anaxyrus boreas*]), and caribou (southern mountain population), as required by Federal condition 8.9 and EAC condition 23.h.ii. Species and group specific sensitive periods applicable to the Project are further defined and described in Section 3.3.1 of the WMMP (ERM 2022a).

Clearing during 2022 was limited to the fall season (September through November) and pre-clearing surveys were only completed for amphibians, bear dens, raptor nests, and bat hibernacula and roosts.

2.1.1 Objectives

The objective of pre-clearing surveys is to identify and protect wildlife features in areas scheduled for clearing or construction activities. In 2022, this included:

- Grizzly and black bear den sites, sensitive denning period of October 1 to March 31.
- Amphibian breeding sites, sensitive breeding season of April 1 to September 30.
- Features that may function as hibernacula and/or roosts for bats during the sensitive roosting period of May 15 to September 30 and hibernation period of October 1 to May 31.
- Raptor nests, which are protected year-round.
- Mineral licks, which are protected year-round.

2.1.2 Methods

Pre-clearing surveys were completed following the relevant methods and guidance outlined in the pre-clearing Standard Operating Procedures (SOPs) developed for the Project for birds, general wildlife features, and amphibians (Appendices B, C, and D).

2.1.2.1 Amphibian Salvage

Amphibian salvage was completed in accordance with the Amphibian Pre-clearing and Salvage SOP provided in Appendix C and in compliance with general wildlife permit #SM22-746546. Amphibians were captured via dipnets and relocated in buckets or ziplocks while wearing disposable nitrile gloves. All equipment was cleaned using a bleach solution prior to salvage and after use to prevent the spread of pathogens.

2.1.3 Results

Pre-clearing surveys were completed for the Early Works Plant Site Area for bear dens, raptor nests, and bat hibernacula and roosts on September 13 and 14, 2022. One waterbody was identified as an amphibian breeding site was identified outside of the Early Works Plant Site Area (see Section 2.1.3.1 below), but no other amphibian breeding habitat was present in the pre-clearing area.

Two pre-clearing survey transects were completed with a combined survey effort of 8 hours and 54 minutes (one set of tracks recorded; Figure 2.1-1; Appendix E). The Early Works Plant Site Area was characterized as having a deadfall understory with small diameter conifer canopy. The overall vegetation cover was dominated by saplings, moss, lichen, and several berry species (Photos 2.1-1 and 2.1-2).

a)  b) 

Photo 2.1-1 (a and b): Representative Example of Small Pine Stands with Dead Understory within the Early Works Plant Site Survey Area, September 2022

a)  b) 

Photo 2.1-2 (a and b): Representative Example of the Tree Clearing Limits within the Early Works Plant Site Survey Area, September 2022

Additionally, an initial assessment was completed for the Early Works Tree Clearing Limits along existing trails for potential bear denning habitat and sensitive wildlife features on September 14 and 15, 2022. Eight survey transects were completed with a combined survey effort of 4 hours and 23 minutes (Figure 2.1-1; Appendix E). The Early Works Tree Clearing Limits was characterized as having a primarily consisting of small pine stands (Photo 2.1-2).

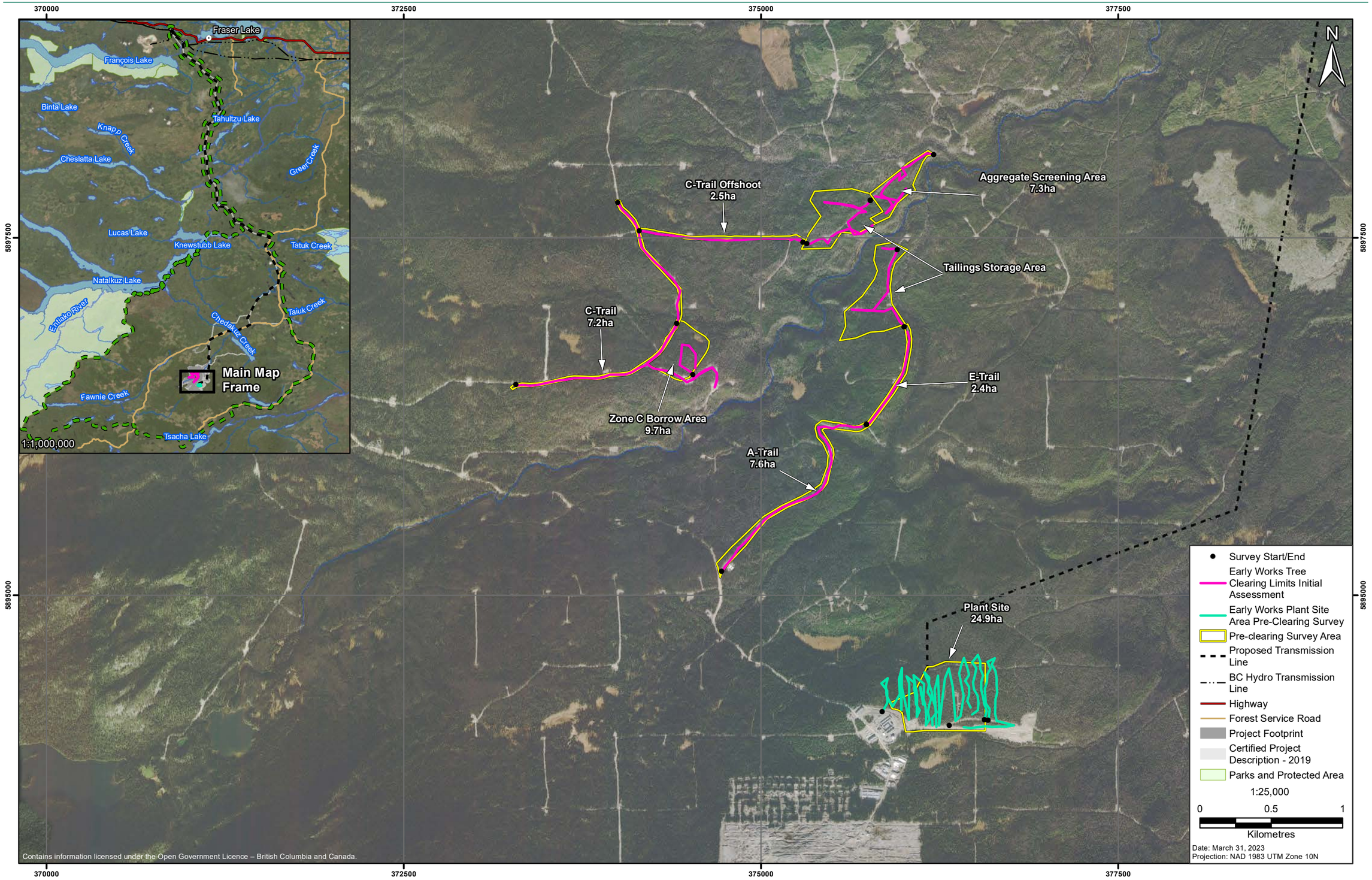


Figure 2.1-1: Pre-clearing Survey Locations, 2022

Pre-clearing survey within the Early Work Plant Site Area and along the Early Works Tree Clearing Limits did not identify any active or historical wildlife features or highly suitable habitat, with limited signs of wildlife use in general (Appendix E).

2.1.3.1 Amphibian Salvage

Amphibian salvage was completed on September 14 and 15, 2022 at one artificial wetland (a ditch pond created by soil stockpile) southeast of the Early Works Plant Site (Figure 2.1-2; Appendix F). Columbia spotted frog and western toad metamorphs and toadlets were incidentally found at the salvage site by onsite environmental personnel. Although the site was not within the Early Works Plant Site clearing limit, amphibians were salvaged due to concern over potential sediment contamination occurring during the clearing and grubbing process. In total, 20 Columbia spotted frog metamorphs were salvaged and relocated without incident (Photo 2.1-3; Appendix F). Western toad metamorphs and toadlets were also observed at the salvage site, salvage was not required as they were naturally leaving the wetland for upland hibernation areas and were not anticipated to be present at the time of planned construction activities in October 2022.



Photo 2.1-3: Colombia spotted frog metamorphs during salvage activities, September 14, 2022.

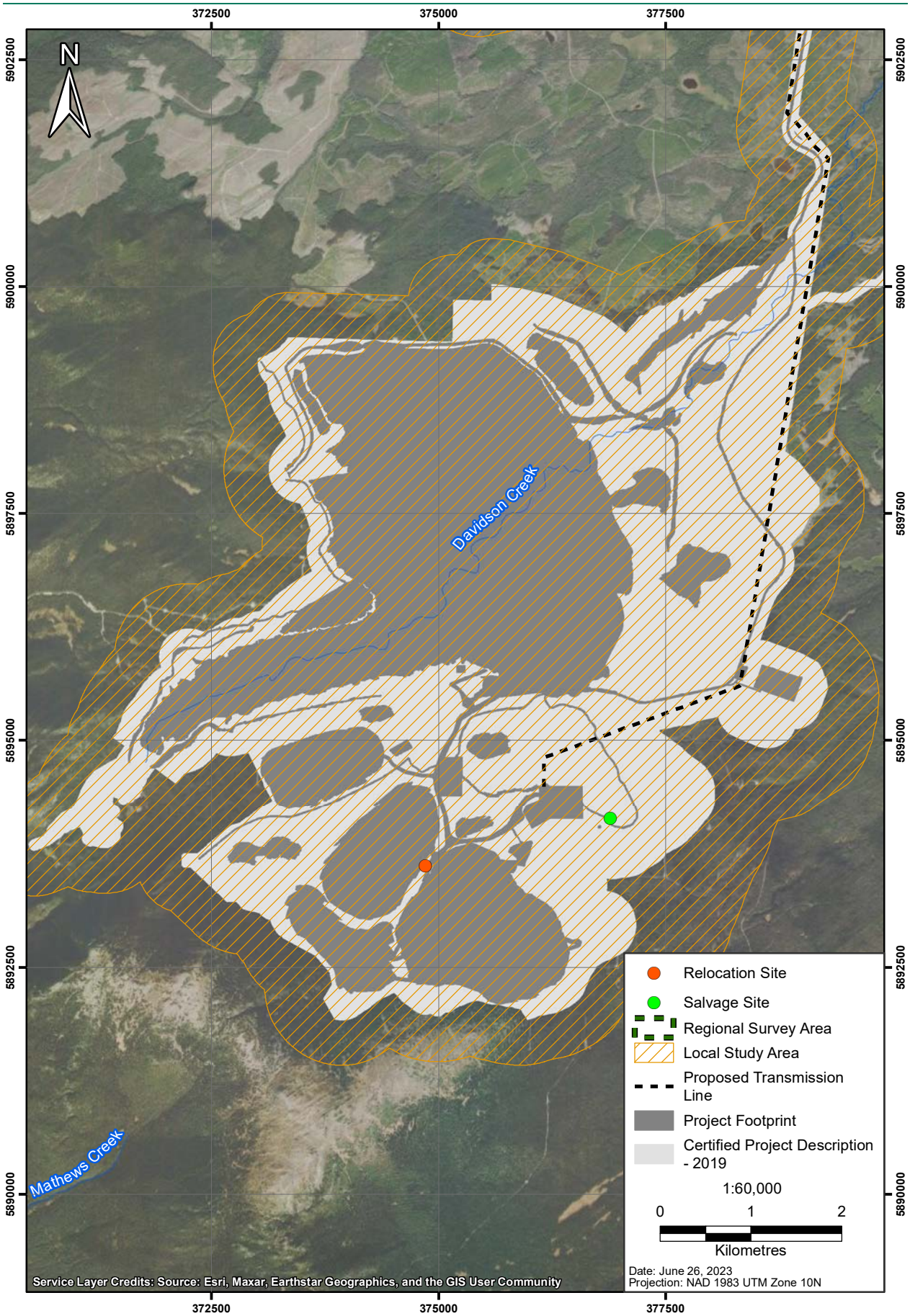


Figure 2.1-2: Amphibian Salvage and Relocation Sites, 2022

The relocation site was 2 km from the salvage site (within the same watershed) and was identified by a Qualified Professional Biologist as the most suitable location for the survivability of the Columbia spotted frog metamorphs (Photo 2.1-3). The relocation site was known to be a Columbia spotted frog breeding site and was deemed suitable based on presence of breeding and overwintering habitat and similarity of pH and water temperature to the salvage site.

2.1.4 Discussion

Clearing and construction activities are planned to occur outside sensitive timing windows for wildlife, where possible, with pre-clearing surveys and mitigation mandated by provincial EAC condition 23.c if clearing must occur during sensitive timing windows. Pre-clearing in 2022 did not occur during the sensitive breeding bird window (for any species groups) or the furbearer denning window. Clearing was scheduled at the end of the amphibian breeding window and bat roosting window, further reducing the potential effects to wildlife.

Pre-clearing surveys were completed for the Early Works Plant Site Area for bear dens, raptor nests, and bat hibernacula and roosts in September 2022. An initial assessment for potential bear denning habitat was also completed along existing Project trails for the Early Works Tree Clearing Limits. No waterbodies or wetlands suitable for amphibian breeding were present in the Early Works Plant Site Area, so no pre-clearing surveys were conducted for amphibians. The overall vegetation cover was dominated by saplings, moss, lichen, and several berry species. The Early Works Tree Clearing Limits was characterized as having a primarily consisting of small pine stands.

Pre-clearing survey within the Early Work Plant Site Area and along the Early Works Tree Clearing Limits did not identify any active or historical wildlife features or highly suitable habitat, with limited signs of wildlife use in general. Additional mitigation was not required and no wildlife habitat features were buffered.

Amphibian salvage was completed at one artificial wetland (a ditch pond created by soil stockpile) southeast of the Early Works Plant Site. The site was not within the Early Works Plant Site clearing limit, but amphibians were salvaged due to concern over potential sediment contamination occurring during the clearing and grubbing process. In total, 20 Columbia spotted frog metamorphs were salvaged and relocated without incident. The relocation site was 2 km from the salvage area, was a known Columbia spotted frog breeding site, and had similar water pH and temperature to the salvage location. Western toad metamorphs and toadlets were also observed at the salvage site, salvage was not required as they were naturally leaving the wetland for upland hibernation areas and were not anticipated to be present at the time of planned construction activities in October 2022. Additional monitoring activities related to amphibians and western toad are reported in Section 3.9.

2.2 Habitat Loss Monitoring

DS conditions addressed: none

EAC conditions addressed: 23.h

Habitat loss monitoring is used to validate predictions in the EIS relating to the amount of wildlife habitat lost due to construction of the project, as outlined in the WMMP (Sections 4.1, 4.4, 4.6, and 4.7; ERM 2022a). Habitat loss is evaluated by comparing the as-built Project footprint with existing habitat suitability mapping for each wildlife Valued Component (VC) in the EIS (New Gold 2015; ERM 2017). Any loss of habitat over predicted levels for a given VC would require adaptive management.

2.2.1 Objectives

- Evaluate wildlife habitat loss from Project construction.
- Measure the amount of habitat recovery at the site during Closure.

2.2.2 Methods

Habitat loss was calculated by comparing the as-built Project footprint (Figure 2.2-1) with existing habitat suitability mapping for specific VCs to verify predicted effects of the Project (ERM 2022a). Species monitored for habitat loss, based on the WMMP (ERM 2022a) are:

- Moose (*Alces alces*; growing and winter);
- Caribou (*Rangifer tarandus caribou*; Matrix 1 critical habitat as described in the CMMP; ERM 2022b);
- Grizzly bear (*Ursus arctos horribilis*; spring, summer, fall, and winter);
- Forest and grassland birds (interior forest habitat, and short-eared owl [*Asio flammeus*] nesting habitat);
- Waterbirds, using individual indicator species:
  - greater yellowlegs (*Tringa melancoleuca*),
  - yellow rail (*Coturnicops noveboracensis*),
  - Wilson's snipe (*Gallinago delicata*); and
- Western toad (*Anaxyrus boreas*).

Habitat suitability models were developed for the EIS using a combination of ecosystem mapping and field surveys for model validation (New Gold 2015; ERM 2017). Models consider species life history and seasons, and can be developed using different rating systems. Model development was consistent with similar models across the province of BC.

A six-class habitat suitability model was used for moose and grizzly bear habitat suitability ranging from (1) high, (2) moderately high, (3) moderate, (4) low, (5) very low, and (6) nil (ERM 2017). The suitability model for caribou determines the amount of lost matrix 1 habitat, summarized in the CMMP (ERM 2022b). Western toad habitat suitability was rated on a four-class scale (high, moderate, low, and nil).

Suitable habitat for birds typically uses fewer seasons and a coarser rating structure (e.g., a three- or four-class system). Suitability mapping for forest interior birds used a two-class scale (available or unavailable), while all other birds (short-eared owl, greater yellowlegs, yellow rail, and Wilson's snipe) used a three-class scale (high, moderate, low).

Suitable habitat to calculate habitat loss was considered moderately to highly suitable mapped habitat. For forest interior birds, habitat suitability maps only provided available habitat so all available habitat was considered suitable.

Annual habitat loss was calculated as the difference between the current year's footprint and the existing footprint from previous years, while cumulative habitat loss was calculated as the difference between the current year's footprint and the pre-construction state.

2.2.3 Results

Clearing completed in 2022 was limited to the Early Works Plant Site Area, which accounted for 25.8 ha of habitat loss (Table 2.2-1). There was no overlap between the 2022 clearing limits and fisher, short eared owl, yellow rail, or Wilson's snipe suitable habitat (Table 2.2-1). Habitat loss was restricted to forested habitat and therefore suitable habitat loss was greatest for species which rely on these areas, including moose growing season habitat (25.8 ha), wolverine growing season habitat (25.4 ha), forest interior bird habitat (25.7 ha), and grizzly bear spring (25.6 ha), summer (25.6 ha), fall (25.6 ha), and winter (25.8 ha) habitat. The small section of cleared area in 2022 resulted in less than 0.1 % of the predicted habitat loss for all species.

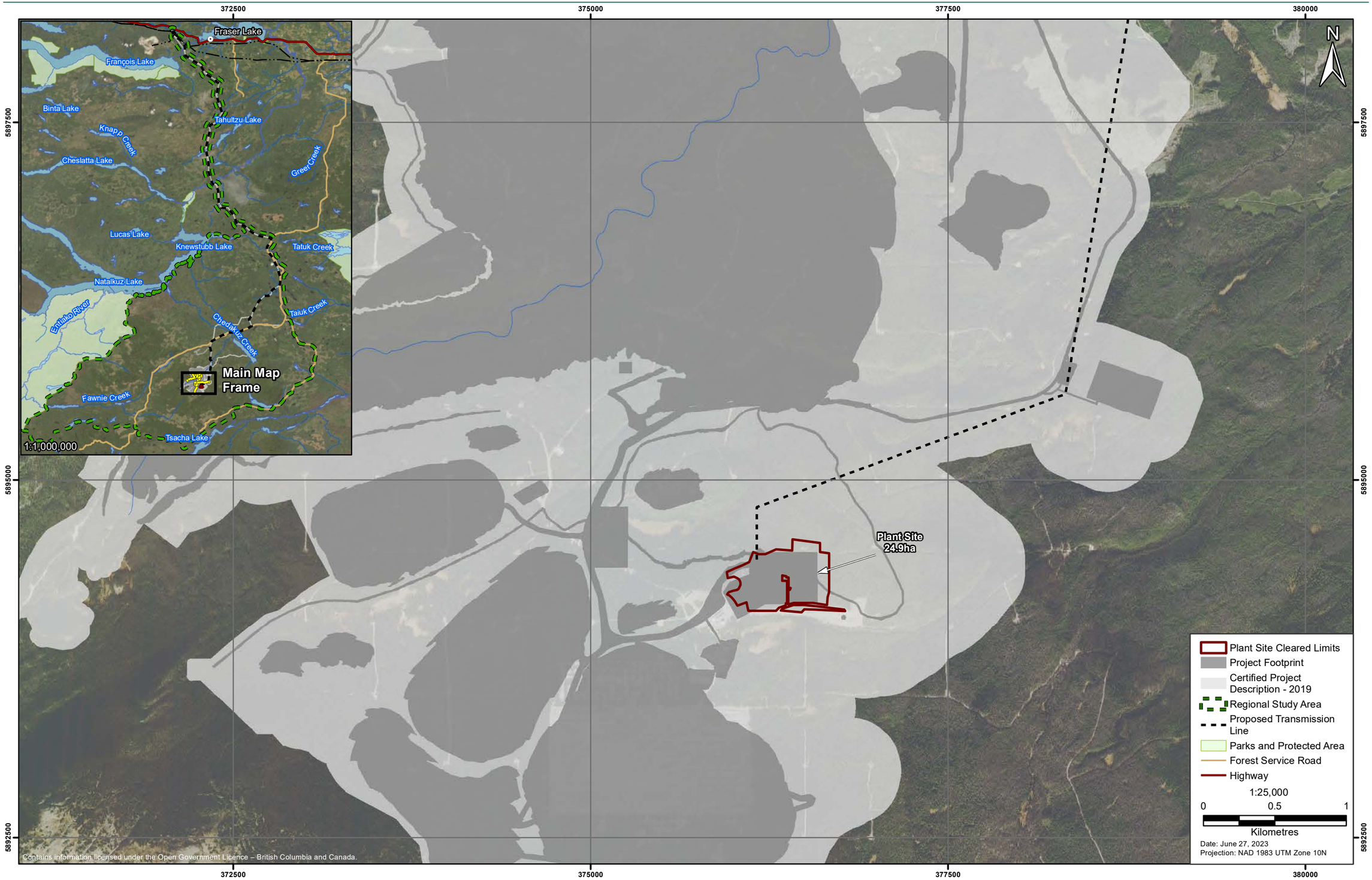


Figure 2.2-1: Blackwater Project Footprint, 2022

Table 2.2-1: Annual and Cumulative Habitat Loss in the Regional Study Area by Species, 2022

Species		Seasonal Habitat	Annual Habitat Loss (ha)	Cumulative Habitat Loss (ha)	Predicted Habitat Loss (ha)	% Cumulative Predicted Loss
Common Name	Scientific Name					
Moose	*Alces alces*	Growing	25.8	25.8	7,709.0	< 0.1
		Winter	0	0	1,443.0	< 0.1
Grizzly bear	*Ursus arctos*	Spring	25.6	25.6	2,463.1	< 0.1
		Summer	25.6	25.6	3,425.5	< 0.1
		Fall	25.6	25.6	3,598.79	< 0.1
		Winter	25.8	25.8	2,508.7	< 0.1
Fisher	*Pekania pennanti*	Denning	0.0	0.0	61.5	0.0
Wolverine	*Gulo gulo*	Growing	25.4	25.4	1,223.1	< 0.1
		Winter	0.0	0.0	1,833.1	0.0
Short-eared Owl	*Asio flammeus*	Nesting	0.0	0.0	166.5	0.0
Greater Yellowlegs	*Tringa melanoleuca*	Nesting	0.7	0.7	2,018.5	< 0.1
Wilson's snipe	*Gallinago delicata*	Nesting	0.0	0.0	567.6	0.0
Interior forest birds	NA	NA	25.7	25.7	1,242.9	< 0.1
Caribou	*Rangifer tarandus*	Matrix habitat	0.0	0.0	2,343	0.0

2.2.4 Discussion

Habitat loss is monitored for specific species to validate predictions from the EIS and confirm the effectiveness of mitigation measures (ERM 2022a). Total habitat loss in 2022 was 25.8 ha, representing clearing for the Early Works Plant Site Area. This was the first year with any clearing for the Project, therefore the annual and cumulative habitat loss are equivalent. Currently, habitat loss for all VCs represents less than 0.1% of the predicted total habitat loss for the Project across all species, based on the EIS (ERM 2017).

2.3 Interactions, Incidents, and Mortalities

DS conditions addressed: none

EAC conditions addressed: 23.n

A wildlife interaction occurs when Project personnel or infrastructure encounter wildlife where deterrents may be used, but does not result in direct harm, injury, damage, or wildlife mortality (e.g., a bear deterred from camp). A wildlife incident occurs when an interaction results in direct harm, injury, damage, or wildlife mortality occurs.

Mine personnel and subcontractors receive wildlife training during site orientation and during annual refreshers. Training includes reporting protocols for wildlife sightings, interactions, and incidents, including reporting of habitat features (e.g., nest, den, mineral lick). All wildlife incidents, including vehicle collisions

and mortalities from human-wildlife interactions, require a formal incident report as per the WMMP (ERM 2022a). Wildlife incidents and mortalities from 2022 are included in this section.

Wildlife observed on the Project site are reported to the Project's Environment Department. All incidental wildlife observations are summarized in the annual WMMP compliance report. Incidental observations from 2022 are described under each relevant species section in this report (EAC condition 23.n).

2.3.1 Vehicle Collisions

Project-related vehicle traffic was predicted to potentially increase mortality risk for moose, caribou, and grizzly bear (ERM 2017). Vehicle-related mortality has the potential to alter the abundance and distribution of these species within the LSA. Potential wildlife crossing areas were identified during pre-construction habitat suitability surveys along the Kluskus Forest Service Road and mine site access road (Figure 2.3-1). BW Gold installed signage to identify these crossing locations in early 2022. Wildlife interaction and incidents involving vehicles are summarized separately from other incidents to validate EIS predictions and the effectiveness of the mitigation measures outlined in the WMMP.

2.3.2 Objectives

The objectives of the interactions, incidents, and mortality monitoring are to:

- Record and report any wildlife related interaction, incident, and mortality associated with Project activity.
- Monitor wildlife-vehicle incidents and mortalities, specifically for moose, caribou, and grizzly bear.

2.3.3 Methods

2.3.3.1 Incidental Observations and Interactions

Incidental observations, interactions, and records of any incidentally observed dead animals (where the mortality was not caused by the Project) were recorded by BW Gold staff (Appendix G) and by consultants and field crews during field surveys (Appendix H) in 2022. Observation data include, where available: the recorder, species, date, time, location, activity, and any management response.

Incidental observations are reported in each relevant species section. Interactions are reported in the Results section below.

2.3.3.2 Incidents

All incidents were recorded in formal incident reports, including: a summary of the event, response action and means of implementation, copies of internal and external communications, follow-up monitoring results, and any adaptive management outcomes, if required.

2.3.3.3 Vehicle Collisions

All wildlife interactions, collisions, and mortalities along or on the roadways were recorded and reported to the Project Environment Department and other relevant personnel as soon as safe to do so. Vehicle collisions are considered wildlife incidents and therefore follow the same incident report protocol as described in the section above.

2.3.4 Results

No interactions, incidents, mortalities, or vehicle collisions were recorded during 2022.

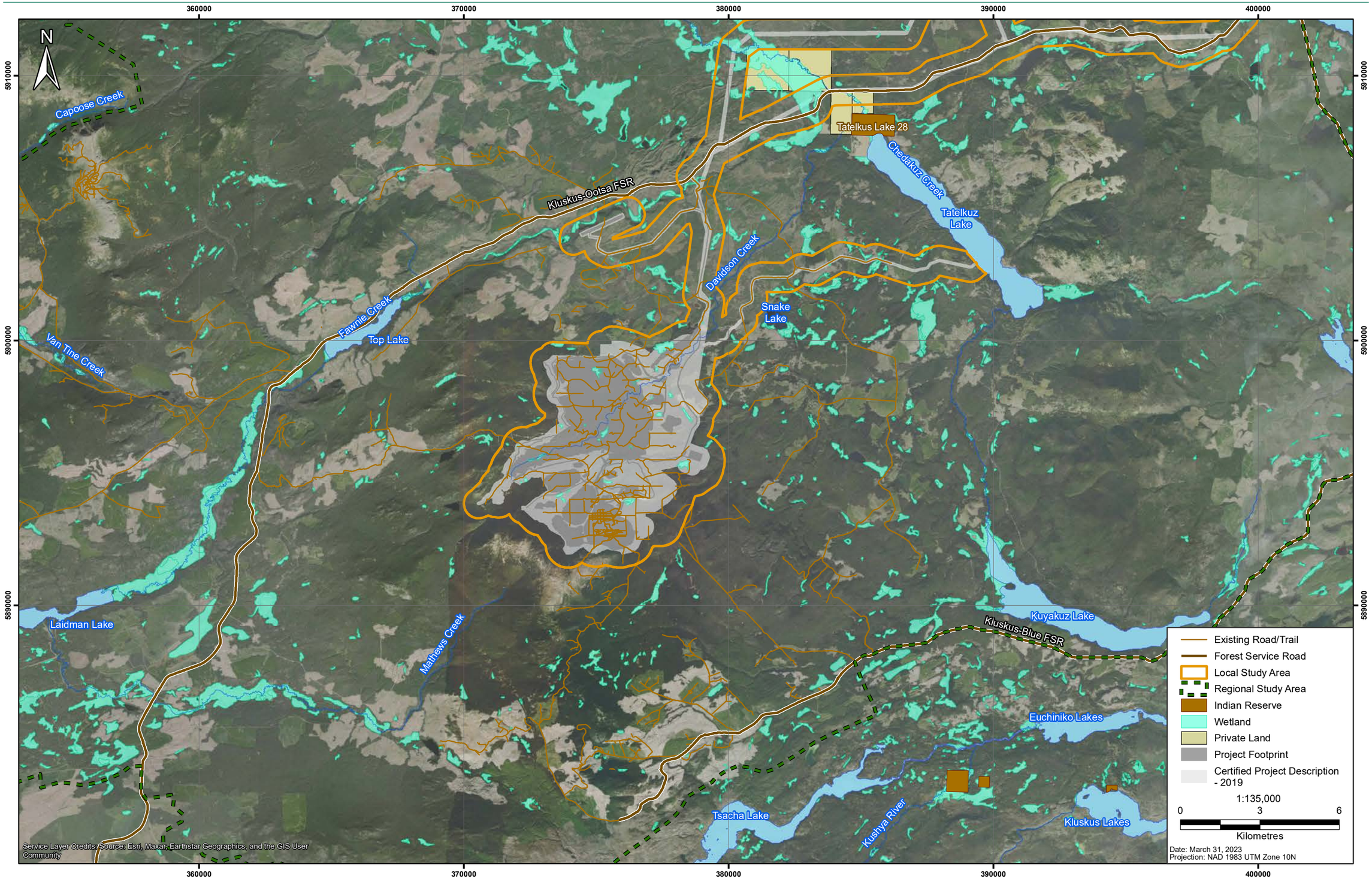


Figure 2.3-1: Blackwater Project Roads

2.3.5 Discussion

No wildlife interactions, incidents, mortalities, or vehicle collisions were recorded in 2022. Wildlife interactions are encounters with wildlife where deterrents may be used, but does not result in direct harm, injury, damage, or wildlife mortality (e.g., a bear deterred from camp). Wildlife incidents are interactions resulting in direct harm, injury, damage, or wildlife mortality.

Vehicle collisions are summarized separately from other types of wildlife incidents and mortalities to validate EIS predictions and the effectiveness of the mitigation measures outlined in the WMMP. To date, no wildlife vehicle collisions have occurred at the Project. Existing mitigations to prevent wildlife vehicle collisions include speed limits, signage at potential wildlife crossings, and reporting incidental sightings. No adaptive management actions are required at this time.

2.4 Facility Water Structure Monitoring

DS conditions addressed: 4.2, 8.12

EAC conditions addressed: 23.k

Facility water structures (i.e., the TSF and all Project ponds) will undergo management and monitoring to prevent wildlife use of areas that may be hazardous. Wildlife (including migratory birds, furbearers, and amphibians) will be deterred from facility water structures as per DS condition 4.2. Monitoring will be completed at facility water structures to determine whether wildlife are using the ponds, and whether deterrence measures are required, based on water quality testing (ERM 2022a). Deterrence methods will be employed to prevent wildlife use of the TSF, pit lake, sediment control ponds, and environmental control dam until water quality parameters meet permit limits. The choice of which method to use will depend on species are present, experience on site, and the results of previously used methods, if any, which may require cycling different methods.

Currently there have been no facility water structures constructed, therefore this program has not yet begun and monitoring was not completed in 2022.

2.4.1 Objectives

The objectives of the facility water structure monitoring program, once initiated, will be to:

- Evaluate amphibian use of facility water structures.
- Monitor the use of facility water structures by birds and other wildlife, such as furbearers.
- Evaluate the effectiveness of deterrents for migratory birds and amphibians used at facility water structures.

2.5 Transmission Line Monitoring

DS conditions addressed: none

EAC conditions addressed: MT 9-22, 9-28, 9-33, 14-28

Electrical power will be supplied to the Project by a new 135 km, 230 kilovolt overland transmission line that will connect to the BC Hydro grid at the Glenannan substation located near the Endako mine, 65 km west of Vanderhoof. The transmission line poses a potential risk to wildlife through habitat loss, disturbance, and risk of bird mortality from collision or electrocution.

There are two follow-up and monitoring programs designed to assess the adverse effects of the transmission line on birds: a transmission line bird mortality monitoring program and a literature review and possible follow-up monitoring program for effects of electromagnetic fields. The program to assess potential effects of electromagnetic fields on birds has not begun but will commence during the Construction phase.

2.5.1 Objectives

The objectives of the transmission line monitoring programs are to:

- Verify the effectiveness of mitigation measures for bird mortality along the transmission line.
- Evaluate potential effects of electromagnetic fields on birds interacting with the transmission line.

2.5.2 Methods

2.5.2.1 Transmission Line Monitoring

Transmission line monitoring transects were established in 2022 following guidelines in the WMMP and industry standardized methods (APLIC 2012; Birdlife International 2015). Locations were chosen in areas with potentially heightened waterbird mortality risk, including where the line crosses waterbodies and wetlands (ERM 2022a). No other terrain features which have potential to restrict bird flight and heighten mortality risk, such as valleys or cliffs, were noted across the length of the transmission line right of way. The chosen survey locations were also compared with waterbird survey observations to confirm that waterbirds are active at the chosen sites.

Although the right of way for the transmission line has not yet been cleared, an initial survey was completed for each transect to collect baseline data and establish the survey route. Surveys were completed for transects 200 m in length and 20-25 meters in width, with two observers walking in parallel to each other. The search area extended 50 meters on either side of the transmission line (ERM 2022a).

Post-construction monitoring will include surveys of each transect once per week during April (spring migration), June (summer breeding period), and September (fall migration) each year. Subsequent monitoring and analysis will be completed once post-construction surveys have begun, as described in Section 4.7.3.6 of the WMMP (ERM 2022a).

2.5.2.2 Electromagnetic Fields

The literature review of potential effects of electromagnetic fields and follow-up recommendations has not yet begun but will commence during the Construction phase, likely 2024 or 2025.

2.5.3 Results

2.5.3.1 Transmission Line Monitoring

A total of five transmission line monitoring transects were surveyed including three which were completed July 10, 2022, and two additional transects established and surveyed on September 10 and 11, 2022. (Figure 2.5-1; Appendix I). Transects were established in identified high risk locations for waterbirds along the transmission line, however monitoring will include mortality records for all species of birds. The initial mortality surveys completed during the establishment of the permanent transects did not detect any signs of bird mortality.

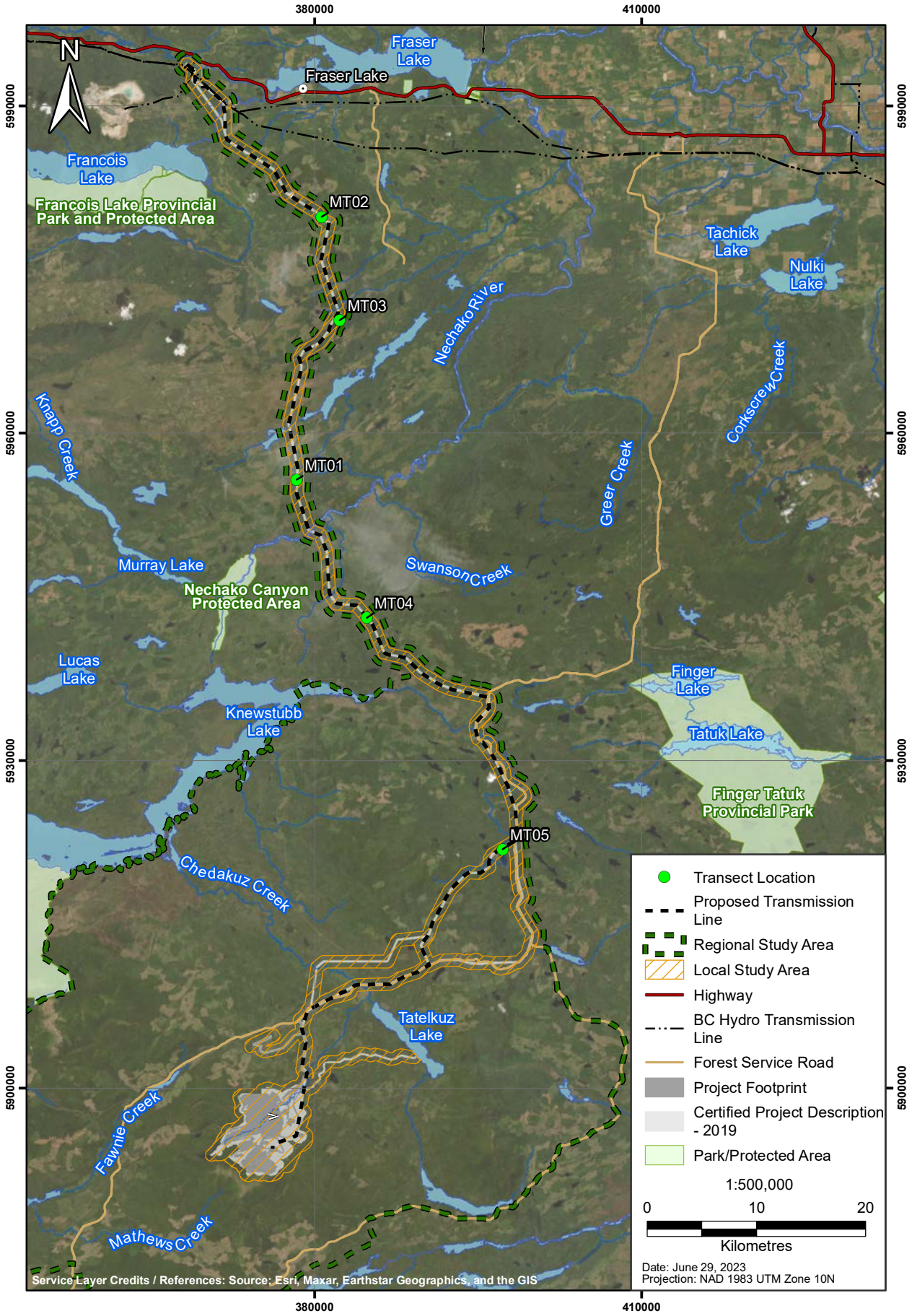


Figure 2.5-1: Transmission Line Mortality Monitoring Transects, 2022

2.5.4 Discussion

No clearing or construction has yet begun on the planned 135 km transmission line. Five transects to monitor potential bird mortality were established in 2022 in preparation for the monitoring program, which will formally begin post-construction. Transect locations were chosen in areas of potentially higher waterbird mortality risk, where the transmission line crosses waterbodies.

A literature review examining potential effects of electromagnetic fields on birds is required prior to operation of the transmission line and will be completed once construction of the transmission line starts.

3. SPECIES SPECIFIC MONITORING PROGRAMS

3.1 Moose

DS conditions addressed: 6.14

EAC conditions addressed: 23.h

Moose are a common, wide-ranging ungulate species that occurs throughout the forested areas of BC. The species has not been assessed by COSEWIC and is not federally listed under Schedule 1 of the *Species at Risk Act* (SARA). Moose are Yellow-listed (secure) in BC (BC CDC 2023). They are a culturally important species for Indigenous groups and are managed as a harvested game species for both resident and non-resident hunting opportunities.

Pre-clearing surveys are required year-round for mineral licks, which are considered sensitive features for ungulates including moose (Section 2.1). There are no specific sensitive timing windows to avoid disturbance to moose. Mitigation measures for moose are designed to reduce disturbances (e.g., noise, light) which may cause moose to avoid the Project. Additionally, mitigation measures have been established along Project roads to reduce the risk of moose mortalities due to vehicle collisions.

The predicted residual effects of the Project on moose as identified in the EIS, Vol 4. Section 5.4.10.4 (New Gold 2015; ERM 2017) are:

- Habitat loss and alteration (not significant, negligible magnitude);
- Wildlife mortality (not significant, minor magnitude);
- Moose movement patterns (not significant, minor magnitude); and
- Changes in moose population dynamics (not significant, minor magnitude).

Monitoring and follow-up programs for moose will be used to verify EIS predictions and evaluate the effectiveness of the mitigation measures outlined in the WMMP. As described in Section 4.4 of the WMMP (ERM 2022a) and Section 6.2.2 of the Caribou Mitigation and Monitoring Plan (CMMP; ERM 2022b), the monitoring programs developed for moose include:

- Habitat loss monitoring (Section 2.2);
- Moose-vehicle collision monitoring (Section 2.3);
- Ungulate distribution monitoring via:
  - Pellet counts (Sections 3.1.2.1 and 3.1.3.1), and
  - Winter track surveys (Section 3.1.2.2).

The follow-up programs for moose distribution monitoring are included in this section.

3.1.1 Objectives

The objectives of the follow-up monitoring program for moose distribution are to determine:

- The winter distribution and relative density of moose within the buffered Project area (DS condition 6.14).
- Whether there is a change in the relative abundance of moose, by proximity to the mine site.

3.1.2 Methods

3.1.2.1 Ungulate Pellet Count Surveys

Ungulate pellet count surveys were completed in June 2022 in accordance with the ungulate pellet count survey SOP (Appendix J) to evaluate if the Project is adversely affecting the distribution and relative abundance of ungulates. Surveys were completed in the spring when pellets are most visible, i.e., after snow melt and before new vegetation growth in the summer.

Baseline field observations from previous years indicated that caribou pellets are less common than moose pellets. To determine the most effective approach to meeting survey objectives, two different methods were used during the first year of surveying: quadrat and distance sampling pellet counts. The level of field effort and pellet detection rates for each method will determine which survey method will be adopted for future surveys.

The pellet count survey area included the proposed Project footprint and the surrounding area within 10 km, divided into zones of potential impact versus control (ERM 2022b). The potential impact zones within the survey area were defined as: < 500 m from mine infrastructure, 500 m – 1 km from mine infrastructure, 1 km – 3 km from mine infrastructure, and 3 km – 5 km from mine infrastructure. The control zone for the survey area was 5 km – 10 km from mine infrastructure (Figure 3.1-1). Transects were established across all zones, with the majority in close proximity to the mine site (< 500 m). Both sampling methods were completed at all transects.

The standard quadrat pellet count methods used transects with repeated sample circles. Ten sampling circles were surveyed per transect, spaced 15 m apart along the transect line. Each sampling circle had a 1.7 m radius in which all pellets were counted (RIC 1998a). Distance sampling of pellets included 10 sample points spaced evenly at 18-m intervals along the transect line. Searches were completed within 10 m of each sample point to locate the nearest pellets, and the distance between the pellets and the sample point were recorded (RIC 1998a). Pellets were tallied and recorded according to the number of piles present (i.e., one pile of pellets = one observation). Once both surveys were completed, all pellet groups were removed from the search area so that subsequent annual survey only include pellets from the current year.

2022 was the first year of data collection for this monitoring program. Additional analysis will be completed as the ungulate pellet count program continues, as outlined in the Section 6.2.2.1 of the CMMP (ERM 2022b).

3.1.2.2 Snow Track Surveys

Snow track surveys will also be completed to evaluate if the Project is adversely affecting the distribution and relative abundance of ungulates. The survey area for snow track surveys will follow the same five zones (four potential effect zones and one control zone) established for pellet count surveys within 10 km of the Project footprint (Figure 3.1-1).

Snow track surveys were not completed in 2022 and will be completed in 2023. Additional methods details for snow track surveys will be included once this program begins.

3.1.3 Results

3.1.3.1 Ungulate Pellet Count Surveys

In total, 22 ungulate pellet count transects were established at varying distances from the proposed Project footprint (Table 3.1-1; Figure 3.1-2; Appendix K). Ten sample points were completed along each transect, with a total of 220 sample points completed using both the distance and quadrat survey method.

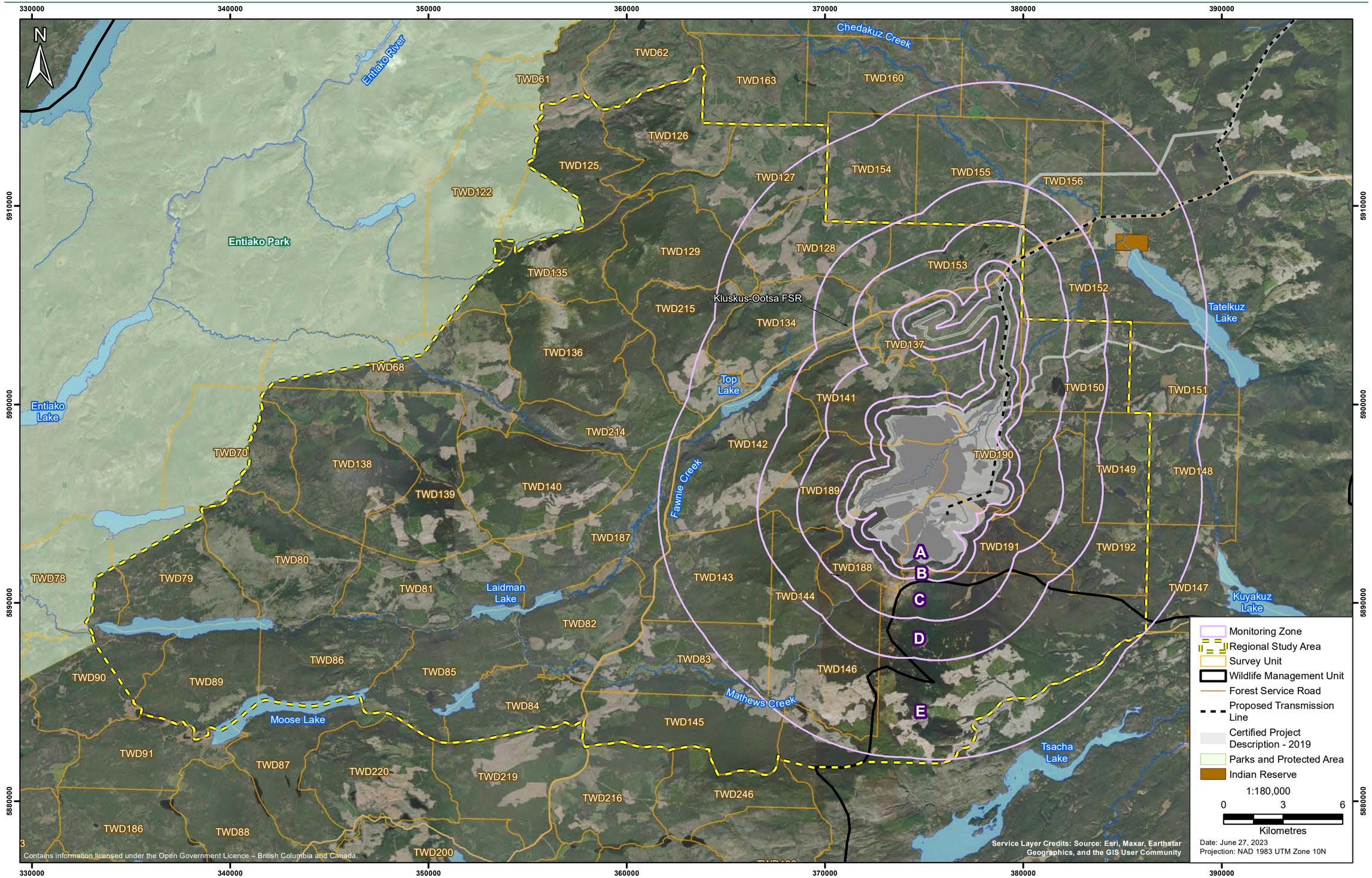


Figure 3.1-1: Survey Areas for Pellet Counts and Snow Track Surveys

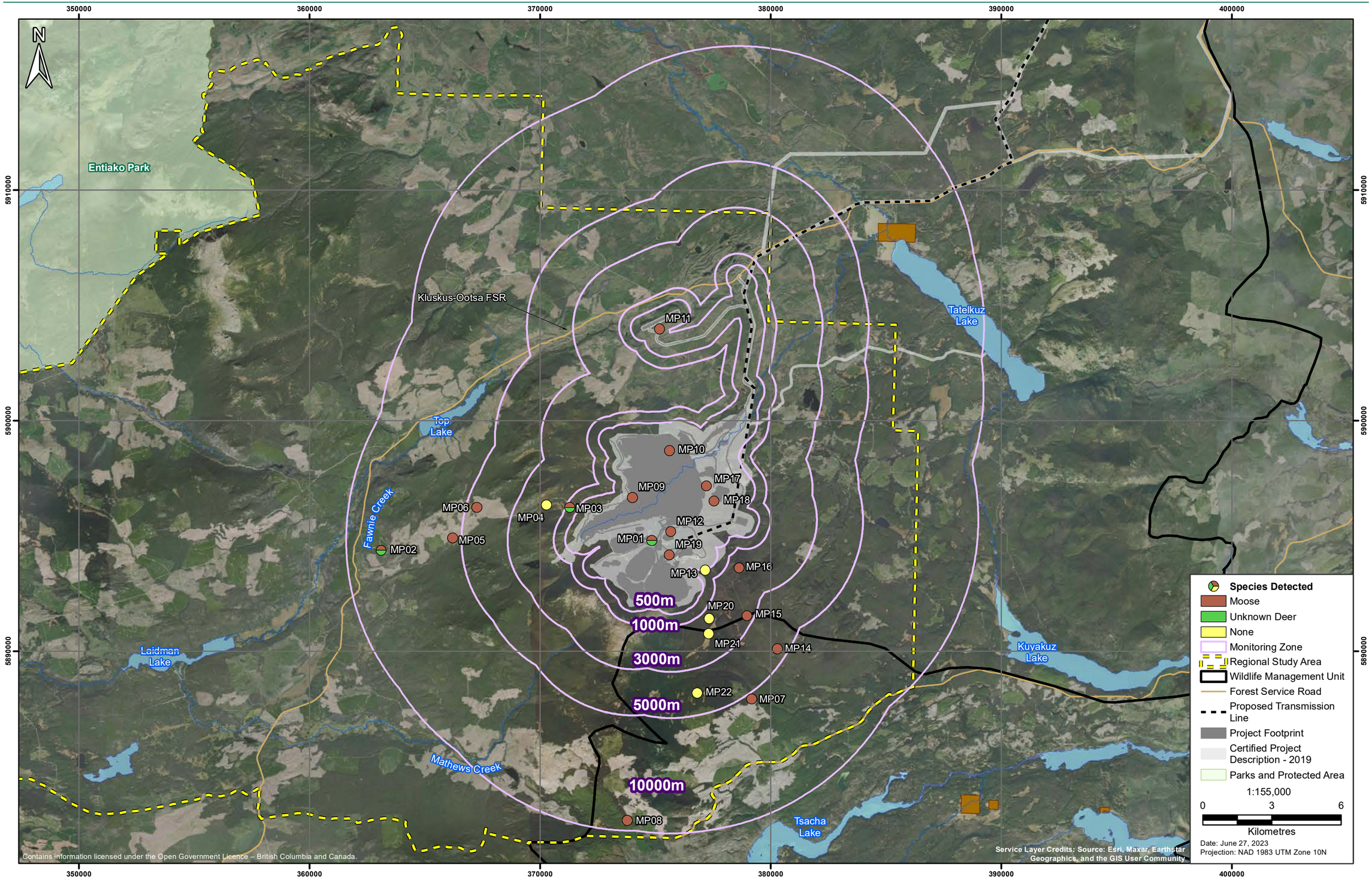


Figure 3.1-2: Ungulate Pellet Count Transect Locations, 2022

Table 3.1-1: Ungulate Pellet Count Sampling Distribution and Detection Rate for the Distance Sampling Method

Distance from Project Footprint	Number of Transects	Number of Sample Points	Number of Transects with Moose Pellets	% Transects with Moose Pellets	Number of Transects with Deer Pellets	% Transects with Deer Pellets
<500 m	8	80	8	100%	1	13%
500 m – 1 km	2	20	1	50%	1	50%
1 km – 3 km	5	50	2	40%	0	0%
3 km – 5 km	3	30	2	67%	0	0%
5 km – 10 km	4	40	4	100%	1	25%
Total	**22**	**220**	**17**	**77%**	**3**	**14%**

Moose pellets were detected at the majority of transects (17 of 22; Table 3.1-1) and were most commonly winter pellets (Distance = 66 pellet piles, Quadrat = 9 pellet piles), with some spring pellets (Distance = 29 pellet piles, Quadrat = 1 pellet pile) and few summer pellets (Distance = 11 pellet piles, Quadrat = 2 pellet piles; Appendices K and L). Four deer pellet piles were recorded, with the distance and quadrat surveys having a similar number of detections (Table 3.1-2; Appendices K and L). No caribou pellets were observed.

Table 3.1-2: Ungulate Pellet Piles Recorded during Distance and Quadrat Surveys

	Distance Survey		Quadrat Survey	
	Transects with Detections	Pellet Piles Detected	Transects with Detections	Pellet Piles Detected
Moose	17	102	9	10
Deer	3	4	2	2

As this was the first year of surveying, pellet age varied. Nearly half of the pellet piles counted were expected to have been deposited within the last year based on qualitative observations of freshness. Results from the first year of sampling do not indicate overall density, but provide an initial impression of moose distribution and relative density.

There was no clear relationship between survey zone (distance from the project footprint) and the abundance of ungulate pellets (Table 3.1-1). Moose pellets were present at the majority of transects across all potential effect survey zones (0 km – 5 km, pellet piles in 13 of 18 transects) and at all transects in the control zone (5 km – 10 km, pellet piles in all 4 transects; Table 3.1-1). Deer pellets were recorded rarely but were found in both potential effect zones (pellet piles in 3 of 18 transects) and the control zone (pellet pile in 1 of 4 transects; Table 3.1-1).

Between survey methods, the distance surveys identified 10 times more moose pellet piles than quadrat surveys but similar amounts of deer pellet piles (Table 3.1-2; Appendices K and L). Due to the difference in search radius (Quadrat: 1.7 m search radius, Distance: 10 m search radius), all the quadrat survey pellet detections were also accounted for in the distance survey. Using quadrat sampling, roughly 40% of transects had moose pellets presence, compared to over 75% using distance sampling. Formal survey time was not recorded to compare between the two methods, but field surveyors estimated the distance sampling required 10 minutes per sample location while the quadrat sampling required an average of

2 minutes per sample location, i.e., the distance sampling took an estimated 5x the survey time due to the additional search area and requirement to record distance of each pellet pile from the transect.

3.1.3.2 Incidental Observations

A total of 30 moose were incidentally recorded in 2022 (Figure 3.1-3; Appendices G and H), including two bulls, nine cows, and eight calves with the remaining observations being 11 adults of unknown sex. Observations included five cow-calf pairs. Additionally, signs of moose were incidentally recorded at 16 locations, including eight pellet piles, five tracks, and one antler drop location. Moose sign and a well-used trail was also identified southwest of the Project area near the base of Mt Davidson (Figure 3.1-3).

Incidental observations were also made mountain goat (n = 3) and mule deer (n = 4). Additionally, mountain goat tracks were observed on three occasions on Mt Davidson (Appendices G and H). Moose were observed on the southwest side of Mt Davidson in one area more often than others.

3.1.4 Discussion

In the EIS, the Project was predicted to have a not significant, minor magnitude potential effect for change in movement patterns and population dynamics of moose (Vol 4. Section 5.4.10.4; New Gold 2015; ERM 2017). The follow-up programs to monitor ungulate distribution and density include ungulate pellet count surveys and snow track surveys. Ungulate pellet count surveys were established in June 2022, while snow track surveys will begin in winter 2023.

Ungulate pellet count surveys were completed using two sampling methods due to concern that the standard quadrat sampling method would not adequately detect pellets for less common species (i.e., caribou). Both the quadrat sampling and distance sampling methods were conducted in 2022, with a comparison of the level of field effort and pellet detection rates between the two methods. No caribou pellets were detected with either sampling method, however 10x the number of moose pellet piles were detected with the distance sampling method. Although the estimated field effort for distance sampling was 5x the effort compared to quadrat sampling, the results indicate that quadrat sampling is likely insufficient at providing accurate data on ungulate distribution and density.

The first year of pellet count surveys cannot provide a density estimate because pellet piles were present which were more than one year old. Since all pellet piles were removed from transect sampling locations during this first year of monitoring, all future years of data will reflect accurate relative density and distribution data for a single year. Additional analysis of ungulate distribution and density will be completed once additional years of monitoring are completed, as described in Section 6.2.21 of the CMMP (ERM 2022b).

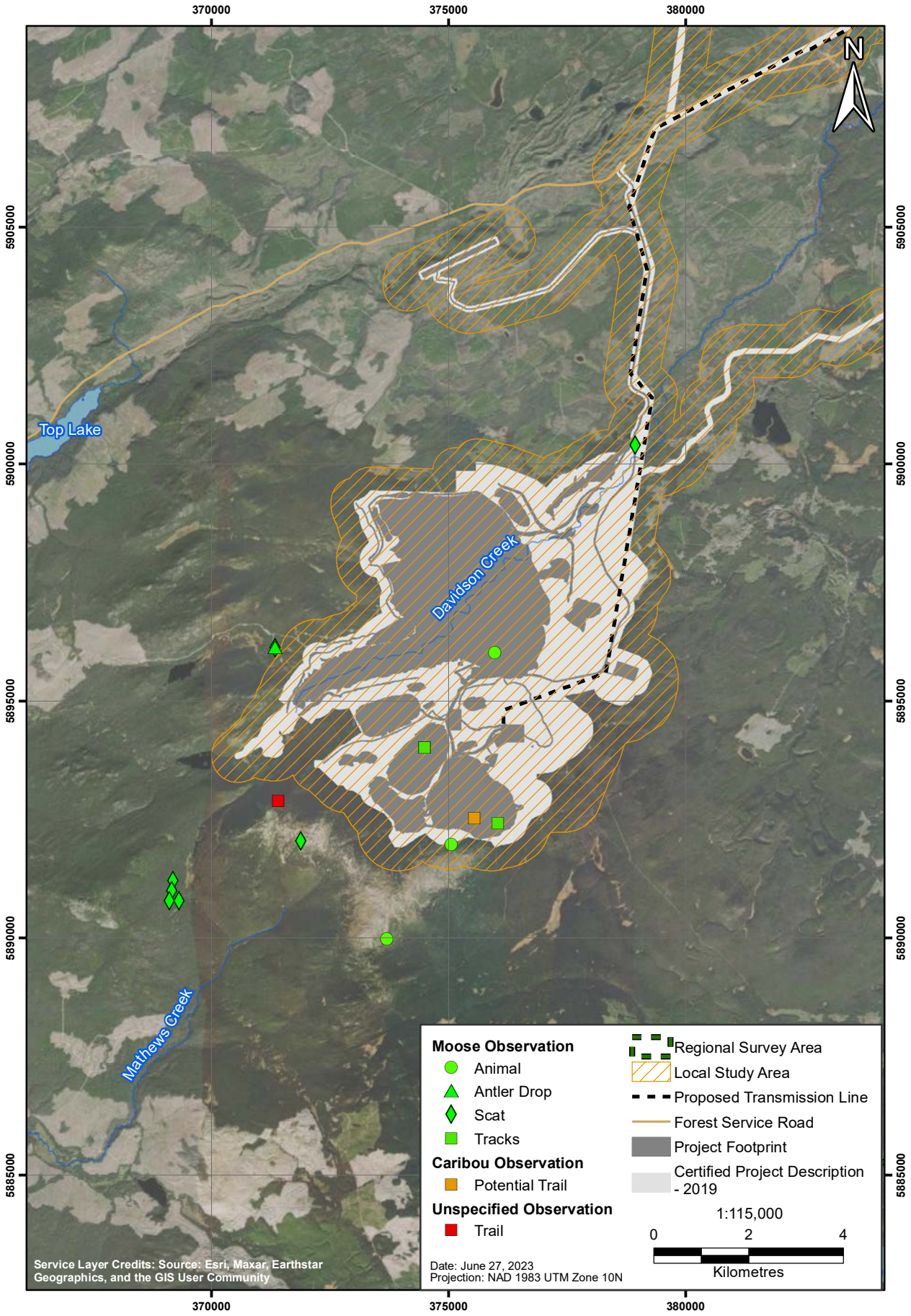


Figure 3.1-3: Incidental Ungulate Observations

3.2 Caribou

DS conditions addressed: 8.9

EAC conditions addressed: 22.p

Caribou in BC are divided into various populations each with their own conservation status and risks. The Project is on the eastern edge of the southern mountain caribou Tweedsmuir Local Population Unit (LPU), with approximately half of the mine site occurring within the LPU boundaries. The southern mountain caribou population in BC is Red-listed (endangered/threatened; BC CDC 2023), has been assessed as endangered by COSEWIC (2014), and is listed as threatened under Schedule 1 of SARA (Government of Canada 2023). The mine site is within the historic range of the Tweedsmuir caribou based on Traditional Knowledge from Ulkatcho First Nation and Lhoosk'uz Dené Nation and includes areas mapped as winter caribou habitat. The mine site is outside of the current annual range (1980-2020) used by collared female caribou but is still used intermittently by caribou based on historical baseline data including aerial surveys, snow track surveys, and incidental observations.

Pre-clearing surveys are required year-round for mineral licks, which are considered sensitive features for ungulates including caribou (Section 2.1). The sensitive timing window for caribou is January 15 – July 15, during the winter calving into the post-calving period (ERM 2022a). Mitigation measures for caribou are designed to reduce disturbances (e.g., noise, light) which may cause caribou to avoid the Project.

The predicted residual effects of the Project on caribou as identified in the EIS, Vol 4 Section 5.4.11.3 (New Gold 2015; ERM 2017) are:

- Habitat loss and alteration (not significant, moderate magnitude);
- Changes in caribou population dynamics (not significant, minor magnitude);
- Changes in caribou movement patterns (not significant, negligible magnitude); and
- Mortality risk (not significant, negligible magnitude).

Monitoring programs for caribou that are included with other wildlife monitoring are presented in this report. Additional reporting for caribou, including the caribou offset monitoring program, is presented in the Caribou Mitigation and Monitoring Plan compliance report (Appendix N).

As described in the CMMP (ERM 2022b), the monitoring programs developed for caribou include:

- Habitat loss monitoring (Section 2.2);
- Mortality risk monitored through wildlife interactions and incidents (Section 2.3);
- Ungulate distribution monitoring via:
  - Pellet counts (Sections 3.1.2.1 and 3.1.3.1),
  - Winter track surveys (Section 3.1.2.2); and
- Caribou Offset Monitoring Program (Appendix N Section 3).

3.2.1 Objectives

The follow-up monitoring programs for caribou included in this section of the report are to:

- Monitor potential change in caribou distribution due to the Project (DS conditions 6.14 and 8.18, EAC condition 22.c).
- Evaluate the effectiveness of the Caribou Offset Program (EAC condition 22.p).

3.2.2 Methods

Ungulate pellet count surveys were completed in June 2022. Snow track surveys were not completed in 2022 and will be completed in winter 2023. Both of these surveys are reported in Section 3.1.

The caribou offset monitoring program consists of four separate monitoring programs: road restoration monitoring, access monitoring, sight lines monitoring, and wildlife use monitoring, which are presented in the CMMP annual compliance report (Appendix N). The caribou offset monitoring program had not yet begun in 2022.

3.2.3 Results

See Section 3.1 for results of the ungulate distribution monitoring surveys in 2022. Additionally, the CMMP compliance report (Appendix N) includes results for the caribou offset monitoring program, however this program had not yet begun in 2022.

3.2.3.1 Incidental Observations

Two potential caribou game trails were identified during whitebark pine and Clark's nutcracker surveys (Figure 3.1-3; Appendix H). Trails were identified at sites T1_1 and T2_4 (Figure 3.1-3). No other caribou observations or signs were recorded in 2022.

3.3 Grizzly Bear

DS conditions addressed: 8.9, 8.10

EAC conditions addressed: 23.c, 23.h

Grizzly bear is a Blue-listed (special concern) species in BC (BC CDC 2023) and is federally assessed as special concern by COSEWIC (2012) and listed as special concern on Schedule 1 of SARA (Government of Canada 2023). Grizzly bear are year-round residents within the Project LSA and RSA. Grizzly bear prefer mature and old growth coniferous forests, although deciduous and mixed forests also contribute to their life requisites. Grizzly bear are most sensitive to disturbance in their dens during winter hibernation and cub birthing. Their dens are protected when occupied, by the BC *Wildlife Act* (1996).

The predicted residual effects of the Project on grizzly bear as identified in the EIS, Vol 4 Section 5.4.12.4 are (New Gold 2015; ERM 2017):

- Habitat loss and alteration (Not significant, minor magnitude);
- Wildlife mortality (not significant, minor magnitude);
- Changes in grizzly bear movement patterns (not significant, negligible magnitude);
- Changes in grizzly bear population dynamics (not significant, negligible magnitude); and
- Changes in grizzly bear health (not significant, negligible magnitude).

As described in Section 4.6 of the WMMP (ERM 2022a), the monitoring programs developed for grizzly bear includes:

- Pre-clearing surveys for grizzly bear (Section 2.1);
- Habitat loss monitoring (Section 2.2);
- Grizzly bear-vehicle collision monitoring (Section 2.3);
- Monitoring of den site mitigation effectiveness (Section 3.3.2.1); and
- Monitoring of kokanee spawning streams (Section 3.3.2.2).

3.3.1 Objectives

The objectives of the follow-up monitoring program for grizzly bear are to:

- Verify that setbacks around probable dens sites have been maintained (EAC condition 23.h).
- Verify ongoing use of kokanee spawning streams by bears (MT 11-5).

3.3.2 Methods

3.3.2.1 Monitoring Den Site Mitigation Effectiveness

Pre-clearing survey methods and results for grizzly bear dens are reported in Section 2.1.

Any den sites buffered during pre-clearing surveys undergo weekly monitoring checks if construction activity is within 250 m of the den site (ERM 2022a). Checks include confirmation that the buffer is intact with no signs of incursion, any wildlife observations including bear sign, and any adaptive management actions and outcomes. Additionally, a remote camera is deployed at the den site to confirm emergence in the spring.

3.3.2.2 Monitoring of Kokanee Spawning Streams

Kokanee spawning streams in the RSA require monitoring for ongoing grizzly bear use. Monitoring will be completed via remote camera, deployed in areas with known bear activity from baseline surveys at Davidson Creek, Creek 661, and Chedakuz Creek upstream of Tatelkuz Lake.

Monitoring at kokanee spawning streams has not been initiated but is expected to begin in 2023.

3.3.3 Results

Pre-clearing surveys for grizzly bear dens were completed in September 2022 (see Section 2.1). No grizzly bear dens were observed and further monitoring was not required.

3.3.3.1 Incidental Observations

Grizzly bears were incidentally observed on two separate occasions: once during the summer waterbird surveys in July 2022, along the transmission line near Targe Creek, and once by onsite personnel in October 2022 at kilometre 2.5 of the mine site access road (Appendices G and H).

3.3.4 Discussion

In the EIS, the Project was predicted to have a not significant, negligible magnitude effect on movement patterns and population dynamics for grizzly bear (Vol 4 Section 5.4.12.4; New Gold 2015; ERM 2017). Monitoring related to these predictions includes verification that mitigation for buffered den sites is effective (EAC condition 23.h), as well as monitoring grizzly bear activity at kokanee salmon spawning streams (required by the project MT).

In 2022, pre-clearing surveys for potential grizzly bear dens and habitat were completed prior to the denning season, in September (Section 2.1). No dens were identified or buffered, therefore no monitoring for mitigation effectiveness was completed in 2022. Monitoring at the kokanee spawning streams has not yet been initiated but is anticipated to begin in 2023.

3.4 Furbearers

DS conditions addressed: 8.9, 8.10

EAC conditions addressed: 23.c, 23.h

Furbearers are species frequently harvested for their fur and include the wolverine (*Gulo gulo*), American marten (*Martes americana*), and fisher (*Pekania pennanti*). Wolverine are Blue-listed (special concern) in BC (BC CDC 2023), federally assessed as special concern by COSEWIC (2003), and listed as special concern on Schedule 1 of SARA (Governement of Canada 2023). American marten are not federally listed and are Yellow-listed in BC (BC CDC 2023), but are an important species for social and economic value, including to Indigenous groups and trappers. Fisher were recently re-assessed in BC and are listed according to different populations; the Columbian Population around the Project LSA and RSA is Red-listed (threatened/endangered; BC CDC 2023). Black bear is also considered a furbearer species; black bear is not listed federally and is provincially Yellow-listed (secure; BC CDC 2023). Furbearer species are most sensitive to disturbance at their dens, when they are raising young through the late winter and spring (or overwinter for black bears). Their dens are protected when occupied, by the BC *Wildlife Act* (1996).

The predicted residual effects of the Project furbearers (excluding beaver; *Castor canadensis*) as identified in the EIS, Vol 4. Section 5.4.13.4 (New Gold 2015; ERM 2017) are:

- Habitat loss and alteration (not significant, minor magnitude).

As described in Section 4.5 of the WMMP (ERM 2022a), the monitoring programs developed for furbearers includes:

- Pre-clearing surveys for furbearers (Section 2.1);
- Habitat loss monitoring (Section 2.2);
- Facility water structure monitoring (Section 2.4); and
- Monitoring den site mitigation effectiveness (Section 3.4.2.1).

3.4.1 Objectives

The objective of monitoring for furbearers is to:

- Verify that setbacks around buffered dens sites have been maintained (EAC condition 23.h).

3.4.2 Methods

3.4.2.1 Monitoring Den Site Mitigation Effectiveness

Pre-clearing survey methods and results for furbearer dens are reported in Section 2.1.

Any den sites buffered during pre-clearing surveys undergo weekly monitoring checks if construction activity is within 250 m of the den site, or have a remote camera deployed to monitor wildlife activity at the den site (ERM 2022a). Checks include confirmation that the buffer is intact with no signs of incursion, any wildlife observations including bear sign, and any adaptive management actions and outcomes. If a camera is deployed, it will be checked at the end of the sensitive period for the relevant species.

3.4.3 Results

3.4.3.1 Monitoring Den Site Mitigation Effectiveness

Clearing in 2022 occurred during the sensitive timing period for black bears, but not for other furbearer species. Pre-clearing surveys for black bear dens were completed in September 2022 and are reported in Section 2.1. No black bear dens were observed and further monitoring was not required.

3.4.3.2 Incidental Observations

Observations and/or signs of six furbearer species were incidentally recorded in 2022 (Figure 3.4-1; Appendices G and H). Black bears were the most frequently observed furbearer, with 18 individuals recorded across 14 detection records. Additionally, two observations and four signs of an unspecified bear species were recorded and were likely black bears, based on the abundance of black bears in the area. Several of the bear sightings and sign were within close proximity to each other on the southeast side of Mt Davidson. Beaver sign was recorded at 24 locations, including 11 lodges. Red Fox (*Vulpes vulpes)* were observed seven times, with observations primarily occurring around Blackwater camp. Canada lynx (*Lynx canadensis)* was observed along the Blackwater access road near kilometre 1 on two separate occasions. Gray wolf (*Canis lupus)* and American marten signs were each recorded once. The majority of these observations were along roads and within the project footprint.

3.4.4 Discussion

In the EIS, the Project was predicted to have a not significant, minor magnitude effect of habitat loss for furbearers (Vol 4 Section 5.4.13.4; New Gold 2015, ERM 2017). Monitoring related to these predictions includes verification that mitigation for buffered den sites is effective (EAC condition 23.h). Monitoring will be completed at all buffered den sites to verify that mitigation for buffered den sites is effective.

In 2022, pre-clearing surveys for potential black bear dens and habitat were completed prior to the denning season, in September (Section 2.1). No dens were identified or buffered, therefore no monitoring for mitigation effectiveness was completed in 2022. No clearing or construction occurred during the furbearer denning season in 2022, therefore no pre-clearing surveys or follow up monitoring were required.

3.5 Bats

DS conditions addressed: 8.14, 8.15, 8.22

EAC conditions addressed: 23.h

All bat species in BC are insectivorous mammals that fill an ecological role in pest control. Five bat species of conservation concern occur in the RSA (Table 3.5-1). Conservation risk to some species, including little brown myotis (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis*), is largely due to White Nose Syndrome, a pathogenic fungus that affects groups of hibernating bats. Bat surveys have been conducted using call detection methods, which cannot always confirm species occurrence with complete accuracy. Due to this, some species have not been reliably detected within the RSA and their presence is considered unconfirmed (Table 3.5-1).

Bats are sensitive to disturbance at their roosts and hibernation sites (hibernacula), which are protected when occupied by the BC *Wildlife Act* (1996). Bats roost in varying group sizes from mid-spring through mid-fall, foraging for insects nocturnally and using roosts to rest and raise pups. Potential roost features vary by species and may include mature and old growth trees, snags, stumps, rootwads, cracks, crevices, and caves. Bats may migrate south to hibernate in winter or hibernate locally if suitable hibernacula are present. Hibernacula must maintain specific temperatures and humidity suitable for bats during the winter. There is no evidence of hibernacula occurring within the RSA to support hibernating bats.

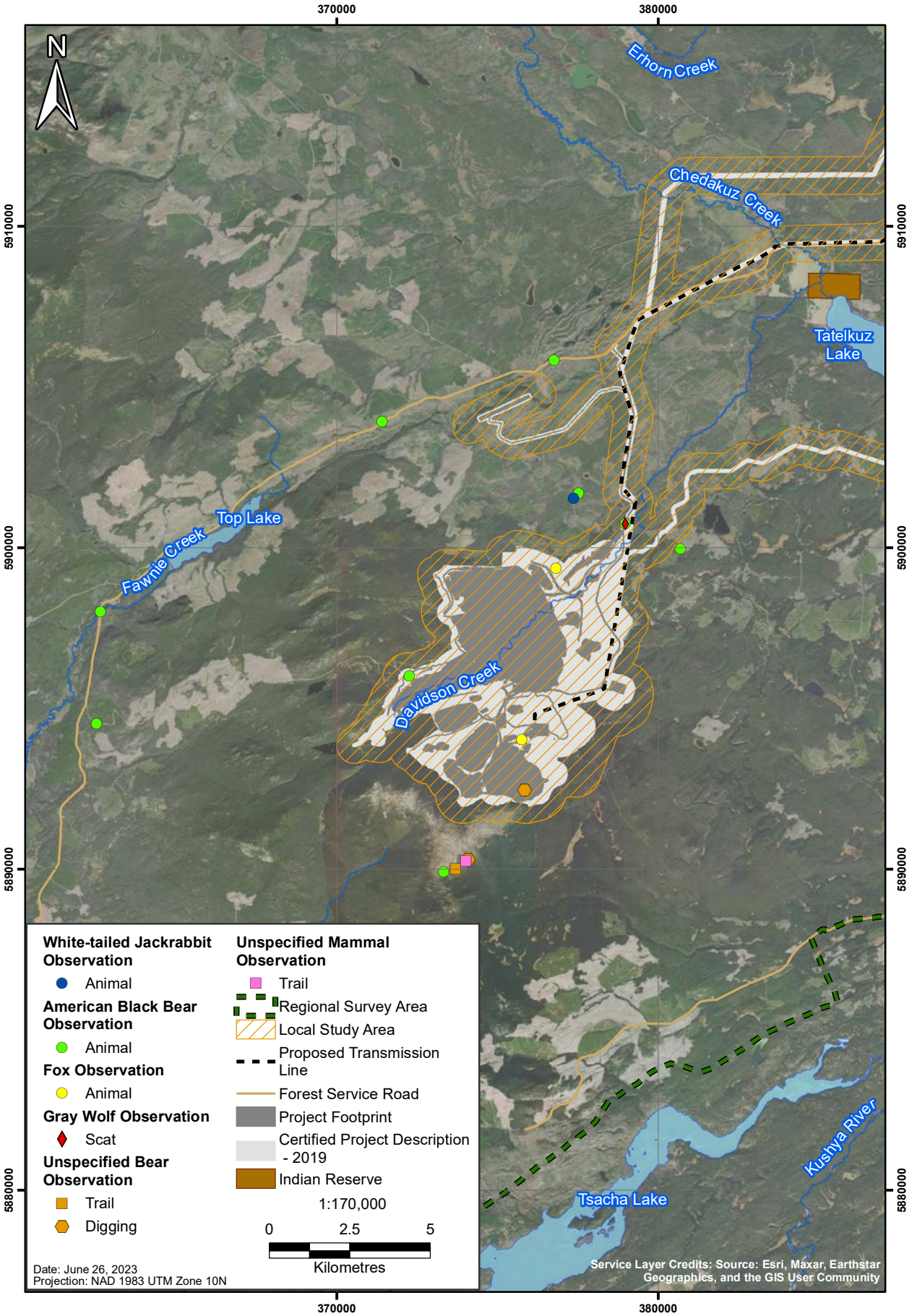


Figure 3.4-1: Incidental Furbearers Observations

Table 3.5-1: Bat Species at Risk with Potential to Occur in the RSA

Common Name	Species Name	Conservation Status[1, 2]	Observed in RSA Previously
Little brown myotis	*Myotis lucifugus*	BC Blue, Endangered	Yes (LSA)
Northern myotis	*Myotis septentrionalis*	BC Blue, Endangered	Yes (LSA)
Townsend's big-eared bat	*Corynorhinus townsendii*	BC Blue	Unconfirmed
Western small-footed Myotis	*Myotis ciliolabrum*	BC Blue	Unconfirmed
Yuma myotis	*Myotis yumanensis*	BC Blue	Unconfirmed

[1] BC List: Yellow (Least Risk), Blue (Special Concern), Red (Threatened, Endangered, or Extirpated); BC CDC (2023)
[2] Schedule 1 of SARA: Special Concern, Threatened, Endangered, or Extirpated; Government of Canada (2023)

The predicted residual effects of the Project on bats as identified in the EIS, Vol 4 Section 5.4.14.4 are (New Gold 2015; ERM 2017):

- Habitat loss and alteration (not significant, negligible magnitude); and
- Wildlife mortality (not significant, negligible magnitude).

The monitoring programs developed to verify predicted effects and the effectiveness of the mitigation measures outlined in Section 4.2 of the WMMP for bats include (ERM 2022a):

- Buffer zone monitoring (Section 3.5.2.1 and 3.5.3.1);
- Bat roosting habitat offset (Sections 3.5.2.2 and 3.5.3.2); and
- North American Bat Monitoring Program (NABAT) Monitoring (Section 3.5.2.3).

Additionally, ongoing discussion with ECCC regarding monitoring for bats at the Project may result in a collaborative study with University of Northern British Columbia (UNBC) researchers, ECCC, and BW Gold. Details on the study goals and design have not yet been decided but will be incorporated into the bat monitoring program in future (see Section 4.2.3.3 in the WMMP; ERM 2022a).

3.5.1 Objectives

The objectives of the follow-up monitoring program for little brown myotis and northern myotis are to:

- Evaluate bat species composition and distribution within the LSA including use of buffered roosts and hibernacula (EAC condition 23.h, DS condition 8.22).
- Evaluate effectiveness of bat roosting structure offsets.
- Monitor bats in the area surrounding the RSA using the NABAT program.

3.5.2 Methods

3.5.2.1 Bat Distribution and Buffer Zone Monitoring

Bat Distribution Field Surveys

Bioacoustic surveys using Autonomous Recording Units (ARUs) were completed in 2022 to record bat echolocation calls. Surveys were completed as part of additional baseline data collection for bat species presence and distribution.

ARUs were deployed in summer and fall when bats are active on a nightly basis, following RIC protocols (RIC 1998b). Wildlife Acoustics SM-mini bat recorders were deployed in habitats within the mine site LSA. Survey locations were selected based on their potential as foraging habitat, including the presence of open areas or wetlands, which attract flying insects. Survey sites were located next to mature or intermediate forest that may provide suitable roosts during the day or cooler nights.

Call Analysis

Recorded bat calls (sonogram files) were analysed for detection of 12 species known to be present or potentially present in the mine site RSA, based on species ranges and previous baseline work (Table 3.5-2). Analysis sonogram files was conducted using the software program Kaleidoscope Pro, version 5.4.8 (Wildlife Acoustics 2019). The call library used was version 5.4.0, and files were processed on the "0 Balanced (Neutral)" setting. Other signal parameters were left at default values. Kaleidoscope has a built-in call library for North American species which runs auto-identification on recorded calls, based on clustering analyses. Auto-ID is a first step of analysis and provides likely occurrences, reducing manual analysis time. While auto-ID is both efficient and generally accurate, variation in recording quality and overlap in species calls requires additional manual review to assess confidence in species presence.

Table 3.5-2: List of Bat Species Potentially Occurring within the Regional Study Area

Likelihood of Occurrence	Common Name	Scientific Name	Characteristic Frequency (Fc)[1]	Call ID Notes[2]
Confirmed (2013 Baseline)	Big brown bat	*Eptesicus fuscus*	22-30 kHz	May have sharper incline on call shape and lower Fc
	Eastern red bat	*Lasiurus borealis*	38-50 kHz	May have a variable Fc within a sequence and a slight uptick at the end
	Hoary bat	*Lasiurus borealis*	18-22 kHz	Fc typically lowest (< 22 kHz), very flat call shape
	Little brown myotis	*Myotis lucifugus*	40-45 kHz	Typically less steep call shape and lower maximum frequency (typically 70-80 kHz)
	Long-legged myotis	*Myotis volans*	40-45 kHz	Diagnostic hook at top of call, but rarely seen; calls exhibit large variety and overlap with other *Myotis* species
	Northern long-eared myotis	*Myotis septentrionalis*	40-45 kHz	Calls have large bandwidth range, with maximum frequency often over 90 kHz and on loud calls exceeding 100 kHz; calls are typically quiet
	Silver-haired bat	*Lasionycteris noctivagans*	22-30 kHz	May have longer pulse break and higher Fc (> 26 kHz)
	Western long-eared myotis	*Myotis evotis*	30-35 kHz	Low Fc distinguishes from other *Myotis*
Possible/ Probable	California myotis	*Myotis californicus*	44-50 kHz	Higher Fc than most *Myotis,* Steeper call shape than *M. yuma*
	Western small-footed myotis	*Myotis ciliolabrum*	40-45 kHz	May have a smooth sweeping curve call shape with a downward ending tail. Lower Fc Then *M. Californicus*

Likelihood of Occurrence	Common Name	Scientific Name	Characteristic Frequency (Fc)[1]	Call ID Notes[2]
	Yuma myotis	*Myotis yumanansis*	44-50 kHz	Higher Fc than most *Myotis;* Less steep call shape than *M. californicus*
Unlikely	Townsend's big eared bat	*Corynorhinus townsendii*	32-35 kHz	May have a low intensity call with a linear downward sweep

[1] *Lausen (2011); Lausen and Livengood (2011); Maxell et al. (2015).*

Reliable differentiation between species based on recorded calls can be challenging. In particular, several species in the genus *Myotis* have overlapping characteristics of echolocation calls around the 40 kHz frequency range (Table 3.5-2; RIC 1998b; Maxell et al. 2015). Additionally, big brown bats and silver-haired bats have very similar call characteristics and are not always possible to identify to species (Table 3.5-2; Maxell et al. 2015). In situations where a given recording could belong to more than one species, identification was left as a list of two or more possible species.

Calls are not always identifiable to species, depending on the frequency and diagnostic features of the species calls, and the clarity of the recording. Therefore, species are reported according to confidence in occurrence to account for uncertainty in call assessment.

Buffer Zone Monitoring

Pre-clearing survey methods and results for bat roosts and hibernacula are reported in Section 2.1.

Monitoring of buffer zones will include ARUs deployed in buffered areas as well as non-buffered control sites while construction is active. As the bat monitoring program continues, additional analysis will be completed as outlined in the WMMP (ERM 2022a).

3.5.2.2 Bat Roosting Structures

Loss of bat roosting habitat must be offset with artificial roosting structures, as part of federal DS condition 8.15. Upon further discussion with ECCC, use of BrandenBark structures (Brandenburg 2013), were recommended instead of standard bat boxes (see WMMP Section 4.2.2 for details; ERM 2022a).

Three BrandenBark structures were installed in the Matthews Creek Wetland Offset Area in September 2022, prior to the onset of construction. Prior to installation, an aerial and ground reconnaissance survey was completed to identify potential roost structure locations in the Matthews Creek Wetland Offset Area. Locations were selected to represent semi-open and closed habitat types. BrandenBark was installed on existing trees with branches cut to accommodate the BrandenBark wrapping around the trees.

Deployment of additional BrandenBark will occur in future years, after completion of a program plan to assess maximum suitability for additional sites and placement of roosting structures. The roosting structures will be assessed for effectiveness using ARUs and guano catchers to determine species presence and activity, as well as temperature loggers installed within BrandenBark structures to analyse microclimate suitability for bats at each location (ERM 2022a).

3.5.2.3 NABAT Monitoring

BW Gold is currently engaged with ECCC on the initiation of a NABAT monitoring program at the Project. The program is anticipated to follow the NABAT programs standard methods. The design process for the program is currently ongoing and was not initiated in 2022. The final design and implementation of the NABAT monitoring program will be included in future years.

3.5.3 Results

3.5.3.1 Bat Distribution and Buffer Zone Monitoring

A total of six ARUs were deployed to record bat activity (Figure 3.5-1; Appendices O and P). Three ARUs were deployed in wetlands within the Project LSA and three ARUs were deployed within the Matthews Creek Wetland Offset Area.

Data in the mine site area were collected for additional baseline; no clearing or construction activities took place during the bat roosting season, so no compliance monitoring was completed. After analysis of ARU files using the Kaleidoscope Pro auto-ID function and manual vetting, three species were detected with high or moderately high confidence (i.e., had many clear diagnostic calls recorded) in the mine site area: little brown myotis, silver-haired bat, and western small-footed myotis (Table 3.5-3). All of these species have been detected in the Project LSA in the past, and little brown myotis and silver-haired bat were also detected with high confidence during baseline studies in 2021 (Table 3.5-3). Nine species have been detected in the LSA during previous baseline studies in 2011-2013, and 2021; the additional data in 2022 only represents a small portion of the overall baseline data for bats and does not include all species known to be present in the Project area.

Table 3.5-3: Bat Species Detected by ARU Surveys, 2022

Species Common Name	Scientific Name	2021	2022	
		Relative Confidence in Detection – Mine Site LSA	Relative Confidence in Detection – Mine Site LSA	Relative Confidence in Detection – Matthew's Creek
Big brown bat	*Eptesicus fuscus*	Moderate High	Moderate Low	Low
California myotis	*Myotis californicus*	Moderate Low	Low	Low
Eastern red bat	*Lasiurus borealis*	Low	Moderate Low	Low
Hoary bat	*Lasiurus cinereus*	Moderate High	Moderate Low	Low
Little brown myotis*	*Myotis lucifugus*	High	High	High
Long-legged myotis	*Myotis volans*	Moderate Low	Low	Low
Northern myotis*	*Myotis septentrionalis*	Moderate Low	Low	Low
Townsend's big eared bat*	*Corynorhinus townsendii*	Low	Low	Low
Silver-haired bat	*Lasionycteris noctivagans*	High	High	Moderate
Western long-eared myotis	*Myotis evotis*	High	Moderate	Low
Western small-footed myotis*	*Myotis ciliolabrum*	Low	Moderate High	Low
Yuma myotis*	*Myotis yumanensis*	Moderate Low	Low	Low

** Indicates a species of conservation concern, see Table 3.5-1.*

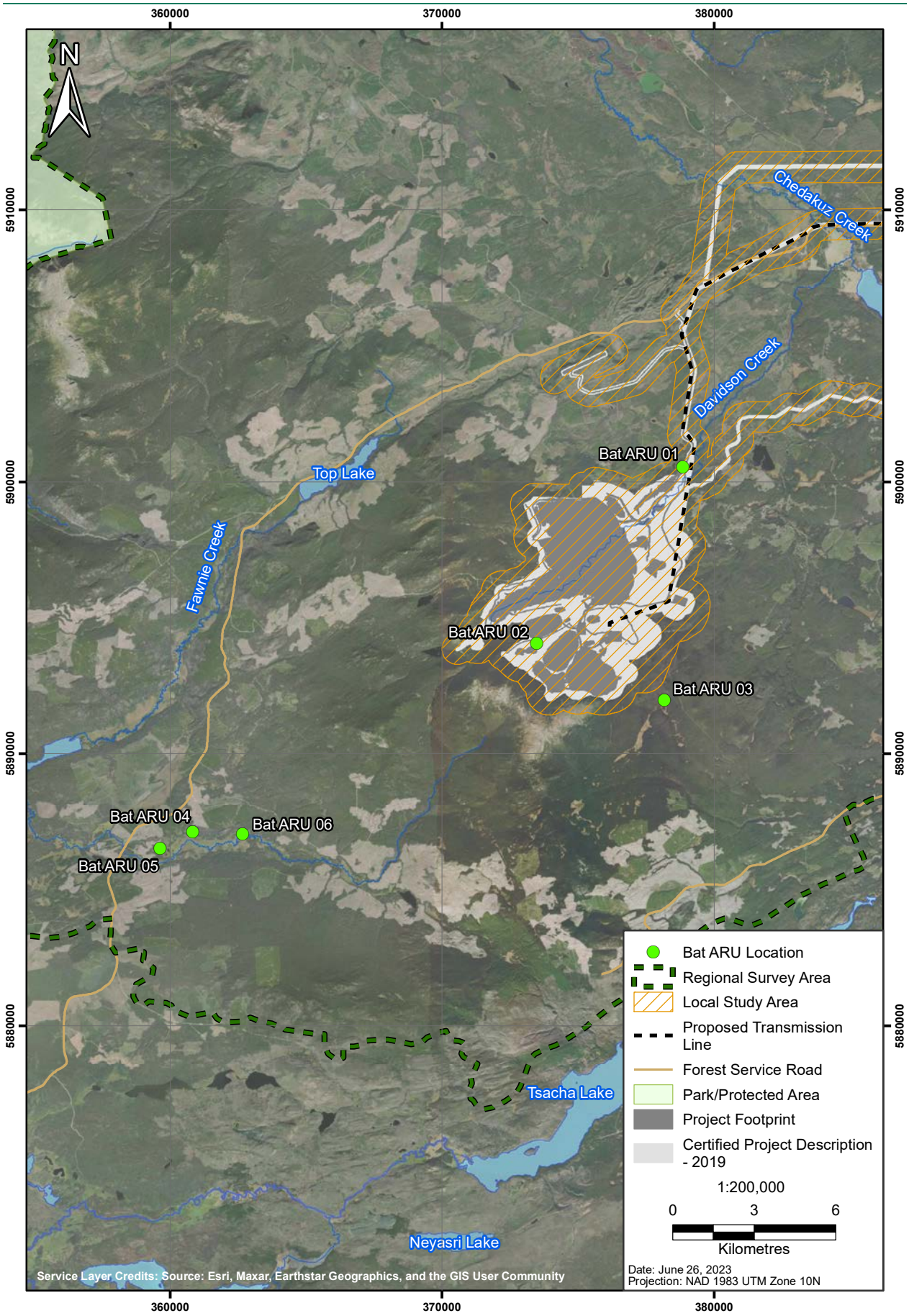


Figure 3.5-1: Bat ARU Locations, 2022

Three ARUs in the Matthews Creek Wetland Offset Area were deployed late in the roosting season and were active through the first ten days of September (Appendix O). Bat activity was lower at these sites compared to ARUs deployed at the mine site, likely due to cooler weather in September compared to July/August (Figure 3.5-1; Appendix P). Analysis of the ARU sound files resulted in detection of one species with high confidence, little brown myotis, and moderate confidence in detection for silver-haired bat (Table 3.5-3).

Pre-clearing surveys for bat roosts and hibernacula were completed in September 2022 and are reported in Section 2.1. No bat roosts or hibernacula were observed and further monitoring was not required.

3.5.3.2 Bat Roosting Structures

Installation of three bat BrandenBark roosting structures was completed on September 1, 2022 (Figure 3.5-2; Appendix Q). Roosting structures were established in semi-open and closed habitat types within the Matthews Creek Wetland Offset Area boundary. Each structure was attached to a tree approximately 3.5 m from the ground.

3.5.3.3 Incidental Observations

No incidental observations or detections of bats were made in 2022.

3.5.4 Discussion

In the EIS, the Project was predicted to have a not significant, negligible magnitude effect of habitat loss and alteration and mortality for bats (Vol 4 Section 5.4.14.4; New Gold 2015; ERM 2017). Bat roosting habitat loss is required to be offset with artificial roosting structures by federal DS condition 8.15, with follow-up requirements from ECCC for BW Gold to participate in NABAT monitoring (detailed in the WMMP; ERM 2022a). Monitoring of buffered bat roosts and hibernacula is required by EAC condition 23.h to verify the effectiveness of buffering bat habitat features.

ARUs were deployed at six sites to collect additional baseline data of bat species presence and distribution in the mine site LSA and at the Mathews Creek Wetland Offset Area. Results from the bioacoustic survey indicated high confidence in presence of little brown myotis in both the mine site LSA and Matthews Creek Wetland Offset Area, as well as high confidence of silver-haired bat in the mine site LSA and moderate confidence in presence at Mathews Creek Wetland Offset Area. Both of these species were also among the most frequently detected during baseline surveys in 2021. Although little brown myotis are listed federally and provincially as a species of conservation concern, this species has consistently had some of the highest numbers of bioacoustic files recorded across monitoring sites and years (ERM 2022a). Little brown myotis and northern long-eared myotis populations underwent sharp declines across North America due to White Nose Syndrome infecting large groups of hibernating bats. To date, no cases of White Nose Syndrome have been detected in BC (Government of BC 2023). No features which are suitable for large group hibernacula have been identified within the Project LSA or RSA, reducing the likelihood that White Nose Syndrome will spread in the region. Healthy bat populations can be sustained in the Project area through maintenance of habitat, including adequately identifying and buffering bat roosts and hibernacula, and offsetting lost roosting habitat (as per the WMMP; ERM 2022a).

Monitoring in 2022 provides additional baseline data but was not conducted as a comprehensive survey covering the LSA, as was done in previous years (e.g., 20 ARUs deployed in 2021). Up to nine species of bat have been previously detected in the LSA and RSA, while only three species were reliably detected in 2022. The NABAT and other monitoring programs for bats were not initiated in 2022 and are under ongoing discussion with ECCC to finalize methods and approach.

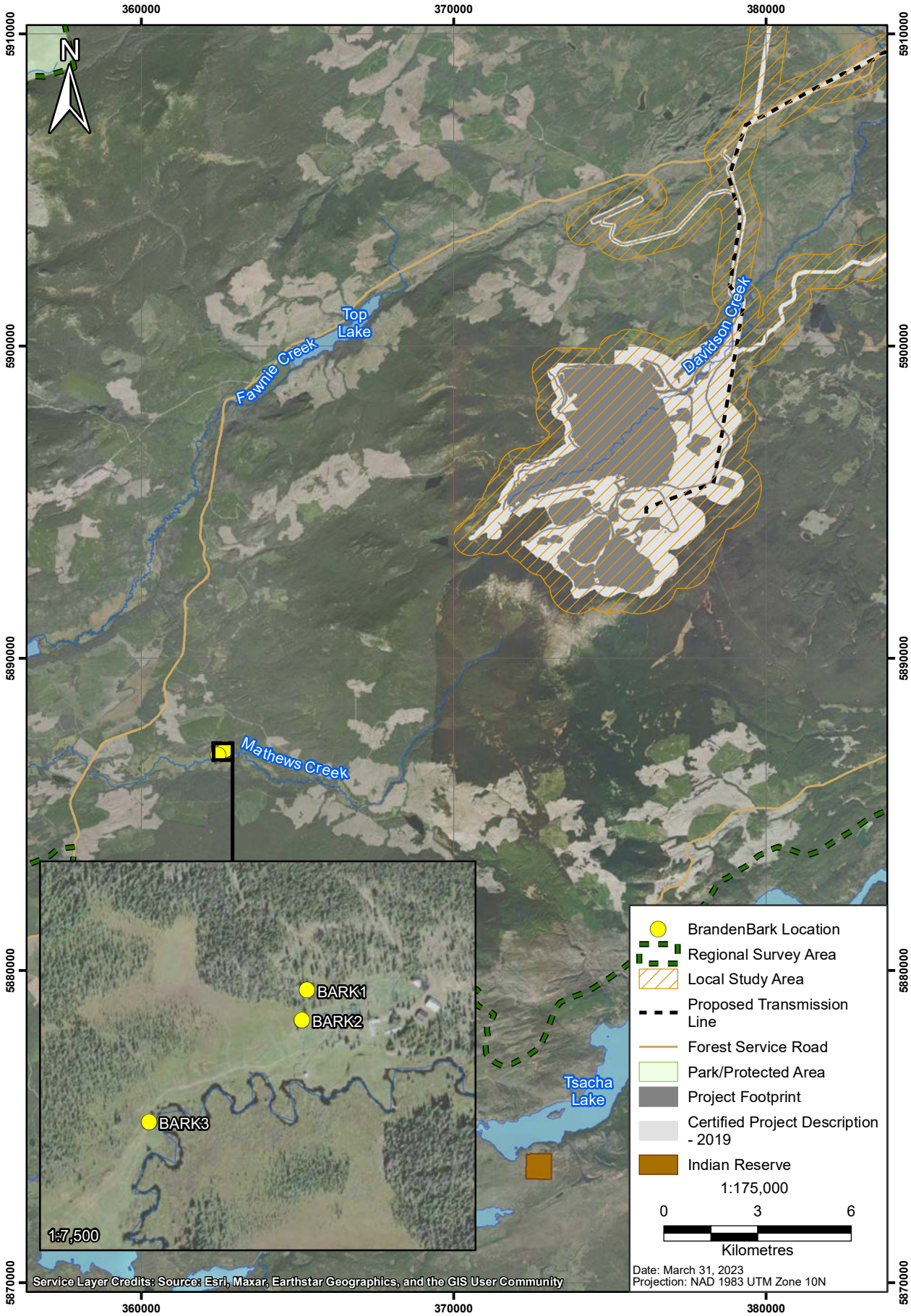


Figure 3.5-2: Bat BrandenBark Locations, 2022

This was the first year of bat surveys at the Matthews Creek Offset Area, and units were deployed during the end of the roosting season in September, which likely accounts for the low amount of bat activity recorded in the area. Artificial roosting structures (BrandenBark) were deployed at the Matthews Creek Wetland Offset Area prior to the onset of construction in 2022. Additional roosting structures will be installed in 2023, and the monitoring program on the offset effectiveness will be initiated (following details in the WMMP; ERM 2022a).

3.6 Raptors

DS conditions addressed: 4.1, 4.5

EAC conditions addressed: 23.c, 23.h

Raptors (i.e., falcons, hawks, eagles, and owls) are long-lived predators that require large home ranges and use a variety of habitats throughout the year. The landscape surrounding the Project has few areas that can support cliff-nesting raptors, making mature forest the primary raptor nesting habitat. Raptor nests are protected year-round by the BC *Wildlife Act* (1996).

Five raptor species of conservation concern have potential to occur in the RSA (Table 3.6-1). Short-eared owl was detected during 2011-2013 baseline surveys prior to the EIS, however habitat assessments and follow-up baseline studies indicate there is limited large open areas which can provide suitable breeding habitat for short-eared owl within both the RSA and LSA. Due to the lack of available habitat, no additional monitoring or management is planned for short-eared owl.

Table 3.6-1: Raptor Species at Risk with Potential to Occur in the RSA

Common Name	Species Name	Conservation Status[1, 2]	Observed in RSA Previously
Broad-winged hawk	*Buteo platypterus*	BC Blue	No
Gyrfalcon	*Falco rusticolus*	BC Blue	No
Peregrine falcon, *anatum* ssp.[3]	*Falco peregrinus anatum*	BC Red	No
Short-eared owl	*Asio flammeus*	BC Blue, Special Concern	Yes (RSA)
Swainson's hawk	*Buteo swainsoni*	BC Red	No

[1] BC List: Yellow (Least Risk), Blue (Special Concern), Red (Threatened, Endangered, or Extirpated); BC CDC (2023)
[2] Schedule 1 of SARA: Special Concern, Threatened, Endangered, or Extirpated; Government of Canada (2023)
[3] Species with migration paths overlapping the RSA but which do not breed or overwinter in the area.

The predicted residual effects of the Project on raptors as identified in the EIS assessment, Vol 4. Section 5.4.9.4 are (New Gold 2015; ERM 2017):

- Habitat loss and alteration (not significant, negligible magnitude).

As described in Section 4.7 of the WMMP (ERM 2022a), the monitoring programs developed for raptors includes:

- Pre-clearing surveys for birds (Section 2.1);
- Habitat loss (Section 2.2);
- Transmission line monitoring (Section 2.5); and
- Nest success surveys (Section 3.6.2.2).

Additionally, nest surveys were completed in 2022 to confirm the location of raptor stick nests within the LSA to assist with planning of future pre-clearing surveys and implementation of additional mitigation requirement, if required.

3.6.1 Objectives

The objective of the follow-up monitoring program for raptors is to:

- Evaluate the success of nesting raptors within setback buffers established during construction and vegetation clearing (DS condition 4.5, EAC condition 23.h).

3.6.2 Methods

3.6.2.1 Aerial Stick Nest Surveys

Aerial surveys were completed in the LSA to identify raptor stick nests within or near the Project footprint. Surveys were flown using a helicopter and two observers following provincial standards (RIC 2001). Flight tracks, observations, and georeferenced photos were recorded. Surveys were completed in fixed-width transects of 300 m to 500 m while maintaining a height between 50 m and 150 m above ground level. Surveys targeted forested and riparian edge habitats where stick nests are most likely to occur.

3.6.2.2 Nest Success Surveys

Pre-clearing surveys for raptor stick nests were completed in September 2022 and are further described in Section 2.1. No clearing occurred during the raptor nesting period, therefore subsequent monitoring was not required.

3.6.3 Results

3.6.3.1 Aerial Stick Nest Survey

Aerial raptor stick nest surveys were completed on May 21, 2022 (Appendix R). Surveys were completed across the LSA but did not identify any new stick nests (Figure 3.6-1). One stick nest was identified during pre-construction surveys in December 2021. The nest was revisited during the May 2022 survey and was unoccupied.

3.6.3.2 Incidental Observations

Ten raptor species were incidentally recorded during the 2022 wildlife field season (Table 3.6-2; Appendix H). In total, 57 individuals and 3 stick nests were incidentally recorded. All three stick nests belonged to osprey (Figure 3.6-2). One Swainson's hawk was the only raptor species of conservation concern recorded in 2022 (Table 3.6-2). The Swainson's hawk was recorded during fall waterbird surveys and therefore may have been migrating through the Project area. The most frequently observed species was bald eagle, accounting for 42% of all raptor observations. Osprey were the second most frequently observed species, accounting for 25% of raptor observations. The majority of incidental raptor observations which included coordinates were within the project footprint (Figure 3.6-2).

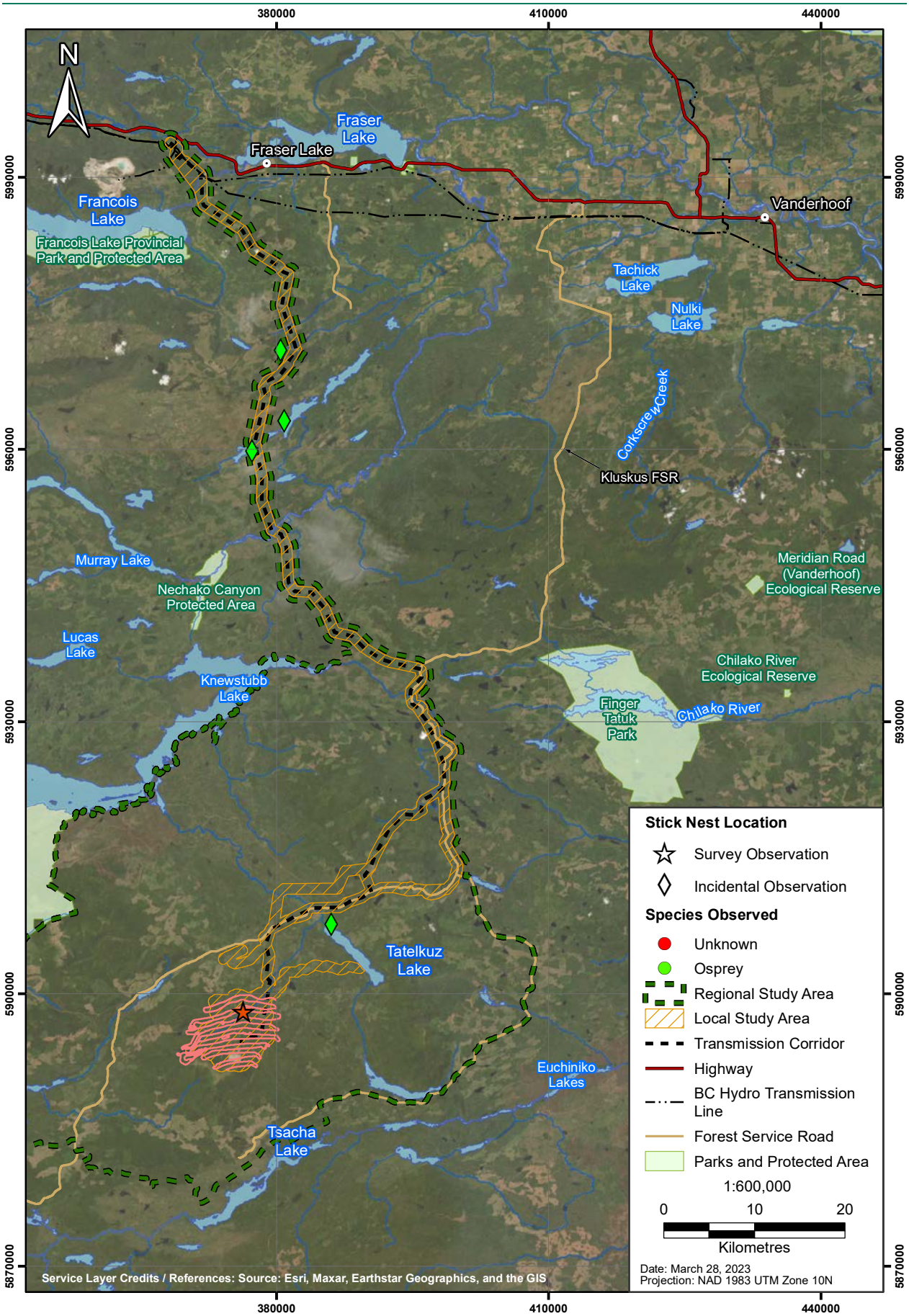


Figure 3.6-1: Raptor Stick Nest Locations and Survey Tracks, 2022

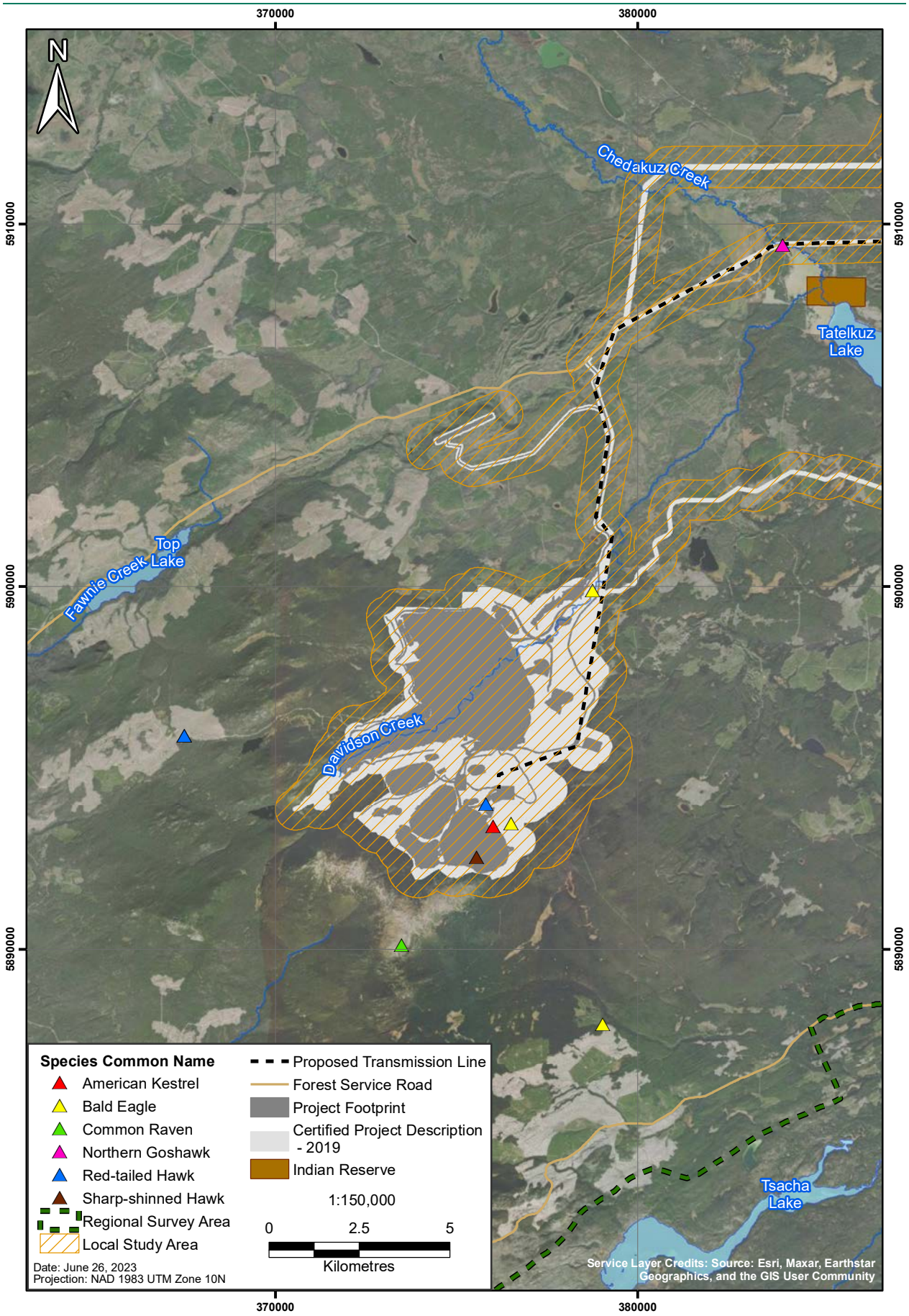


Figure 3.6-2: Incidental Raptor Observations

Table 3.6-2: Raptor Incidental Observations, 2022

Species	Scientific Name	Number of Individuals	Number of Stick Nests
American kestrel	*Falco sparverius*	1	0
Bald eagle	*Haliaeetus leucocephalus*	24	0
Northern goshawk	*Accipiter gentilis*	1	0
Northern harrier	*Circus hudsonius*	2	0
Osprey	*Pandion haliaetus*	14	3
Red-tailed hawk	*Buteo jamaicensis*	7	0
Rough-legged hawk	*Buteo lagopus*	2	0
Sharp-shinned hawk	*Accipiter striatus*	1	0
Swainson's hawk*	*Buteo swainsoni*	1	0
Unknown harrier	-	3	0
Total		**57**	**3**

** Indicates a species of conservation concern, see Table 3.5-1.*

3.6.4 Discussion

Monitoring for raptors focuses on measuring the success of mitigation measures, including implementation of pre-clearing surveys and outcomes of buffered active nests, which are required by EAC conditions 23.c and 23.h, and DS condition 4.5. Additional monitoring for raptors related to potential effects of the transmission line are reported in Section 2.5.

All buffered active raptor nests will be monitored to determine the outcome of the nest (i.e., fledged or failed) and assess whether implemented buffer distances are effective. In 2022, no clearing occurred during the raptor nesting season. Because raptor nests are protected year-round, pre-clearing surveys for raptor nests were still conducted prior to clearing in September 2022 and are reported in Section 2.1.

No raptor nest success monitoring occurred, given the lack of clearing during the raptor nesting season. In future years if active raptor nests are buffered, an analysis will be conducted to determine whether the success rate of buffered raptor nests are similar to known success rates for non-buffered nests. Nesting success can vary widely depending on the weather, food availability, predators, and other factors. Therefore, nesting success within buffered areas is not expected to be 100%. Average nest success will be determined based on published research for raptors and will be included in reporting numbers.

An additional survey was completed to identify raptor nest locations within or near the planned Project footprint, to aid in planning potential mitigation for future years. No new raptor nests were identified during the survey in May 2022; one previously identified stick nest within the Project footprint was unoccupied in both 2021 and 2022. Three additional osprey nests were incidentally identified in 2022, however none are close enough to the planned Project footprint to require mitigation in future years.

3.7 Waterbirds

DS conditions addressed: 4.1, 4.5

EAC conditions addressed: 23.c, 23.h

The term waterbird is used to encompass all birds that primarily use aquatic habitats for foraging, breeding, or migratory staging during the year. This includes dabbling and diving ducks, loons, gulls,

geese, swans, and shorebirds. Waterbirds require aquatic habitats for most of their life cycle, in addition to adjacent terrestrial and wetland habitats for nesting and sometimes feeding. Within the RSA, waterbirds may use wetlands (fens, bogs, or swamps), as well as lakes, rivers, and ponds. Both migratory waterbirds and their nests are protected federally under the *Migratory Birds Convention Act* (1994) while additional protections may be afforded under the *Species at Risk Act* (Government of Canada 2023). Waterbird species of conservation concern potentially occurring within the RSA are listed in Table 3.7-1.

Table 3.7-1: Waterbird Species at Risk with Potential to Occur in the RSA

Common Name	Species Name	Conservation Status[1, 2]	Observed in RSA Previously
American bittern	Botaurus lentiginosus	BC Blue	No
American golden plover	*Pluvialis dominica*	BC Blue	No
American white pelican	*Pelecanus erythrorhynchos*	BC Red	No
Brant[3]	*Branta bernicla*	BC Blue	No
California gull[3]	*Larus californicus*	BC Blue	No
Eared grebe[3]	*Podiceps nigricollis*	BC Blue	No
Great blue heron	*Ardea herodias*	BC Blue	Yes (RSA)
Horned grebe	*Podiceps auritus*	BC Yellow, Special Concern	Yes (Transmission Line LSA)
Killdeer	*Charadrius vociferus*	BC Blue	Yes (RSA)
Lesser yellowlegs	*Tringa flavipes*	BC Blue, COSEWIC Threatened (2020)	Yes (RSA)
Long-tailed duck[3]	*Clangula hyemalis*	BC Blue	No
Red-necked phalarope[3]	*Phalaropus lobatus*	BC Blue, Special Concern	No
Surf scoter[3]	*Melanitta perspicillata*	BC Blue	
Western grebe	*Aechmophorus occidentalis*	BC Red, Special Concern	No

[1] BC List: Yellow (Least Risk), Blue (Special Concern), Red (Threatened, Endangered, or Extirpated); BC CDC (2023)
[2] Schedule 1 of SARA: Special Concern, Threatened, Endangered, or Extirpated; Government of Canada (2023)
[3] Species with migration paths overlapping the RSA but which do not breed or overwinter in the area.

The predicted residual effects of the Project on waterbirds as identified in the EIS, Vol 4. Section 5.4.8.4 (New Gold 2015; ERM 2017) are:

- Habitat loss and alteration (not significant, minor magnitude);
- Mortality risk (not significant, negligible magnitude); and
- Change in population dynamics (not significant, negligible magnitude).

The predictions in the EIS included the potential for reduced bird density within 100 m of the Project footprint due to habitat alteration and potential for increased predator access to alter population dynamics near the Project (EIS Application, Vol 4, Section 5.4.8; New Gold 2015; ERM 2017). The effectiveness of mitigation measures will be evaluated through monitoring waterbird population dynamics within the LSA and RSA, as well as behavioural responses to the Project.

As described in Section 4.7 of the WMMP (ERM 2022a), the monitoring programs developed for waterbirds include:

- Pre-clearing surveys for waterbirds (Section 2.1);
- Habitat loss (Section 2.2);
- Bird mortality (Section 2.3);
- Facility water structure monitoring (Section 2.4);
- Transmission line monitoring (Section 2.5);
- Waterbird population monitoring (Section 3.7.2.1); and
- Nest success surveys (Section 3.7.2.2).

3.7.1 Objectives

The objectives of the follow-up monitoring program for waterbirds are to:

- Detect changes in bird population dynamics in the Project area (DS conditions 4.1, 4.5).
- Evaluate the success of nesting waterbirds within setback buffers established during construction and vegetation clearing (DS condition 4.5, EAC condition 23.h).

3.7.2 Methods

3.7.2.1 Waterbird Population Monitoring

Three separate surveys for waterbirds were completed in 2022: spring pairing, summer brooding, and fall migration. All wetlands and waterbodies throughout the LSA were surveyed.

Waterbird aerial surveys were completed according to provincial RISC standards (RIC 1998c). Aerial surveys were conducted across the LSA instead of ground surveys at a subset of ponds, as described in the WMMP, due to lack of accessible ponds close to the Project footprint. The mine site LSA has few waterbodies within the intended potential effect zone of within 200 m of the Project footprint (ERM 2022a), and most sites were inaccessible for ground surveys due to being surrounded by forest on all sides and without options for nearby road access or helicopter landing sites. Therefore, all waterbodies in the LSA were surveyed by helicopter. Future analysis will be conducted according to a continuous distance measurement of a given waterbird observation to the Project footprint, with modelling control variables to account for the number and type of waterbodies by distance from infrastructure. The WMMP will be updated to reflect this program change, along with any other program changes, following a broad program assessment after the first two years of compliance monitoring (as described in the Methods for each monitoring program; WMMP Section 4.8; ERM 2022a).

Two biologists were present for each aerial survey, one in the front of the helicopter to navigate and the other in the back to record notes. Environmental conditions such as weather, wind, and visibility were recorded at the start of each survey. Survey routes and bird observations were georeferenced and data on species, number of individuals, sex, age, and habitat were recorded for each observation, when possible. The habitat associated with each observation was classified as pond, lake, river, creek, swamp, or wetland habitats.

Waterbird data were summarized by relative abundance and species richness. Relative abundance is the number of individuals counted, while species richness is the total number of species observed during each survey period. These estimates included only those data that were collected during formal waterbird surveys (i.e., no incidentals).

As the waterbird monitoring program continues, additional analysis will be completed as outlined in the WMMP (ERM 2022a).

3.7.2.2 Nest Success Surveys

Clearing was not initiated during the waterbird sensitive period in 2022 and neither pre-clearing surveys nor subsequent nest success surveys were required.

3.7.3 Results

3.7.3.1 Waterbird Population Monitoring

Waterbird population surveys were completed for three periods in 2022: spring pair (May 18 to 20), summer brood (July 8 to 12), and fall migration (September 9 to 11; Figures 3.7-1 to 3.7-3; Appendix S). Waterbird distribution was relatively consistent across the Transmission Line portion of the LSA, while very few waterbirds were recorded across all seasons in the mine site LSA (Figures 3.7-1 to 3.7-3). This is reflective of the lack of waterbodies present in the mine site LSA.

Surveys detected a total of 35 species and 2,564 individuals from 8 waterbird groups (Table 3.7-2; Appendix T): dabbling ducks (n = 7), diving ducks (n = 9), geese and swans (n = 2), gulls and terns (n = 3), loons and grebes (n = 4), riverine birds (n = 1), shorebirds (n = 6), and other birds (n = 3). Ten observations of unspecified species were also recorded during surveys. Most unspecified species are records of individuals which were not reliably identifiable, typically due to the birds flushing or hiding. Some species are also similar in appearance which makes identification during aerial surveys challenging (e.g., scaup species, sandpiper species, and yellowlegs species).

The most commonly observed species were mallard (*Anas platyrhynchos*; n = 483), bufflehead (*Bucephala albeola*; n = 329), ring-necked duck (*Aythya collaris*; n = 234), and lesser scaup (*Aythya affinis*; n = 217). There were 12 species that were only observed during one of the survey periods (spring = 6, summer = 2, fall = 4; Table 3.7-2). Nearly 50% of all waterbird observations were in the fall, with observations in the spring and summer at roughly half the abundance of the fall survey. Notably, over 85% of all geese observations occurred in the fall.

Waterbird groups were detected across all potential habitat types including pond, lake, wetland, river, creek, swamp/bog, and other (gravel pit and ditch). Detections were most common in lakes (59%) and ponds (32%; Figure 3.7-4). Some groups had strong associations with certain habitats, such as loons and grebes (76%) and geese and swans (80%) being most strongly associated with lakes. Diving ducks (94%) and dabbling ducks (77%; Figure 3.7-4). Shorebirds were recorded in more even numbers across all habitat types (Figure 3.7-4).

Species of Conservation Concern

Across all surveys, six species of conservation concern were recorded: American white pelican (n = 7, summer), great blue heron (n = 2, fall), killdeer (n = 1, spring), lesser yellowlegs (n = 9, spring and summer), red-necked phalarope (n = 1, fall), and western grebe (n = 14, summer, fall). Three of these species have not previously been recorded in the Project RSA (Table 3.7-1): American white pelican, western grebe, and red-necked phalarope. Western grebe are only known to breed regularly on three lakes within the BC (Salmon Arm, north arm of Okanagan Lake, and Duck Lake). The American white pelican is similarly only known to breed at two locations in BC: Stum Lake and Puntzi Lake both west of Williams Lake. The observations of these two species during the summer breeding season in 2022 may indicate errant non-breeders for the year, or represent breeding individuals out of their normal range. No nests or young of either species were recorded (Table 3.7-2). The single red-necked phalarope observation occurred during fall migration survey; the RSA is within the potential migration range for red-necked phalarope, even though they have not been recorded in the RSA previously (Table 3.7-1).

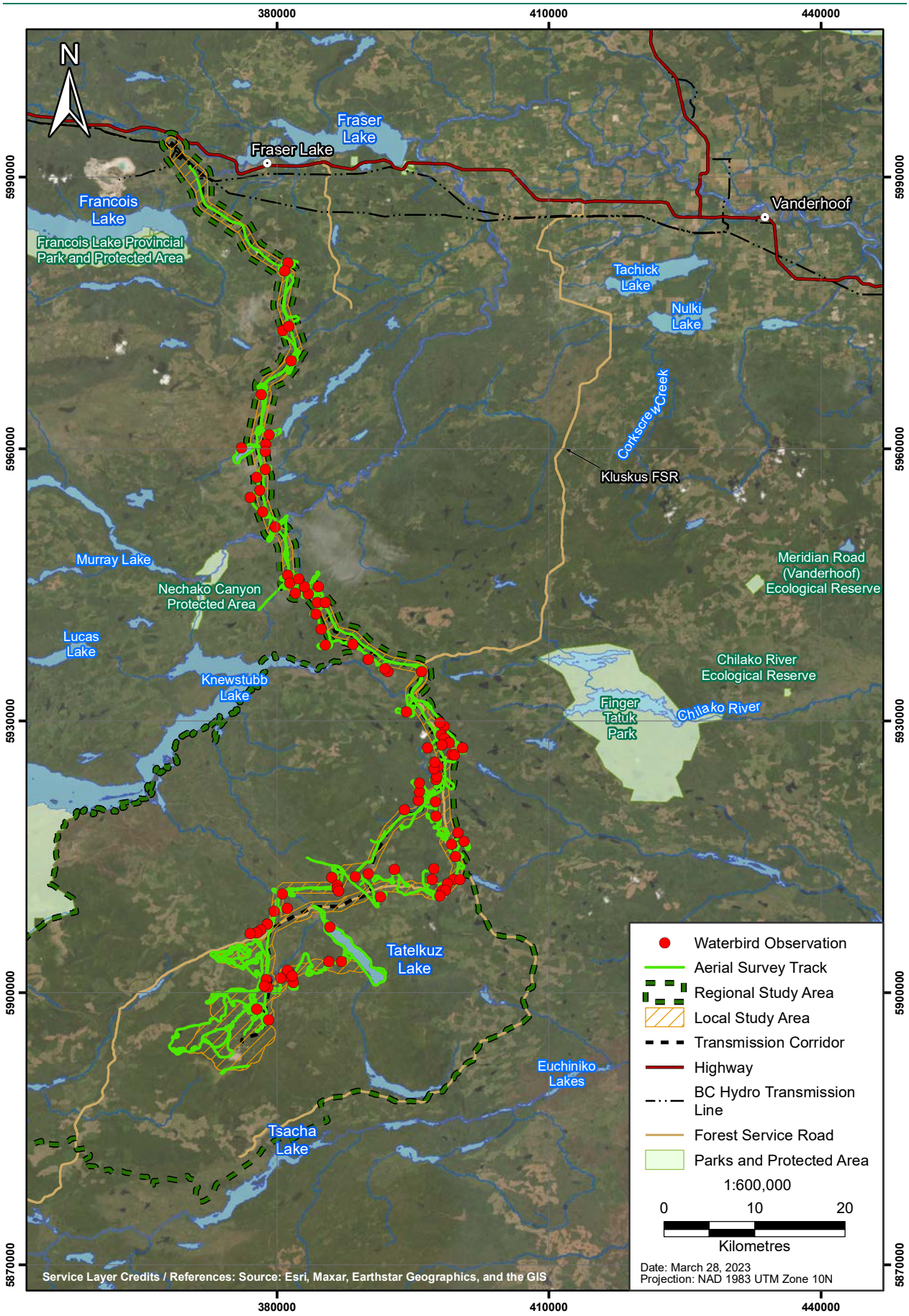


Figure 3.7-1: Waterbird Distribution during Spring Pair Surveys, 2022

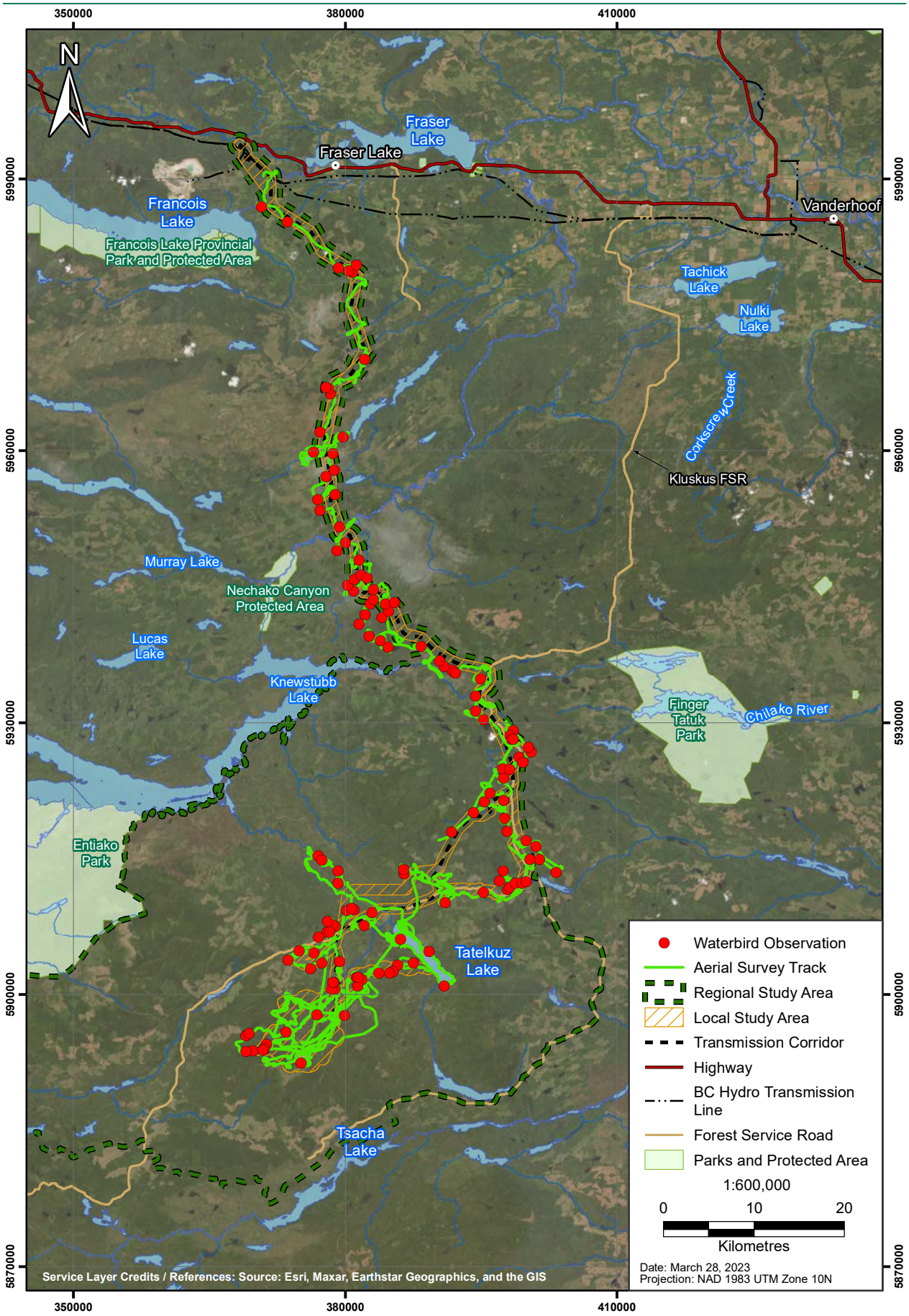


Figure 3.7-2: Waterbird Distribution during Summer Brood Surveys, 2022

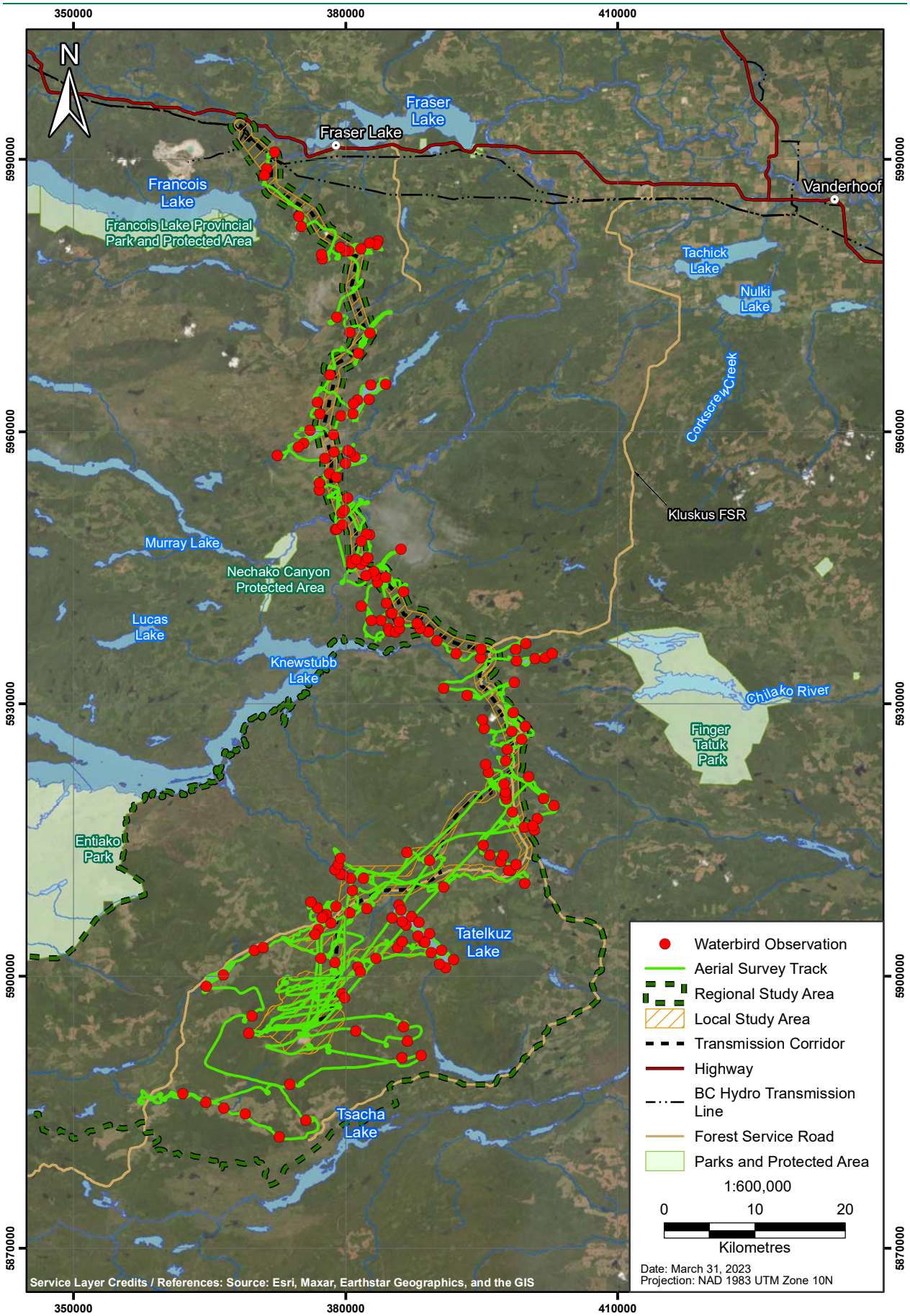


Figure 3.7-3: Waterbird Distribution during Fall Migration Surveys, 2022

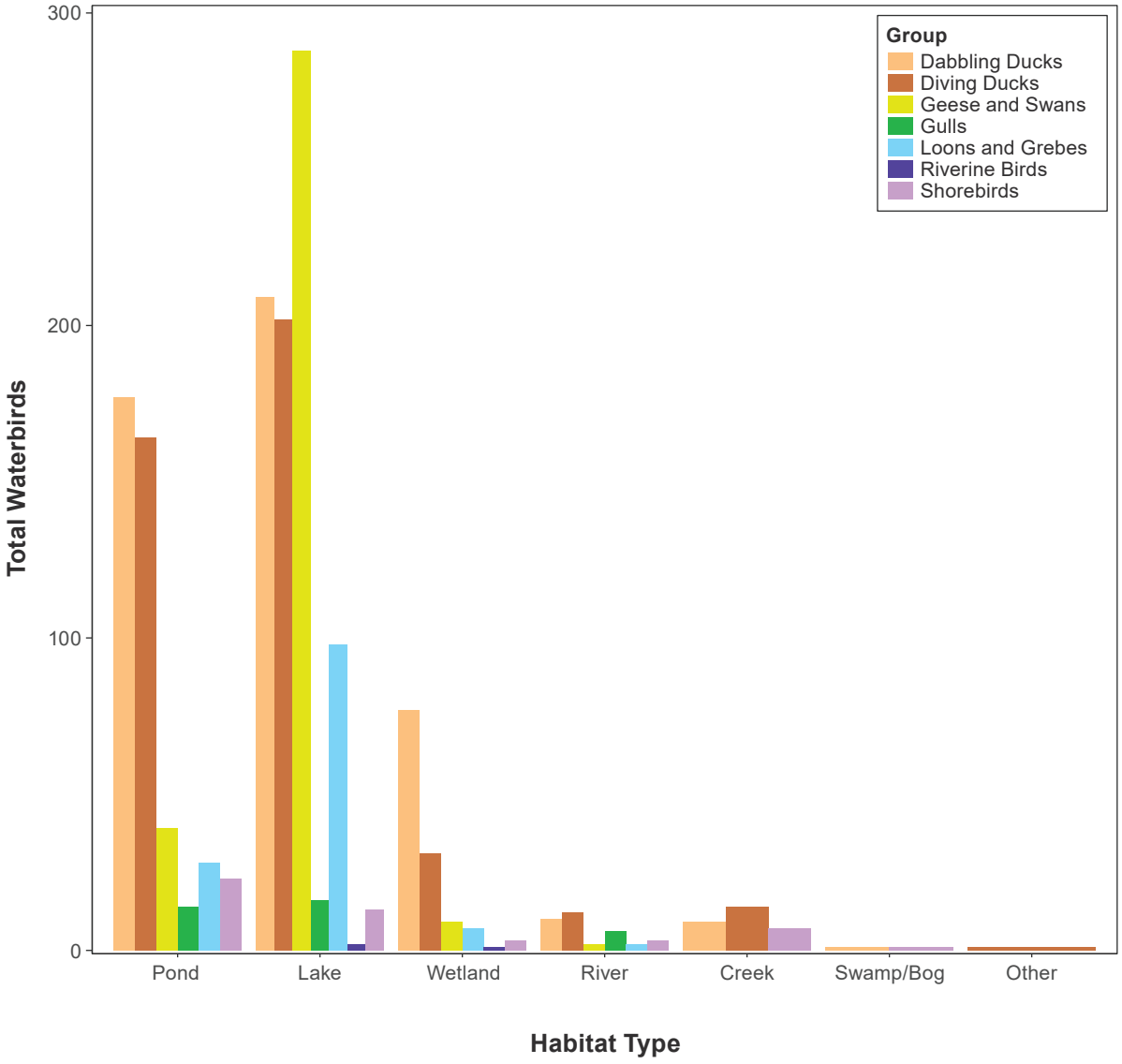


Figure 3.7-4: Waterbird Habitat Associations, 2022

Table 3.7-2: Total Waterbird Observations by Survey, 2022

Species Group	Species		Spring Pair	Summer Brood[1]	Fall Migration	Total
	Common Name	Scientific Name				
Dabbling Ducks	American wigeon	*Anas americana*	3	-	40	43
	Blue-winged teal	*Spatula discors*	13	9	5	27
	Cinnamon teal	*Anas cyanoptera*	1	-	5	6
	Green-winged teal	*Anas carolinensis*	2	-	17	19
	Mallard	*Anas platyrhynchos*	109	83	291	483
	Northern shoveler	*Anas clypeata*	-	-	14	14
	Wood duck	*Aix sponsa*	2	-	-	2
	Unspecified duck	-	-	-	62	62
	Unspecified teal	-	3	29	-	32
	Total		**133**	**121**	**434**	**688**
Diving Ducks	Barrow's goldeneye	*Buchephala islandica*	22	5	-	27
	Bufflehead	*Bucephala albeola*	125	173	31	329
	Common goldeneye	*Bucephala clangula*	13	32	-	45
	Common merganser	*Mergus merganser*	29	13	41	83
	Hooded merganser	*Lophodytes cucullatus*	4	-	-	4
	Lesser scaup	*Aythya affinis*	22	-	195	217
	Red-breasted merganser	*Mergus serrator*	-	11	-	11
	Ring-necked duck	*Aythya collaris*	119	31	84	234
	Ruddy duck	*Oxyura jamaicensis*	1	1	-	2
	Unspecified diver	-	7	-	-	7
	Unspecified goldeneye	-	18	53	-	71
	Unspecified scaup	-	69	19	-	88
	Total		**429**	**338**	**351**	**1,118**
Geese and Swans	Canada goose	*Branta canadensis*	36	15	4	55
	Trumpeter swan	*Cygnus buccinator*	-	-	10	10
	Unspecified goose	-	-	-	336	336
	Total		**36**	**15**	**350**	**401**
Gulls and Terns	Bonaparte's gull	*Chroicocephalus philadelphia*	3	3	-	6
	Common tern	*Sterna hirundo*	2	-	-	2
	Ring-billed Gull	*Larus delawarensis*	3	33	-	36
	Unspecified gull	-	5	-	-	5
	Total		**13**	**36**	**0**	**49**

Species Group	Species		Spring Pair	Summer Brood[1]	Fall Migration	Total
	Common Name	Scientific Name				
Loons and Grebes	Common loon	*Gavia immer*	33	53	48	134
	Pied-billed grebe	*Podilymbus podiceps*	-	1	31	32
	Red-necked grebe	*Podiceps grisegena*	2	5	16	23
	Western grebe*	*Aechmophorus occidentalis*	-	3	13	16
	Unspecified grebe	-	-	1	-	1
	Total		**35**	**63**	**108**	**206**
Riverine Birds	Belted kingfisher	*Megaceryle alcyon*	-	2	1	3
	Total		**-**	**2**	**1**	**3**
Shorebirds	Black turnstone	*Arenaria melanocephala*	1	-	-	1
	Greater yellowlegs	*Tringa melanoleuca*	4	3	-	7
	Killdeer*	*Charadrius vociferus*	1	-	-	1
	Lesser yellowlegs*	*Tringa flavipes*	8	7	-	15
	Red-necked Phalarope*	*Phalaropus lobatus*	-	-	1	1
	Spotted sandpiper	*Actitis macularius*	13	1	-	14
	Unspecified shorebird	-	15	31	-	46
	Unspecified yellowlegs	-	2	-	1	3
	Total		**44**	**42**	**2**	**88**
Others	Great blue heron*	*Ardea herodias*	**-**	**-**	2	2
	Sandhill crane	*Grus canadensis*	2	**-**	**-**	2
	American white pelican*	*Pelecanus erythrorhynchos*	**-**	7	**-**	7
	Total		**2**	**7**	**2**	**11**
TOTAL			**692**	**624**	**1,248**	**2,564**

** Indicates a species of conservation concern, see Table 3.7-1.*

[1] Count of brood survey includes young.

3.7.3.2 Incidental Observations

Six waterbird species (36 individuals) were incidentally observed in 2022 (Figure 3.7-5; Appendix H). All observations were made during other wildlife surveys and were observed primarily in the early summer (50% of observations in June and July). Solitary sandpiper (*Tringa solitaria*) was the only incidentally observed species that was not also observed during waterbird surveys in 2022. Not all observations included coordinates, however known locations include two observations within the LSA (solitary sandpiper and greater yellowlegs). Additionally, a pair of Barrow's goldeneyes were observed in a small wetland outside the LSA (Appendix H; Figure 3.7-5). Other observations included sandhill cranes in a cut block at Mathews Creek.

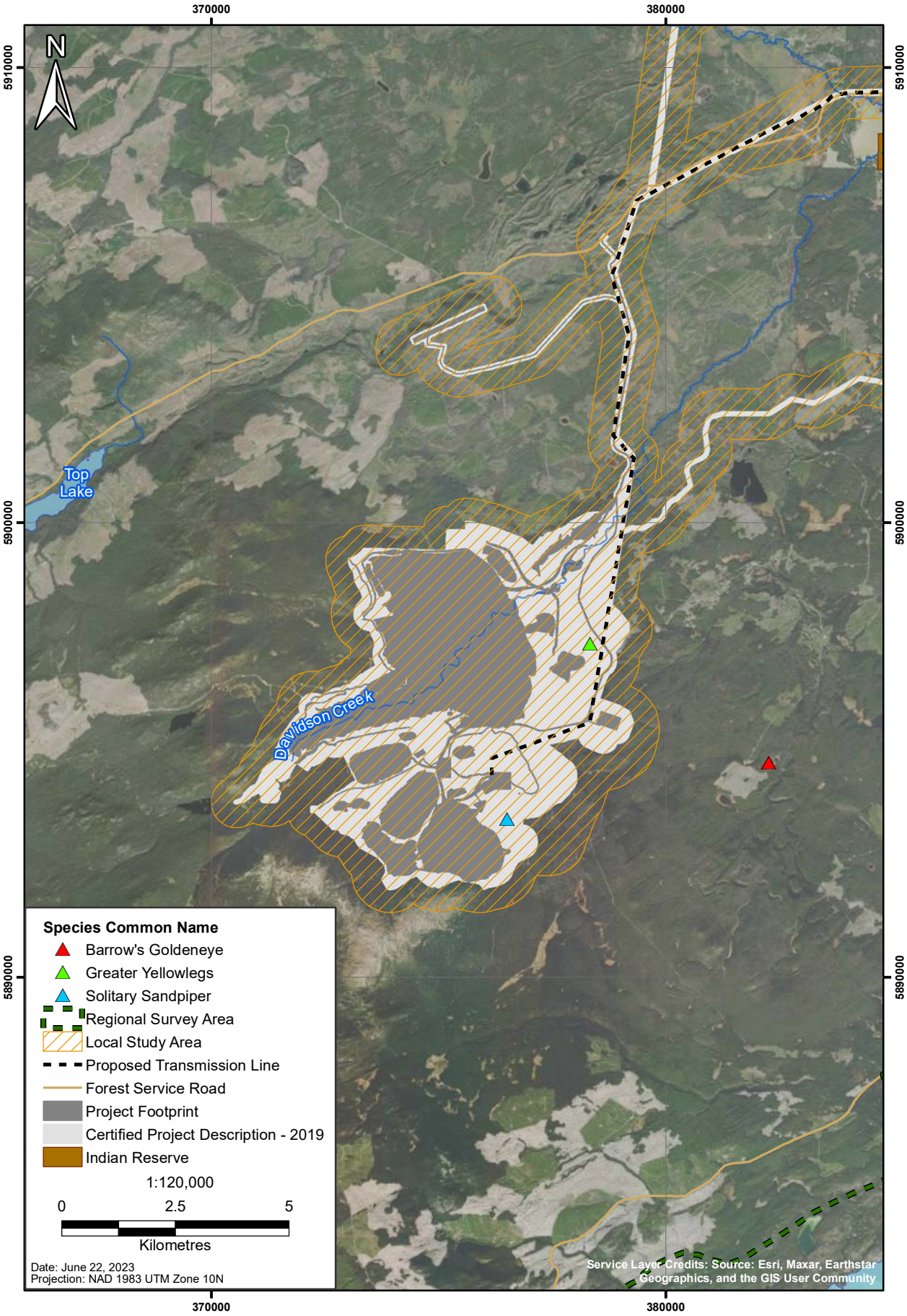


Figure 3.7-5: Incidental Waterbird Observations

3.7.4 Discussion

In the EIS, the Project was predicted to have a not significant, minor magnitude effect of habitat loss and alteration, and a not significant negligible magnitude effect of mortality and change in population dynamics for waterbirds (Vol 4 Section 5.4.8.4, New Gold 2015, ERM 2017). A waterbird population monitoring program is required to confirm the prediction in the EIS that waterbirds may avoid the Project by up to 100 m (DS conditions 4.1 and 4.5). Monitoring is also conducted to confirm the success of mitigation measures, including pre-clearing surveys and outcomes of buffered active nests, which are required by EAC condition 23.h and DS condition 4.5. Additional monitoring for waterbirds related to potential effects of the transmission line are reported in Section 2.5.

Waterbird aerial population monitoring was conducted for the first time in 2022; all surveys were completed prior to the onset of Construction and will contribute to the “before” impact data in the Before-After-Control-Impact (BACI) program design for waterbird population monitoring (as described in the WMMP Section 4.8.3.5; ERM 2022a). Aerial surveys were conducted across the LSA instead of ground surveys at a subset of ponds, as described in the WMMP, due to lack of accessible ponds close to the Project footprint (see Methods Section 3.7.2). Future analysis will be conducted according to a continuous distance measurement of a given waterbird observation to the Project footprint, with modelling control variables to account for the number and type of waterbodies by distance from infrastructure. The WMMP will be updated to reflect this program change, along with any other program changes, following a broad program assessment after the first two years of compliance monitoring (as described in the Methods for each monitoring program; WMMP Section 4.8; ERM 2022a). Formal analysis of waterbird population monitoring will begin during the Operations phase, once data have been recorded for a sufficient number of years to conduct statistical modelling (WMMP Section 4.8.3.5; ERM 2022a).

Waterbird population surveys were completed for three periods in 2022: spring pair, summer brood, and fall migration. Very few waterbirds were recorded across all seasons in the mine site LSA due to the lack of waterbodies present, but waterbirds were consistently present across the Transmission Line LSA during all survey periods. The fall migration period had nearly twice the waterbird abundance of the spring and summer surveys, indicating that more individuals are using the LSA as migration and staging habitat rather than breeding habitat. Surveys detected a total of 35 species and 2,564 individuals. The most commonly observed species were consistent with previous years of baseline data, including: mallard, bufflehead, ring-necked duck, and lesser scaup.

Across all surveys in 2022, six species of conservation concern were recorded: American white pelican, great blue heron, killdeer, lesser yellowlegs, red-necked phalarope, and western grebe. Three of these species have not previously been recorded in the Project RSA (Table 3.7-1): American white pelican, western grebe, and red-necked phalarope. Western grebe and American white pelicans are only known to breed regularly at specific lakes in BC and are not known breeders within the RSA. The observations of these two species during the summer breeding season in 2022 may indicate errant non-breeders for the year, or represent breeding individuals out of their normal range. No nests or young of either species were recorded. The single red-necked phalarope observation occurred during fall migration survey; the RSA is within the potential migration range for red-necked phalarope, even though they have not been recorded in the RSA previously.

Clearing was not initiated during the waterbird sensitive period in 2022 and neither pre-clearing surveys nor subsequent nest success surveys were required. All buffered active waterbird nests will be monitored to determine the outcome of the nest (i.e., fledged or failed) and assess whether implemented buffer distances are effective. In future years if active waterbird nests are buffered, an analysis will be conducted to determine whether the success rate of buffered nests are similar to known success rates for non-buffered nests. Nesting success can vary widely depending on the weather, food availability, predators, and other factors. Therefore, nesting success within buffered areas is not expected to be

100%. Average nest success will be determined based on published research for waterbirds and will be included in reporting numbers.

3.8 Upland Birds

DS conditions addressed: 4.1, 4.5, 8.2

EAC conditions addressed: 23.c, 23.h

Upland birds (sometimes referred to as forest and grassland birds) are a diverse group of species, which from a practical standpoint include all birds that are not raptors or waterbirds. Upland birds and their nests are protected by the *Migratory Bird Convention Act* (1994) and the provincial *Wildlife Act* (1996), with additional conservation measures for species of conservation concern under the SARA (Governement of Canada 2023). Several upland bird species of conservation concern are known to occur in the RSA (Table 3.8-1). Two upland bird species of conservation concern which are known to occur in the LSA, barn swallow (*Hirundo rustica*) and common nighthawk (*Chordeiles minor*), are not likely to be detected through the standard point count survey method, and therefore have species-specific monitoring programs. Several other species of conservation concern which have potential to occur in the RSA do not currently have targeted monitoring programs due to a lack of suitable habitat in the LSA (bank swallow [*Riparia riparia*], black swift [*Cypseloides niger*], and sharp-tailed grouse [*Tympanuchus phasianellus columbianus]*). Clark's nutcracker (*Nucifraga columbiana*) is not a species of conservation concern, but it has an obligate mutualist relationship with whitebark pine (*Pinus albicaulis*), a provincially Red-listed tree occuring in the RSA (BC CDC 2023), by dispersing the seeds through caching. Clark's nutcracker is therefore monitored in relation to whitebark pine management (DS condition 8.2).

Table 3.8-1: Upland Bird Species at Risk with Potential to Occur in the RSA

Common Name	Species Name	Conservation Status[1, 2]	Observed in RSA Previously
Band-tailed pigeon	*Patagioenas fasciata*	BC Blue, Special Concern	No
Bank swallow	*Riparia riparia*	BC Yellow, Threatened	No
Barn swallow	*Hirundo rustica*	BC Yellow, Threatened	Yes (LSA)
Black swift	*Cypseloides niger*	BC Blue, Endangered	No
Bobolink	*Dolichonyx oryzivorus*	BC Blue, Threatened	No
Common Nighthawk	*Chordeiles minor*	BC Yellow, Threatened	Yes (LSA)
Horned lark, *merrilli* ssp.	*Eremophila alpestris merrilli*	BC Blue	No
Olive-sided flycatcher	*Contopus cooperi*	BC Yellow, Special Concern	Yes (LSA)
Pine grosbeak, *carlottae* ssp.	*Pinicola enucleator carlottae*	BC Blue	No
Rusty blackbird	*Euphagus carolinus*	BC Blue, Special Concern	Yes (Transmission Line LSA)
Sharp-tailed grouse, *columbianus* ssp.	*Tympanuchus phasianellus columbianus*	BC Blue	Yes (RSA)

[1] BC List: Yellow (Least Risk), Blue (Special Concern), Red (Threatened, Endangered, or Extirpated); BC CDC (2023)
[2] Schedule 1 of SARA: Special Concern, Threatened, Endangered, or Extirpated; Government of Canada (2023)

The predicted residual effects of the Project on upland birds as identified in the EIS, Vol 4. Section 5.4.9.4 are (New Gold 2015; ERM 2017):

- Habitat loss and alteration (not significant, negligible magnitude).

The prediction in the EIS stated that there may be habitat alteration and reduced bird density within 100 m of the Project footprint (EIS, Volume 4, Section 5.4.9; New Gold 2015, ERM 2017). The effectiveness of mitigation measures will be evaluated through monitoring upland bird population dynamics within the LSA and RSA, as well as behavioural responses to the Project.

As described in Section 4.7 of the WMMP (ERM 2022a), the monitoring programs developed for upland birds include:

- Pre-clearing surveys for birds (Section 2.1);
- Habitat loss (Section 2.2);
- Bird mortality (Section 2.3);
- Transmission line monitoring (Section 2.5);
- Upland bird population monitoring (Section 3.8.2.1);
- Common nighthawk monitoring (Section 3.8.2.2);
- Swift and swallow monitoring (Section 3.8.2.3 and 3.8.3.2);
- Clark's nutcracker monitoring (Section 3.8.2.4 and 3.8.3.3); and
- Nest success surveys (Section 3.8.2.5).

3.8.1 Objectives

The objectives of the follow-up monitoring programs for upland birds are to:

- Evaluate changes in bird population dynamics in the Project area, including listed species of conservation concern (DS condition 4.1, 4.5).
- Monitor the Clark's nutcracker relative abundance and use of whitebark pine habitat (DS condition 5.2).
- Evaluate the success of nesting upland birds within setback buffers established during construction and vegetation clearing (DS condition 4.1).

3.8.2 Methods

3.8.2.1 Upland Bird Population Monitoring

The upland birds survey area included the proposed Project footprint and the surrounding area within 5 km, divided into zones of potential impact versus control (ERM 2022a). The potential impact zone was within 200 m from mine infrastructure, while the control zone was 200 m – 5 km from mine infrastructure (Figure 3.8-1). Point count transects were established with roughly even occurrence between the two zones, and in a range of distances out to a maximum of 5 km from the Project footprint (Figure 3.8-1). The WMMP survey plan indicated that the control area would be established within 2 km from Project infrastructure, however due to limits in accessibility surveyors extended the control area (ERM 2022a).

Surveys were completed using a 100 m radius Variable Range Point Count (VRPC) survey protocol, a common technique used to estimate species richness and relative abundance of forest birds (Ralph et al. 1995). Surveys were conducted in transects of up to 5 VRPC locations spaced at 200 m intervals. A total of 15 transects and 75 VRPC surveys were established.

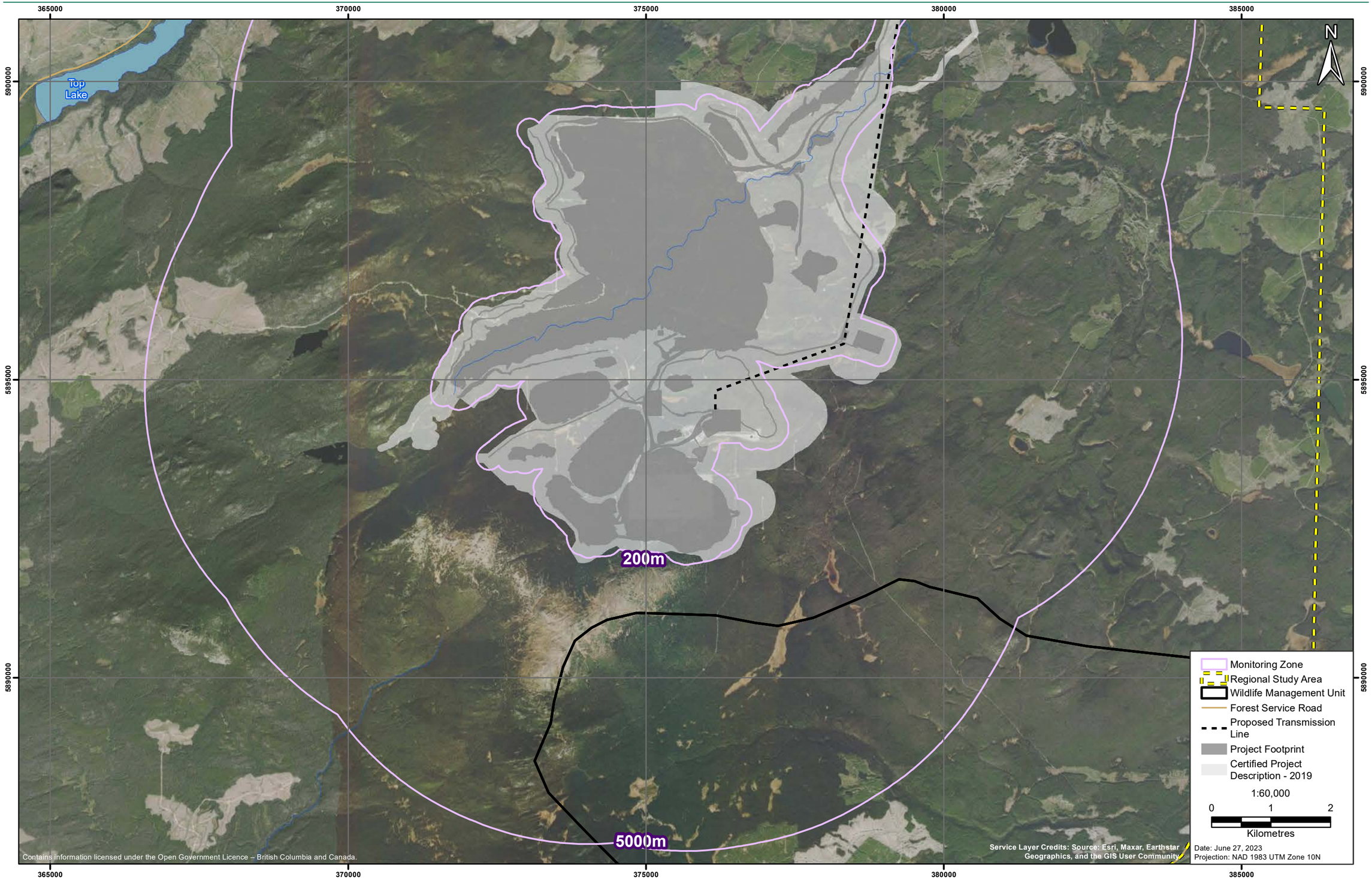


Figure 3.8-1: Survey Areas for Upland Bird Population Monitoring Surveys

Surveys followed standard RIC protocols (RIC 1999), occurring within four hours after sunrise during the breeding bird period in June. VRPC surveys were conducted for five minutes during which all bird species seen and heard were recorded. Detections before or after the survey were recorded as incidentals. Bird detections were estimated according to distance from the observer and binned into 0 – 50 m and 50 – 100 m distances. Surveys were not completed when wind speeds exceeded approximately 30 km/h (greater than four on the Beaufort scale) or when precipitation exceeded a light, intermittent drizzle. All crews that completed VRPCs had at least one qualified observer who is experienced in identifying birds by sight and sound.

Upland bird data were summarized by relative abundance and species richness. Relative abundance is the number of individuals counted, while species richness is the total number of species observed during each survey period. These estimates included only those data that were collected during VRPC surveys (i.e., no incidentals).

As the upland bird monitoring program continues, additional analysis will be completed as outlined in the WMMP (ERM 2022a).

3.8.2.2 Common Nighthawk Monitoring

Common nighthawk monitoring was not begun in 2022 due to resource limitations during the first year of compliance monitoring. Compliance monitoring for common nighthawk is scheduled to commence in 2023, following methods outlined in the WMMP (ERM 2022a).

3.8.2.3 Swallow and Swift Monitoring

A species-specific monitoring for swift and swallow species at risk was initiated in 2022. Due to lack of suitable habitat identified in the LSA and RSA for bank swallow and black swift, monitoring was only conducted for barn swallow (ERM 2022a). Point count surveys for barn swallows were completed in suitable habitat areas in mid-June 2022. These areas included infrastructure or buildings suitable for barn swallow nesting.

Survey methods for unlimited radius point counts followed RIC standards (RIC 1998e). Unlimited radius point counts were completed for three minutes per site during daytime hours (10 am to 3 pm). Surveys were completed in low wind conditions (< 10 km/hr) and with no precipitation, corresponding to ideal conditions for swallows to actively forage for insects. All individuals detected during the survey time were recorded. Detections before or after the survey were recorded as incidentals. Locations of nest sites and statuses of nests (e.g., occupied, incubating) were also recorded.

3.8.2.4 Clark's Nutcracker Monitoring

Surveys for Clark's nutcracker and whitebark pine were completed in 2022 to support the implementation of the Whitebark Pine Management Plan. The survey method for Clark's nutcracker was adapted from a combination of literature and protocols (e.g., RIC 1999; Tomback 2005; Lorenz 2009). Transects were established within the mine site LSA and RSA in whitebark pine critical and recruitment habitats on and in the vicinity of Mt Davidson. Transects were 1,000 m in length and 11 assessment sites were established at 100 m intervals along each transect. Each assessment site was established as an 11.3 m radius circle.

Whitebark Pine and Clark's Nutcracker Presence Surveys

Surveys were completed during the whitebark pine seed caching season (late August to early September). Data were collected at each site on whitebark pine features (stand density, tree height, diameter at breast height, and health attributes including signs of blister rust) as well as signs of wildlife use and presence of any seed caches. Seed caching features observed between assessment sites were tallied at 10 m intervals.

Call payback surveys for Clark's nutcracker were completed at every odd assessment site (i.e., every 200 m) to detect presence of territorial (i.e., breeding) Clark's nutcracker. Surveys followed methods standardized for other species groups (raptors and waterbirds) with a 20-second duration sound clip played 3 times, including 30 second pauses in between each clip (RIC 1998f). The number of Clark's nutcracker responses (i.e., number of individuals present) was recorded for each playback site.

As the whitebark pine and Clark's nutcracker monitoring program continues, additional analysis will be completed as outlined in the WMMP (ERM 2022a).

Camera and ARU Surveys

Remote cameras and ARUs were deployed in pairs at the first site of each whitebark pine and Clark's nutcracker transect. These surveys were conducted to obtain additional baseline data on the presence of Clark's nutcracker in the whitebark pine habitat on Mt Davidson and are not part of the standard compliance monitoring program. In total, five camera and ARU pairs were deployed, one pair at each monitoring transect. Three ARUs were initially deployed in July, and all remaining units were deployed in late August. Cameras and ARUs remained deployed through November, except one ARU (T5_1) which could not be located in November due to snow and was active until it failed in February 2023.

Cameras were Reconyx brand PC800, set to take three timed photos each hour and three photos when motion-triggered, timed one second apart. Cameras were placed near seed caches and aimed along slopes which provided views of several trees. The ARUs were Wildlife Acoustics SM-mini units, set to record for five minutes of every hour from sunrise to sunset. Camera data were processed manually by an observer trained in Clark's nutcracker identification. The ARU data were processed using a cluster analysis in Kaleidoscope Pro, which sorts audio detections according to similarities in their sound frequency, duration, and pattern. The cluster analysis results were reviewed by an observer trained in Clark's nutcracker sound identification. Data for both camera and ARU data were summarized by the number of Clark's nutcracker detections at each site.

3.8.2.5 Nest Success Surveys

Clearing was not completed at the Project during the breeding bird sensitive period in 2022 and as a result no pre-clearing surveys nor subsequent nest success surveys were completed.

3.8.3 Results

3.8.3.1 Upland Bird Population Monitoring

Upland bird VRPC surveys were completed at 15 transects and 74 sites from June 14 to 15 and June 18 to 21, 2022 (Table 3.8-2; Appendix U). One VRPC survey (UB11_S4) was not completed due to high winds (Figure 3.8-2). Transects UB01 and UB02 were located within the planned footprint, and therefore will be relocated for future monitoring years (Figure 3.8-2).

A total of 165 individual upland birds were recorded across 34 species (Table 3.8-2, Appendix V). The most commonly observed species were yellow-rumped warbler (n=38; *Setophaga coronata*), dark-eyed junco (n=18; *Junco hyemalis*), Canada jay (n = 17; *Perisoreus canadensis*), and varied thrush (n = 14; *Ixoreus naevius*; Table 3.8-3). Species richness varied between 4 and 11 species per transect (average = 6 species; Table 3.8-2). Bird abundance varied between 5 and 20 birds per transect (average = 11 individuals; Table 3.8-2). Species richness and bird abundance did not follow similar trends; some transects had low species richness but high abundance (Table 3.8-2). However, transects with higher species richness also had high abundance (Table 3.8-2). Transect UB08 in the western portion of the control zone had the highest bird abundance and second highest species richness; sites in this transect had varied habitat including mature forest, pine plantation, and wetlands, potentially contributing to the

high species richness and bird abundance recorded (Table 3.8-2). There were no obvious trends in either species richness or abundance based on the potential impact or control areas (Table 3.8-2; Figure 3.8-2). Surveys were conducted prior to the onset of Construction, therefore these data are considered to be baseline and were not analyzed in detail for differences between potential impact and control zones.

Table 3.8-2: Variable Radius Point Count Surveys Effort, Species Richness, and Abundance, 2022

Date	Transect ID	No. Species	No. Individuals
6/14/2022	UB01	7	10
	UB02	6	15
6/15/2022	UB03	5	15
	UB04	6	9
	UB05	4	6
	UB06	8	12
6/18/2022	UB07	5	12
	UB08	9	20
	UB09	6	9
	UB10	4	5
6/19/2022	UB11	5	9
6/20/2022	UB12	7	10
	UB13	5	7
6/21/2022	UB14	8	13
	UB15	11	15

Table 3.8-3: Upland Bird Species Recorded during Variable Radius Point Count Surveys, 2022

Species Common Name	Scientific Name	No. Individuals
American pipit	*Anthus rubescens*	1
American robin	*Turdus migratorius*	7
American three-toed woodpecker	*Picoides dorsalis*	3
Barn swallow*[1]	*Hirundo rustica*	-
Barrow's goldeneye[1]	*Bucephala islandica*	-
Boreal chickadee	*Poecile hudsonicus*	1
Canada jay	*Perisoreus canadensis*	17
Cedar waxwing	*Bombycilla cedrorum*	2
Chipping sparrow	*Spizella passerina*	5
Common raven[1]	*Corvus corax*	-

Species Common Name	Scientific Name	No. Individuals
Dark-eyed junco	*Junco hyemalis*	18
Dusky grouse	*Dendragapus obscurus*	1
Fox sparrow	*Passerella iliaca*	3
Golden-crowned kinglet	*Regulus satrapa*	1
Golden-crowned sparrow	*Zonotrichia atricapilla*	1
Hermit thrush	*Catharus guttatus*	3
Lincoln's sparrow	*Melospiza lincolnii*	5
Magnolia warbler	*Setophaga magnolia*	3
Mountain chickadee[1]	*Poecile gambeli*	-
Olive-sided flycatcher*	*Contopus cooperi*	2
Orange-crowned warbler	*Leiothlypis celata*	1
Pacific wren	*Troglodytes pacificus*	3
Pine grosbeak	*Pinicola enucleator*	1
Pine siskin	*Spinus pinus*	4
Purple finch	*Haemorhous purpureus*	1
Red crossbill	*Loxia curvirostra*	2
Red-breasted nuthatch[1]	*Sitta canadensis*	-
Red-tailed hawk[1]	*Buteo jamaicensis*	-
Ruby-crowned kinglet	*Corthylio calendula*	7
Ruffed grouse[1]	*Bonasa umbellus*	-
Savannah sparrow	*Passerculus sandwichensis*	2
Spruce grouse[1]	*Canachites canadensis*	-
Swainson's thrush	*Catharus ustulatus*	5
Townsend's solitaire	*Myadestes townsendi*	3
Townsend's warbler	*Setophaga townsendi*	4
Tree swallow	*Tachycineta bicolor*	3
Unknown bird	-	2
Varied thrush	*Ixoreus naevius*	14
Wilson's warbler	*Cardellina pusilla*	2
Yellow-rumped warbler	*Setophaga coronata*	38
Total		**165**

** Indicates a species of conservation concern, see Table 3.8-1.*

[1] Species only recorded incidentally, see Section 3.8.2 Methods.

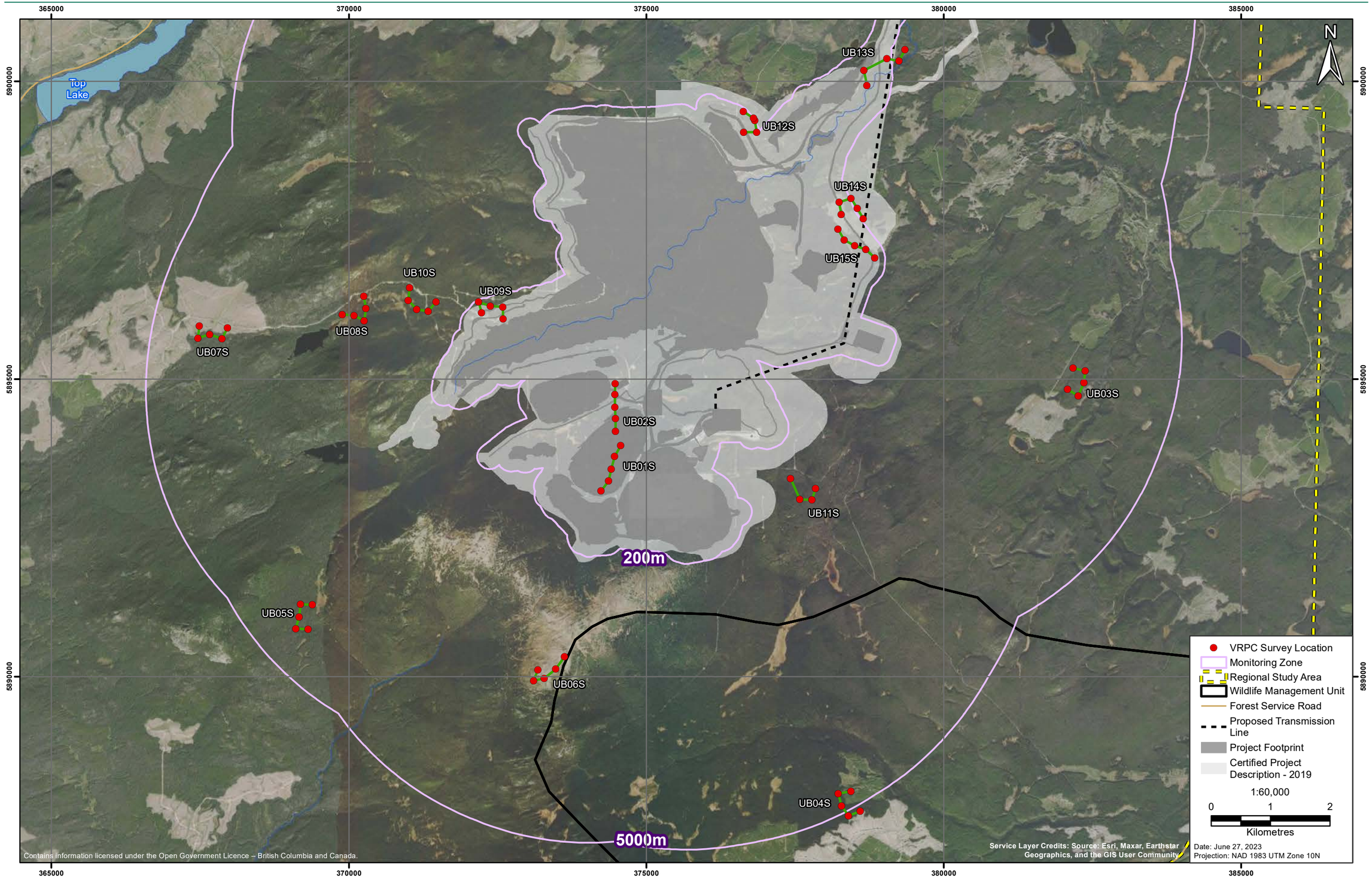


Figure 3.8-2: VRPC Survey Locations, 2022

Olive-sided flycatcher (n = 3; *Contopus cooperi*) and barn swallow (n = 2; *Hirundo rustica*) were the only upland bird species of conservation concern recorded (Table 3.8-3; Appendix V). Olive-sided flycatcher was detected at survey sites S1 and S5 along transect UB08, and incidentally detected at survey site S1 along transect UB07 (Figure 3.8-2). All three detections were made within 100 m of the Blackwater access road and/or a cutblock (Figure 3.8-2), which provide suitable forest edge habitat for olive-sided flycatcher. The barn swallow was only incidentally observed during the VRPC survey, at site S5 along transect UB06. This transect is in the alpine on Mt Davidson, which is atypical of barn swallow habitat. However, it is possible that the individual was foraging or flying between foraging and nesting areas when it was detected.

3.8.3.2 Swallow and Swift Monitoring

Surveys for barn swallows were completed around mine site infrastructure from June 14 to 20, 2022 (Figure 3.8-3; Appendix W). No other suitable nesting sites were found in the LSA or accessible areas of the RSA. Three species of swallow were observed, including barn swallow (n = 6), tree swallow (n = 7), and violet-green swallow (n = 4; Table 3.8-4; Appendix X). Three active barn swallow nests were identified, and two potential tree swallow or violet-green swallow nesting locations were identified, with several additional inactive nests noted (Table 3.8-4). Activity was recorded along buildings with vaulted roof covers supported by wooden beams. Precise nest counts could not be confirmed due to the building design.

Table 3.8-4: Swallow Observations, 2022

Species		Individuals	Active Nests	Comments
Species Observed	Scientific Name			
Barn Swallow	*Hirundo rustica*	6	3	Nests located on camp office and dorm buildings.
Tree Swallow	*Tachycineta bicolor*	7	-	Potential nesting noted in areas that were not accessible by survey (e.g., on cell tower).
Violet-green Swallow	*Tachycineta thalassina*	4	-	Potential nesting noted in areas that were not accessible by survey (e.g., on cell tower).

All swallow activity and nests were recorded at sites in the vicinity of camp buildings, while sites near undeveloped portions of the Project footprint or in the control area did not have swallows recorded (Figure 3.8-3).

3.8.3.3 Clark's Nutcracker Monitoring

Whitebark Pine and Clark's Nutcracker Presence Surveys

Whitebark pine and Clark's nutcracker transects were surveyed on August 29 and 30, 2022. Transect T3 was the only transect with no whitebark pine present (Table 3.8-5; Figure 3.8-4; Appendices Y and Z). Transect T4 had the greatest abundance of whitebark pine, with seedlings up to 10 m tall trees recorded in 9 of 11 sites in the transect (Table 3.8-5). Transect T1 had the only survey site with a whitebark pine tree over 10 m tall (Table 3.8-5), while trees in the < 3 m tall and 3 – 10 m tall range were the most commonly recorded across all transects (Table 3.8-5).

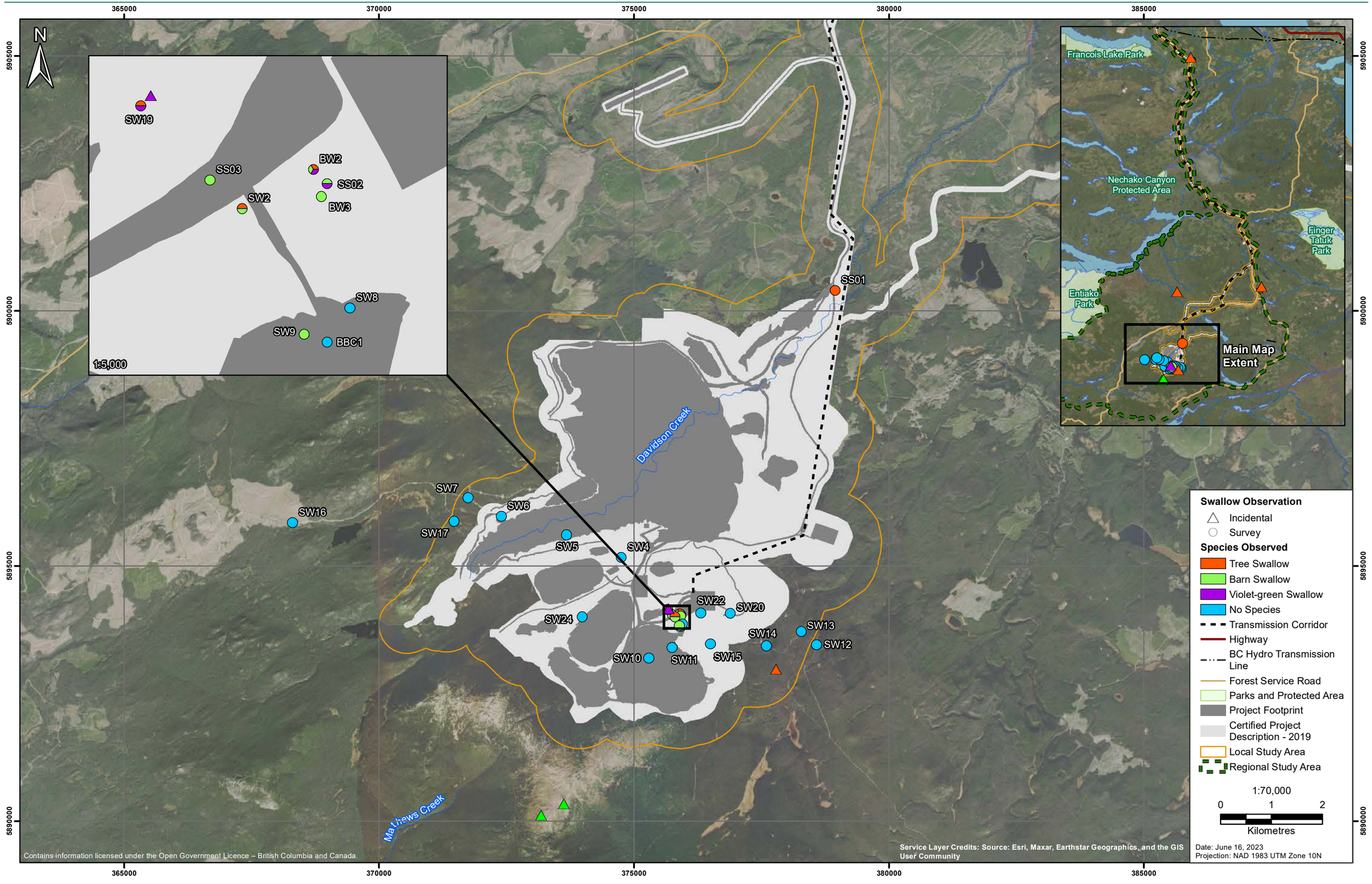


Figure 3.8-3: Swallow Observations, 2022

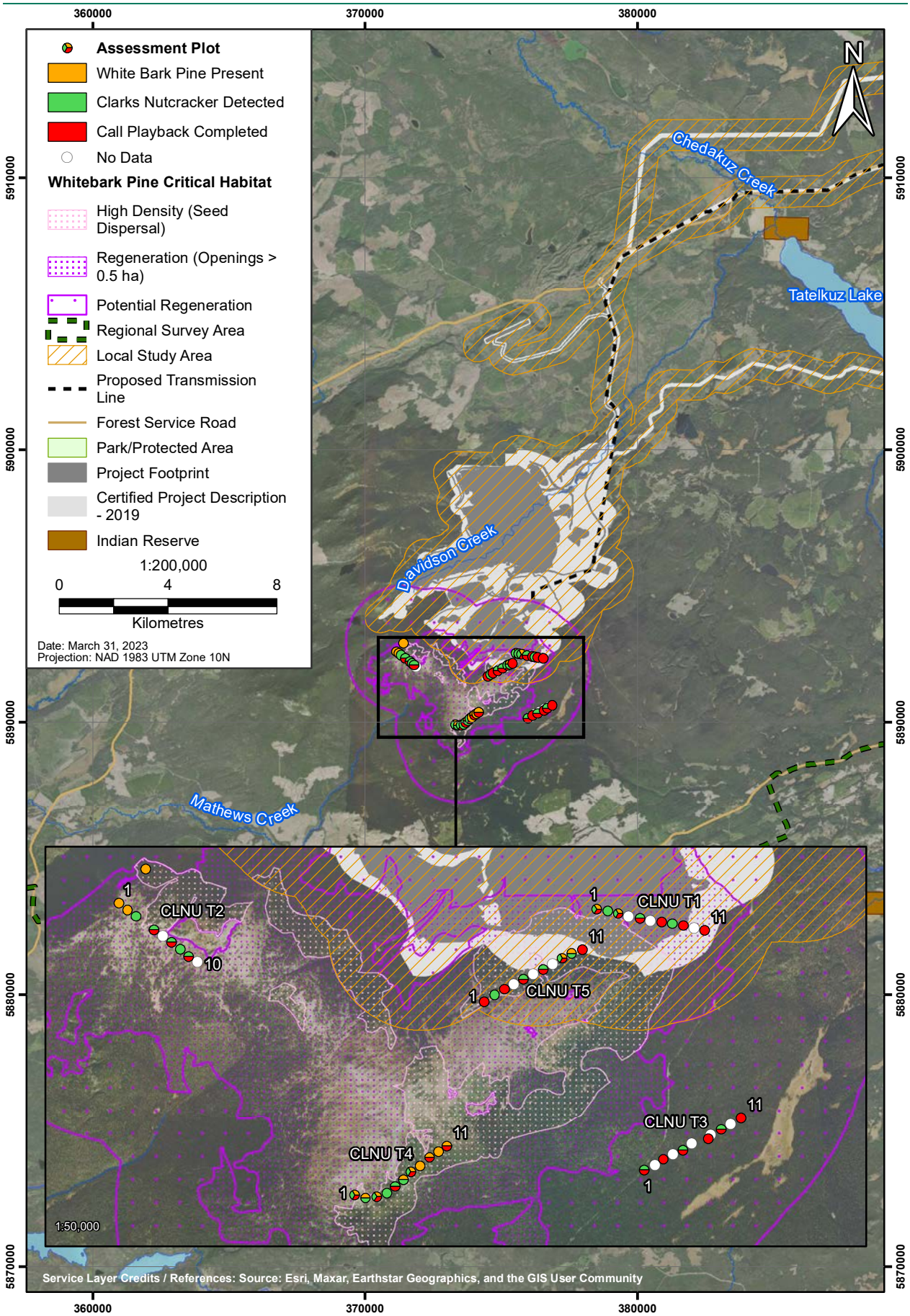


Figure 3.8-4: Whitebark Pine and Clark's Nutcracker Survey Transects and Call Playback Locations, 2022

Table 3.8-5: White Bark Pine Transect Observations, 2022

Transect	Number of Sites with Whitebark Pine Detected					Number of Sites with Cones	Number of Sites with Clark's Nutcracker Detection	Total Number of Cache Features[1]
	Seedling	<3m Tall	3-10 m Tall	>10 m Tall	Total Sites			
T1	-	2	1	1	2	2	6	36
T2	2	3	2	-	4	3	5	54
T3	-	-	-	-	-	-	3	13
T4	4	7	8	-	9	9	7	42
T5	-	2	3	-	2	1	5	33
Total	**6**	**14**	**14**	**1**	**17**	**15**	**25**	**178**

[1] Includes all tree and ground caches detected within the survey sites and all cache features detected between each survey site.

Most (88%) of sites with whitebark pine also had cones present (Table 3.8-5). Rust was observed on whitebark pine at 35% of sites (n = 6; Appendix Z), which is similar to previous data in the area (Clason and Moody 2013). Five of the sites had less than 10% of trees affected by rust and one site had greater than 10% of trees affected by rust (Appendix Y).

Sites with whitebark pine typically had a higher proportion of cache features and a greater number of Clark's nutcracker detections (Table 3.8-5).

Call playback surveys were completed at every odd-numbered survey site along each transect, except three sites at transect T2 which did not have call playback surveys (27 survey sites; Table 3.8-6; Appendix Z). Transects with whitebark pine had a higher percentage of call playbacks that elicited responses from Clark's nutcrackers (Tables 3.8-5 and 3.8-6). Transects T3 and T5 were the only ones with a minority of sites that had Clark's nutcracker detections (Table 3.8-6). Transect T3 is southeast of the Project and occurs on the outskirts of the whitebark pine habitat area on Mt Davidson, while transect T5 is just south of the Project footprint on Mt Davidson (Figure 3.8-4).

Table 3.8-6: Clark's Nutcracker Call Playback Survey Responses, 2022

Transect	Responses per VRPC Site						Total Responses	Number of Sites with Responses	Number Survey Sites	% Sites with Responses
	1	3	5	7	9	11				
T1	3	2	3	0	0	0	8	3	6	50%
T2	-	-	1	1	2	-	4	3	3	100%
T3	0	0	1	0	0	0	1	1	6	17%
T4	2	3	1	1	0	0	7	4	6	67%
T5	0	0	1	1	2	0	4	4	6	22%
Total							**24**	**15**	**27**	**55%**

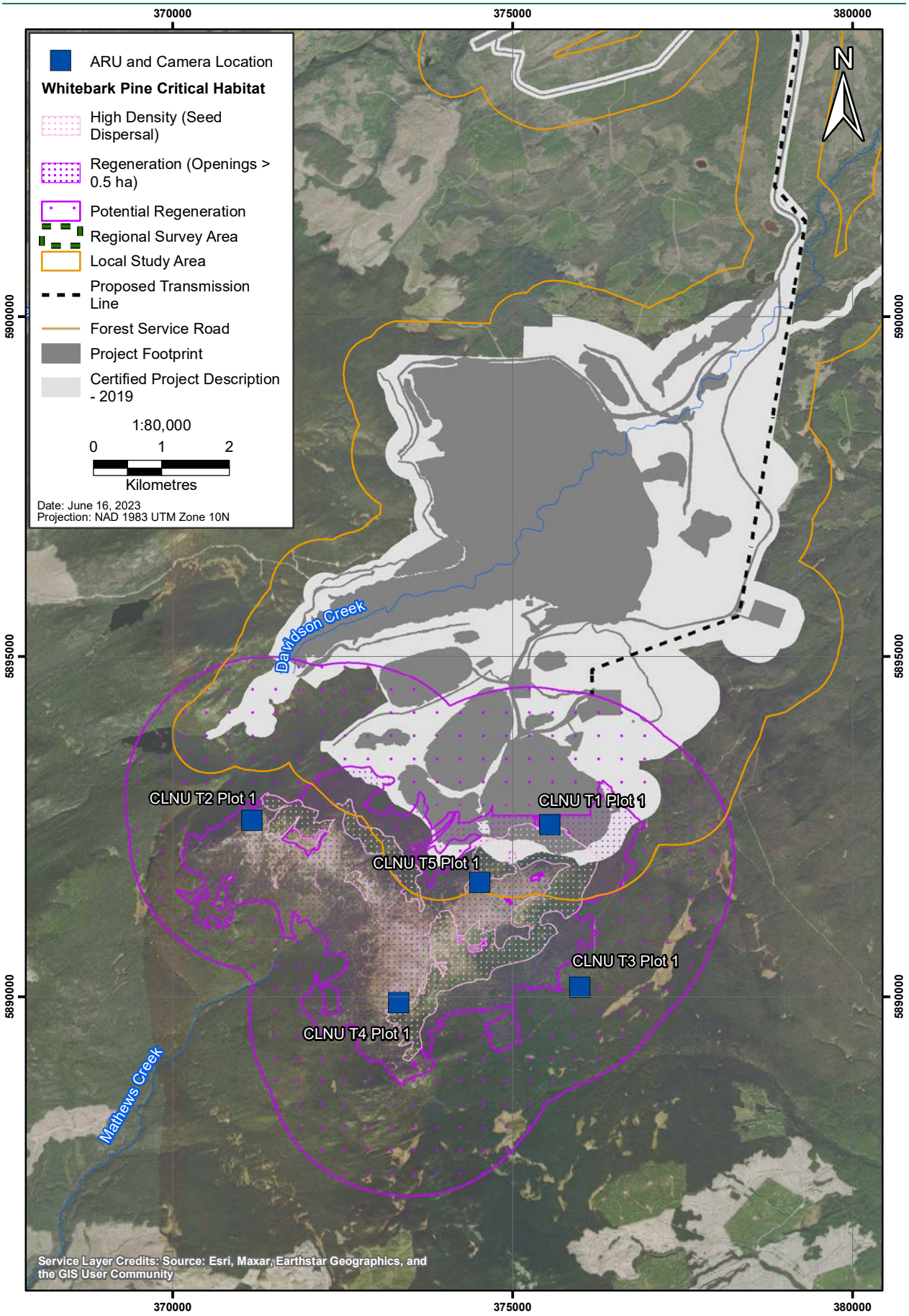


Figure 3.8-5: Clarks Nutcracker Camera and ARU Locations, 2022

Camera and ARU Surveys

Three ARUs were deployed at transects T1 – T3 on July 8 during surveys for other monitoring programs, and the remaining two ARUs and five cameras were deployed on August 29 and 30 (Figure 3.8-5; Table 3.8-7; Appendix AA). These units were deployed as additional baseline monitoring during the peak seed-caching season for Clark's nutcrackers and are not part of the compliance program. The ARUs and cameras were functionally deployed for a varied amount of time due to unit failures or settings errors (Table 3.8-7).

Table 3.8-7: Clark's Nutcracker Camera and ARU Results 2022

Site	ARU Deployment Date	ARU Retrieval Date	Camera Deployment Date	Camera Retrieval Date	Camera Detections	ARU Detections	Deployment Notes
T1_1	7/11/2022	11/2/2022	8/29/2022	11/2/2022	0	87	
T2_1	7/11/2022	11/2/2022	8/29/2022	11/2/2022	0	35	
T3_1	7/8/2022	7/10/2022	NA	NA	NA	NA	Settings error – no data
T4_1	8/30/2022	11/2/2022	8/29/2022	11/2/2022	0	23	
T5_1	8/30/2022	2/21/2023	9/11/2022	2/21/2023	0	42	Error on first camera deployment. Camera start at unit check 9/11/2022.

Clark's nutcrackers were identified in 187 ARU files across all sites with available data (Appendix BB). Detections by ARU span all months of recording in 2022 and February 2023 for the ARU at site T3_1 before the batteries died in late February (Table 3.8-7). Site T1_1 had the most ARU detections (46%), with detections occurring at least multiple times per week from early August through pick up in November (Appendix BB). All ARU sites had consistent Clark's nutcracker detections throughout deployment, except over winter for site T5_1 (one detection in December, no detections in January, and four detections in February; Appendix BB).

None of the cameras detected Clark's nutcracker (Table 3.8-7). Birds are difficult to monitor via remote camera due to their small size and fast movements. The lack of camera detections despite abundant Clark's nutcracker detections by ARU and call playback indicate that cameras are likely not a useful monitoring tool for this species.

3.8.3.4 Incidental Observations

An additional 244 individual upland birds from 42 species were incidentally observed during the 2022 field season (Figure 3.8-6; Appendix H). Of the 42 species incidentally observed, 5 were not observed during other upland field surveys in the 2022 season: pileated woodpecker (*Dryocopus pileatus*), mountain bluebird (*Sialia currucoides*), ptarmigan species (*Lagopus spp.*), red-breasted sap sucker (*Sphyrapicus ruber*), yellow warbler (*Setophaga petechia*). The most commonly observed incidental upland bird species were unknown sparrow (n=23), yellow-rumped warbler (n=23), and Canada jay (*Perisoreus canadensis*; n=16; Appendix H). Incidental observations made during the upland bird VRPC surveys (i.e., before or after formal survey times, or detections outside of the survey radius) made up 37% of total incidentally observed individuals and 67% of total incidentally observed species. Olive-sided flycatcher was the only upland bird species of conservation concern that was incidentally observed.

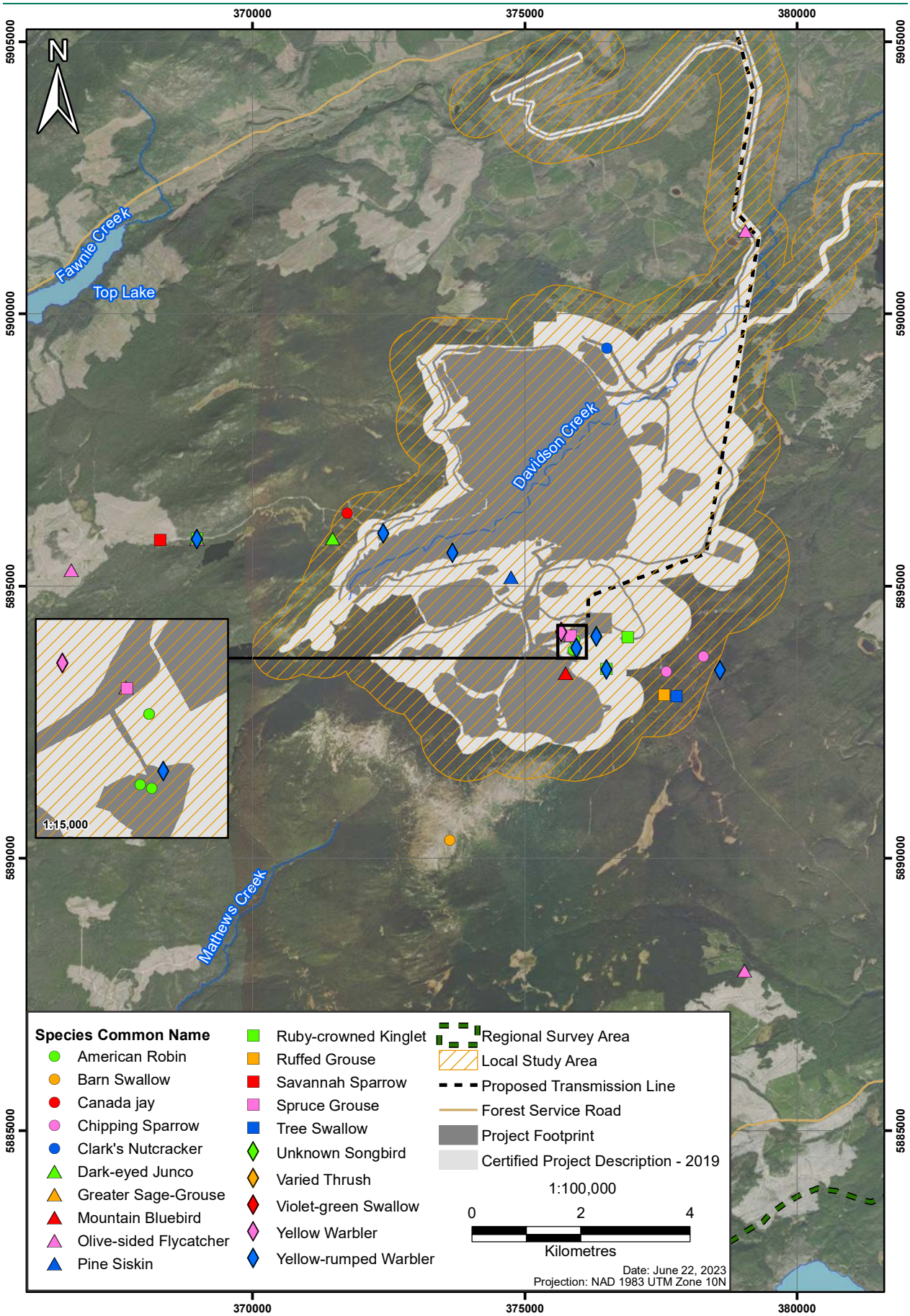


Figure 3.8-6: Incidental Upland Bird Observations

Additionally, three inactive American robin (*Turdus migratorius*) nests were recorded on camp infrastructure in 2022 (Appendix H). Two wildlife trees with woodpecker activity were also incidentally recorded in the RSA (Appendix H).

3.8.4 Discussion

In the EIS, the Project was predicted to have a not significant, negligible magnitude effect of habitat loss and alteration for forest and grassland (i.e., upland) birds (Vol 4 Section 5.4.9.4; New Gold 2015; ERM 2017). An upland bird population monitoring program is required to confirm the prediction in the EIS that birds may avoid the Project by up to 100 m (DS conditions 4.1 and 4.5). Species-specific survey programs were implemented for species of conservation concern known to occur within the LSA and which cannot be reliably surveyed through standard point count methods. In 2022, the species-specific program for barn swallow (*Hirundo rustica*) was completed, however common nighthawk monitoring was not begun due to resource limitations during the first year of compliance monitoring. Clark's nutcracker (*Nucifraga columbiana*) is not a species of conservation concern but is monitored in relation to whitebark pine management (ERM 2022a).

Monitoring is also conducted to confirm the success of mitigation measures, including pre-clearing surveys and outcomes of buffered active nests, which are required by EAC condition 23.h and DS condition 4.5. However, these programs were not required in 2022 because there was no clearing during the sensitive breeding bird period. Additional monitoring for upland birds related to potential effects of the transmission line are reported in Section 2.5.

3.8.4.1 Upland Bird Population Monitoring

Upland bird population monitoring was conducted for the first time in 2022; all surveys were completed prior to the onset of Construction and will contribute to the "before" impact data in the Before-After-Control-Impact (BACI) program design for bird population monitoring (as described in the WMMP Section 4.8.3.2; ERM 2022a). Formal analysis of upland bird population monitoring will begin during the Operations phase, once data have been recorded for a sufficient number of years to conduct statistical modelling (WMMP Section 4.8.3.2; ERM 2022a).

The upland birds survey area included a potential impact zone within 200 m from mine infrastructure and a control zone 200 m – 5 km from mine infrastructure Upland bird VRPC surveys were completed at 15 transects and 74 sites in mid June 2022. A total of 165 individual upland birds were recorded across 34 species. The most commonly observed species were consistent with baseline monitoring surveys: yellow-rumped warbler, dark-eyed junco, Canada jay, and varied thrush. Species richness and bird abundance varied greatly between transects, and the two metrics did not always follow similar trends. Some transects had low species richness but high abundance, though transects with higher species richness also had high abundance. Transect UB08 in the western portion of the control zone had the highest bird abundance and second highest species richness; sites in this transect had varied habitat including mature forest, pine plantation, and wetlands, potentially contributing to the high species richness and bird abundance recorded. There were no obvious trends in either species richness or abundance based on the potential impact or control areas. Surveys were considered to be baseline and were not analyzed in detail for differences between potential impact and control zones.

Olive-sided flycatcher and barn swallow were the only upland bird species of conservation concern recorded. Olive-sided flycatcher was detected at three sites in the western portion of the control zone; all sites within 100 m of the Blackwater access road and/or a cutblock, which provide suitable forest edge habitat. A barn swallow was incidentally observed during VRPC surveys in the alpine on Mt Davidson, which is atypical of barn swallow habitat. However, it is possible that the individual was foraging or flying between foraging and nesting areas when it was detected.

3.8.4.2 Swallow and Swift Monitoring

A species-specific monitoring for swift and swallow species at risk was initiated in 2022. Due to lack of suitable habitat identified in the LSA and RSA for bank swallow and black swift, monitoring was only conducted for barn swallow (ERM 2022a). Point count surveys for barn swallows were completed in suitable habitat areas (infrastructure and buildings) in mid-June 2022. Three species of swallow were observed, including barn swallow, tree swallow, and violet-green swallow. All swallow activity and nests were recorded at sites in the vicinity of camp buildings, while sites near undeveloped portions of the Project footprint or in the control area did not have swallows present. Three active barn swallow nests were identified, with several additional inactive nests noted. Activity was recorded along camp buildings with vaulted roof covers supported by wooden beams. Precise nest counts could not be confirmed due to the building design.

3.8.4.3 Clark's Nutcracker Monitoring

Surveys for Clark's nutcracker and whitebark pine were completed in 2022 to support the implementation of the Whitebark Pine Management Plan, as required by federal DS condition 8.2. Surveys included five transects with data collection for whitebark pine (presence, attributes, health, cone crop, and seed caches), as well as Clark's nutcracker call playback surveys. Four of five transects had whitebark pine present, and sites with more whitebark pine typically had more seed caches and a higher number of Clark's nutcrackers detected during call playback surveys. The only transect with no whitebark pine present (transect T3) is southeast of the Project and occurs on the outskirts of the whitebark pine habitat area on Mt Davidson. Blister rust, a whitebark pine pathogen, was observed at 35% of sites, which is similar to previous data in the area (Clason and Moody 2013). Five of the sites had less than 10% of trees affected by rust and one site had greater than 10% of trees affected by rust. The whitebark pine transect results indicate that Clark's nutcracker are abundant within the whitebark pine area and are using whitebark pine cones for seed caching. Additional monitoring in 2023 will include Clark's nutcracker and whitebark pine cone crop surveys in a control area (e.g., Capoose). Formal analysis of Clark's nutcracker monitoring will begin during the Operations phase, once data have been recorded for a sufficient number of years to conduct statistical modelling (WMMP Section 4.8.3.7; ERM 2022a).

Five remote cameras and ARUs were deployed in pairs at the first site of each transect, for varied dates from July/August 2022 through November 2022, with one unit deployed until February 2023. One camera and ARU pair had programming issues and did not collect data, leaving four sites with camera and ARU data. These surveys were conducted to obtain additional baseline data on the presence of Clark's nutcracker in the whitebark pine habitat on Mt Davidson and are not part of the standard compliance monitoring program.

Clark's nutcrackers were identified in 187 ARU files across four sites with available data. Detections by ARU span all months of recording in 2022 and February 2023 for the single ARU deployed past November 2022. All ARU sites had consistent Clark's nutcracker detections throughout deployment, with the majority of detections in August through October. The single ARU deployed beyond November had lower detections overwinter (one detection in December, no detections in January, and four detections in February). None of the cameras detected Clark's nutcracker. Birds are difficult to monitor via remote camera due to their small size and fast movements. Birds in flight may trigger cameras but photos may be either too slow to capture the animal, or photos can be too blurry to identify. Additionally, camera placement is difficult as birds can land in a wide variety of locations and may simply never land directly in front of the camera. The lack of camera detections despite abundant Clark's nutcracker detections by ARU and call playback indicate that cameras are likely not a useful monitoring tool for this species. Future years of monitoring will be conducted via the compliance program only (Clark's nutcracker playback and whitebark pine cone crop monitoring).

3.9 Amphibians

DS conditions addressed: 8.11, 8.12, 8.21

EAC conditions addressed: 23.c, 23.h

The amphibian monitoring program focuses on Western toad, the only amphibian species of conservation concern in the Project RSA. Western toads are federally assessed by COSEWIC and listed on Schedule 1 of SARA (Governement of Canada 2023) as a species of special concern, and are provincially Blue-listed (special concern; BC CDC 2023). Western toad and other amphibian species with potential to interact with the Project are most sensitive to disturbance at breeding sites (BC MFLNRO 2014). The western toad breeding period in the Project RSA occurs from April 1 – September 30, when adults, eggs, tadpoles, and/or toadlets are present at breeding sites. Western toads hibernate in terrestrial habitat for the winter, dispersing en masse from natal breeding areas in late summer (ECCC 2016).

The predicted residual effects of the Project on amphibians as identified in the EIS, Vol 4. Section 5.4.7.3 are (New Gold 2015; ERM 2017):

- Habitat loss and alteration from Project activities (not significant, negligible magnitude);
- Western toad mortalities along roads (not significant, negligible magnitude); and
- Change in amphibian distribution (not significant, negligible magnitude).

As described in Section 4.1 of the WMMP (ERM 2022a), the monitoring programs developed for western toads includes:

- Habitat loss (Section 2.2);
- Facility water structure monitoring (Section 2.4);
- Monitoring toad mortality on roads (Section 3.9.2.1); and
- Monitoring toad breeding ponds (Section 3.9.2.2).

3.9.1 Objectives

The objectives of the follow-up monitoring programs for western toad are to:

- Evaluate western toad mortalities on roads (DS condition 8.21).
- Evaluate changes in western toad distribution (DS condition 8.11).
- Identify western toad breeding areas (DS condition 8.21).
- Record western toad distribution at salvage relocation areas (DS condition 8.21).

3.9.2 Methods

3.9.2.1 Monitoring Toad Mortality on Roads

Monitoring of toad mortality on roads was not completed in 2022 because the Project had not begun Construction during the applicable monitoring period (ERM 2022a). Monitoring for toad mortalities on Project roads is scheduled to commence in 2023.

3.9.2.2 Monitoring Toad Breeding Ponds

Surveys to confirm and identify western toad breeding sites and habitat within the LSA were completed in August and September 2022. Field assessments followed RISC standards (RIC 1998d). Time-constrained

visual surveys were completed with two or three observers, with surveyors visually examining aquatic habitats for evidence of breeding (i.e., tadpoles, metamorphs, and emerging toadlets), and the adjacent terrestrial habitat for adults. Data were recorded for survey time, weather, effort, habitat characteristics, and amphibian observations (species, life stage, and estimated number).

In future years, monitoring will also be conducted at relocation sites for salvaged western toads as per the WMMP and federal DS condition 8.11. Western toad salvage was not completed in 2022, therefore no monitoring of relocation areas was necessary. Pre-clearing surveys for amphibians and salvage for Columbia spotted frog were completed in September 2022 and are further described in Section 2.1.

3.9.3 Results

3.9.3.1 Monitoring Toad Breeding Ponds

Surveys were completed at 109 sites within the LSA from August 30 to September 10, 2022 (Appendix CC) and the findings have been incorporated into the Amphibian Pre-Clearing and Salvage SOP (Appendix D). In total, 36 amphibian breeding sites were identified within the LSA (Table 3.9-1; Appendix CC). Western toad were recorded at 34 sites, with 21 confirmed breeding sites (Table 3.9-1; Figure 3.9-1). Breeding was also confirmed at 19 sites for Columbia spotted frog, and 10 sites for wood frog (Table 3.9-1). Six sites suitable as potential relocation sites for future amphibian salvage were also identified (Figure 3.9-1).

Table 3.9-1: Amphibian Breeding Locations, 2022

Species	Scientific Name	Total Sites Present	Confirmed Breeding Sites	Potential Breeding Sites
Western Toad	*Anaxyrus boreas*	34	21	14
Wood Frog	*Lithobates sylvaticus*	10	10	0
Columbia Spotted Frog	*Rana luteiventris*	19	19	0

Detailed data from amphibian surveys (i.e., habitat, weather, effort, and life stage counts) were lost due to device error during digital data collection. Western toad breeding pond surveys will be completed again in 2023, at which time additional detail on habitat data will be provided.

3.9.3.2 Incidental Observations

One incidental observation of western toad was recorded in 2022 (Appendix H). Western toad eggs and tadpoles were observed in a ditch along a decommissioned spur in a large cut block, at kilometre 6 of the mine site access road (i.e., in the southwestern portion of the RSA).

3.9.4 Discussion

In the EIS, the Project was predicted to have a not significant, negligible magnitude effect of habitat loss and alteration, mortality, and change in distribution for western toad (Vol 4 Section 5.4.7.3; New Gold 2015; ERM 2017). Monitoring related to these predictions, and to validate the effectiveness of mitigation measures, includes surveys for toad mortalities along active Project roads and monitoring of western toad breeding ponds (required by DS condition 8.21).

Monitoring is also conducted to confirm the success of salvaged western toad relocation sites (DS condition 8.11), however no western toad salvage occurred in 2022 so this monitoring program has not yet begun. Amphibian pre-clearing surveys and salvage are reported in Section 2.1. Additional monitoring for amphibians related to potential effects of facility water structures are reported in Section 2.4.

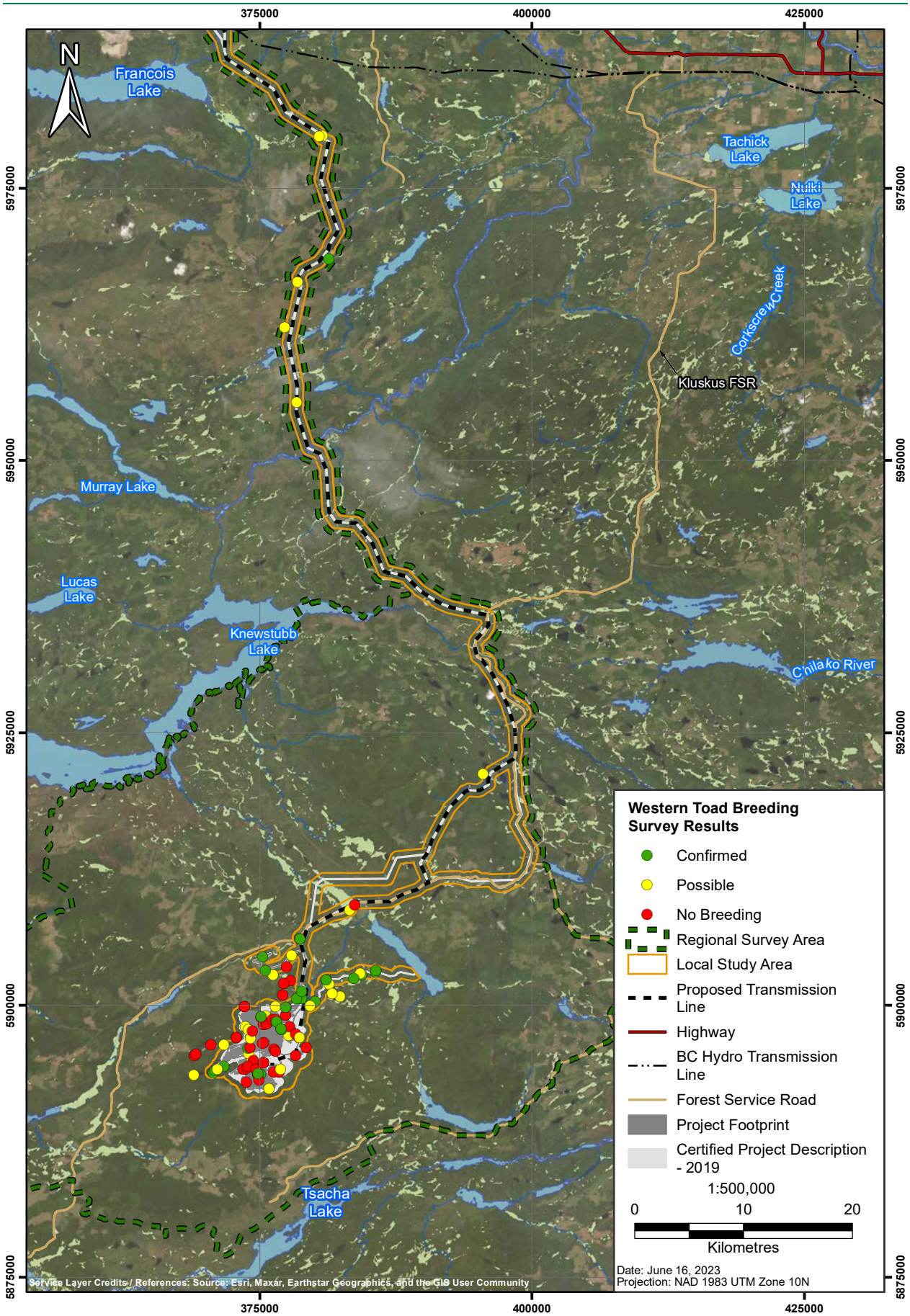


Figure 3.9-1: Western Toad Breeding Locations

Western toad breeding ponds were monitored in 2022, with surveys completed at 109 waterbody and wetland sites within the mine site and transmission line LSAs and small portions of the RSA. Western toad were recorded at 34 sites, with 21 confirmed breeding sites. Breeding was also confirmed at 19 sites for Columbia spotted frog, and 10 sites for wood frog. Detailed data from amphibian surveys (i.e., habitat, weather, effort, and life stage counts) were lost due to device error during digital data collection. Western toad breeding pond surveys will be completed again in 2023, at which time additional detail on habitat data and abundance will be provided. Once additional years of data (including data collected during Construction and monitoring at relocation sites) are available, data will be formally analyzed using a time series analysis as described in the WMMP (Section 4.1.3.3; ERM 2022a).

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APPENDIX A CONCORDANCE WITH CANADIAN ENVIRONMENTAL ASSESSMENT AGENCY DECISION STATEMENT (APRIL 2018) AND ENVIRONMENTAL ASSESSMENT CERTIFICATE #M19-01 (JUNE 21, 2019)

Appendix A-1: Concordance with Canadian Environmental Assessment Agency Decision Statement (April 2018)

Condition	Description	Location in Plan
Condition 2.1 (General Conditions)	The Proponent shall ensure that its actions in meeting the conditions set out in this Decision Statement during all phases of the Designated Project are considered in a careful and precautionary manner, promote sustainable development, are informed by the best information and knowledge available at the time the Proponent takes action (including community and Indigenous traditional knowledge), are based on methods and models that are recognized by standard-setting bodies, are undertaken by qualified individuals, and have applied the best available economically and technically feasible technologies.	Included throughout all sections, applicable topics summarized in each Discussion section. Also see CMMP report Appendix N
Condition 2.2 (General Conditions)	*The Proponent shall, when mitigation is a requirement of a condition set out in this Decision Statement, give preference to avoiding the adverse environmental effect of the Designated Project over minimizing the adverse environmental effect of the Designated Project. If unable to avoid the adverse environmental effect, the Proponent shall give preference to minimizing the adverse environmental effect of the Designated Project over compensating for the adverse environmental effect of the Designated Project. If unable to minimize the adverse environmental effect, the Proponent shall compensate for the adverse environmental effect of the Designated Project.*	*N/A – Addressed by the WMMP Sections 3 and 4 (ERM 2022a)*
Condition 2.3 (Consultation)	The Proponent shall, where consultation is a requirement of a condition set out in this Decision Statement: 2.3.1 provide a written notice of the opportunity for the party or parties being consulted to present their views and information on the subject of the consultation;	Addressed in the WMMP (ERM 2022a) and CMMP (ERM 2022b). For the CMMP, See CMMP report Appendix N Section 1.3
	2.3.2 provide all information available and relevant on the scope and the subject matter of the consultation and a period of time agreed upon with the party or parties being consulted, not less than 15 days, to prepare their views and information;	
	2.3.3 undertake a full and impartial consideration of all views and information presented by the party or parties being consulted on the subject matter of the consultation;	
	2.3.4 strive to reach consensus with Indigenous groups; and	
	2.3.5 advise the party or parties being consulted on how the views and information received have been considered by the Proponent including a rationale for why the views have, or have not, been integrated. The Proponent shall advise the party or parties in a time period that does not exceed the period of time taken in 2.3.2.	

Condition	Description	Location in Plan
Condition 2.4 (Consultation)	*The Proponent shall, where consultation with Indigenous groups is a requirement of a condition set out in this Decision Statement, determine and strive to reach consensus with each Indigenous group regarding the manner by which to satisfy the consultation requirements referred to in condition 2.3, including:* *2.4.1 the methods of notification;*	*N/A – Addressed in the WMMP (ERM 2022a) and CMMP (ERM 2022b)*
	2.4.2 the type of information and the period of time to be provided when seeking input;	
	2.4.3 the process to be used by the Proponent to undertake impartial consideration of all views and information presented on the subject of the consultation; and	
	2.4.4 the period of time and the means by which to advise Indigenous groups of how their views and information were considered by the Proponent.	
Condition 2.5 (Follow-up and Adaptive Management)	*The Proponent shall, where a follow-up program is a requirement of a condition set out in this Decision Statement, have a Qualified Professional, where such a qualification exists for the subject matter of the follow-up program, determine, as part of the development of each follow-up program and in consultation with the party or parties being consulted during the development, the following information:* *2.5.1 the follow-up activities that must be undertaken by a qualified individual;* *2.5.2 the methodology, location, frequency, timing and duration of monitoring associated with the follow-up program;* *2.5.3 the scope, content, format and frequency of reporting of the results of the follow-up program;* *2.5.4 the levels of environmental change relative to baseline conditions that would require the Proponent to implement modified or additional mitigation measure(s), including instances where the Proponent may require Designated Project activities to be stopped; and* *2.5.5 the technically and economically feasible mitigation measures to be implemented by the Proponent if monitoring conducted as part of the follow-up program shows that the levels of environmental change referred to in condition 2.5.4 have been reached or exceeded.*	
Condition 2.6 (Follow-up and Adaptive Management)	*The Proponent shall update and maintain the follow-up and adaptive management information referred to in condition 2.5 during the implementation of each follow-up program in consultation with the party or parties being consulted during the development of each follow-up program.*	*N/A – Addressed in WMMP Section 1.4 and 7 (ERM 2022a)*
Condition 2.7 (Follow-up and Adaptive Management)	*The Proponent shall provide a draft of the follow-up programs referred to in conditions 3.14, 3.15, 3.16, 4.5, 5.5, 6.11, 6.12, 6.13, 6.14, 8.18.6, 8.20.5, 8.21, and 8.22, if required, to the party or parties being consulted during the development of each follow-up program for a consultation period of up to 60 days prior to providing follow-up programs pursuant to condition 2.8.*	*N/A – Addressed in WMMP Section 4 (ERM 2022a)*

Condition	Description	Location in Plan
Condition 2.8 (Follow-up and Adaptive Management)	*The Proponent shall provide the follow-up programs referred to in conditions 3.14, 3.15, 3.16, 4.5, 5.5, 6.11, 6.12, 6.13, 6.14, 8.18.6, 8.20.5, 8.21, and 8.22, if required, to the Agency and to the party or parties being consulted during the development of each follow-up program prior to the implementation of each follow-up program. The Proponent shall also provide any update(s) made pursuant to condition 2.6 to the Agency and to the party or parties being consulted during the development of each follow-up program within 30 days of the follow-up program being updated.*	*N/A – Addressed in WMMP Section 4 (ERM 2022a)*
Condition 2.9 (Follow-up and Adaptive Management)	The Proponent shall, where a follow-up program is a requirement of a condition set out in this Decision Statement: 2.9.1 conduct the follow-up program according to the information determined pursuant to condition 2.5; 2.9.2 undertake monitoring and analysis to verify the accuracy of the environmental assessment as it pertains to the particular condition and/or to determine the effectiveness of any mitigation measure(s); 2.9.3 determine whether modified or additional mitigation measures are required based on the monitoring and analysis undertaken in accordance with condition 2.9.2; and 2.9.4 if modified or additional mitigation measures are required pursuant to condition 2.9.3, develop and implement these mitigation measures in a timely manner and monitor them in accordance with condition 2.9.2.	Section 2 and 3. WMMP Section 4 (ERM 2022a).
Condition 2.10 (Follow-up and Adaptive Management)	*Where consultation with Indigenous groups is a requirement of a follow-up program, the Proponent shall discuss the follow-up program with Indigenous groups and determine, in consultation with Indigenous groups, opportunities for their participation in the implementation of the follow-up program, including the analysis of the follow-up results and whether modified or additional mitigation measures are required, as set out in condition 2.9.*	*N/A – Addressed in WMMP Section 4 (ERM 2022a)*
Condition 2.11 (Annual Reporting)	The Proponent shall, commencing in the reporting year during which the Proponent begins the implementation of the conditions set out in this Decision Statement, prepare an annual report that sets out: 2.11.1 the activities undertaken by the Proponent in the reporting year to comply with each of the conditions set out in this Decision Statement; 2.11.2 how the Proponent complied with condition 2.1; 2.11.3 for conditions set out in this Decision Statement for which consultation is a requirement, how the Proponent considered any views and information that the Proponent received during or as a result of the consultation, including a rationale for how the views have, or have not, been integrated; 2.11.4 the information referred to in conditions 2.5 and 2.6 for each follow-up program;	Addressed through the submission of this report

Condition	Description	Location in Plan
	2.11.5 the results of the follow-up program requirements identified in conditions 3.14, 3.15, 3.16, 4.5, 5.5, 6.11, 6.12, 6.13, 6.14, 8.18.6, 8.20.5, 8.21, and 8.22 if required; 2.11.4 any update made to any follow-up program in the reporting year; 2.11.7 any modified or additional mitigation measures implemented or proposed to be implemented by the Proponent, as determined under condition 2.9 and rationale for why mitigation measures were selected pursuant to condition 2.5.4; and 2.11.8 any change(s) to the Designated Project in the reporting year.	
Condition 2.12 (Annual Reporting)	The Proponent shall provide a draft annual report referred to in condition 2.11 to Indigenous groups, no later than June 30 following the reporting year to which the annual report applies. The Proponent shall consult Indigenous groups on the content and findings in the draft annual report.	Addressed through the submission of this report
Condition 2.13 (Annual Reporting)	The Proponent, in consideration of any comments received from Indigenous groups pursuant to condition 2.12 shall revise and submit to the Agency and Indigenous groups a final annual report, including an executive summary in both official languages, no later than September 30 following the reporting year to which the annual report applies.	Addressed through the submission of this report
Condition 2.14 (Information Sharing)	The Proponent shall publish on the Internet, or any medium which is publicly available, the annual reports and the executive summaries referred to in conditions 2.11 and 2.13, the offsetting plan(s) referred to in condition 3.11, the compensation plan referred to in condition 8.18 and, if required, condition 5.3, the whitebark pine management plan referred to in condition 8.20, the communication plans referred to in conditions 6.15 and 10.5, the reports related to accidents and malfunctions referred to in conditions 10.4.2 and 10.4.3, the schedules referred to in conditions 11.1 and 11.2, and any update(s) or revision(s) to the above documents, upon submission of these documents to the parties referenced in the respective conditions. The Proponent shall keep these documents publicly available for 25 years following the end of decommissioning of the Designated Project. The Proponent shall notify the Agency and Indigenous groups of the availability of these documents within 48 hours of their publication.	Addressed through the submission of this report
Condition 2.15 (Information Sharing)	*When the development of any plan is a requirement of a condition set out in this Decision Statement, the Proponent shall submit the plan to the Agency and to Indigenous groups prior to construction, unless otherwise required through the condition.*	*N/A – Addressed through the submission of the WMMP (ERM 2022a)*
Condition 4.1	The Proponent shall carry out the Designated Project in a manner that protects migratory birds and avoids harming, killing or disturbing migratory birds or destroying, disturbing or taking their nests or eggs. In this regard, the Proponent shall take into account Environment and Climate Change Canada's Avoidance Guidelines and the risk of incidental take. The Proponent's actions when carrying out the Designated Project shall be in compliance with the *Migratory Birds Convention Act, 1994*, the *Migratory Birds Regulations* and with the *Species at Risk Act*.	Section 2.1, 3.6, 3.7, 3.8

Condition	Description	Location in Plan
Condition 4.2	The Proponent shall deter migratory birds from using or frequenting the tailings storage facility, reclamation wetlands, pit lake and sediment control ponds until such time that water quality in these structures meets legislative requirements and water quality objectives. The Proponent shall identify the water quality objectives using an ecological risk based approach, developed in consultation with Indigenous groups and relevant authorities.	Section 2.4
Condition 4.3	*The Proponent shall conduct pre-construction surveys for migratory birds and their habitat in the Designated Project area to validate the results of habitat suitability modelling for migratory birds, including migratory birds that are listed species at risk, conducted by the Proponent and presented in the Environmental Impact Statement and in the Blackwater Gold Project – Waterbird Memo (Response to LDN/UFN #684, 693, 697, and NWFN/StFN #964). As part of the pre-construction surveys, the Proponent shall validate the applicability of fisher (Martes pennant) habitat suitability modelling to migratory birds, as identified by the Proponent in the Blackwater Gold Project – Forest Birds (Supplemental Information in Response to 681, 683, 685, 694, 695, 703, 717, 936; and ECCC Annex 1, IR 21, 24, 25). Based on the results of the pre-construction surveys the Proponent shall, in consultation with Indigenous groups and relevant authorities, develop and implement mitigation measures for migratory bird habitat.*	*N/A – Addressed in WMMP Section 4.7(ERM 2022a)*
Condition 4.4	*The Proponent shall develop, prior to construction, and in consultation with relevant authorities, mitigation measures related to sensitive periods and locations for migratory birds, including greater yellowlegs (Tringa melanoleuca). The mitigation measures shall consider critical habitat identified in applicable recovery strategies under the Species at Risk Act and suitable habitat identified by the Proponent in the environmental assessment for migratory birds, including common nighthawk (Chordeiles minor), olive - sided flycatcher (Contopus cooperi), yellow rail (Coturnicops noveboracensis), barn swallow (Hirundo rustica), bank swallow (Riparia riparia), horned grebe (Podiceps auritus). The Proponent shall implement the mitigation measures during all phases of the Designated Project.*	*N/A – Addressed in WMMP Sections 3.3 and 4.7 (ERM 2022a)*
Condition 4.5	The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and determine the effectiveness of all mitigation measures to avoid harm to migratory birds, including migratory birds that are listed species at risk, their eggs and nests. The follow-up program shall include the mitigation measures used to comply with condition 4.1 to 4.4. The Proponent shall implement the follow-up program during all phases of the Designated Project and shall apply conditions 2.9 and 2.10 when implementing the follow-up program.	Section 3.6, 3.7, 3.8
Condition 6.2	*The Proponent shall establish a speed limit of a maximum of 50 kilometres/hour on project roads and require that all persons abide by this speed limit during all phases of the Designated Project.*	*N/A - Addressed in WMMP Section 3.6 (ERM 2022a)*

Condition	Description	Location in Plan
Condition 6.10	*The Proponent shall, during all phases of the Designated Project, prohibit employees and contractors associated with the Designated Project from fishing, hunting, trapping and gathering for any purposes not associated with the Designated Project, within the Designated Project area, or using the Designated Project area to access lands outside the Designated Project area for fishing, hunting, trapping and gathering, unless an employee or contractor is provided access by the Proponent for traditional purposes or for exercising Aboriginal rights, to the extent that such access is safe.*	*N/A - Addressed in WMMP Section 2.1 (ERM 2022a)*
Condition 6.14	The Proponent shall, prior to construction and in consultation with Indigenous groups and relevant authorities, develop a follow-up program to verify the accuracy of the environmental assessment as it pertains to adverse effects from the Designated Project on moose (*Alces alces*) and determine the effectiveness of mitigation measures. As part of the implementation of the follow-up program, the Proponent shall conduct winter distribution and density surveys for moose (*Alces alces*) starting prior to construction and until the end of operation. The Proponent shall implement the follow-up program from construction through decommissioning and shall apply conditions 2.9 and 2.10 when implementing the follow-up program.	Section 3.1 *(ERM 2022a)*
Condition 8.1	*The Proponent shall control lighting required for all phases of the Designated Project, including direction, timing and intensity, to avoid adverse effects on listed species at risk, while meeting health and safety requirements.*	*N/A - Addressed in WMMP Section 3.1 (ERM 2022a)*
Condition 8.2	*The Proponent shall, prior to construction and in consultation with Indigenous groups and relevant authorities, identify wildlife corridors that intersect project roads and shall install and maintain, during all phases of the Designated Project, wildlife crossing signs where the wildlife corridors intersect the project roads.*	*N/A - Addressed in WMMP Sections 3.6 and 4 (ERM 2022a)*
Condition 8.3	*The Proponent shall not use salt for de-icing or traction control purposes on project roads during all phases of the Designated Project, unless all other methods used for de-icing or traction control purposes do not meet safety requirements.*	*N/A - Addressed in WMMP Section 3.6 (ERM 2022a)*
Condition 8.4	*The Proponent shall, from the start of construction to the end of decommissioning, manage carrion on project roads in consultation with relevant authorities and Indigenous groups.*	*N/A – Addressed in WMMP Section 3.6 (ERM 2022a)*
Condition 8.5	*The Proponent shall, during all phases of the Designated Project, manage snow bank height along project roads and shall create and maintain escape pathways where the wildlife corridors identified pursuant to condition 8.2 intersect the project roads to allow ungulates and wolverines (Gulo gulo) to exit the plowed roads in winter.*	*N/A – Addressed in WMMP Section 3.6 (ERM 2022a)*
Condition 8.6	*The Proponent shall, prior to the start of construction, conduct mineral lick surveys within the Designated Project area. If the results of the surveys indicate the presence of mineral licks outside the area disturbed by Designated Project components, the Proponent shall, in consultation with Indigenous groups and relevant authorities, maintain the mineral licks in their natural state.*	*N/A – Addressed in WMMP Section 4.4 (ERM 2022a)*

Condition	Description	Location in Plan
Condition 8.7	*The Proponent shall maintain vegetation under the transmission line right of way to a minimum height of 1 metre from the ground except at the location of the tower bases, guy anchor points and along the transmission line access roads, or where not feasible for safety reasons.*	*N/A –Addressed in WMMP Section 3.4 (ERM 2022a)*
Condition 8.8	*The Proponent shall deposit woody debris on the surface of upland slopes, between rocks and parallel and perpendicular to the slope when undertaking vegetation maintenance under the transmission line pursuant to condition 8.7, unless not feasible for safety reasons.*	*N/A – Addressed in WMMP Section 3.4 (ERM 2022a)*
Condition 8.9	The Proponent shall identify, prior to construction and in consultation with Indigenous groups and relevant authorities, time periods during which construction activities must be carried out to protect wildlife during sensitive life stages, including for grizzly bear (*Ursus arctos*), western toad (*Anaxyrus boreas*), wolverine (*Gulo gulo*), American marten (*Martes americana*), fisher (*Pekania pennanti*) and southern mountain caribou (*Rangifer tarandus caribou*). In doing so, the Proponent shall: 8.9.1 apply British Columbia's Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia. Interim Guidance, North Area when identifying these time periods; 8.9.2 notify, prior to construction, the Agency and Indigenous groups of these time periods and of the areas within which each of these time periods shall apply; and 8.9.3 conduct construction activities during these time periods, unless not technically feasible.	Section 2.1, 3.2, 3.3, 3.4, 3.9
Condition 8.10	If construction during the time periods referred to in condition 8.9 for grizzly bear (*Ursus arctos*), western toad (*Anaxyrus boreas*), wolverine (*Gulo gulo*), American marten (*Martes americana*) and fisher (*Pekania pennanti*) is not technically feasible, the Proponent shall conduct pre-construction surveys to identify western toad (*Anaxyrus boreas*) breeding habitat and wolverine (*Gulo gulo*), American marten (*Martes americana*), fisher (*Pekania pennanti*) and grizzly bear (*Ursus arctos*) denning habitat and develop and implement additional mitigation measures, from construction until the end of operation, in consultation with Indigenous groups and relevant authorities. In doing so, the Proponent shall: 8.10.1 establish no work buffer zones for habitat identified during pre-construction surveys. The Proponent shall take into account British Columbia's Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia when establishing buffer zones for western toad breeding habitat and shall take into account British Columbia's Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia. Interim Guidance, North Area when establishing buffer zones for wolverine (*Gulo gulo*), American marten (*Martes americana*), fisher (*Pekania pennanti*) and grizzly bear (*Ursus arctos*) denning habitat.	Section 2.1, 3.3, 3.4, 3.9

Condition	Description	Location in Plan
Condition 8.11	The Proponent shall, in consultation with Environment and Climate Change Canada, have a qualified individual salvage and relocate western toad (*Anaxyrus boreas*) to suitable habitat, prior to clearing activities that cannot be scheduled outside of sensitive periods pursuant to condition 8.9.	Section 3.9
Condition 8.12	The Proponent shall deter western toad (*Anaxyrus boreas*) from the tailings storage facility, reclamation wetlands, pit lake, sediment control ponds, and environmental control dam until such time that water meets British Columbia's Water Quality Guidelines for the Protection of Wildlife and from project roads during construction, operation and decommissioning.	Sections 2.4 and 3.9
Condition 8.13	*The Proponent shall take into account the Western Canada White Nose Syndrome Transmission Prevention when undertaking construction activities in little brown myotis (Myotis lucifugus) and northern myotis (Myotis septentrionalis) habitat. The Proponent shall report evidence of white nose syndrome as indicated by white muzzle or dead bats to British Columbia's Ministry of Forests, Lands, and Natural Resource Operations and Rural Development, Environment and Climate Change Canada, and Indigenous groups.*	*N/A – Addressed in WMMP Section 3.2 (ERM 2022a)*
Condition 8.14	The Proponent shall conduct pre-construction surveys to determine the distribution of little brown myotis (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis*), and establish from construction until the end of operation, in consultation with Indigenous groups and relevant authorities, buffer zones around active hibernacula and active roosts. The Proponent shall take into account British Columbia's Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia when identifying active hibernacula and active roosts and when establishing buffer zones.	Sections 2.1 and 3.5
Condition 8.15	If the pre-construction surveys referred to in condition 8.14 identify the loss of little brown myotis (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis*) roosting habitat, the Proponent shall install, prior to construction, and maintain, during construction operation, and decommissioning, roosting structures to offset any loss of little brown myotis (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis*) roosting habitat.	Section 3.5
Condition 8.16	*The Proponent shall, prior to construction and in consultation with Indigenous groups and relevant authorities, conduct pre-construction surveys to identify short-eared owl (Asio flammeus) moderate to high-value nesting and foraging habitat, and shall implement measures to mitigate the loss of short-eared owl (Asio flammeus) habitat caused by the Designated Project.*	*N/A – Addressed in WMMP Section 4.7 (ERM 2022a)*

Condition	Description	Location in Plan
Condition 8.17	The Proponent shall, during all phases of the Designated Project and in consultation with Indigenous groups, Environment and Climate Change Canada and other relevant authorities, mitigate adverse environmental effects on southern mountain caribou (*Rangifer tarandus caribou*) and its habitat, including by carrying out construction activities during time periods referred to in condition 8.9 for southern mountain caribou (Rangifer tarandus caribou). In doing so, the Proponent shall give preference to avoiding the destruction or alteration of habitat over minimizing the destruction or alteration of habitat, to minimizing the destruction or alteration of habitat over restoring altered or destroyed habitat on-site, and to restoring altered or destroyed habitat on-site over offsetting.	Section 2.1
Condition 8.18	*For any offsetting required pursuant to condition 8.17, the Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, and to the satisfaction of Environment and Climate Change Canada, a compensation plan for southern mountain caribou (Rangifer tarandus caribou). When developing the compensation plan, the Proponent shall take into account habitat needs for migratory birds and listed species at risk. The Proponent shall implement the compensation plan from the beginning of construction. The compensation plan shall include:* *8.18.1 mapping of critical habitat of southern mountain caribou (Rangifer tarandus caribou) altered or destroyed by the Designated Project;*	*N/A – CMMP Sections 2.2, 4.2, 4.3, and 4.5 (ERM 2022b)*
	8.18.2 an offsetting ratio for direct habitat loss and indirect (e.g., sensory) losses based on an assessment of options, including revegetation and road closures, that consider the types of offset, location, time lags, securement, technical and economic feasibility, and probability of success;	*N/A – CMMP Section 4 (ERM 2022b)*
	8.18.3 field verified suitability mapping of areas to be prioritized for offsetting;	*N/A – CMMP Section 5.7 (ERM 2022b)*
	8.18.4 if residual environmental effects cannot be fully offset with habitat-based measures, a description of non-habitat measures to be implemented by the Proponent and a description of how these measures will be implemented by the Proponent, including a schedule for implementation;	*N/A – CMMP Sections 4.3 and 5.6 (ERM 2022b)*
	8.18.5 a description of performance indicators to be used by the Proponent to evaluate the effectiveness of habitat-based and non-habitat-based compensation measures; and	*N/A – CMMP Section 6.3 (ERM 2022b)*
	8.18.6 a description of the follow-up program the Proponent shall implement to determine the effectiveness of the mitigation measures included in the compensation plan. As part of the development of the follow-up program, the Proponent shall determine, in consultation with Indigenous groups, the methods, timing and frequency for conducting winter surveys for caribou abundance and distribution within the Designated Project area. The Proponent shall apply conditions 2.9 and 2.10 when implementing the follow-up program.	*N/A – CMMP Section 6 (ERM 2022b)*

Condition	Description	Location in Plan
Condition 8.21	The Proponent shall develop, in consultation with Indigenous groups, Environment and Climate Change Canada and other relevant authorities, a follow-up program to verify the accuracy of the environmental assessment and determine the effectiveness of the mitigation measures as it pertains to the effects of changes caused by the Designated Project on western toad (*Anaxyrus boreas*). The Proponent shall implement the follow-up program from construction through decommissioning and shall apply conditions 2.9 and 2.10 when implementing the follow-up program. As part of the follow-up program, the Proponent shall: 8.21.1 conduct western toad surveys annually in breeding habitat identified pursuant to condition 8.10 from the start of construction until the end of decommissioning; 8.21.2 monitor western toad (*Anaxyrus boreas*) in relocation areas for western toad (*Anaxyrus boreas*) salvage conducted pursuant to condition 8.11; and 8.21.3 monitor western toad (*Anaxyrus boreas*) mortality on project roads from the start of construction until the end of decommissioning.	Section 3.9
Condition 8.22	The Proponent shall develop, in consultation with Indigenous groups, and implement a follow-up program to monitor little brown myotis (*Myotis lucifugus*) and northern myotis (*Myotis septentrionalis*) usage of buffer zones established pursuant to condition 8.14 and roosting structures installed and maintained by the proponent pursuant to condition 8.15 to determine the effectiveness of the mitigation measures. The Proponent shall implement the follow-up program during construction and operation and shall apply conditions 2.9 and 2.10 when implementing the follow-up program.	Section 3.5

Appendix A-2: Concordance with Environmental Assessment Certificate #M19-01 (June 2019)

Condition	Description	Section In Report
2 *Plan Development*	*Where a condition of this Certificate requires the Holder to develop a plan, program or other document, any such plan, program or other document must, at a minimum, include the following information:* *a) purpose and objectives of the plan, program or other document;* *b) roles and responsibilities of the Holder and Employees;* *c) names and, if applicable, professional certifications and professional stamps/seals, of those responsible for the preparation of the plan, program, or other document;* *d) schedule for implementing the plan, program or other document throughout the relevant Project phases;* *e) means by which the effectiveness of the mitigation measures will be evaluated including the schedule for evaluating effectiveness;* *g) schedules and methods for the submission of reporting to specific agencies, Aboriginal Groups and the public and the required form and content of those reports;* *h) and process and timing for updating and revising the plan, program or other document, including any consultation with agencies and Aboriginal Groups that would occur in connection with such updates and revisions.*	*N/A – Addressed in WMMP Sections 1.1, 1.2, 3, 4, 5, 8 (ERM 2022a)*
3 *Adaptive Management*	*Where a condition of this Certificate requires the Holder to develop a plan, program or other document that includes monitoring, including monitoring of mitigation measures or monitoring to determine the effectiveness of the mitigation measures, the Holder must include adaptive management in that plan. The objective of the adaptive management is to address the circumstances that will require the Holder to implement alternate or additional mitigation measures to address effects of the Project if the monitoring shows that those effects:* *a) are not mitigated to the extent contemplated in the Application;* *b) are not predicted in the Application; or* *c) have exceeded the triggers identified in paragraph g) of this condition.* *The adaptive management in the plan must include at least the following:* *d) the monitoring program that will be used including methods, location, frequency, timing and duration of the monitoring;* *e) the baseline information that will be used, or collected where existing baseline information is insufficient, to support the monitoring program;*	*N/A – Addressed in WMMP Sections 1.4 and 4 (ERM 2022a)*
	f) the scope, content and frequency of reporting of the monitoring results;	*N/A – Addressed in WMMP Sections 4 and 5 (ERM 2022a)*

Condition	Description	Section In Report
	g) the identification of qualitative and quantitative triggers, which, when observed through monitoring required under paragraph d), will require the Holder to alter existing, or develop new, mitigation measures to avoid, reduce, and/or remediate effects; *h) the methods that will be applied to detect when a numeric trigger, or type or level of change referred to in paragraph g), has occurred;* *i) a description of the process for and timing to alter existing mitigation measures or develop new mitigation measures to reduce or avoid effects;* *j) identification of the new and/or altered mitigation measures that will be applied when any of the changes identified in paragraphs a) to c) occur, or the process by which those will be established and updated over the relevant timeframe for the specific condition;* *k) the monitoring program that will be used to determine if the altered or new mitigation measures and/or remediation activities are effectively mitigating or remediating the effects and or avoiding potential effects; and* *l) the scope, content and frequency of reporting on the implementation of altered or new mitigation measures.* *If there are any requirements or mitigation measures required in the plan, program or other document for which adaptive management, or elements of adaptive management listed in paragraphs d) to l) are assessed to be not appropriate or applicable, the plan must include identification of those requirements and measures, and the rationale for that assessment.*	*N/A – Addressed in WMMP Sections 1.4 and 4 (ERM 2022a)*
4 Consultation	*Where a condition of this Certificate requires the Holder consult a particular party or parties regarding the content of a plan, program or other document, the Holder must, to the satisfaction of the EAO:* *a) provide written notice to each such party that:* *i. includes a copy of the plan, program or other document;* *ii. invites the party to provide its views on the content of such plan, program or other document; and* *iii. indicates: i) if a timeframe for providing such views to the Holder is specified in the relevant condition of this Certificate, that the party may provide such views to the Holder within such time frame; or ii) if a timeframe for providing such views to the Holder is not specified in the relevant condition of this Certificate, specifies a reasonable period during which the party may submit such views to the Holder;*	*N/A – WMMP (ERM 2022a) and CMMP (ERM 2022a)*
	b) undertake a full and impartial consideration of any views and other information provided by a party in accordance with the timelines specified in a notice given pursuant to paragraph (a); c) provide a written explanation to each such party that provided comments in accordance with a notice given pursuant to paragraph (a) as to: i. how the views and information provided by such party to the Holder have been considered and addressed in a revised version of the plan, program or other document; or ii. why such views and information have not been addressed in a revised version of the plan, program or other document.	Addressed in the WMMP (ERM 2022a) and CMMP (ERM 2022b). For the CMMP, See CMMP report Appendix N Section 1.3

Condition	Description	Section In Report
	d) maintain a record of consultation with each such party regarding the plan, program or other document; and	
	e) provide a copy of such consultation record to the EAO, the relevant party, or both, promptly upon the written request of the EAO or such party. The copy of such consultation record must be provided to the EAO, relevant party, or both, no later than 15 days after the Holder receives the request for a copy of the consultation record, unless otherwise authorized by the EAO.	*N/A – Noted by the WMMP (ERM 2022a) and CMMP (ERM 2022b)*
5 Compliance Verification and Reporting	The Holder must provide to the EAO and to the Aboriginal Groups any document, data or information requested by the EAO for the purposes of compliance inspection and verification. The Holder must provide any document, data or information requested within the timeframe and in the manner specified by the EAO. The Holder must submit a report to the attention of the EAO and Aboriginal Groups on the status of compliance with this Certificate at the following times: a) at least 30 days prior to the start of Construction; b) on or before March 31 in each year after the start of Construction c) at least 30 days prior to the start of Operations; d) on or before March 31 in each year after the start of Operations; e) at least 30 days prior to the start of Closure; f) on or before March 31 in each year after the start of Closure until the end of Closure; g) at least 30 days prior to the start of Post-closure; and h) on or before March 31 in each year after the start of Post-closure until the end of Post-closure. The reports must be in a form satisfactory to the EAO. The EAO may adjust or extend this reporting requirement by providing written notice to the Holder.	Entire WMMP Report, and CMMP Report (Appendix N)
22 Caribou Mitigation and Monitoring Plan	*The Holder must retain a Qualified Professional to develop the Caribou Mitigation and Monitoring Plan to avoid, reduce and offset the Project's adverse effects on caribou and its critical habitat as defined in the Recovery Strategy for the Woodland Caribou, Southern Mountain population (Rangifer tarandus caribou) in Canada (Environment and Climate Change Canada (ECCC) 2014, or as updated or replaced from time to time). The plan must be developed in consultation with FLNRORD, ENV, EMPR, ECCC, and Aboriginal Groups.*	*N/A – Addressed by CMMP (ERM 2022b)*
	The plan must include at least the following: *a) the means by which the mitigation measures identified in the Mitigation Table required under Condition 43 for the valued component Caribou will be implemented;*	*N/A – Addressed in CMMP Section 3 (ERM 2022b)*

Condition	Description	Section In Report
	b) a requirement that during Construction the Existing Exploration Access Road (from its origin at the Kluskus-Ootsa Forest Service road to the Mine Site) and the Mt. Davidson Exploration Road, as identified in Figure A1-1 and A-2 of Schedule A to the Certificate, be decommissioned and caribou habitat disturbed by these roads be reclaimed in a manner that supports the reestablishment of caribou habitat;	*N/A – Addressed in CMMP Section 3.3.1 and 5.3 (ERM 2022b)*
	c) the type, timing and frequency for undertaking caribou surveys prior to commencement of Construction, as well as during Operations, and how that information will inform development and implementation of monitoring and mitigation measures during Construction and Operations;	*N/A – Addressed in CMMP Section 6.2.2 (ERM 2022b)*
	d) provision of survey results to Aboriginal Groups, FLNRORD, EMPR and ENV;	Addressed by submission of this report
	e) scheduling Construction activities to take into account the caribou "least risk window" (as defined by Ungulate Winter Range Order U-7-012), including monitoring and implementation of management or mitigation measures to avoid or reduce impacts in the event caribou are observed in the area of the Project Site;	*N/A – Addressed in CMMP Sections 3.1 and 3.2 (ERM 2022b)*
	f) the conditions under which work would be stopped if caribou are seen in the area during Construction; *g) development and implementation of caribou awareness protocols for Employees;*	*N/A – Addressed in CMMP Section 3.2 (ERM 2022b)*
	h) the timing and frequency, which must be at least once per year, unless otherwise authorized by the EAO, that the Holder will request to meet with FLNRORD and Aboriginal Groups to discuss opportunities for the Holder's Participation in provincial caribou regional initiatives and in initiatives related to caribou established under Section 5.2b)i.c. of the Hubulhsooninats'uhoot'alh: Foundation Framework Agreement (July 22, 2018, or as updated or replaced from time to time), between the Province and the Southern Dakelh Nation Alliance. When FLNRORD and/or Aboriginal Groups agree to meet, the Holder must organize such meeting; and	*N/A – Addressed in CMMP Section 5.6 (ERM 2022b)*
	i) the development of a work plan for the Holder's Participation in those initiatives identified in paragraph h) when invited to do so by FLNRORD or the Ministry of Indigenous Relations and Reconciliation.	*N/A – Noted by the CMMP (ERM 2022b)*
	The plan must also include a plan to offset the loss of caribou habitat with recovery and protection of caribou habitat that will benefit the same herd of caribou that is affected by the Project. The offsetting plan must include at a minimum:	*N/A – Addressed in CMMP Sections 4 and 5 (ERM 2022b)*
	j) Demonstration of how the plan takes into consideration the assessment and proposals contained in the Application document: New Gold's Response to the May 25, 2018 Information Request from the Canadian Environmental Assessment Agency – Updated Assessment of Impacts to Southern Mountain Caribou and Proposed Caribou Offset, submitted on August 31, 2018 (August 2018 Caribou Memo), including with respect to:	*N/A – Addressed in CMMP Section 2 to 2.3, and 4 (ERM 2022b)*

Condition	Description	Section In Report
	i) mapping of the caribou critical habitat altered or destroyed by the Project; *ii) identifying offset locations within the Tweedsmuir-Entiako Herd Boundary;* *iii) defining ecological equivalency for areas of proposed offsets compared to the areas affected by the Project and related offset area ratios; and* *iv) providing a rationale for any deviation from the assessment or proposal in the August 2018 Caribou Memo, including how deviations result in the same or improved overall effectiveness in offsetting the adverse effects to caribou as compared to that included in the August 2018 Caribou Memo;*	
	k) demonstration of how the Holder has considered and designed the offsetting plan to be consistent with or to support any provincial and/or federal plans for the recovery of the herd of caribou affected by the Project;	*N/A – Addressed in CMMP Section 2 to 3.3. 4, and 5.1 (ERM 2022b)*
	l) how, in identifying offset locations, the Holder sought and considered information on: *i) areas currently used by caribou;* *ii) Traditional Knowledge and Traditional Land Use; and* *iii) areas that would create contiguous blocks of protected habitat;*	*N/A – Addressed in CMMP Section 2.1 to 4.5 (ERM 2022b)*
	m) how the proposed offset selection takes into account the duration of effects, including the potential for the duration to change in the future, and technical and financial considerations;	*N/A – Addressed in CMMP Section 4.3 (ERM 2022b)*
	n) 1:20,000 scale topographic maps including UTM grid for areas proposed and secured for habitat-based offsetting;	*N/A – Addressed in CMMP Section 5.7 (ERM 2022b)*
	o) a description of how areas secured for habitat-based offsetting will be maintained;	*N/A – Addressed in CMMP Section 4 and 5 (ERM 2022b)*
	p) a monitoring program to determine the effectiveness of the offset; and	Section 3.2 and CMMP Report (Appendix N)
	q) the specific actions required on the part of the Holder to secure the offsets, identification of the extent to which the Holder has the ability to implement the offset and identification of actions required by other parties that have been identified by the Holder for the offsets to be fully secured and implemented.	*N/A – Addressed in CMMP Section 4.3 (ERM 2022b)*
23 Wildlife Mitigation and Monitoring Plan	*The Holder must retain one or more Qualified Professionals to develop a Wildlife Management and Monitoring Plan. The plan must be developed in consultation with EMPR, ENV, FLNRORD, ECCC and Aboriginal Groups.* *The plan must include at least the following:*	*N/A – Addressed in WMMP Sections 3 and 4 (ERM 2022b)*

Condition	Description	Section In Report
	a) the means by which the mitigation measures identified in the Mitigations Table required under Condition 43 for the following valued components: Amphibians, Bats, Forest and Grassland Birds, Waterbirds, Furbearers, Grizzly Bear, Invertebrates, Moose, Ecosystem Composition and Plant species and Ecosystems at Risk will be implemented;	
	b) the means by which the implementation and effectiveness of mitigation measures in the plan will be monitored;	Section 2 and 3. WMMP Section 4 (ERM 2022a)
	c) pre-construction surveys for wildlife features to be undertaken and the associated avoidance or mitigation measures to be undertaken if specified wildlife features are found in the Project Area, as listed in Table 1, including: *i) the method(s), timing and duration for surveys and the related rationale for that method(s), timing and duration;* *ii) the identified measures to be undertaken in light of the requirements for different wildlife features; and* *iii) the circumstances under which the required measures in the Table 1 would not be implemented, if any, including a clear rationale for those exceptions and identification of alternative measures that will be applied.*	*N/A – Addressed in WMMP Sections 3.3 and 4 (ERM 2022a)*
	Table 1 Pre-construction Surveys and Associated Avoidance and Mitigation Measures: **Mineral Licks:** If pre-construction surveys identify that mineral licks are present within or near areas disturbed (sensory and physical) by Project components, identify measures to maintain the mineral licks in their natural state as determined by a Qualified Professional. If a mineral lick is discovered during Construction or Operations that wasn't identified in a pre-construction survey, the Qualified Professional must identify appropriate mitigation measures to minimize impacts to the mineral lick.	Section 2.1.
	Grizzly bear dens: If the results of the survey indicate that there are grizzly bear dens in use, establish a setback around the den(s) while it is in active use, as determined by Qualified Professional.	Section 2.1 and 3.3.
	Bat roosts and hibernacula features: If the results of the pre-construction surveys indicate bat roosts or hibernacula are in the Project Area, avoid disturbance. If avoidance is not possible, install alternative roosts within the vicinity of the observed roost, as well as other mitigation measures as determined by a Qualified Professional. The Holder must demonstrate how the Best Management Practices Guidelines for Bats in British Columbia (ENV February 2016, or as updated or replaced from time to time) were applied. In addition to the pre-construction survey, the Holder must maintain an inventory of features that may function as potential roosts and hibernacula and must conduct surveys to confirm whether these features are used and by which species. If the features are being used by bats, avoid disturbance or apply appropriate mitigation measures if avoidance is not possible, as determined by a Qualified Professional.	Section 2.1 and 3.5.

Condition	Description	Section In Report
	Furbearer dens: Should a probable active natal or maternal furbearer den be located, establish a 50-metre setback around the den during the denning period as determined by a Qualified Professional. Should the survey or assessment determine that there is furbearer denning habitat within the Project Area, the plan must identify mitigation measures to be applied during the denning period, as determined by a Qualified Professional, if avoidance is not possible, and in consideration of BC Environmental Mitigation Policy, including Procedures for Mitigating Impacts on Environmental Values (BC EMP).	Section 2.1 and 3.4.
	Active bird nests (resident and migratory, forest, grassland and waterbirds: If the results of the survey indicate that there are nests in use, establish a setback around the nest while it is in active use, as determined by Qualified Professional. The Holder must document and maintain detailed records of efforts undertaken to avoid incidental bird takes during these surveys.	Section 2.1, 3.6, 3.7, and 3.8.
	d) the means by which information from the habitat suitability mapping for the Project Site will be confirmed or updated for the use of the Project Site by grizzly bears and moose prior to Construction at the Project Site, and in consultation with Aboriginal Groups. This must include: *i) consideration of habitat identified through the Terrestrial Ecosystem Mapping of the Project Site contained in the Application and identification of the habitat types requiring further assessment;* *ii) identification of methods to be used to acquire the information, including consideration of applicable Resources Information Standards Committee guidance documents and other information made available to the Holder;* *iii) the role of Aboriginal Group monitors or members of Aboriginal Groups in gathering the information;* *iv) after the information is gathered, an assessment of the adequacy of the mitigation measures proposed in the Mitigations Table required under Condition 43 in addressing the effects of the Project, in light of the new information gathered;* *v) if the assessment indicates that additional mitigation is required, the development of new or additional mitigations in a manner consistent with the BC EMP, and documentation of how the BC EMP was applied;* *vi) how the effectiveness of the mitigation measures identified in paragraphs d)iv) and d)v) will be monitored; and* *vii) the development of a technical report and a report for a lay audience that documents the activities and outcomes required under paragraphs* *d)i) to vi). The report must be provided to Aboriginal Groups at least 60 days prior to the start of Construction at the Project Site;*	*N/A – Addressed in WMMP Sections 4, 4.4 4.6, 5, and Appendix D (ERM 2022a)*
	e) the means by which the Holder will confirm effects on wildlife and ecosystems in the area flooded in the Davidson Creek watershed upstream of the TSF and the mitigation measures that will be applied to address identified effects;	*N/A – Addressed in WMMP Sections 3.9 and 4.4 (ERM 2022a)*

Condition	Description	Section In Report
	f) the timing and frequency, which must be at least once per year, or as otherwise authorized by the EAO, that the Holder will request to meet with FLNRORD and Aboriginal Groups to discuss the Holder's Participation in provincial moose and grizzly bear regional wildlife and resource management initiatives in Wildlife Management Units 6-01 and 7-12 and initiatives related to wildlife established under sections 5.2b)i.c. and 5.2b)i.g. under the Hubulhsooninats'uhoot'alh: Foundation Framework Agreement (July 22, 2018, or as updated or replaced from time to time) between the Province and the Southern Dakelh Nation Alliance. When FLNRORD and/or Aboriginal Groups agree to meet, the Holder must organize such meeting;	*N/A – Addressed in WMMP Sections 4.4 and 4.6 (ERM 2022a)*
	g) the development of a work plan for the Holder's Participation in those initiatives identified in paragraph f) when invited to do so by FLNRORD or the Ministry of Indigenous Relations and Reconciliation;	*N/A – Ongoing as a part of the WMMP (ERM 2022a)*
	h) the development of sub-component plans, which must include: i) related mitigation measures, the type, timing and frequency for undertaking wildlife surveys during Construction and Operations, and how that information will inform development and implementation of monitoring and mitigation for the following species: i. moose; ii. grizzly bears; iii. bats; iv. amphibians; v. birds (waterbirds and forest and grassland birds); and vi. furbearers; ii) identification of sensitive life stages for grizzly bears, moose, furbearers, and birds and how the Holder will avoid or mitigate impacts during these time periods taking into account at least the following: i. mitigation measures must include no-work zones, rescheduling construction activities, and applying minimum setbacks to construction activities. Where the Qualified Professional is of the view that such measures are not necessary or are impracticable, the plan must include clear justification as to under what circumstances those measures are not feasible or required and identification of alternative measures that are equally effective in mitigating effects; and ii. in identifying these life stages and mitigation measures, the Holder must document how it has taken into consideration the A Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia. Interim Guidance, FLNRORD, 2014 (or as updated or replaced from time to time time).	Sections 2.1, and 3

Condition	Description	Section In Report
	i) the means by which the Wildlife Management and Monitoring Plan will inform the Country Foods Monitoring Plan (Condition 41) and the End Land Use Plan (Condition 25);	*N/A – Addressed in WMMP Section 2.2 (ERM 2022a)*
	j) establishment of policies that prohibit Employees, unless that activity is specifically related to employment requirements, from: *i) fishing, hunting, or trapping;* *ii) harassing or feeding wildlife; or* *iii) possessing firearms;* *when travelling, for work-related purposes along Project Roads, the Kluskus and Kluskus-Ootsa Forest Service Roads, and/or when at the Project Site. The policies must identify the circumstances under which any of these activities may be allowed if they are by members of Aboriginal Groups exercising Aboriginal Interests;*	*N/A – Addressed in WMMP Section 2.1 (ERM 2022a)*
	k) how the Holder will implement at least the following mitigation measures specific to the Project Site: *i) management of lighting including direction, timing and intensity, to avoid adverse effects on wildlife, while meeting health and safety requirements;*	*N/A – Addressed in WMMP Sections 3.1, 3.5, and 3.10.3 (ERM 2022a)*
	ii) regular monitoring of wildlife use of the TSF and water quality in the TSF to determine whether the water quality in the TSF poses a health risk to wildlife; and *iii) measures to exclude wildlife from the TSF during periods of health risk for wildlife that are becoming habituated to using or drinking water from the TSF;*	Section 2.4
	l) the means by which the Holder will implement at least the following mitigation measures specific to the transmission line right of way and transmission line access roads: *i) after the transmission line is constructed, allowing the vegetation within the transmission line right of way to grow in order to minimize predator sight lines by maintaining limits of approach and, after vegetation has grown to one meter in height or more, not reducing the height of the plant community to any lower than one metre from ground level, unless the area is required for tower bases, guy anchor points or along existing access roads;* *ii) the means by which visual barriers will be created, as directed by a Qualified Professional, to reduce sight lines for predators along the transmission line right of way; and* *iii) a vegetation and access management plan for the transmission line right of way that sets out the timing and means by which all newly created access roads for the construction of the transmission line will be decommissioned and revegetated after they are no longer needed for Construction, the circumstances under which access may be re-established for maintenance and/or repairs of the transmission line, and the means by which roads re-opened for maintenance or repair activity will be*	*N/A – Addressed in WMMP Section 3.4 (ERM 2022a)*

Condition	Description	Section In Report
	decommissioned and revegetated following the maintenance and/or repair activities to meet the requirements in paragraphs l) i) and ii);	
	m) how the Holder will implement at least the following mitigation measures specific to road use: *i) establishing a 50 kilometres per hour speed limit on all Project Roads;* *ii) identifying wildlife corridors and/or habitual crossing areas that intersect Project Roads and install and maintain wildlife crossing signs where those wildlife corridors intersect the Project Roads;* *iii) identifying wildlife corridors and/or habitual crossing areas that intersect the Kluskus and Kluskus-Ootsa Forest Service Roads and describe how the Holder will identify those to FLNRORD and offer to install and maintain wildlife crossing signs where those wildlife corridors intersect the Kluskus and Kluskus-Ootsa Forest Service Roads; and* *iv) the means and timing by which the Holder will notify FLRNORD of carrion resulting from impacts with Project Vehicles on Project Roads and the Kluskus and Kluskus-Ootsa Forest Service Roads, and when safe to do so, remove the carrion to a suitable location where the carrion can serve as a food source for wildlife, as determined by a Qualified Professional, unless FLRNORD is not able to authorize that removal and relocation;*	*N/A – Addressed in WMMP Section 3.6 (ERM 2022a)*
	n) the means by which the Holder will, throughout all phases of the Project: i) record wildlife observations, wildlife mortalities observed, and significant interactions and/or conflicts between people and wildlife in the Project Area; ii) tabulate and submit the information recorded in paragraph n) i) to ENV, FLNRORD and Aboriginal Groups on an annual basis; and iii) report on identified risks to wildlife and/or people learned from such monitoring and how such risks will be addressed; and	Sections 2.3 and 3
	o) identify the project phase or phases applicable for each mitigation and/or management measure in the plan, including a rationale for why mitigation and/or management measures would not be applicable in a certain project phase or phases.	*N/A – Addressed in WMMP Sections 3 and 4 (ERM 2022a)*
	The Holder must provide the draft plan that was developed in consultation with EMPR, ENV, FLNRORD, ECCC, and Aboriginal Groups to EMPR, ENV, FLNRORD, ECCC, Aboriginal Groups, and the EAO for review a minimum of 60 days prior to the planned commencement of Construction or as listed in the Document Submission Plan required by Condition 10 of this Certificate.	*N/A – Completed as a part of the WMMP (ERM 2022a)*
	The plan, and any amendments thereto, must be implemented to the satisfaction of a Qualified Professional throughout Construction, Operations, Closure and Post-closure and to the satisfaction of the EAO.	*N/A – Ongoing as a part of the WMMP (ERM 2022a)*

APPENDIX B PRE-CLEARING BIRD NESTING SURVEY – STANDARD OPERATING PROCEDURE (SOP)

Blackwater Mine

Pre-Clearing Bird Nesting Survey

	STANDARD OPERATING PROCEDURE	ENVIRO-02
	November 2022	Version B.1
Scope of Work:	This SOP provides guidance for the avoidance of active upland bird, waterbird, and raptor nests during land clearing and construction of project infrastructure during sensitive breeding periods. It is intended for Environment personnel conducting pre-clearing surveys prior to land clearing and construction of project infrastructure.	
Contacts:	Jack Love, Environmental Manager Sarah Harrison, Environmental Superintendent	jlove@artemisgoldinc.com sharrison@artemisgoldinc.com
	Greg Sharam Technical Director, ERM	greg.sharam@erm.com 778-628-0974

1. INTRODUCTION

Development of the Blackwater Gold Project (the Project) including infrastructure, roads, and transmission corridors, will require the clearing of natural vegetation. The Project Wildlife Mitigation and Monitoring Plan (WMMP) follows the mitigation hierarchy to avoid, minimize, and mitigate effects of clearing:

- Avoid: clearing will primarily be completed outside of designated bird breeding and nesting seasons.
- Minimize/Manage: if clearing occurs during the bird breeding season, conduct pre-clearing surveys and establish buffers to avoid nests.

Birds and their nests are protected under provincial and federal legislation, such as the BC *Wildlife Act* (1996), the Canada *Migratory Birds Convention Act* (MBCA; 1994), and the Canada *Species at Risk Act* (SARA; 2002). Provincial and federal legislation prohibits the disruption or destruction of a bird, its nest, or eggs (Province of BC 1996; Government of Canada 1994) and protects designated species at risk (Government of Canada 2002). Environment and Climate Change Canada (ECCC) has developed the *Guidelines to reduce risk to migratory birds* (ECCC 2022), which provides recommendations on how to avoid or minimize risk to nesting and breeding birds. Implementation of pre-clearing nest surveys helps to ensure that all clearing activities align with current legislation.

1.1 Objectives

This Standard Operating Procedure (SOP) is intended to:

- Provide methodology for pre-clearing nest surveys to be completed prior to any clearing activities that are planned during designated bird breeding periods; and
- Provide mitigation to avoid potential impacts to nesting birds.

2. SEASONAL TIMING OF SURVEYS

Pre-clearing nest surveys outlined in this SOP will be completed when vegetation clearing is scheduled to occur during sensitive breeding periods designated for bird species occurring in the Project area (Table 1).

- Sensitive breeding periods for the Project area are designated for waterbirds and landbirds, raptors, northern goshawk, and Clark's nutcracker (Birds Canada, 2021).
- Nesting periods may be modified to address specific requirements of migratory bird species at risk or local species of concern.
- Breeding periods for birds can be impacted by weather and seasonal migration across regions. The periods detailed in Table 1 should be used as a guideline in determining when pre-clearing bird nest surveys should be completed.
    - Potential fluctuations in bird breeding activity will be considered by a Qualified Professional, particularly with regards to weather conditions (e.g. a late spring may delay the sensitive breeding period).

Table 1: Sensitive Breeding Periods Applicable to the Project Area

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Waterbirds and Landbirds				15				31				
Raptors – (general)			15					15				
Northern Goshawk		15							15			
Clark's Nutcracker			15					31				

Note: the date ranges of the nesting periods in the Table do not reflect the entire active nesting periods for all bird species as outlined in the Environment Canada Nesting Calendars (Birds Canada, 2021).

3. METHODS FOR PRE-CLEARING NEST SURVEYS

Pre-clearing surveys may include both aerial and ground-based surveys to ensure the identification of nests of various sizes and from different bird groups.

- Aerial surveys will be aimed at identifying larger nests such as raptor stick nests, while ground surveys are aimed at identifying songbird, waterbird, and cavity nests.
    - Some owl species are nocturnal and will require a different survey methodology (Section 3.3.4).
- Surveys will be led by a Qualified Professional that is knowledgeable and experienced in bird identification and behaviour, and completing bird nest surveys.
    - Additional survey crew assisting the lead will have a base knowledge in bird identification and be trained in or have experience conducting bird nest surveys.
- The survey team will establish a strong communication network with project personnel on-site conducting the clearing activities to ensure the survey team can easily inform construction crews on pre-clearing requirements and outcomes.

3.1 Indicators of Bird Breeding and Nesting

Many behaviors and visual signs are indicative of active breeding or nesting by birds in the area even if a nest is not initially identified. Generally, bird nests are well hidden or camouflaged to protect the nest from predators.

To best identify potential bird breeding in an area, survey teams will actively be looking for signs and behaviors that suggest nesting. Examples of signs and behaviors indicative of nesting occurring in the area include:

- Female flushed off of a nest (e.g., emerging suddenly from brush);
- Shorebirds displaying “broken-wing” behaviour;
- Birds defending a nest through behaviours such as alarm calls and acting aggressively to humans;
- Owls calling at night;
- Bird carrying nesting material;
- Bird carrying faecal sacs;
- Bird carrying food for young; and
- Birds feeding or rearing newly fledged young.

3.1.1 Determining Nest Status

Determining the status of a nest can typically be done by looking at the condition of a nest, and observing bird behaviour around the nest using binoculars at a safe distance to avoid nest abandonment.
Nest status will be categorized into the following three categories:

- Active: Nests with signs of new nest building (new branches or greenery) and presence of adults, juveniles, or eggs will be deemed as active.
- Inactive: Nests in poor condition or with visual signs that it hasn’t been recently used (e.g., presence of spider webs, ongoing decay of material with no other sign of use or repair) will be deemed as inactive.
- Potentially Active: Any nest that cannot clearly be deemed as active or inactive will be labeled as potentially active. Potentially active nests are nests that are generally in good condition but no bird presence or signs of breeding within were recorded. These nests require a second survey on a subsequent day prior to clearing to ensure they are truly inactive (see Section 3.1.1 for additional follow-up guidance).

3.1.2 Potentially Active Nest Follow-up

If an area was considered to be a “potential nesting location” or to have a “potentially active” nest, it can only be deemed inactive after a follow up ground survey of approximately 1 hr is conducted and no additional behaviors or signs suggesting active nesting or breeding are observed. Use the following framework to resolve potentially active nests:

- Revisit the location on a separate day;
- Conduct a ground survey of one hour, including a point count and spot mapping;
- For potentially active stick nests that cannot be observed from the ground, follow up surveys can be conducted by aerially revisiting the nest on two separate days;

- If an active nest or further signs of breeding (see above) are not recorded during the second survey on a separate day, the location will be classified as an inactive nesting location; and
- If at any point an adult bird displays aggressive behavior towards the surveyor, the surveyor should leave the area immediately and once clear of the area, the behavior should be recorded, and the nest recorded as “active”.

Ample distance should always be maintained between the surveyor and any identified nests. Surveyors should never touch or impede on nesting areas. To limit disturbance to nesting birds when an area is identified as a nesting area, but a nest has not been located, the area will be marked and buffered as a nesting location (Section 3.3, ECCC 2022).

3.2 Aerial Stick Nest Survey Methodology

Aerial surveys are optimal for the identification of larger nests, primarily raptor or heron stick nests. Stick nests are often positioned high in the tree canopy and can be difficult to see from the ground.

3.2.1 Pre-survey Planning

There are two survey components for the aerial stick nest methodology; an initial survey to determine potential nests during a period of high sightability (no leaves and some snow), and a second survey to confirm activity status immediately prior to clearing.

- Aerial surveys for stick nests should first be completed in the spring or earlier in the year, prior to leaf-out to increase the likelihood of seeing a nest, as deciduous trees have yet to grow their full summer foliage.
- Any potential nests identified during the spring survey will be re-surveyed prior to clearing activities. Follow-up ground or aerial surveys for nests deemed potentially active will be conducted within one week of the proposed start date for the clearing of the area.
- If the preliminary aerial surveys cannot be completed in the spring or earlier, they should be completed at least two weeks prior to commencement of clearing.

Any previously recorded stick nests or signs of raptor nesting will be compiled and continuously updated as additional surveys are completed. All members of the survey team will review this SOP, all datasheets, and the survey plan to ensure they are familiarized with the methods and standards outlined here.
The team will establish a survey path or plan prior to starting aerial surveys to ensure the whole survey area is being properly covered.

3.2.2 Survey Execution

Pre-clearing aerial surveys will follow RISC (2001) methodology for aerial stick nest surveys:

- Surveys will follow aerial grid or linear lines when appropriate, and the survey path will be recorded.
- An appropriate distance (at least 100m) from nests must be maintained at all times in order to limit any potential disturbance to nesting birds.
- Survey teams should ensure that locations with previously recorded stick nests within 300 m of the planned clearing area are revisited to confirm whether the nests are currently active.
- Data collection will include survey effort (i.e., temporal and spatial effort) and details on all identified stick nests, as outlined in Section 4.2.3.

Some raptor species return to the same nest in reoccurring years, and are therefore protected year-round by the British Columbia *Wildlife* Act (1996):

- Buffers around these nests should be followed regardless of the sensitive breeding period.
- A permit is required to remove or relocate empty nests.

3.3 Ground Nest Survey Methodology

Ground surveys are optimal for the passive identification of nests, primarily of smaller forest bird species and cavity nesters.

Three types of ground surveys are described in this SOP:

1. Variable Radius Point Count Survey (Section 3.3.2)
2. Spot Mapping Survey (3.3.3)
3. Owl Survey (Section 3.3.4)

3.3.1 Pre-survey Planning

Ground surveys will be completed prior to the commencement of clearing. Table 2 shows an overview of a timeline for pre-clearing surveys and the preferred length of time that clearing can be conducted post-survey.

- Clearing is preferred within 3 days of the survey during the nest initiation period (May and early June).
- Clearing is preferred within 5 days during the rest of the bird breeding period (July and August).
- However, clearing is allowed for up to seven days following the completion of both components of the ground survey:
  - Clearing planned to occur outside of this timeframe requires an additional ground survey to be completed.

Table 2: Example Survey and Clearing Schedule

Breeding Period Day:	1	2	3	4	5	6	7	8
Nesting initiation period	Survey 1	Survey 2						
Nesting period	Survey 1	Survey 2						

Table Legend	Pre-clearing bird surveys completed	Clearing is allowed	No clearing until a new pre-clearing survey is completed (Start at day 1)

- Surveys cover the proposed clearing area *and* an additional 100 m around the outer boundary.
- Site maps are used to predetermine survey transect and plot locations to ensure the whole survey area is being adequately covered.
- Point count plot and spot mapping surveys will occur at 200 m intervals along each survey transect. If transects are adjacent to each other, plot location will be staggered.
- Surveys are conducted within 4 hr of sunrise when birds are most active (RIC, 1999).
- Surveys are conducted only when the weather is fair (i.e., no rain, low winds, temperature at ~5 °C; RIC, 1999). Birds are less active and more difficult to detect in poor weather.

- Nocturnal owl surveys will occur along survey transects at 500 m intervals.
- Environment Staff will conduct pre-clearing surveys prior to commencement of construction activities if construction is to occur during an active timing window (Table1). Surveys will be repeated if clearing activities do not occur within the post survey clearing window (Table 2).

3.3.2 Point Count Survey

A point count survey will be conducted using the Variable Radius Point Count method at each location identified during planning, using the following methods (RIC, 1999):

- Surveys will be conducted twice for each location at least one day apart, to increase the chance of observing nesting behaviour.
- A standard point count radius of 100 m from the survey location will used.
- The surveyor will stand at each predetermined survey location and wait 2 minutes before beginning the survey to allow for bird activity to resume.
    - This waiting period can be used to quietly record data on weather and environmental conditions.
- A five-minute survey is completed at each point count survey location.
- All birds seen and heard, and any nesting behaviour observed during the survey will be recorded, including species ID, and their location relative to the surveyor estimated by 50 m intervals (i.e., 0 to 50 m, 50 to 100 m as outlined in the RIC 1999).
- If needed, surveying can continue beyond 5 minutes to ensure species identification and other information are confirmed.
- Point count survey data form is provided in Appendix A.

3.3.3 Spot Mapping Survey

After the completion of point count surveys, spot mapping surveys will be completed to further classify whether individuals observed during point counts are actively breeding and to locate/map breeding territories. Spot mapping surveys will be conducted following (RIC, 1999):

- Surveyors can quietly move around the survey area to get a better view of any potential nesting areas identified during the point count survey, but should attempt to be as quiet and non-impeding as possible to avoid disturbance.
- All individuals displaying nesting behaviour recorded during point count surveys will be further observed during spot mapping to confirm nesting.
- An attempt will be made to identify pairs of breeding birds (both male and female) and the associated nest. If a single male or female bird is identified, they will be further watched to determine presence of a partner and/or nest.
- If additional behaviours or signs indicative of breeding or nesting are not observed, it is recommended that the surveyor leave the area and observe the bird identified during the point count survey from afar with binoculars.
- If the surveyor is uncertain of nest presence after spot mapping, the location will be classified as a potential nesting area.
    - the surveyor will record the GPS location of the encounter area and what nesting signs were identified.

- The area will be re-surveyed on a following day (see Section 3.1.2).
- If the nest still cannot be located/identified (by a QP), the area should be marked and buffered (100 m) as a nesting location.

3.3.4 Owl Survey

Automated Recording Units (ARUs) will be deployed during pre-clearing surveys to determine use by nocturnal species not easily detectable during the day. ARU and deployment details are provided in Appendix B. Units will be deployed during daily pre-clearing surveys, then retrieved the following morning and re-deployed at the new day's locations:

- Units will be deployed in areas with suitable cavity nesting habitat at 500 m intervals along the ground survey transect line.

3.3.4.1 Deployment and Pick-up Timing

- On the first day, deploy units and leave them out overnight.
- On all subsequent days, retrieve the units in the morning prior to beginning the next pre-clearing area.
  - For each unit, open the cover and swap out the SD card to a fresh card.
  - Ensure that the new SD card is working and the programming schedule is intact.
  - Re-deploy the units at new sites during the day's pre-clearing work and leave out overnight.

3.3.4.2 Audio Data Listening

At the end of each day's pre-clearing field work, listen to the sound recordings from the previous day.

- Upload the recorded sound files to a laptop or hard drive where they will be safely stored.
- Open each sound file one by one and listen for the 5 minute duration. Each site should have 3 recordings for a total of 15 minutes.
  - To speed up the process, use a free spectrogram viewing program such as RavenLite or Audacity (free downloads available: https://ravensoundsoftware.com/raven-lite-downloads/ or https://www.audacityteam.org/download/).
    - Spectrogram viewers allow you to visualize the sound recordings; therefore, it is possible to see which recordings have sound and which are blank, without spending the entire listening time. It is also possible to select locations in the recordings with sound and listen to those portions only.
- Clear the SD cards once the files have been loaded on the computer to ensure files do not get mixed between sites.

3.3.4.3 Site Assessment at Detection Locations

Any locations where an owl is detected by ARU should be noted on the deployment data forms immediately. The location should be returned to the following day for a detailed check. This includes:

- Searching trees in the area for signs of wildlife/owls, including pellets and cavities.
- Knocking on larger diameter trees or snags which may serve as roosts.
- Utilizing playback for the detected species to elicit a reaction from owls in the area.
- Deploying an ARU unit for an additional night to determine if owl presence is consistent at the site.

4. NEST BUFFERS

If a nest is identified, a setback buffer will be established following a risk-based approach that considers the sensitivity of different bird groups, the risk of a planned activity disturbing birds and, and whether the activity is “Project critical”.

- Preferred buffers are listed in Table 3.
- A QP will determine what types of birds are present, the types of planned activity and risk of disturbance (e.g., storing material may have a low risk and have a smaller buffer, blasting and crushing rock would have a high risk of disturbing birds and require a larger buffer).
- Project critical activities are those typically associated with road construction to allow for the passage of equipment past the bird nest to continue road construction further up the alignment.

Table 3: Preferred Nest Buffer Sizes

Bird Species or Group	Preferred Buffer Size[1]
Songbirds including Ground Nesters	50 m Radius
Waterbirds	50 m Radius
Cavity Nesters (e.g., tree holes)	50 m Radius
Clark’s Nutcracker (VEC)	100 m Radius
Raptors (e.g., stick nests)	100 m Radius
Raptors (e.g., cavity nests for owls)	100 m Radius
Bald Eagle, Osprey, and Peregrine Falcon	200 m Radius
Golden Eagle and Northern Goshawk	500 m Radius

[1]: Determining of buffer size was informed by: Guidelines for Raptor Conservation during Urban and Rural Land Development in British Columbia 2013 (BC MFLNRO 2013); Buffer Zone and Setback Distances Recommendations (Environment Canada 2014b); and Develop With Care 2014: Environmental Guidelines for Urban and Rural Land Development in British Columbia (BC MFLNRO 2014b).

4.1.1 Flagging of Buffer Areas

Flagging tape will be used to designate buffer areas where clearing will be avoided, following these steps:

- Flagging tape will be used to indicate the buffer boundaries. A predetermined colour or colour combination should be used to avoid confusion of flagging meaning.
  - Flagging tape is commonly used to identify and mark numerous project related boundaries and is known to cause confusion when colours overlap between setback buffers and clearing/construction boundaries.
- A highly visible waterproof label will be attached to the flagging tape delineating the buffer boundary and will provide the following information: distance, direction, and general height of nest, the associated species, and the unique ID assigned to the nest.
  - The nest should never be flagged to avoid attracting predators.
- The outer boundary of the buffer should clearly indicate the boundary as to not be missed. If dense vegetation makes the boundary flagging difficult to see, flagging tape should be run as a barricade strip through that area.

4.1.2 Additional Monitoring of Active Nests

Follow up surveys are required to be completed throughout the sensitive breeding period at all active and potential nesting locations. Follow up surveys will track the status of the nest and breeding activities and indicate once the nest is deemed fully inactive.

- If a nest was previously marked active, but is inactive during the most recent survey, it should be re-surveyed immediately prior (within 7 days) of clearing to ensure the nesting area is in fact inactive.
- Ample distance should always be maintained between the surveyor and nest. Surveyors should never touch or impede on nesting areas.
- If the nest belongs to a raptor species that reuses nesting locations (see Section 3.2) the buffer will be maintained throughout the year.
    - A permit is required to remove or relocate raptor nests
- If the nest does not belong to a species known to return to nesting locations, the nest buffer can be removed once deemed inactive by two surveys conducted on different days.

4.2 Survey Prep and Data Management

4.2.1 Pre-field

- Review survey SOPs and methodologies.
- Review sensitive time periods for species of concern and associated protocols and SOPs for the surveys being conducted.
- Obtain current geo-referenced pdf maps (20k scale) - map features include roads, Fresh Water Atlas streams, wetlands and lakes), mine infrastructure, mine LSA and RSA boundaries, private and FN lands, on top of orthophotos.
- Any previously recorded nests or breeding activity recorded throughout the year will be compiled and will be continuously updated as additional surveys are completed. Any areas identified with potential breeding during prior surveys should be revisited to confirm breeding activity.

4.2.2 Field Gear

- GPS enable tablet loaded with maps (Avenza App), SOPs, Survey123 forms, bird visual and auditory ID resources.
- Backup battery for the tablet.
- Field notebook, pencils, sharpie.
- ARU units, extra batteries and SD cards.
- Hand held GPS unit, binoculars, compass.
- 50m measuring tape.
- Flagging tape (pre-determined colour(s)).

4.2.3 Data Collection

4.2.3.1 Survey Data

The following habitat data is collected at identified nesting sites:

- Survey date and start/end time;
- Transect ID and start location;
- Weather;
- Observation type, species and location;
- Photo details;
- GPS track of survey; and
- GPS waypoints.

4.2.3.2 Bird Nest Data

The following bird and nest data will be collected at each nest location:

- Species, life stage, and sex, where possible; and
- Photographs (without approaching the nest).

4.2.3.3 Monitoring Data

Monitoring nest status to determine activity:

- Date and time of monitoring;
- Nest status; and
- Estimated time required for nesting completion.

4.2.4 Deliverables

- Daily field reports detailing progress, issues related to field sampling and safety issues emailed to PM or designated receiver along with scanned Health and Safety Field Safety Meeting daily forms.
- Survey123 forms will be uploaded daily.
- Database will be updated with new nest locations and monitoring status of previously identified nest locations daily.
- Scanned copies of all field notes, digital copies of all field forms, photographs and all track and waypoint files will be uploaded to a pre-determined location (e.g., SharePoint).
- Short trip report summarizing field activities, methodologies, team, and objectives achieved, delays, issues, or concerns using the trip report template will be provided upon field program completion.

5. REFERENCES

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RIC. 2001. *Inventory Methods for Raptors: Standards for Components of British Columbia's Biodiversity No. 11. Version 2.0*. Prepared by Ministry of Environment, Lands and Parks Resources Inventory Branch for the Terrestrial Ecosystems Task Force Resources Inventory Committee (RIC): Victoria, BC.

APPENDIX A VARIABLE RADIUS POINT COUNT DATA FORM

VARIABLE RADIUS POINT COUNT DATA SHEET

Date (ddmmyy):	**Project:**	**BEC Subzone:**
Transect ID:	**Point Count ID:**	**Sky/Cloud Cover:**
UTM Easting:	**UTM Northing:**	**Waypoint number:**
Observers:		
Start Time:	**Wind:**	**Temp:**
Noise:	**Photo No:**	**General Habitat Description:**
Dominant Plants:		

Vegetation/Cover Type (%):

Habitat Type: % River: ____ ; % Wetland: ____; % Marsh: ____; % Pond: ____; % Lake: ____;

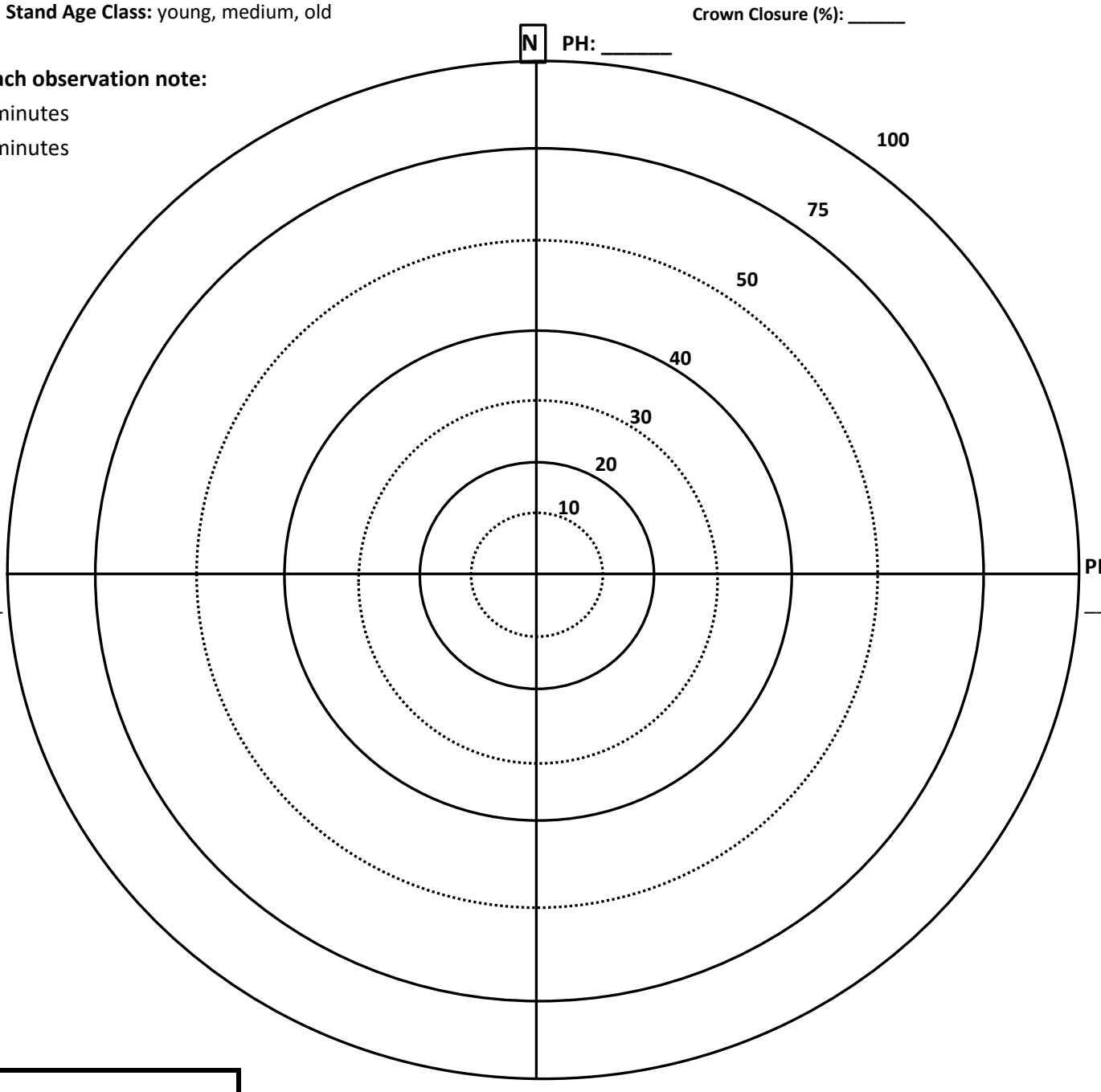
% Conifer Forest: _____; %Deciduous Forest: _____; % Mixed Forest: _____; % Mountain _____; % Tundra: _____

Stand Age Class: young, medium, old **Crown Closure (%): _____**

For each observation note:

0 - 3 minutes

3 - 5 minutes



Cues	
S = Song	**D** = Drum
C = Call	**V** = Visual

Comments:	**Flyovers** 10 20 30 40 50 75 100	**Nest predators:**
		ie. gull, raven, raptors
	Before/After Survey Birds	

Wind: 0-1 None. 2 Felt on face, leaves rustle. 3 Leaves and small twigs in constant motion. 4 Small branches in motion. 5 Tall trees sway (no survey)

Noise: 0 None. 1 Stream/noise heard. 2 Moderate noise, doesn't affect detections. 3 Loud/very loud noise and does affect detections (no survey)

Sky: 0 Clear or very few clouds. 1 Partly cloudy. 2 Mostly cloudy. 3 Fog/smoke. 4 Light drizzle. 5 Rain (no survey)

Vegetation/Cover Types: Trees,shrubs, forbs, grasses and sedges, mosses and lichens, and bare ground

APPENDIX B ARU DEPLOYMENT – OWLS

Wildlife Autonomous Recording Unit (ARU) Deployment

Nocturnal Owl Surveys

November 2022 Version B.1

1. INVENTORY LIST

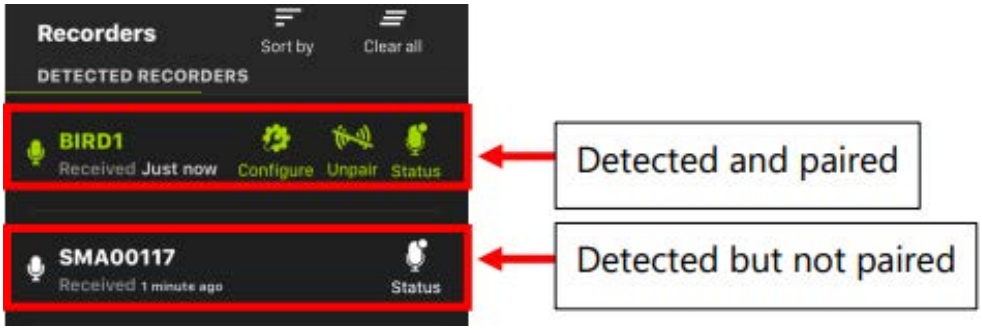
- 5 ARU units (SM minis).
- 30 AA batteries (4x AA batteries per unit, plus 10 extra) – lithium ion preferred.
- 12 SD memory cards (2 per unit for swapping during work, plus 2 extra).
- Bungee cords, zip ties, and/or cord for attaching units to trees/branches.
- WildlifeAcoustic's SM-mini User Guide.
- Song Meter Configurator app (download on any android/iOS blue-tooth enabled mobile device).

2. UNIT PROGRAMMING

Open the unit and input the AA batteries and memory card; turn on one unit at a time to set programming.

Settings and schedules must be set via the Song Meter Configurator app (available on android and iOS mobile devices).

- On the unit, hold the PAIR/STATUS button for 3 seconds to pair the Bluetooth.
  - Under the battery slots, the LED light for "Bluetooth" will show a green blinking light when it is trying to pair, and a solid green light when the unit is paired.
  - See Sections 3.2 and 4.5 of the User Guide for trouble shooting.
- The app should start on the Recorders screen:



- Once the device is paired, select "Status" and check that the SD card is empty and no errors are displayed.
- Navigate back to the Recorders screen and select "Configure" on the right of the screen. This is the configuration screen.
- Select "Acoustic settings":
  - Select "Maximum recording length" and change to 5 minutes:
    - Navigate back to the configuration screen. Then select "Location & time zone"; and

- Enter the Lat/Long coordinates for KSM: 56.497 N, -130.298 W. Click “Set” to the right of the lat/long entry boxes.

- Navigate back to the configuration screen. Then scroll down to the “Schedule” section.
  - Under START, select the boxes to read “Time” “+” and enter 22:00 (i.e., 10 PM).
  - Under DUTY CYCLE, select “Cycle” (instead of “Always”).
    - Set “Duty On” to 00:05 and “Duty Off” to 00:55.
  - Under END, select the boxes to read “Time” “+” and enter 00:00 (i.e., 12 AM).
- Check that the LED status light (under the batteries) labelled “Recording” shows solid green.
- Navigate back to the Recorders screen. Unpair the current unit but leave it on (the unit will go to sleep until it is time to record).
- Turn on the next unit and repeat all steps in this section.

3. DEPLOYMENT LOCATIONS

3.1 Overview

Units will be deployed during daily pre-clearing surveys, then retrieved the following morning and re-deployed at the new day’s locations. Audio data should be listened to each day, and any sites which have owls detected should be returned to for a detailed search, described below.

- Deploy units across the daily 3 km pre-clearing survey area at 500 m intervals, placed at the center line of the ROW.
  - Therefore, the first unit will be placed at each day’s 500 m mark, and the last unit will be placed at the 2.5 km mark.
- Ensure the deployment data form is completed for each site.

3.2 Deployment and Pick-up Timing

- On the first day, deploy units and leave them out overnight.
- On all subsequent days, retrieve the units in the morning prior to beginning the next pre-clearing area.
  - For each unit, open the cover and swap out the SD card to a fresh card.
  - Open the Configurator app and pair the device (following steps in Section 2) to ensure that the new SD card is working and the programming schedule is intact.
  - Re-deploy the units at new sites during the day’s pre-clearing work and leave out overnight.

3.3 Audio Data Listening

At the end of each day’s pre-clearing field work, listen to the sound recordings from the previous day.

- Upload the recorded sound files to a laptop or hard drive where they will be safely stored.
- Open each sound file one by one and listen for the 5 minute duration. Each site should have 3 recordings for a total of 15 minutes.

- To speed up the process, use a free spectrogram viewing program such as RavenLite or Audacity (free downloads available: https://ravensoundsoftware.com/raven-lite-downloads/ or https://www.audacityteam.org/download/).
    - Spectrogram viewers allow you to visualize the sound recordings; therefore, it is possible to see which recordings have sound and which are blank, without spending the entire listening time. It is also possible to select locations in the recordings with sound and listen to those portions only.

- Clear the SD cards once the files have been loaded on the computer to ensure files do not get mixed between sites.

3.4 Site Assessment at Detection Locations

Any locations where an owl is detected by ARU should be noted on the deployment data forms immediately. The location should be returned to the following day for a detailed check. This includes:

- Searching trees in the area for signs of wildlife/owls, including pellets and cavities.
- Knocking on larger diameter trees or snags which may serve as roosts.
- Utilizing playback for the detected species to elicit a reaction from owls in the area.
- Deploying an ARU unit for an additional night to determine if owl presence is consistent at the site.

APPENDIX C PRE-CLEARING WILDLIFE FEATURES SURVEY – STANDARD OPERATING PROCEDURE (SOP)

Blackwater Mine

Pre-Clearing Wildlife Features Survey

	STANDARD OPERATING PROCEDURE	ENVIRO-03
	November 2022	Version B.1

Scope of Work:	This SOP provides guidance for the completion of pre-clearing surveys for the identification of wildlife features for bats, bears, ungulates and furbearers. It is intended for Environment personnel conducting pre-clearing surveys prior to land clearing and construction of project infrastructure.	
Contacts:	Jack Love, Environmental Manager Sarah Harrison, Environmental Superintendent	jlove@artemisgoldinc.com sharrison@artemisgoldinc.com
	Greg Sharam Technical Director, ERM	greg.sharam@erm.com 778-628-0974

1. INTRODUCTION

Development of the Blackwater Gold Project (Project) including infrastructure, roads, and transmission corridors, will require the clearing of natural vegetation. The Project Wildlife Mitigation and Monitoring Plan (WMMP) includes mitigation, following the mitigation hierarchy:

- Avoid: clearing will primarily be completed outside of sensitive timing windows for habitat features such roosts, dens, and mineral licks; and
- Minimize/Manage: if clearing occurs during the sensitive periods, conduct pre-clearing surveys and establish buffers to avoid disturbance.

This SOP describes methods for conducting pre-clearing surveys for important wildlife features such as dens, roosts, and mineral licks. Pre-clearing survey methodologies for other important wildlife features such as nests and amphibian breeding ponds are described in the Pre-Clearing Surveys for Bird Nests SOP (ENVIRO-02) and in the Amphibian Salvage and Relocation SOP (ENVIRO-01).

Pre-clearing surveys for wildlife habitat features outlined in this SOP will be completed anytime vegetation clearing is scheduled to occur during sensitive periods designated for wildlife species occurring in the Project area (Table 1-1). Sensitive periods for the Project area are designated for bats, furbearers, and ungulates (BC MFLNRO 2014).

Table 1-1: Wildlife Features and Sensitive Periods Applicable to the Project Area

Species Group	Species	Habitat Feature	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Bat	Little Brown Myotis and Northern Myotis	Day or Maternity Roost												
		Hibernaculum												
	All	Den												

Species Group	Species	Habitat Feature	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Furbearer	Fisher	Den												
	American Marten	Den												
	Wolverine	Den												
	Black and Grizzly Bear	Den												
Ungulate	Caribou	Mineral Lick												
	Moose													

2. PRE-CLEARING SURVEYS FOR WILDLIFE FEATURES

A qualified professional that is knowledgeable and experienced in identification of important wildlife features and habitat will lead surveys. Additional survey crew assisting the lead will have a base knowledge in feature identification and will be trained in, or have experience conducting pre-clearing surveys. The survey team will establish a strong communication network with project personnel on-site conducting the clearing activities to ensure the survey team can easily inform construction crews what the pre-clearing surveys include, why they are required, and the proper protocol for features identified during surveys.

2.1 Bat Surveys

Resources on bat species distributions and habitat preferences are available from the BC Community Bat Program (https://www.bcbats.ca/index.php/bat-basics/bc-bat-species). Pre-clearing surveys should be conducted in suitable habitat even if bat occupancy was not previously confirmed at a particular site.

The first choice for minimizing risks to bats is to avoid clearing during May - September in areas with old growth tree snags that may be used by bats as summer roosts, or during hibernation periods (October – May) around features identified as potential hibernacula (e.g., karst landscapes, caves, etc.). If clearing is planned in these areas during sensitive timing windows, then pre-clearing surveys will be conducted.

2.1.1 Features

Two types of habitat features are important for bats: summer roosts and winter hibernacula.

2.1.1.1 Roosts

Bats have day, night, and maternal roosts (where females congregate with young) and include the following features:

- Trees similar to those used by raptors and woodpeckers for nesting; and
- Structural stage 6 and 7 old growth trees, including snags with cavities or loose bark for shelter.

These areas typically occur in low elevation riparian or flood plain forest habitat.

Terrestrial ecosystem mapping and other imagery will be used to identify forested areas that may have mature trees, and the areas can be visually inspected for suitable roost trees and/or signs of bat use (Table 2-1).

Table 2-1: Tree Features Bats Use for Roosting and Indicators of Use

Features of Trees Used as Bat Roosts	Signs Indicating Possible Use by Bats
■ Natural holes ■ Woodpecker holes ■ Cracks/splits in major limbs ■ Loose bark ■ Hollows/cavities ■ Dense epicormic growth (bats may roost within it)	■ Tiny scratches around entry point ■ Staining around entry point ■ Bat droppings in, and around or below entrance ■ Audible squeaking at dusk or in warm weather ■ Flies around entry point ■ Distinctive smell of bats ■ Smoothing of surfaces around cavity

Adapted from Hundt (2012)

2.1.1.2 Hibernacula

Habitat features with the potential to be hibernacula often include the following:

- Caves that provide a damp and relatively warm environment through the winter (any karst material can be mapped prior to heading out in the field);
- rock or cliff crevices;
- Large root balls; and
- abandoned mines.

Signs of bat presence prior to hibernating at potential sites include:

- the presence of guano;
- urine or body oil stains; and
- discarded food items.

2.1.2 Survey Methods

Pre-clearing surveys will be conducted for roosts in the spring/summer, and for hibernacula in the fall/winter. Methods involve a combination of auditory and visual surveys within the disturbance area and 1 km around this area for potential bat hibernacula. Survey data collection requirements are detailed in Section 4.3.

2.1.2.1 Auditory Surveys

Auditory surveys using automated recording devices (ARUs) can document bat activity. Automated recorders are programmed to record bat sounds between sunset and sunrise and deployed in identified or potential roost habitat or outside of possible hibernacula entrances in early or late hibernation periods to pick up activity of bats entering or exiting the hibernacula.

Weather conditions can influence bat activity and should be taken into consideration when analysing ARU data. Rain can prevent bats from foraging and dry spells following rain can influence longer foraging periods (J. Collins (ed.) 2016).

Size of the area to surveyed should also be taken into consideration when conducting these surveys. An ARU's listening range is between 30 and 100m, depending on the loudness of the bat call. For hibernaculum, one unit set up near the feature is adequate. For roosting surveys, surveys should consist of one unit per hectare (100 m x100 m).

Setting up the ARUs involves the following steps:

- Program the ARUs
  - Utilize the ultrasonic microphone for recording bat calls.
  - Set timer to record calls between sunset and sunrise.
  - Can set to record for 5 minutes every hour to limit the amount of collected data.
- Select the location
  - Deploy the ARU in the area to be cleared (1 unit/ha).
  - If the area is large, you can minimize the number of units deployed by selecting a location with roosting or feeding attributes (wetland edge, opening).
- Deploy the ARUs
  - Ensure the unit programmed and turned on.
  - Attach the unit to a tree at head height using zip strips or bungy cords.
  - If using an older SM3 model, attach the microphone to a branch so it is pointing out and slightly upwards.
  - If using the mini model, ensure the ultrasonic mic is facing outward.
  - Flag the tree, keeping the flag tails away from the mic.
  - Record the weather conditions (past, present and forecasted).
- Determine presence
  - Follow the ARU guide (Appendix A) to analyse the recorded calls.
  - If bats are detected, return to the site for additional surveys and applying the setback buffers (Table 2-2).

2.1.2.2 Visual Surveys

Suitable roosting habitat areas are also visually surveyed for current occupancy.

- Observers survey by foot along transect lines;
- Transect widths will depend in forest conditions and are spaced so potential roosting trees or hibernating structures can be identified;
- A ground level assessment is conducted along the transect to identify signs of bat activity (Table 2-2; J. Collins (ed.) 2016);
- Once identified, a detailed inspection is completed from the ground level. Trees are inspected consistently around all parts from all angles and from both close to the trunk and further away;
- Features identified as potential hibernacula are inspected for signs of bat use including the presence of guano, urine or body oil stains, and discarded food items. If no sign is identified an ARU should be deployed to determine use; and
- A flashlight and binoculars can help identify more detail. Inspections should be carried out in in daylight conditions and can be conducted in conjunction with bird surveys if seasonally timed.

Table 2-2: Habitat Feature Buffer Distances for Bats

Bat Habitat Feature	Setback Distance for Low Impact Activity (m)	Setback Distance for Higher Impact Activity (m)
Day/Night Roost Sites	100 m	300 m
Maternal Roost Sites	300 m	1 km
Hibernacula	300 m	1 km

Adapted from BC MFLNRO (2014); BC MOE (2020). Species of conservation concern may require larger buffer areas

Areas with identified bat roosting activity will be buffered by a minimum of 100 m (Table 2-2). Buffer distances may be higher for certain activities (e.g., blasting) or more sensitive species. Roosting areas can be checked periodically (e.g., once per week or two weeks) to determine if bats have vacated the roost site. Work may proceed when bats are no longer occupying the area.

Hibernacula and maternal roosts require greater buffer distances because bats are particularly sensitive during these periods. Specific management plans should be created to moderate activity occurring within 1 km if occupied hibernacula or maternal roosts are identified, to ensure ongoing viability of the habitat (BC MOE 2020). These sites should not be destroyed or disturbed even when inactive, because they are re-used between years. Buffer distances should be documented, along with any monitoring of areas for ongoing activity (Section 4).

2.2 Den Surveys

Surveys are required to look for den sites for American marten, black bear and grizzly bears, fisher, and wolverine within the area of disturbance and an additional 100 m outside of the clearing boundary.

2.2.1 Den Identification

2.2.1.1 Grizzly and Black Bear

Grizzly bear ground dens are typically located in the following areas:

- On moderate to steep (40–90%) mountain slopes in alpine, subalpine, or montane environments;
- Cooler north or east-facing aspects where insulating snow accumulations are greater;
- In flat topography, ground dens may be located on high spots or small knolls, as the sides of these features provide easier digging conditions;
- Where conditions are optimal (i.e., slope, soil texture, aspect, snow cover, security), more than one Den site may be found in a relatively small area (1– 2 ha); and
- Grizzly bears may use these areas year after year as hibernation sites.

Black bear dens are found in the following areas:

- In valley-bottom environments on the forest floor;
- Under root mats and fallen logs or in hollow tree cavities; or
- Black bears will excavate ground dens in areas with suitable soil substrates.

In general, grizzly bear ground dens usually have larger entrances and larger inside chambers than the dens of black bears. Things to look for when identifying a bear den:

- Ground den entrances of a grizzly bear is usually about 75 cm in diameter;

- Grizzly bear den chambers may be 150–225 cm in diameter with a height of 125 cm and are usually lined (some may be unlined) with shrub branches, tree boughs, duff, or grass;
- Hair is often visible at the den entrance and in bedding material;
- Because the grizzly bear's long front claws and powerful shoulder muscles adapted for digging, many dens are excavated. In these cases, large piles of soil, rocks, or wood (called a "porch") are found downslope of the den entrance;
- Fresh material, with little or no vegetation growing on a debris pile, may indicate a freshly dug den;
- Black bears often den in large diameter (>1 m) trees or wooden structures derived from trees (logs, root boles and stumps);
- Unexcavated dens are often located under root wads of large trees and occasionally in sheltered, dry caves or rock cavities;
- Den sites are often most visible in spring during snowmelt when soil from the den gets tracked onto the surrounding snow; this enhances snowmelt immediately around the den (i.e., the den area becomes more visible in contrast to the adjacent snow); and
- Tracks in the snow or trails on the ground may lead to or from den site in late fall or at the end of the hibernation season in spring; however, during hibernation, bears do not leave the den so there will not be any visible tracks.

2.2.1.2 Fisher

Female fishers require large diameter trees with cavities to birth and raise their young.

- Fishers use cottonwood, balsam poplar, trembling aspen, Douglas-fir, and lodgepole pine as den trees in BC;
- Trees generally have extensive heart-rot forming large internal cavities while the tree is still living. Other trees, such as spruce, also get heart-rot, but don't maintain the hard exterior shell that preserves the standing tree and cavity for many years;
- The minimum tree diameter depends on the tree type, but is generally large for the particular tree species;
- They will only use cavities (~25 to 30cm d) with entrance holes that are approximately 8 to 12 cm in diameter: large enough for them to squeeze into, but small enough to keep larger predators away from their kits;
- Den trees also need to have other trees and shrubs around them to allow the female approach her den unseen; and
- Multiple cavities are usually required to accommodate the growing kits.

2.2.1.3 Wolverine

Wolverines are known to den in alpine, subalpine, taiga, boreal forest, and tundra habitats. A critical feature of wolverine denning habitat is the dependability of deep snow throughout the denning season (February-May).

- Snow greater than 1 m deep, distributed uniformly or accumulated in drifts, provides protection from cold temperatures;

- Long, complex snow tunnels in hardened snowdrifts characterize den sites in tundra and alpine areas, and in some cases, the tunnels lead down to entrances under boulders that provide additional protection for kits; and
- In forested areas where snow is deep and soft, dens are located under fallen trees or boulders that provide added structure to the den, preventing snow tunnels from slumping (Wolverine Foundation 2022).

There are two types of reproductive dens:

- Natal Dens:
  - In forested habitats, natal dens are often located under fallen trees, either under a single large tree that has fallen or a group of trees that have blown down or been sheared off by an avalanche; and
  - The trees are covered with deep snow and dens are formed in snow tunnels that incorporate subnivean spaces under the tree trunks.
- Maternal Dens:
  - Sites used for maternal dens are often close to the natal den and have similar structure, although the distance between the natal den and maternal den can be 3-4 km away.

2.2.1.4 American Marten

Forests with old growth structure provide martens with places for resting and denning. Winter resting dens tend to be at ground level under logs, root masses, brush piles, and rock jumbles.

Dens are classified as either natal dens, where parturition takes place, or maternal dens, where females move their kits after birth. Denning structures and sign include:

- Dens sites are often identified with trails radiating out from such habitat elements;
- Cavities in standing dead or live trees that are more than 35 cm diameter;
- Branches, cavities or broken tops of live trees, snags, stumps, logs;
- Woody debris piles, rock piles; and
- Red squirrel nests or middens.

2.2.2 Survey Methods

Den surveys are best completed when done in two stages, particularly when the survey area is large or complex. A pre-aerial survey is conducted first to identify areas to conduct ground surveys. The ground survey is then completed in the areas identified.

1. A pre-aerial survey is used to delineate habitat types and to determine where to focus efforts. This is helpful when the survey area is large and it will take considerable time to caver the entire area on the ground. The survey will consist of flying along transects approximately 40 km/h at approximately 50 m above ground level, with surveyors looking for habitat features within 100 m on either side of each transect.
2. A ground survey will be conducted in areas that were identified during the aerial reconnaissance survey as areas that contain potentially suitable denning habitat for bears and furbearers, such as mature deciduous or coniferous trees potentially containing cavities or snags with hollow cores.

Ground Survey methods include:

- The den surveys will be completed on foot, walking transect lines spaced no more than 25 m apart;
- Tree decay class from decay class 1 to 9 will be noted as outlined in Maser et al. (1979); live trees are classed as decay classes 1 and 2 while hollow snags are considered in later stages of decay (e.g., classes 6 and 7);
- Root wads, blowdown trees, and coarse woody debris will be evaluated for the potential for subnivian dens;
- Observers will conduct a visual search of potential den trees for presence of cavities and other characteristics suggestive of active den sites (e.g., scratch marks created by furbearers climbing up and down trees, scat, tracks in the snow, and hair);
- Potential cavities at higher levels in the canopy will be visually inspected with binoculars from the ground for evidence of use;
- Presence and habitat use by any potential prey species for furbearers will also be noted;
- Infrared remote and forward-looking Infrared (FLIR) cameras can be used to confirm suspected den locations:
    - It should be noted that denning locations that are covered by rock, thick layers of debris, or deep into the ground cannot be confirmed “not active” if nothing is detected with the FLIR; and
- Den activity must be determined by a qualified person knowledgeable and experienced in feature and important wildlife habitat identification.

2.2.3 Mitigation and Buffers for Dens

Active den sites will be buffered using the setback distances listed in Table 2-3. These are different for different species and based on the denning activity (hibernation vs maternal).

Table 2-3: Habitat Feature Buffer Distances for Dens

Species	Setback Distance for Low Impact Activity (m)	Setback Distance for Higher Impact Activity (m)
Black Bear	100	200
Grizzly Bear	100	200-1000
Fisher	250	500
Wolverine	250	500
American Marten	100	100

Adapted from BC MFLNRO (2014); BC MOE (2020). Species of conservation concern may require larger buffer areas

Many animals (bats, ground squirrels) undergo true “hibernation” where their body temperature drops and they cannot be woken up unless they are warmed up. Bears, however, are not true hibernators and are instead in a deep sleep and can be woken by loud noises or vibrations. Hence the need for management in the 100 m buffer surrounding the den for low impact activities.

Low-risk activities are allowed in “limited work” zones, defined as activities with reduced chance of waking a bear up or disturbing newly emerged bears due to noise and vibration.

- If a bear den is detected, a 100 m buffer will be set and maintained around the den site until it is confirmed the bears have emerged, no longer use the den and have left the area;

- Only limited work may occur inside the buffer and at least 50 m from the den site; and
- Limited work includes moving machinery through the area and conducting critical clearing to enable movement. Work within 50 m of the den site and all high and moderate risk works must be deferred until the dens are no longer occupied.

Note: Its not always evident that the den is empty. Also, if the den was occupied by a sow with cubs, the cubs could still be in the den even if the sow is out. Additionally, the bears may be emerged but still use the den until they are ready to move on. If a sow is disturbed she may temporarily leave the den site, coming back to get her cubs when she feels its safe.

2.3 Mineral Lick Surveys

Habitat features such as mineral licks are important and require specific management. Licks are used by ungulate species to compensate for mineral deficiencies and imbalances; as well as potentially decreasing the influence of toxic plant compounds. Mineral licks are relatively rare on the landscape and may be used annually by multiple species of ungulate or multiple individuals of a single species. Ungulates typically use mineral licks in the spring and early summer, and can travel more than 1 km away from security habitat to reach them (Roy et al. 2004).

Buffer zones are used to mitigate disturbance to licks and should be assigned by a wildlife biologist with local species knowledge based on the importance of the lick to the wildlife species using it, the intensity of use, and the occurrence of similar features across the landscape. Lick protection guidelines encompass lick site trail networks, hydrological features, nearby thermal and security cover, and adjacent foraging sites (Roy et al, 2004; Wiles and Weeks 1986).

2.3.1 Mineral Lick Identification

Some mineral licks are easily recognizable by their exposed crystallization, which shows as white or colourful deposits. Other mineral licks are nondescript and are easily overlooked, only appearing as bare soil areas or muddy seepages. Most mineral licks will have visible, well-used wildlife trails that typically radiate out in multiple directions from the mineral lick (Roy et al. 2004).

Mineral licks often occur naturally and provide important nutrients such as sodium, calcium, iron, phosphorus and zinc, which are required for building bone and muscle. There are two visually distinct types of licks including wet and dry:

- Wet licks are usually associated with groundwater springs and develop into muddy clearings used mainly by moose;
- Dry licks are often associated with steep, well-drained slopes, and are used by mountain ungulates. They include dry earth exposures, such as clay or lacustrine deposits, often found above river cut banks and rock face mineral licks;
- Numerous tracks in conjunction with well-defined trails converging at one spot are good indicators of a wet or dry mineral lick; and
- Bare soil areas associated with most mineral licks are usually covered in animal tracks that can help identify the wildlife species using the mineral lick.

2.3.2 Mitigation and Buffers for Mineral Licks

Upon discovery of a mineral lick, the lick, and associated trails and features will be accurately mapped to allow for appropriate disturbance setbacks. Guidelines indicate a 250 m to 1 KM buffer may be required depending on lick significance. Preffered setbacks are listed in Table 2-4.

Table 2-4: Preferred Buffer Distance for Mineral Licks

Mineral Lick Significance (as determined by QP)	Setback Distance for Mineral Lick (m)	Setback Distance for Access Trail (m)	Setback Distance for Associated Hydrological Features
Non-Significant	Min 250	TBD	TBD
Significant	Up to 1000	100	100

A Significant lick is one that is naturally occurring and is used at least annually by one or more species (BC MFLNRO 2014) as evidenced by:

- Well established or braided trial leading to the site;
- Extensive excavating or trampling; and
- Teeth marks, hair, pellets and tracks.

2.3.3 Survey Methods

Two surveys will be conducted for mineral licks:

1. **An aerial survey** will be conducted over the clearing area to look for important features such as wetlands, cliffs, trails, and mineral licks. The survey will consist of flying along transects approximately 40 km/h at approximately 50 m above ground level, with surveyors looking for habitat features within 100 m on either side of each transect.
2. **A ground survey** will be conducted in areas that were identified during the aerial reconnaissance survey as possibly supporting mineral licks. The surveys will be completed on foot walking transect lines spaced no more than 25 m apart. All trails in a suspected lick area will be followed and tracked. All wildlife sign will be recorded. If a lick is identified, the lick boundary will be mapped and fully described with photos. Upland features will also be described.

3. BUFFERS

If a feature is identified, a setback buffer will be established following a risk-based approach that considers the species sensitivity and associated risk due to the planned activity. Preferred buffer sizes are listed in each survey section and summarized in Table 3-1.

Table 3-1: Preferred Buffer Sizes

Wildlife Species	Wildlife Habitat Feature	Preferred Buffer Size (m)
Bat	General Day Roost	100-300
	Maternity Roost	300-1000
	Hibernacula	300-1000
Black/Grizzly Bear	Den	100-200
Marten	Den	100
Fisher	Den	250-500
Wolverine	Den	250-500
Ungulate (moose, caribou)	Mineral Lick	250-1000

3.1 Flagging of Buffer Areas

Flagging tape will be used to designate buffer areas where clearing will be avoided, following these steps:

- Flagging tape should be used to indicate the buffer boundaries. A predetermined colour or colour combination should be used to avoid confusion of flagging meaning.
- A waterproof label will be attached to the flagging tape and will provide the following information: distance, direction, and general height of the feature, the associated species, and the unique ID assigned to the feature when initially identified. The feature itself should not be flagged to avoid predation marking.
- The outer boundary of the buffer should clearly indicate the boundary as to not be missed. If dense vegetation makes the boundary flagging difficult to see, flagging tape should be run as a barricade strip through that area.

4. SURVEY PREP AND DATA MANAGEMENT

4.1 Pre-field

- Review survey SOPs and methodologies;
- Review sensitive time periods for species of concern and associated protocols and SOPs for the surveys being conducted; and
- Obtain current geo-referenced pdf maps (20k scale) - map features include roads, FWA (streams, wetlands and lakes), mine infrastructure, mine LSA and RSA boundaries, private and FN lands, on top of orthophotos.

4.2 Field Gear

- GPS enable tablet loaded with maps (Avenza App), SOPs, Survey123 forms, bird visual and auditory ID resources;
- Backup battery for the tablet;
- Field notebook, pencils, sharpie;
- ARU units, extra batteries and sd cards;
- Hand held GPS unit, binoculars, compass; and
- 50m measuring tape and flagging tape (pre-determined colour(s).

4.3 Data Collection

4.4 Survey Data

The following habitat data is collected at identified features:

- Survey date and start/end time;
- Transect ID and start location;
- Weather;
- Observation type, species and location

- Photo details;
- GPS track of survey; and
- GPS waypoints.

5. DELIVERABLES

- Daily field reports detailing progress, issues related to field sampling and safety issues emailed to PM or designated receiver along with scanned Health and Safety Field Safety Meeting daily forms;
- Scanned copies of all field notes, digital copies of all field forms, photographs and all track and waypoint files will be uploaded to a predetermined sharepoint site;
- Short trip report summarizing field activities, methodologies, team, and objectives achieved, delays, issues, or concerns using the trip report template will be provided upon field program completion; and
- All surveys, features, monitoring and mitigation activities will be reported in the Wildlife Mitigation and Monitoring Program (WMMP) annual report.

6. RESOURCES

ARU data collection Info: How Far Can Your Wildlife Acoustics Microphone… | Wildlife Acoustics

ARU user guide: User Guides: Recorders & Software | Wildlife Acoustics

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APPENDIX D PRE-CLEARING AMPHIBIAN SALVAGE AND RELOCATION PROCEDURES FOR LAND CLEARING, PRE-CONSTRUCTION, AND CONSTRUCTION – STANDARD OPERATING PROCEDURE (SOP)

Blackwater Gold Project

Pre-clearing Amphibian Salvage and Relocation Procedures for Land Clearing, Pre-construction, and Construction

STANDARD OPERATING PROCEDURE	ENVIRO-01
December 2022	Version B.1

Scope of Work:	This SOP provides guidance for the avoidance of active amphibian breeding identified during land clearing and construction of project infrastructure from April through September. It is intended for Environment personnel conducting pre-clearing surveys prior to land clearing and construction of project infrastructure.	
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	Jack Love, Environmental Manager Sarah Harrison, Environmental Superintendent	jlove@artemisgoldinc.com sharrison@artemisgoldinc.com

1. INTRODUCTION

Federal Decision Statement Condition 8.11 requires Blackwater Gold (BW Gold) to have a qualified individual salvage and relocate western toads (*Anaxyrus boreas*) to suitable habitat prior to clearing activities if clearing is occurring at a breeding site during the sensitive breeding period (April 1 to September 30).

The mine area is known to overlap with active toad breeding sites. Surveys conducted in 2021 and 2022 identified breeding areas as well as habitats where breeding may occur. Additional incidental breeding areas may include sumps, open wells, and ditch/puddle type habitats that result from mine activities and occur throughout the mine area.

This Standard Operating Procedure (SOP) describes amphibian relocation ("salvage") if pre-clearing surveys or incidental observations identify amphibians at any life stage in or adjacent to a site identified for clearing or construction.

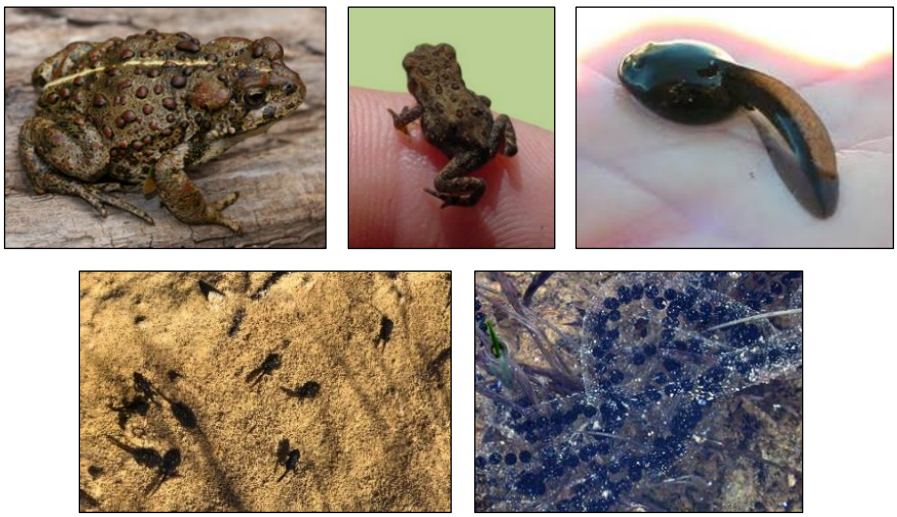


Plate 1-1: Life stages of western toad. From left to right: adult, toadlet, tadpole (larval), tadpole and metamorph, and egg.

2. APPROACH

As a condition of Federal DS Condition 8.10 and 8.11 issued for this Project, surveys for western toad are required prior to commencing clearing or site preparation if construction commences during the breeding period for this species. Consistent with the Wildlife Mitigation and Monitoring Plan (WMMP), Project-related impacts on amphibians and their habitats will be avoided, to the extent practical.

When avoidance is practical, it will be accomplished by adjusting the site of an activity, using alternative methods, adjusting the timing or schedule of an activity, or ceasing an activity altogether. As described in DS Condition 8.10, avoidance will include no-work buffers surrounding known breeding ponds and taking into account *BC Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia* (BC MOE 2014), which recommends a 30-150 m buffer zone. The site-specific buffer zone will be determined by a Qualified Professional based on a risk assessment of the location, planned activities at the site, and mitigation (e.g., altering activities).

When disturbance of amphibian habitats cannot be avoided, amphibian salvage and relocation will be implemented by a qualified individual under the guidance of a Qualified Professional, in consultation with Environment and Climate Change Canada (ECCC) and Indigenous groups.

- Qualified individual means someone who, through education, experience and knowledge relevant to a particular matter, may be relied on by the Proponent to provide advice within his or her area of expertise. Knowledge relevant to a particular matter may include community and Indigenous traditional knowledge (DS CEAA 2012).
- Qualified Professional means a person who has training, experience and expertise in a discipline relevant to the field of practice set out in the condition, and who is registered with the appropriate professional organization in British Columbia, is acting under that organization's code of ethics and is subject to disciplinary action by that organization (DS CEAA 2012).

2.1 Reference Documents

Salvage and relocation methods will take into account:

- Guidelines for Amphibian and Reptile Conservation during Urban and Rural Land Development in British Columbia (BC MOE 2014);
- Best Management Practices for Amphibian and Reptile Salvages in British Columbia (BC MFLNRORD 2016);
- Inventory Methods for Pond-breeding Amphibians and Painted Turtle, Version 2.0 (RIC 1998a);
- Salvage and relocation activities will also adhere to prescribed methods and hygiene protocols provided by the provincial government and the Canadian Council on Animal Care (CCAC) (i.e., RIC 1998b; CCAC 2003; CCAC 2004; CCAC 2021, BC MOE 2008);
- Best Management Practices for Amphibian and Reptile Salvages in British Columbia (BC MFLNRORD 2016);
- Guidelines on the care and use of wildlife (CCAC 2003), the Canadian Council on Animal Care: Species-specific recommendations on amphibians and reptiles (CCAC 2004), the CCAC Guidelines on: Amphibians (CCAC 2021); and
- Live Animal Capture and Handling Guidelines for Wild Mammals, Birds, Amphibians & Reptiles, Version 2.0 (RIC 1998b).

3. OBJECTIVE

The objective of Amphibian Salvage and Relocation is to avoid accidental injury or mortality to amphibians that may result from Project activities (including vegetation clearing, ground disturbance, and construction).

3.1 Species Conservation Status

Amphibian species are subject to provincial wildlife regulations, and Red- and Blue-listed species may be subject to the *Species at Risk Act* (SARA; Government of Canada 2002). Broad habitat and species protection measures in the BC Forest and Range Practices Act (BC MFLNRORD 2016) and BC Wildlife Act provide direction for protection of these species.

Four amphibian species are known to occur in the Project area; these species and their conservation status within BC are listed in Table 3-1. Western toad is federally listed as Special Concern on Schedule 1 of the SARA (Government of Canada 2002).

Table 3-1: Conservation Status of Amphibian Species Expected to Occur in the Project Area

Species Name		Conservation Status		
		Provincial	Federal	
Common	Scientific	BC CDC [1]	COSEWIC [2]	SARA Schedule 1 [3]
Columbia Spotted Frog	*Rana luteiventris*	Yellow	Not at Risk	Not Assessed
Long-toed Salamander	*Ambystoma macrodactylum*	Yellow	Not at Risk	Not Assessed
Western Toad	*Anaxyrus boreas*	Yellow	**Special Concern**	**Special Concern**
Wood Frog	*Lithobates sylvatica*	Yellow	Not Assessed	Not Assessed

*1) Species conservation status code definitions from BC Conservation Data Centre: **Red** – Includes any indigenous species or subspecies that have been designated, or are candidates for, Extirpated, Endangered, or Threatened status in British Columbia. **Blue** – Includes any indigenous species or subspecies considered to be of Special Concern (formerly Vulnerable) in British Columbia. **Yellow** – Includes species that are apparently secure and not at risk of extinction. Yellow-listed species may have red- or blue-listed subspecies.*

*2) COSEWIC (Committee on the Status of Endangered Wildlife In Canada) ranking system: **Endangered** – A species facing imminent extirpation or extinction. **Threatened** – A species that is likely to become endangered if limiting factors are not reversed. **Special Concern** – A species of special concern because of characteristics that make it is particularly sensitive to human activities or natural events.*

3) SARA (Species at Risk Act) Federal Public Registry uses the same ranking system as COSEWIC.

4. SALVAGE AND RELOCATION FIELD PROGRAM

Surveys and/or salvage and relocation activities will be carried out prior to site preparation and construction activities at incidental habitats*[1], and watercourses, wetlands, and terrestrial habitats where amphibians are known or likely to disperse (e.g., upland habitats adjacent to amphibian breeding habitats). Pre-clearing surveys to identify amphibian breeding sites and need for salvage are described in the Wildlife Mitigation and Monitoring Plan (WMMP).

[1] *Incidental habitats are alternative habitats used by amphibians during breeding and migration, and can include water filled ditches, sumps and depressions.

Several steps will be followed to carry out once an area in need of amphibian salvage has been identified:

1. Field confirmation of identified relocation sites (Section 4.2.1 Relocation Sites).
2. Isolation of salvage areas (Section 4.2.2 Isolation of Salvage Areas).
3. Capture and relocation of amphibians (Sections 4.2.3 Salvage Methods and 4.2.4 Storage, Transportation and Release).
4. Follow up surveys to confirm no remaining amphibians in salvage area – time and area constrained surveys of salvage area (as described in WMMP).
    a. Two follow up surveys with no amphibians identified – **no further salvage required.**
    b. Amphibians identified – **Continue from Step 3.**
5. Monitor relocated amphibians at relocation sites (Section 4.2.5 Monitoring Relocation Sites).

4.1 Hygiene Protocols

All surveys will follow the protocols outlined in The BC Interim Hygiene Protocols for Amphibian field staff and researchers to reduce risk of disease transmission among sites and among animals within a site. These include:

- When handling amphibians, hands and gloves must be free of lotion, sunscreen, insect repellent, hand sanitizer or other substances that amphibians can absorb through their skin.
- All aquatic and amphibian related field equipment arriving at site from other locations, or equipment leaving site to use elsewhere, must be disinfected. This includes footwear (boots or waders), nets and aquatic trapping equipment.

Disinfection Procedure

- To disinfect equipment in the field, the following will be required:
    - Bucket/brush/spray bottle
    - Disinfectant (A bleach solution with 0.2 % sodium hypochlorite)
    - Protective gloves to wear while disinfecting
    - Clean water
- Before leaving site, field workers must scrub using a hand brush and rinse using the pond/stream water to remove mud, algae, plants, snails and other invertebrates from all equipment. Disinfection procedures work best on cleaned equipment, free of debris.
- A bleach solution with 0.2 % sodium hypochlorite and exposure time of 10 minutes has been shown to be effective against Bd (Johnson et al 2003). Commercial household bleach sold in North America often contains 6.15% sodium hypochlorite, but concentrations can vary. To prepare the disinfectant solution, add 32 ml of household bleach to 1 litre of water. This translates to approximately 3.5 cups (0.85 litre) of bleach to one tall bucket or tote (~ 25 litres) of water. In the absence of municipal/well water supply, water from the pond or stream can be used.
- All equipment must be soaked in the bleach solution for a minimum of 15 minutes. Small items such as dipnets, and sample containers can be immersed in the bleach solution in a bucket or plastic tote. Larger items such as chest waders, paddles, boats, canoes, meter sticks and other survey equipment should be thoroughly soaked with the bleach solution using a spray bottle.

- The bleach solution can be rinsed off after 15 minutes with clean water from a well or municipal supply. However, if clean treated water is not available, the items can be hung out to dry, preferably in sunlight, so that the bleach evaporates completely from the equipment.
- The bleach solution can damage exposed skin and clothing. Dishwashing gloves and rubber aprons should be worn to protect clothing and skin from exposure to the bleach solution.
- Any off-road vehicles, boats, and other floatation devices are subject to the same SOP as sampling equipment.

4.2 Salvage and Relocation

Salvage and relocation may involve a variety of life stages, from egg through tadpole to adult, and include monitoring of animals in their new locations.

Salvage and relocation activities occur when clearing and construction activities occur during the breeding season (May-September) and where impacts to occupied habitats cannot be avoided. A permit must be obtained to capture, hold, and relocate animals to a safe location and work must be guided by a Qualified Professional.

- General Wildlife Permit must be obtained, under the Wildlife Act, from BC MFLNRORD (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development) from FrontCounter BC.
- Amphibian salvage and relocation will be implemented in consultation with Environment and Climate Change Canada (ECCC) and Indigenous groups.

Although salvage activities are targeted primarily toward western toad, other native amphibians (Table 3-1) encountered during salvage operations within affected wetlands and watercourses will also be captured and relocated.

4.2.1 Relocation Sites

Amphibians will be moved from where they are encountered to a place sufficiently far from disturbance while maintaining proximity to their originating location. Potential relocation sites have been identified based on 2021 and 2022 amphibian assessments (Figure 4-1) and are to be confirmed in the field prior to commencement of salvage activities. Field confirmation will be carried out by a qualified individual, to ensure that the pre-selected site is still suitable for the amphibians to be salvaged. If the conditions no longer fit the requirements, an alternative site will be selected.

Relocation sites will be selected based on the following criteria:

- Located within the same watershed to minimize the potential spread of chytrid fungus;
- Located outside of the Project workspaces by at least 300 m, with priority given to sites within 3 km of salvage sites;
- Sites of equal or better habitat suitability, relative to salvage sites, and meet the life requisites of target species. Relocation and salvage sites should be comparable by:
  - Cover and structure
  - pH within 1.0
  - Temperature within 5°C
  - Similar potential food sources
- If the salvage location is an incidental habitat, upland habitat characteristics should be similar to the salvage location.

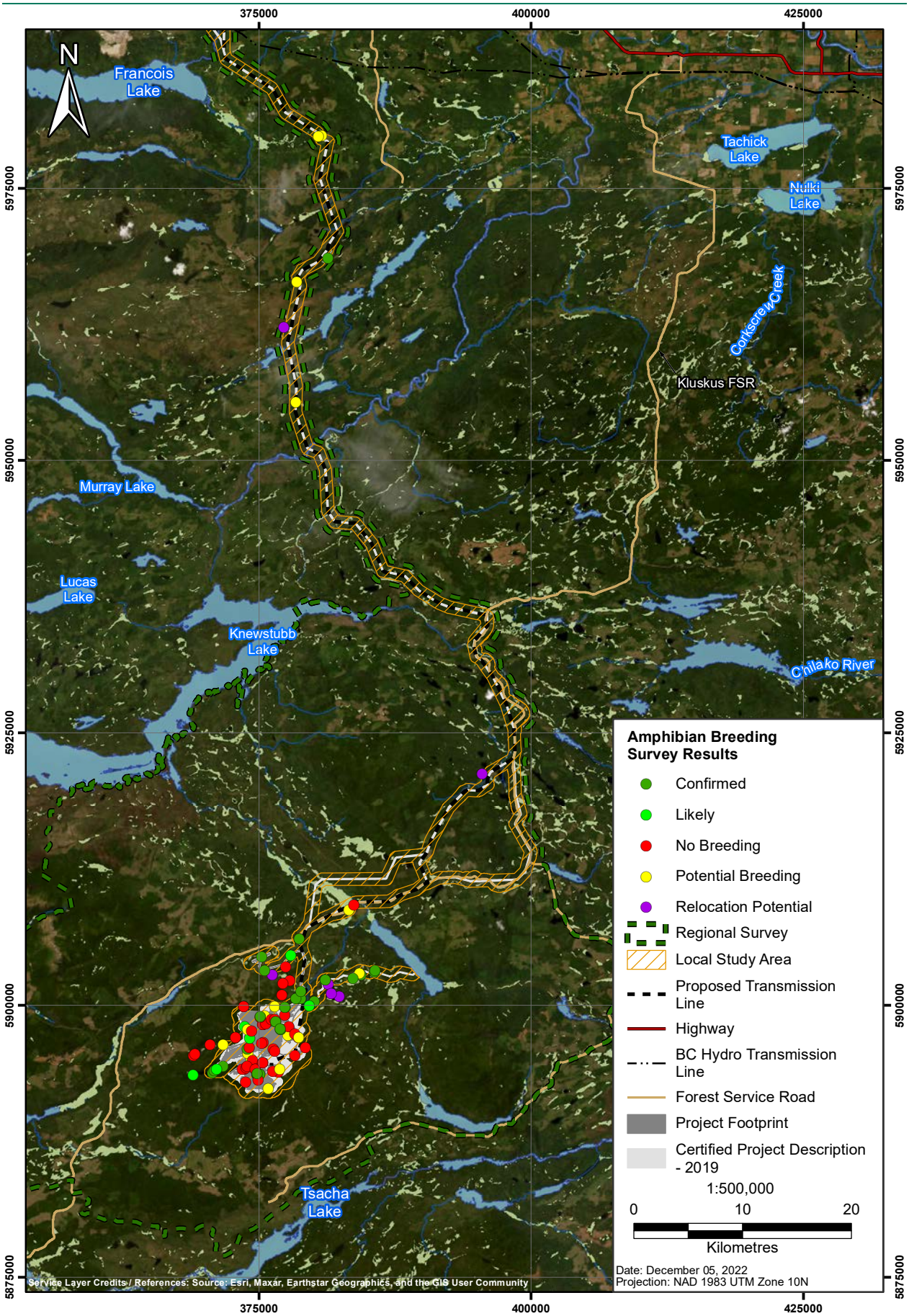


Figure 1: Blackwater Amphibian Locations

4.2.2 Isolation of Salvage Areas

Western toad breeding areas which will be de-watered or disturbed will be isolated by fencing to prevent additional access by amphibians:

- Geotextile exclusion fencing will be installed as necessary around affected wetlands and watercourses (salvage areas) to isolate amphibians from Project activities.
- Wetlands and watercourses near to the Project workspaces will be fenced on one side, along the edge of the workspaces, to direct dispersing amphibians away from active construction areas.
- The integrity of installed exclusion fencing will be monitored and adjusted/repaired as necessary throughout site preparation and construction activities.
- Exclusion fencing will be removed once Project construction activities are complete.

4.2.3 Salvage Methods

Salvage and relocation activities will be undertaken by qualified individuals under the guidance of a Qualified Professional (Section 2) in accordance condition 8.11 and 8.10 of the EAC.

Following isolation of the salvage area, affected wetlands and watercourses will be systematically surveyed:

- Hand and dip netting
  - May be used to capture adults, juveniles, and egg masses of all amphibian species.
- Baited funnel or minnow traps
  - Traps must be modified with a platform to allow amphibians to position themselves above water.
  - Traps must be positioned so that the top of the trap is above the water level.
  - Traps will be baited with approximately 10 g of moist cat food.
  - Checked at regular intervals that do not exceed 12 hours (RIC 1998b).
- Dewatering
  - Habitats affected by dewatering activities will be isolated with fencing to prevent incursion.
  - Qualified biologists will remain on-site for the entire dewatering process and actively salvage amphibians that may have avoided capture during the initial salvage.
  - These individuals will be captured by hand and transported to relocation sites.
- Pit-fall traps
  - May be used during certain life stage periods, e.g., presence of metamorphosing toadlets, where necessary
  - Traps to be placed in upland areas, along the edge of exclusion fencing to improve likelihood of salvaging dispersing adult and recently metamorphosed amphibians if detected.
  - Traps will contain a layer of moist moss (or a moistened sponge if moss is not available) and perforations to prevent captured amphibians from desiccation or drowning (RIC 1998b).
  - Traps will also include a length of jute twine stapled to the side of the pit-trap to provide an effective escape route for small mammals.
  - Traps will be checked at least every 12 hours. Captured amphibians will be transported to relocation sites (RIC 1998b).

- Salvage efforts will continue until there are two consecutive zero-capture sessions that are at least six hours apart.
    - The time between salvage sessions is to allow for amphibians that may be in hiding to appear, and/or for sediment (if present) to settle.
- Sweeps
    - At watercourses, wetlands, and terrestrial habitats where amphibians have been identified, surveys will be completed prior to the start of daily construction activities (including equipment mobilization) for amphibians that may have entered the workspaces overnight.
    - If a western toad is discovered within the Project workspaces, or in association with any other Project activity or facility, the discovery will be reported to the environmental monitor who will initiate the appropriate salvage procedure.

4.2.4 Animal Storage, Transportation, and Release

Efforts will be taken to retain captured individuals for as short a period as possible. Individuals will be transported and released at relocation sites using buckets or small containers. The following guidelines will be followed for capture, handling, transportation, and release of amphibians:

- Handling of amphibians will be limited and done quietly and without sudden movements. Hand nets (made of non-abrasive material) will be used to reduce the risk injury. The field crew will wear nitrile gloves for all salvage and relocation activities.
- The field crew will not wear lotions, perfumes, insect repellent, or other potentially harmful substance on their hands.
- Where handling is necessary, amphibians will be grasped around the waist with the hind limbs uninhibited to reduce the risk of injury. Larger individuals should also be grasped around the forelegs. Tadpoles will not be handled out of water.
- Captured animals will always be kept in buckets and containers and separated by species and life stage to limit the risk of injury, predation, or the spread of disease (BC MFLNRORD 2016).
- Transport buckets and containers will be sealed, adequately ventilated, properly insulated, and include a source of moisture. Captured amphibians in the larval stage will be transported in buckets filled with water sourced from the salvage location. Transportation buckets and containers holding captured individuals will be kept out of direct sunlight.
- Amphibians will not be exposed to large changes in water pH or water temperature between sites. Individuals will be given time to acclimate to their release location:
    - Transportation containers will be temperature adjusted until water is within 50 C of the release site. Temperature acclimation can be achieved by adding water from the release site to the transportation containers.
    - Safe temperature change time is approximately 20 C every 15 minutes.
    - pH of the release site cannot be changed, and therefore must be within 1.0 pH scale point of the salvage location.
- Traps and all other salvage equipment will be disinfected when brought to Blackwater site, and if taken to other projects (Section 4.1).

- If an animal is inadvertently injured, or does not recover from stress or myopathy, such that death is imminent, the individual will be euthanized per the CCAC species-specific recommendations for amphibians (CCAC 2021):
  - Field crews will carry appropriate euthanasia kits as suggested in CCAC 2021 – Section 11.
  - **Euthanasia will only be carried out by competent personnel using the least invasive method that is suited to the particular species and life stage of the animal (CCAC 2021).**
  - Suggested kit contents:
    - Nitrile gloves
    - Minimum 3 litre size container with lid to be used as a wet bucket
    - Benzocaine Hydrochloride, Commonly sold as Orajel (Example Product Link) – **must be menthol free**
  - Application of 20% gel to the ventral abdomen in a 2cm x 1mm strip is generally an effective means of anesthesia and euthanasia.
  - Animals are to be placed in a wet, sealed container (e.g., bucket). Deep anesthesia is expected within ~7 minutes, euthanasia within 5 hours.
  - Euthanized animals will be preserved in 90% ethanol and delivered as a voucher specimen to the Royal BC Museum.

4.2.5 Ad hoc salvage of adult toads

Salvage of adult toads may be necessary to move the animal out of harm's way. Moving terrestrial toads must be done with gloved hands or bare hands that are free of any chemicals (bug spray, lotions, soap residue, perfumes, etc.). Hands, gloved or not, should be moist and cool to limit any stress to the toad.

- Toads should be moved to a location as close to its capture location and a distance of 500m from an active work area.
- Release sites should be riparian wetland or adjacent upland forested habitats. Toads are terrestrial animals and should not be held in water or placed in water.

Handling methods for adult toads include:

- Scoop the toad into a net or cupped hand and cover it with the other hand – grasping the toad can cause injury or undo stress.
- Walk carefully to a release point and release the toad by lowering your cupped hands to the ground and opening them up to free it.
- If the distance to the release site is further away, a lidded container lined with moist moss can be used to transport the toad.
- Use the scooping method in step one to get the toad into and out of the container. Or, gently place the container on the ground on an angle to let the toad walk out of the container.
- Toads should not be held for long periods of time, and need to be kept cool until released.
- Data collection includes the following habitat and animal information:
  - Location, type (eco type or wetland class) and size of salvage and relocation areas;
  - Location of the salvage and relocation sites (i.e., UTM NAD83 GPS coordinate);
  - Capture method, date and time;

- Species, life stage, and sex, where possible, of captured and relocated individuals; and
- Photographs (without flash and only if this can be completed without causing distress).

4.2.6 Monitoring Relocation Sites

Post-salvage monitoring is important to determine the effectiveness of salvage operations in avoiding mortality, and to determine practices that can improve the effectiveness of future salvages. The goal of post-salvage monitoring is to assess salvage has any impacts on amphibian persistence or survival (BC MFLNRORD 2016):

- Relocation sites will be revisited the day following release of animals.
  - Ideally, monitoring will occur within 24-48 hours of relocation, but at least within 5 days.
- Amphibian monitoring will follow established RIC standards for the amphibian species that were relocated.
  - Using a combination of area-based and time-constrained searches of suitable habitats to determine short-term survivorship.
  - Any mortalities will be recorded.
- The information obtained from these surveys will inform upcoming relocations.
- Each aquatic relocation site will continue to be monitored annually for a minimum of three years during the breeding periods to identify western toad use of salvage recipient breeding ponds, and to assess longer-term survival and breeding success.

4.3 Survey Prep and Data Management

The following sections describe data that will be collected at sites where disturbance will occur, sites assessed for relocation suitability, and for amphibians captured during salvage operations.

4.3.1 Pre-field

- Review Figure 4-1 for potential relocation sites applicable to the survey location.
- Review sensitive time periods for species of concern and associated protocols and SOPs for the surveys being conducted.
- Obtain current geo-referenced .pdf maps (20k scale) – map features include roads, BC Fresh Water Atlas (streams, wetlands and lakes), mine infrastructure, mine LSA and RSA boundaries, on top of orthophotos.

4.3.2 Field Gear

- GPS enable tablet loaded with maps (Avenza App) or paper field maps if a tablet is not available (or for backup), SOPs, amphibian ID keys.
- Backup battery for the tablet.
- Field notebook, pencils, sharpie.
- Hand held GPS unit, binoculars, compass.
- 30 m measuring tape.
- Flagging tape (pre-determined colour(s)).

- Dip and hand nets, traps (as required – see section 4.2.3).
- 2 x 5 gallon pails with lids, gloves.
- pH/Temp pen (calibrated).
- Hygiene equipment (Section 4.2.2.3).

4.3.3 Data Collection

The following data will be collected at salvage and relocation sites.

4.3.3.1 Habitat Data

The following habitat data is collected at salvage sites and relocations sites:

- Location, type (eco type or wetland class) and size of salvage and relocation areas;
- Location of the salvage and relocation sites (i.e., UTM NAD83 GPS coordinate);
- Time taken to complete salvages and monitoring; and
- Water quality parameters including pH, temperature, depth (if relevant).

4.3.3.2 Amphibian Data

The following data regarding amphibians will be collected at each site where amphibians are observed:

- Capture method, date, time, and distance from water/shoreline;
- Species, life stage, and sex, where possible, of captured and relocated individuals; and
- Photographs (without flash and only if this can be completed without causing distress).

4.3.3.3 Post-Relocation Monitoring Data

After relocation has been completed, the following data will be collected:

- Date and time of monitoring;
- Water quality parameters; and
- Presence of western toad at relocation sites including life stage and evidence of breeding.

4.3.4 Reporting Requirements

Data and a written report of the activities related to the Permit must be submitted within 90 days of the permit expiry as outlined in Appendix A of the permit.

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APPENDIX E PRE-CLEARING SURVEY DATA, 2022

Appendix E: Pre-clearing Survey Data, 2022

Transect Name	Date	Time Start	Start WPT	Transect Start Zone	Transect Start Easting	Transect Start Northing	Temp	Cloud (%)	Beaufort Wind	Wind Direction	Light	Precipitation	Snow Depth	Confirmed Observations	Time End	End WPT	Transect End Zone	Transect End Easting	Transect End Northing	Comments
Plant_1	2022-09-13	07:50	Bwam1	10U	2929-01-14	5894185	9.00	0.00	0	SW	Bright	Nil	0	None	15:27	Bwam2	10U	376564.00	5894129.00	Generally poor quality habitat for bears, raptors, and bats. Dry small conifer stand (pine, spruce, fir) with moss, lichen, rhododendron, small blueberry with no fruit as understory. 1 old bear scat. no bat or raptor sign. Mostly old moose scat observed.
Plant_2	2022-09-14	07:04	Bwam3	10U	2931-01-24	5894127	0.00	0.00	0	NE	Bright	Nil	0	None	08:21	Bwam4	10U	376318.00	5894089.00	Generally poor quality - small conifer stand. Lots of half dead trees and deadfall. Same as BW_Plant_1. There is potential for bear dens in woody debris piles along S roadway. No sign of bear, bats, or raptor. Old moose and potential caribou scat seen.
ctrail_1	2022-09-15	08:24	Ctrail1	10U	373285	5896475	3	25	1	SW	Bright	Nil	0	None	08:54	Ctrail2	10U	373999	5897749	Small conifers, not high value for dens, raptors, or bats. Huckleberries present so some forage habitat.
atrail	2022-09-15	14:34	Atrail1	10U	2925-12-16	5895166	13.00	60.00	1	W	Bright	Nil	0	None	14:48	Atrail2	10U	375739.00	5896195.00	Poor quality small pine stand. No sign of target species. Some huckleberry with fruit which bear could feed on but no sign of potential den sites.
etrail	2022-09-15	14:51	Etrail1	10U	375739	5896193	13	60	1	W	Bright	Nil	0	None	14:58	Etrail2	10U	376004	5896879	More poor quality small pine stand and some clearcut patches. No clear potential for target species and no sign
tail2	2022-09-15	15:00	Tail3	10U	376003	5896879	13	60	1	W	Flat	Nil	0	None	15:38	Tail4	10U	375954	5897420	More poor quality small pine stand. Some areas quite dense and some sparse. Good amount of standing dead trees . Some forage berries for bears but no clear potential denning spots. No sign of target species. Some potential caribou lichen spots as well.
borrow	2022-09-15	11:38	Borrow1	10U	374412	5896903	14	10	0	W	Bright	Nil	0	None	12:31	Borrow2	10U	374525	5896543	Small post burn conifer stand with some more diverse understory areas and somewhat larger trees but nothing significant. Not great habitat for bear dens but more foraging areas, lots of huckleberries in fruit. Some bear sign, several fresh-ish bear scat.
tail1	2022-09-15	10:34	Tail1	10U	375767	5897765	11	10	0	W	Bright	Nil	0	None	11:22	Tail2	10U	375323	5897460	Generally poor habitat. Small post fire pine stand. 1 old bear scat found. Some huckleberry with fruit. Mostly a bit of deer or moose sign but sparse wildlife in general.
agg	2022-09-15	09:28	Agg1	10U	376209	5898083	8	15	0	W	Bright	Nil	0	None	10:25	Agg2	10U	375766	5897762	Poor quality small diameter conifer stands. Mostly lichen and moss in understory. Ok caribou foraging habitat but not great for preclear species of interest. SSHA seen flying nearby.
coff	2022-09-15	08:57	Coff1	10U	374149	5897550	9	15	-	SW	Bright	Nil	0	None	09:13	Coff2	10U	375295	5897469	Small fir and pines. Poor quality habitat for dens and raptor nests. No sign of species of interest. Some summer moose forage sign.

APPENDIX F AMPHIBAIN SALVAGE DATA, 2022

Appendix F: Amphibian Salvage Data, 2022

Date	Crew	Temp	Cloud Cover (%)	Precipitation	Salvage Site											Relocation Site								Species Name	Age Class	Number Salvaged	Comments
					Site ID	Zone	Easting	Northing	pH	Water Temp (°C)	Water Clarity	Wetland Fate	Wetland Fate Details	Start Time	End Time	Acclimation Start Time	Site ID	Zone	Easting	Northing	pH	Water Temp (°C)	Water Clarity	Release Time				
2022-09-14	Alice Merondun, Sean Sharpe	10	0	Nil	BW_W_AM1	10U	376891	5894139	7.30	4.00	Clear	Drain, Fill	Site will most likely be pumped in October	10:16	14:43	10:57	BW-W_AM1R	10U	374854	5893617	7.8	6	Can see to bottom but not clear	11:10	A-RALU	Metamorph	19	Large deep pond with emergent vegetation and spotted frogs seen (metamorphs and adult). 3 captures+relocations completed within the survey time.
2022-09-15	Alice Merondun, Sean Sharpe	15	50	Nil	BW_W_AM1	10U	376891	5894139	7.40	4.00	Clear	Drain, Fill		13:28	14:17	14:00	BW_W_AM1R	10U	374839	5893605	4.9	6	Can see to bottom but not clear	14:11	A-RALU	Metamorph	1	Continuation of salvage from yesterday. Thought that we may have missed 1 CSFR and we did find one today. Checked in the morning and afternoon at salvage site. Relocation to same site as yesterday, lots of active CSFR at relocation site.

APPENDIX G BLACKWATER WILDLIFE SIGHTING LOG, 2022

Appendix G: Blackwater Wildlife Sighting Log, 2022

Date	Time	Name of Individual Reporting	Species Observed	Number Observed	Gender of Species Observed	Age of Animal(s)	Health of Animal	Behaviour	Type of Interaction	Location	Comments
2022-09-30	11:30am	AO	Moose	1	Male	Adult	Healthy	Crossing the road	Visual	Kluskus FSR 99km	
2022-09-27	11:00am	AO	Unspecified Bear	1	Unknown	Unknown	Healthy	Crossing the road	Visual	Mine Access Road 1.5km	
2022-10-04	1:45pm & 2pm	EW	Unspecified Bear	1	Unknown	Unknown	Healthy	Walked off the road both times	Visual	11km on access road	Seen this bear twice. once at 1:45pm and 2pm
2022-10-04	10am	EW	Moose	1	Unknown	Unknown	Healthy	See on tree line	Visual	67km on blue road	
2022-10-04	8:15am	EW	Fox	1	Unknown	Unknown	Healthy	Walking on ore body	Visual	On ore Body	
2022-10-06	11:45am, 2pm, 2:30pm	EW	Deer	3	Female	Adult	Healthy	Grazing	Visual	end of blue road	Mom and two calves
2022-10-09	6:00	Worker	Black Bear	1	Unknown	Juvenile	Healthy	ran away	Visual	Temporary Camp Pad Light Tower	
2022-10-18	8:00	Lowbed Truck Driver	Grizzly Bear	1	Male	Adult	Healthy	walking across road	Visual	2.5km on access road	
2022-10-20	16:45	Bill	Black Bear	1	Male	Adult	Healthy	Exiting forest towards roadway	Visual	13KM Blackwater Access Road	
2022-11-14	16:40	KT	Fox	1	Unknown	Adult	Healthy	Moved out of the way of the vehicle but didn't scare off. Stayed near camp.	Visual	Behind D dorm	
2022-11-16	13:00	JL	Fox	1	Unknown	adult	Healthy	cruising through camp	Visual	camp office parking lot	regular sightings
2023-01-13	8:00:00	RH	Lynx	1	Unknown	adult	healthy	stood around for 15 min	visual	1 km on access road	
2023-03-08	11:30am	RS	Fox	1	Unknown	Unknown	Healthy	Friendly	Visual	A trail	No comments
2023-03-09	5:30pm	AO	Lynx	1	Unknown	Unknown	Healthy	Normal	Visual	1.5km on Blackwater Access Road	

APPENDIX H INCIDENTAL WILDLIFE DETECTIONS DURING THE 2022 WILDLIFE FIELD SEASON

Appendix H: Incidental Wildlife Detections during the 2022 Wildlife Field Season

Survey Type	Site ID	Date	Easting	Northing	Species Common Name	Group	Total Detected/ Observed	Signs Observed	Comment
Ungulate Pellet Counts		2022-06-16			Western Toad	Amphibian			Western toad eggs and tadpoles in a ditch along a decommissioned spur in the large cut block at ~6km on the BW access road
June Trip Incidentals	I003	2022-06-14	377529	5901691	American Black Bear	Mammal	1		On road while driving. Ran away
June Trip Incidentals	I004	2022-06-14	376772	5905831	American Black Bear	Mammal	1		On side of road ran into tree cover
June Trip Incidentals	I006	2022-06-14	362534	5894511	American Black Bear	Mammal	2		Two separate bears on side of road. Retreated into forest
June Trip Incidentals	I007	2022-06-16	372264	5896009	American Black Bear	Mammal	1		On road walked into bush
June Trip Incidentals	I008	2022-06-17	380701	5899965	American Black Bear	Mammal	1		On road ran into trees
June Trip Incidentals	B1	2022-06-20	378980	5900740	American Black Bear	Mammal	1		Running along road and int bush
June Trip Incidentals		2022-06-22	362654	5898003	American Black Bear	Mammal	1		End of bw access road where it incepts with the kluskus
June Trip Incidentals	I005	2022-06-14	371407	5903912	American Black Bear	Mammal	1		Brown phase. Golden brown, ran into bush
White bark pine transect	T4_1	2022-08-29	373325	5889906	American Black Bear	Mammal			
Fall Waterbird	501	2022-09-11			American Black Bear	Mammal	1		
Ungulate Pellet Counts		2022-06-16			American Black Bear	Mammal	1		at 14km
Summer Waterbird/CLNU		2022-07-08			American Black Bear	Mammal	1		on the mine access road where the Kluskus-Ootsa FSR intersects.
Summer Waterbird/CLNU		2022-07-09			American Black Bear	Mammal	4		Black bear with triplets near Chedakuz Creek and Tatelkuz Lake
Spring Waterbirds	3	2022-05-20			Beaver	Mammal	1		Beaver swimming
Spring Waterbirds	7	2022-05-20			Beaver	Mammal	0	Lodge	
Spring Waterbirds	9	2022-05-20			Beaver	Mammal	0	Lodge	
Spring Waterbirds	19	2022-05-20			Beaver	Mammal	0	Lodge	
Spring Waterbirds	20	2022-05-20			Beaver	Mammal	0		unspecified
Spring Waterbirds	36	2022-05-20			Beaver	Mammal	0		unspecified
Spring Waterbirds	42	2022-05-20			Beaver	Mammal	0		unspecified
Spring Waterbirds	44	2022-05-20			Beaver	Mammal	0	Lodge	
Spring Waterbirds	45	2022-05-20			Beaver	Mammal	0		unspecified
Spring Waterbirds	48	2022-05-20			Beaver	Mammal	0		unspecified
Spring Waterbirds	49	2022-05-20			Beaver	Mammal	0		unspecified
Spring Waterbirds	54	2022-05-20			Beaver	Mammal	0		unspecified
Spring Waterbirds	55	2022-05-20			Beaver	Mammal	0		unspecified
Summer Waterbird	15	2022-07-08			Beaver	Mammal	0		unspecified
Spring Waterbirds	55	2022-05-20			Beaver	Mammal	0		unspecified
Summer Waterbird	15	2022-07-08			Beaver	Mammal	0		unspecified
Summer Waterbird	21	2022-07-08			Beaver	Mammal	0	Lodge	
Summer Waterbird	28	2022-07-08			Beaver	Mammal	0	Lodge	
Summer Waterbird	29	2022-07-08			Beaver	Mammal	0	Lodge	
Summer Waterbird	32	2022-07-08			Beaver	Mammal	0	Lodge	
Summer Waterbird	44	2022-07-09			Beaver	Mammal	0	Lodge	
Summer Waterbird	53	2022-07-09			Beaver	Mammal	2	Lodge	
Summer Waterbird	63	2022-07-09			Beaver	Mammal	0	Lodge	
Summer Waterbird	71	2022-07-09			Beaver	Mammal	0		unspecified
Summer Waterbird	75	2022-07-09			Beaver	Mammal	0		unspecified
Summer Waterbird	113	2022-07-10			Beaver	Mammal	0	Lodge	unspecified
Fall Waterbird	312	2022-09-09			Beaver	Mammal			
ARU	ARU 2	2022-11-02			Beaver	Mammal		Activity	
White bark pine transect	T1_1	2022-08-29	375547	5892530	Caribou	Mammal		Trail	
White bark pine transect	T2_4	2022-08-29	371405	5892901	Ungulate (Caribou/Moose)	Mammal		Trail	
Swift and Swallow	SS03	2022-06-14	375756	5894041	Fox	Mammal	1		Seen outside of time but near Heli pad walking to office
June Trip Incidentals	I002	2022-06-14	378978	5900730	Gray Wolf	Mammal	0	Scat	Scat in side of road
Summer Waterbird/CLNU		2022-07-10			Grizzly Bear	Mammal	1		
White bark pine transect	T4_9	2022-08-29	374012	5890252	Unidentified Mammal	Mammal		Trail	
ARU		2022-11-02			American Marten	Mammal		Tracks	on Mount Davidson
June Trip Incidentals	MOOSETRKTRAIL1	2022-06-14	374490	5894020	Moose	Mammal	0	Tracks	Well established trail with fresh tracks. Heading south
June Trip Incidentals	MOOSETRK2	2022-06-14	374492	5894021	Moose	Mammal	0	Tracks	Tracks along old road that has conifer regen
June Trip Incidentals	MOOSETRAK1	2022-06-14	374492	5894022	Moose	Mammal	0	Tracks	Tracks along old road that has conifer regen
June Trip Incidentals	MOO1	2022-06-15	369189	5891210	Moose	Mammal	0	Scat	
June Trip Incidentals	MOO2	2022-06-15	369161	5891004	Moose	Mammal	0	Scat	Saw 2 piles in same general area
June Trip Incidentals	Ub05s4	2022-06-15	369111	5890794	Moose	Mammal	0	Scat	Many piles. At least 3
June Trip Incidentals	Moo4	2022-06-15	369317	5890794	Moose	Mammal	0	Scat	
June Trip Incidentals	UB10S1	2022-06-18	371335	5896136	Moose	Mammal	0	Scat	Near to survey site

Appendix H: Incidental Wildlife Detections during the 2022 Wildlife Field Season

Survey Type	Site ID	Date	Easting	Northing	Species Common Name	Group	Total Detected/ Observed	Signs Observed	Comment
June Trip Incidentals	SHED1	2022-06-18	371335	5896135	Moose	Mammal	0	Antler Drop	
June Trip Incidentals	Mooseobs	2022-06-21	375969	5896026	Moose	Mammal	1		Moose on road
June Trip Incidentals	ISO3	2022-06-15	0	0	Moose	Mammal	0	Scat	Scat found while performing upland bird transect
White bark pine transect	T1_6	2022-08-29	376039	5892429	Moose	Mammal		Tracks	
White bark pine transect	T5_7	2022-08-31	375054	5891977	Moose	Mammal			
White bark pine transect	T4_5	2022-08-29	373695	5889985	Moose	Mammal			
White bark pine transect	T2_10	2022-08-29	371884	5892045	Moose	Mammal		Scat, Browse	
Fall Waterbird	328	2022-09-09			Moose	Mammal	2		cow and calf
Fall Waterbird	337	2022-09-09			Moose	Mammal	1		cow moose
Fall Waterbird	450	2022-09-10			Moose	Mammal	1		swimming
Fall Waterbird	477	2022-09-11			Moose	Mammal	2		cow and calf
Fall Waterbird	485	2022-09-11			Moose	Mammal	2		cow and calf
Fall Waterbird	496	2022-09-11			Moose	Mammal	2		cow and calf
Fall Waterbird	503	2022-09-11			Moose	Mammal	1		cow moose
Fall Waterbird	504	2022-09-11			Moose	Mammal	2		cow and calf
Swift and Swallow	SS01	2022-06-14	378943	5900401	Moose	Mammal	0	Scat	Seen on trail
Summer Waterbird/CLNU		2022-07-08			Moose	Mammal	3		Moose cow and two calves in a wetland near Chedakuz Creek, north of the proposed airstrip
Summer Waterbird/CLNU		2022-07-08			Moose	Mammal	1		Moose cow in the wetland northeast of the mine access road.
Summer Waterbird/CLNU		2022-07-09			Moose	Mammal	2		in a wetland, north and northeast of the proposed transmission line (Mills Ranch re-route), respectively
Summer Waterbird/CLNU		2022-07-11			Moose	Mammal	1		within Project footprint 500 m buffer area
Summer Waterbird/CLNU		2022-07-12			Moose	Mammal	5		Three moose and two juveniles at Matthews Creek.
Summer Waterbird/CLNU		2022-07-13			Moose	Mammal	1		Bull moose on the Kluskus FSR
CLNU		2022-08-28			Moose	Mammal	2		at Matthews Creek
CLNU		2022-08-31			Moose	Mammal	1		cow feeding on pond vegetation in the LSA
ARU		2022-11-02			Moose	Mammal		Tracks	on Mount Davidson
CLNU		2022-08-29			Mountain Goat	Mammal	2		were identified in the RSA during the aerial recce
ARU	CLNU T2	2022-11-02			Mountain Goat	Mammal	1		Juvenile mountain goat on Mount Davidson
ARU		2022-11-02			Mountain Goat	Mammal		Tracks	on Mount Davidson
Fall Waterbird	479	2022-09-11			Mule Deer	Mammal	1		deer
White bark pine transect	T4_5	2022-08-29	373695	5889985	Unspecified Bear	Mammal		Trail	
June Trip Incidentals		2022-06-20	376825	5899342	Red Fox	Mammal	1		Fox with ratty tail know as misty, seen around camp a lot. Was seen hanging by end of D wing, stayed and watched for a bit. Then retreated through a small hole under D wing
White bark pine transect	T1_4	2022-08-29	375839	5892464	Unspecified Bear	Mammal		Digging	
White bark pine transect	T4_10	2022-08-29	374094	5890306	Unspecified Bear	Mammal		Digging	
ARU		2022-11-02			Unspecified Bear	Mammal		Tracks	on Mount Davidson
June Trip Incidentals		2022-06-20	377367	5901529	White-tailed Jackrabbit	Mammal	1		Crossed road
June Trip Incidentals	IN02	2022-06-19	376013	5893395	American Kestrel	Raptor	1		
June Trip Incidentals	BALD	2022-06-20	378749	5899889	Bald Eagle	Raptor	1		Flew to open mossy area. Landed on ground looked to be foraging, flew over head and along stream
June Trip Incidentals	ISO4	2022-06-15	379028	5887932	Bald Eagle	Raptor	1		
June Trip Incidentals	Sw15	2022-06-19	376499	5893470	Bald Eagle	Raptor	1		
Spring Waterbirds	48	2022-05-20			Bald Eagle	Raptor	1		immature
Summer Waterbird	24	2022-07-08			Bald Eagle	Raptor	2		immature
Summer Waterbird	25	2022-07-08			Bald Eagle	Raptor	1		immature
Summer Waterbird	39	2022-07-09			Bald Eagle	Raptor	1		
Summer Waterbird	52	2022-07-09			Bald Eagle	Raptor	1		
Summer Waterbird	54	2022-07-09			Bald Eagle	Raptor	1		
Summer Waterbird	111	2022-07-10			Bald Eagle	Raptor	2		adult (x1), young (x1), perched
Summer Waterbird	112	2022-07-10			Bald Eagle	Raptor	1		
Fall Waterbird	313	2022-09-09			Bald Eagle	Raptor	1		
Fall Waterbird	323	2022-09-09			Bald Eagle	Raptor			
Fall Waterbird	381	2022-09-09			Bald Eagle	Raptor	1		
Fall Waterbird	425	2022-09-10			Bald Eagle	Raptor	2		
Fall Waterbird	430	2022-09-10			Bald Eagle	Raptor	1		
Fall Waterbird	453	2022-09-10			Bald Eagle	Raptor	1		
Fall Waterbird	481	2022-09-11			Bald Eagle	Raptor	1		
Fall Waterbird	482	2022-09-11			Bald Eagle	Raptor	1		

Appendix H: Incidental Wildlife Detections during the 2022 Wildlife Field Season

Survey Type	Site ID	Date	Easting	Northing	Species Common Name	Group	Total Detected/ Observed	Signs Observed	Comment
Fall Waterbird	484	2022-09-11			Bald Eagle	Raptor	1		
Summer Waterbird/CLNU		2022-07-12			Bald Eagle	Raptor	2		Adult eagle pair at Matthews Creek
Breeding Bird Survey	UB06S2	2022-06-15	373478	5890126	Common Raven	Raptor	1		
June Trip Incidentals		2022-06-13	384004	5909416	Northern Goshawk	Raptor	1		While driving in. No wpt. 53.3218269, -124.7299233 Flew over road while driving in.
Fall Waterbird	316	2022-09-09			Northern Harrier	Raptor	1		
Fall Waterbird	461	2022-09-11			Northern Harrier	Raptor	1		harrier
Summer Waterbird	52	2022-07-09			Osprey	Raptor	1		
Summer Waterbird	112	2022-07-10			Osprey	Raptor	1		
Summer Waterbird	130	2022-07-10			Osprey	Raptor	2		
Fall Waterbird	313	2022-09-09			Osprey	Raptor	1		
Fall Waterbird	330	2022-09-09			Osprey	Raptor	1		flying
Fall Waterbird	411	2022-09-10			Osprey	Raptor	1		
Fall Waterbird	424	2022-09-10			Osprey	Raptor	1		
Fall Waterbird	434	2022-09-10			Osprey	Raptor	2	Nest	stick Nest
Fall Waterbird	439	2022-09-10			Osprey	Raptor	1		
Fall Waterbird	440	2022-09-10			Osprey	Raptor	2	Nest	stick Nest
Fall Waterbird	459	2022-09-11			Osprey	Raptor	1		
Summer Waterbird/CLNU		2022-07-10			Osprey	Raptor		Nest	Large active osprey Nest near the Transmission Line, west of Targe Creek.
Breeding Bird Survey	UB07S1	2022-06-18	0367485	5895891	Red-tailed Hawk	Raptor	1		before survey. Flew along forest edge and plot edge.
June Trip Incidentals	SW2	2022-06-17	375801	5894001	Red-tailed Hawk	Raptor	1		Hawk flying over northwest of mine site
June Trip Incidentals	UB07S1	2022-06-18	367484	5895891	Red-tailed Hawk	Raptor	1		Hawk soaring over edge of cut block and conifer forest. Hawk seen just prior to beginning UB07S1 point count at same location
Summer Waterbird	21	2022-07-08			Red-tailed Hawk	Raptor	1		
Fall Waterbird	452	2022-09-10			Red-tailed Hawk	Raptor	1		forest
Fall Waterbird	454	2022-09-10			Red-tailed Hawk	Raptor	1		
Fall Waterbird	502	2022-09-11			Red-tailed Hawk	Raptor	1		
Fall Waterbird	418	2022-09-10			Rough-legged Hawk	Raptor	2		rough-legged x2
White bark pine transect	T1_1	2022-08-29	375547	5892530	Sharp-shinned Hawk	Raptor	1		
Fall Waterbird	380	2022-09-09			Swainson's Hawk	Raptor	1		swainson's photo 681/682
Fall Waterbird	308	2022-09-09			Unknown Harrier	Raptor	1		Unknown, dark back
Fall Waterbird	433	2022-09-10			Unknown Harrier	Raptor	1		unknown hawk, dark
Fall Waterbird	453	2022-09-10			Unknown Harrier	Raptor	1		juvenile
Breeding Bird Survey	UB09S4	2022-06-18	372183	5896293	American Robin	Upland Bird	1		before survey
Breeding Bird Survey	UB09S5	2022-06-18	372232	5896113	American Robin	Upland Bird	1		
Breeding Bird Survey	UB14S4	2022-06-21	0378545	5897866	American Robin	Upland Bird	1		before survey
June Trip Incidentals		2022-06-18	375920	5893814	American Robin	Upland Bird	0	Nest	Building behind core shack 1. Nest is empty and has not been used in a while
June Trip Incidentals	BW3	2022-06-17	375912	5894018	American Robin	Upland Bird	0	Nest	Nests found in side roof of machine shop, may be unused Nests from previous years. Ask Theresa/Ken for picture of Nests
June Trip Incidentals	BW3	2022-06-17	375912	5894018	American Robin	Upland Bird	1		Heard robin and swallow but did not see birds enter machine room roof
June Trip Incidentals	SW6	2022-06-17	372398	5895973	American Robin	Upland Bird	1		
June Trip Incidentals	SW9	2022-06-18	375888	5893825	American Robin	Upland Bird	0	Nest	3 Nests found on right side of building, in rafters. One located at rear, two approximately 5m from front of building. All 3 Nests determined to not be currently active/occupied
White bark pine transect	T5_6	2022-08-31	374965	5891935	American Robin	Upland Bird	1		
Breeding Bird Survey	UB02S5	2022-06-14	374477	5894919	American Three-toed Woodpecker	Upland Bird	0		after survey
Breeding Bird Survey	UB10S4	2022-06-18	370998	5896322	American Three-toed Woodpecker	Upland Bird	0		flyover; before survey
Breeding Bird Survey	UB15S3	2022-06-21	378505	5897239	American Three-toed Woodpecker	Upland Bird	1		
Breeding Bird Survey	UB06S5	2022-06-15	373178	5890113	Barn Swallow	Upland Bird	2		BASW; flew to the alpine area of the survey and while waiting for Heli pick up. Feeding behaviour.
June Trip Incidentals	UB06S1	2022-06-15	373622	5890335	Barn Swallow	Upland Bird	2		On top of mount harry Davis seen flying over while waiting for Heli
June Trip Incidentals	Muster point	2022-06-17	375673	5894159	Barn Swallow	Upland Bird	2		Likely is same swallows identified at other buildings on mine site downhill
Breeding Bird Survey	UB04S2	2022-06-15	0378401	5887660	Boreal Chickadee	Upland Bird	2		after survey; probably a pair
Breeding Bird Survey	UB02S4	2022-06-14	374473	5894742	Canada Jay	Upland Bird	1		singing before survey
Breeding Bird Survey	UB03S2	2022-06-15	0382379	5895131	Canada Jay	Upland Bird	2		before survey
Breeding Bird Survey	UB04S2	2022-06-15	0378401	5887660	Canada Jay	Upland Bird	1		before survey
Breeding Bird Survey	UB10S1	2022-06-18	371467	5896296	Canada Jay	Upland Bird	1		
June Trip Incidentals	SW7	2022-06-17	371745	5896337	Canada jay	Upland Bird	1		
White bark pine transect	T1_1	2022-08-29	375547	5892530	Canada Jay	Upland Bird	3		

Appendix H: Incidental Wildlife Detections during the 2022 Wildlife Field Season

Survey Type	Site ID	Date	Easting	Northing	Species Common Name	Group	Total Detected/ Observed	Signs Observed	Comment
White bark pine transect	T3_2	2022-08-29	376080	5890179	Canada Jay	Upland Bird	1		
White bark pine transect	T3_6	2022-08-29	376422	5890379	Canada Jay	Upland Bird	1		
White bark pine transect	T5_6	2022-08-31	374965	5891935	Chickadee	Upland Bird	3		
Breeding Bird Survey	UB15S2	2022-06-21	378329	5897331	Chipping Sparrow	Upland Bird	1		out in cut block
June Trip Incidentals	SW13	2022-06-19	378281	5893713	Chipping Sparrow	Upland Bird	1		
June Trip Incidentals	SW14	2022-06-19	377596	5893433	Chipping Sparrow	Upland Bird	1		
June Trip Incidentals	CN1	2022-06-20	376506	5899374	Clark's Nutcracker	Upland Bird	4		Likely a family. Likely 2 adults 2 young. Young displaying begging behaviour.
Fall Waterbird	309	2022-09-09			Common Raven	Upland Bird	1		
Fall Waterbird	495	2022-09-11			Common Raven	Upland Bird	2		cut block
Breeding Bird Survey	UB01S3	2022-06-14	0374410	5893485	Dark-eyed Junco	Upland Bird	1		heard singing en route
Breeding Bird Survey	UB05S1	2022-06-15	369389	5891208	Dark-eyed Junco	Upland Bird	1		
Breeding Bird Survey	UB08S3	2022-06-18	0370257	5895975	Dark-eyed Junco	Upland Bird	1		heard after survey
Breeding Bird Survey	UB10S3	2022-06-18	371139	5896171	Dark-eyed Junco	Upland Bird	1		
Breeding Bird Survey	UB13S4	2022-06-20	378656	5900182	Dark-eyed Junco	Upland Bird	1		before survey
Breeding Bird Survey	UB14S3	2022-06-21	0378441	5898036	Dark-eyed Junco	Upland Bird	1		
Breeding Bird Survey	UB15S1	2022-06-21	378222	5897514	Dark-eyed Junco	Upland Bird	1		before survey
June Trip Incidentals	SW17	2022-06-19	371471	5895874	Dark-eyed Junco	Upland Bird	1		
Breeding Bird Survey	UB05S5	2022-06-15	369316	5890797	Dusky Grouse	Upland Bird	1		located on the walk back to the Heli pick up. Coordinates: 369433, 5890882
Breeding Bird Survey	UB06S3	2022-06-15	373285	5889968	Fox Sparrow	Upland Bird	1		
White bark pine transect	T5_8	2022-08-31	375140	5892031	Fox Sparrow	Upland Bird	1		
White bark pine transect	T5_10	2022-08-31	375316	5892125	Fox Sparrow	Upland Bird	1		
White bark pine transect	T5_11	2022-08-31	375414	5892159	Fox Sparrow	Upland Bird	1		
White bark pine transect	T1_1	2022-08-29	375547	5892530	Golden Crowned Kinglet	Upland Bird	1		
White bark pine transect	T1_2	2022-08-29	375647	5892513	Golden Crowned Kinglet	Upland Bird	1		
White bark pine transect	T1_3	2022-08-29	375743	5892491	Golden Crowned Kinglet	Upland Bird	1		
White bark pine transect	T1_5	2022-08-29	375943	5892447	Golden Crowned Kinglet	Upland Bird	1		
White bark pine transect	T1_6	2022-08-29	376039	5892429	Golden Crowned Kinglet	Upland Bird	1		
White bark pine transect	T1_10	2022-08-29	376441	5892354	Golden Crowned Kinglet	Upland Bird	1		
White bark pine transect	T5_11	2022-08-31	375414	5892159	Golden Crowned Kinglet	Upland Bird	1		
Breeding Bird Survey	UB01S1	2022-06-14	0374569	5893877	Golden-crowned Kinglet	Upland Bird	1		en route to waypoint
Breeding Bird Survey	UB02S1	2022-06-14	374483	5894122	Golden-crowned Kinglet	Upland Bird	1		singing after survey
Breeding Bird Survey	UB02S2	2022-06-14	0374481	5894331	Golden-crowned Kinglet	Upland Bird	1		en route. Between S1 and S2
Breeding Bird Survey	UB08S3	2022-06-18	0370257	5895975	Golden-crowned Kinglet	Upland Bird	1		en route before survey.
Breeding Bird Survey	UB12S1	2022-06-20	0376629	5899491	Golden-crowned Kinglet	Upland Bird	1		en route
Breeding Bird Survey	UB12S5	2022-06-20	376637	5899148	Gray Jay	Upland Bird	1		
June Trip Incidentals	ISO1	2022-06-15	375849	5894093	Greater Sage-Grouse	Upland Bird	0	Scat	Scat found on upland bird transect
Breeding Bird Survey	UB06S4	2022-06-15	373107	5889929	Hermit Thrush	Upland Bird	1		
Breeding Bird Survey	UB14S2	2022-06-21	0378244	5897968	Hermit Thrush	Upland Bird	1		
June Trip Incidentals	SW11	2022-06-18	375747	5893401	Mountain Bluebird	Upland Bird	2		Seen in proposed pit mine on a snag.
Breeding Bird Survey	UB12S3	2022-06-20	376826	5899341	Mountain Chickadee	Upland Bird	1		walk back to truck
White bark pine transect	T1_4	2022-08-29	375839	5892464	Northern Flicker	Upland Bird	1		
White bark pine transect	T5_6	2022-08-31	374965	5891935	Northern Flicker	Upland Bird	1		
White bark pine transect	T5_7	2022-08-31	375054	5891977	Northern Flicker	Upland Bird	1		
White bark pine transect	T5_8	2022-08-31	375140	5892031	Northern Flicker	Upland Bird	1		
White bark pine transect	T5_11	2022-08-31	375414	5892159	Northern Flicker	Upland Bird	1		
Fall Waterbird	298	2022-09-09			Northern Flicker	Upland Bird	3		
Fall Waterbird	300	2022-09-09			Northern Flicker	Upland Bird	1		
Summer Waterbird	3	2022-07-08			Northern Shrike	Upland Bird	4		young (x2)
Breeding Bird Survey	UB07S1	2022-06-18	0367485	5895891	Olive-sided Flycatcher	Upland Bird	1		
June Trip Incidentals	I001	2022-06-14	379046	5901523	Olive-sided Flycatcher	Upland Bird	1		Mixed conifer dominant. Deadfall. Driving looking for sites, stopped for a minute and heard it
June Trip Incidentals	ISO4	2022-06-15	379028	5887932	Olive-sided Flycatcher	Upland Bird	1		
June Trip Incidentals	OS1	2022-06-17	366666	5895293	Olive-sided Flycatcher	Upland Bird	1		Cut block with some mature conifer forest. Bird along edge of cut block
June Trip Incidentals	O44	2022-06-17	368979	5895871	Olive-sided Flycatcher	Upland Bird	1		
Breeding Bird Survey	UB02S2	2022-06-14	0374481	5894331	Pacific Wren	Upland Bird	1		before survey
White bark pine transect	T1_5	2022-08-29	375943	5892447	Pileated woodpecker	Upland Bird	1		
Breeding Bird Survey	UB10S3	2022-06-18	371139	5896171	Pine Siskin	Upland Bird	1		flyover; before survey

Appendix H: Incidental Wildlife Detections during the 2022 Wildlife Field Season

Survey Type	Site ID	Date	Easting	Northing	Species Common Name	Group	Total Detected/ Observed	Signs Observed	Comment
Breeding Bird Survey	UB15S1	2022-06-21	378222	5897514	Pine Siskin	Upland Bird	1		before survey
June Trip Incidentals	SW4	2022-06-17	374748	5895167	Pine Siskin	Upland Bird	1		Pine siskin Only bird observed at site
White bark pine transect	T2_1	2022-08-29	371162	5892588	Ptarmigan	Upland Bird	1		
White bark pine transect	T1_3	2022-08-29	375743	5892491	Ptarmigan	Upland Bird	1		
White bark pine transect	T3_7	2022-08-29	376572	5890422	Red breasted Nuthatch	Upland Bird	1		
White bark pine transect	T3_11	2022-08-29	376870	5890613	Red breasted Nuthatch	Upland Bird	1		
Breeding Bird Survey	UB03S1	2022-06-15	0382175	5895182	Red Crossbill	Upland Bird	1		flyover
Breeding Bird Survey	UB10S3	2022-06-18	371139	5896171	Red-breasted Nuthatch	Upland Bird	1		before survey
White bark pine transect	T5_1	2022-08-31	374515	5891679	Ruby Crowned Kinglet	Upland Bird	1		
White bark pine transect	T5_5	2022-08-31	374872	5891888	Ruby Crowned Kinglet	Upland Bird	1		
White bark pine transect	T5_6	2022-08-31	374965	5891935	Ruby Crowned Kinglet	Upland Bird	1		
White bark pine transect	T5_7	2022-08-31	375054	5891977	Ruby Crowned Kinglet	Upland Bird	1		
White bark pine transect	T5_8	2022-08-31	375140	5892031	Ruby Crowned Kinglet	Upland Bird	1		
Breeding Bird Survey	UB01S5	2022-06-14	0374241	5893119	Ruby-crowned Kinglet	Upland Bird	1		en route
Breeding Bird Survey	UB02S4	2022-06-14	374473	5894742	Ruby-crowned Kinglet	Upland Bird	1		singing before survey
Breeding Bird Survey	UB06S3	2022-06-15	373285	5889968	Ruby-crowned Kinglet	Upland Bird	1		
Breeding Bird Survey	UB06S3	2022-06-15	373285	5889968	Ruby-crowned Kinglet	Upland Bird	1		
Breeding Bird Survey	UB06S4	2022-06-15	373107	5889929	Ruby-crowned Kinglet	Upland Bird	1		
Breeding Bird Survey	UB09S3	2022-06-18	372378	5896224	Ruby-crowned Kinglet	Upland Bird	1		
Breeding Bird Survey	UB10S2	2022-06-18	371333	5896132	Ruby-crowned Kinglet	Upland Bird	1		between S1 and S2
Breeding Bird Survey	UB10S4	2022-06-18	370998	5896322	Ruby-crowned Kinglet	Upland Bird	0		
June Trip Incidentals	O44	2022-06-17	368979	5895871	Ruby-crowned Kinglet	Upland Bird	1		
June Trip Incidentals	Sw15	2022-06-19	376499	5893470	Ruby-crowned Kinglet	Upland Bird	1		
June Trip Incidentals	SW20	2022-06-20	376888	5894068	Ruby-crowned Kinglet	Upland Bird	1		
Breeding Bird Survey	UB13S1	2022-06-20	0379044	5900379	Ruffed Grouse	Upland Bird	1		Before survey
June Trip Incidentals	IN01	2022-06-19	377561	5893000	Ruffed Grouse	Upland Bird	2		Likely a pair of mating ruffed grouse
June Trip Incidentals	SW16	2022-06-19	368303	5895847	Savannah Sparrow	Upland Bird	1		
Breeding Bird Survey	UB04S5	2022-06-15	0378441	5888074	Spruce Grouse	Upland Bird	1		visual on the way out of the plot the pick up spot
Breeding Bird Survey	UB10S2	2022-06-18	371333	5896132	Spruce Grouse	Upland Bird	1		heard clucking between S1 and S2.
Breeding Bird Survey	UB11S4	2022-06-19	0377395	5893113	Spruce Grouse	Upland Bird	2		flushed about 20m from plot center as we walked to the next plot
June Trip Incidentals	ISO2	2022-06-15	375851	5894091	Spruce Grouse	Upland Bird	0	Scat	Grouse scat found during upland bird transect
Breeding Bird Survey	UB04S5	2022-06-15	0378441	5888074	Swainson's Thrush	Upland Bird	1		
Breeding Bird Survey	UB10S4	2022-06-18	370998	5896322	Swainson's Thrush	Upland Bird	1		
Breeding Bird Survey	UB12S3	2022-06-20	376826	5899341	Swainson's Thrush	Upland Bird	1		walk back to truck
Breeding Bird Survey	UB12S5	2022-06-20	376637	5899148	Swainson's Thrush	Upland Bird	1		
Breeding Bird Survey	UB13S2	2022-06-20	0379250	5900341	Swainson's Thrush	Upland Bird	1		
Breeding Bird Survey	UB15S2	2022-06-21	378329	5897331	Swainson's Thrush	Upland Bird	1		
Breeding Bird Survey	UB01S3	2022-06-14	0374410	5893485	Townsend's Warbler	Upland Bird	1		heard singing en route
Breeding Bird Survey	UB02S3	2022-06-14	374471	5894525	Townsend's Warbler	Upland Bird	1		
Breeding Bird Survey	UB03S1	2022-06-15	0382175	5895182	Townsend's Warbler	Upland Bird	1		
Breeding Bird Survey	UB04S2	2022-06-15	0378401	5887660	Townsend's Warbler	Upland Bird	1		
Breeding Bird Survey	UB04S3	2022-06-15	0378280	5887823	Townsend's Warbler	Upland Bird	1		
Breeding Bird Survey	UB08S1	2022-06-18	0369891	5896081	Townsend's Warbler	Upland Bird	1		
June Trip Incidentals	UB011S2	2022-06-19	377785	5892972	Tree Swallow	Upland Bird	1		
Spring Waterbirds	51	2022-05-20			Tree Swallow	Upland Bird	3		
Summer Waterbird	20	2022-07-08			Tree Swallow	Upland Bird	6		young (x4)
Summer Waterbird	120	2022-07-10			Tree Swallow	Upland Bird	1		adult (x1)
June Trip Incidentals	SW22	2022-06-20	376309	5894077	Unknown Songbird	Upland Bird	1		
White bark pine transect	T1_7	2022-08-29	376142	5892412	Unknown Sparrow	Upland Bird	1		
White bark pine transect	T1_9	2022-08-29	376343	5892381	Unknown Sparrow	Upland Bird	1		
White bark pine transect	T5_1	2022-08-31	374515	5891679	Unknown Sparrow	Upland Bird	2		
White bark pine transect	T5_2	2022-08-31	374609	5891745	Unknown Sparrow	Upland Bird	1		
White bark pine transect	T5_3	2022-08-31	374699	5891797	Unknown Sparrow	Upland Bird	1		
White bark pine transect	T5_4	2022-08-31	374786	5891842	Unknown Sparrow	Upland Bird	1		
White bark pine transect	T5_5	2022-08-31	374872	5891888	Unknown Sparrow	Upland Bird	1		

Appendix H: Incidental Wildlife Detections during the 2022 Wildlife Field Season

Survey Type	Site ID	Date	Easting	Northing	Species Common Name	Group	Total Detected/ Observed	Signs Observed	Comment
White bark pine transect	T5_6	2022-08-31	374965	5891935	Unknown Sparrow	Upland Bird	1		
White bark pine transect	T5_7	2022-08-31	375054	5891977	Unknown Sparrow	Upland Bird	2		
White bark pine transect	T5_8	2022-08-31	375140	5892031	Unknown Sparrow	Upland Bird	2		
White bark pine transect	T5_9	2022-08-31	375230	5892081	Unknown Sparrow	Upland Bird	1		
White bark pine transect	T5_10	2022-08-31	375316	5892125	Unknown Sparrow	Upland Bird	2		
White bark pine transect	T4_3	2022-08-29	373527	5889890	Unknown Sparrow	Upland Bird	1		
White bark pine transect	T4_4	2022-08-29	373620	5889922	Unknown Sparrow	Upland Bird	1		
White bark pine transect	T4_6	2022-08-29	373774	5890048	Unknown Sparrow	Upland Bird	1		
White bark pine transect	T2_2	2022-08-29	371239	5892523	Unknown Sparrow	Upland Bird			
White bark pine transect	T2_3	2022-08-29	371316	5892466	Unknown Sparrow	Upland Bird	2		
White bark pine transect	T2_4	2022-08-29	371405	5892901	Unknown Sparrow	Upland Bird	4		
White bark pine transect	T2_5	2022-08-29	371483	5892342	Unknown Sparrow	Upland Bird	3		
White bark pine transect	T2_6	2022-08-29	371564	5892282	Unknown Sparrow	Upland Bird	2		
White bark pine transect	T2_7	2022-08-29	371643	5892227	Unknown Sparrow	Upland Bird	3		
White bark pine transect	T2_8	2022-08-29	371723	5892162	Unknown Sparrow	Upland Bird	1		
White bark pine transect	T2_9	2022-08-29	371801	5892097	Unknown Sparrow	Upland Bird	1		
White bark pine transect	T1_3	2022-08-29	375743	5892491	Unknown Woodpecker	Upland Bird		Wildlife Tree	
White bark pine transect	T3_1	2022-08-29	375984	5890136	Unknown Woodpecker	Upland Bird		Wildlife Tree	
Breeding Bird Survey	UB05S3	2022-06-15	369163	5891003	Varied Thrush	Upland Bird	1		
Breeding Bird Survey	UB06S3	2022-06-15	373285	5889968	Varied Thrush	Upland Bird	1		
Breeding Bird Survey	UB06S5	2022-06-15	373178	5890113	Varied Thrush	Upland Bird	1		
Breeding Bird Survey	UB07S2	2022-06-18	0367461	5895686	Varied Thrush	Upland Bird	1		
Breeding Bird Survey	UB07S3	2022-06-18	0367660	5895749	Varied Thrush	Upland Bird	1		
Breeding Bird Survey	UB07S5	2022-06-18	0367959	5895861	Varied Thrush	Upland Bird	1		
Breeding Bird Survey	UB08S5	2022-06-18	0370253	5896393	Varied Thrush	Upland Bird	1		
Breeding Bird Survey	UB09S3	2022-06-18	372378	5896224	Varied Thrush	Upland Bird	1		
Breeding Bird Survey	UB10S2	2022-06-18	371333	5896132	Varied Thrush	Upland Bird	1		
Breeding Bird Survey	UB12S5	2022-06-20	376637	5899148	Varied Thrush	Upland Bird	1		
June Trip Incidentals	O44	2022-06-17	368979	5895871	Varied Thrush	Upland Bird	1		
June Trip Incidentals	Muster point	2022-06-17	375673	5894159	Violet-green Swallow	Upland Bird	1		
White bark pine transect	T5_1	2022-08-31	374515	5891679	Canada Jay	Upland Bird	1		
White bark pine transect	T5_5	2022-08-31	374872	5891888	Canada Jay	Upland Bird	1		
White bark pine transect	T4_2	2022-08-29	373423	5889879	Canada Jay	Upland Bird	2		
White bark pine transect	T4_7	2022-08-29	373839	5890119	Canada Jay	Upland Bird	1		
White bark pine transect	T4_9	2022-08-29	374012	5890252	Canada Jay	Upland Bird	1		
White bark pine transect	T4_11	2022-08-29	374170	5890357	Canada Jay	Upland Bird	1		
June Trip Incidentals	Muster point	2022-06-17	375673	5894159	Yellow Warbler	Upland Bird	1		
Breeding Bird Survey	UB02S1	2022-06-14	374483	5894122	Yellow-rumped Warbler	Upland Bird	1		
Breeding Bird Survey	UB02S1	2022-06-14	374483	5894122	Yellow-rumped Warbler	Upland Bird	1		
Breeding Bird Survey	UB02S2	2022-06-14	0374481	5894331	Yellow-rumped Warbler	Upland Bird	1		before survey
Breeding Bird Survey	UB03S3	2022-06-15	0382355	5894938	Yellow-rumped Warbler	Upland Bird	2		en route before survey
Breeding Bird Survey	UB03S5	2022-06-15	0382082	5894824	Yellow-rumped Warbler	Upland Bird	1		en route. Between S4 and S5
Breeding Bird Survey	UB04S4	2022-06-15	0378229	5888029	Yellow-rumped Warbler	Upland Bird	1		
Breeding Bird Survey	UB06S4	2022-06-15	373107	5889929	Yellow-rumped Warbler	Upland Bird	1		
Breeding Bird Survey	UB07S3	2022-06-18	0367660	5895749	Yellow-rumped Warbler	Upland Bird	1		en route to plot
Breeding Bird Survey	UB08S3	2022-06-18	0370257	5895975	Yellow-rumped Warbler	Upland Bird	1		
Breeding Bird Survey	UB10S4	2022-06-18	370998	5896322	Yellow-rumped Warbler	Upland Bird	1		flyover; after survey
Breeding Bird Survey	UB11S1	2022-06-19	0377845	5893161	Yellow-rumped Warbler	Upland Bird	1		Counter singing with YRWA in plot
Breeding Bird Survey	UB12S1	2022-06-20	0376629	5899491	Yellow-rumped Warbler	Upland Bird	1		en route
Breeding Bird Survey	UB14S5	2022-06-21	0378648	5897687	Yellow-rumped Warbler	Upland Bird	1		en route; possibly the same bird as in plot
Breeding Bird Survey	UB15S3	2022-06-21	378505	5897239	Yellow-rumped Warbler	Upland Bird	1		
June Trip Incidentals	SW5	2022-06-17	373673	5895608	Yellow-rumped Warbler	Upland Bird	1		
June Trip Incidentals	SW6	2022-06-17	372398	5895973	Yellow-rumped Warbler	Upland Bird	1		
June Trip Incidentals	O44	2022-06-17	368979	5895871	Yellow-rumped Warbler	Upland Bird	1		
June Trip Incidentals	SW8	2022-06-18	375952	5893862	Yellow-rumped Warbler	Upland Bird	1		Point count completed in proximity to core shack number 3 One yellow rumped warbler heard in forest beside core shack

Appendix H: Incidental Wildlife Detections during the 2022 Wildlife Field Season

Survey Type	Site ID	Date	Easting	Northing	Species Common Name	Group	Total Detected/ Observed	Signs Observed	Comment
June Trip Incidentals	SW12	2022-06-19	378579	5893452	Yellow-rumped Warbler	Upland Bird	3		
June Trip Incidentals	Sw15	2022-06-19	376499	5893470	Yellow-rumped Warbler	Upland Bird	2		
June Trip Incidentals	SW22	2022-06-20	376309	5894077	Yellow-rumped Warbler	Upland Bird	1		
Swift and Swallow	SS01	2022-06-14	378943	5900401	Chipping Sparrow	Upland Bird	1		
Swift and Swallow	SS01	2022-06-14	378943	5900401	Yellow-rumped Warbler	Upland Bird	1		Fly over and laded in a tree
Swift and Swallow	SS01	2022-06-14	378943	5900401	Olive-sided Fly Catcher	Upland Bird	1		Greater than 100m
Swift and Swallow	SS01	2022-06-14	378943	5900401	Canada Jay	Upland Bird	1		
Swift and Swallow	SS02	2022-06-14	375920	5894036	Yellow-rumped Warbler	Upland Bird	1		
Swift and Swallow	SS03	2022-06-14	375756	5894041	American pipit	Upland Bird	2		Flew overheard
Ungulate Pellet Counts		2022-06-16			American Three-toed Woodpecker	Upland Bird	1		near the large cut block at ~5km on the BW access road
Summer Waterbird/CLNU		2022-07-09			Unspecified Woodpecker	Upland Bird	1		in the wetlands east of the mine site road, near Taiuk Creek
Bat Roost		2022-09-01			Clark's Nutcracker	Upland Bird	1		
Bat Roost		2022-09-01			Ruby-crowned Kinglet	Upland Bird	1		
Bat Roost		2022-09-01			Boreal Chickadee	Upland Bird	1		
Bat Roost		2022-09-01			Red-breasted Nuthatch	Upland Bird	1		
Bat Roost		2022-09-01			Dark-eyed Junco	Upland Bird	1		
Bat Roost		2022-09-01			Canada Jay	Upland Bird	1		
Bat Roost		2022-09-01			Barn Swallow	Upland Bird	1		
Bat Roost		2022-09-01			Red-breasted Sapsucker	Upland Bird	1		
ARU	CLNU T4	2022-11-02			Clark's Nutcracker	Upland Bird	1		being chased by a group of songbirds
Breeding Bird Survey	UB03S4	2022-06-15	0382261	5894716	Barrow's Goldeneye	Wetland Bird	2		a pair in wetland. detected between surveys.
Breeding Bird Survey	UB15S2	2022-06-21	378329	5897331	Greater Yellowlegs	Wetland Bird	4		before survey; suspect pair present
Fall Waterbird	392	2022-09-10			Sandhill Crane	Wetland Bird	16		same possible juveniles
Fall Waterbird	494	2022-09-11			Sandhill Crane	Wetland Bird	2		cut block
June Trip Incidentals	Sw15	2022-06-19	376499	5893470	Solitary Sandpiper	Wetland Bird	1		
Summer Waterbird/CLNU		2022-07-09			White Pelican	Wetland Bird	7		in the wetlands east of the mine site road, near Taiuk Creek
Summer Waterbird/CLNU		2022-07-10			Western Grebe	Wetland Bird	1		
Summer Waterbird/CLNU		2022-07-10			Trumpeter Swan	Wetland Bird	1		
CLNU		2022-08-28			Sandhill Crane	Wetland Bird	2		at Matthews Creek (likely the Nesting pair observed in July).

APPENDIX I TRANSMISSION LINE TRANSECTS SITE DATA, 2022

Appendix I: Transmission Line Transects Site Data, 2022

Site	Survey Date	Zone	Easting Start	Northing Start	Easting End	Northing End	Notes	Wildlife Sign
MT01	2022-07-10	10u	378359	5955706	-	-	Approximately 27 km northwest from the intersection of the Proposed Transmission Line Mine Access Road and Kluskus FSR Mine Site Road	-
MT02	2022-07-10	10u	380637	5975758	-	-	Approximately 18 km northwest from the intersection of the Proposed Transmission Line Mine Access Road and Kluskus FSR Mine Site Road	-
MT03	2022-09-10	10u	382300	5970338	382210	5970029	Cut block east of lake and planned TL	vole activity, good spot for bears
MT04	2022-09-11	10u	384779	5943069	384772	5943193	Burn area surrounded by wetlands, landed right at starting location	moose tracks, woodpecker activity
MT05	2022-09-11	10u	397220	5921860	397146	5921852	Landed on road near Brewster Lake Rec site. Transect is in forest between lake and wetland.	squirrel midden, northern flicker

APPENDIX J UNGULATE PELLET SURVEYS – STANDARD OPERATING PROCEDURE (SOP)

Blackwater Gold Project

Ungulate Pellet Survey

STANDARD OPERATING PROCEDURE

June 2023 Version A.1

Scope of Work: This SOP provides guidance for the completion of ungulate pellet surveys.

Contacts:

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1. INTRODUCTION

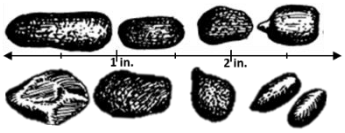
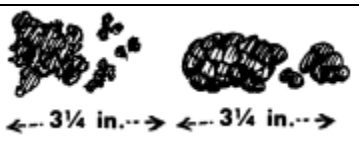
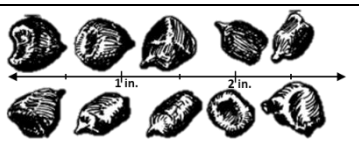
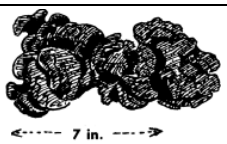
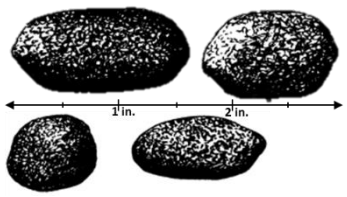
Proposed development of the Blackwater Gold Project (the Project) falls within the British Columbia (BC) Ungulate Winter Range number U-7-012 (BC MOE 2008) and is on the easter edge of the Tweedsmuir local population unit of southern mountain caribou (*Rangifer tarandus caribou*). Blackwater Gold (BW Gold) met with the Ministry of Forests, Lands, Natural Resource Operations, and Rural Development (FLNRORD), Environment and Climate Change Canada (ECCC), Ulkatcho First Nation, and Lhoosk'uz Dené Nation on January 26, 2022, to discuss the monitoring of ungulate populations within the Project area. At that time, FLNRORD indicated that the province is already doing aerial surveys for moose population and composition estimates and caribou population estimates, caribou herd composition, and caribou calf survival estimates in the Tweedsmuir area and would prefer that BW Gold: conduct pellet counts and/or snow track surveys to measure relative distribution of caribou and moose in lieu of aerial surveys.

As such, based on this feedback and direction, BW Gold will conduct yearly pellet count surveys to assess any indications of avoidance of the mine by ungulates. This Standard Operating Procedure (SOP) is intended to provide suggested methodology for ungulate pellet surveys to be completed.
Two methodologies for ungulate pellet count surveys are suggested to be completed in year one to assist in determining the best methodology for estimating ungulate population at the Project.

2. PELLET IDENTIFICATION

Ungulate pellets in close proximity sourced from one defecation event are referred to as a pellet group. Ungulate pellets can vary greatly in composition, shape, and size due to factors such as species, diet, and season. Pellets that are soil and well defined are often deposited during the winter or dry seasons. Whereas cake like deposits or wet and clumped depositions are often deposited during the summer or high nutrient season. Caribou, mule deer, and moose are the likely ungulate species to be present within the pellet survey's study area. The general description of each species pellets by season is presented in Table 1. Additional field guides on ungulate pellet identification may be necessary to best distinguish similar depositions.

Table 1: Distinctions Between Pellets of Ungulate Species Potentially Present at the Blackwater Mine

Ungulate	Season	Pellet Description	Size[1] (in)	Examples of Variation[2]
Caribou	Summer	■ Pellets are coalesced in a clump or soft patty with some to no pellet shape often in a log like mass. ■ Resembles summer mule deer pellets but generally has a less defined pellet shape.	1 to 3.25	
	Winter	■ Irregularly shaped pellets that often have concave or pointed edges. ■ Resembles winter mule deer pellets but is generally short and stout in comparison.	~0.5	
Mule Deer	Summer	■ Pellets often are fused together generally retaining some pellet shape.	~3	
	Winter	■ Long ovular pellets that are often smooth, but some are irregular with points and concaves. ■ Pellet groups typically contain 68 to 128 pellets.	0.5 to 0.9	
Moose	Summer	■ Typically, no distinction between pellets. Resembles a large cow patty. ■ Usually are much larger and less defined than caribou and mule deer pellets.	1.25 to 8	
	Winter	■ Smooth round or oval pellets that look like compressed sawdust. ■ Pellet groups typically contain 78 to 192 pellets, with an average of 128 pellets. ■ Spring and fall pellets are often indicated by an angular or irregular shape or conjoined pellets. ■ Pellets are noticeable larger with more woody debris than caribou and mule deer pellets.	1 to 1.75	

[1] *Approximate size but may vary based on individual and region.*

[2] *Examples sourced from: Murie, O.J. 1975. A field guide to animal tracks. Peterson Field Guide Series No. 9. Houghlin Mifflin Co. Boston, Mass.*

Knowing if pellet groups were deposited within a year of surveying is important for monitoring and correctly estimating ungulate populations. The following are signs that may suggest the pellet group was deposited over a year ago:

- Light brown colouration;
- Sides resting on ground are noticeably darker then exposed sides;
- Leaves or other material covering the pellet group;

- Moss growing on pellets; and
- Fragile or easily falling apart.

Surveyors should be knowledgeable in identification of species and approximate season deposited. For the first survey year, detailed descriptions of the pellets condition should be recorded to assist in determining approximately how long ago the pellet group was deposited. For all additional survey years, only the general season deposited is required as all pellet groups recorded in previous years will be removed from the survey plots. Surveyors will wear gloves any time they must touch or move pellets or summer depositions.

3. SURVEY LOCATIONS

The study area for pellet count surveys will include the mine site and the 10 km surrounding area. The pellet count program is designed as a Before-After, Control-Impact (BACI) study. The study area will be separated into five zones with different levels of Project impact:

- < 500 m from the mine site;
- Between 500 m and 1 km from the mine site;
- Between 1 and 3 km from the mine site;
- Between 3 and 5 km from the mine site; and
- One Control Zone between 5 and 10 km from the mine site.

Development of the mine will occur during the construction phase, generally starting from the centre and building outwards towards the eventual final footprint. During the early years of construction, mining activities will be in the centre of the future footprint (1-3 km from the future edge of the final footprint) and will represent the 0 km mark in this study. Establishing zones based on the future footprint of the Project will provide a understanding on how the construction and expansion of the mine impacts ungulate populations surrounding the Project. Therefore, all samples in any zones greater then 5 km from the edge of the existing mine footprint will be considered “Before” impact.

Ten sampling transects will be established in each study zone using recent site maps prior to field work commencing. Survey transects should be stratified by suitable ungulate habitat type to proportionally represent habitat types within each study zone. Study zones closest to the mine site may only have one habitat type, and therefore may not allow for stratification. Drainage patterns should be considered and transect should be established to run diagonally along them. Designated survey transects will be used for each subsequent sampling year.

4. METHODS FOR UNGULATE PELLET SURVEYS

Ungulate pellet surveys will be completed at the Project to determine whether the mine site has an impact on the relative abundance of ungulates in the area. Surveys should be completed in the early spring as pellets are most visible before vegetation grows their full summer foliage. Surveys will count pellet groups containing at least 10 pellets or summer depositions.

Ideally, one survey methodology could be used estimate relative abundance for all ungulates at the Project; however, field observations indicate that some ungulate pellets are more commonly observed then others. Particularly, caribou pellets have been reported to be much less common than moose pellets at the Project. Observations of both moose and caribou pellets were made in the summer of 2021 during habitat suitability fieldwork and incidentally during other surveys in the area surrounding the mine site.

Moose pellets were abundant and observed daily, while caribou pellets were rare compared to moose pellets, with approximately 10-15 total observations.

To determine the best methodology to properly estimate the relative abundance of all ungulate species within the study area, two different methodologies will be used during the first year of surveying: transect and distance pellet counts. Level of field effort and detection accuracy will determine which survey methodology will be adopted for surveys conduced in subsequent years. The survey locations used during the first year of sampling for the adopted methodology will be re-sampled for each subsequent sampling year.

4.1 Quadrat Methodology

Survey methods for quadrat surveys will follow methodology from RIC 1998, *Ground-based Inventory Methods for Selected Ungulates: Moose, Elk and Deer.* Ten quadrat survey locations will be established in 15 m intervals along each survey transect. A circle with a 1.7 m radius stemming from each quadrat survey location will be established. The center of each circular survey plot will be marked with a staked and ferromagnetic marker. A description of the site including information on habitat type, vegetation community, and notable characteristics or features will be recorded for each survey plot.

Starting at the center of the plot, the survey team should initially walk clockwise from the center to the outer boundary of the circle looking for pellet groups and then repeat by walking counter-clockwise. For each pellet group or summer deposition identified, the number of pellets, potential season deposited, and the species will be recorded. If the species cannot be confidently identified, detailed notes on pellet size and shape will be recorded and a picture will be taken. Once the survey plot has been scanned twice, all recorded pellets or summer depositions will be removed and reallocated to an area outside of the survey plot. If a deposition cannot be fully removed, a temporary marker should be placed or a detailed note on the location should be taken.

4.2 Distance Methodology

Survey methods for quadrat surveys will follow methodology from Batcheler 1975, *Development of a Distance Method for Deer Census from Pellet Groups* and Goulet 1984, *Ungulate pellet group surveys on the Liard and Stikine Rivers using the plotless Batcheler's technique.* Ten distance survey starting locations will be established in 18m intervals along each survey transect. A description of the habitat type, vegetation community, and notable characteristics or features surrounding the distance survey starting location will be recorded.

Starting at each designated starting location, the survey team should walk (clockwise or counter-clockwise) from the center to locate the nearest pellet grouping or summer deposit. A maximum of 10 m from the starting location will be searched. The distance from the starting point to the center of the nearest pellet group (group A) will be recorded. The center of the group A will act as the next “starting location” to identify the next nearest pellet group (group B) residing within the 10 m boundary. If a group B is found, it will then act as the next “starting location” to identify the next nearest pellet group (group C) residing within the 10 m boundary. Surveys should be continued until no additional pellet groups are found or the 10m boundary is reached. The distance from the centroid of the “starting location” pellet group to the nearest pellet group will be recorded for each group identified. In addition to the distance from the starting point or pellet group, the number of pellets, potential season deposited, and the species will be recorded for each pellet group or summer deposition. If the species cannot be confidently identified, detailed notes on pellet size and shape will be recorded and a picture will be taken. All recorded pellet groups or summer depositions will be removed and reallocated to an area well outside of the survey area. If a deposition cannot be fully removed, a temporary marker should be placed or a detailed note on the location should be taken.

4.3 Analysis

Pellet count data will be assessed using a BACI analysis to test the interaction between study zone type (control vs impact) and time period (before vs. after). The analysis will include a random effect due to repeated measurements at transects and include covariates to control for habitat type. In addition, pairwise comparisons will be conducted to compare each impact zone to the control zone to explore more precisely the distances at which a potential effect is detected.

5. REFERENCES

BC MOE (Ministry of Environment). 2008. Order – Ungulate Winter Range #U-7-012.

Batcheler, C.L. 1975. Development of a distance method for deer census from pellet groups. J. Wildl. Manage. 39: 641-652

Goulet, L.A. 1984. Ungulate pellet group surveys on the Liard and Stikine Rivers using the plotless Batcheler's technique. pp. 26-34, in L.A. Stordeur (ed). Proceedings of a seminar on ungulate pellet group sampling and data analysis techniques. B.C. Min. For. WHR-7, Victoria, BC.

Murie, O.J. 1975. A field guide to animal tracks. Peterson Field Guide Series No. 9. Houghlin Mifflin Co. Boston, Mass.

RIC. 1998. *Ground-based Inventory Methods for Selected Ungulates: Moose, Elk, and Deer.* Standards for Components of British Columbia's Biodiversity No. 33. Prepared by Ministry of Environment, Lands and Parks, Resources Inventory Branch for Terrestrial Ecosystem Task Force, Resources Inventory Committee (RIC): Victoria, BC.

APPENDIX K UNGULATE PELLET COUNT SITE DATA, 2022

Appendix K: Ungulate Pellet Count Site Data, 2022

Date	Transect ID	Site ID	Zone	Easting	Northing	Observers	Temp (°C)	% Cloud Cover	% River	% Wetland	% Marsh	% Pond	% Lake	% Conifer	% Deciduous	BEC subzone	Dominant Plants	Stand Age Class	% Crown Closure	Habitat Description
2022-06-14	MP01	01	10U	374843	5894795	MF, EH	7	20	0	0	0	0	0	100	0	ESSFmv1	Heather, wintergreen, willow	Medium	10	Open clearing, 25m from decommissioned road, 150m from stream
	MP01	02	10U	374859	5894781	MF, EH			0	0	0	0	0	100	0	ESSFmv1	Heather, moss	Medium	25	Opening in forest, perp to spur road
	MP-01	03	10U	374878	5894772	MF, EH	6	10	0	0	0	0	0	100	0	ESSFmv1	Heather, moss	Medium	10	Forest opening
	MP01	04	10U	374887	5894767	MF, EH	6	15	0	0	0	0	0	100	0	ESSFmv1	Heather, moss	Medium	10	Forest opening
	MP01	05	10U	374906	5894759	MF, EH	7	5	0	0	0	0	0	100	0	ESSFmv1	Heather, moss	Medium	5	Forest opening
	MP01	06	10U	374926	5894749	MF, EH	8	5	0	0	0	0	0	100	0	ESSFmv1	Heather, moss, willow	Medium	15	Opening, at end of fallen tree
	MP01	07	10U	374938	5894744	MF, EH	8	10	0	0	0	0	0	100	0	ESSFmv1	Heather, moss, willow	Medium	15	Forest opening
	MP01	08	10U	374954	5894735	MF, EH	9	0	0	5	0	0	0	95	0	ESSFmv1	Heather, moss, willow	Medium	35	Near edge of spur road. Forest edge with lots of windthrow.
	MP01	09	10U	374971	5894729	MF, EH	11	10	0	0	0	0	0	100	0	ESSFmv1	Willow, grass	Medium	0	Edge of spur road
	MP01	10	10U	374988	5894741	MF, EH	13	5	0	0	0	0	0	100	0	ESSFmv1	Willow, grass	Medium	25	Edge of spur
2022-06-15	MP02	1	10	363106	5894354	MF, EH	8	0	0	0	0	0	0	100	0	SBSmc2	Shepperdia, rose	Medium	0	Off decommissioned spur at 1.5 km on access road. Near lots of windthrow. Open clearing with dead spruce.
	MP02	2	10	363091	5894367	MF, EH	8	0	0	10	0	0	0	90	0	SBSmc2	Willow, rose	Medium	5	Open area with small wet area
	MP02	3	10	363071	5894357	MF, EH	9	0	0	5	0	5	0	88	2	SBSmc2	Sheperdia, willow, aspen seedlings	Medium	0	Wet open meadow
	MP02	4	10	363058	5894344	MF, EH	11	0	0	5	0	0	0	95	0	SBSmc2	Sheperdia	Medium	0	Wet opening in forest
	MP02	5	10	363039	5894349	MF, EH	12	0	0	0	0	0	0	100	0	SBSmc2	Sheperdia	Medium	5	
	MP02	6	10	363032	5894361	MF, EH	12	0	0	25	0	0	0	75	0	SBSmc2	Willow, horsetails	Medium	20	
	MP02	7	10	363031	5894382	MF, EH	14	0	0	10	0	0	0	90	0	SBSmc2	Sheperdia, willow	Medium	10	
	MP02	8	10	363013	5894386	MF, EH	14	0	0	10	0	0	0	90	0	SBSmc2	Sheperdia	Medium	25	
	MP02	9	10	362997	5894386	MF, EH	15	0	0	15	0	0	0	85	0	SBSmc2	Willow	Medium	65	Tighter forest
	MP02	10	10	362988	5894375	MF, EH	15	0	0	10	0	0	0	90	0	SBSmc2	Willow	Medium	45	
	MP03	1	10	371286	5896234	MF, EH	18	10	0	0	0	0	0	100	0	ESSFmv1	Heather, lichen	Medium	10	Off spur road k
	MP03	2	10	371267	5896222	MF, EH	19	5	0	0	0	0	0	100	0	ESSFmv1	Heather, lichen, moss	Medium	15	
	MP03	3	10	371248	5896209	MF, EH	19	5	0	0	10	0	0	90	0	ESSFmv1	Heather, moss	Medium	35	
	MP03	4	10	371234	5896207	MF, EH	18	10	0	0	0	0	0	100	0	ESSFmv1	Heather, moss	Medium	15	
	MP03	5	10	371217	5896201	MF, EH	20	10	0	0	0	0	0	100	0	ESSFmv1	Moss	Medium	45	On small cleared road boundary
	MP03	6	10	371202	5896203	MF, EH	18	20	0	0	0	0	0	100	0	ESSFmv1	Heather, moss	Medium	25	
	MP03	7	10	371181	5896208	MF, EH	19	20	0	0	0	0	0	100	0	ESSFmv1	Heather, moss	Medium	15	
	MP03	8	10	371163	5896207	MF, EH	19	25	0	0	0	0	0	100	0	ESSFmv1	Moss	Medium	35	
	MP03	9	10	371145	5896207	MF, EH	20	25	0	0	0	0	0	100	0	ESSFmv1	Lichen, heather	Medium	15	Lichen meadow
	MP03	10	10	371124	5896210	MF, EH	20	20	0	0	0	0	0	100	0	ESSFmv1	Lichen	Medium	15	
2022-06-16	MP04	1	10	370260	5896318	MF, EH	7	95	0	85	0	0	0	15	0	ESSFmv1	Grass, willow	Medium	10	Meadow at 10km on bw road
	MP04	2	10	370261	5896317	MF, EH	8	95	0	98	0	0	0	2	0	ESSFmv1	Grass, willow	Medium	5	
	MP04	3	10	370256	5896308	MF, EH	8	100	0	90	0	0	0	10	0	ESSFmv1	Grass, willow	Medium	10	
	MP04	4	10	370247	5896301	MF, EH	8	100	0	90	0	0	0	10	0	ESSFmv1	Willow, grass	Medium	10	
	MP04	5	10	370246	5896293	MF, EH	8	100	0	65	0	0	0	35	0	ESSFmv1	Grass, willow	Medium	25	
	MP04	6	10	370229	5896291	MF, EH	10	95	0	15	0	0	0	85	0	ESSFmv1	Heather, moss, willow	Medium	35	
	MP04	7	10	370210	5896280	MF, EH	10	90	0	15	0	0	0	85	0	ESSFmv1	Heather, moss	Medium	45	
	MP04	8	10	370199	5896264	MF, EH	11	90	0	0	0	0	0	100	0	ESSFmv1		Medium	35	
	MP04	9	10	370191	5896252	MF, EH	12	100	0	0	0	0	0	100	0	ESSFmv1	Lichen, heather, moss	Medium	40	
	MP04	10	10	370175	5896243	MF, EH	12	90	0	0	0	0	0	100	0	ESSFmv1	Heather lichen, moss, aster	Medium	25	
	MP05	1	10	366217	5894871	MF, EH	14	65	0	0	0	0	0	100	0	ESSFmv1	Grass, moss,	Medium	30	Edge of giant clearcut
	MP05	2	10	366203	5894884	MF, EH	14	40	0	0	0	0	0	100	0	ESSFmv1	Kinnikinik, moss	Medium	15	
	MP05	3	10	366210	5894872	MF, EH	14	20	0	0	0	0	0	100	0	ESSFmv1	Kinikinik, heather, moss, lichen	Medium	15	Edge of meadow
	MP05	4	10	366211	5894851	MF, EH	15	60	0	75	0	0	0	25	0	ESSFmv1	Grass, willow	Medium	5	
	MP05	5	10	366209	5894834	MF, EH	15	50	0	65	0	0	0	35	0	ESSFmv1	Grass, willow	Medium	10	
	MP05	6	10	366193	5894830	MF, EH	15	35	0	90	0	0	0	10	0	ESSFmv1	Willow	Medium	5	
	MP05	7	10	366193	5894801	MF, EH	15	75	0	70	0	0	0	30	0	ESSFmv1	Willow, grass	Medium	15	
	MP05	8	10	366186	5894788	MF, EH	14	80	0	70	0	0	0	30	0	ESSFmv1	Willow, grass	Medium	10	
	MP05	9	10	366175	5894774	MF, EH	15	75	0	80	0	0	0	20	0	ESSFmv1		Medium	10	
	MP05	10	10	366131	5894769	MF, EH	16	45	0	65	0	0	0	35	0	ESSFmv1	Willow, grass	Medium	10	
	MP06	1	10	367254	5896229	MF, EH	18	90	0	0	0	0	0	100	0	ESSFmv1	Grass	Medium	0	Cut block
	MP06	2	10	367235	5896222	MF, EH	17	90	0	0	0	0	0	100	0	ESSFmv1	Heather	Young	0	In cut block
	MP06	3	10	367229	5896219	MF, EH	15	100	0	0	0	0	0	100	0	ESSFmv1		Young	0	Cut block
	MP06	4	10	367219	5896221	MF, EH	16	100	0	0	0	0	0	100	0	ESSFmv1	Grass	Young	0	Cut block
	MP06	5	10	366442	5895952	MF, EH	13	100	0	0	0	0	0	100	0	ESSFmv1	Fireweed	Young	0	Cut block
	MP06	6	10	367205	5896219	MF, EH	15	90	0	0	0	0	0	100	0	ESSFmv1	Willow, grass	Young	0	Cut block
	MP06	7	10	367198	5896216	MF, EH	16	90	0	0	0	0	0	100	0	ESSFmv1	Willow, grass	Young	0	Cut block
	MP06	8	10	367189	5896213	MF, EH	14	95	0	0	0	0	0	100	0	ESSFmv1	Willow, fireweed	Young	0	Cut block
	MP06	9	10	367182	5896209	MF, EH	15	90	0	0	0	0	0	100	0	ESSFmv1	Willow, fireweed	Young	0	Cut block
	MP06	10	10	367172	5896207	MF, EH	15	85	0	0	0	0	0	100	0	ESSFmv1	Fireweed, moss	Young	0	Cut block

Appendix K: Ungulate Pellet Count Site Data, 2022

Date	Transect ID	Site ID	Zone	Easting	Northing	Observers	Temp (°C)	% Cloud Cover	% River	% Wetland	% Marsh	% Pond	% Lake	% Conifer	% Deciduous	BEC subzone	Dominant Plants	Stand Age Class	% Crown Closure	Habitat Description
2022-06-17	MP07	1	10	379174	5887920	MF, EH	8	100	0	0	0	0	0	100	0	ESSFmv1	Heather, fireweed	Young	5	Regenerating block
	MP07	2	10	379189	5887920	MF, EH	8	100	0	0	0	0	0	100	0	ESSFmv1	Fireweed, kinikinik, grass	Young	0	Regenerating block
	MP07	3	10	379198	5887918	MF, EH	8	95	0	0	0	0	0	100	0	ESSFmv1	Heather, fireweed	Young	0	Regenerating block
	MP07	4	10U	379205	5887915	MF, EH	9	95	0	0	0	0	0	100	0	ESSFmv1	Kinikinik, fireweed	Young	0	Regen block
	MP07	5	10	379222	5887914	MF, EH	9	95	0	0	0	0	0	100	0	ESSFmv1	Kinikinik, heather	Young	0	Regen block
	MP07	6	10	379230	588799	MF, EH	8	100	0	0	0	0	0	100	0	ESSFmv1	Kinikinik, heather	Young	0	Regen block
	MP07	7	10	379222	5887905	MF, EH	8	100	0	0	0	0	0	100	0	ESSFmv1	Heather, moss, willow	Young	0	Regen block
	MP07	8	10	379246	5887900	MF, EH	7	100	0	0	0	0	0	100	0	ESSFmv1	Heather, lupin	Young	0	Regen block
	MP07	9	10	379253	5887893	MF, EH	7	100	0	0	0	0	0	100	0	ESSFmv1	Kinikinik, heather	Young	0	Regen block
	MP07	10	10	379264	5887898	MF, EH	8	100	0	0	0	0	0	100	0	ESSFmv1	Heather	Young	0	Regen block
	MP08	1	10	373775	5882638	MF, EH	8	100	0	30	0	0	0	70	0	ESSFmv1	Reeds, willow	Medium	40	Open wetland off large cut block
	MP08	2	10	373787	5882641	MF, EH	9	100	0	35	0	0	0	65	0	ESSFmv1	Reed, willows	Medium	30	
	MP08	3	10	373752	5882634	MF, EH	8	100	0	90	0	0	0	10	0	ESSFmv1	Willow	Medium	5	
	MP08	4	10	373745	5882625	MF, EH	9	100	0	90	0	0	0	10	0	ESSFmv1	Willow	Medium	5	
	MP08	5	10	373717	5882619	MF, EH	8	100	0	95	0	0	0	5	0	ESSFmv1	Willow	Medium	5	
	MP08	6	10	373743	5884800	MF, EH	8	100	0	100	0	0	0	0	0	ESSFmv1	Willow	Medium	0	
	MP08	7	10	373703	5882605	MF, EH	9	100	0	100	0	0	0	0	0	ESSFmv1	Willow	Medium	0	
	MP08	8	10	373697	5882606	MF, EH	9	100	0	100	0	0	0	0	0	ESSFmv1	Willow	Medium	0	
	MP08	9	10	373679	5882610	MF, EH	8	100	0	100	0	0	0	0	0	ESSFmv1	Willow	Medium	0	
	MP08	10	10	373671	5882606	MF, EH	9	100	0	100	0	0	0	0	0	ESSFmv1	Willow	Medium	0	
2022-06-18	MP09	1	10	373987	5896647	MF, EH	10	55	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, moss	Medium	65	Off c-trail just outside footprint
	MP09	2	10	373999	5896659	MF, EH	10	65	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, moss	Medium	35	
	MP09	3	10	373997	5896687	MF, EH	11	85	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, moss	Medium	55	
	MP09	4	10	373993	5896700	MF, EH	11	100	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, moss, Labrador tea	Medium	55	
	MP09	5	10	374006	5896724	MF, EH	12	100	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, Labrador tea, 5 leaf bramble	Medium	30	
	MP09	6	10	374007	5896712	MF, EH	12	100	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, Labrador tea, 5leaf bramble	Medium	40	
	MP09	7	10	374026	5896763	MF, EH	12	100	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, moss	Medium	30	
	MP09	8	10	374029	5896766	MF, EH	12	100	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, moss	Medium	25	
	MP09	9	10	374039	5896777	MF, EH	12	100	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, moss, heather	Medium	15	
	MP09	10	10	374056	5896814	MF, EH	12	100	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, heather, moss	Medium	40	
	MP10	1	10	375605	5898692	MF, EH	14	85	0	0	0	0	0	100	0	SBPSmc	Lichen, kinikinik	Young	15	
	MP10	2	10	375614	5898704	MF, EH	12	100	0	0	0	0	0	100	0	SBPSmc	Kinikinik, fireweed	Young	20	Decommissioned spur road
	MP10	3	10	375627	5898722	MF, EH	13	100	0	0	0	0	0	100	0	SBPSmc	Kinikinik, heather	Young	20	Decommissioned spur
	MP10	4	10	375638	5898740	MF, EH	13	95	0	0	0	0	0	100	0	SBPSmc		Young	15	Decommissioned spur
	MP10	5	10	375648	5898752	MF, EH	14	95	0	0	0	0	0	100	0	SBPSmc	Kinikik, heather	Young	20	Decommissioned spur
	MP10	6	10	375657	5898767	MF, EH	13	100	0	0	0	0	0	100	0	SBPSmc	Heather, grass, fireweed	Young	20	Decommissioned spur
	MP10	7	10	375667	5898781	MF, EH	13	100	0	0	0	0	0	100	0	SBPSmc	Lichen, heather	Young	15	Decommissioned spur
	MP10	8	10	375682	5898798	MF, EH	14	100	0	0	0	0	0	100	0	SBPSmc	Grass, heather, kinikinik	Young	10	End of decommissioned spur
	MP10	9	10	374313	5899252	MF, EH	14	90	0	0	0	0	0	100	0	SBPSmc	Heather, moss	Young	35	Past end of spur, regen forest
	MP10	10	10	375691	5898817	MF, EH	12	100	0	0	0	0	0	100	0	SBPSmc	Heather, moss	Young	25	
	MP11	1	10	375176	5903986	MF, EH	14	100	0	0	0	0	0	100	0	SBSmc3		Medium	70	Off spur to airstrip
	MP11	2	10	375179	5903985	MF, EH	12	100	0	0	0	0	0	100	0	SBSmc3	Kinikinik, lichen, grass	Medium	70	Near airstrip
	MP11	3	10	375183	5903976	MF, EH	11	100	0	0	0	0	0	100	0	SBSmc3	Kinikinik, lichen	Medium	55	Near airstrip
	MP11	4	10	375207	5904006	MF, EH	13	100	0	0	0	0	0	100	0	SBSmc3	Kinikinik, lichen	Medium	15	Near airstrip
	MP11	5	10	375218	5904013	MF, EH	14	100	0	0	0	0	0	100	0	SBSmc3	Sheperdia, kinikinik, lichen	Medium	15	Near airstrip
	MP11	6	10	375241	5904008	MF, EH	16	55	0	0	0	0	0	100	0	SBSmc3	Sheperdia, lichen, Labrador tea	Medium	25	Near airstrip
	MP11	7	10	375241	5904025	MF, EH	14	85	0	0	0	0	0	100	0	SBSmc3	Sheperdia, lichen, kinikinik	Medium	35	Near airstrip
	MP11	8	10	375255	5904050	MF, EH	14	70	0	0	0	0	0	100	0	SBSmc3	Kinikinik, lichen	Medium	10	Near airstrip
	MP11	9	10	375267	5904061	MF, EH	14	55	0	0	0	0	0	100	0	SBSmc3	Kinikinik, lichen, sheperdia	Medium	20	Near airstrip
	MP11	10	10	375270	5904069	MF, EH	15	80	0	0	0	0	0	100	0	SBSmc3	Sheperdia, kinikinik, lichen	Medium	10	Near airstrip
2022-06-19	MP12	1	10	375726	5895237	MF, EH	12	5	0	0	0	0	0	100	0	ESSFmv1	Kinikinik, unk woody shrub	Medium	0	Gravel dump just off 15.5km spur
	MP12	2	10	375666	5895189	MF, EH	13	5	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, willow	Medium	15	
	MP12	3	10	375670	5895213	MF, EH	14	0	0	0	0	0	0	100	0	ESSFmv1	False huckleberry, moss, lichen	Medium	20	
	MP12	4	10	375667	5895231	MF, EH	13	0	0	0	0	0	0	100	0	ESSFmv1	False huckleberry	Medium	10	
	MP12	5	10	375659	5895239	MF, EH	13	10	0	0	0	0	0	100	0	ESSFmv1	False huckleberry	Medium	30	
	MP12	6	10	375655	5895251	MF, EH	12	5	0	0	0	0	0	100	0	ESSFmv1	False huckleberry, heather	Medium	10	
	MP12	7	10	375648	5895262	MF, EH	13	0	0	0	0	0	0	100	0	ESSFmv1	False huckleberry, wild rose	Medium	15	
	MP12	8	10	375643	5895283	MF, EH	14	0	0	5	0	0	0	95	0	ESSFmv1	False huckleberry, moss	Medium	25	
	MP12	9	10	375646	5895291	MF, EH	14	0	0	0	0	0	0	100	0	ESSFmv1	False huckleberry	Medium	40	
	MP12	10	10	375612	5895292	MF, EH	14	0	0	0	0	0	0	100	0	ESSFmv1	Moss, dogwood	Medium	85	More closed forest than rest of transect
	MP13	1	10	377143	5893486	MF, EH	14	0	0	0	0	0	0	100	0	ESSFmv1	Heather, moss, sheperdia	Medium	85	Off weather station (?) Road. Mod open forest, thin damp understory.

Appendix K: Ungulate Pellet Count Site Data, 2022

Date	Transect ID	Site ID	Zone	Easting	Northing	Observers	Temp (°C)	% Cloud Cover	% River	% Wetland	% Marsh	% Pond	% Lake	% Conifer	% Deciduous	BEC subzone	Dominant Plants	Stand Age Class	% Crown Closure	Habitat Description
2022-06-19	MP13	2	10	377149	5893505	MF, EH	13	0	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, moss	Medium	80	
(cont'd)	MP13	3	10	377146	5893538	MF, EH	15	0	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, moss	Medium	60	
	MP13	4	10	377153	5893532	MF, EH	18	0	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, moss	Medium	85	
	MP13	5	10	377139	5893556	MF, EH	16	0	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, moss, heather	Medium	30	
	MP13	6	10	377131	5893605	MF, EH	17	0	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, moss	Medium	35	
	MP13	7	10	377140	5893609	MF, EH	18	0	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, moss	Medium	80	
	MP13	8	10	377136	5893593	MF, EH	18	0	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, moss	Medium	90	
	MP13	9	10	377133	5893638	MF, EH	18	0	0	0	0	0	0	100	0	ESSFmv1	Moss, five leaf bramble	Medium	55	
	MP13	10	10	377145	5893661	MF, EH	18	0	0	0	0	0	0	100	0	ESSFmv1	Moss, five leaf bramble	Medium	85	
2022-06-20	MP14	1	10	380356	5890058	MF, EH	9	100	0	0	0	0	0	100	0	ESSFmv1	Grass	Medium	5	End of decommissioned spur, offAuro road
	MP14	2	10	380300	5890129	MF, EH	9	100	0	0	0	0	0	100	0	ESSFmv1	Five leaf bramble, swamp birch	Medium	65	
	MP14	3	10	380296	5890123	MF, EH	9	100	0	0	0	0	0	100	0	ESSFmv1	Moss, kinikinik	Medium	35	
	MP14	4	10	380305	5890122	MF, EH	9	100	0	0	0	0	0	100	0	ESSFmv1	Heather, moss, false hellebores	Medium	30	
	MP14	5	10	380334	5890140	MF, EH	8	100	0	0	0	0	0	100	0	ESSFmv1	Moss, fairy slipper, fireweed	Medium	45	
	MP14	6	10	380352	5890148	MF, EH	8	100	0	0	0	0	0	100	0	ESSFmv1	Moss, heather, fireweed	Medium	30	
	MP14	7	10	380363	5890159	MF, EH	8	100	0	0	0	0	0	100	0	ESSFmv1	Moss, kinikinik, fireweed	Medium	10	
	MP14	8	10	380385	5890161	MF, EH	8	100	0	0	0	0	0	100	0	ESSFmv1	Fireweed, heather, willow	Medium	10	
	MP14	9	10	380399	5890161	MF, EH	8	100	0	0	0	0	0	100	0	ESSFmv1	Heather, willow, moss, lichen	Medium	5	More open, lots of wind throw
	MP14	10	10	380419	5890166	MF, EH	8	100	0	0	0	0	0	100	0	ESSFmv1	Fireweed, kinikinik, grass	Medium	10	
	MP15	1	10	378966	5891531	MF, EH	8	100	0	20	0	0	0	80	0	ESSFmv1	Willow, moss, juniper	Medium	15	Off auro road. Marshy clearing
	MP15	2	10	378972	5891545	MF, EH	9	100	0	20	0	0	0	80	0	ESSFmv1	Willow, heather, moss	Medium	10	
	MP15	3	10	378990	5891565	MF, EH	10	100	0	15	0	0	0	85	0	ESSFmv1	Willow, moss, juniper	Medium	10	
	MP15	4	10	378996	5891570	MF, EH	12	100	0	15	0	0	0	85	0	ESSFmv1	Willow, grass, moss	Medium	25	
	MP15	5	10	379012	5891590	MF, EH	13	45	0	10	0	0	0	90	0	ESSFmv1	Willow, moss, false hellebore	Medium	15	
	MP15	6	10	379021	5891607	MF, EH	14	30	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, sheperdia	Medium	40	
	MP15	7	10	379035	5891609	MF, EH	14	35	0	0	0	0	0	100	0	ESSFmv1	Willow, grass, juniper	Medium	20	
	MP15	8	10	379055	5891607	MF, EH	15	20	0	0	0	0	0	100	0	ESSFmv1	False hellebore, swamp birch, grass	Medium	25	
	MP15	9	10	379063	5891624	MF, EH	15	40	0	0	0	0	0	100	0	ESSFmv1	Sheperdia, juniper, moss	Medium	70	
	MP15	10	10	379094	5891639	MF, EH	15	85	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, grass, false hellebore	Medium	25	
	MP16	1	10	378630	5893610	MF, EH	15	30	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, five leaf bramble, moss	Old	60	Off auro road at 3km. Med density forest
	MP16	2	10	378637	5893592	MF, EH	16	30	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, heather, moss	Old	4	
	MP16	3	10	378644	5893576	MF, EH	16	20	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, heather, thinleaf huckleberry	Old	55	
	MP16	4	10	378662	5893559	MF, EH	16	40	0	0	0	0	0	100	0	ESSFmv1	Thinkeaf huckleberry, moss, swamp birch	Old	35	
	MP16	5	10	378668	5893555	MF, EH	16	55	0	0	0	0	0	100	0	ESSFmv1	Thinleaf huckleberry, swamp birch, heather, moss	Old	30	
	MP16	6	10	378680	5893539	MF, EH	16	30	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, heather, moss	Medium	15	
	MP16	7	10	378678	5893529	MF, EH	16	50	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, moss	Old	15	
	MP16	8	10	378694	5893509	MF, EH	16	70	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, heather	Old	15	
	MP16	9	10	378708	5893494	MF, EH	17	80	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, thinleaf huckleberry, heater	Old	70	
	MP16	10	10U	378737	5893499	MF, EH	16	85	0	0	0	0	0	100	0	ESSFmv1	Swamp birch,thinleaf huckleberry, moss	Old	30	
2022-06-21	MP17	1	10	377210	5896997	MF, EH	6	100	0	0	0	0	0	100	0	ESSFmv1	Willow	Medium	10	Decommissioned spur
	MP17	2	10	377229	5896996	MF, EH	6	100	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, moss	Medium	5	Decommissioned spur
	MP17	3	10	377247	5896995	MF, EH	7	100	0	0	0	0	0	100	0	ESSFmv1	Willow, swamp birch	Medium	0	
	MP17	4	10	377267	5896995	MF, EH	7	100	0	0	0	0	0	95	5	ESSFmv1	Pine saplings, aspen seedlings	Medium	5	Decommissioned spur
	MP17	5	10	377280	5896994	MF, EH	8	100	0	0	0	0	0	98	2	ESSFmv1	Swamp birch, aspen, moss	Medium	5	Decommissioned spur
	MP17	6	10	377298	5896992	MF, EH	8	100	0	0	0	0	0	100	0	ESSFmv1	Willow, pine seedlings, swamp birch	Medium	5	Decommissioned spur
	MP17	7	10	377313	5896987	MF, EH	9	100	0	0	0	0	0	98	2	ESSFmv1	Willow, swamp birch, pine saplings	Medium	0	Decommissioned spur
	MP17	8	10	377337	5896997	MF, EH	9	100	0	0	0	0	0	100	0	ESSFmv1	Willow, swamp birch, moss	Medium	0	Decommissioned spur
	MP17	9	10	377358	5896987	MF, EH	8	100	0	0	0	0	0	100	0	ESSFmv1	Fireweed, swamp birch,	Medium	0	Decommissioned spur
	MP17	10	10	377370	5896993	MF, EH	9	100	0	0	0	0	0	100	0	ESSFmv1	Fireweed, grass	Medium	0	Decommissioned spur
	MP18	1	10	377539	5896508	MF, EH	9	100	0	0	0	0	0	100	0	ESSFmv1	Willow, pine saplings, spruce saplings	Medium	15	Regen spur
	MP18	2	10	377556	5896511	MF, EH	9	100	0	0	0	0	0	100	0	ESSFmv1	Willow, grass, pine saplings	Medium	30	Regen spur
	MP18	3	10	377576	5896507	MF, EH	9	100	0	0	0	0	0	100	0	ESSFmv1	Willow, spruce saplings	Medium	15	Regen spur
	MP18	4	10	377593	5896508	MF, EH	9	100	0	0	0	0	0	100	0	ESSFmv1	Willow, spruce saplings	Medium	10	Regen spur
	MP18	5	10	377601	5896501	MF, EH	8	100	0	0	0	0	0	100	0	ESSFmv1	Willow, spruce sapling, heather	Medium	5	Regen spur
	MP18	6	10	377629	5896503	MF, EH	9	100	0	0	0	0	0	100	0	ESSFmv1	Willow, pine saplings, spruce saplings, moss	Medium	10	Regen spur
	MP18	7	10	377640	5896513	MF, EH	9	100	0	0	0	0	0	100	0	ESSFmv1	Rose, pine saplings, spruce sapling	Medium	0	Regen spur
	MP18	8	10	377671	5896506	MF, EH	10	100	0	0	0	0	0	100	0	ESSFmv1	Pine seedlings, spruce saplings, willow	Medium	5	Regen spur
	MP18	9	10	377681	5896517	MF, EH	10	100	0	0	0	0	0	10	0	ESSFmv1	Pine seedlings, spruce saplings, swamp birch	Medium	15	Regen spur
	MP18	10	10	377700	5896502	MF, EH	10	100	0	0	0	0	0	100	0	ESSFmv1	Willow, pine seedlings, spruce saplings	Medium	5	Regen spur
	MP19	1	10	375492	5894228	MF, EH	7	100	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, moss	Old	45	Near cell tower and camp gate
	MP19	2	10	375587	5894169	MF, EH	7	100	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, moss,	Old	35	

Appendix K: Ungulate Pellet Count Site Data, 2022

Date	Transect ID	Site ID	Zone	Easting	Northing	Observers	Temp (°C)	% Cloud Cover	% River	% Wetland	% Marsh	% Pond	% Lake	% Conifer	% Deciduous	BEC subzone	Dominant Plants	Stand Age Class	% Crown Closure	Habitat Description
2022-06-21	MP19	3	10	375566	5894163	MF, EH	9	100	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, moss, thinleaf huckleberry	Old	70	
(cont'd)	MP19	4	10	375559	5894172	MF, EH	7	100	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, moss	Old	45	
	MP19	5	10	375544	5894157	MF, EH	7	100	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, moss	Old	85	
	MP19	6	10	375531	5894160	MF, EH	6	100	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, moss, five leaf bramble	Old	40	
	MP19	7	10	375525	5894143	MF, EH	7	100	0	0	0	0	0	100	0	ESSFmv1		Old	25	
	MP19	8	10	375503	5894123	MF, EH	7	100	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, moss	Old	55	
	MP19	9	10	375504	5894123	MF, EH	7	100	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, moss	Old	70	
	MP19	10	10	375512	5894121	MF, EH	6	100	0	0	0	0	0	100	0	ESSFmv1	Swamp birch, moss, lichen	Old	35	
2022-06-22	MP20	1	10	377332	5890936	MF, EH	7	25	0	100	0	0	0	0	0	ESSFmv1	Willow, grass	Old	0	Open wetland complex. Southeast of mt Davidson
	MP20	2	10	377337	5890925	MF, EH	9	5	0	100	0	0	0	0	0	ESSFmv1	Willow, grass	Old	0	Open wetland complex
	MP20	3	10	377348	5890945	MF, EH	10	20	0	100	0	0	0	0	0	ESSFmv1	Willow, roundleaf snowberry, grass	Old	0	
	MP20	4	10	377351	5890958	MF, EH	12	20	0	100	0	0	0	0	0	ESSFmv1	Heather, roundleaf snowberry	Old	0	
	MP20	5	10	377361	5890967	MF, EH	10	45	0	100	0	0	0	0	0	ESSFmv1	Roundleaf snowberry, grass, moss	Old	0	
	MP20	6	10	377387	5890975	MF, EH	8	60	0	100	0	0	0	0	0	ESSFmv1	Roundleaf snowberry, grass	Old	0	
	MP20	7	10	377401	5890981	MF, EH	7	55	0	100	0	0	0	0	0	ESSFmv1	Roundleaf snowberry, willow, grass	Old	0	
	MP20	8	10	377410	5890985	MF, EH	6	40	0	100	0	0	0	0	0	ESSFmv1	Roundleaf snowberry, grass, willow	Old	0	
	MP20	9	10	377424	5890999	MF, EH	7	45	0	90	0	0	0	10	0	ESSFmv1	Roundleaf snowberry, grass	Old	10	
	MP20	10	10	377441	5891017	MF, EH	7	80	0	90	0	0	0	10	0	ESSFmv1	Grass, roundleaf snowberry, moss	Old	10	
	MP21	1	10	377306	5890752	MF, EH	9	35	0	100	0	0	0	0	0	ESSFmv1	Grass, roundleaf snowberry	Old	0	Wetland complex
	MP21	2	10	377289	5890748	MF, EH	12	40	0	100	0	0	0	0	0	ESSFmv1	Grass, snowberry, moss, Labrador tea	Old	0	
	MP21	3	10	377272	5890760	MF, EH	12	80	0	100	0	0	0	0	0	ESSFmv1	Snowberry, grass, Labrador tea, moss, heather	Old	0	
	MP21	4	10	377257	5890758	MF, EH	12	95	0	100	0	0	0	0	0	ESSFmv1	Grass, snowberry, moss	Old	0	
	MP21	5	10	377243	5890750	MF, EH	10	100	0	100	0	0	0	0	0	ESSFmv1	Grass, snowberry	Old	0	
	MP22	1	10	376808	5888172	MF, EH	12	85	0	95	0	0	0	5	0	ESSFmv1	Moss, snowberry	Old	5	
	MP22	2	10	376797	5888185	MF, EH	13	85	0	80	0	0	0	20	0	ESSFmv1	Moss, snowberry	Old	25	
	MP22	3	10	376780	5888194	MF, EH	14	90	0	20	0	0	0	80	0	ESSFmv1	Moss, heather, snowberry	Old	20	
	MP22	4	10	376785	5888212	MF, EH	12	95	0	15	0	0	0	85	0	ESSFmv1	Moss, heather, snowberry	Old	15	
	MP22	5	10	376766	5888232	MF, EH	12	85	0	20	0	0	0	80	0	ESSFmv1	Heather, false hellebore	Old	30	Off end of wet meadow
	MP22	6	10	376776	5888247	MF, EH	14	80	0	20	0	0	0	80	0	ESSFmv1	Heather, swamp birch, moss	Old	15	
	MP22	7	10	376786	5888258	MF, EH	14	65	0	15	0	0	0	85	0	ESSFmv1	Heather, snowberry, swamp birch	Old	25	
	MP22	8	10	376797	5888274	MF, EH	14	70	0	10	0	0	0	90	0	ESSFmv1	Snowberry, heather	Old	65	
	MP22	9	10	376816	5888278	MF, EH	14	95	0	0	0	0	0	100	0	ESSFmv1	Heather, snowberry, moss	Old	55	Edge of clearing/wetland
	MP22	10	10	376831	5888273	MF, EH	15	45	0	15	0	0	0	85	0	ESSFmv1	Snowberry, heather, moss	Old	15	

APPENDIX L UNGULATE DISTANCE PELLET COUNT DATA, 2022

Appendix L: Ungulate Distance Pellet Count Data, 2022

Transect ID	Site ID	Pellets Observed	Pellet Group	Species	Approximate Pellet Age (Years)	Pellet Season	Number of Pellets	Distance (m)	Comments
MP01	1	No							1 old bear scat present
	2	No							
	3	No							
	4	Yes	1	Unknown Deer	2	Summer	35	0.6	Old and decaying
	5	No							
	6	No							
	7	No							
	8	No							
	9	Yes	1	Moose	1	Spring	24	4	Fresher winter type pellet
	9	Yes	2	Moose	0	Summer	1	1.1	Still wet. Very fresh.
	9	Yes	3	Moose	1	Spring	18	1.8	Fresher winter style pellet
	10	No							Moose pellets just outside survey area (12m)
MP02	1	No							
	2	Yes	1	Moose	3	Summer	40	8.5	Very old
	2	Yes	2	Moose	4	Summer	35	1.2	Old crusty moldy
	3	No							
	4	Yes	1	Moose	1	Spring	25	5	
	5	Yes	1	Moose	4	Summer	22	0.9	Very old
	5	Yes	2	Unknown Deer	1	Winter	105	3.8	
	6	Yes	1	Moose	1	Winter	45	4.7	
	6	Yes	2	Moose	1	Winter	120	11.7	
	7	Yes	1	Moose	2	Winter	25	0.7	
	7	Yes	2	Moose	4	Summer	30	7.9	Very old
	8	Yes	1	Moose	1	Winter	35	2.9	
	8	Yes	2	Moose	4	Summer	25	4.1	Very old
	8	Yes	3	Moose	0.5	Winter	40	11.9	Juvenile moose
	9	Yes	1	Moose	2	Winter	40	9.1	Crusty and dry, starting to grow mold
	9	Yes	2	Moose	2	Winter	45	5.4	
	10	No							
MP03	1	Yes	1	Unknown Deer	1	Winter	150	7.8	
	2	No							
	3	No							
	4	No							
	5	Yes	1	Unknown Deer	1.5	Winter	35	1.1	
	6	No							
	7	No							
	8	Yes	1	Moose	1.5	Winter	35	0.1	
	8	Yes	2	Moose	0.5	Winter	85	4.5	
	9	No							
	10	No							

Appendix L: Ungulate Distance Pellet Count Data, 2022

Transect ID	Site ID	Pellets Observed	Pellet Group	Species	Approximate Pellet Age (Years)	Pellet Season	Number of Pellets	Distance (m)	Comments
MP04	1	No							
	2	No							
	3	No							
	4	No							
	5	No							
	6	No							
	7	No							One moose pile at 10.6m just outside boundary. 1yr winter deposit
	8	No							
	9	No							
	10	No							
MP05	1	No							
	2	No							
	3	Yes	1	Moose	0.5	Winter	65	8.6	
	4	Yes	1	Moose	4	Summer	25	9.2	Very old , decomposing
	5	No							
	6	Yes	1	Moose	0	Summer	25	4.5	Very fresh
	6	Yes	2	Moose	2	Winter	70	2.8	
	7	No							Spring moose pellets at 12m, outside transect
	8	Yes	1	Moose	0.5	Winter	80	9.9	
	9	Yes	1	Moose	0.5	Winter	20	6	Dispersed grouping
	10	Yes	1	Moose	0.5	Winter	65	4.8	
	10	Yes	2	Moose	0.5	Winter	70	8.4	
	10	Yes	3	Moose	0.5	Winter	45	7.8	
MP06	1	Yes	1	Moose	0.5	Winter	130	9.1	
	1	Yes	2	Moose	0.5	Winter	90	3.6	
	2	No							
	3	No							
	4	No							
	5	No							
	6	No							
	7	No							
	8	No							
	9	No							
	10	No							
MP07	1	Yes	1	Moose	2	Winter	50	9.1	
	2	No							
	3	No							
	4	Yes	1	Moose	3	Winter	17	6.6	
	5	No							
	6	No							

Appendix L: Ungulate Distance Pellet Count Data, 2022

Transect ID	Site ID	Pellets Observed	Pellet Group	Species	Approximate Pellet Age (Years)	Pellet Season	Number of Pellets	Distance (m)	Comments
MP07	7	No							
(cont'd)	8	No							
	9	No							
	10	No							1 year winter moose pellets at 14.5m
MP08	1	No							
	2	Yes	1	Moose	2	Summer	45	4.6	
	3	Yes	1	Moose	0.5	Winter	85	3.5	
	3	Yes	2	Moose	0.5	Winter	40	10	
	4	Yes	1	Moose	3	Winter	70	1	
	4	Yes	2	Moose	1.5	Winter	45	4.6	
	5	Yes	1	Moose	3	Winter	25	4.2	
	5	Yes	2	Moose	0.5	Spring	45	2.9	
	5	Yes	3	Moose	3	Winter	130	1.2	
	5	Yes	4	Moose	2	Winter	125	7.6	
	6	No							
	7	No							
	8	No							
	9	No							
	10	No							
MP09	1	Yes	1	Moose	1	Spring	45	0.4	
	1	Yes	2	Moose	1	Spring	95	3.6	
	1	Yes	3	Moose	0	Spring	100	4.2	
	2	Yes	1	Moose	0	Spring	65	7.6	
	3	No							
	4	No							
	5	No							
	6	No							
	7	No							
	8	No							
	9	No							
	10	No							
MP10	1	No							
	2	No							
	3	Yes	1	Moose	0.5	Winter	120	0.1	
	4	No							
	5	No							
	6	No							
	7	No							
	8	Yes	1	Moose	3	Winter	55	7.1	
	9	No							
	10	No							

Appendix L: Ungulate Distance Pellet Count Data, 2022

Transect ID	Site ID	Pellets Observed	Pellet Group	Species	Approximate Pellet Age (Years)	Pellet Season	Number of Pellets	Distance (m)	Comments
MP11	1	Yes	1	Moose	0	Spring	110	8.4	
	1	Yes	2	Moose	0	Spring	2	2.2	
	2	Yes	2	Moose	3	Winter	105	11.6	
	2	Yes	1	Moose	2	Winter	55	4.2	
	3	No							
	4	Yes	1	Moose	0	Spring	130	5.2	
	4	Yes	2	Moose	2	Winter	80	0.6	
	4	Yes	3	Moose	2	Winter	45	5.2	
	5	Yes	1	Moose	0	Spring	70	4.6	
	5	Yes	2	Moose	2	Winter	60	3.3	
	6	Yes	1	Moose	0	Spring	100	7.4	
	7	No							
	8	No							
	9	Yes	1	Moose	3	Winter	55	9.3	
	10	Yes	1	Moose	2	Winter	150	7.1	
	10	Yes	2	Moose	2	Winter	40	19.2	
MP12	1	Yes	1	Moose	0.5	Winter	50	0.4	
	2	Yes	1	Moose	0.5	Winter	50	2.4	
	3	No							
	4	No							
	5	Yes	1	Moose	0	Spring	85	5	
	5	Yes	2	Moose	0	Spring	40	1.1	
	5	Yes	3	Moose	0	Spring	35	3.6	Juvenile moose
	6	Yes	1	Moose	4	Summer	65	8.8	
	7	No							
	8	Yes	1	Moose	0	Spring	50	4.6	
	9	Yes	1	Moose	1.5	Winter	35	2.4	
	10	Yes	1	Moose	0.5	Winter	25	2.3	
MP13	1	No							
	2	No							
	3	No							
	4	No							
	5	No							
	6	No							
	7	No							
	8	No							
	9	No							
	10	No							

Appendix L: Ungulate Distance Pellet Count Data, 2022

Transect ID	Site ID	Pellets Observed	Pellet Group	Species	Approximate Pellet Age (Years)	Pellet Season	Number of Pellets	Distance (m)	Comments
MP14	1	No							
	2	No							
	3	Yes	1	Moose	0.5	Winter	75	5.5	
	4	No							
	5	Yes	1	Moose	1.5	Winter	60	4.6	
	6	Yes	1	Moose	0.5	Winter	70	5.2	
	7	No							
	8	No							
	9	No							
	10	No							
MP15	1	Yes	1	Moose	1	Spring	35	9.1	Juvenile moose
	1	Yes	2	Moose	1.5	Winter	55	18.2	
	2	Yes	1	Moose	3	Winter	40	2.9	
	2	Yes	2	Moose	3	Winter	45	0.8	
	2	Yes	3	Moose	2	Spring	25	8.8	
	3	Yes	1	Moose	3	Winter	55	2.1	
	4	No							
	5	Yes	1	Moose	3	Winter	60	6.9	
	5	Yes	2	Moose	1	Spring	90	11	
	5	Yes	3	Moose	2	Winter	35	2.2	
	6	Yes	1	Moose	2	Winter	70	6.7	
	6	Yes	2	Moose	4	Winter	90	13.7	
	7	No							
	8	Yes	1	Moose	1	Spring	20	8.4	
	8	Yes	2	Moose	2	Spring	70	18.2	
	9	No							
	10	No							
MP16	1	Yes	1	Moose	2	Winter	70	1.6	
	1	Yes	2	Moose	3	Winter	50	9.4	
	2	No							
	3	No							
	4	No							
	5	No							
	6	No							
	7	No							
	8	No							
	9	No							
	10	No							

Appendix L: Ungulate Distance Pellet Count Data, 2022

Transect ID	Site ID	Pellets Observed	Pellet Group	Species	Approximate Pellet Age (Years)	Pellet Season	Number of Pellets	Distance (m)	Comments
MP17	1	Yes	1	Moose	0.5	Winter	25	0.8	
	2	No							
	3	No							
	4	Yes	1	Moose	1	Spring	55	3.6	
	4	Yes	2	Moose	1.5	Winter	20	2.7	
	4	Yes	3	Moose	1	Spring	60	2.1	
	5	No							
	6	No							
	7	Yes	1	Moose	1.5	Winter	70	5	
	8	No							
	9	Yes	1	Moose	2	Spring	60	7.3	
	9	Yes	2	Moose	0.5	Winter	60	4.6	
	10	No							
MP18	1	No							
	2	Yes	1	Moose	2	Spring	40	3.7	
	3	Yes	1	Moose	2.5	Winter	80	8.1	
	4	No							
	5	Yes	1	Moose	2	Winter	65	3.7	
	5	Yes	2	Moose	1	Spring	50	3.9	
	5	Yes	3	Moose	2.5	Winter	35	5.9	
	6	No							
	7	No							
	8	Yes	1	Moose	2.5	Winter	50	0.3	
	8	Yes	2	Moose	3.5	Winter	40	3.6	
	8	Yes	3	Moose	3	Spring	45	4.3	
	9	No							
	10	No							
MP19	1	No							
	2	No							
	3	No							
	4	No							
	5	No							
	6	No							
	7	No							
	8	Yes	1	Moose	1	Spring	65	4	
	9	No							
	10	No							

Appendix L: Ungulate Distance Pellet Count Data, 2022

Transect ID	Site ID	Pellets Observed	Pellet Group	Species	Approximate Pellet Age (Years)	Pellet Season	Number of Pellets	Distance (m)	Comments
MP20	1	No							
	2	No							
	3	No							
	4	No							
	5	No							
	6	No							
	7	No							
	8	No							
	9	No							
	10	No							
MP21	1	No							
	2	No							
	3	No							
	4	No							
	5	No							
MP22	1	No							
	2	No							
	3	No							
	4	No							
	5	No							
	6	No							
	7	No							
	8	No							
	9	No							
	10	No							

APPENDIX M UNGULATE QUADRAT PELLET COUNT DATA, 2022

Appendix M: Ungulate Quadrat Pellet Count Data, 2022

Transect ID	Site ID	Pellets Observed	Pellet Group	Species	Approximate Pellet Age (years)	Pellet Season	Number of Pellets	Comments
MP01	1	No						
	2	No						
	3	No						
	4	Yes	1	Unknown Deer	2	Summer	35	Dried, old, moldy
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						
MP02	1	No						
	2	No						
	3	No						
	4	No						
	5	Yes	1	Moose	4	Summer	22	Very old
	6	No						
	7	Yes	1	Moose	1.5	Winter	20	
	8	No						
	9	No						
	10	No						
MP03	1	No						
	2	No						
	3	No						
	4	No						
	5	Yes	1	Unknown Deer	1.5	Winter	35	
	6	No						
	7	No						
	8	Yes	1	Moose	1.5	Winter	55	
	9	No						
	10	No						
MP04	1	No						
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						
MP05	1	No						
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						

Appendix M: Ungulate Quadrat Pellet Count Data, 2022

Transect ID	Site ID	Pellets Observed	Pellet Group	Species	Approximate Pellet Age (years)	Pellet Season	Number of Pellets	Comments
MP06	1	No						
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						
MP07	1	No						
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						
MP08	1	No						
	2	No						
	3	No						
	4	Yes	1	Moose	3	Winter	75	
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						
MP09	1	Yes	1	Moose	1	Spring	45	
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						
MP10	1	No						
	2	No						
	3	Yes	1	Moose	0.5	Winter	120	
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						

Appendix M: Ungulate Quadrat Pellet Count Data, 2022

Transect ID	Site ID	Pellets Observed	Pellet Group	Species	Approximate Pellet Age (years)	Pellet Season	Number of Pellets	Comments
MP11	1	No						
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						
MP12	1	Yes	1	Moose	0.5	Winter	50	
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						
MP13	1	No						
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						
MP14	1	No						
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						
MP15	1	No						
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						

Appendix M: Ungulate Quadrat Pellet Count Data, 2022

Transect ID	Site ID	Pellets Observed	Pellet Group	Species	Approximate Pellet Age (years)	Pellet Season	Number of Pellets	Comments
MP16	1	Yes	1	Moose	2	Winter	70	
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						
MP17	1	Yes	1	Moose	0.5	Winter	25	
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						
MP18	1	No						
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	Yes	1	Moose	2.5	Winter	50	
	9	No						
	10	No						
MP19	1	No						
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						
MP20	1	No						
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						

Appendix M: Ungulate Quadrat Pellet Count Data, 2022

Transect ID	Site ID	Pellets Observed	Pellet Group	Species	Approximate Pellet Age (years)	Pellet Season	Number of Pellets	Comments
MP21	1	No						
	2	No						
	3	No						
	4	No						
	5	No						
MP22	1	No						
	2	No						
	3	No						
	4	No						
	5	No						
	6	No						
	7	No						
	8	No						
	9	No						
	10	No						

APPENDIX N BLACKWATER GOLD PROJECT CMMP EAC COMPLIANCE REPORT



BW GOLD LTD
a subsidiary company of Artemis Gold Inc

Blackwater Gold Project

CMMP Compliance Report

June 2023

Project No.: 0679295

The business of sustainability

ERM

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1. INTRODUCTION

The Blackwater Gold Project (the Project) is a proposed gold and silver open pit mine located in central British Columbia (BC), 160 kilometres (km) southwest of Prince George, BC. The Project is located within the traditional territories of Lhoosk'uz Dené Nation (LDN), Ulkatcho First Nation (UFN), Skin Tyee Nation (STN) and Tsilhqot'in Nation. The Kluskus and Kluskus-Ootsa Forest Service Roads and Project transmission line cross the traditional territories of Nadleh Whut'en First Nation, Saik'uz First Nation, and Stellat'en First Nation (collectively, the Carrier Sekani First Nations; CSFNs) as well as the traditional territories of the Nazko First Nation (NFN), Nee-Tahi-Buhn Band (NTBIB), Cheslatta Carrier Nation (CCN), and Yekooche First Nation (YFN).

Mineral tenures, assets, and rights for the Project were transferred from New Gold Inc. (New Gold) to Artemis Gold Inc. (Artemis) in August 2020. Artemis transferred the Project certificate to their subsidiary BW Gold who currently runs the Project. Project construction is estimated to last two years and includes the establishment of a tailings storage facility (TSF), ore processing facilities, waste rock, overburden and soil stockpiles, borrow areas and quarries, water management infrastructure, water treatment plants, accommodation camps, and ancillary facilities. A 135-km, 230 kilovolt overland transmission line will supply electrical power to the Project from the Glenannan substation BC Hydro grid.

In 2022, the Project was completing required management plans and authorizations in advance of early works and Construction of the Project (scheduled to start in 2023). Early works in 2022 included limited site preparation activities, including tree clearing and earth works for new structures, geotechnical drilling, and other planning and field-investigations required for construction.

A Caribou Mitigation and Monitoring Plan (CMMP) was developed to manage potential Project-related adverse effects on caribou and caribou habitat, and to specify offsetting measures for caribou habitat (ERM 2022a). The CMMP incorporates requirements from the Environmental Assessment Certificate #M19-01 (EAC) and the federal Decision Statement (DS).

Many of the reporting requirements for the CMMP are included in the annual Wildlife Mitigation and Monitoring Program (WMMP) compliance report (ERM 2023a). Therefore, the CMMP compliance report is submitted as an appendix to the WMMP compliance report and references applicable sections in the WMMP compliance report instead of duplicating reporting in this document. A concordance table tracking requirements from the DS and EAC is in Appendix A of the WMMP compliance report (ERM 2023a). \

As defined by the CMMP and relevant Project conditions, an annual report for the CMMP will be prepared and will:

1. Summarize the activities undertaken to comply with each of the conditions set out in the federal DS and provincial EAC conditions, including any changes to the Designated Project and updates to the follow-up program for caribou;
2. Specify compliance with federal DS conditions 2.1 (General Conditions), 2.5 (Follow-up Programs and Adaptive Management), and 2.6 (Follow-up Programs and Adaptive Management);
3. Describe consideration and integration of any views and information received during or as a result of consultation;
4. Describe any modified or additional mitigation measures implemented or proposed, as determined under federal DS condition 2.9, with rationale pursuant to federal DS condition 2.5.4;
5. Be sent to the EAO and Aboriginal Groups by March 31 the year following the reporting year, from the start of Construction through the end of Closure, and at least 30 days prior to the start of Project Construction, Operations, and Closure;

6. Subsequently, be sent to Environment and Climate Change Canada (ECCC) and Indigenous groups for review and comment by June 30 of the year following the reporting year (DS condition 2.12); and
7. Be delivered in its final version to the Canadian Environmental Assessment Agency by September 30 of the year following the reporting year (DS condition 2.13).

This is the first year the annual CMMP compliance report has been completed and as such, some of the monitoring activities have not yet been initiated.

1.2 Study Area

The Blackwater Gold Project is on the eastern edge of the Tweedsmuir Local Population Unit (LPU) of southern mountain caribou (*Rangifer tarandus caribou*).

Approximately half of the mine site occurs within the LPU. The entire mine site is within the historic range of the Tweedsmuir caribou, based on Traditional Knowledge from UFN and LDN and within areas mapped as winter caribou habitat (Figure 1.2-1). The mine site is outside of the annual range (1980-2020) used by collared female caribou, although the area is still used intermittently by caribou based on aerial surveys, snow track surveys, and incidental observation. The construction of the Project will result in the removal and disturbance of three types of Type 1 Matrix habitat (high elevation, low elevation and general) and potential disturbance by noise of High Elevation Winter Range habitat (suitable habitat, but outside of the multi-year range of the herd).

1.3 Monitoring Requirements and Objectives

This report includes a summary of the CMMP annual monitoring activities as well as a summary of compliance with the offsetting requirements for caribou.

The objectives of the CMMP monitoring programs are to:

- Verify the accuracy of the effects assessment,
- Evaluate the effectiveness in the mitigation measures,
- Monitor the effectiveness of the offsetting program, and
- Determine if adaptive management is required.

There are two primary monitoring programs, each with multiple monitoring methods, designed to accomplish these objectives. Adaptive management measures are addressed throughout each section where applicable and summarized in Section 1.4. The majority of the monitoring program results are provided in the WMMP compliance report (ERM 2023a) but are referenced in this document for completeness. The CMMP monitoring programs and their applicable report sections are specified in Table 1.3-1.

1.4 Consultation

BW Gold engages in regular consultation with Indigenous groups (as defined in the EAC) and Aboriginal Groups (as defined in the DS) as well as federal and provincial regulators regarding the CMMP design and progress. Reporting on consultation recommendations and how they were considered and/or incorporated into the CMMP is required by federal DS condition 2.11.

In 2022, consultation focused on details of the finalizing caribou offsetting program and production of a video made as a story-telling narrative sharing the Nations connection with caribou and about development of the caribou management plan developed with the UFN and LDN. Consultation activities and outcomes are summarized in Table 1.4-1.

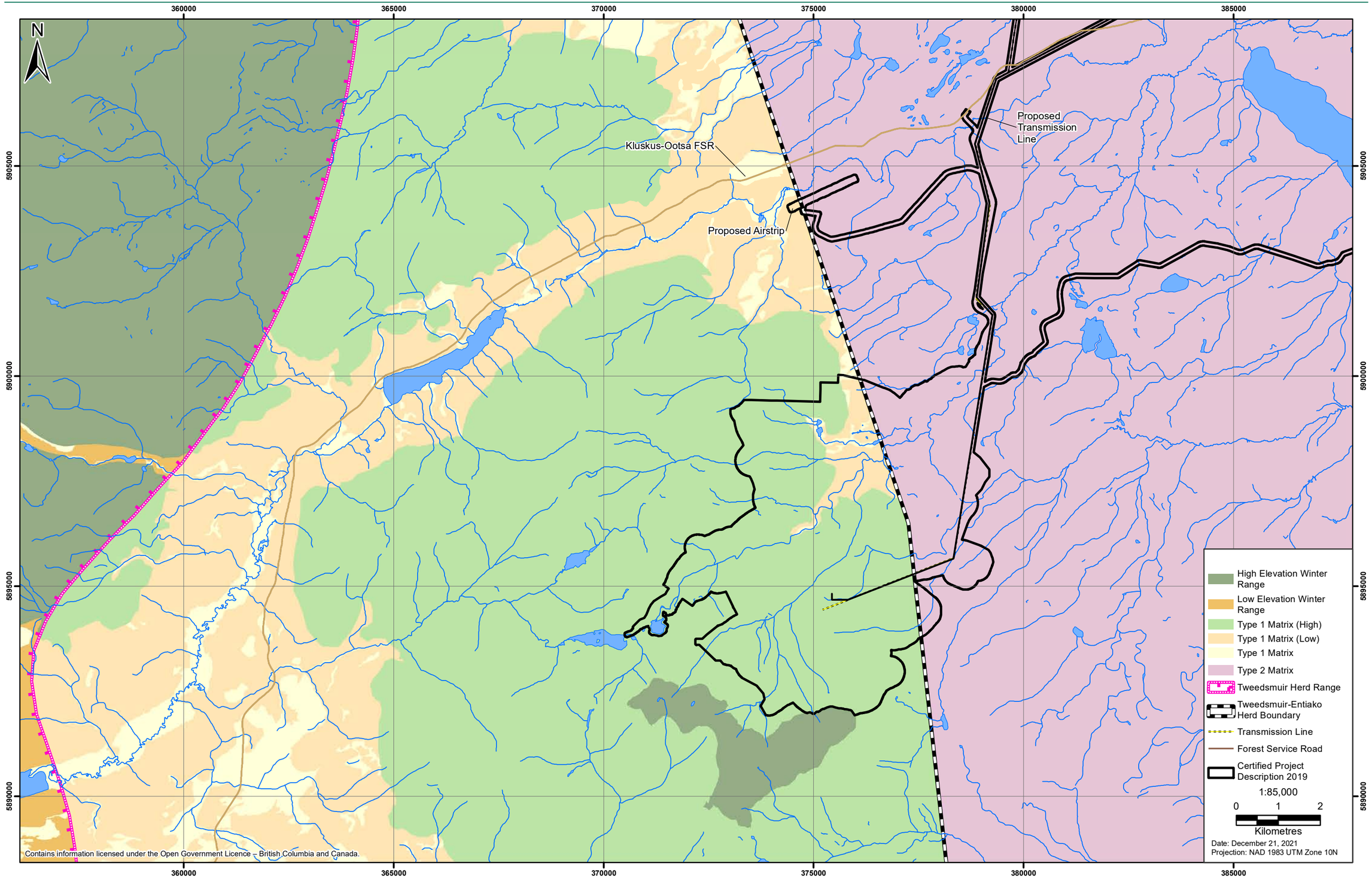


Figure 1.2-1: Tweedsmuir Caribou Range Habitat in Relation to the Blackwater Project Certified Project Description

Table 1.3-1: CMMP Monitoring Programs

Program	Monitoring Component	Report Section[1]
Verifying the Accuracy of the Effects Assessment and Monitoring Effectiveness of Mitigation Measures	Direct Habitat Loss	WMMP 2.2
	Indirect Habitat Loss – Ungulate Pellet Counts	WMMP 3.1.2.1 and 3.1.3.1
	Indirect Habitat Loss – Snow Track Surveys	WMMP 3.1.2.2
	Changes in Caribou Population Dynamics	CMMP 1.3.1
	Mortality Risk	WMMP 2.3
	Changes in Caribou Health	Country Foods Monitoring Program (ERM 2023b)
Caribou Offset Monitoring Program	Road Restoration Monitoring	CMMP 2.2
	Access Monitoring	CMMP 2.3
	Sight Lines Monitoring	CMMP 2.4
	Wildlife Use Monitoring	CMMP 2.5

[1]The WMMP refers to the annual WMMP compliance report (ERM 2023a). The CMMP refers to this report.

1.4.1 Caribou Population Dynamics Coordination

The Environmental Impact Statement (EIS) predicted potential changes in caribou population dynamics and movement patterns due to the potential for the increased predator access along the transmission line, and due to increased traffic on Project roads and the Kluskus Forest Service Road (FSR; ERM 2018). Monitoring the population dynamics and movement of Tweedsmuir caribou at the herd or LPU level is achieved through participation in:

- Environmental Monitoring Committee (established by EAC condition 19); and
- Regional programs with FLNRORD, ECCC, and Indigenous groups to monitor caribou herds by sharing data collected as part of BW Gold's caribou monitoring programs and/or coordinating monitoring efforts.

BW Gold will meet with FLNRORD, ECCC and Indigenous groups each September during Construction, Operations and Closure to discuss collaborating with provincial monitoring. The goal of this meeting will be to determine if available regional data may be used to address effects of the Project on population dynamics or movement patterns of caribou.

Project Construction had not yet begun in September 2022, and no specific meetings occurred for the caribou population dynamics monitoring program. A summary of consultation and outcomes from the Environmental Monitoring Committee are included in Table 1.4-1.

Table 1.4-1: Consultation for the CMMP in 2022

Meeting Type	Date(s)	Method	CMMP Topics Discussed, Applicable Outcomes
Management Plans (NTBIB/STN/MNBC)	1/4/2022	E-mail	Provided Skin Tyee Nation (STN), MNBC (Metis Nation British Columbia), and Nee-Tahi-Buhn-Band (NTBIB) with a table of concordance summary which provided background information on conditions. Also provided the Caribou Management and Mitigation Plan with comments due on February 3, 2022
Management Plans (TNG) Tsilhqot'in National Government	1/4/2022	E-mail	Provided Tsilhqot'in National Government (TNG) with a table of concordance summary which provided background information on conditions. Also provided the Cultural and Spiritual Plan with comments due on January 7, 2022, the Caribou Management and Mitigation Plan with comments due on February 3, 2022,
CMMP Response Letter (LDN/UFN/CSFNs/NFN/ECCC/BC EMLI/BC MOE/BC FLNRORD/BC ECCS/BC EAO)	1/10/2022	E-mail	Provided ECCC with a response letter to the November 30, 2021 letter in regards to the draft CMMP. (LDN, UFN, CSFNs, NFN, BC Ministry of Energy, Mines, and Low Carbon Innovation (BC EMLI), BC Ministry of Environment (BC MOE), BC Forests, Lands, Natural Resource Operations and Development (BC FLNRORD), BC Ministry of Environment and Climate Chane Strategy (BC ECCS), and BC Environmental Assessment Office (BC EAO) included in response.)
EMB Meeting (LDN/UFN)	1/13/2022	Teleconference	Held LDN, UFN, and Keefer Environmental Monitoring Board (EMB) meeting. Discussed moose and caribou surveys
CMMP Discussion (LDN/UFN/BC EMLI/BC FLNRORD/ECCC)	1/21/2022	Teleconference	Discussed with LDN, UFN, ECCC, BC EMLI, and BC FLNRORD the CMMP.
Meeting Material (LDN/UFN/BC EMLI/BC FLNRORD/ECCC)	1/25/2022	E-mail	Received from LDN and UFN a comment tracking table and a caribou restoration opportunities report in preparation of the January 26, 2022 CMMP follow up discussion. (BC EMLI, BC FLNRORD, and ECCC included in response.)
EMB Meeting (LDN/UFN)	1/27/2022	Teleconference	Held LDN, UFN, Keefer, and O'Kane Environmental Monitoring Board (EMB) meeting. Discussed BC EAO feedback review, moose and caribou survey updates.
Draft CMMP and Comments (ECCC/LDN/UFN/CSFNs/NFN/BC EAO/ECCC/BC EMLI/BC ECCS/BC FLNRORD)	1/28/2022	E-mail	Received from ECCC comments regarding the December 2021 draft CMMP and response letter. (LDN, UFN, CSFNs, NFN, BC EAO, BC ECCS, BC FLNRORD, and BC EMLI included in response.) Provided LDN, UFN, BC EMLI, BC FLNRORD, ECCC, BC EAO, and BC ECCS with the draft CMMP section 4 for review.
Leadership Meeting (LDN/UFN)	2/01/2022	Teleconference	Held LDN and UFN leadership meeting. LDN and UFN provided community updates. BW Gold provided updates regarding caribou.
Draft CMMP Comments (LDN/UFN/BC EMLI/BC FLNRORD/ ECCC/BC EAO/BC ECCS)	2/02/2022 and 2/07/2022	E-mail	Received from ECCC comments regarding the draft CMMP section 4. Also received comment logistics and an updated draft CMMP restoration securement and cost table. (LDN, UFN, BC FLNRORD, BC EMLI, BC EAO, and BC ECCS included in response.)
Meeting Participation Request (CSFNs)	2/08/2022	E-mail	Received CSFNs request to participate in future caribou meetings.

Meeting Type	Date(s)	Method	CMMP Topics Discussed, Applicable Outcomes
Updated Draft CMMP Sections (LDN/UFN/ECCC/BC FLNRORD/BC ECCS/BC EMLI/BC EAO)	2/11/2022	E-mail	Provided LDN, UFN, ECCC, BC FLNRORD, BC EMLI, BC EAO, and BC ECCS with updated sections 5.7 and 6 of the draft CMMP and editing logistics. Also requested comments by February 18, 2022.
CMMP Meeting Proposal (LDN/UFN/CSFNs/NFN/BC EAO/ECCC/BC EMLI)	2/14/2022 and 2/15/2022	E-mail	Proposed to LDN, UFN, CSFNs, NFN, BC EAO, ECCC, and BC EMLI a meeting to provide an update on the CMMP and inquired about availability. Communicated with LDN, UFN, and ECCC on proposed dates and meeting topics.
JIC Meeting (LDN/UFN)	2/18/2022	Teleconference	Held LDN and UFN Joint Implementation Committee (JIC) meeting. Discussed caribou story feedback and the caribou plan.
Revised Agreement (LDN/UFN/BC EMLI/ECCC/BC FLNRORD)	3/01/2022	E-mail	Provided LDN, UFN, ECCC, BC EMLI, and BC FLNRORD with a revised securement agreement and highlighted changes. Advised that changes to the CMMP would be circulated and that the finalized version would be submitted by March 3, 2022. Also provided submission logistics.
Proposed Agreement Language (LDN/UFN/BC EMLI/ECCC/BC FLNRORD)	3/01/2022	E-mail	Provided LDN, UFN, BC EMLI, ECCC, and BC FLNRORD with proposed updated language regarding the securement agreement section 4.3.3 and invited feedback. Advised that the updated language would be incorporated into the next CMMP version. (Received proposed alternative language from ECCC on March 14, 2022 regarding section 4.3.3 of the CMMP. Also received logistics regarding the Securement Agreement if the proposed language was or was not accepted. (LDN, UFN, CSFNs, BC EMLI, and BC FLNRORD included in response.)
Draft CMMP Comments (LDN/UFN/ECCC/BC FLNRORD/BC EMLI/BC EAO/BC ECCS)	03/02/2022	E-mail	Received from ECCC consolidated comments from ECCC, FLNRORD, UFN and LDN regarding sections 5.7 and 6.0 of the draft CMMP. (LDN, UFN, BC FLNRORD, BC EMLI, BC EAO, and BC ECCS included in response.)
TL Meeting (CSFNs)	03/11/2022	Teleconference	Held CSFNs and Source transmission line (TL) meeting. Discussed the Caribou plans updates.
CMMP Proposed Language (LDN/UFN/CSFNs/ECCC/BC EMLI/BC FLNRORD)	3/14/2022	E-mail	Received from ECCC proposed alternative language regarding section 4.3.3 of the CMMP. Also received logistics regarding the Securement Agreement if the proposed language was or was not accepted. (LDN, UFN, CSFNs, BC EMLI, and BC FLNRORD included in response.)
Revised CMMP Language (LDN/UFN/CSFNs/BC EMLI/BC FLNRORD/ECCC)	3/15/2022	E-mail	Acknowledged ECCC proposed alternative language regarding section 4.3.3 of the CMMP. Proposed revised language version for review. (Received proposed alternative language from ECCC on March 14, 2022. Also received logistics regarding the Securement Agreement if the proposed language was or was not accepted. LDN, UFN, CSFNs, BC EMLI and BC FLNRORD included in response.)
Draft CMMP (LDN/UFN/CSFNs/NFN/ECCC/BC EAO/BC FLNRORD/BC EMLI/BC ECCS)	3/15/2022	E-mail	Provided LDN, UFN, CSFNs, NFN, ECCC, BC EAO, BC FLNRORD, BC EMLI and BC ECCS with a link to the draft CMMP, EAC condition 22 for approval.

Meeting Type	Date(s)	Method	CMMP Topics Discussed, Applicable Outcomes
CMMP Tracking Table (LDN/UFN/CSFNs/NFN/BC EAO/BC ECCS/BC FLNRORD/BC EMLI/ECCC)	3/21/2022	E-mail	Provided LDN, UFN, CSFNs, NFN, BC EAO, BC ECCS, BC FLNRORD, BC EMLI, and ECCC with the CMMP, condition 22) issue tracking table (ITT).
Community Meeting (UFN)	3/30/2022	Teleconference	Held UFN community meeting. Gave a presentation on the CMMP.
JIC Meeting (LDN/UFN)	4/13/2022	Teleconference	Held LDN and UFN Joint Implementation Committee (JIC) meeting. BW Gold provided an update on caribou storyboard update
CMMP Acknowledgement (LDN/UFN/CSFNS/NFN/ECCC/BC EAO/BC EMLI/BC FLNRORD/BC ECCS)	4/14/2022	E-mail	Following the March 15, 2022 submission, received ECCC acknowledgement regarding the CMMP, EAC Condition 22). ECCC confirmed that the CMMP had been reviewed and determined that it met the criteria for satisfaction, as required by federal condition 8.18. Received update that the determination was based on the understanding that BW Gold recognized that the cost of restoration was based on estimated, present day costs and this understanding came from the appropriate way costs were described as estimates in the CMMP, and recent discussions where BW Gold acknowledged First Nations' concerns around the potential for inflation-related cost increases. Also received recommendation that for clarity and consistency with recent discussions, BW Gold include an explicit statement in the final CMMP about adjusting future year payments for inflation, and a statement indicating that BW Gold would consider the possibility of providing additional funding in the event that the costs to restore 338 km of road or 27,100 ha of critical habitat exceed $2,707,614. (LDN, UFN, CSFNs, NFN, BC EAO, BC EMLI, BC FLNRORD, and BC ECCS included in response.) BW Gold Confirmed ECCC acknowledgement regarding the CMMP, EAC Condition 22 and that the CMMP was to the satisfaction of ECCC as required by condition 8.18.
Community Presentation (StFN)	4/20/2022	In-Person	Hosted StFN community presentation in Fraser Lake followed by dinner and prizes. Provided a Project information refresher with historical context, and presented on the construction plan and schedule, timeline, regulatory and legal context, the Yinka Dene 'U za'hné water law, transmission line (TL) route and route selection process, and employment timing, types, and 2022 postings, and next steps. Presented on collaboration on StFN key issues including environmental and community concerns. Community concerns included caribou
EMB Meeting (LDN/UFN)	4/21/2022	Teleconference	Held LDN, UFN, O'Kane, and Keefer Environmental Monitoring Board (EMB) meeting. Discussed caribou video.

Meeting Type	Date(s)	Method	CMMP Topics Discussed, Applicable Outcomes
Request Response (LDN/UFN/CSFNs/NFN/BC EMLI/BC ECCS/BC EAO/BC FLNRORD/ECCC)	5/03/2022	E-mail	Acknowledged ECCC confirmation that the CMMP, EAC Condition 18 required by decision statement (DS) Condition 8.18 had been developed to ECCC's satisfaction. Advised that BW Gold's position regarding adjusting future payments to inflation within the CMMP had not changed, and was due partly to the fact that the calculation was based on an upper bound costing of $6,000/km. Also advised that due to that the upper bound of the range of restoration costs provided by BC FLNRORD was used in calculation of the restoration component of the offsetting, BW Gold was confident that the restoration work could be completed in the agreed-upon costing. (LDN, UFN, CSFNs, NFN, BC EMLI, BC ECCS, BC EAO, and BC FLNRORD included in response.)
EMB Meeting (LDN/UFN)	5/05/2023	Teleconference	Held LDN, UFN, O'Kane, and Keefer Environmental Monitoring Board (EMB) meeting. Discussed transparent tracking of Management Plan (MP) commitments across early works permit MPs and EAC MPs, and caribou video.
Action Items Meeting (CSFNs)	5/06/2022	Teleconference	Held CSFNs and Source action items list meeting. Discussed filming caribou videos/ CMMP updates, community meeting updates.
Inflation Concern Letter (LDN/UFN/CSFNs/NFN/ECCC/BC EMLI/BC FLNRORD/BC ECCS/BC EAO)	06/01/2022	E-mail	Following the May 3, 2022 response, received from LDN and UFN a letter expressing serious concerns regarding BW Gold's refusal to match caribou offset payments with inflation, and indicated that ECCC had agreed with the Nations. The letter noted that since the Nations agreed to do the restoration work, the Nations were taking on some of the liability of BW Gold, and not having the costs linked to inflation posed unacceptable economic risk to the Nations. (CSFNs, NFN, BC EMLI, BC ECCS, BC FLNRORD, BC EAO, and ECCC included in response.)
EMC Meeting (LDN/UFN/CSFNs/NFN/BC EAO/BC ECCS/BC EMLI/BC FLNRORD)	06/09/2022	Teleconference	Held LDN, UFN, CSFNs, NFN, BC EAO, BC ECCS, BC EMLIBC FLNRORD, Okane, Source, and Keefer Environmental Monitoring Committee (EMC) meeting. Keefer raised a CSFNs concern regarding the CMMP, EAC Condition 22) that the offset money was not indexed with inflation.
Final Caribou Report (LDN/UFN/CSFNs/NFN/ECCC/BC FLNRORD/BC EAO/BC ECCS)	6/21/2022	E-mail	Received from LDN and UFN the final caribou herd recovery report. Received notice that feedback was welcome and that LDN and UFN could present the final report if desired. Received notice that there were a number of GIS files associated with the models in the report that could be shared. (CSFNs, NFN, ECCC, BC FLNRORD, BC EAO, and BC ECCS included in response.) Acknowledged the LDN and UFN final caribou herd recovery report. Advised regarding setting up a presentation and advised that the report would be reviewed.
CMMP Comments (CSFNs)	6/30/2022	E-mail	Received from CSFNs comments regarding version 4 of the CMMP, EAC condition 22). Received notice that review of the CMMP covered if and how concerns regarding the August 2021 version of the plan were addressed, and an evaluation of the revised approach to caribou mitigation, monitoring, and offsetting.

Meeting Type	Date(s)	Method	CMMP Topics Discussed, Applicable Outcomes
CMMP Comments Response (CSFNs/BC EAO)	7/04/2022	E-mail	Advised CSFNs that the CMMP, EAC condition 22) had been approved by BC EAO for implementation in an April 14, 2022 letter, as well as by BC ECCC via an April 14, 2022 email. Advised that the CSFNs comments received on June 30, 2022 would be considered and the CMMP updated if required. Advised that responses to comments would be provided in an issue tracking table (ITT) in alignment with section 8 of the CMMP, and that feedback would be requested in advance of 2023 annual review. Provided BC EAO with a June 30, 2022 email communication from CSFNs providing comments on the CMMP. (BC EAO included in response.)
EMB Meeting (LDN/UFN)	7/21/2022	Teleconference	Held LDN, UFN, Keefer, and O'Kane Environmental Monitoring Board (EMB) meeting. Discussed caribou video
EMC Meeting (LDN/UFN/CSFNs/NFN/BC EAO/BC EMLI/BC ECCS/BC FLNRORD)	7/21/2022	Teleconference	Held LDN, UFN, CSFNs, NFN, BC EAO, BC EMLI, BC ECCS, BC FLNRORD, O'Kane, Keefer, and Source Environmental Monitoring Committee (EMC) meeting. ERM provided an update on the wildlife plan and overview of the 2021 baseline report. Keefer provided an update on the caribou habitat modelling.
Wildlife and Caribou MP Community Meeting (UFN)	7/27/2022	Teleconference	Held UFN community meeting. Discussed the wildlife and caribou management plans.
SUP Feedback (LDN/UFN)	8/04/2022	E-mail	In preparation of the August 4, 2022 Environmental Monitoring Board (EMB) meeting, thanked LDN and UFN for reviewing the Special Use Permit (SUP) amendment application and for supporting the changes proposed to make the road safer. Also acknowledged that the road upgrades were not an area of high priority caribou habitat and were not proposing any changes to the timeline for deactivating that road. Also, the caribou road deactivation funding in the CMMP, EAC Condition 22) was linked to the start of construction so it would be closely tied in schedule to these road upgrades.
CMMP Request (UFN)	8/05/2022	E-mail	Received UFN request for the draft CMMP, EAC Condition 22). Provided UFN with the draft CMMP, EAC Condition 22) for review and the July 27, 2022 wildlife and caribou management plan community meeting presentation slides.
EMB Meeting (LDN/UFN)	8/18/2022	Teleconference	Held LDN, UFN, and Keefer Environmental Monitoring Board (EMB) meeting. Keefer raised concerns including that the caribou offsetting payments had not included inflation and some of the mitigations were not included in the management plans.
EMB Action Item (LDN/UFN)	8/18/2022	E-mail	Following the August 18, 2022 Environmental Monitoring Board (EMB) meeting, provided LDN and UFN with the May 3, 2022 correspondence between BW Gold and ECCC which addressed inflation/escalation considerations for future payments in the CMMP, EAC Condition 22).
Inflation Letter Response Request (LDN/UFN)	8/24/2022	E-mail	Received LDN and UFN request for a response to the May 31, 2022 letter regarding inflation/escalation considerations for future payments in the CMMP, EAC Condition 22). Also received request for this topic to be discussed at the next EMB meeting.
EMB Meeting (LDN/UFN)	9/01/2022	Teleconference	Held LDN, UFN, Keefer and O'Kane Environmental Monitoring Board (EMB) meeting. Discussed the caribou plan offsetting all-in proposal and caribou video.

Meeting Type	Date(s)	Method	CMMP Topics Discussed, Applicable Outcomes
Memo Inquiry (LDN/UFN)	9/07/2022	E-mail	Received LDN and UFN inquiry for a memo addressing inflation/escalation considerations for future payments in the CMMP, EAC Condition 22). Also received request for a discussion at the next Environmental Monitoring Board (EMB). Advised LDN and UFN that the May 3, 2022 correspondence between BW Gold and ECCC which addressed inflation/escalation considerations for future payments in the CMMP, EAC Condition 22) was understood to be the Environmental Monitoring Board (EMB) action. Proposed discussing the action at the next EMB meeting.
JIC Meeting (LDN/UFN)	9/14/2022	Teleconference	Held LDN and UFN Joint Implementation Committee (JIC) meeting. Discussed the Caribou Plan and inflation.
EMB Meeting (LDN/UFN)	9/15/2022	Teleconference	Held LDN, UFN, Keefer, and O'Kane Environmental Monitoring Board (EMB) meeting. Discussed the caribou plan inflation adjustment.
Business Opportunities Committee (BOC) Meeting (LDN/UFN) Meeting	10/12/2022	Teleconference	Held LDN and UFN Business Opportunities Committee (BOC) meeting. Discussed caribou rehab.
EMB Meeting (LDN/UFN)	10/13/2022	Teleconference	Held LDN, UFN, Keefer, and O'Kane Environmental Monitoring Board (EMB) meeting. Discussed offsetting opportunities, caribou offsetting payment follow up, and caribou inflation.
Video Access (UFN)	11/30/2022	E-mail	Provided UFN with web links to the caribou video. The Caribou video was a story telling narrative that shared the Nations connection with caribou as well as the story of how the caribou management plan was developed together. This was also a record keeping video and to celebrate with UFN and LDN.
Survey Inquiry (LDN/UFN)	12/12/2022	E-mail	Inquired with LDN and UFN regarding information about winter ungulate snow track survey timing at Blackwater. Advised that the CMMP, EAC Condition 22) laid out that aerial and ground snow track surveys would be conducted to determine which method was better at detecting caribou. Agreed to choose timing based on whether caribou were more likely to be in the area in early winter or late winter. Inquired whether there was any data that showed whether early or late winter would be more likely to have caribou in the BW Gold area. Advised that either collar data and/or Traditional Knowledge (TK) based data would be ideal.
Survey Timing (LDN/UFN)	12/15/2022	E-mail	Received LDN and UFN update that the collared Tweedsmuir herd individuals did not stray into the surroundings of the mine so there was no recent GPS collar data for the BW Gold area over winter and the area over winter and had not been surveyed. Received update that female collared caribou in the Capoose and low elevation area in Entiako were using those areas both in early and late winter but there was more use in the BW Gold area late winter specifically in late February and early March. This suggested that February - March might be a better time. Anytime between January and mid-March 2023 would be a good time to conduct the surveys. Ensuring the tracking conditions were good were likely more important and giving tracks some time to accumulate (approximately three to five days after snowfall) would also be important.

1.5 Adaptive Management

An adaptive management framework has been incorporated into the CMMP to meet regulatory requirements and objectives of the CMMP (see the CMMP Section 6; ERM 2022a). The follow-up monitoring programs provide data to assess the effectiveness of mitigations. If necessary, outcomes of the monitoring programs will also support recommendations for changes to the monitoring (objectives, frequency, methods, or timing). The CMMP defines qualitative and quantitative triggers to assess whether mitigation measures need to be altered or additional mitigation measures need to be implemented.

Any adaptive management actions or recommendations will be addressed within the relevant section for this report, and are summarized here for compliance with the reporting requirements in federal DS condition 2.11.

To date, no adaptive management actions for the CMMP have been implemented. The first compliance monitoring year occurred in 2022, and program data are still considered baseline (pre-construction). In future years, a summary of annual and cumulative adaptive management actions will be included in this section.

2. VERIFYING THE ACCURACY OF THE EFFECTS ASSESSMENT AND MONITORING EFFECTIVENESS OF MITIGATION MEASURES

The predicted residual effects of the Project on caribou as identified in the EIS, Vol 4 Section 5.4.11.3 (ERM 2018) are:

- Habitat loss and alteration (not significant, moderate magnitude).
- Changes in caribou population dynamics (not significant, minor magnitude).
- Changes in caribou movement patterns (not significant, negligible magnitude).
- Mortality risk (not significant, negligible magnitude).

Mitigation measures for caribou have been implemented to address these potential effects, and monitoring methods will provide data to confirm the effectiveness of mitigation measures and verify the accuracy of the effects assessment (CMMP Section 6.2 and 6.6; ERM 2022a). The monitoring methods for this program are also carried out for other wildlife, and the results are therefore reported in the WMMP compliance report (ERM 2023a):

- Habitat loss monitoring (WMMP Section 2.2).
- Indirect habitat loss (ungulate distribution) monitoring via:
  - Pellet count surveys (WMMP Sections 3.1.2.1 and 3.1.3.1), and
  - Snow track surveys (WMMP Section 3.1.2.2).
- Changes in caribou population dynamics monitored through regional cooperation (Section 1.3.1).
- Mortality risk monitored through wildlife interactions and incidents (WMMP Section 2.3).
- Changes in caribou health (no prediction in the EIS) monitored through the CFMP.
  - Baseline report for 2021-2022 available in ERM (2023b).

3. CARIBOU OFFSET MONITORING PROGRAM

The caribou offset monitoring program was designed to evaluate the effectiveness of the caribou offset, as required by federal DS condition 8.18.5 and provincial EAC condition 22.p. This program consists of four separate monitoring methods:

- Road restoration monitoring.
- Access monitoring.
- Sight lines monitoring.
- Wildlife use monitoring.

The habitat restoration for the caribou offset was not initiated in 2022, and therefore these monitoring programs had not yet begun. However, the following sections outline each monitoring method for completeness of reporting requirements.

3.1 Road Restoration Monitoring

3.1.1 Objective

The objective of road restoration monitoring is to determine success of revegetation along deactivated roads compared to natural restoration.

3.1.2 Methods

The study area will include the areas where road restoration is planned.

The study will be established as a Before-After, Control-Impact (BACI) design. Before and after measurements will be taken at roads to be removed (impact) and roads that will be left to restore naturally (control). The control will be split into 2 types: 1) roads with evidence of vehicle access, and 2) roads without access where natural restoration is occurring.

Samples will be taken during the Construction period prior to restoration as a “before” sample, and after restoration at years 3, 5, 10, and every 5 years thereafter until the end of Closure pending review through adaptive management framework.

This monitoring program was not yet commenced in 2022.

3.2 Access Monitoring

3.2.1 Objectives

The objectives of access monitoring are to determine:

- If the public is able to access restored roads; and
- The means and locations of access (if it exists), and how to prevent further access.

Vehicle and public access and use of restored roads can impede vegetation regrowth and thus discourage wildlife use.

3.2.2 Methods

The study area will include areas where road restoration has occurred.

The study is designed as a Before-After-Impact study, with records of human access before and after road restoration. Sampling will be conducted in coordination with the monitoring of road restoration at years 3, 5, 10 and every 5 years thereafter until the end of closure or until analysis has shown that the road surface is on a trajectory to be fully restored and no further monitoring is warranted. Camera traps will be monitored on an annual basis, in concert with the wildlife use monitoring (Section 3.4).

This monitoring program was not yet commenced in 2022.

3.3 Sight Lines Monitoring

3.3.1 Objective

The objective of sight lines monitoring is to determine if sight lines have been blocked for wolves. Sight lines will be blocked by creating visual barriers (mounded soil or piles of debris) and allowing increased vegetation regrowth. This monitoring will be conducted in coordination with access monitoring (Section 3.2).

3.3.2 Methods

The study area will include all the areas of restored roads.

The study is designed as a Before-After, Control-Impact (BACI) study, with records of sight lines before and after road restoration and on restored roads and control roads that are not restored. Sampling will be conducted in coordination with the monitoring of road restoration at years 3, 5, 10 and every 5 years thereafter until the end of closure or until analysis has shown that the road surface is on a trajectory to be fully restored and no further monitoring is warranted.

This monitoring program was not yet commenced in 2022.

3.4 Wildlife Use Monitoring

3.4.1 Objective

The objective of wildlife use monitoring is to track the relative use of common wildlife on restored and control roads, focusing on wildlife that can be detrimental to caribou such as moose and wolves.

3.4.2 Methods

The study area will include the area where road restoration has occurred.

The study is designed as a Before-After study, with records of wildlife before and after road restoration. Sampling will be conducted in coordination with the monitoring of road restoration at 3, 5, 10 and every 5 years thereafter until the end of closure, or until analysis has shown that the road surface is on a trajectory to be fully restored and no further monitoring is warranted, or based on the adaptive management approach should other forms of monitoring be available. Forty remote cameras will be monitored on an annual basis.

This monitoring program was not yet commenced in 2022.

Fifteen cameras were deployed in the caribou offset areas as part of ongoing baseline data collection in 2021 (reported in the Blackwater Pre-construction Baseline Report; ERM 2022b). Sites chosen based on sign and habitat for focal mammals (caribou, moose, bear, and wolf) and do not align with the monitoring locations required for the wildlife use monitoring program. Data from these cameras has not yet been processed but will be used to guide initiation of the CMMP monitoring programs, and reported in future CMMP annual compliance reports.

4. REFERENCES

ERM. 2023a. *Blackwater Gold Project: 2022 Wildlife Mitigation and Monitoring Program Compliance Report.* Prepared for New Gold Inc. by ERM Consultants Canada Ltd.: Vancouver, BC.

ERM.2023b. *Blackwater Gold Project 2021-2022 Cumulative Dustfall, Soil, and Plant Metal Concentration Baseline Report.* Prepared by ERM for BW Gold Ltd. Vancouver, BC.

ERM. 2022a. *Blackwater Gold Project Caribou Mitigation and Management Plan Version 4.* Prepared by ERM for BW Gold Ltd. Vancouver, BC.

ERM. 2022b. *Blackwater Gold Project Pre-construction Wildlife Baseline 2021.* Prepared by ERM for BW Gold Ltd. Vancouver, BC.

ERM. 2018. *Blackwater Gold Project: New Gold Response to Canadian Environmental Assessment Agency Information Request (IR130, IR132, and IR210) – Updated Assessment of Impacts to Southern Mountain Caribou and Proposed Caribou Offset.* Prepared for New Gold Inc. by ERM Consultants Canada Ltd.: Vancouver, BC.

New Gold. 2015. *Blackwater Gold Project Application for and Environmental Assessment Certificate.* Prepared for New Gold Inc., Vancouver, BC.

APPENDIX O BAT AUTOMATED RECORDING UNIT SURVEY SITE DATA, 2022

Appendix O: Bat Automated Recording Unit Survey Site Data, 2022

Survey Area	Site Name	ARU Card Name	UTM Zone	Easting	Northing	Recording Start Date	Recording End Date	Comments
Mine Site	Bat ARU 01	SMU 02680	10U	0378858	5900534	2022-07-12	2022-11-02	Large marsh
	Bat ARU 02	SMU 02550	10U	0373480	5894067	2022-07-12	2022-11-02	Wetland bog with stream and small ponds
	Bat ARU 03	SMU 02696	10U	0378179	5891974	2022-06-17	2022-06-19	
Matthews Creek	Bat ARU 04	SMU 3113	10U	0360830	5887120	2023-08-31	2023-09-09	
	Bat ARU 05	SMU 303217	10U	0359624	5886538	2023-08-31	2023-09-09	
	Bat ARU 06	SMU 3126	10U	0362669	5887036	2023-08-30	2023-09-10	

APPENDIX P BAT ANALYSIS AUTO-ID RESULTS

Appendix P: Bat Analysis Auto-ID Results

Survey Area	Site Name	ARU Card Name	Recording Start Date	Recording End Date	Species						
					Myotis						
					California	Little Brown	Long-legged	Northern	Western Long-eared	Western Small-footed	Yuma
Mine Site	Bat ARU 01	SMU 02680	2022-07-12	2022-11-02		36				14	
	Bat ARU 02	SMU 02550	2022-07-12	2022-11-02		142	3		27	57	
	Bat ARU 03	SMU 02696	2022-06-17	2022-06-19		115			9	6	
Matthews Creek	Bat ARU 04	SMU 3113	2023-08-31	2023-09-09		88	2		4	1	
	Bat ARU 05	SMU 303217	2023-08-31	2023-09-09		24	2		4	1	
	Bat ARU 06	SMU 3126	2023-08-30	2023-09-10		**12**			**2**		
Total					**0**	**417**	**7**	**0**	**46**	**79**	**0**

Note: Species ID numbers are from Kaleidoscope auto-ID and do not represent precise counts of species IDs.

Appendix P: Bat Analysis Auto-ID Results

Survey Area	Site Name	ARU Card Name	Recording Start Date	Recording End Date	Species					No ID	Total Bat Files	Noise Files
					Non *Myotis*							
					Big Brown Bat	Eastern Red Bat	Hoary Bat	Townsend's Big Eared Bat	Silver-haired Bat			
Mine Site	Bat ARU 01	SMU 02680	2022-07-12	2022-11-02		5	1		20	84	89697	175
	Bat ARU 02	SMU 02550	2022-07-12	2022-11-02	3	25	2	2	21	189	89903	48
	Bat ARU 03	SMU 02696	2022-06-17	2022-06-19	1	27	17		60	79	89695	114
Matthews Creek	Bat ARU 04	SMU 3113	2023-08-31	2023-09-09		2	5		14	37	90463	44
	Bat ARU 05	SMU 303217	2023-08-31	2023-09-09		5	4		8	13	90395	6
	Bat ARU 06	SMU 3126	2023-08-30	2023-09-10			**3**		**23**	5	90387	2
Total					**4**	**64**	**32**	**2**	**146**	**407**	**797**	**389**

Note: Species ID numbers are from Kaleidoscope auto-ID and do not represent precise counts of species IDs.

APPENDIX Q BAT BRANDENBARK SITE DATA, 2022

Appendix Q: Bat BrandenBark Site Data, 2022

Site ID	UTM Zone	Easting	Northing	Height from Ground	Opening at Base	Notes
BARK1	10U	0362685	5887094	3.90 m	20 cm	On dead spruce.
BARK2	10U	0362678	5887053	3.43 m	8 cm - 30 cm	On a dead spruce. Opening at bottom varies significantly. Flagging tape inside installation, requires fixing.
BARK3	10U	0362468	5886913	3.45 m	20 cm	On live spruce, very close to small creek.

APPENDIX R RAPTOR SURVEY DATA, 2022

Appendix R: Raptor Survey Data, 2022

Date	Survey	Observations	Easting	Northing	Comments
2022-05-20	Raptor Aerial Stick Nest Survey	Unnocupied Stick Nest	376374	5898058	Originally observed during the 2021 baselines, but status was not confirmed. Still found to be unnocupied during the 2022 stick nest surveys.

APPENDIX S WATERBIRD SURVEY SITE DATA, 2022

Appendix S: Waterbird Survey Site Data, 2022

Survey Period	Survey Date	Survey Area	Time Start	Time End	Navigator	Observer	Pilot	Air Temp (°C)	Cloud Cover (%)	Beaufort Wind	Visibility/ Lighting	Comments
Spring Pair	2022-05-18	Mine LSA	11:05 AM	11:05 AM	LR	LR, TW	Conor	1	1	2	Moderate	11:50 AM weather stop, 13:00 start again
	2022-05-19	Transmission Line (N to S)		3:07 PM	LR	LR, TW	Conor	1			Good	
	2022-05-20	Transmission Line	7:13 AM	9:53 AM	LR	LR, TW	Conor	1			Good	
	2022-05-20	Transmission Line	11:00 AM	12:55 PM	LR	LR, TW	Conor	1			Good	
	2022-05-20	Transmission Line	2:30 PM	3:50 PM	LR	LR, TW	Conor	1			Good	
Summer Brood	2022-07-08	Transmission Line		10:16 AM	LR	LR, TW, SB	Brent	12	80		Very Good	
	2022-07-08	Transmission Line		1:03 PM	LR	LR, TW, SB	Brent	12	80		Very Good	
	2022-07-08	Transmission Line	1:30 PM	2:25 PM	LR	LR, TW, SB	Brent	12	80		Very Good	
	2022-07-09	Transmission Line (S to N)	10:15 AM	11:42 AM	LR	LR, TW, SB	Brent	13	50	1 - 2	Very Good	
	2022-07-09	Transmission Line (S to N)	1:20 PM	2:45 PM	LR	LR, TW, SB	Brent	13	50		Very Good	
	2022-07-09	Transmission Line (S to N)	4:30 PM	6:13 PM	LR	LR, TW, SB	Brent	8	90		Very Good	
	2022-07-10	Transmission Line	7:40 AM	10:00 AM	LR	LR, TW, SB	Brent		90-100		Very Good	
	2022-07-10	Transmission Line	11:40 AM	2:35 PM	LR	LR, TW, SB	Brent		90-100		Very Good	
	2022-07-10	Mine LSA	4:30 PM	6:01 PM	LR	LR, TW, SB	Brent	8	85	2	Good	
	2022-07-12	Mine LSA	10:20 AM	10:57 AM	LR	LR	Brent	12	80	1	Good	
Fall Staging	2022-09-09	Transmission Line S	7:56 AM	3:41 PM	HV	HV,MF	Brent		0	0	NA	Break 12:45 TO 13:17 (FUEL), Break 9:06 TO 9:40 (ground survey)
	2022-09-10	Transmission Line N	7:45 AM	3:54 PM	HV	HV,MF	Brent		0	0	NA	Break 9:41-11:02 (FUEL), Break 13:30-14:39 (ground survey)
	2022-09-11	Mine Site and Matthews Creek	9:15 AM	2:10 PM	HV	HV,MF	Brent		5	0	NA	Break 11:08 TO 11:55

APPENDIX T WATERBIRD SURVEY OBSERVATION DATA, 2022

Appendix T: Waterbird Survey Data, 2022

Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Spring Pair	2022-05-18	1	MALL	Mallard	2	0	0		2	Pond, Wetland	
	2022-05-18	2	BAGO	Barrow's Goldeneye	1	1	0		2	Creek, Wetland	
	2022-05-18	3	DIVER	Unidentified Diver	0	0	2		2	Creek, Wetland M	unknown; divers
	2022-05-18	4	MALL	Mallard	1	0	0		1	Creek	
	2022-05-19	1	USCA	Unidentified Scaup	0	0	1		1	Lake S	Unidentified scaup
	2022-05-19	2	GOEY	Unidentified Goldeneye	1	0	0		1	Lake S	
	2022-05-19	2	BUFF	Bufflehead	1	0	1		2	Lake S	
	2022-05-19	2	USCA	Unidentified Scaup	2	1	0		3	Lake S	
	2022-05-19	3	MALL	Mallard	1	0	0		1	River	
	2022-05-19	3	GOEY	Unidentified Goldeneye	1	1	0		2	River	
	2022-05-19	4	USCA	Unidentified Scaup	1	0	0		1	River	
	2022-05-19	5	DIVER	Unidentified Diver	0	0	1		1	Lake M	unknown; diver, likely COLO
	2022-05-19	6	BUFF	Bufflehead	1	0	0		1	Pond	
	2022-05-19	6	MALL	Mallard	2	0	0		2	Pond	
	2022-05-19	7	MALL	Mallard	1	1	0		2	Pond	
	2022-05-19	7	COLO	Common Loon	1	0	0		1	Pond	
	2022-05-19	7	LEYE	Lesser Yellowlegs	0	0	1		1	Pond	
	2022-05-19	7	CAGO	Canada Goose	0	0	1		1	Pond	
	2022-05-19	8	BWTE	Blue-winged Teal	0	0	1		1	Wetland	
	2022-05-19	9	COLO	Common Loon	1	1	0		2	Wetland	
	2022-05-19	9	BUFF	Bufflehead	3	1	0		4	Wetland	
	2022-05-19	10	CAGO	Canada Goose	1	1	0		2	Lake L	
	2022-05-19	10	MALL	Mallard	1	1	0		2	Lake L	
	2022-05-19	10	UGUL	Unidentified Gull	0	0	1		1	Lake L	possibly ring bill
	2022-05-19	11	BUFF	Bufflehead	1	0	0		1	Lake L	
	2022-05-19	11	MALL	Mallard	1				1	Lake L	
	2022-05-19	11	LESC	Lesser Scaup	11	0	0		11	Lake L	
	2022-05-19	11	USCA	Unidentified Scaup	0	9	0		9	Lake L	
	2022-05-19	12	MALL	Mallard	2	0	0		2	Lake L	
	2022-05-19	12	LESC	Lesser Scaup	6	5	0		11	Lake L	
	2022-05-19	12	COLO	Common Loon	0	0	2		2	Lake L	
	2022-05-19	13	LEYE	Lesser Yellowlegs	0	0	1		1	Lake L	
	2022-05-19	13	MALL	Mallard	1	0	0		1	Lake L	
	2022-05-19	13	RNDU	Ring-necked Duck	1	0	0		1	Lake L	
	2022-05-19	13	BUFF	Bufflehead	1	0	0		1	Lake L	
	2022-05-19	13	USCA	Unidentified Scaup	0	0	9		9	Lake L	
	2022-05-19	14	BUFF	Bufflehead	2	2	0		4	Lake L	
	2022-05-19	14	KILL	Killdeer	0	0	1		1	Lake L	
	2022-05-19	15	BUFF	Bufflehead	1	0	0		1	Lake L	
	2022-05-19	16	BLTU	Black Turnstone	0	0	1		1	Lake L	Possibly nesting
	2022-05-19	16	COME	Common Merganser	3	2			5	River	
	2022-05-19	16	CAGO	Canada Goose	0	0	2		2	River	
	2022-05-19	16	LEYE	Lesser Yellowlegs	0	0	1		1	River	
	2022-05-19	16	SPSA	Spotted Sandpiper	0	0	3		3	River	Lesser

Appendix T: Waterbird Survey Data, 2022

Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Spring Pair *(cont'd)*	2022-05-19	16	MALL	Mallard	1	0	0		1	River	
	2022-05-19	17	BUFF	Bufflehead	11	12	0		23	Lake M	
	2022-05-19	17	RNDU	Ring-necked Duck	2	1	0		3	Lake M	
	2022-05-19	17	USCA	Unidentified Scaup	1				1	Lake M	
	2022-05-19	18	RNDU	Ring-necked Duck	6	7	0		13	Lake M	
	2022-05-19	18	BUFF	Bufflehead	2	2	0		4	Lake M	
	2022-05-19	18	GOEY	Unidentified Goldeneye	0	0	0		0	Lake M	
	2022-05-19	18	DIVER	Unidentified Diver	0	0	3		3	Lake M	Unknown; diver
	2022-05-19	18	BAGO	Barrow's Goldeneye	1	1	0		2	Lake M	
	2022-05-19	18	RUDU	Ruddy Duck	1	0	0		1	Lake S, Pond, Wetland	
	2022-05-19	18	USCA	Unidentified Scaup	1	1	0		2	Lake M	
	2022-05-19	19	BUFF	Bufflehead	2	1	0		3	Lake S, Pond, Wetland	
	2022-05-19	19	MALL	Mallard	2	0	0		2	Lake S, Pond, Wetland	
	2022-05-19	19	BAGO	Barrow's Goldeneye	1	1	0		2	Lake S, Pond, Wetland	
	2022-05-19	20	COLO	Common Loon	0	0	2		2	Lake M	
	2022-05-19	21	COLO	Common Loon	1	1	0		2	Lake M	
	2022-05-19	21	RNDU	Ring-necked Duck	3	2	0		5	Lake M	
	2022-05-19	21	SPSA	Spotted Sandpiper	0	0	7		7	Lake M	Shorebirds (SPSA)
	2022-05-19	21	BOGU	Bonaparte's Gull	0	0	2		2	Lake M	
	2022-05-19	22	CAGO	Canada Goose	0	0	1		1	Lake M	
	2022-05-19	23	COLO	Common Loon	1	1	0		2	Lake M	
	2022-05-19	24	SPSA	Spotted Sandpiper	0	0	1		1	Lake L	
	2022-05-19	24	BUFF	Bufflehead	1	0	0		1	Lake L	
	2022-05-19	24	RNDU	Ring-necked Duck	8	4	0		12	Pond, Wetland	
	2022-05-19	24	BUFF	Bufflehead	1	3	1		5	Pond, Wetland	
	2022-05-19	25	CAGO	Canada Goose	0	0	1		1	Pond M	
	2022-05-19	26	RNDU	Ring-necked Duck	1	1	0		2	Pond M	
	2022-05-19	26	GRYE	Greater Yellowlegs			1		1	Pond M	
	2022-05-19	27	WODU	Wood Duck	1	1	0		2	Pond M	
	2022-05-19	28	COME	Common Merganser	1	0	0		1	Pond M	
	2022-05-19	28	CAGO	Canada Goose	0	0	12		12	Pond M	
	2022-05-19	28	MALL	Mallard	1	0	0		1	Pond M	
	2022-05-19	29	GRYL	Greater Yellowlegs	0	0	2		2	Pond M	
	2022-05-19	30	SACR	Sandhill Crane	0	0	1		1	Pond M	
	2022-05-19	30	BWTE	Blue-winged Teal	6	1	0		7	Pond M	
	2022-05-19	30	RNDU	Ring-necked Duck	2	2	0		4	Pond M	
	2022-05-19	30	MALL	Mallard	2	2	0		4	Pond M	
	2022-05-19	30	USCA	Unidentified Scaup	5	5	0		10	Pond M	
	2022-05-19	31	COLO	Common Loon	1	1	0		2	Pond M	
	2022-05-19	32	UGUL	Unidentified Gull			1		1	Pond M	
	2022-05-19	33	BAGO	Barrow's Goldeneye	1	1	0		2	Lake S	
	2022-05-19	33	RNDU	Ring-necked Duck	6	3	0		9	Lake S	
	2022-05-19	33	BUFF	Bufflehead	1	0	0		1	Lake S	
	2022-05-19	33	USCA	Unidentified Scaup	1	1	0		2	Lake S	

Appendix T: Waterbird Survey Data, 2022

Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Spring Pair *(cont'd)*	2022-05-19	34	COME	Common Merganser	1	1	0		2	Lake S	
	2022-05-19	34	USCA	Unidentified Scaup	2	2	0		4	Lake S	
	2022-05-19	35	COLO	Common Loon	0	0	1		1	Lake S	
	2022-05-19	36	GOEY	Unidentified Goldeneye	1	1	0		2	Lake S	
	2022-05-19	36	USCA	Unidentified Scaup	1	1	0		2	Lake S	
	2022-05-19	37	COGO	Common Goldeneye	3	4	0		7	Lake S	
	2022-05-20	1	BAGO	Barrow's Goldeneye	1	1	0		2	Pond	
	2022-05-20	1	LEYE	Lesser Yellowlegs	0	0	1		1	Pond	
	2022-05-20	2	BAGO	Barrow's Goldeneye	1	1	0		2	Pond	
	2022-05-20	2	RNDU	Ring-necked Duck	1	1	0		2	Pond	
	2022-05-20	3	COLO	Common Loon	0	0	1		1	Lake S	
	2022-05-20	3	MALL	Mallard	1	1	0		2	Lake S	
	2022-05-20	3	LEYE	Lesser Yellowlegs	0	0	1		1	Lake S	
	2022-05-20	3	SPSA	Spotted Sandpiper	0	0	1		1	Lake S	
	2022-05-20	4	BUFF	Bufflehead	3	5	0		8	Lake	
	2022-05-20	4	MALL	Mallard	1	1	0		2	Lake	
	2022-05-20	4	RNDU	Ring-necked Duck	3	2	0		5	Lake	
	2022-05-20	4	USCA	Unidentified Scaup	1	5	0		6	Lake	
	2022-05-20	5	SHOR	Unidentified Shorebird	0	0	1		1	Creek, Pond, Wetland Complex	Shorebird
	2022-05-20	5	COLO	Common Loon	0	0	1		1	Creek, Pond, Wetland Complex	
	2022-05-20	6	COLO	Common Loon	0	0	3		3	Lake	
	2022-05-20	7	COLO	Common Loon	1	1	0		2	Lake	
	2022-05-20	7	BOGU	Bonaparte's Gull			1		1	Lake	
	2022-05-20	7	SACR	Sandhill Crane	0	0	1		1	Lake	
	2022-05-20	7	LEYE	Lesser Yellowlegs	0	0	1		1	Wetland of Lake	
	2022-05-20	7	SPSA	Spotted Sandpiper	0	0	1		1	Wetland of Lake	
	2022-05-20	7	MALL	Mallard	1	1	0		2	Lake	
	2022-05-20	7	LEYE	Lesser Yellowlegs	0	0	2		2	Lake	
	2022-05-20	8	SHOR	Unidentified Shorebird	0	0	4		4	Creek of Lake	
	2022-05-20	8	MALL	Mallard	2	1	0		3	Lake, Creek	
	2022-05-20	9	DIVER	Unidentified Diver	0	0	1		1	Pond M	
	2022-05-20	9	RBGU	Ring-billed Gull	0	0	2		2	Pond M	
	2022-05-20	9	BUFF	Bufflehead	0	1	0		1	Pond M	
	2022-05-20	9	COLO	Common Loon	0	0	1		1	Pond M	
	2022-05-20	9	RNDU	Ring-necked Duck	1	1	0		2	Pond M	
	2022-05-20	9	CITE	Cinnamon Teal	1	0	0		1	Pond M	
	2022-05-20	9	USCA	Unidentified Scaup	1	0	0		1	Pond M	
	2022-05-20	10	RNDU	Ring-necked Duck	1	0	0		1	Lake, Wetland	
	2022-05-20	10	BUFF	Bufflehead	3	2	0		5	Lake, Wetland	
	2022-05-20	10	RNGR	Red-necked Grebe	1	1	0		2	Lake, Wetland	
	2022-05-20	10	MALL	Mallard	3	4	0		7	Lake, Wetland	
	2022-05-20	10	GOEY	Unidentified Goldeneye	0	0	1		1	Lake, Wetland	
	2022-05-20	11	UGUL	Unidentified Gull	0	0	1		1	Lake S	
	2022-05-20	11	BUFF	Bufflehead	3	1	0		4	Lake S	

Appendix T: Waterbird Survey Data, 2022

Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Spring Pair *(cont'd)*	2022-05-20	11	GOEY	Unidentified Goldeneye	3	1	0		4	Lake S	
	2022-05-20	11	MALL	Mallard	2	2	0		4	Lake S	
	2022-05-20	11	USCA	Unidentified Scaup	1	1	0		2	Lake S	
	2022-05-20	11	GRYE	Greater Yellowlegs	0	0	1		1	Lake S	
	2022-05-20	12	BUFF	Bufflehead	1	1	0		2	Lake S, Wetland	
	2022-05-20	12	MALL	Mallard	2	0	0		2	Lake S, Wetland	
	2022-05-20	13	BAGO	Barrow's Goldeneye	1	1	0		2	Lake S, Pond	
	2022-05-20	13	MALL	Mallard	1	0	0		1	Lake S, Pond	
	2022-05-20	14	BUFF	Bufflehead	3	4	0		7	Pond	
	2022-05-20	14	RNDU	Ring-necked Duck	1	1	0		2	Pond	
	2022-05-20	14	COME	Common Merganser	1	1	0		2	Pond	
	2022-05-20	14	USCA	Unidentified Scaup	1	1	0		2	Pond	
	2022-05-20	14	GOEY	Unidentified Goldeneye	2	1	0		3	Pond	
	2022-05-20	15	BUFF	Bufflehead	1	1	0		2	Pond	
	2022-05-20	16	RNDU	Ring-necked Duck	1	1	0		2	Pond	
	2022-05-20	17	RNDU	Ring-necked Duck	2	2	0		4	Pond L	
	2022-05-20	17	BUFF	Bufflehead	2	0	0		2	Pond L	
	2022-05-20	17	COTE	Common Tern	0	0	2		2	Pond L	
	2022-05-20	18	GOEY	Unidentified Goldeneye			1		1	Pond L	
	2022-05-20	18	MALL	Mallard	5	1	0		6	Pond L	
	2022-05-20	18	USCA	Unidentified Scaup	1	1	0		2	Pond L	
	2022-05-20	19	RNDU	Ring-necked Duck	12	6	0		18	Lake S	
	2022-05-20	19	BAGO	Barrow's Goldeneye	2	1	0		3	Lake S	
	2022-05-20	19	MALL	Mallard	1	1	0		2	Lake S	
	2022-05-20	19	USCA	Unidentified Scaup	2	1	0		3	Lake S	
	2022-05-20	21	COME	Common Merganser	1	1	0		2	River	Meandering channel
	2022-05-20	22	BUFF	Bufflehead	1	1			2	Pond	Female on nest likely
	2022-05-20	23	MALL	Mallard	1	1	0		2	Lake S	
	2022-05-20	23	BUFF	Bufflehead	1	0	0		1	Lake S	
	2022-05-20	24	BUFF	Bufflehead	1	0	0		1	Lake S	
	2022-05-20	25	BWTE	Blue-winged Teal	1	1	0		2	Lake S	
	2022-05-20	25	COLO	Common Loon	0	0	1		1	Lake S	
	2022-05-20	26	SHOR	Unidentified Shorebird			4		4	Lake S	shorebirds
	2022-05-20	26	AMWI	American Wigeon	2	1	0		3	Lake S	
	2022-05-20	26	GOEY	Unidentified Goldeneye	2	0	0		2	Wetland	
	2022-05-20	27	SHOR	Unidentified Shorebird			1		1	Wetland	shorebirds
	2022-05-20	28	MALL	Mallard	8	3	0		11	Pond	
	2022-05-20	28	BUFF	Bufflehead	1	1	0		2	Pond	
	2022-05-20	28	CAGO	Canada Goose	0	0	2		2	Pond	
	2022-05-20	28	UTEA	Unidentified Teal			1		1	Pond	
	2022-05-20	29	BAGO	Barrow's Goldeneye	1	0	0		1	Pond	kettle ponds
	2022-05-20	30	MALL	Mallard	1	1	0		2	Pond	kettle ponds
	2022-05-20	31	MALL	Mallard	1	1	0		2	Pond	kettle ponds
	2022-05-20	31	BUFF	Bufflehead	1	1	0		2	Pond	kettle ponds

Appendix T: Waterbird Survey Data, 2022

Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Spring Pair *(cont'd)*	2022-05-20	32	BUFF	Bufflehead	1	1	0		2	Pond	
	2022-05-20	33	SHOR	Unidentified Shorebird			1		1	Pond	shorebirds
	2022-05-20	34	MALL	Mallard	1	1	0		2	Pond	
	2022-05-20	35	RNDU	Ring-necked Duck	1	0	0		1	Pond	
	2022-05-20	36	COLO	Common Loon	0	0	2		2	Pond	
	2022-05-20	36	MALL	Mallard	2	1	0		3	Pond	
	2022-05-20	37	UYEL	Unidentified Yellowlegs	0	0	1		1	Bog	Yellowlegs
	2022-05-20	38	RBGU	Ring-billed Gull			1		1	River, Creek	stream, meandering
	2022-05-20	38	BUFF	Bufflehead	0	1	0		1	River	stream, meandering
	2022-05-20	39	BUFF	Bufflehead	4	3	0		7	Pond	
	2022-05-20	40	MALL	Mallard	1	1	1		3	Pond	shorebird
	2022-05-20	40	BUFF	Bufflehead	1	1	0		2	Pond	
	2022-05-20	40	RNDU	Ring-necked Duck	2	1	0		3	Pond	
	2022-05-20	41	MALL	Mallard	1	1	0		2	Wetland	Flood meadow
	2022-05-20	42	BUFF	Bufflehead	1	1	0		2	Wetland	
	2022-05-20	42	RNDU	Ring-necked Duck	2	1	0		3	Wetland	
	2022-05-20	42	COLO	Common Loon	1	1			2	Wetland	
	2022-05-20	42	CAGO	Canada Goose	0	0	4		4	Wetland	
	2022-05-20	42	BWTE	Blue-winged Teal	3	0	0		3	Wetland	
	2022-05-20	42	BUFF	Bufflehead	2	2	0		4	Wetland	
	2022-05-20	42	MALL	Mallard	2	2	0		4	Wetland	
	2022-05-20	43	UGUL	Unidentified Gull			1		1	Lake L	Boats on LK, fishing
	2022-05-20	43	COLO	Common Loon	0	0	1		1	Lake L	
	2022-05-20	43	MALL	Mallard	1	1	0		2	Lake L	
	2022-05-20	44	CAGO	Canada Goose	0	0	1		1	Wetland	stream, flooded
	2022-05-20	44	MALL	Mallard	1	1	0		2	Wetland	
	2022-05-20	44	RNDU	Ring-necked Duck	2	1	0		3	Wetland	
	2022-05-20	45	RNDU	Ring-necked Duck	1	1	0		2	Pond, Wetland	stream, beaver meadow ponds
	2022-05-20	45	MALL	Mallard	3	0	0		3	Pond, Wetland	
	2022-05-20	45	CAGO	Canada Goose	0	0	2		2	Pond, Wetland	
	2022-05-20	45	GWTE	Green-winged Teal	1	1	0		2	Pond, Wetland	high use - damming
	2022-05-20	46	MALL	Mallard	1	1	0		2	Lake M	shallow
	2022-05-20	46	RNDU	Ring-necked Duck	2	1	0		3	Lake M	
	2022-05-20	47	GOEY	Unidentified Goldeneye	1	1	0		2	Lake M	
	2022-05-20	47	BUFF	Bufflehead	1	1	0		2	Lake M	
	2022-05-20	48	CAGO	Canada Goose	0	0	4		4	Lake M	
	2022-05-20	48	BUFF	Bufflehead	2	3	0		5	Lake M	
	2022-05-20	48	MALL	Mallard	2	2	0		4	Lake M	
	2022-05-20	48	HOME	Hooded Merganser	1	1	0		2	Lake M	
	2022-05-20	48	COGO	Common Goldeneye	2	2	0		4	Lake M	
	2022-05-20	48	UTEA	Unidentified Teal	0	0	2		2	Pond	
	2022-05-20	49	BUFF	Bufflehead	1	1	0		2	Pond	
	2022-05-20	50	MALL	Mallard	2	0	0		2	Pond	
	2022-05-20	50	COGO	Common Goldeneye	1	1	0		2	Pond	

Appendix T: Waterbird Survey Data, 2022

Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Spring Pair *(cont'd)*	2022-05-20	50	CAGO	Canada Goose	0	0	2		2	Pond	
	2022-05-20	51	MALL	Mallard	1	1	0		2	Lake L	
	2022-05-20	51	COLO	Common Loon	0	0	2		2	Lake L	
	2022-05-20	51	UYEL	Unidentified Yellowlegs	0	0	1		1	Lake L	NE edge
	2022-05-20	51	CAGO	Canada Goose			1		1	Lake L	SW edge
	2022-05-20	51	CAGO	Canada Goose			1		1	Lake L	S end
	2022-05-20	51	COME	Common Merganser	4	8	0		12	Lake L	
	2022-05-20	51	COME	Common Merganser	3	2	0		5	Lake L	
	2022-05-20	51	UGUL	Unidentified Gull	0	0	1		1	Lake L	
	2022-05-20	52	MALL	Mallard	1	0	0		1	Pond	
	2022-05-20	52	BUFF	Bufflehead	0	1	0		1	Pond	
	2022-05-20	52	BAGO	Barrow's Goldeneye			1		1	Pond	
	2022-05-20	53	MALL	Mallard	2	2	0		4	Pond	
	2022-05-20	53	SHOR	Unidentified Shorebird	0	0	2		2	Pond	
	2022-05-20	57	COLO	Common Loon	0	0	3		3	Pond	
	2022-05-20	57	BAGO	Barrow's Goldeneye	1	0	0		1	Pond	
	2022-05-20	58	SHOR	Unidentified Shorebird	0	0	1		1	Pond	
	2022-05-20	58	BUFF	Bufflehead	1	1	0		2	Pond	
	2022-05-20	58	SHOR	Unidentified Shorebird	0	0	1		1	Pond	
	2022-05-20	58	HOME	Hooded Merganser	1	1	0		2	Pond	
	2022-05-20	59	BUFF	Bufflehead	0	1	0		1	Pond	
	2022-05-20	59	MALL	Mallard	1	0	0		1	Pond	
	2022-05-20	60	RNDU	Ring-necked Duck	1	1	0		2	Pond	
	2022-05-20	61	RNDU	Ring-necked Duck	1	1	0		2	Pond	
	2022-05-20	61	BUFF	Bufflehead	1	1	0		2	Pond	
	2022-05-20	62	RNDU	Ring-necked Duck	1	1	0		2	Pond	
	2022-05-20	63	BUFF	Bufflehead	1	1	0		2	Pond	
	2022-05-20	63	RNDU	Ring-necked Duck	10	3	0		13	Pond	
	2022-05-20	64	USCA	Unidentified Scaup	5	4	0		9	Pond	
	2022-05-20	65	BAGO	Barrow's Goldeneye	1	1	0		2	Pond	
	2022-05-20	66	MALL	Mallard	0	2	0		2	Pond	
	2022-05-20	8	MAHA	Unidentified Bird	0	1	0		1	Wetland	
	2022-05-20	13	UNKN	Unidentified Bird	0	0	1		1	Lake S, Pond	
	2022-05-20	14	UNKN	Unidentified Bird	0	0	4		4	Pond	
	2022-05-20	20	UNKN	Unidentified Bird	0	0	3		3	Lake M	
	2022-05-20	35	UNKN	Unidentified Bird	1	0	0		1	Lake S	
	2022-05-20	38	MAHA	Unidentified Bird			1		1	River, Creek	stream, meandering
	2022-05-20	42	COGE	Unidentified Bird	17	4	0		21	Wetland	
	2022-05-20	51	UNKN	Unidentified Bird	0	0	4		4	Lake L	Unknown; shore, NE edge
	2022-05-20	51	UNKN	Unidentified Bird	0	0	3		3	Lake L	NE edge
	2022-05-20	51	UNKN	Unidentified Bird	0	0	7		7	Lake L	SW edge
	2022-05-20	51	UNKN	Unidentified Bird			1		1	Lake L	SW edge
	2022-05-20	56	UNKN	Unidentified Bird	0	0	1		1	Pond	Unknown; gull
	2022-05-20	57	UNKN	Unidentified Bird	0	1	0		1	Pond	Unknown; GOEY

Appendix T: Waterbird Survey Data, 2022

Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Summer Brood	2022-07-08	1	GRYE	Greater Yellowlegs	1	0	0		1	Pond M-S	
	2022-07-08	1	COME	Common Merganser			1		1	Pond M-S	
	2022-07-08	1	BUFF	Bufflehead	4	2	0		6	Pond M-S	
	2022-07-08	2	BOGU	Bonaparte's Gull	1	0	0		1	Pond M-S	
	2022-07-08	4	LEYE	Lesser Yellowlegs	0	0	1		1	Pond M-S	
	2022-07-08	5	RBGU	Ring-billed Gull	0	1	0	3	4	Pond M-S	adult (x1), on nest (x3)
	2022-07-08	6	SPSA	Spotted Sandpiper	0	0	1		1	Complex M	
	2022-07-08	7	UNKN	Unidentified Bird	0	0	1		1	River, Pond	Unknown; Dabble
	2022-07-08	7	LEYE	Lesser Yellowlegs	0	0	1		1	River, Pond	
	2022-07-08	8	UNKN	Unidentified Bird	0	0	2	8	10	River, Pond	Unknown; GOEY, young (x8), family group
	2022-07-08	8	GOEY	Unidentified Goldeneye	0	1	0		1	River, Pond	
	2022-07-08	9	GOEY	Unidentified Goldeneye	1	0	0		1	Pond S-M	Immature
	2022-07-08	10	GOEY	Unidentified Goldeneye	2	1	0		3	Pond S	
	2022-07-08	10	UNKN	Unidentified Bird	2	3	0		5	Pond S	
	2022-07-08	11	COLO	Common Loon			1		1	Pond M-L	
	2022-07-08	11	MALL	Mallard	0	1	0	3	4	Pond M-L	young (x3)
	2022-07-08	12	GOEY	Unidentified Goldeneye	3	2	0	2	7	Pond M	young (x2)
	2022-07-08	13	COLO	Common Loon	0	0	1	1	2	Pond M	young (x1)
	2022-07-08	14	COLO	Common Loon	1	1	0		2	Pond M	
	2022-07-08	14	GOEY	Unidentified Goldeneye	1	0	0	3	4	Pond M	young (x3)
	2022-07-08	14	UNKN	Unidentified Bird	0	0	2		2	Pond M	Unknown; Divers
	2022-07-08	15	UTEA	Unidentified Teal	0	2	3		5	Wetland L, Pond S	
	2022-07-08	16	BAGO	Barrow's Goldeneye	1	1	0		2	Pond S-M	
	2022-07-08	16	MALL	Mallard	1	0	0		1	Pond S-M	
	2022-07-08	17	GOEY	Unidentified Goldeneye	1	0	0	1	2	Pond S-M	young (x1)
	2022-07-08	18	BAGO	Barrow's Goldeneye	0	1	0		1	Pond S-M	
	2022-07-08	19	GOEY	Unidentified Goldeneye	1	0	0		1	Pond L	
	2022-07-08	19	BUFF	Bufflehead	1	0	0		1	Pond L	
	2022-07-08	19	BWTE	Blue-winged Teal	1	0	0	8	9	Pond L	young (x8)
	2022-07-08	19	USCA	Unidentified Scaup	1	0	0		1	Pond L	
	2022-07-08	19	MALL	Mallard	4	2	0		6	Pond L	
	2022-07-08	19	RNDU	Ring-necked Duck	0	2	0		2	Pond L	
	2022-07-08	20	UTEA	Unidentified Teal	1	1	10		12	Lake	
	2022-07-08	20	BEKI	Belted Kingfisher			1		1	Lake	
	2022-07-08	20	RBGU	Ring-billed Gull	0	0	3		3	Lake	
	2022-07-08	20	COLO	Common Loon	1	1	0		2	Lake	
	2022-07-08	20	GOEY	Unidentified Goldeneye	1	4	0		5	Lake	
	2022-07-08	21	MALL	Mallard	5	3	0		8	Lake	
	2022-07-08	21	GOEY	Unidentified Goldeneye	2	1	0		3	Lake	
	2022-07-08	21	COLO	Common Loon	1	1	0		2	Lake	
	2022-07-08	22	GRYE	Greater Yellowlegs	1	1	0		2	Lake	
	2022-07-08	22	UNKN	Unidentified Bird	0	0	2		2	Lake	Unknown; diver
	2022-07-08	23	COME	Common Merganser	0	1	0		1	Creek	
	2022-07-08	24	RBGU	Ring-billed Gull	0	0	1		1	Lake L	

Appendix T: Waterbird Survey Data, 2022

Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Summer Brood *(cont'd)*	2022-07-08	24	COME	Common Merganser	0	0	1		1	Lake L	
	2022-07-08	25	COLO	Common Loon	0	0	6		6	Lake L	
	2022-07-08	25	UNKN	Unidentified Bird	0	0	4		4	Lake L	
	2022-07-08	26	COME	Common Merganser	1	1	0		2	Lake L	
	2022-07-08	26	BUFF	Bufflehead	0	0	3		3	Lake L	diver
	2022-07-08	27	BUFF	Bufflehead	1	0	0	4	5	Lake L	young (x4)
	2022-07-08	28	UNKN	Unidentified Bird			1		1	Lake L	
	2022-07-08	30	COLO	Common Loon	1	1	0		2	Lake L	
	2022-07-08	30	RBGU	Ring-billed Gull	0	0	2	4	6	Lake L	w/ young
	2022-07-08	30	LEYE	Lesser Yellowlegs	0	0	2		2	Lake L	
	2022-07-08	31	BUFF	Bufflehead	1	3	0		4	Lake L	
	2022-07-08	32	COLO	Common Loon	1	1	0		2	Lake	
	2022-07-08	32	RBGU	Ring-billed Gull	0	0	1		1	Lake	
	2022-07-08	33	UNKN	Unidentified Bird			1		1	Pond, Wetland Complex	
	2022-07-08	34	BUFF	Bufflehead	2	0	2		4	Pond, Wetland Complex	
	2022-07-08	35	MALL	Mallard	0	2	0	7	9	Pond, Wetland Complex	young (x7), family groups (x2)
	2022-07-08	35	BUFF	Bufflehead	0	1	0		1	Pond, Wetland Complex	
	2022-07-09	37	RBGU	Ring-billed Gull	0	0	3		3	River, Pond	
	2022-07-09	37	COLO	Common Loon	1	1	0		2	River, Pond	
	2022-07-09	37	LEYE	Lesser Yellowlegs	0	0	1		1	River, Pond	
	2022-07-09	38	BUFF	Bufflehead	0	0	0	1	1	Lake M	young (x1)
	2022-07-09	39	COLO	Common Loon	1	0	0		1	Wetland M	
	2022-07-09	40	BUFF	Bufflehead	2	0	0		2	Pond S	
	2022-07-09	40	SHOR	Unidentified Shorebird	0	0	1		1	Pond S	
	2022-07-09	41	SHOR	Unidentified Shorebird			1		1	Pond S	
	2022-07-09	41	BUFF	Bufflehead	1	0	0		1	Pond S	
	2022-07-09	42	COLO	Common Loon			1		1	Pond S	
	2022-07-09	42	GOEY	Unidentified Goldeneye	0	1	0		1	Pond S	
	2022-07-09	43	RBME	Red-breasted Merganser	1	1		6	8	Pond S	young (x6)
	2022-07-09	44	UGOE	Unidentified Goldeneye	0	0	1		1	Pond S	Unknown; GOEY
	2022-07-09	45	GOEY	Unidentified Goldeneye	0	1	0	12	13	Pond	young (x12)
	2022-07-09	46	SHOR	Unidentified Shorebird	0	0	2		2	Pond	
	2022-07-09	47	GOEY	Unidentified Goldeneye	0	1	0	7	8	Pond	young (x7)
	2022-07-09	48	UNKN	Unidentified Bird	1	1	1		3	Pond M-L	
	2022-07-09	49	MALL	Mallard	0	1	22		23	Pond S	
	2022-07-09	50	COLO	Common Loon	0	0	3		3	Pond L	
	2022-07-09	51	WHPE	White Pelican	0	0	6		6	Lake S	
	2022-07-09	51	COLO	Common Loon	0	0	1		1	Lake S	
	2022-07-09	51	SHOR	Unidentified Shorebird	0	0	6		6	Lake S	
	2022-07-09	52	COLO	Common Loon				2	2	Lake L	young (male x1, female x1)
	2022-07-09	52	BEKI	Belted Kingfisher	0	0	1		1	Lake L	
	2022-07-09	52	WHPE	White Pelican	0	0	1		1	Lake L	
	2022-07-09	53	COLO	Common Loon	0	0	1		1	Lake L	
	2022-07-09	53	RBGU	Ring-billed Gull	0	0	2		2	Lake L	

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Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Summer Brood *(cont'd)*	2022-07-09	54	COLO	Common Loon	1	1	0		2	Lake L	
	2022-07-09	55	COLO	Common Loon	1	1	0		2	Lake L	
	2022-07-09	55	MALL	Mallard	1	1	0		2	Lake L	
	2022-07-09	56	BAGO	Barrow's Goldeneye	1	1	0		2	Pond M	
	2022-07-09	57	BUFF	Bufflehead	0	1	6		7	Pond M	
	2022-07-09	58	MALL	Mallard	0	1	0		1	Lake M-L	
	2022-07-09	58	RBME	Red-breasted Merganser	0	1	0		1	Lake M-L	
	2022-07-09	59	BUFF	Bufflehead	2	0	0		2	Pond M	immature
	2022-07-09	60	BUFF	Bufflehead	1	1	0	4	6	Pond M	young (x4)
	2022-07-09	61	COLO	Common Loon	1	0	0		1	Pond M	
	2022-07-09	61	MALL	Mallard	1	2	0		3	Pond M	
	2022-07-09	61	COGE	Unidentified Bird	0	1	0	3	4	Pond M-L	young (x3)
	2022-07-09	62	SHOR	Unidentified Shorebird	0	0	3		3	Creek	
	2022-07-09	63	UNKN	Unidentified Bird	0	1	0	1	2	Creek,BK	young (x1)
	2022-07-09	64	UTEA	Unidentified Teal	0	1	0	4	5	Wetland, Creek	young (x4)
	2022-07-09	65	SHOR	Unidentified Shorebird			1		1	Wetland, Creek	
	2022-07-09	66	MALL	Mallard	0	2	0	5	7	Wetland, Creek	young (x5)
	2022-07-09	67	BUFF	Bufflehead	0	1	4		5	Pond M	
	2022-07-09	68	CAGO	Canada Goose	0	1	4		5	Pond M	
	2022-07-09	69	UNKN	Unidentified Bird			1		1	Creek, Wetland Complex	Unknown; diver
	2022-07-09	70	COGO	Common Goldeneye			1		1	Creek, Wetland Complex	
	2022-07-09	71	UTEA	Unidentified Teal	0	0	3		3	Pond S	
	2022-07-09	72	LEYE	Lesser Yellowlegs	0	0	2		2	Pond S	
	2022-07-09	73	BUFF	Bufflehead	1	1	0		2	Pond S	
	2022-07-09	74	BUFF	Bufflehead	0	1	3	5	9	Pond S	young (x5)
	2022-07-09	75	USCA	Unidentified Scaup	1	1	8		10	Pond M	
	2022-07-09	75	BUFF	Bufflehead	1	0	0		1	Pond M	
	2022-07-09	76	BUFF	Bufflehead	0	1	0	2	3	Pond S	young (x2)
	2022-07-09	77	BUFF	Bufflehead	0	1	0	2	3	Pond S	young (x2)
	2022-07-09	78	GOEY	Unidentified Goldeneye	1	0	0		1	Pond	
	2022-07-09	79	MALL	Mallard	0	2	7		9	Pond M	
	2022-07-09	79	BUFF	Bufflehead	1	1	5		7	Pond M	
	2022-07-09	79	COME	Common Merganser	0	0	5		5	Pond M	
	2022-07-09	80	COME	Common Merganser	1	0	0		1	Pond M	
	2022-07-09	81	RBGU	Ring-billed Gull	0	0	5		5	Pond, Wetland Complex	
	2022-07-09	81	COLO	Common Loon	1	1	0		2	Pond, Wetland Complex	
	2022-07-09	82	COME	Common Merganser	1	0	0		1	Lake S	
	2022-07-09	83	BUFF	Bufflehead	0	0	17	5	22	Pond L	adult + young; 17 + 5
	2022-07-09	83	RNDU	Ring-necked Duck	0	0	9		9	Pond L	
	2022-07-09	84	SHOR	Unidentified Shorebird	0	0	4		4	Pond L	
	2022-07-09	85	SHOR	Unidentified Shorebird	0	0	3		3	Pond L	
	2022-07-09	86	SHOR	Unidentified Shorebird	0	0	2		2	Pond L	
	2022-07-09	87	COLO	Common Loon	1	1	0		2	Pond L	end 18:13
	2022-07-10	87	COLO	Common Loon	0	0	2		2	Pond M	

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Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Summer Brood *(cont'd)*	2022-07-10	88	RNDU	Ring-necked Duck	2	0	0		2	Pond S	
	2022-07-10	89	BUFF	Bufflehead	1	0	0		1	Pond	
	2022-07-10	90	COLO	Common Loon	0	0	1		1	Pond L	
	2022-07-10	91	COGO	Common Goldeneye	0	0	8		8	Pond M	
	2022-07-10	92	COLO	Common Loon	0	0	1		1	Lake S	
	2022-07-10	93	BUFF	Bufflehead	0	1	0		1	Pond S, Wetland Complex	
	2022-07-10	94	MALL	Mallard	1				1	River, Wetland Complex	
	2022-07-10	94	BUFF	Bufflehead	0	1	0	1	2	River, Wetland Complex	immature male (x1)
	2022-07-10	95	UNKN	Unidentified Bird	0	0	0	3	3	Pond S	unknown, young (x3)
	2022-07-10	96	BUFF	Bufflehead	0	1	8		9	Lake S	
	2022-07-10	96	USCA	Unidentified Scaup			0	8	8	Lake S	young female (x6), young male (x2)
	2022-07-10	96	BUFF	Bufflehead	0	1	0	6	7	Lake S	young (x6)
	2022-07-10	96	COLO	Common Loon			1		1	Lake S	
	2022-07-10	96	COGO	Common Goldeneye	0	1	0	2	3	Lake S	young (x2)
	2022-07-10	96	COGO	Common Goldeneye	0	1	0	2	3	Lake S	young (x2)
	2022-07-10	96	SHOR	Unidentified Shorebird	0	0	3		3	Lake S	
	2022-07-10	96	BUFF	Bufflehead	0	1	0		1	Lake S	
	2022-07-10	97	BUFF	Bufflehead	0	0	0	1	1	Pond S	immature
	2022-07-10	98	RBGU	Ring-billed Gull	0	0	2		2	River, Wetland Complex	
	2022-07-10	99	BUFF	Bufflehead	1	0	0		1	Pond S	
	2022-07-10	100	RNDU	Ring-necked Duck	1	1	0	2	4	Lake S	young (x2)
	2022-07-10	100	RNDU	Ring-necked Duck	2	0	3		5	Lake S	
	2022-07-10	100	BUFF	Bufflehead	0	1	5		6	Lake S	
	2022-07-10	100	UNKN	Unidentified Bird	0	0	1		1	Lake S	
	2022-07-10	100	UGRE	Unidentified Grebe	1				1	Lake S	
	2022-07-10	101	RBGU	Ring-billed Gull	2	1	0		3	Pond M	
	2022-07-10	101	BUFF	Bufflehead	1	0	0		1	Pond M	
	2022-07-10	101	BUFF	Bufflehead	1	1	0	2	4	Pond M	young (x2)
	2022-07-10	102	SHOR	Unidentified Shorebird	0	0	2		2	Pond M	
	2022-07-10	102	BUFF	Bufflehead	1	1	0	4	6	Pond M	young (x4)
	2022-07-10	103	UNKN	Unidentified Bird	0	0	4		4	Pond S	x2, likely BUFF
	2022-07-10	104	RNGR	Red-necked Grebe	0	2	0	3	5	Lake S	adult female (x2), young (x2).
	2022-07-10	105	BUFF	Bufflehead	1	2	0		3	Pond S	
	2022-07-10	107	BUFF	Bufflehead	1	2	12		15	Lake M	
	2022-07-10	107	WEGR	Western Grebe	1	1	0		2	Lake M	
	2022-07-10	108	COLO	Common Loon	1	1	0		2	Pond L	
	2022-07-10	109	MALL	Mallard	0	1	0	1	2	Pond L	young (x1)
	2022-07-10	109	RNDU	Ring-necked Duck	1	1	0		2	Pond L	
	2022-07-10	109	BUFF	Bufflehead	1	1	5		7	Pond L	
	2022-07-10	109	COGO	Common Goldeneye	2	2	0		4	Pond L	
	2022-07-10	109	WEGR	Western Grebe	0	1	0		1	Pond L	
	2022-07-10	109	SHOR	Unidentified Shorebird	0	0	2		2	Pond L	
	2022-07-10	110	COLO	Common Loon	0	0	1		1	Lake, Wetland	
	2022-07-10	111	RBGU	Ring-billed Gull	0	0	2		2	Lake, Wetland Complex	

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Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Summer Brood *(cont'd)*	2022-07-10	111	BOGU	Bonaparte's Gull	0	0	2		2	Lake, Wetland Complex	
	2022-07-10	111	MALL	Mallard	1	0	0		1	Lake, Wetland Complex	
	2022-07-10	111	COLO	Common Loon	0	0	1		1	Lake, Wetland Complex	
	2022-07-10	111	RNDU	Ring-necked Duck	2	3	0		5	Lake, Wetland Complex	
	2022-07-10	111	CAGO	Canada Goose	2	2	6		10	Lake, Wetland Complex	
	2022-07-10	112	COLO	Common Loon	1	1	0		2	Lake M-L	
	2022-07-10	112	RBGU	Ring-billed Gull	0	0	1		1	Lake M-L	
	2022-07-10	113	COGO	Common Goldeneye	1	1	0		2	Pond, Wetland	
	2022-07-10	114	COGO	Common Goldeneye	0	1	4		5	Pond L	
	2022-07-10	114	RNDU	Ring-necked Duck	1	1	0		2	Pond L	
	2022-07-10	114	UNKN	Unidentified Bird	0	0	4		4	Pond L	unknown; diver
	2022-07-10	115	GOEY	Unidentified Goldeneye			1		1	Ditch	
	2022-07-10	116	BUFF	Bufflehead	0	0	1		1	Gravel Pit	
	2022-07-10	117	GOLO	Unidentified Bird	0	0	2		2	Lake L	
	2022-07-10	118	BUFF	Bufflehead	1	1	0	3	5	Pond M	young (x3)
	2022-07-10	118	RBME	Red-breasted Merganser	0	0	1		1	Pond S	young (x1)
	2022-07-10	119	RBME	Red-breasted Merganser	1	0	0		1	Pond S	
	2022-07-10	120	RUDU	Ruddy Duck	0	0	1		1	Pond M-L	
	2022-07-10	120	UNKN	Unidentified Bird	0	0	3		3	Pond M-L	
	2022-07-10	121	BUFF	Bufflehead	0	1	5		6	Pond, Wetland Complex M	
	2022-07-10	121	COGO	Common Goldeneye	1	1	2		4	Pond, Wetland Complex M	
	2022-07-10	121	UTEA	Unidentified Teal	0	1	3		4	Pond, Wetland Complex M	
	2022-07-10	122	GOEY	Unidentified Goldeneye	0	1	0		1	Pond S	
	2022-07-10	123	COME	Common Merganser		1			1	River	
	2022-07-10	125	BUFF	Bufflehead	0	0	1		1	Pond S	
	2022-07-10	125	SHOR	Unidentified Shorebird	0	0	1		1	Pond S	
	2022-07-10	126	COGO	Common Goldeneye	0	1	0		1	Pond S	
	2022-07-10	127	COLO	Common Loon	0	0	1		1	Lake M-S	
	2022-07-10	128	COGO	Common Goldeneye	1	0	0		1	Pond M	
	2022-07-10	129	COLO	Common Loon	0	0	1		1	Lake L	
	2022-07-10	132	COLO	Common Loon			1		1	Lake L	
	2022-07-10	133	MALL	Mallard	0	2	0		2	Wetland	
	2022-07-10	134	PBGR	Pied-billed Grebe		1			1	Wetland	
	2022-07-12	135	MALL	Mallard	0	0	4		4	Wetland	
Fall Staging	44813	294	COLO	Common Loon	1				1	Lake	
	44813	294	RNDU	Ring-necked Duck	1	1			2	Lake	
	44813	294	PBGR	Pied-billed Grebe			5		5	Lake	Likely family group
	44813	295	LESC	Lesser Scaup			2		2	Lake	
	44813	295	MALL	Mallard			2		2	Lake	
	44813	296	LESC	Lesser Scaup			5		5	Pond	
	44813	296	MALL	Mallard			7		7	Pond	
	44813	297	MALL	Mallard			1		1	Wetland	
	44813	337	BWTE	Blue-winged Teal			5		5	Lake	
	44813	294	GOsp	Unidentified Goose			1		1	Lake	

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Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Fall Staging *(cont'd)*	44813	301	MALL	Mallard			1		1	Wetland	
	44813	302	MALL	Mallard			7		7	Lake	
	44813	295	GOsp	Unidentified Goose			7		7	Lake	
	44813	303	MALL	Mallard			1		1	Pond	
	44813	303	COME	Common Merganser			2		2	Pond	
	44813	303	GOsp	Unidentified Goose			5		5	Pond	
	44813	303	NOSH	Northern Shoveler			2		2	Pond	
	44813	303	MALL	Mallard			2	2	4	Pond	
	44813	303	GOsp	Unidentified Goose			3		3	Pond	
	44813	304	GOsp	Unidentified Goose			3		3	Pond	
	44813	306	LESC	Lesser Scaup			11		11	Lake	
	44813	306	PBGR	Pied-billed Grebe			6		6	Lake	
	44813	305	GOsp	Unidentified Goose			2		2	Pond	
	44813	307	GOsp	Unidentified Goose			1		1	Lake	
	44813	310	COME	Common Merganser			2	3	5	Creek	
	44813	310	MALL	Mallard			1		1	Creek	
	44813	311	COME	Common Merganser			8		8	Creek	
	44813	315	GOsp	Unidentified Goose			16		16	Lake	
	44813	313	MALL	Mallard			7		7	Creek	
	44813	314	LESC	Lesser Scaup			4		4	Pond	
	44813	314	RNGR	Red-necked Grebe			4		4	Pond	
	44813	315	UNKN	Unidentified Bird			3		3	Lake	
	44813	315	COLO	Common Loon	1	1			2	Lake	
	44813	318	GOsp	Unidentified Goose			1		1	Lake	
	44813	315	UNKN	Unidentified Bird			3		3	Lake	
	44813	316	TRUS	Trumpeter Swan			3		3	Lake	Trumpeter Swans
	44813	316	COME	Common Merganser			2		2	Lake	
	44813	317	LESC	Lesser Scaup			3		3	Lake	
	44813	318	WEGR	Western Grebe			2		2	Lake	
	44813	320	GOsp	Unidentified Goose			4	1	5	Lake	
	44813	319	LESC	Lesser Scaup			1		1	Pond	
	44813	320	LESC	Lesser Scaup			3		3	Lake	
	44813	322	GOsp	Unidentified Goose			1		1	Lake	
	44813	321	RNDU	Ring-necked Duck			3		3	Lake	
	44813	329	GOsp	Unidentified Goose			4		4	Lake	
	44813	324	RNDU	Ring-necked Duck			1		1	Pond	
	44813	325	COLO	Common Loon			1		1	Lake	
	44813	326	LESC	Lesser Scaup	2	2	5	1	10	Lake	
	44813	327	COLO	Common Loon			1		1	Lake	
	44813	334	GOsp	Unidentified Goose			17		17	Lake	
	44813	340	GOsp	Unidentified Goose			2		2	Pond	
	44813	330	COLO	Common Loon			2		2	Lake	
	44813	331	WEGR	Western Grebe			1		1	Wetland	
	44813	332	UNKN	Unidentified Bird			4		4	Wetland	

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Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Fall Staging *(cont'd)*	44813	333	COLO	Common Loon	1	1			2	Lake	
	44813	342	GOsp	Unidentified Goose			1		1	Pond	
	44813	334	MALL	Mallard			2		2	Lake	
	44813	335	COLO	Common Loon			1		1	Lake	
	44813	336	RNDU	Ring-necked Duck			11		11	Wetland	
	44813	361	GOsp	Unidentified Goose			1		1	Pond	
	44813	363	GOsp	Unidentified Goose			37		37	Lake	
	44813	337	MALL	Mallard			7		7	Lake	
	44813	337	COLO	Common Loon	1	1			2	Lake	
	44813	367	GOsp	Unidentified Goose			85		85	Lake	
	44813	338	LESC	Lesser Scaup			1		1	Lake	
	44813	339	MALL	Mallard			1		1	Pond	
	44813	340	LESC	Lesser Scaup			5		5	Pond	
	44813	367	GOsp	Unidentified Goose			20		20	Lake	
	44813	341	MALL	Mallard			10		10	Pond	
	44813	341	AMWI	American Wigeon			5		5	Pond	
	44813	371	GOsp	Unidentified Goose			1		1	Lake	
	44813	343	AMWI	American Wigeon			6		6	Pond	
	44813	343	MALL	Mallard			12		12	Pond	
	44813	344	COLO	Common Loon	1	1			2	Lake	
	44813	361*	GWTE	Green-winged Teal	1	1			2	Pond	
	44813	371	GOsp	Unidentified Goose			2		2	Lake	
	44813	362	MALL	Mallard			2		2	Wetland	
	44813	372	GOsp	Unidentified Goose			1		1	Lake	
	44813	364	COLO	Common Loon			1		1	Lake	
	44813	365	COLO	Common Loon			1		1	Lake	
	44813	377	GOsp	Unidentified Goose			1		1	Lake	
	44813	367	MALL	Mallard			3		3	Wetland	
	44813	378	GOsp	Unidentified Goose			6		6	Lake	
	44813	367	LESC	Lesser Scaup			25		25	Lake	
	44813	367	PBGR	Pied-billed Grebe			14		14	Lake	
	44813	367	CAGO	Canada Goose			2		2	Lake	
	44813	367	COLO	Common Loon			1		1	Lake	
	44813	385	GOsp	Unidentified Goose			1		1	Wetland	
	44813	367	LESC	Lesser Scaup			13		13	Lake	
	44813	367	CITE	Cinnamon Teal			5		5	Lake	
	44813	368	RNGR	Red-necked Grebe			2		2	Lake	
	44813	369	COLO	Common Loon			1		1	Lake	
	44813	370	WEGR	Western Grebe			1		1	Lake	
	44813	371	AMWI	American Wigeon						Lake	
	44814	387	GOsp	Unidentified Goose			6		6	Lake	
	44814	389	GOsp	Unidentified Goose			1		1	Wetland	
	44814	395	GOsp	Unidentified Goose			6		6	Pond	
	44813	372	COLO	Common Loon			1		1	Lake	

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Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Fall Staging *(cont'd)*	44813	374	BUFF	Bufflehead			2		2	Pond	
	44813	375	MALL	Mallard			2		2	Wetland	
	44813	376	MALL	Mallard			9		9	Wetland	
	44813	377	LESC	Lesser Scaup			2		2	Lake	
	44814	397	GOsp	Unidentified Goose			3		3	Lake	
	44814	399	GOsp	Unidentified Goose			3		3	Wetland	
	44813	379	MALL	Mallard			1		1	SW	
	44813	381	NOSH	Northern Shoveler			4		4	Lake	
	44813	381	MALL	Mallard			3		3	Lake	
	44813	382	MALL	Mallard			4		4	Lake	
	44813	383	RNGR	Red-necked Grebe			2		2	Lake	
	44813	384	MALL	Mallard			2		2	Wetland	
	44814	401	GOsp	Unidentified Goose			2		2	Wetland	
	44813	386	RNDU	Ring-necked Duck			2		2	Lake	
	44814	402	GOsp	Unidentified Goose			1		1	Wetland	
	44814	387	LESC	Lesser Scaup	1	1			2	Lake	
	44814	405	GOsp	Unidentified Goose			5		5	Lake	
	44814	406	GOsp	Unidentified Goose			5		5	Lake	
	44814	409	GOsp	Unidentified Goose			2		2	Lake	
	44814	390	BEKI	Belted Kingfisher			1		1	Wetland	
	44814	390	MALL	Mallard			2		2	Wetland	
	44814	391	MALL	Mallard			4		4	Wetland	
	44814	392	NOSH	Northern Shoveler			3		3	Lake	
	44814	393	COLO	Common Loon	1	1			2	Lake	
	44814	393	MALL	Mallard			1		1	Lake	
	44814	393	MALL	Mallard			4		4	Lake	
	44814	394	MALL	Mallard			1		1	Wetland	
	44814	394	PBGR	Pied-billed Grebe			3		3	Wetland	
	44814	395	RNDU	Ring-necked Duck			6		6	Pond	
	44814	414	GOsp	Unidentified Goose			8		8	Lake	
	44814	396	PBGR	Pied-billed Grebe			2		2	Wetland	
	44814	419	GOsp	Unidentified Goose			1		1	Wetland	
	44814	398	AMWI	American Wigeon		1		2	3	Wetland	
	44814	398	MALL	Mallard			2		2	Wetland	
	44814	427	GOsp	Unidentified Goose			5		5	Lake	
	44814	400	PBGR	Pied-billed Grebe			1		1	Wetland	
	44814	401	MALL	Mallard		1		1	2	Wetland	
	44814	428	GOsp	Unidentified Goose			6		6	Lake	
	44814	428	GOsp	Unidentified Goose			5		5	Lake	
	44814	403	RNDU	Ring-necked Duck			2		2	Pond	
	44814	405	MALL	Mallard			9		9	Lake	
	44814	431	GOsp	Unidentified Goose			4		4	Lake	
	44814	406	MALL	Mallard			1		1	Lake	
	44814	437	GOsp	Unidentified Goose			4		4	Lake	

Appendix T: Waterbird Survey Data, 2022

Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Fall Staging *(cont'd)*	44814	407	RNDU	Ring-necked Duck			1		1	Pond	
	44814	408	MALL	Mallard			2		2	Pond	
	44814	408	BUFF	Bufflehead		1			1	Pond	
	44814	440	GOsp	Unidentified Goose			1		1	Lake	
	44814	410	MALL	Mallard			7		7	River	
	44814	412	MALL	Mallard			4		4	Wetland	
	44814	413	BUFF	Bufflehead			4		4	Lake	
	44814	413	RNDU	Ring-necked Duck			1	2	3	Lake	
	44814	414	LESC	Lesser Scaup			2		2	Lake	
	44814	414	MALL	Mallard			10	3	13	Lake	
	44814	414	LESC	Lesser Scaup			1	2	3	Lake	
	44814	441	GOsp	Unidentified Goose			1		1	Lake	
	44814	414	RNDU	Ring-necked Duck			1	1	2	Lake	
	44814	415	BUFF	Bufflehead			5		5	Lake	
	44814	415	LESC	Lesser Scaup			4		4	Lake	
	44814	416	NOSH	Northern Shoveler			4		4	Pond	
	44814	416	MALL	Mallard			7		7	Pond	
	44814	417	WEGR	Western Grebe			5		5	Lake	
	44814	442	GOsp	Unidentified Goose			1		1	Pond	
	44814	420	MALL	Mallard			7		7	Wetland	
	44814	421	MALL	Mallard			8		8	Lake	
	44814	421	COME	Common Merganser			2		2	Lake	
	44814	421	RNPH	Red-necked Phalarope			1		1	Lake	RED-NECKED PHARALOPE
	44814	422	RNDU	Ring-necked Duck			2		2	Lake	
	44814	423	GWTE	Green-winged Teal			15		15	Lake	
	44814	423	MALL	Mallard			25		25	Lake	
	44814	424	MALL	Mallard			7		7	Lake	
	44814	426	COLO	Common Loon	1	1			2	Lake	
	44814	426	MALL	Mallard			2		2	Lake	
	44814	427	BUFF	Bufflehead			9	4	13	Lake	
	44814	443	GOsp	Unidentified Goose			1		1	Pond	
	44814	428	LESC	Lesser Scaup			4		4	Lake	
	44814	428	RNDU	Ring-necked Duck			4		4	Lake	
	44814	428	LESC	Lesser Scaup			64		64	Lake	
	44814	444	GOsp	Unidentified Goose			2		2	Lake	
	44814	446	GOsp	Unidentified Goose			9		9	Pond	
	44814	428	LESC	Lesser Scaup			14		14	Lake	
	44814	429	RNGR	Red-necked Grebe			5		5	Lake	
	44814	429	WEGR	Western Grebe			1		1	Lake	
	44814	448	GOsp	Unidentified Goose			5		5	Pond	
	44814	429	TRUS	Trumpeter Swan			3		3	Lake	
	44814	430	COLO	Common Loon			1		1	Lake	
	44814	431	NOSH	Northern Shoveler			1		1	Lake	
	44814	431	COLO	Common Loon			1		1	Lake	

Appendix T: Waterbird Survey Data, 2022

Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Fall Staging *(cont'd)*	44814	451	GOsp	Unidentified Goose			15		15	Lake	
	44814	431	MALL	Mallard			1		1	Lake	
	44814	432	CAGO	Canada Goose			2		2	Lake	
	44815	459	GOsp	Unidentified Goose			1		1	Lake	
	44814	434	COLO	Common Loon			3		3	Lake	
	44814	435	MALL	Mallard			1		1	Pond	
	44814	435	BUFF	Bufflehead			2		2	Pond	
	44815	468	GOsp	Unidentified Goose			1		1	Lake	
	44814	437	RNDU	Ring-necked Duck			18		18	Lake	
	44815	476	GOsp	Unidentified Goose			1		1	Lake	
	44815	478	GOsp	Unidentified Goose			2		2	Lake	
	44814	439	COLO	Common Loon			1		1	Lake	
	44815	492	GOsp	Unidentified Goose			5		5	Lake	
	44814	445	AMWI	American Wigeon			2		2	Lake	
	44814	447	MALL	Mallard			9		9	Pond	
	44814	448	MALL	Mallard			7		7	Pond	
	44814	449	MALL	Mallard			2		2	Pond	
	44814	449	MALL	Mallard			2		2	Pond	
	44814	450	TRUS	Trumpeter Swan			1		1	Pond	SWAN
	44814	451	LESC	Lesser Scaup			1		1	Lake	
	44814	455	COME	Common Merganser			4		4	River	
	44815	456	MALL	Mallard			4		4	Pond	
	44815	457	COLO	Common Loon	1	1			2	Lake	
	44813	337	RNGR	Red-necked Grebe			3		3	Lake	
	44815	458	AMWI	American Wigeon			3		3	Lake	
	44815	458	MALL	Mallard			4		4	Lake	
	44815	458	AMWI	American Wigeon			6		6	Lake	
	44813	297	UNDU	Unidentified Duck			1		1	Wetland	Diver, small water channels
	44815	459	COLO	Common Loon			3		3	Lake	
	44813	298	UNDU	Unidentified Duck			1		1	Wetland	Diver
	44815	460	MALL	Mallard			1		1	Wetland	
	44815	462	COLO	Common Loon			1		1	Lake	
	44815	464	COLO	Common Loon			1		1	Lake	
	44815	465	WEGR	Western Grebe			1		1	Lake	
	44815	465	GBHE	Great Blue Heron			2		2	Lake	heron pair
	44815	466	COLO	Common Loon			1		1	Lake	
	44815	467	WEGR	Western Grebe			2		2	Lake	
	44815	467	MALL	Mallard			11		11	Lake	
	44813	366	UNDU	Unidentified Duck			1		1	Wetland	hiding in grass
	44815	468	AMWI	American Wigeon			1		1	Lake	
	44813	386	UNDU	Unidentified Duck			3		3	Lake	unknown duck
	44814	388	UNDU	Unidentified Duck			2		2	Lake	
	44814	429	UNDU	Unidentified Duck			2		2	Lake	diver
	44814	436	UNDU	Unidentified Duck			1		1	Pond	diver (glare)

Appendix T: Waterbird Survey Data, 2022

Survey Period	Date	Waypoint	Species Code	Species Common Name	# Male	# Female	# Unknown	# Young	# Total	Habitat Type	Comments
Fall Staging *(cont'd)*	44814	438	UNDU	Unidentified Duck			1		1	Pond	diver
	44815	458	UNDU	Unidentified Duck			1		1	Lake	
	44815	480	COLO	Common Loon			1		1	Lake	
	44815	480	MALL	Mallard			6		6	Lake	
	44815	481	TRUS	Trumpeter Swan			3		3	Lake	
	44815	481	RNDU	Ring-necked Duck			15		15	Lake	
	44815	481	MALL	Mallard			10		10	Lake	
	44815	481	COME	Common Merganser			6		6	Lake	
	44815	481	COME	Common Merganser			12		12	Lake	
	44815	482	MALL	Mallard			2		2	Lake	
	44815	482	AMWI	American Wigeon			4		4	Lake	
	44815	483	COLO	Common Loon			1		1	Lake	
	44815	467	UNDU	Unidentified Duck			40		40	Lake	too close to private ranch to ID
	44815	486	MALL	Mallard			6		6	Wetland	
	44815	487	COLO	Common Loon			1		1	Lake	
	44815	487	COLO	Common Loon	1	1			2	Lake	
	44815	488	LESC	Lesser Scaup			12		12	Lake	increasing wind
	44815	488	AMWI	American Wigeon			7		7	Lake	
	44815	489	AMWI	American Wigeon			3		3	Pond	
	44815	490	MALL	Mallard			3		3	Pond	
	44815	491	MALL	Mallard			13		13	Lake	
	44815	491	BUFF	Bufflehead			4		4	Lake	
	44815	468	UNDU	Unidentified Duck			2		2	Lake	divers
	44815	492	MALL	Mallard			8		8	Lake	
	44815	492	RNDU	Ring-necked Duck			12		12	Lake	
	44815	491	UNDU	Unidentified Duck			7		7	Lake	dark grey body
	44815	493	LESC	Lesser Scaup	2	2			4	Lake	
	44815	497	COLO	Common Loon	1	1			2	Lake	
	44815	498	MALL	Mallard			2		2	Wetland	
	44815	499	COLO	Common Loon			1		1	Lake	
	44815	499	MALL	Mallard			2		2	Lake	
	44815	500	COLO	Common Loon			1		1	Lake	
	44815	502	COLO	Common Loon	1	1			2	Lake	
	44815	458	YEsp	Unidentified Yellowlegs			1		1	Lake	

APPENDIX U UPLAND BIRD VARIABLE RADIUS POINT COUNT SURVEY SITE DATA, 2022

Appendix U: Upland Bird Variable Radius Point Count Survey Site Data, 2022

Transect ID	Site ID	Survey Date	Zone	Easting	Northing	Noise	Temp (°C)	Sky	Wind	Time Start	BEC subZone	% River	% Wetland	% Marsh	% Pond	% Lake	% Conifer Forest	% Deciduous Forest	% Mixed Forest	% Mountain	% Tundra	% Crown Closure	Stand Age
UB01	S1	2022-06-14	10U	0374569	5893877	0	4	0	1	06:39	ESSFmv1	0	0	5	0	0	95	0	0	0	0	35	Medium
	S2	2022-06-14	10U	0374466	5893696	1	3	0	1	07:14	ESSFmv1	0	0	0	0	0	100	0	0	0	0	40	Medium
	S3	2022-06-14	10U	0374410	5893485	1		0	1	07:47	ESSFmv1	10	0	0	0	0	90	0	0	0	0	30	Medium
	S4	2022-06-14	10U	0374365	5893286	0		0	1	08:17	ESSFmvp	0	0	0	0	0	100	0	0	0	0	40	Medium
	S5	2022-06-14	10U	0374241	5893119	1		0	1	08:43	ESSFmv1	0	0	0	0	0	100	0	0	0	0	50	Medium
UB02	S1	2022-06-14	10U	0374483	5894122	1	4	1	2	06:32	ESSFmv1	0	0	0	0	0	100	0	0	0	0	70	Old
	S2	2022-06-14	10U	0374481	5894331	1	4	1	2	06:59	ESSFmv1	0	0	0	0	0	100	0	0	0	0	60	Old
	S3	2022-06-14	10U	0374471	5894525	1	4	0	1	07:23	ESSFmv1	0	0	0	0	0	100	0	0	0	0	20	Old
	S4	2022-06-14	10U	0374473	5894742	1	4	0	1	07:46	ESSFmv1	0	0	0	0	0	100	0	0	0	0	40	Old
	S5	2022-06-14	10U	0374477	5894919	0	4	0	1	08:10	ESSFmv1	0	0	0	0	0	100	0	0	0	0	30	Old
UB03	S1	2022-06-15	10U	0382175	5895182	0		0	0	05:59	SBSmc3	0	0	0	0	0	100	0	0	0	0	25	Medium
	S2	2022-06-15	10U	0382379	5895131	1		0	0	06:28	SBSmc3	5	0	0	0	0	95	0	0	0	0	20	Medium
	S3	2022-06-15	10U	0382355	5894938	0		0	0	06:58	SBSmc3	0	0	0	0	0	100	0	0	0	0	25	Medium
	S4	2022-06-15	10U	0382261	5894716	0		0	0	07:32	SBSmc3	0	5	0	0	0	95	0	0	0	0	25	Medium
	S5	2022-06-15	10U	0382082	5894824	0		0	0	08:00	SBSmc3	0	0	0	0	0	100	0	0	0	0	50	Medium
UB04	S1	2022-06-15	10U	0378595	5887737	0		0	0	09:16	ESSFmv1	0	0	0	0	0	100	0	0	0	0	55	Medium
	S2	2022-06-15	10U	0378401	5887660	1		0	0	09:35	ESSFmv1	0	0	0	0	0	100	0	0	0	0	60	Old
	S3	2022-06-15	10U	0378280	5887823	1		0	0	10:03	ESSFmv1	0	0	0	0	0	100	0	0	0	0	45	Old
	S4	2022-06-15	10U	0378229	5888029	1		0	0	10:38	ESSFmv1	0	0	0	0	0	100	0	0	0	0	20	Young
	S5	2022-06-15	10U	0378441	5888074	1		0	0	11:05	ESSFmv1	0	0	0	0	0	100	0		0	0	35	Young
UB05	S1	2022-06-15	10U	0369389	5891208	1	3	0	0	06:00	ESSFmv1	0	0	0	0	0	100	0	0	0	0	60	Old
	S2	2022-06-15	10U	0369188	5891213	1	3	0	0	06:18	ESSFmv1	0	0	0	0	0	100	0	0	0	0	75	Old
	S3	2022-06-15	10U	0369163	5891003	0	3	0	0	06:36	ESSFmv1	0	0	0	0	0	100	0	0	0	0	30	Old
	S4	2022-06-15	10U	0369107	5890804	1	3	0	0	06:55	ESSFmv1	0	0	0	0	0	100	0	0	0	0	20	Old
	S5	2022-06-15	10U	0369316	5890797	0	5	0	0	07:20	ESSFmv1	0	0	0	0	0	100	0	0	0	0	50	Old
UB06	S1	2022-06-15	10U	0373622	5890335	0	9	0	2	08:37	BAFAun	0	0	0	0	0	0	0	0	0	0	0	Old
	S2	2022-06-15	10U	0373478	5890126	0	9	0	2	08:55	BAFAun	0	0	0	0	0	0	0	0	0	0	0	Old
	S3	2022-06-15	10U	0373285	5889968	0	9	0	1	09:22	BAFAun	0	0	0	0	0	0	0	0	0	0	0	Old
	S4	2022-06-15	10U	0373107	5889929	0	14	0	1	09:39	BAFAun	0	0	0	0	0	0	0	0	0	0	5	Old
	S5	2022-06-15	10U	0373178	5890113	0	14	1	1	10:10	BAFAun	0	0	0	0	0	0	0	0	0	0	0	Old
UB07	S1	2022-06-18	10U	0367485	5895891	1		3	0	05:26	ESSFmv1	0	0	0	0	0	100	0	0	0	0	0	Young
	S2	2022-06-18	10U	0367461	5895686	1		3	0	05:48	ESSFmv1	5	0	0	0	0	95	0	0	0	0	40	Old
	S3	2022-06-18	10U	0367660	5895749	1		3	0	06:14	ESSFmv1	5	0	0	0	0	95	0	0	0	0	40	Old
	S4	2022-06-18	10U	0367871	5895676	1		3	0	06:36	ESSFmv1	5	0	0	0	0	95	0	0	0	0	20	Old
	S5	2022-06-18	10U	0367959	5895861	0		3	0	06:57	ESSFmv1	0	0	0	0	0	100	0	0	0	0	2	Young
UB08	S1	2022-06-18	10U	0369891	5896081	0		3	0	07:46	ESSFmv1	0	20	0	0	0	80	0	0	0	0	30	Old
	S2	2022-06-18	10U	0370088	5896070	0		3	0	08:06	ESSFmv1	0	10	0	0	0	90	0	0	0	0	30	Medium
	S3	2022-06-18	10U	0370257	5895975	0		3	0	08:36	ESSFmv1	0	0	0	0	0	100	0	0	0	0	50	Medium
	S4	2022-06-18	10U	0370288	5896179	0		3	0	08:59	ESSFmv1	0	0	0	0	0	100	0	0	0	0	20	Medium
	S5	2022-06-18	10U	0370253	5896393	1		4	0	09:17	ESSFmv1	5	15	0	0	0	80		0	0	0	30	Medium
UB09	S1	2022-06-18	10U	372594	5896009	0	6	2	0	05:08	ESSFmv1	0	0	0	0	0	100	0	0	0	0	50	Old
	S2	2022-06-18	10U	0372588	5896212	0	6	2	0	05:24	ESSFmv1	0	0	0	0	0	100	0	0	0	0	60	Old
	S3	2022-06-18	10U	0372378	5896224	1	6	2	0	05:45	ESSFmv1	0	0	0	0	0	100	0	0	0	0	75	Old
	S4	2022-06-18	10U	0372183	5896293	0	6	1	1	06:06	ESSFmv1	0	0	0	0	0	100	0	0	0	0	10	Medium
	S5	2022-06-18	10U	0372232	5896113	1	6	1	0	06:25	ESSFmv1	0	80	0	0	0	20	0	0	0	0	5	Medium

Appendix U: Upland Bird Variable Radius Point Count Survey Site Data, 2022

Transect ID	Site ID	Survey Date	Zone	Easting	Northing	Dominant Plants	General Habitat	Comment
UB01	S1	2022-06-14	10U	0374569	5893877	Conifer	Conifer tree forest in wet ground area, little visible ground water	
	S2	2022-06-14	10U	0374466	5893696	Conifer	Conifer forest	
	S3	2022-06-14	10U	0374410	5893485	Conifer	Conifer forest	Survey taken approximately 5 m in from old cut road. Old cut road is now slow moving stream. Large open area along cut road.
	S4	2022-06-14	10U	0374365	5893286	Conifer	Crossed boggy area to reach waypoint. Waypoint greater than 100 m into conifer forest	
	S5	2022-06-14	10U	0374241	5893119	Conifer	Thicker stand of conifer forest, some snow still present on ground	
UB02	S1	2022-06-14	10U	0374483	5894122	Moss (club moss, step moss), balsam regen	Coniferous forest with moss floor and some down trees	Light stream noise in the distance
	S2	2022-06-14	10U	0374481	5894331	Spruce, balsam, moss	Mainly spruce, some water logged areas. Moss floor	
	S3	2022-06-14	10U	0374471	5894525	Spruce, balsam, moss	Mossy floor, trees not fully canopy height. Some scrub birch and crow berry. Some reindeer lichen.	
	S4	2022-06-14	10U	0374473	5894742	Balsam, spruce, moss	Sime crow berry, reindeer lichen, mature tree opening with young shrub level trees. Some deadfall.	
	S5	2022-06-14	10U	0374477	5894919	Balsam, pine, crowberry	Open forest, dead fall	
UB03	S1	2022-06-15	10U	0382175	5895182	Conifer	Conifer forest in semidry soil	
	S2	2022-06-15	10U	0382379	5895131	Conifer	Conifer forest in dry soil. Small creek within 100 m of point count.	
	S3	2022-06-15	10U	0382355	5894938	Conifer	Conifer forest in dry soil	
	S4	2022-06-15	10U	0382261	5894716	Conifer	Conifer forest with small wetland within 50 m of plot. Lake within 200 m of plot.	
	S5	2022-06-15	10U	0382082	5894824		Thicker stand of conifer forest, dry soil. Ground within survey area largely covered with moss.	
UB04	S1	2022-06-15	10U	0378595	5887737	Conifer	Conifer forest. Clear cut approximately 100 m away to the west	
	S2	2022-06-15	10U	0378401	5887660	Conifer	Mature conifer forest, clear cut less than 1 00m away to the west .	Large quantity of mosquitoes contributing to noise heard during point count
	S3	2022-06-15	10U	0378280	5887823	Conifer	Mature conifer forest in dry soil. Ground cover in survey area largely moss.	Large quantity of mosquitoes contributing to background noise during point count
	S4	2022-06-15	10U	0378229	5888029	Pine	Young pine plantation, approximately 20 years of growth. Minimal undergrowth present.	Mosquitoes causing background noise during point count
	S5	2022-06-15	10U	0378441	5888074	Pine, balsam mix	On edge of young pine plantation and old growth conifer forest	Mosquitoes causing elevated noise levels during point count
UB05	S1	2022-06-15	10U	0369389	5891208	Balsam, moss, tree and moss cover	Dense forest with open patches and moss floor	This whole transect is just off of a wetland.
	S2	2022-06-15	10U	0369188	5891213	Balsam and moss.	Tall tree cover and mossy floor	Delete waypoint 004. Miss added
	S3	2022-06-15	10U	0369163	5891003	Balsam, moss	Tree cover, in a slight open area but has some mature and juvenile trees. Moss floor.	
	S4	2022-06-15	10U	0369107	5890804	Balsam, grass and ground vegetation	Open area with mature and juvenile trees. Swampy	
	S5	2022-06-15	10U	0369316	5890797	Balsam, moss	Mature trees with moss floor, some deadfall	
UB06	S1	2022-06-15	10U	0373622	5890335	Balsam, spruce (lodgepole and white bark), crowberry, moss	Open with shorter mature trees. Near top of mountain	
	S2	2022-06-15	10U	0373478	5890126	Balsam, spruce (lodgepole and white bark), crowberry, moss	On top of mountain	
	S3	2022-06-15	10U	0373285	5889968	Balsam, spruce (lodgepole and white bark), crowberry, moss	Top of mountain	
	S4	2022-06-15	10U	0373107	5889929	Balsam, spruce (lodgepole and white bark), lichen	Down side of mountain a bit. More trees present.	
	S5	2022-06-15	10U	0373178	5890113	Balsam, spruce (lodgepole and white bark), lichen, shrubs still dead from winter	Top of mountain, trees very short	
UB07	S1	2022-06-18	10U	0367485	5895891	In cut block, within 100 m of conifer forest. Grasses, shrubs, and young pine found within cut block	Cut block, within 100 m of conifer forest	
	S2	2022-06-18	10U	0367461	5895686	Conifer	Conifer forest on edge of cut block. Cut block less than 100 m away to the south. Small stream less than 100 m away.	
	S3	2022-06-18	10U	0367660	5895749	Conifer	Mature conifer forest. Small stream within 100 m of plot. Open areas covered by moss.	
	S4	2022-06-18	10U	0367871	5895676	Conifer, pine stand	Mature pine forest. Small stream less than 100 m away in forest. Open areas within forest covered by moss. Large amounts of deadfall.	
	S5	2022-06-18	10U	0367959	5895861	Open cut block. Young pine trees, grasses and shrubs	Open cut block. Conifer forest approximately 100 m away to the south. Plot within 5 m of 10 m by 20 m burned area. Access road within 50 m of plot.	
UB08	S1	2022-06-18	10U	0369891	5896081	Conifer forest	Mature conifer forest. Open areas covered by moss. Wetland with open water approximately 10 m away from plot to the southwest. Grasses and shrubs dominate area surrounding wetland.	
	S2	2022-06-18	10U	0370088	5896070	Conifer, grasses in wetland	Medium growth conifer forest. Wetland less than 100 m away to the south east. Grasses and shrubs found in wet ground area surrounding wetland. Open areas without tree cover covered by slow moving water, boggy areas.	
	S3	2022-06-18	10U	0370257	5895975	Conifer	Conifer forest on gentle slope. Semidry soil. Ground largely covered by moss. Some deadfall present.	
	S4	2022-06-18	10U	0370288	5896179	Conifer	Conifer forest in wet soil. Boggy areas within 100 m of plot. Open areas covered by moss and grasses. Some young pine present within 20 m of plot.	Very, very light rain during point count. A drizzle
	S5	2022-06-18	10U	0370253	5896393	Conifer, grasses within wetland area	Conifer forest on wet soil. Small stream approximately 15 m south of plot. Young pine stand and grasses along riverbank. Wetland with open water within 100 m of plot. Road within 100 m of plot.	Slightly more rain than UB08S4. point count completed. Light drizzle
UB09	S1	2022-06-18	10U	372594	5896009	Balsam, moss	Down logs, moss floor and some lichen and scrubby plants	
	S2	2022-06-18	10U	0372588	5896212	Balsam trees and moss	Some shrubs. Down logs	
	S3	2022-06-18	10U	0372378	5896224	Balsam, moss		Stream nearby.
	S4	2022-06-18	10U	0372183	5896293	Balsam, moss, shrubs	Miss floor with lichen, deadfall some mature trees with some young.	
	S5	2022-06-18	10U	0372232	5896113	Pine, sedges, shrubs -lab tea, willow, scrub birch	Open wetland surrounded by conifer forest. Open with mature trees	

Appendix U: Upland Bird Variable Radius Point Count Survey Site Data, 2022

Transect ID	Site ID	Survey Date	Zone	Easting	Northing	Noise	Temp (°C)	Sky	Wind	Time Start	BEC subZone	% River	% Wetland	% Marsh	% Pond	% Lake	% Conifer Forest	% Deciduous Forest	% Mixed Forest	% Mountain	% Tundra	% Crown Closure	Stand Age
UB10	S1	2022-06-18	10U	0371467	5896296	1	6	3	0	06:56	ESSFmv1	0	0	0	0	0	100	0	0	0	0	60	Old
	S2	2022-06-18	10U	0371333	5896132	0	6	3	1	07:15	ESSFmv1	0	0	0	0	0	100	0	0	0	0	30	Old
	S3	2022-06-18	10U	371139	5896171	0	6	2	1	07:34	ESSFmv1	0	0	0	0	0	100	0	0	0	0	30	Old
	S4	2022-06-18	10U	0370998	5896322	1	6	3	0	07:52	ESSFmv1	0	80	0	0	0	20	0	0	0	0	0	Medium
	S5	2022-06-18	10U	0371025	5896530	0	6	3	0	08:11	ESSFmv1	0	0	0	0	0	100	0	0	0	0	65	Old
UB11	S1	2022-06-19	10U	0377845	5893161	1		2	4	04:41	ESSFmv1	0	0	0	0	0	100	0	0	0	0	30	Medium
	S2	2022-06-19	10U	0377784	5892970	1		1	3	05:58	ESSFmv1	0	0	0	0	0	100	0	0	0	0	30	Medium
	S3	2022-06-19	10U	0377580	5892976	1		1	4	06:26	ESSFmv1	0	0	0	0	0	100	0	0	0	0	30	Medium
	S4	2022-06-19	10U	0377395	5893113	1		0	5	06:56	ESSFmv1	0	0	0	0	0	100	0	0	0	0	25	Medium
	S5	2022-06-19	10U	0377422	5893329	1		1	4	07:24	ESSFmv1	0	0	0	0	0	100	0	0	0	0	25	Medium
UB12	S5	2022-06-20	10U	376637	5899148	2	7	2	3	06:28	SBSmc3	0	0	0	0	0	100	0	0	0	0	40	Medium
	S4	2022-06-20	10U	376855	5899145	2	6	2	3	06:56	SBSmc3	0	0	0	0	0	100	0	0	0	0	35	Old
	S3	2022-06-20	10U	376826	5899341	1	6	2	0	07:19	SBSmc3	0	0	0	0	0	100	0	0	0	0	60	Old
	S1	2022-06-20	10U	0376629	5899491	1		2	2	06:26	SBSmc3	0	0	0	0	0	100	0	0	0	0	40	Medium
	S2	2022-06-20	10U	0376806	5899380	2		2	3	06:48	SBSmc3	0	0	0	0	0	100	0	0	0	0	30	Medium
UB13	S5	2022-06-20	10U	0378710	5899927	1	9	2	2	08:07	SBSmc3	0	0	0	0	0	100	0	0	0	0	80	Old
	S4	2022-06-20	10U	0378656	5900182	1	9	2	1	08:35	SBSmc3	0	0	0	0	0	100	0	0	0	0	70	Old
	S1	2022-06-20	10U	0379044	5900379	2		2	3	08:00	SBSmc3	0	0	0	0	0	50	0	50	0	0	30	Old
	S2	2022-06-20	10U	0379250	5900341	1		2	1	08:23	SBSmc3	5	0	0	0	0	95	0	0	0	0	40	Old
	S3	2022-06-20	10U	0379351	5900532	0		2	1	08:51	SBSmc3	0	0	0	0	0	100	0	0	0	0	35	Medium
UB14	S1	2022-06-21	10U	0378279	5897761	0		2	0	05:19	SBSmc3	0	0	0	0	0	100	0	0	0	0	60	Young
	S2	2022-06-21	10U	0378244	5897968	0		4	0	05:34	SBSmc3	0	0	0	0	0	100	0	0	0	0	30	Young
	S3	2022-06-21	10U	0378441	5898036	0		4	0	05:58	SBSmc3	0	0	0	0	0	100	0	0	0	0	40	Old
	S4	2022-06-21	10U	0378545	5897866	0		4	0	06:26	SBSmc3	0	0	0	0	0	100	0	0	0	0	30	Old
	S5	2022-06-21	10U	0378648	5897687	1		4	3	06:47	SBSmc3	0	0	0	0	0	100	0	0	0	0	35	Young
UB15	S1	2022-06-21	10U	0378222	5897514	0	8	2	0	05:17	SBSmc3	0	0	0	0	0	100	0	0	0	0	60	Old
	S2	2022-06-21	10U	0378329	5897331	0	8	4	0	05:36	SBSmc3	0	0	100	0	0	0	0	0	0	0	40	Old
	S3	2022-06-21	10U	0378505	5897239	0	8	4	0	05:59	SBSmc3	0	0	0	0	0	100	0	0	0	0	75	Old
	S4	2022-06-21	10U	0378691	5897174	1	8	4	0	06:22	SBSmc3	0	0	0	0	0	100	0	0	0	0	50	Old
	S5	2022-06-21	10U	0378841	5897031	1	8	4	0	06:41	SBSmc3	0	0	0	0	0	100	0	0	0	0	65	Old

Appendix U: Upland Bird Variable Radius Point Count Survey Site Data, 2022

Transect ID	Site ID	Survey Date	Zone	Easting	Northing	Dominant Plants	General Habitat	Comment
UB10	S1	2022-06-18	10U	0371467	5896296	Balsam, moss, some grasses	Mossy floor. Some floor plants and tree saplings	
	S2	2022-06-18	10U	0371333	5896132	Balsam, moss	Moss floor , some deadfall some crowberry	
	S3	2022-06-18	10U	371139	5896171	Moss, balsam,	Moss floor mature trees with some saplings. Some deadfall, lichen, and crowberry	
	S4	2022-06-18	10U	0370998	5896322	Sedges, moss, balsam and spruce	Wetland surrounded by conifers. Some trees within but spaced out.	
	S5	2022-06-18	10U	0371025	5896530	Balsam, moss	Mature forest with moss floor, some deadfall	
UB11	S1	2022-06-19	10U	0377845	5893161	Conifer, pine	Conifer forest on dry soil on slope. Ground cover in open areas dominated by shrubs and moss. Some deadfall in proximity to site. Slope leads down to river valley. River greater than 100 m away from plot.	Wind noise slightly impacting auditory observations during point count
	S2	2022-06-19	10U	0377784	5892970	Conifer	Conifer forest on dry soil on steep slope. Ground cover includes short shrubs and small quantities of moss. Some deadfall present on slope. Slope leads down to river valley. River greater than 100 m away from plot.	Less wind than UB011S1. Some noise interference with auditory observations during point count.
	S3	2022-06-19	10U	0377580	5892976	Conifer	Conifer forest on semidry soil. Ground cover includes shrubs and moss. Reached crest of hill, ground flatter than S2 and S1. Some deadfall present within 100 m of plot.	More wind than UB011S2. Wind noise slightly interfering with auditory observations during point count.
	S4	2022-06-19	10U	0377395	5893113	Conifer	Conifer forest on wet soil. Small (~5m squared) boggy area within 100 m of plot. Plot at crest of hillslope noted in S1 and S2. Ground cover includes shrubs and mossy areas.	Wind noise increased since S3. Crew waited several minutes to determine if wind would die down enough to facilitate survey. Wind determined too strong to continue survey at S4
	S5	2022-06-19	10U	0377422	5893329	Conifer	Conifer forest on wet soil. Small boggy area within 100 m of plot. Ground cover includes shrubs and mossy areas. Small amount of deadfall in proximity to plot.	Wind noise less than at S4. Point count completed. Noise causing interference with auditory observations during point count
UB12	S5	2022-06-20	10U	376637	5899148	Pine, lichen, crow berry, bare ground	Pine plantation stand. Deadfall	Some wind guts reaching a 4. Align wind info with ken and Nicole. Hanged to S5 from s1.
	S4	2022-06-20	10U	376855	5899145	Pine, moss, deadfall, balsam	Just outside of Pine plantation, mossy floor. Near top of hill, trees mature throughout but denser at bottom of hill.	Some wind noise heard. Gusting to a 4. Changed from s2 to s4
	S3	2022-06-20	10U	376826	5899341	Balsam, spruce, moss, shrubs (lab tea)	A lot of Deadfall. Mossy floor, mature stand	In valley protected from wind.
	S1	2022-06-20	10U	0376629	5899491	Conifer, pine	On edge of young pine plantation and medium growth pine forest. Ground cover includes moss and lichen. Dry soil. Little deadfall present within 100 m of plot.	Some wind present during point count. Some interference with auditory observations
	S2	2022-06-20	10U	0376806	5899380	Conifer, pine	Conifer forest on dry soil. Ground cover includes moss and short shrubs. Some deadfall present within 100 m of plot. Some snags present within 100 m of plot.	Wind noise causing sone interference with auditory observations during point count. Wind gusts above 3 on Beaufort.
UB13	S5	2022-06-20	10U	0378710	5899927	Pine, balsam, moss	Mossy floor, lots of dead fall large and small.	Stronger creek noise
	S4	2022-06-20	10U	0378656	5900182	Balsam, moss	Some spruce. Lots of deadfall	Did s5 first. Could not cross river. So waled across access road
	S1	2022-06-20	10U	0379044	5900379	Conifer, aspen	Mature mixed forest on dry soil. Aspen and coniferous stands in proximity to plot. Young pine plantation to west of plot within 100 m. Ground cover includes short shrubs. Some deadfall present within 100 m of plot.	Wind noise causing slight interference with auditory observations American 3 toed woodpecker nest in aspen tree approximately 15 m from plot. Babies heard. (photo on Ken's iPad)
	S2	2022-06-20	10U	0379250	5900341	Conifer	Mature conifer forest on wet soil. Boggy areas present within 100 m of plot. Ground cover includes moss and some grasses in proximity to boggy areas. River present within 100 m SW of plot. Deadfall present	Stream noise heard during auditory observations
	S3	2022-06-20	10U	0379351	5900532	Conifer	Conifer forest on semidry soil. Ground cover includes moss and small shrubs. Some deadfall present within 100 m of plot.	Wind died down. Wind not affecting auditory observations during point count
UB14	S1	2022-06-21	10U	0378279	5897761	Conifer, pine	Young regenerating pine stand on dry soil. Little deadfall present within 100 m of plot. Ground is mostly bare/soil covered by pine needles and few vegetation.	
	S2	2022-06-21	10U	0378244	5897968	Conifer, pine	Young regenerating pine stand on dry soil. Ground cover includes moss and few small shrubs. Little deadfall present within 100 m of plot. Medium growth fir stand approximately 100 m away to the SE.	Light drizzle occurring during point count. Point count completed
	S3	2022-06-21	10U	0378441	5898036	Conifer	Mature conifer stand on dry soil. Ground cover principally moss, few short vegetative plants. Large amounts of deadfall present with 100 m of site.	Light drizzle during point count. Point count completed
	S4	2022-06-21	10U	0378545	5897866	Conifer	Mature conifer forest on dry soil. Ground cover includes moss and short vegetation. Large amounts of deadfall within 100 m of plot. Clearing in proximity to plot has several young spruce trees.	Light drizzle during point count. Point count completed
	S5	2022-06-21	10U	0378648	5897687	Conifer, pine	Young regenerating pine stand on dry soil. Ground cover includes moss and short vegetation. Small amount of deadfall in proximity to site.	Wind increased since S4. Wind causing slight interference with auditory observations during point count .
UB15	S1	2022-06-21	10U	0378222	5897514	Spruce, moss	Some deadfall. Some shrubs	
	S2	2022-06-21	10U	0378329	5897331	Spruce, shrubs (sheep laurel, willow), moss	Marsh surrounded by conifer old forest	
	S3	2022-06-21	10U	0378505	5897239	Pine, moss, balsam	Wetland nearby. Deadfall	Cut block near sites 1, 2, and 3
	S4	2022-06-21	10U	0378691	5897174	Pine, balsam, low shrubs, moss, plant litter	Mature stand with downfall	
	S5	2022-06-21	10U	0378841	5897031	Balsam, moss, grass and shrub	Open mature stand with some partial dead standing trees	

APPENDIX V UPLAND BIRD VARIABLE RADIUS POINT COUNT OBSERVATION DATA, 2022

Appendix V: Upland Bird Variable Radius Point Count Observation Data, 2022

Transect ID	Site ID	Incidental	Species Code	# Male	# Female	# Unknown	# Young	# Total	Behavior	Distance	Timing (0-3 /3-5min)	Obs Type	Comment
UB01	S2	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	
	S3	No	Boreal Chickadee	1	0	0	0	1	V/C	0-50	0-3	Aud + Vis	
	S3	No	Canada Jay	1	0	0	0	1	V/C	0-50	0-3	Aud + Vis	
	S3	No	Varied Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	
	S4	No	Pine Siskin	1	0	0	0	1	C	0-50	0-3	Auditory	
	S5	No	Varied Thrush	1	0	0	0	1	S	0-50	0-3	Auditory	counter singing to the other VATH male
	S5	No	Varied Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	counter singing to the other VATH male
	S5	No	Townsend's Warbler	1	0	0	0	1	S	0-50	0-3	Auditory	
	S5	No	Ruby-crowned Kinglet	1	0	0	0	1	S	0-50	0-3	Auditory	
UB02	S1	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	moved during survey.
	S2	No	Townsend's Warbler	1	0	0	0	1	S	0-50	0-3	Auditory	
	S2	No	Yellow-rumped Warbler	1	0	0	0	1	S	0-50	0-3	Auditory	
	S2	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	
	S2	No	Dark-eyed Junco	1	0	0	0	1	S	50-100	0-3	Auditory	
	S3	No	Dark-eyed Junco	1	1	0	0	2	S	0-50	0-3	Aud + Vis	suspected pair
	S3	No	Golden-crowned Kinglet	1	0	0	0	1	S	0-50	0-3	Auditory	
	S3	No	Yellow-rumped Warbler	1	0	0	0	1	S	0-50	0-3	Auditory	
	S3	No	Yellow-rumped Warbler	1	0	0	0	1	S	0-50	3-5	Auditory	
	S4	No	Ruby-crowned Kinglet	1	0	0	0	1	S	50-100	3-5	Auditory	
	S5	No	Yellow-rumped Warbler	0	0	1	0	1	C	0-50	3-5	Auditory	
	S5	No	Yellow-rumped Warbler	1	0	0	0	1	S/Ch	50-100	0-3	Auditory	
	S5	No	Yellow-rumped Warbler	1	0	0	0	1	S/Ch	50-100	0-3	Auditory	
	S5	No	Purple Finch	1	0	0	0	1	S	50-100	0-3	Auditory	
UB03	S1	No	Chipping Sparrow	1	0	0	0	1	S	50-100	0-3	Auditory	
	S1	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	
	S2	No	Ruby-crowned Kinglet	1	0	0	0	1	S	50-100	0-3	Auditory	
	S2	No	Canada Jay	1	0	0	0	1	C	50-100	3-5	Auditory	
	S2	No	Ruby-crowned Kinglet	1	0	0	0	1	S	50-100	0-3	Auditory	
	S2	No	Canada Jay	1	0	0	0	1	C	50-100	3-5	Auditory	
	S3	No	Yellow-rumped Warbler	1	0	0	0	1	S	0-50	3-5	Auditory	counter singing other YRWA
	S3	No	Dark-eyed Junco	1	0	0	0	1	C	50-100	3-5	Auditory	
	S3	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	counter singing other YRWA
	S3	No	Canada Jay	1	0	0	0	1	C	50-100	3-5	Auditory	
	S4	No	Yellow-rumped Warbler	1	0	0	0	1	S	0-50	0-3	Auditory	Bird moved locations during survey.
	S4	No	Canada Jay	1	1	0	2	4	C	0-50	0-3	Aud + Vis	family of 4; begging behavior
	S5	No	Yellow-rumped Warbler	1	0	0	0	1	C	0-50	3-5	Auditory	moved within the plot
	S5	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	moved within the plot
UB04	S1	No	Dark-eyed Junco	1	0	0	0	1	S	50-100	0-3	Auditory	
	S1	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	
	S1	No	Canada Jay	0	0	1	0	1	C	50-100	3-5	Auditory	
	S3	No	Ruby-crowned Kinglet	1	0	0	0	1	S	50-100	3-5	Auditory	
	S4	No	American Three-toed Woodpecker	1	0	0	0	1	D	50-100	0-3	Auditory	
	S4	No	Dark-eyed Junco	1	0	0	0	1	S	50-100	3-5	Auditory	
	S5	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	3-5	Auditory	Counter singing other YRWA
	S5	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	Counter singing other YRWA
	S5	No	Orange-crowned Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	
UB05	S3	No	Canada Jay	1	0	0	0	1	C	0-50	0-3	Auditory	
	S3	No	Dark-eyed Junco	1	0	0	0	1	S			Auditory	before survey
	S4	No	Varied Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	
	S4	No	Canada Jay	1	0	0	0	1	C	50-100	0-3	Auditory	
	S5	No	Pacific Wren	1	0	0	0	1	S	50-100	3-5	Auditory	
	S5	No	Varied Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	
UB06	S1	No	Townsend's Solitaire	1	0	0	0	1	V/S	0-50	0-3	Aud + Vis	
	S1	No	American Robin	0	0	1	0	1	C	50-100	0-3	Auditory	
	S1	No	Golden-crowned Sparrow	1	0	0	0	1	S/V	0-50	0-3	Aud + Vis	
	S2	No	Yellow-rumped Warbler	1	0	0	0	1	V/S	0-50	0-3	Aud + Vis	Bird was flying through out the plot for the survey time.
	S2	No	Townsend's Solitaire	1	0	0	0	1		50-100	3-5		Same as S1
	S2	No	Golden-crowned Sparrow	0	0	0	0	0		0-50			Same GCSP as PCS1

Appendix V: Upland Bird Variable Radius Point Count Observation Data, 2022

Transect ID	Site ID	Incidental	Species Code	# Male	# Female	# Unknown	# Young	# Total	Behavior	Distance	Timing (0-3 /3-5min)	Obs Type	Comment
UB06 *(cont'd)*	S2	No	Fox Sparrow	1	0	0	0	1	V/S	50-100	0-3	Aud + Vis	
	S3	No	American Pipit	1	0	0	0	1	C	50-100	3-5	Aud + Vis	flyover
	S4	No	Townsend's Solitaire	1	0	0	0	1	V	0-50	3-5	Visual	flyover. Same as S1 and S2.
	S4	No	Varied Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	
	S4	No	Fox Sparrow	1	0	0	0	1	S	50-100	0-3	Auditory	
	S5	No	Fox Sparrow	1	0	0	0	1	S	50-100	3-5	Auditory	
	S5	No	Savannah Sparrow	1	0	0	0	1	S	50-100	3-5	Auditory	
UB07	S1	No	Lincoln Sparrow	1	0	0	0	1	S	0-50	3-5		
	S1	No	Wilson's Warbler	1	0	0	0	1	S	50-100	3-5	Auditory	
	S1	No	Savannah Sparrow	0	0	0	0	0	C	50-100	3-5	Auditory	
	S1	No	Yellow-rumped Warbler	0	0	0	0	0	S	50-100	0-3	Auditory	
	S1	No	Yellow-rumped Warbler	0	0	0	0	0	S	50-100	0-3	Auditory	
	S2	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	
	S4	No	Lincoln Sparrow	1	0	0	0	1	C	50-100	3-5	Auditory	
	S4	No	Yellow-rumped Warbler	1	0	0	0	1	C	50-100	0-3	Auditory	
	S4	No	American Robin	1	0	0	0	1	C	50-100	0-3	Auditory	
	S5	No	Lincoln Sparrow	1	0	0	0	1	C	0-50	0-3	Auditory	
	S5	No	American Robin	1	0	0	0	1	V	0-50	3-5	Visual	
	S5	No	Savannah Sparrow	1	0	0	0	1	S	50-100	0-3	Auditory	
	S5	No	Wilson's Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	
	S5	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	
	S5	No	Lincoln Sparrow	1	0	0	0	1	S	50-100	3-5	Auditory	Same bird as UB07S4
UB08	S1	No	Dark-eyed Junco	1	1	0	0	2	S/C	0-50	3-5	Aud + Vis	pair. Possible DEJU nest
	S1	No	Varied Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	
	S1	No	Olive-sided Flycatcher	1	0	0	0	1	S	50-100	0-3	Auditory	
	S2	No	American Robin	0	0	1	0	1	C	50-100	0-3	Auditory	
	S2	No	Townsend's Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	
	S2	No	Varied Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	
	S2	No	Canada Jay	0	0	1	0	1	C	50-100	0-3	Auditory	
	S2	No	Dark-eyed Junco	1	0	0	0	1	S	50-100	3-5	Auditory	
	S2	No	Cedar Waxwing	0	0	2	0	2					CEDW en route. 2 birds detected between plots 1 and 2.
	S3	No	Varied Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	
	S3	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	3-5	Auditory	
	S4	No	Yellow-rumped Warbler	0	0	1	0	1	C/V	0-50	0-3	Aud + Vis	
	S4	No	Varied Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	Counter singing other VATH
	S4	No	Varied Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	Counter singing other VATH
	S4	No	Pine Grosbeak	1	0	0	0	1	S/V	50-100	3-5	Aud + Vis	sitting at the top of the tree
	S5	No	Olive-sided Flycatcher	0	0	1	0	1	C	50-100	0-3	Auditory	
	S5	No	Yellow-rumped Warbler	0	0	1	0	1	C	0-50	0-3	Auditory	
	S5	No	Varied Thrush	1	0	0	0	1	S	50-100	3-5	Auditory	
UB09	S1	No	Swainson's Thrush	0	0	1	0	1	C	50-100	3-5	Auditory	
	S1	No	Pine Siskin	0	0	1	0	1	C	50-100	0-3	Auditory	flyover
	S2	No	Dusky Grouse	1	0	0	0	1	S	0-50	0-3	Auditory	2 hoots
	S3	No	Unidentified Bird	1	0	0	0	1	O	0-50	3-5	Auditory	Chip behavior
	S4	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	
	S4	No	Varied Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	
	S5	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	counter singing with YRWA out of the plot
	S5	No	Varied Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	
UB10	S2	No	American Three-toed Woodpecker	0	0	1	0	1	C/V	0-50	0-3	Aud + Vis	ATTW was heard feeding before survey.
	S3	No	Ruby-crowned Kinglet	1	0	0	0	1	S	50-100	0-3	Auditory	Note: Same incidental bird heard singing between S1 and S2.
	S4	No	Tree Swallow	1	0	1	0	2	C/O	50-100	0-3	Aud + Vis	TRES; feeding behavior; flyover.
	S5	No	Yellow-rumped Warbler	1	0	0	0	1	S	0-50	0-3	Auditory	
UB11	S1	No	Pine Siskin	1	0	0	0	1	S	50-100	3-5	Auditory	
	S1	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	Counter singing with YRWA out of plot
	S2	No	Canada Jay	1	0	0	0	1	C	50-100	0-3	Auditory	
	S2	No	Tree Swallow	0	0	1	0	1	C/V			Aud + Vis	TRES; flyover; after survey. MS: Changed to code for Tree Swallow.

Appendix V: Upland Bird Variable Radius Point Count Observation Data, 2022

Transect ID	Site ID	Incidental	Species Code	# Male	# Female	# Unknown	# Young	# Total	Behavior	Distance	Timing (0-3 /3-5min)	Obs Type	Comment
UB11 *(cont'd)*	S3	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	3-5	Auditory	
	S5	No	Canada Jay	1	0	0	0	1	C	0-50	3-5	Auditory	
	S5	No	Yellow-rumped Warbler	1	0	0	0	1	C/S	0-50	0-3	Auditory	
	S5	No	Chipping Sparrow	1	0	0	0	1	S	50-100	3-5	Auditory	
	S5	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	
UB12	S1	No	Canada Jay	1	0	0	0	1	C	50-100	0-3	Auditory	
	S1	No	Dark-eyed Junco	1	0	0	0	1	C	50-100	0-3	Auditory	
	S1	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	3-5	Auditory	
	S1	No	Dark-eyed Junco	1	0	0	0	1	S	50-100	3-5	Auditory	
	S2	No	Chipping Sparrow	0	0	1	0	1	C	0-50	3-5	Auditory	
	S2	No	Canada Jay	0	0	1	0	1	C	50-100	3-5	Auditory	
	S4	No	Red Crossbill	1	0	0	0	1	C	50-100	3-5	Auditory	flyover
	S4	No	Magnolia Warbler	1	0	0	0	1	S	50-100	3-5	Auditory	
	S5	No	Yellow-rumped Warbler	1	0	0	0	1	S	0-50	0-3	Auditory	
	S5	No	Swainson's Thrush	1	0	0	0	1	S	50-100	3-5	Auditory	
UB13	S1	No	Dark-eyed Junco	1	0	0	0	1	S	0-50	0-3	Auditory	
	S1	No	American Three-toed Woodpecker	1	0	0	0	1	C/V	0-50	0-3	Aud + Vis	Nest in dead At tree. Tree height: 20 m. Nest at 15 m. Tree DBH 18 cm.
	S1	No	Chipping Sparrow	1	0	0	0	1	S	50-100	0-3	Auditory	
	S2	No	Dark-eyed Junco	1	0	0	0	1	S	50-100	0-3	Auditory	
	S3	No	Dark-eyed Junco	1	0	0	0	1	S	0-50	0-3	Auditory	
	S3	No	American Robin	0	0	1	0	1	C	50-100	0-3	Auditory	
	S5	No	Pacific Wren	1	0	0	0	1	S	0-50	0-3	Auditory	
UB14	S1	No	Yellow-rumped Warbler	1	0	0	0	1	S	0-50	3-5	Auditory	
	S1	No	Hermit Thrush	1	0	0	0	1	S	50-100	3-5	Auditory	
	S1	No	Swainson's Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	
	S1	No	Dark-eyed Junco	1	0	0	0	1	S	50-100	0-3	Auditory	
	S1	No	Chipping Sparrow	1	0	0	0	1	S	50-100	0-3	Auditory	
	S1	No	Dark-eyed Junco	1	0	0	0	1	S	50-100	0-3	Auditory	
	S1	No	Chipping Sparrow	1	0	0	0	1	S	50-100	0-3	Auditory	
	S1	No	Ruby-crowned Kinglet	1	0	0	0	1	S	50-100	0-3	Auditory	
	S2	No	Dark-eyed Junco	1	0	0	0	1	S	0-50	0-3	Auditory	
	S2	No	Ruby-crowned Kinglet	1	0	0	0	1	S	50-100	0-3	Auditory	
	S4	No	Pine Siskin	0	0	1	0	1		0-50			flyover
	S4	No	Hermit Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	
	S5	No	Yellow-rumped Warbler	1	0	0	0	1	S	0-50	3-5	Auditory	
	S5	No	Hermit Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	
	S5	No	American Robin	1	0	0	0	1	S/V	50-100	0-3	Aud + Vis	
UB15	S1	No	American Robin	0	0	1	0	1	C	0-50	0-3	Auditory	
	S1	No	Red Crossbill	0	0	1	0	1	C	50-100	3-5	Auditory	flyover
	S1	No	Swainson's Thrush	1	0	0	0	1	S	50-100	0-3	Auditory	
	S2	No	Yellow-rumped Warbler	1	0	0	0	1	S/V	50-100	0-3	Aud + Vis	
	S2	No	Lincoln Sparrow	1	0	0	0	1	S	50-100	0-3	Auditory	close to cut block
	S3	No	Swainson's Thrush	0	0	1	0	1	C	0-50	3-5	Auditory	
	S3	No	Dark-eyed Junco	1	0	0	0	1	S	50-100	0-3	Auditory	
	S3	No	Canada Jay	0	0	1	0	1	C	50-100	3-5	Auditory	
	S3	No	Magnolia Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	Counter singing with bird outside the plot.
	S4	No	Magnolia Warbler	1	0	0	0	1		50-100			MAWA; same bird as S3 potentially.
	S4	No	Canada Jay	0	0	1	0	1	C	50-100	3-5	Auditory	
	S5	No	Townsend's Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	
	S5	No	Pacific Wren	1	0	0	0	1	S	50-100	0-3	Auditory	
UB09	S1	No	Yellow-rumped Warbler	1	0	0	0	1	S	50-100	0-3	Auditory	
UB15	S5	No	Unidentified Bird	0	0	1	0	1	C/V	0-50	0-3	Aud + Vis	Poor light for positive identification.

APPENDIX W SWALLOW AND SWIFT SURVEY SITE DATA, 2022

Appendix W: Swallow and Sift Survey Observation Data, 2022

Site ID	Species Name	Observation Type (Visual/Sign)	Number of Males	Number of Females	Number of Unknown Gender	Number of Young	Total	Behaviour	Signs	Habitat Type	Other Habitat Description	Comments
BW2	Barn Swallow	Both			1		1	NS,FO,CA		Other	Nests in roof of mine infrastructure	6 nests observed in rafters of b wing building in mine camp. Nests are close to connection to main hall. 2 additional nests found in same building. Likely old, unactive nests
	Tree Swallow	Both			1		1	CA,FO,NS		Other	Nesting in rafters of B wing building within mine site	Likely old, inactive nests
	Violet-green Swallow	Both			1		1	CA,FO,NS		Other	Nesting in rafters of B wing building on mine site	Likely old, inactive nests
BW3	Barn Swallow	Sign					0		Nest	Other	Nests inmine infrastructure roofs	Nests found in machine shop roof, may be inactive nests from previous years. Ask theresa/ken for picture
SW19	Tree Swallow	Both	1	1	0		2	CA,FO,RE		Conifer Forest		Tree swallows noted to be resting on cell tower. It is likely that tree swallows are nesting approximately 30 m up cell tower in horizontal gray tubes. One pair of coupled tree swallows.
	Violet-green Swallow	Both			2		2	CA,FO		Conifer Forest		Violet greens noted to be resting at top of cell tower. There is potential for nests near the top of the cell tower
SW2	Barn Swallow	Both		1	0		1	NF,NS,FO,CA		Other	Nests in roof of buildings of mine infrastructure	4 nests at apex of roof of building across road of main office (ATCO trailers). Nests aproximately 2 m in from entrance. Second nest in from door is active. Female currently sitting on nest (visual comfirmation)
	Tree Swallow	Visual			1		1	FO,RE		Other		Tree swallow found, there is a potential that the tree swallow found the other day as opposed to violet green
SW9	Barn Swallow	Visual					0	NF		Other	Nests found in rafters of buildings	3 nests found in geology building across from core shacks. Nests located in centre rafters approximately 1 m from entrance. All 3 nests determined to be not currently active

APPENDIX X SWALLOW AND SWIFT SURVEY OBSERVATION DATA, 2022

Appendix X: Swallow and Sift Survey Site Data, 2022

Site ID	Date	Observation Time	Zone	Easting	Northing	Observers
BBC1	2022-06-18	13:45	10U	375920	5893814	TW, KW
BW2	2022-06-17	13:02	10U	375901	5894056	TW, KW, NP
BW3	2022-06-17	13:16	10U	375912	5894018	TW, KW, NP
SW10	2022-06-18	13:52	10U	375290	5893191	TW, KW, NP, MS
SW11	2022-06-18	14:01	10U	375747	5893401	TW, KW
SW12	2022-06-19	11:09	10U	378579	5893452	TW, KW, NP, EH
SW13	2022-06-19	11:24	10U	378281	5893713	TW, KW, NP, EH
SW14	2022-06-19	11:35	10U	377596	5893433	TW, KW, NP, EH
Sw15	2022-06-19	11:48	10U	376499	5893470	TW, KW, NP, EH
SW16	2022-06-19	13:17	10U	368303	5895847	TW, KW, NP, EH
SW17	2022-06-19	13:37	10U	371471	5895874	TW, KW, NP
SW19	2022-06-19	13:53	10U	375659	5894145	TW, KW, NP
SW2	2022-06-17	13:24	10U	375801	5894001	TW, KW
SW20	2022-06-20	13:11	10U	376888	5894068	TW, KW, NP
SW22	2022-06-20	13:21	10U	376309	5894077	TW, KW, NP
SW24	2022-06-20	13:53	10U	373982	5894002	TW, KW, NP
SW4	2022-06-17	14:14	10U	374748	5895167	TW, KW, NP
SW5	2022-06-17	14:23	10U	373673	5895608	TW, KW
SW6	2022-06-17	14:32	10U	372398	5895973	TW, KW
SW7	2022-06-17	14:43	10U	371745	5896337	TW, KW
SW8	2022-06-18	13:28	10U	375952	5893862	TW, KW, NP, MS
SW9	2022-06-18	13:35	10U	375888	5893825	TW, KW, NP, MS

APPENDIX Y CLARK'S NUTCRACKER SURVEY TRANSECT DATA, 2022

Appendix Y: Clark's Nutcracker Survey Transect Data, 2022

Transect ID	Date	WBPI Habitat Area	Precipitation	Wind Beaufort	Cloud Cover (%)	Temp	Days Since Rain	Camera Deployed	ARU Deployed	Total Transect Time (min)	Total Transect Length (m)	Site Comments
CLNU T1	2022-08-29	Potential Regeneration	low	3	<50%	11	0	Yes	Yes	180	1000	Plot 10 may have duplicate points. Majority of the transect is in Balsam type with scattered PL& WBPI.
CLNU T2	2022-08-29	Regeneration	medium	3	<50%	12	0	Yes	Yes	NA	1000	Not much WBPI between plots, more WBPI in higher elevation. Caribou and moose signs between plots.
CLNU T3	2022-08-29	Potential Regeneration	low	2	>50%	15	0	Yes	Yes	120	1000	Red breasted nuthatch between plots 3 and 4. Rocky/wet ground from plots 9 to 11.
CLNU T4	2022-08-29	High Density	low	3	<50%	15	0	Yes	Yes	NA	1000	Potentially same CLNU in plots 1-6.
CLNU T5	2022-08-31	High Density	None	2	<50%	10	2	Yes	Yes	180	1000	TC started 20m SE of road. Golden/ruby crowned kinglets throughout transect. American robin by wetland. High moose/caribou tracks in area.

APPENDIX Z CLARK'S NUTCRACKER SURVEY OBSERVATION DATA, 2022

Appendix Z: Clark's Nutcracker Survey Observation Data, 2022

Transect ID	Plot Number	Site ID (Transect_Plot)	Zone	Easting	Northing	Slope (%)	Aspect	WBPI Size/Cover (A,B,C,D)				WBPI Conditions (1/2/3) and Code (R/B/O)	WBPI Cones	Tree Cache	Ground Cache	Nest	Tally of Between Plot Caching Features (m)										Clark's Nutcracker Detections
								A	B	C	D						0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	
CLNU T1	1	T1_1	10U	375547	5892530	-5	E		8		6		Yes	3	4												2
	2	T1_2	10U	375647	5892513	4	N							2	2		2						1	1			1-2
	3	T1_3	10U	375743	5892491	1	N		1	5			Yes	1	1			1					1				1-2
	4	T1_4	10U	375839	5892464	-9	NE																				0
	5	T1_5	10U	375943	5892447	-8	NE							2	1				1						1		1-2
	6	T1_6	10U	376039	5892429	-8	N,NE																				0
	7	T1_7	10U	376142	5892412	-6	N.NE								1				1								0
	8	T1_8	10U	376240	5892398	-9	NE,E							1	1												1
	9	T1_9	10U	376343	5892381	-2	NE,E								1						2	1					0
	10	T1_10	10U	376441	5892354	-4	NE,E							1	1												0
CLNU T2	1	T2_1	10U	371162	5892588	15	NW	11	10	13			Yes		5												0
	2	T2_2	10U	371239	5892523	34	N		5				Yes		1			1		1			2				0
	3	T2_3	10U	371316	5892466	-2	N							3				1	1	2	1						2-3
	4	T2_4	10U	371405	5892901	-8	NE	1						2	2		1			1							0
	5	T2_5	10U	371483	5892342	-2	S,SE							1				1	4			1					1
	6	T2_6	10U	371564	5892282	5	S													1			1				0
	7	T2_7	10U	371643	5892227	-3	S,SE							1							1	1					2
	8	T2_8	10U	371723	5892162	-1	S							1	1				2	1					1		3
	9	T2_9	10U	371801	5892097	2	S,SW												1	1		1					1-3
	10	T2_10	10U	371884	5892045	2	S							1	1									1			0
	11	T2_11	10U	317968	5891984	15	SW		2	1		3 R	Yes	1	1			2		2							0
CLNU T3	1	T3_1	10U	375984	5890136	-9	E							1	2												1-3
	2	T3_2	10U	376080	5890179	-12	SE																				0
	3	T3_3	10U	376158	5890235	-5	SE																				0
	4	T3_4	10U	376249	5890283	-9	SE								1												0
	5	T3_5	10U	376338	5890318	-7	SE															2	1				1-2
	6	T3_6	10U	376422	5890379	-7	E								1			1									0
	7	T3_7	10U	376572	5890422	-8	E								1												0
	8	T3_8	10U	376595	5890465	-6	E																				0
	9	T3_9	10U	376690	5890510		NE, E																				1-2
	10	T3_10	10U	376777	5890558	-5	E								2			1									0
	11	T3_11	10U	376870	5890613	-3	E																				0
CLNU T4	1	T4_1	10U	373325	5889906	-32	SE		5	7			Yes														4-5
	2	T4_2	10U	373423	5889879	-13	S,SE	1	1	2			Yes	1													1-3
	3	T4_3	10U	373527	5889890	-32	SE		3	12		2 R	Yes	1				2		1	2	1					2-4
	4	T4_4	10U	373620	5889922	-12	S,SE							2	1			2	2			1	1				0
	5	T4_5	10U	373695	5889985									1	2				1			1					1-3
	6	T4_6	10U	373774	5890048	-10	SE			7			Yes	1	2						1						1-3
	7	T4_7	10U	373839	5890119	-7	SE	4	6	3		2B	Yes	2	2					1							2-3
	8	T4_8	10U	373925	5890175	-9	SE	17	11	9		3 R	Yes		2			3									0
	9	T4_9	10U	374012	5890252	6	SE		2				No							1								0
	10	T4_10	10U	374094	5890306	12	SE			6		2 R	Yes							1	1						0
	11	T4_11	10U	374170	5890357	6	SE	5	1	5		2 R	Yes	1						1						1	0
CLNU T5	11	T1_11	10U	376538	5892337	10	N,NE								1												0
	1	T5_1	10U	374515	5891679	-3	N,NW															1					0
	2	T5_2	10U	374609	5891745	-4	N,NW							1													1-2
	3	T5_3	10U	374699	5891797	-4	N,NW											1				1	1				0
	4	T5_4	10U	374786	5891842	1	N,NW							2				2			3			1			0
	5	T5_5	10U	374872	5891888	-3	N,NW							1	1		2							2			1-2
	6	T5_6	10U	374965	5891935	-4	N,NW																				0
	7	T5_7	10U	375054	5891977	-2	N,NW																		1		1
	8	T5_8	10U	375140	5892031	-3	N,NW							1					1					1			0
	9	T5_9	10U	375230	5892081	-4	N,NW		1			2 R	No	1							2						0
	10	T5_10	10U	375316	5892125	-4	N,NW		1	3			Yes	2						2		2				1	1
	11	T5_11	10U	375414	5892159	-3	N,NW																				0

Appendix Z: Clark's Nutcracker Survey Observation Data, 2022

Transect ID	Plot Number	Site ID (Transect_Plot)	Zone	Easting	Northing	Slope (%)	Aspect	Call Play Back Competed	Call Play Back Results	Comment
CLNU T1	1	T1_1	10U	375547	5892530	-5	E	Yes	3/3	Category D=3 dead. Ground Cache = brush pile by plot
	2	T1_2	10U	375647	5892513	4	N	No	N/A	Tree Cache = dead heads. GC = old stump
	3	T1_3	10U	375743	5892491	1	N	Yes	2/3	both caches = wildlife tree for cache
	4	T1_4	10U	375839	5892464	-9	NE	No	N/A	
	5	T1_5	10U	375943	5892447	-8	NE	Yes	3/3	
	6	T1_6	10U	376039	5892429	-8	N,NE	No	N/A	
	7	T1_7	10U	376142	5892412	-6	N.NE	Yes	0/3	Ground Cache = windfall
	8	T1_8	10U	376240	5892398	-9	NE,E	No	N/A	Bl(PL) in transect features comments
	9	T1_9	10U	376343	5892381	-2	NE,E	Yes	0/3	
	10	T1_10	10U	376441	5892354	-4	NE,E	No	N/A	
CLNU T2	1	T2_1	10U	371162	5892588	15	NW	No	N/A	
	2	T2_2	10U	371239	5892523	34	N	No	N/A	B = Clumped together
	3	T2_3	10U	371316	5892466	-2	N	No	N/A	Tree Cache = two potential balsam trees
	4	T2_4	10U	371405	5892901	-8	NE	No	N/A	
	5	T2_5	10U	371483	5892342	-2	S,SE	Yes	1/3	
	6	T2_6	10U	371564	5892282	5	S	No	N/A	
	7	T2_7	10U	371643	5892227	-3	S,SE	Yes	1/3	
	8	T2_8	10U	371723	5892162	-1	S	No	N/A	
	9	T2_9	10U	371801	5892097	2	S,SW	Yes	2/3	
	10	T2_10	10U	371884	5892045	2	S	No	N/A	
	11	T2_11	10U	317968	5891984	15	SW	No	N/A	
CLNU T3	1	T3_1	10U	375984	5890136	-9	E	Yes	0/3	
	2	T3_2	10U	376080	5890179	-12	SE	No	N/A	
	3	T3_3	10U	376158	5890235	-5	SE	Yes	0/3	
	4	T3_4	10U	376249	5890283	-9	SE	No	N/A	
	5	T3_5	10U	376338	5890318	-7	SE	Yes	1/3	Wildlife tree potential
	6	T3_6	10U	376422	5890379	-7	E	No	N/A	
	7	T3_7	10U	376572	5890422	-8	E	Yes	0/3	
	8	T3_8	10U	376595	5890465	-6	E	No	N/A	
	9	T3_9	10U	376690	5890510		NE, E	Yes	0/3	
	10	T3_10	10U	376777	5890558	-5	E	No	N/A	Ground Caches = old stumps. 10-20 = WBPI
	11	T3_11	10U	376870	5890613	-3	E	Yes	0/3	
CLNU T4	1	T4_1	10U	373325	5889906	-32	SE	Yes	2/3	Cones seen on 1 tree
	2	T4_2	10U	373423	5889879	-13	S,SE	No	N/A	
	3	T4_3	10U	373527	5889890	-32	SE	Yes	3/3	rust on 1 tree
	4	T4_4	10U	373620	5889922	-12	S,SE	No	N/A	
	5	T4_5	10U	373695	5889985			Yes	1/3	
	6	T4_6	10U	373774	5890048	-10	SE	No	N/A	Category C = clumped together
	7	T4_7	10U	373839	5890119	-7	SE	Yes	1/3	
	8	T4_8	10U	373925	5890175	-9	SE	No	N/A	
	9	T4_9	10U	374012	5890252	6	SE	Yes	0/3	
	10	T4_10	10U	374094	5890306	12	SE	No	N/A	Category C = clumped together
	11	T4_11	10U	374170	5890357	6	SE	Yes	0/3	
CLNU T5	11	T1_11	10U	376538	5892337	10	N,NE	Yes	0/3	Ground Cache = Stump
	1	T5_1	10U	374515	5891679	-3	N,NW	Yes	0/3	
	2	T5_2	10U	374609	5891745	-4	N,NW	No	N/A	Balsam fir regen. Heard 1 CLNU between plots. Tree Cache= potential cache on BL fork.
	3	T5_3	10U	374699	5891797	-4	N,NW	Yes	0/3	Balsam Fir regen. Cache feature stumps
	4	T5_4	10U	374786	5891842	1	N,NW	No	N/A	More PL passed 50m. Tree Cache = Forks in PL. 40-50 = first WBPI.
	5	T5_5	10U	374872	5891888	-3	N,NW	Yes	1/3	more open, less crown cover passed 20m. Tree Cache = Fork in tree. Ground Cache = rocky ground. 0-10 = 2nd/3rd WBPI. 70-80 = WBPI
	6	T5_6	10U	374965	5891935	-4	N,NW	No	N/A	BC regen between plots. No potential cache features.
	7	T5_7	10U	375054	5891977	-2	N,NW	Yes	1/3	WBPI inside wetland. 80-90 = on dead tree.
	8	T5_8	10U	375140	5892031	-3	N,NW	No	N/A	Tree Cache = fork in tree. 20-30 = rock
	9	T5_9	10U	375230	5892081	-4	N,NW	Yes	2/3	Tree Cache = WBPI potential fectule
	10	T5_10	10U	375316	5892125	-4	N,NW	No	N/A	30-40 = dead BL. 50-60 = dead windfall/root. 90-100 = dead BL
	11	T5_11	10U	375414	5892159	-3	N,NW	Yes	0/3	

APPENDIX AA CLARK'S NUTCRACKER ARU AND CAMERA DATA, 2022

Appendix AA: Clark's Nutcracker ARU and Camera Data, 2022

Transect ID	Site	Zone	Easting	Northing	ARU Deployment Date	ARU Retrieval Date	Camera Deployment Date	Camera Retrieval Date	Deployment Notes	Camera Detections	ARU Detections
CLNU T1	T1_1	10U	375547	5892530	2022-07-11	2022-11-02	2022-08-29	2022-11-02		no detections	87
CLNU T2	T2_1	10U	371162	5892588	2022-07-11	2022-11-02	2022-08-29	2022-11-02		no detections	35
CLNU T3	T3_1	10U	375984	5890136	2022-07-08	2022-07-10	NA	NA	Settings error on ARU - no data. Camera failure - never turned on.	NA	NA
CLNU T4	T4_1	10U	373325	5889906	2022-08-30	2022-11-02	2022-08-29	2022-11-02		no detections	23
CLNU T5	T5_1	10U	374515	5891679	2022-08-30	2023-02-21	44815	2023-02-21	Error on first camera deployment in August. Camera start date at unit check 9/11/2022.	no detections	42

APPENDIX BB CLARK'S NUTCRACKER ARU DATA RESULTS, 2022

Appendix BB: Clark's Nutcracker ARU Data Results, 2022

Site	File Name	Date	Time	Cluster ID
T1	SMU2588B27_20220711_203700.wav	2022-07-11	20:37	cluster.018
	SMU2588B27_20220723_085300.wav	2022-07-23	8:56	cluster.208
	SMU2588B27_20220725_185600.wav	2022-07-25	18:56	cluster.184
	SMU2588B27_20220725_215600.wav	2022-07-25	21:56	cluster.208
	SMU2588B27_20220726_125700.wav	2022-07-26	13:00	cluster.275
	SMU2588B27_20220801_210700.wav	2022-08-01	21:08	cluster.196
	SMU2588B27_20220801_160700.wav	2022-08-01	16:08	cluster.275
	SMU2588B27_20220802_100800.wav	2022-08-02	10:10	cluster.018
	SMU2588B27_20220804_201200.wav	2022-08-04	20:13	cluster.196
	SMU2588B27_20220808_081800.wav	2022-08-08	8:19	cluster.018
	SMU2588B27_20220812_162500.wav	2022-08-12	16:27	cluster.183
	SMU2588B27_20220814_112800.wav	2022-08-14	11:30	cluster.183
	SMU2588B27_20220814_192800.wav	2022-08-14	19:32	cluster.201
	SMU2588B27_20220815_113000.wav	2022-08-15	11:32	cluster.190
	SMU2588B27_20220816_153200.wav	2022-08-16	15:36	cluster.183
	SMU2588B27_20220817_163300.wav	2022-08-17	16:33	cluster.183
	SMU2588B27_20220817_183300.wav	2022-08-17	18:34	cluster.186
	SMU2588B27_20220818_123500.wav	2022-08-18	12:39	cluster.018
	SMU2588B27_20220818_133500.wav	2022-08-18	13:36	cluster.018
	SMU2588B27_20220818_163500.wav	2022-08-18	16:36	cluster.183
	SMU2588B27_20220818_183500.wav	2022-08-18	18:39	cluster.187
	SMU2588B27_20220824_194600.wav	2022-08-24	19:50	cluster.196
	SMU2588B27_20220824_114600.wav	2022-08-24	11:49	cluster.197
	SMU2588B27_20220825_054700.wav	2022-08-25	5:50	cluster.240
	SMU2588B27_20220827_095100.wav	2022-08-27	9:53	cluster.183
	SMU2588B27_20220827_195100.wav	2022-08-27	19:51	cluster.201
	SMU2588B27_20220828_165200.wav	2022-08-28	16:53	cluster.196
	SMU2588B27_20220831_115800.wav	2022-08-31	11:58	cluster.183
	SMU2588B27_20220831_125800.wav	2022-08-31	13:01	cluster.196
	SMU2588B27_20220901_185900.wav	2022-09-01	19:02	cluster.186
	SMU2588B27_20220903_170300.wav	2022-09-03	17:05	cluster.202
	SMU2588B27_20220904_180400.wav	2022-09-04	18:06	cluster.200
	SMU2588B27_20220905_110600.wav	2022-09-05	11:10	cluster.183
	SMU2588B27_20220905_100600.wav	2022-09-05	10:08	cluster.188
	SMU2588B27_20220905_140600.wav	2022-09-05	14:06	cluster.188
	SMU2588B27_20220906_200800.wav	2022-09-06	20:10	cluster.185
	SMU2588B27_20220906_070800.wav	2022-09-06	7:10	cluster.190
	SMU2588B27_20220906_130800.wav	2022-09-06	13:10	cluster.198
	SMU2588B27_20220909_151300.wav	2022-09-09	15:17	cluster.197
	SMU2588B27_20220909_111300.wav	2022-09-09	11:13	cluster.197
	SMU2588B27_20220910_201500.wav	2022-09-10	20:16	cluster.196
	SMU2588B27_20220910_161500.wav	2022-09-10	16:16	cluster.196
	SMU2588B27_20220910_181500.wav	2022-09-10	18:16	cluster.196
	SMU2588B27_20220911_151600.wav	2022-09-11	15:17	cluster.188
	SMU2588B27_20220911_191600.wav	2022-09-11	19:17	cluster.190
	SMU2588B27_20220912_191800.wav	2022-09-12	19:20	cluster.196
	SMU2588B27_20220918_142800.wav	2022-09-18	14:29	cluster.197

Appendix BB: Clark's Nutcracker ARU Data Results, 2022

Site	File Name	Date	Time	Cluster ID
T1	SMU2588B27_20220921_173400.wav	2022-09-21	17:36	cluster.199
(cont'd)	SMU2588B27_20220922_133500.wav	2022-09-22	13:39	cluster.264
	SMU2588B27_20220926_174200.wav	2022-09-26	17:45	cluster.196
	SMU2588B27_20220927_134400.wav	2022-09-27	13:46	cluster.185
	SMU2588B27_20220927_064400.wav	2022-09-27	6:46	cluster.190
	SMU2588B27_20220927_084400.wav	2022-09-27	8:48	cluster.190
	SMU2588B27_20220928_174600.wav	2022-09-28	17:46	cluster.018
	SMU2588B27_20220928_134600.wav	2022-09-28	13:46	cluster.187
	SMU2588B27_20220928_124600.wav	2022-09-28	12:49	cluster.188
	SMU2588B27_20220928_094600.wav	2022-09-28	9:50	cluster.196
	SMU2588B27_20220930_064900.wav	2022-09-30	6:50	cluster.018
	SMU2588B27_20220930_134900.wav	2022-09-30	13:50	cluster.200
	SMU2588B27_20221001_185100.wav	2022-10-01	18:53	cluster.185
	SMU2588B27_20221002_145300.wav	2022-10-02	14:57	cluster.188
	SMU2588B27_20221002_165300.wav	2022-10-02	16:53	cluster.199
	SMU2588B27_20221002_135300.wav	2022-10-02	13:54	cluster.216
	SMU2588B27_20221004_185600.wav	2022-10-04	18:59	cluster.184
	SMU2588B27_20221005_125800.wav	2022-10-05	13:00	cluster.186
	SMU2588B27_20221006_190000.wav	2022-10-06	19:01	cluster.188
	SMU2588B27_20221007_150200.wav	2022-10-07	15:03	cluster.197
	SMU2588B27_20221008_150300.wav	2022-10-08	15:04	cluster.190
	SMU2588B27_20221009_120500.wav	2022-10-09	12:07	cluster.187
	SMU2588B27_20221009_150500.wav	2022-10-09	15:08	cluster.196
	SMU2588B27_20221009_080500.wav	2022-10-09	8:05	cluster.208
	SMU2588B27_20221014_101400.wav	2022-10-14	10:17	cluster.187
	SMU2588B27_20221014_161400.wav	2022-10-14	16:18	cluster.190
	SMU2588B27_20221015_161600.wav	2022-10-15	16:17	cluster.188
	SMU2588B27_20221018_182100.wav	2022-10-18	18:23	cluster.183
	SMU2588B27_20221018_172100.wav	2022-10-18	17:21	cluster.196
	SMU2588B27_20221020_122500.wav	2022-10-20	12:25	cluster.187
	SMU2588B27_20221022_132900.wav	2022-10-22	13:32	cluster.190
	SMU2588B27_20221022_162900.wav	2022-10-22	16:30	cluster.196
	SMU2588B27_20221025_173400.wav	2022-10-25	17:37	cluster.188
	SMU2588B27_20221027_083800.wav	2022-10-27	8:42	cluster.183
	SMU2588B27_20221029_144200.wav	2022-10-29	14:42	cluster.018
	SMU2588B27_20221031_134600.wav	2022-10-31	13:50	cluster.183
	SMU2588B27_20221031_124600.wav	2022-10-31	12:49	cluster.190
	SMU2588B27_20221101_124800.wav	2022-11-01	12:49	cluster.183
	SMU2588B27_20221101_084800.wav	2022-11-01	8:50	cluster.187
	SMU2588B27_20221101_114800.wav	2022-11-01	11:48	cluster.208
T2	SMU2670B26_20220720_124800.wav	2022-07-20	12:48	cluster.240
	SMU2670B26_20220727_185900.wav	2022-07-27	19:03	cluster.196
	SMU2670B26_20220727_045900.wav	2022-07-27	5:03	cluster.240
	SMU2670B26_20220810_182200.wav	2022-08-10	18:23	cluster.196
	SMU2670B26_20220811_202300.wav	2022-08-11	20:24	cluster.200
	SMU2670B26_20220814_202800.wav	2022-08-14	20:30	cluster.188
	SMU2670B26_20220814_192800.wav	2022-08-14	19:31	cluster.196

Appendix BB: Clark's Nutcracker ARU Data Results, 2022

Site	File Name	Date	Time	Cluster ID
T2	SMU2670B26_20220816_193200.wav	2022-08-16	19:36	cluster.184
(cont'd)	SMU2670B26_20220816_203200.wav	2022-08-16	20:35	cluster.190
	SMU2670B26_20220818_183500.wav	2022-08-18	18:38	cluster.200
	SMU2670B26_20220818_113500.wav	2022-08-18	11:36	cluster.208
	SMU2670B26_20220821_194000.wav	2022-08-21	19:42	cluster.203
	SMU2670B26_20220823_184400.wav	2022-08-23	18:47	cluster.196
	SMU2670B26_20220828_165200.wav	2022-08-28	16:53	cluster.190
	SMU2670B26_20220901_195900.wav	2022-09-01	20:01	cluster.018
	SMU2670B26_20220901_175900.wav	2022-09-01	18:00	cluster.185
	SMU2670B26_20220913_182000.wav	2022-09-13	18:23	cluster.196
	SMU2670B26_20220914_142200.wav	2022-09-14	14:22	cluster.196
	SMU2670B26_20220914_182200.wav	2022-09-14	18:26	cluster.203
	SMU2670B26_20220915_112300.wav	2022-09-15	11:23	cluster.187
	SMU2670B26_20220915_172300.wav	2022-09-15	17:23	cluster.196
	SMU2670B26_20220918_132800.wav	2022-09-18	13:28	cluster.205
	SMU2670B26_20220927_174400.wav	2022-09-27	17:44	cluster.198
	SMU2670B26_20220928_154600.wav	2022-09-28	15:48	cluster.202
	SMU2670B26_20220928_144600.wav	2022-09-28	14:46	cluster.205
	SMU2670B26_20221002_115300.wav	2022-10-02	11:55	cluster.201
	SMU2670B26_20221004_135600.wav	2022-10-04	13:56	cluster.199
	SMU2670B26_20221005_145800.wav	2022-10-05	15:02	cluster.188
	SMU2670B26_20221008_090300.wav	2022-10-08	9:07	cluster.187
	SMU2670B26_20221015_101600.wav	2022-10-15	10:20	cluster.187
	SMU2670B26_20221018_182100.wav	2022-10-18	18:22	cluster.190
	SMU2670B26_20221022_112900.wav	2022-10-22	11:29	cluster.188
	SMU2670B26_20221022_132900.wav	2022-10-22	13:33	cluster.196
	SMU2670B26_20221022_152900.wav	2022-10-22	15:31	cluster.196
	SMU2670B26_20221022_102900.wav	2022-10-22	10:30	cluster.292
T4	SMU2696B29_20220904_170400.wav	2022-09-04	17:04	cluster.183
	SMU2696B29_20220904_120400.wav	2022-09-04	12:06	cluster.183
	SMU2696B29_20220906_180800.wav	2022-09-06	18:08	cluster.187
	SMU2696B29_20220906_150800.wav	2022-09-06	15:10	cluster.196
	SMU2696B29_20220913_182000.wav	2022-09-13	18:23	cluster.187
	SMU2696B29_20220913_122000.wav	2022-09-13	12:22	cluster.188
	SMU2696B29_20220914_082200.wav	2022-09-14	8:22	cluster.208
	SMU2696B29_20220918_192800.wav	2022-09-18	19:28	cluster.190
	SMU2696B29_20220920_183200.wav	2022-09-20	18:35	cluster.196
	SMU2696B29_20220930_174900.wav	2022-09-30	17:49	cluster.197
	SMU2696B29_20221002_185300.wav	2022-10-02	18:55	cluster.186
	SMU2696B29_20221004_135600.wav	2022-10-04	14:00	cluster.198
	SMU2696B29_20221004_185600.wav	2022-10-04	18:58	cluster.205
	SMU2696B29_20221005_175800.wav	2022-10-05	18:02	cluster.018
	SMU2696B29_20221007_070200.wav	2022-10-07	7:05	cluster.190
	SMU2696B29_20221015_141600.wav	2022-10-15	14:20	cluster.196
	SMU2696B29_20221016_181800.wav	2022-10-16	18:21	cluster.196
	SMU2696B29_20221016_071800.wav	2022-10-16	7:20	cluster.196
	SMU2696B29_20221022_172900.wav	2022-10-22	17:29	cluster.183

Appendix BB: Clark's Nutcracker ARU Data Results, 2022

Site	File Name	Date	Time	Cluster ID
T4	SMU2696B29_20221022_162900.wav	2022-10-22	16:32	cluster.196
(cont'd)	SMU2696B29_20221022_152900.wav	2022-10-22	15:31	cluster.205
	SMU2696B29_20221025_143400.wav	2022-10-25	14:38	cluster.196
	SMU2696B29_20221102_085000.wav	2022-11-02	8:53	cluster.205
T5	SMU2550B28_20220831_175800.wav	2022-08-31	17:58	cluster.197
	SMU2550B28_20220901_055900.wav	2022-09-01	6:03	cluster.187
	SMU2550B28_20220905_060600.wav	2022-09-05	6:09	cluster.018
	SMU2550B28_20220909_091300.wav	2022-09-09	9:17	cluster.190
	SMU2550B28_20220909_181300.wav	2022-09-09	18:17	cluster.196
	SMU2550B28_20220910_171500.wav	2022-09-10	17:17	cluster.186
	SMU2550B28_20220914_072200.wav	2022-09-14	7:22	cluster.200
	SMU2550B28_20220914_062200.wav	2022-09-14	6:23	cluster.205
	SMU2550B28_20220916_172500.wav	2022-09-16	17:27	cluster.188
	SMU2550B28_20220918_072800.wav	2022-09-18	7:32	cluster.018
	SMU2550B28_20220921_193400.wav	2022-09-21	19:35	cluster.201
	SMU2550B28_20220923_113700.wav	2022-09-23	11:37	cluster.209
	SMU2550B28_20220927_164400.wav	2022-09-27	16:47	cluster.196
	SMU2550B28_20220928_104600.wav	2022-09-28	10:50	cluster.018
	SMU2550B28_20220928_184600.wav	2022-09-28	18:46	cluster.188
	SMU2550B28_20220928_114600.wav	2022-09-28	11:48	cluster.199
	SMU2550B28_20220929_164700.wav	2022-09-29	16:50	cluster.203
	SMU2550B28_20220929_124700.wav	2022-09-29	12:47	cluster.205
	SMU2550B28_20220930_074900.wav	2022-09-30	7:52	cluster.196
	SMU2550B28_20221002_165300.wav	2022-10-02	16:53	cluster.202
	SMU2550B28_20221005_145800.wav	2022-10-05	15:02	cluster.196
	SMU2550B28_20221005_065800.wav	2022-10-05	7:02	cluster.199
	SMU2550B28_20221005_115800.wav	2022-10-05	11:59	cluster.275
	SMU2550B28_20221006_190000.wav	2022-10-06	19:02	cluster.188
	SMU2550B28_20221008_070300.wav	2022-10-08	7:04	cluster.184
	SMU2550B28_20221008_180300.wav	2022-10-08	18:03	cluster.190
	SMU2550B28_20221012_181100.wav	2022-10-12	18:14	cluster.197
	SMU2550B28_20221012_071100.wav	2022-10-12	7:15	cluster.211
	SMU2550B28_20221013_091200.wav	2022-10-13	9:14	cluster.018
	SMU2550B28_20221017_162000.wav	2022-10-17	16:23	cluster.196
	SMU2550B28_20221019_092300.wav	2022-10-19	9:27	cluster.292
	SMU2550B28_20221023_153100.wav	2022-10-23	15:34	cluster.018
	SMU2550B28_20221023_173100.wav	2022-10-23	17:32	cluster.187
	SMU2550B28_20221027_173800.wav	2022-10-27	17:40	cluster.211
	SMU2550B28_20221031_174600.wav	2022-10-31	17:46	cluster.018
	SMU2550B28_20221112_160800.wav	2022-11-12	16:08	cluster.211
	SMU2550B28_20221116_091600.wav	2022-11-16	9:18	cluster.018
	SMU2550B28_20221224_150300.wav	2022-12-24	15:03	cluster.279
	SMU2550B28_20230201_103400.wav	2023-02-01	10:35	cluster.188
	SMU2550B28_20230211_181600.wav	2023-02-11	18:19	cluster.279
	SMU2550B28_20230213_131200.wav	2023-02-13	13:16	cluster.275
	SMU2550B28_20230214_181000.wav	2023-02-14	18:13	cluster.292

APPENDIX CC WESTERN TOAD BREEDING LOCATIONS

Appendix CC: Western Toad Breeding Locations

Site ID	Breeding Status	Amphibian Habitat Present	Species Observed	Easting	Northing
0	Possible	Yes	Western Toad	374283	5895048
1	Possible	Yes	Western Toad	374000	5895532
2	Possible	Yes	Western Toad	377691	5897205
3	Relocation Site Potential	Yes		395501	5921232
4	Confirmed	Yes	Western Toad	384389	5902764
5	Possible	Yes	Western Toad	383265	5908755
6	Relocation Site Potential	Yes		377282	5962224
7	Confirmed	Yes	Western Toad	376544	5898452
8	Confirmed	Yes	Western Toad	377004	5897827
9	Confirmed	Yes	Western Toad	373938	5895978
10	Confirmed	Yes	Western Toad	376988	5897779
11	Confirmed	Yes	Western Toad	376267	5898538
12	Confirmed	Yes	Western Toad	381110	5902331
13	Confirmed	Yes	Western Toad	385631	5903052
14	Confirmed	Yes	Western Toad	378763	5900598
15	Confirmed	Yes		375274	5904403
16	Confirmed	Yes	Western Toad, Columbia Spotted Frog	380076	5900338
17	No	Unknown		377769	5897974
18	Possible	Yes	Western Toad	375451	5898692
19	Possible	Yes	Western Toad	375561	5898983
20	No	Unknown		377384	5899024
21	No	No		375400	5898237
22	No	No		375347	5898234
23	No	No		375669	5898261
24	No	No		376137	5898669
25	No	No		377118	5900959
26	No	No		377858	5902196
27	No	No		375376	5896551
28	No	Unknown		373596	5899879
29	No	Unknown		372839	5897018
30	No	Unknown		378301	5895347
31	No	Unknown		379297	5896124
32	No	Unknown		376451	5898715
33	No	Unknown		375139	5898855
34	No	Unknown		378591	5897038
35	No	Unknown		378694	5906086
36	No	No		376335	5895957
37	No	No		374438	5894892
38	No	No		377467	5903530
39	No	No		373671	5894113
40	No	No		374658	5894100
41	No	No		370522	5896346
42	No	No		374116	5896135
43	No	No		375359	5894665
44	No	No		377217	5901989

Appendix CC: Western Toad Breeding Locations

Site ID	Breeding Status	Amphibian Habitat Present	Species Observed	Easting	Northing
45	No	No		369010	5895361
46	Confirmed	Yes	Columbia Spotted Frog, Wood Frog	375065	5893617
47	Confirmed	Yes	Columbia Spotted Frog, Wood Frog	375009	5893595
48	Confirmed	Yes	Columbia Spotted Frog, Wood Frog	374878	5893611
49	Confirmed	Yes	Columbia Spotted Frog, Wood Frog	374843	5893596
50	Confirmed	Yes	Columbia Spotted Frog, Wood Frog	374839	5893606
51	Confirmed	Yes	Columbia Spotted Frog, Wood Frog	374850	5893608
52	Relocation Site Potential	Yes		376233	5902762
53	Relocation Site Potential	Yes		381361	5901938
54	No			369149	5895469
55	Confirmed	Yes	Wood Frog	377409	5899801
56	Possible	Yes	Western Toad	379607	5899942
57	Confirmed	Yes	Columbia Spotted Frog, Wood Frog	375118	5893614
58	Possible	Yes	Western Toad	373710	5897982
59	Possible	Yes	Western Toad	374172	5896937
60	Possible	Yes	Western Toad	371718	5896389
61	Relocation Site Potential	Yes		382388	5900790
62	Relocation Site Potential	Yes		381674	5901036
63	Possible	Yes	Western Toad	373943	5897760
64	Possible	Yes	Western Toad	376438	5899896
65	Possible	Yes	Western Toad	384250	5902906
66	No	Unknown		372843	5897003
67	No	Unknown		373483	5894082
68	No	Unknown		373813	5894205
69	No	Unknown		373929	5894329
70	No	Unknown		378322	5897340
71	Possible	Unknown		378638	5897006
72	Confirmed	Yes	Western Toad	376518	5898497
73	No	Unknown		375264	5896481
74	Confirmed	Yes	Western Toad	371695	5894381
75	Confirmed	Yes	Western Toad, Columbia Spotted Frog	378681	5906096
76	Confirmed	Yes	Columbia Spotted Frog	377372	5899787
77	Confirmed	Yes	Wood Frog	375151	5898937
78	No	Unknown		373604	5899855
79	Possible	Yes		368965	5893571
80	Confirmed	Yes	Western Toad	370747	5893763
81	Confirmed	Yes	Columbia Spotted Frog	370926	5893994
82	Possible	Yes	-	371118	5894128
83	Confirmed	Yes	Western Toad, Columbia Spotted Frog	385660	5903192

Appendix CC: Western Toad Breeding Locations

Site ID	Breeding Status	Amphibian Habitat Present	Species Observed	Easting	Northing
84	Confirmed	Yes	Western Toad, Columbia Spotted Frog	378867	5900564
85	Confirmed	Yes	Western Toad	378420	5900601
86	No	Unknown		383731	5909201
87	Possible	Unknown		377917	5904536
88	Confirmed	Yes	Columbia Spotted Frog	375530	5903179
89	Confirmed	Yes	Columbia Spotted Frog	383639	5902471
90	Confirmed	Yes	Columbia Spotted Frog, Wood Frog	381101	5902284
91	Confirmed	Yes	Western Toad, Columbia Spotted Frog	378871	5901303
92	Confirmed	Yes	Western Toad, Columbia Spotted Frog	376965	5897817
93	No	Unknown		374346	5897662
94	No	Unknown		376437	5895797
95	No	Unknown		373778	5892962
96	No	Unknown		376783	5893860
97	Possible	Unknown		375860	5892348
98	No	Unknown		374677	5894099
99	No	Unknown		374920	5893106
100	Confirmed	Yes	Western Toad, Columbia Spotted Frog	374858	5893713
101	No	No		375365	5894665
102	No	Yes		376275	5893878
103	Possible	Yes		376901	5894150
104	Possible	Yes		380759	5979868
105	Possible	Yes		380465	5979756
106	Confirmed	Yes	Western Toad	381365	5968554
107	Possible	Yes		378485	5966384
108	Possible	Yes		378410	5955397

Appendix 6: Air Quality and Fugitive Dust Management Annual Report 2022

ARTEMIS GOLD INC

Blackwater Mine



Air Quality and Fugitive Dust Management Annual Report 2022

Blackwater Mine

Air Quality and Fugitive Dust Management Annual Report 2022

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Acronyms and Abbreviations

Aboriginal Groups or Indigenous Nations	Aboriginal Groups include: Lhoosk'uz Dené Nation, Ulkatcho First Nation, Nadleh Whut'en First Nation, Stellat'en First Nation, Saik'uz First Nation, and Nazko First Nation (as defined in the Project's Environmental Assessment Certificate #M19-01)
AAQO	Ambient Air Quality Objective
AQDMP	Air Quality and Fugitive Dust Management Plan
AQO	Air Quality Objective
Artemis	Artemis Gold Inc.
BC	British Columbia
Blackwater	Blackwater Gold Project
BW Gold or Proponent	BW Gold LTD.
CAAQs	Canadian Ambient Air Quality Standards
CCME	Canadian Council of Ministers of the Environment
CEA Agency	Canadian Environmental Assessment Agency
CO	Carbon monoxide
CFMP	Country Foods Monitoring Plan
DS	Decision Statement
EAC or Certificate	Environmental Assessment Certificate
EC	Environment Canada
ECCC	Environment and Climate Change Canada
ECD	Environmental Control Dam
EM	Environmental Manager
EMC	Environmental Monitoring Committee
EMLI	Ministry of Energy, Mines and Low Carbon Innovation
EMP	Environmental Management Plan
EMPR	Ministry of Energy, Mines and Petroleum Resources
ENV	Ministry of Environment and Climate Change Strategy
EPCM	Engineering, Procurement and Construction Management
FLNRORD	Ministry of Forests, Lands, Natural Resource Operations and Rural Development
FSR	Forest Service Road
ha	Hectares

HHRA	Human Health Risk Assessment
HQ	Hazard quotient
HVAC	Heating, ventilation and air conditioning
Indigenous groups or Aboriginal Peoples	Lhoosk'uz Dené Nation, Ulkatcho First Nation, Nadleh Whut'en First Nation, Saik'uz First Nation, Stellat'en First Nation, Nazko First Nation, Skin Tyee Nation, Tŝilhqot'in Nation, Métis Nation British Columbia, and Nee-Tahi-Buhn Band (as defined in the Project's federal Decision Statement)
km	Kilometre
KP	Knight Piésold Ltd.
LGO	Low grade ore
MAR	Mine Access Road
MOE	Ministry of Environment
MOH	Ministry of Health
MP	Management plan
Mtpa	Million tonnes per annum
New Gold	New Gold Inc.
NOx	Nitrogen oxides
OVB	Overburden
PASS	Passive Air Sampling System
PM	Particulate matter
POC	Parameter of concern
POPC	Parameter of potential concern
Project	Blackwater Gold Project
QA/QC	Quality control/quality assurance
SO2	Sulphur dioxide
SOP	Standard operating procedure
t	Tonne
Tatelkus Lake 28	Tatelkus Lake Indian Reserve 28
TSF	Tailings Storage Facility
µm	Microns
WMMP	Wildlife Management and Monitoring Plan

1.0 Purpose and Scope

The purpose of the 2022 Annual Monitoring Report for Air Quality and Fugitive Dust Management is to identify measures taken to minimize the effects of the Project's air emissions on human health and the natural environment. The scope of work conducted was in accordance with the Air Quality and Fugitive Dust Management Plan (AQDMP) provided in Appendix A. The AQDMP identifies the Project's fugitive dust-emitting sources and mitigation and contingency measures in the event that primary control measures are not effectively controlling dust emissions.

The intent of this report is to comply with the management plan's annual reporting requirements.

2.0 Background

Pursuant to Part 2, Section 14 of the Environmental Management Act, BW Gold is seeking an authorization for air discharges during the Construction and Operation phases as follows:

- Discharge of fugitive dust generated at the mine site during the Construction and Operations phases; and
- Discharge of air emissions from the processing plant and assay lab during the Operations phase.

The AQDMP was submitted with Blackwater's Joint Application for Mines Act/Environmental Management Act permits (Application). It addresses the requirements of EAC #M19-01 Condition 20 and federal Decision Statement (DS) Conditions 6.1, 6.3, 6.12 and 6.15. The AQDMP also includes the information requested in Developing a Fugitive Dust Management Plan for Industrial Projects (Guidance; EMPR & ENV 2018).

2.1 Existing Permits

BW Gold has a permitted diesel-fired putrescible waste incinerator (Environmental Management Act Authorization #106530, the Authorization), which is located near the exploration camp. The Authorization allows a maximum discharge rate of 110 m^3/minute and maximum waste feed of 1.1 tonnes/day. Authorized waste for incineration includes putrescible camp waste, paper, cardboard, and lumber scraps that cannot be recycled. Condition 2.1.3 of the Authorization requires that every effort be made to minimize incineration of plastics.

BW Gold did not use the incinerator onsite in 2022. If operational conditions change such that an ash landfill is required, a landfill will be located, permitted, and constructed. Any excess waste above and beyond what the permitted incinerator can process will be disposed of in an alternate manner (i.e., taken off-site for disposal). As the site develops and head count increases, consideration will be given to expanding site incineration capacity if the waste generated exceeds the permitted capacity of the existing incinerator.

2.2 Exclusions

Consistent with the Guidance (EMPR & ENV 2018), the AQDMP does not address occupational health and safety requirements pertaining to workplace exposures to dust. Worker health and safety at mine sites is regulated by the Health, Safety and Reclamation Code for Mines in British Columbia (EMLI 2021). The Project's Occupational Health and Safety Program is discussed in Chapter 8 of the Application (Blackwater Project Joint Application for a Mines Act and Environmental Management Act Permits).

2.3 Related Documents

Environmental Assessment Certificate Condition 20 requires the AQDMP to indicate how the plan informs the Country Foods Monitoring Plan (CFMP) and the Wildlife Mitigation and Monitoring Plan (WMMP). Fugitive dust deposition monitoring is not recommended by the Ministry of Environment and Climate Change Strategy (ENV) for the purposes of wildlife and human health protection (ENV 2020) and is not included in the AQDMP. However, as required by EAC Condition 41, analysis of dust for metal concentrations was monitored for the CFMP and data collected can be used to inform the WMMP.

Monitoring of trace element (metals) uptake in vegetation and soils is considered in the Reclamation and Closure Plan (Chapter 4) and the CFMP. Plant tissue can be affected by the deposition of dust (particulate matter) containing metals generated by Project activities. Plants can also accumulate metals from the soil through uptake of metals through the root. Monitoring under the CFMP will determine whether concentrations of metals have changed in soil or in vegetation tissue because of Project activities. The results of trace metals monitoring and potential implications for wildlife based on results from monitoring under the CFMP will be addressed in the WMMP (Appendix 9-H of the Application).

Results of the AQDMP for monitoring of particulate matter (Section 6.4.3) and nitrogen dioxide and sulfur dioxide (Section 6.4.4) will inform the CFMP, as this monitoring is required by EAC Condition 41 for the CFMP. As such, results of the CFMP Dustfall monitoring (Section 3.2, CFMP) will inform this Air Quality and Dust Management report.

3.0 Facility Description and Setting

3.1 Physical Location and Access

The Project is an open pit gold and silver mine located approximately 112 kilometres (km) southwest of Vanderhoof and 160 km southwest of Prince George, BC. The Project falls within NTS map sheet 93F/02, centred at 5893000 N and 375400 E (UTM Zone 10 NAD83). The mine site is centred at 53°11'22.872" N and 124°52'0.437" W. The Project is presently accessed via the Kluskus Forest Service Road (FSR), the Kluskus-Ootsa FSR and an exploration access road, which connects to the Kluskus-Ootsa FSR at km 148. A new, approximately 13.8 km road (Mine Access Road; MAR) will be built to replace the existing exploration access road, which will be decommissioned. The new planned access is at km 124.5.

Figure 3.1-1 and Figure 3.1-2 identifies the Project location and the access route from Vanderhoof in relation to nearby communities.

The Blackwater mine site is located within the traditional territories of Lhoosk'uz Dené Nation (LDN), Ulkatcho First Nation (UFN), Skin Tyee Nation and Tsilhqot'in Nation. The Kluskus and Kluskus-Ootsa FSRs and Project transmission line cross the traditional territories of Nadleh Whut'en First Nation (NWFN), Saik'uz First Nation (SFN), and Stellat'en First Nation (StFN; collectively, the Carrier Sekani First Nations) as well as the traditional territories of the Nazko First Nation (NFN), Nee Tahi Buhn Band, Cheslatta Carrier Nation and Yekooche First Nation (BC EAO 2019a, 2019b).

BW Gold holds a 100% recorded interest in 328 mineral claims covering an area of 148,688 hectares (ha) distributed among the Blackwater, Capoose, Auro, Key, Parlane, and RJK claim blocks (Artemis 2020). The Blackwater mine site is located within the Blackwater claim block (Figure 3.1-2).

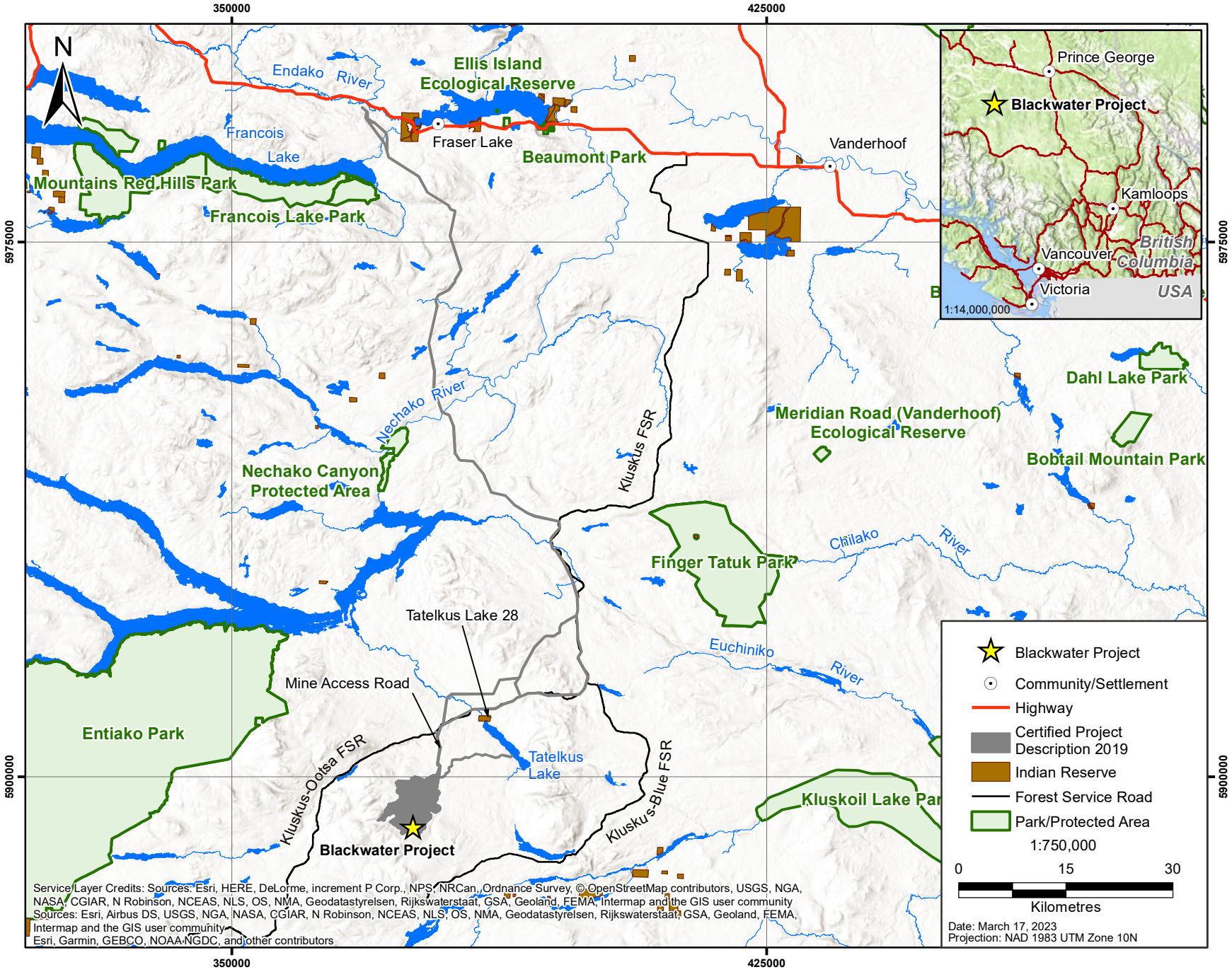


Figure 3.1-1: Blackwater Project Location

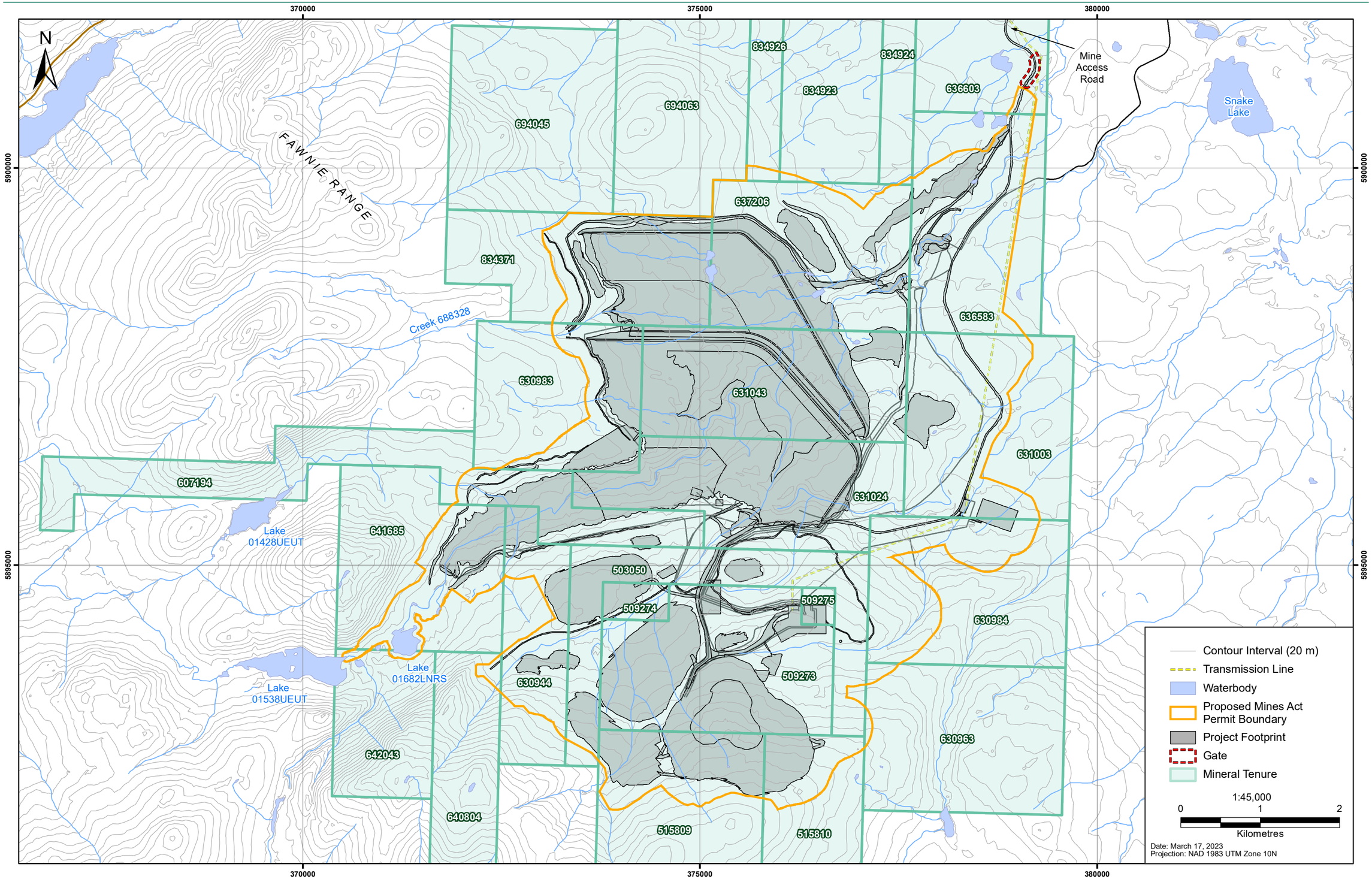
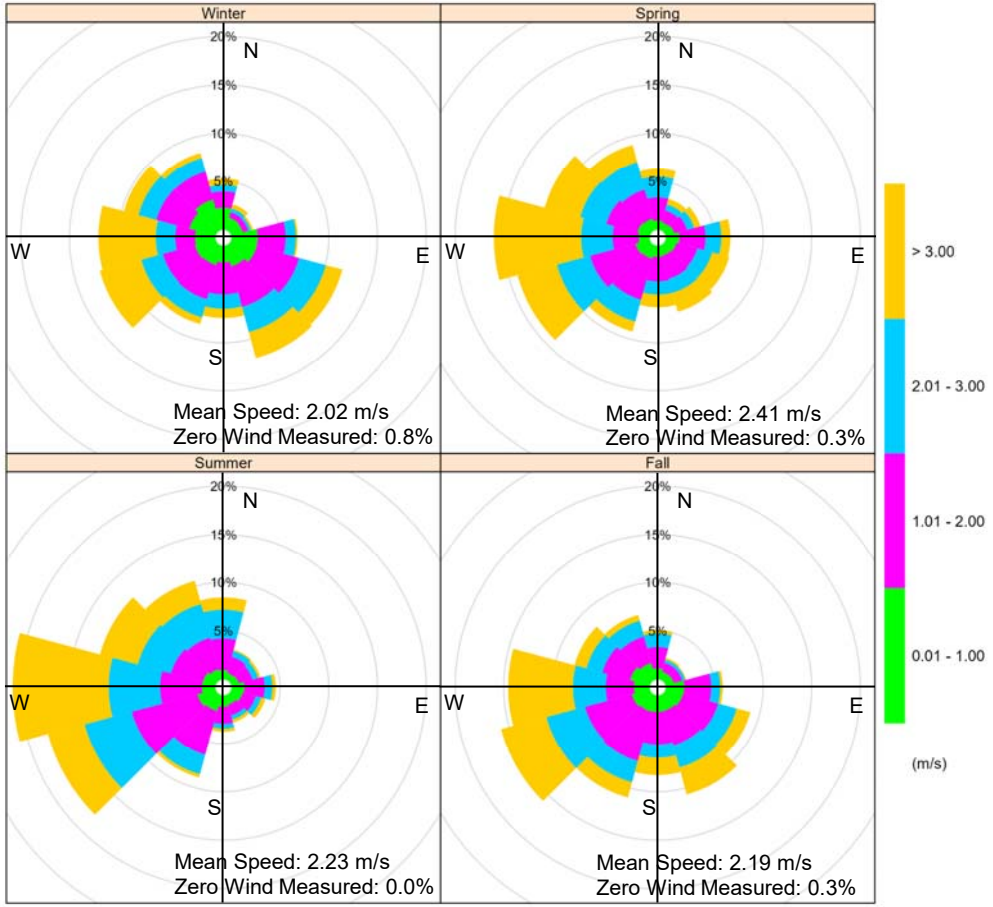


Figure 3.1-2: Blackwater Mineral Tenures within Proposed Mines Act Permit Boundary



NOTE:
1. WIND DIRECTIONS DIVIDED INTO 30° SEGMENTS

REV	DATE	DESCRIPTION	PREP'D	RVW'D
1	13MAR'23	ISSUED WITH TRANSMITTAL	BTN	MJB

BW GOLD INC.

BLACKWATER GOLD PROJECT

BLACKWATER LOW CLIMATOLOGY STATION WIND ROSE

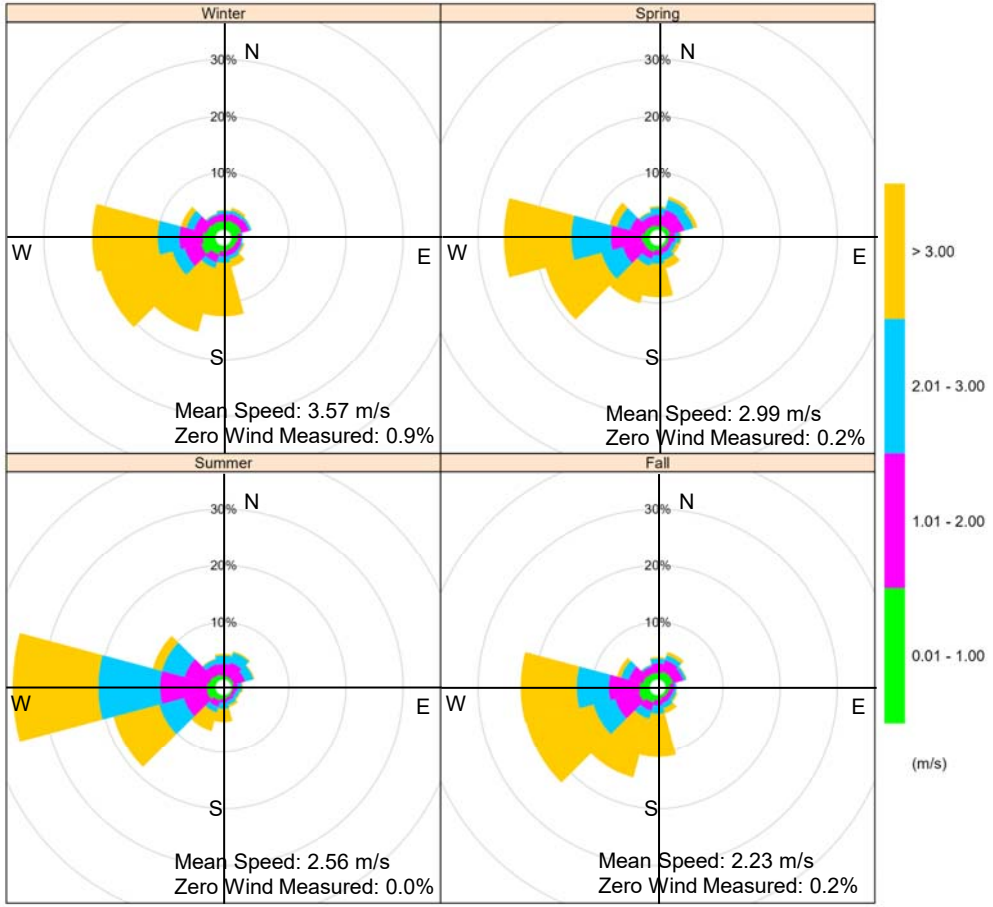
Knight Piésold CONSULTING

P/A NO. VA101-457/37

REF. NO. VA23-00397

FIGURE 3.2-1

REV 1



NOTE:
1. WIND DIRECTIONS DIVIDED INTO 30° SEGMENTS

REV	DATE	DESCRIPTION	PREP'D	RVW'D
1	13MAR'23	ISSUED WITH TRANSMITTAL	BTN	MJB

BW GOLD INC.

BLACKWATER GOLD PROJECT

BLACKWATER HIGH CLIMATOLOGY STATION WIND ROSE

Knight Piésold CONSULTING

P/A NO. VA101-457/37

REF. NO. VA23-00397

FIGURE 3.2-2

REV 1

3.2 Environmental Setting

The Project is located on the Nechako Plateau, a region of flat to gently rolling terrain on the northern slope of Mount Davidson. The mean annual wind speed at the Blackwater low elevation meteorological station (Blackwater Low) is approximately 2.2 m/s (7.9 km/h), with the wind direction being predominantly from the west and southwest. Strong southeast winds were also evident in the fall and winter at the Blackwater Low station (Figure 3.2-1). At the Blackwater high elevation station (Blackwater High) the wind direction is predominately from the west with strong southwest gusts during the fall and winter (Figure 3.2-2). The mean annual wind speed at the Blackwater High station is approximately 2.8 m/s (10.1 km/h).

3.3 Facility and Process Description

Major mine components will include a tailings storage facility (TSF), ore processing facilities, waste rock, overburden and soil stockpiles, borrow areas and quarries, water management infrastructure, water treatment plants, accommodation camps and ancillary facilities. The gold and silver will be recovered into a gold-silver doré product and shipped by air and/or transported by road. Electrical power will be supplied by a new approximately 135 km, 230 kilovolt (kV) overland transmission line that will connect to the BC Hydro grid at the Glenannan substation located near the Endako mine, 65 km west of Vanderhoof.

For more comprehensive review of the proposed mine site operation and infrastructure, refer to the AQDMP provided in Appendix A, Section 5.3.

4.0 Identification of Potential Air Emission Sources

Fugitive dust is the primary source of air emissions. Potential dust sources include material handling/ re-handling, construction and use of unpaved roads, blasting, compaction, drilling, grading, material (including ore) loading and unloading, and ore processing. Erodible surface areas such as stockpiles and the TSF beach) are also sources of fugitive dust.

In 2022 the following activities were conducted at the mine site that may have resulted in emitting fugitive dust.

- Land clearing and earthworks for the construction camp and plant site.
- Construction and use of unpaved access and mine roads.
- Material handling/re-handling at aggregate and topsoil stockpiles.
- Parking lot and road grading.

Table 4.0-1 provides further detail on dust emissions by Project component.

Table 4.0-2 identifies current emission sources and predicted emissions of total suspended particulate (TSP), particulate matter less than 10 µm (microns) in diameter (PM_{10}), particulate matter less than 2.5 µm in diameter ($PM_{2.5}$), carbon monoxide (CO), nitrogen oxides (NOx); and sulphur dioxide (SO_2).

Non-dust air emission sources include mine fleet exhaust (multiple), backup diesel generators (multiple), NO_x and SO_2 from blasting and the existing diesel-fired putrescible waste incinerator.

Once construction starts and the mine is operating, more activities will be present that could potentially result in fugitive dust. The AQDMP further discusses the activities resulting in fugitive dust by Project Phase and Project Components (Section 6.0, Appendix A).

Table 4.0-1: Fugitive Dust Emission Sources by Project Component

Component	Potential Source	Dust-generating Material	Generating Conditions
Topsoil stockpiles	Wind erosion, material handling, vehicle traffic	Topsoil	Wind, dry, hot days, or extremely cold weather
Service roads	Vehicles traffic, grading	Aggregate	Any conditions
Mine access road	Vehicle traffic, grading	Aggregate	Wind, dry, hot days, or extremely cold weather

Table 4.0-2: Current Emission Sources and Predicted Emissions

Emission Source	Maximum Emissions (tonnes/day)					
	TSP	PM_{10}	$PM_{2.5}$	SO_2	NO_x	CO
Material Handling	4.40	1.63	0.34	-	-	-
Unpaved Road (MAR)	0.57	0.14	0.014	1.1E-04	0.018	0.0056
Dump/Storage Areas	6.02	3.01	0.45	-	-	-
Incinerator	0.041	0.041	0.038	0.0022	0.0054	0.065

5.0 Regulatory Objectives and Standards

The Canadian Environmental Protection Act, 1999 establishes National Ambient Air Quality Objectives (NAAQOs) and Canadian Ambient Air Quality Standards (CAAQS) to protect human health and the environment. BC has established Ambient Air Quality Objectives (AAQOs) pursuant to the Environmental Management Act. Federal and BC air quality objectives are provided in Table 5.0-1 and are non-legally binding limits. As even low levels of air pollution can affect some individuals, air quality objectives should not be viewed as levels that can be ‘polluted up to’, but levels to stay well below.

Table 5.0-1: Federal and BC Ambient Air Quality Objectives

Contaminants	Averaging Period	Objectives / Standards (µg/m^3)				
		Federal [a,b,c,d]			British Columbia [e]	
		Maximum Desirable	Maximum Acceptable	Maximum Tolerable	BCAAQO [f]	CAAQS [g]
TSP	24-hour	-	120	400	120	
	Annual	60	70	-	60 [h]	
PM_{10}	24-Hour	-			50	
$PM_{2.5}$	24-Hour	27 to 28 [i]			25 [j]	28 [k]
	Annual	8.8 to 10 [l]			8 [m]	10 [n]
CO	1-hour	15,000	35,000	-	14,300	
	8-hour	6,000	15,000	20,000	5,500	
NO_2	1-hour	79 to 113 [o]			188 [p]	113 [q]
	Annual	23 to 32 [r]			60 [s]	32
SO_2	1-hour	170 to 183 [t]			196 [u]	183 [v]
	Annual	10 to 13 [w]			13 [x]	

Sources: [a] CCME 1999, [b] Government of Canada 2013, [c] Government of Canada 2017a, [d] Government of Canada 2017b, and [e] ENV 2020.

Notes:

µg/m^3 = micrograms per cubic metre; mg/dm^2/d = milligrams per square decimetre per day; TSP = total suspended particulate; PM_{10} = Particulate matter less than 10 µm (microns) in diameter; $PM_{2.5}$ = Particulate matter less than 2.5 µm (microns) in diameter; CO = carbon monoxide; NO_2 = nitrogen dioxide; SO_2 = sulphur dioxide

"-" signifies no air quality objective is available.

[f0] BC Ambient Air Quality Objectives.

[g] Canadian Ambient Air Quality Standards.

[h] Based on geometric mean.

[i] CAAQS is 28 µg/m^3 in 2015 and 27 µg/m^3 in 2020 (CCME 1999); compliance based on 98th percentile value, averaged over three consecutive years.

[j] Achieved based on annual 98th percentile of daily average, over one year.

[k] Achieved based on 98th percentile of daily average, averaged over three consecutive years.

[l] CAAQS is 10 µg/m^3 in 2015 and 8.8 µg/m^3 in 2020 (CCME 1999); compliance based on the average over three consecutive years.

[m] Achievement based on annual average, over on year. There is a planning goal of 6 µg/m^3.

[n] Achievement based on annual average, averaged over three consecutive years.

[o] CAAQS is 113 µg/m^3 from December 2017 through December 2024 and 79 µg/m^3 as of January 2025 (Government of Canada 2017a)' compliance based on a three-year average of the annual 98th percentile of the daily 1-hour maximum concentration

(D1HM).

[p] Interim provincial AAQO, currently under review. Achievement based on annual 98th percentile of D1HM, over one- year.

[q] Achievement based on annual 98th percentile of D1HM, averaged over three consecutive years.

[r] CAAQS is 32 µg/m3 from December 2017 through December 2024 and 23 µg/m3 as of January 2025 (Government of Canada 2017a); compliance based on a one-calendar-year average of all 1-hour average concentrations.

[s] Interim provincial AQO, currently under review.

[t] CAAQS is 183 µg/m3 from October 2017 through December 2024 and 170 µg/m3 as of January 2025 (Government of Canada 2017b); compliance based on a three-year average of the annual 99th percentile of the daily-maximum 1-hour average concentrations.

[u] Achievement based on annual 97th percentile of D1HM averaged over 2015-2017, annual 97.5th percentile of D1HM averaged over 2016-2018 and annual 98th percentile of D1HM averaged over 2017-2019, with one allowable excursion above 75ppb to a maximum of 85 ppb over a three-year period prior to 2020. Superseded by CAAQS level and metric January 1, 2020.

[v] Achievement based on annual 99th percentile of D1HM, averaged over three consecutive years, effective January 1, 2020. Used to inform new air management decisions beginning January 1, 2017 and all air management decisions beginning January 1, 2020.

[w] CAAQS is 13 µg/m3 from October 2017 through December 2024 and 10 µg/m3 as of January 2025 (Government of Canada 2017b); compliance based on a one-calendar-year average of all the 1-hour average concentrations.

[x] Used to inform new air management decisions beginning January 2017 and all air management decisions beginning January 1, 2020.

Particulate matter ($PM_{2.5}$ and PM_{10}) are the main parameters of concern for mining operations as they relate to human health. For the Project's human health risk assessment (HHRA), emissions of nitrogen oxides, SO_2, CO and PM ($PM_{2.5}$ and PM_{10}) were modelled to estimate concentrations at each human receptor location (including full-time residents, temporary land users and off-duty workers) for comparison with BC objectives (ERM 2021; Appendix 6-A of the Application). The HHRA considered estimated metal concentrations in dust that is predicted to be deposited at soils and vegetation sampling locations.

Figure 5.0-1 identifies sensitive receptors in relation to the Project. The closest on-site receptor is the operations camp which will house off-duty workers. The closest off-site receptor is Tatelkus Lake Indian Reserve 28 (Tatelkus Lake 28), located approximately 5.8 km northeast of the mine site.

Air dispersion modelling was conducted to predict concentrations of parameters of concern for both off-site human receptor locations and operation camp, refer to AQDMP, Appendix A. The baseline on-site concentrations were used for comparison against the particulate matter results.

Prediction of 24hour ground level $PM_{2.5}$ and PM_{10} concentrations can be found in the HHRA.

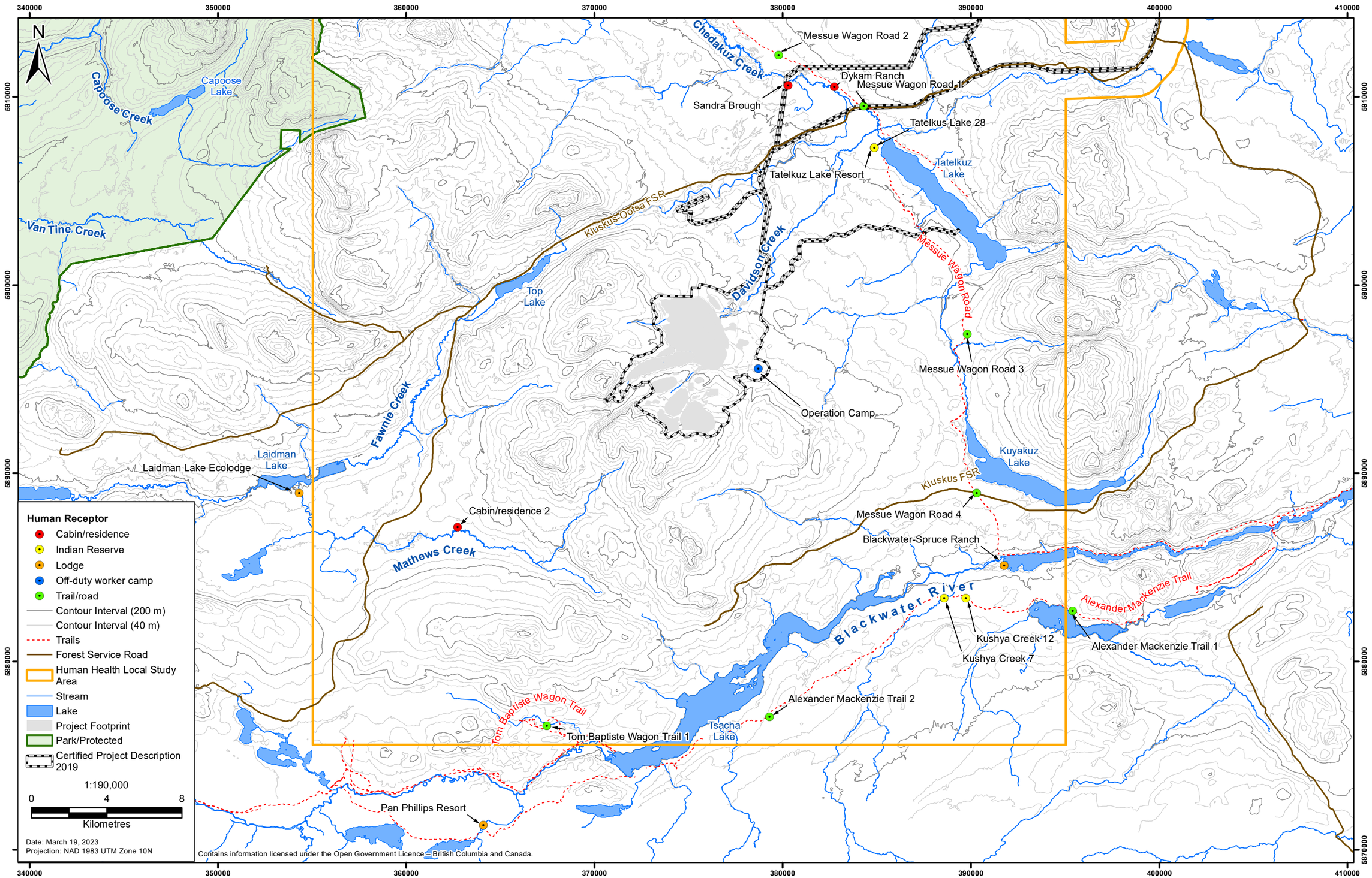


Figure 5.0-1: Air Quality Human Receptors

6.0 Implementation

The following sections present the mitigation measures, training, and monitoring that was implemented in 2022 to manage fugitive dust and to help assess if mitigation measures are working.

6.1 Training and Awareness

As part of the environmental on-boarding training session and Site Orientation, employees and contractors receive training in fugitive dust management and air quality awareness upon their arrival on site. The purpose of this training is to provide all site personnel with a basic level of environmental awareness and an understanding of their obligations regarding compliance with regulatory requirements, commitments, and best practices. Targeted training related to dust management will be provided to individuals and/or groups of workers assuming a specific authority or responsibility related to air quality.

BW Gold will regularly review and update the training and awareness plan based on changes in training needs and regulatory requirements.

6.2 On-site Partisol Training

In September 2022, Stantec provided training to three Environmental Department employees from BW Gold, on the implementation of the Thermo Scientific Partisol-FRM Model 2025i-D PM sampler (Partisol) and particulate matter sampling. The training was completed over a two-day period and highlighted the following:

- Reviewed operator's manual and standard operating procedure;
- Reviewed Partisol components and its mechanisms;
- Hands on assembly of the Partisol sampler;
- Sample duration and frequency review;
- Conducting air flow calibrations;
- Calibration requirements and frequency;
- Proper installation of sampling cassettes;
- Maintenance and cleaning requirements;
- How to complete the laboratory chain of custody; and
- Identified temporary designated location to set up Partisol sampler.

6.3 Mitigation Measures

Site-specific mitigation measures, including best management practices, were applied to all dust sources as listed in Table 6.3-1 which is condensed to show only activities that occurred in 2022. For a full list of emission sources please refer to the AQDMP, Section 8.2. In the event that measures are ineffective, contingency measures are also proposed, where relevant.

Table 6.3-1: Air Quality Mitigation Measures, Best Management Practices, and Contingency

Emisssion Source	Best Management and Mitigation Measures
Topsoil Stockpiles	• When unloading material, the piles should form low piles that extend horizontally. • Seed stockpiles to reduce erosion and establishment of invasive species.
MAR	• Speed limits will be established based on road design class, with the maximum speed limit of 50 km/hr on all Project roads. • Reduce speed limits on Project-owned roads if weather conditions cause fugitive dust emissions and dust cannot be controlled by watering. • Speed limits are clearly marked through signage and enforced by site security through periodic checks using a radar speed gun. Personnel caught speeding will face disciplinary measures, and if violators are encountered they will be provided with constructive instructions on the importance of adhering to speed limits to limit dust generation. • Manage dust emissions from roadways in accordance with the Fugitive Dust Management SOP. • Water roads in accordance with Section 5.1.1 (watering) of the Fugitive Dust Management Plan. • Apply dust suppressant reagents after spring melt (e.g., calcium chloride, magnesium chloride or other equivalent) as approved by the Mine Manager. • Grader maintenance with road crush as required. • Regular compaction. • Use coarse aggregate on roads with low silt content to reduce silt loading on roads.
Vehicles	• Maintain equipment in good working condition according to manufacturer's recommendations. • Restrict speeds and reducing idling.

Emisssion Source	Best Management and Mitigation Measures
	• Use Tier IV engines for mine fleet.

6.4 Monitoring

The air quality monitoring program will remain in place during all phases of the Project. Figure 6.4-1 illustrates the existing and planned monitoring sites, with further details provided in the following sections.

6.4.1 Meteorological Stations

There are two existing, automated meteorological stations (Figure 6.4-1). Table 6.4-1 provides information on the locations, parameters measured, and the available period of data. Prevailing winds have historically been observed to come from the west (see Section 5.2), which can cause fugitive dust events.

The parameters identified in Table 6.4.1-1 will be monitored over all phases of the Project. Data is reviewed according to guidance in Water and Air Baseline Guidance Document for Mine Proponents and Operators (BC MOE 2016c).

Table 6.4.1-1: Blackwater Project Meteorological Stations

Station Name	Station Height	Latitude (deg N)	Longitude (deg W)	Elevation (masl)	Meterological Parameters Monitored	Data Period Available
Low	10 m	53.29979	124.80025	1,050	Air temperature, relative humidity, precipitation, wind speed and direction, barometric pressure, snow depth, net radiation, solar radiation	August 2011 - present
High	10 m	53.18113	124.84620	1,470	Air temperature, relative humidity, precipitation, wind speed and direction, barometric pressure, snow depth, net radiation, solar radiation	July 2012 - present

Based on the 2022 data wind direction continues to be predominately from the west with strong southwest gusts during the fall and winter.

Radiation, temperature, precipitation, relative humidity, barometric pressure and snow depth data plots are provided for the high and low station (Appendix B). The plot data show readings from September 2022 (start of early works construction) through to December 2022.

No Net Radiation data is available for Blackwater High due to a sensor malfunction. No snow depth data is available for Blackwater Low due to a sensor malfunction, as well a dead battery was experienced at Blackwater Low between November 2 and 4, 2022.

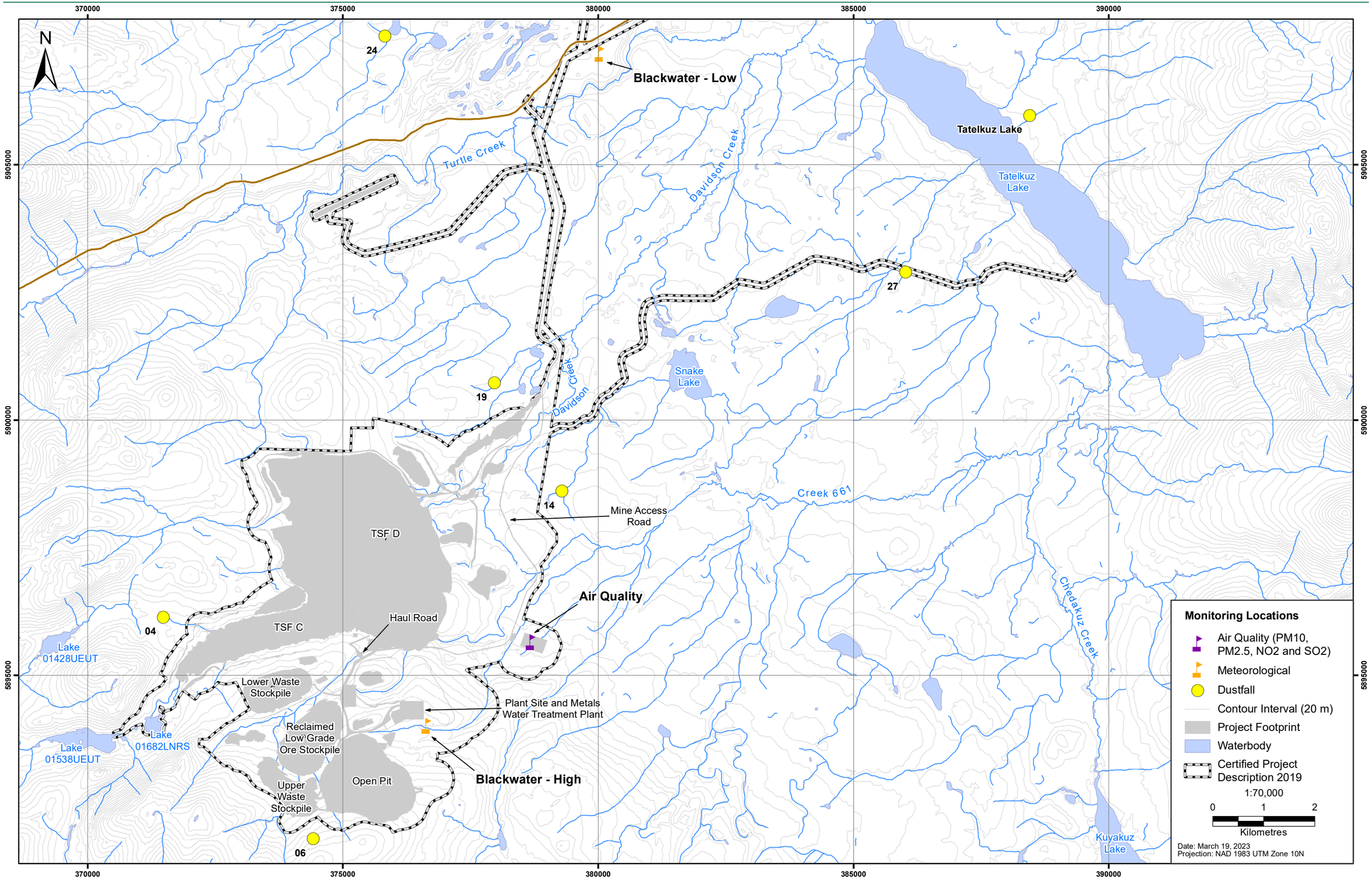


Figure 6.4-1: Air Quality Monitoring Locations

6.4.2 Dustfall Monitoring

Although dustfall monitoring and the dustfall Pollution Control Objectives have outdated methodology and are no longer recommended by BC ENV (2020), dustfall samples were collected from eight locations for baseline data for the CFMP.

Analytical results for dust samples analyzed in 2022 (in mg/dm^2-day and in mg) are provided in Appendix C in the Certificate of Analysis from ALS. These samples were collected as part of the baseline study (August and September 2022) and did not capture data when early works construction commenced. Future dustfall samples are proposed for 2023 as per CFMP (ERM 2023).

The following information has been taken from ERM.2023. *"2021-2022 Cumulative Dustfall, Soil and Plant Metal Concentration Baseline Report".*

Dust was collected for 40 to 48 days, depending on time of installation of the collectors at the different sites. As expected from a review of field photographs, station 027 had the highest total dustfall of 2.58 mg/dm^2-day, whereas all other stations had total dustfall at or slightly above the dustfall DLs (up to 3 x DL).

There are no guidelines for metals in dust. Based on the analytical results, only five metals identified as a Contaminant of Potential Concern (COPCs) for human health (Entia 2021a, 2021b) were detectable in dust samples collected in both or one of the two areas (near-field or control): aluminum, cadmium, lead, manganese, and zinc. Cadmium was non-detectable in dust from all stations, except for station 027, where cadmium was recorded as detected (0.000021 mg), but only 0.000001 mg above the DL of 0.000020 mg. Other detectable metals not listed as COPCs for human health were barium, calcium, magnesium, phosphorus, potassium, sodium, and strontium. These metal concentrations were too low (less than five times the DL) to allow a statistical comparison between near-field and control areas.

Summary statistics in the report are provided for the near-field sites (004, 006, 014, 019) and the control sites (024, 027, 032, 040). Table 6.4.2-1 provides the summary statistics for all samples collected within the study area (ERM 2023). Figure 6.4-1 above illustrates the dustfall sampling locations for 2022.

Table 6.4.2-1: Summary Statistics for Dust, Study Area-wide, 2022

Parameter	Lowest Detection Limit (DL)	Total Samples with Concentrations > DL	All Samples (n = 8)							
			Minimum	Mean	Standard Deviation	Standard Error	95% UCLM	Median	95th Percentile	Maximum
Particulates (Matrix: Air)										
dustfall, total insoluble	1.9	6	0.95	4.1	4.6	1.6	7.2	2.3	11.8	13.9
dustfall, total soluble	1.9	5	0.95	8.3	17.6	6.2	20.5	2.3	34.9	51.8
Anions and Nutrients (Matrix: Air)										
ammonia, total (as N)	0.019	4	0.010	0.22	0.54	0.19	0.59	0.026	1.0	1.5
chloride	3.4	0	1.7	1.7	-	-	1.7	1.7	1.7	1.7
nitrate (as N)	0.019	5	0.010	0.02	0.0078	0.0028	0.02	0.019	0.03	0.028
sulfate	0.22	0	0.11	0.11	-	-	0.11	0.11	0.11	0.11
Total Metals (Matrix: Air)										

Parameter	Lowest Detection Limit (DL)	Total Samples with Concentrations > DL	All Samples (n = 8)							
			Minimum	Mean	Standard Deviation	Standard Error	95% UCLM	Median	95th Percentile	Maximum
aluminum, total	0.0030	8	0.0052	0.0082	0.0018	0.00065	0.0095	0.0083	0.011	0.0106
antimony, total	0.000050	0	<0.000050	<0.000050	-	-	<0.000050	<0.000050	<0.000050	<0.000050
arsenic, total	0.000050	0	<0.000050	<0.000050	-	-	<0.000050	<0.000050	<0.000050	<0.000050
barium, total	0.000050	8	0.00011	0.00024	0.00011	0.000038	0.00031	0.00022	0.00039	0.00040
beryllium, total	0.00025	0	<0.00025	<0.00025	-	-	<0.00025	<0.00025	<0.00025	<0.00025
bismuth, total	0.00025	0	<0.00025	<0.00025	-	-	<0.00025	<0.00025	<0.00025	<0.00025
boron, total	0.0050	0	<0.0050	<0.0050	-	-	<0.0050	<0.0050	<0.0050	<0.0050
cadmium, total	0.000020	1	<0.000020	<0.000020	-	-	<0.000020	<0.000020	<0.000020	0.000021
calcium, total	0.010	8	0.018	0.026	0.010	0.004	0.033	0.023	0.042	0.050
chromium, total	0.00025	0	<0.00025	<0.00025	-	-	<0.00025	<0.00025	<0.00025	<0.00025
cobalt, total	0.000050	0	<0.000050	<0.000050	-	-	<0.000050	<0.000050	<0.000050	<0.000050
copper, total	0.00050	0	<0.00050	<0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050
iron, total	0.015	0	<0.015	<0.015	-	-	<0.015	<0.015	<0.015	<0.015
Total Metals (Matrix: Air; *cont'd*)										
lead, total	0.000025	1	<0.000025	<0.000025	-	-	<0.000025	<0.000025	<0.000025	0.000028
lithium, total	0.0025	0	<0.0025	<0.0025	-	-	<0.0025	<0.0025	<0.0025	<0.0025
magnesium, total	0.0025	8	0.0081	0.0234250	0.020	0.0069	0.037	0.015	0.054	0.056
manganese, total	0.00010	6	<0.00045	0.0020	0.0022	0.00077	0.0035	0.0011	0.0057	0.0067
mercury, total	0.000025	0	<0.000025	<0.000025	-	-	<0.000025	<0.000025	<0.000025	<0.000025
molybdenum, total	0.000025	0	<0.000025	<0.000025	-	-	<0.000025	<0.000025	<0.000025	<0.000025
nickel, total	0.00025	0	<0.00025	<0.00025	-	-	<0.00025	<0.00025	<0.00025	<0.00025
phosphorus, total	0.025	6	<0.025	0.18	0.24	0.08	0.34	0.07	0.57	0.69
potassium, total	0.025	8	0.033	0.29	0.34	0.12	0.52	0.14	0.84	0.97
selenium, total	0.00050	0	<0.00050	<0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050
silicon, total	0.025	0	<0.025	<0.025	-	-	<0.025	<0.025	<0.025	<0.025
silver, total	0.0000050	0	<0.0000050	<0.0000050	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050
sodium, total	0.025	5	<0.025	0.065	0.080	0.028	0.12	0.036	0.19	0.25

Parameter	Lowest Detection Limit (DL)	Total Samples with Concentrations > DL	All Samples (n = 8)							
			Minimum	Mean	Standard Deviation	Standard Error	95% UCLM	Median	95th Percentile	Maximum
strontium, total	0.000050	8	0.000091	0.00016	0.00011	0.000038	0.00023	0.00013	0.00032	0.00042
thallium, total	0.000050	0	<0.000050	<0.000050	-	-	<0.000050	<0.000050	<0.000050	<0.000050
tin, total	0.000050	1	<0.000050	<0.000050	-	-	<0.000050	<0.000050	<0.000050	0.000056
titanium, total	0.0050	0	<0.005	<0.005	-	-	<0.005	<0.005	<0.005	<0.005
uranium, total	0.0000050	0	<0.0000050	<0.0000050	-	-	<0.0000050	<0.0000050	<0.0000050	<0.0000050
vanadium, total	0.00050	0	<0.00050	<0.00050	-	-	<0.00050	<0.00050	<0.00050	<0.00050
zinc, total	0.0015	3	<0.0015	<0.0015	-	-	<0.0015	<0.0015	0.0017	0.0018

Notes:
All concentrations are reported in milligrams.
UCLM = Upper confidence limit of the mean
"-" = Standard deviation and standard error are not calculated for parameters where more than 70% of values are non-detects. The 95% UCLM is replaced by the mean.

As dustfall samples are not recommended, mine personnel will be trained to be observant for dust related concerns which may arise. These observations, together with meteorological conditions and mitigation efforts taken to deal with a problem, will be recorded and included in monthly and annual reports. Visual monitoring will focus on areas where there are active surface earthworks, haul roads and overburden and soil stockpiles. Visual monitoring occurs on a daily basis at all locations where fugitive dust generation is occurring once major work commences.

6.4.3 Particulate Matter Monitoring

A Thermo Scientific Partisol FRM Model 2025i D PM sampler (Partisol) was installed in October 2022. The location of the Partisol was recommended by an Air Quality QP and is centred at 5894019 N and 375894 E (UTM Zone 10 NAD83). Although the monitoring of particulate matter is not required until major works construction has commenced, the air quality monitoring program was initiated on October 17th, 2022, for baseline data. The Partisol was installed near the existing exploration camp, between Dorm block A and the maintenance shop. It should be noted that the maintenance shop contains a wood burning furnace to the approximately 25 m east of the Partisol, that may have been burning during the days of sampling.

Once the construction camp has been completed, the Partisol will be moved to a new location with advice from an Air Quality QP, as the construction camp will house majority of staff on Site until the operations camp is completed.

The Partisol measures PM < 10 microns (PM_{10}) and PM < 2.5 microns ($PM_{2.5}$) mass concentrations on a 47 mm filter contained in a single-action filter change mechanism. Samples were collected over a 24-hour period at a target flow rate of 1m^3/hr. Sample volumes were recorded and divided into the mass concentration to yield a 24-hour average concentration in units of µg/m^3. During the months of May to October, fine particulate sampling will occur every third day, simultaneously for $PM_{2.5}$ and PM_{10}. During November to April, sampling will be conducted on a weekly basis simultaneously for $PM_{2.5}$ and PM_{10}. As these samples

are for baseline data, samples were collected simultaneously for $PM_{2.5}$ and PM_{10} on a weekly basis following the National Air Pollution Surveillance Sampling Schedule.

Analytical results for dust samples analyzed in 2022 (in µg/m^3) are provided in Appendix C in the Certificate of Analysis from ALS and are presented in Table 6.4.3-1.

BWG collected samples on October 21st, 27th, November 2nd, 8th, 14th, 19th, 25th, December 1st, 7th, 13th, and 19th, 2022. The results were compared to British Columbia Ambient Air Quality Objectives (BCAAQO), Canadian Ambient Air Quality Standards (CAAQS), Federal Air Quality Objectives as well as modelled baseline concentrations for on-site described in the AQDMP section 7.1 Appendix A.

Based on the analytical results, no samples exceeded any of the applicable provincial or federal objectives or standards (Table 6.4.3-1); however, the baseline PM_{10} concentration (9 µg/m^3) was exceeded on December 19th, 2022, and the $PM_{2.5}$ baseline concentration (4 µg/m^3) was exceeded on November 14, December 1st and 19th, 2022. The highest $PM_{2.5}$ and PM_{10} concentration of 14.8 µg/m^3 was observed on December 19th, 2022. The remaining sample results were below 6.4 µg/m^3 with the lowest $PM_{2.5}$ concentration of <2.3 µg/m^3 observed on October 21st, November 2nd, and 8th and lowest PM_{10} concentration of <3.0 observed on October 21st and November 2nd.

The Partisol sample results on December 19th, had a concentration twice as high as the remaining results. During this time period temperatures were below –30°C, resulting in increased use of the wood burning furnace at the maintenance shop. The wind direction was generally in a westwardly direction on the morning of December 19th blowing smoke from the furnace towards the Partisol.

The particulate matter samples compared to the predicted baseline concentrations are above; however, are below the federal and provincial objectives and standards. As such, no adverse health effects for human receptors are likely to occur.

Table 6.4.3-1: Summary Analytical $PM_{2.5}$ and PM_{10} Results

Client Sample ID	Date Sampled	Particulate, Fine	Particulate, Coarse	Particulate, PM10	Particulate, PM2.5
BCAAQO				50	25[a]
CAAQS				50	28[b]
Federal Air Quality Objectives				-	27 to 28[c]
Baseline modelling concentrations				9	4
	Units	µg/m³	µg/m³	µg/m³	µg/m³
78099/78152	21-Oct-2022	<2.3	<2.0	<3.0	<2.3
78102/77706	27-Oct-2022	2.4	2.4	4.8	2.4
78107/77710	02-Nov-2022	<2.3	2.2	<3.0	<2.3
77707/77715	08-Nov-2022	<2.3	4.5	4.5	<2.3
78104/77716	14-Nov-2022	5.9	<2.0	5.9	**5.9**
78151/77713	19-Nov-2022	2.9	2.4	5.3	2.9
77718/77711	25-Nov-2022	3.9	<2.0	3.9	3.9
77714/78103	01-Dec-2022	6.4	<2.0	6.4	**6.4**
78106/78130	07-Dec-2022	3.4	<2.0	3.4	3.4
78101/77729	13-Dec-2022	3.5	2.0	5.5	3.5
78147/77725	19-Dec-2022	14.8	<2.0	**14.8**	**14.8**
Annual Average Concentration[d]				5.5	**4.55**

All units are in µg/m³ unless otherwise specified.
sources: British Columbia Ministry of Environment and Climate Change Strategy (BCAAQO, 2023) and Canadian Ambient Air Quality Standards (CAAQS, 2013)
a- achieved based on annual 98th percentile value.
b- achieved based on 98th percentile of daily average, averaged over three consecutive years.
c- CAAQS is 28 µg/m³ in 2015 and 27 µg/m³ in 2020 (CCME 1999); compliance based on 98th percentile value, averaged over three consecutive years.

d- where concentrations were non-detect, the detection limit was used for the calculation.
BOLD - indicates result exceeds the baseline concentration.

6.4.4 Nitrogen Dioxide and Sulfur Dioxide Monitoring

Nitrogen dioxide (NO_2) and Sulfur Dioxide ($SO_{2)}$ passive air samples were not collected in 2022. The passive air sampling system (PASS) apparatus was installed at the exploration camp near the Partisol sampler. The first set of passive samples were deployed on February 23, 2023. The Radiello passive samplers will be deployed for 30 days ± 4 days, collected, and then shipped to ALS laboratory under chain of custody for analysis.

6.4.5 Carbon Monoxide

Carbon monoxide monitoring was not completed in 2022.

Based on the air dispersion modelling results (AQDMP), CO monitoring is not recommended as CO levels are below BC air quality objectives at the human receptor locations (i.e., less than 5% of the objective). The maximum 1-hr CO concentration at any human receptor is 317 ug/m^3 while the objective is 14,300 ug/m^3. The maximum 8-hr CO concentration is 205 ug/m^3 while the objective is 5,500 ug/m^3.

6.4.6 Point Source Discharge Monitoring

Point source discharge monitoring was not completed in 2022 as the baghouses and dust suppression systems have not been constructed at the mine site.

6.5 Quality Assurance / Quality Control

The sample were submitted to a CALA-certified laboratory (ALS Laboratories), a review of the sample receipt confirmation was completed to identify any issues that may have occurred during transport to the lab. The sample receipt confirmation indicated samples were successfully delivered with no issues pertaining to the sample and or container integrity.

The quality assurance/quality control (QA/QC) program for air quality included:

- Use of standard field data sheets and SOPs (e.g., calibration of the Partisol) for field sampling and data collection;
- Field notes were recorded during all stages of the monitoring programs, including photographic records for: Meteorological stations, Dustfall monitoring and Particulate matter monitoring;
- Review of data once transferred to a database to minimize the potential for transcription errors;
- Appropriate training for field personnel responsible for collecting samples;
- Use of chain of custody (COC) forms and CALA-accredited laboratory for analysis of samples; and
- Appropriate laboratory-based QA/QC programs, consistent with the requirements of the British Columbia Environmental Laboratory Manual (BC ENV 2020a).

6.6 Community Feedback Mechanism

Pursuant to DS Condition 6.3, BW Gold has established a feedback mechanism to manage input and complaints related to exposure to dust from the Project during construction, operation, and decommissioning. Complaints may arise from Project-related use of the FSRs between Vanderhoof and

the Project site. Monitoring activities will include a review of any complaints received from the public related to fugitive dust and air quality and an initial response within 48 hours. Complaints will be carefully investigated, tracked and logged, contributing factors that may have resulted in the complaint, and any actions that were undertaken and follow-up to address the complaint. Complaints may require a more in-depth root cause analysis and result in modification of the Plan.

As of writing this report no complaints specific to dust and/or air quality have been made.

6.7 Follow-up Program

To determine if modified or additional mitigation measures are required the results of the monitoring program were compared to the predicted concentrations of criteria air contaminants shown in Table 5.0-1 above. The predicted concentrations are considered to be baseline concentrations for the purposes of the follow up program (FUP). The baseline PM_{10} concentration (9 µg/m^3) was exceeded on December 19th, 2022(14.8 µg/m^3) , and the $PM_{2.5}$ baseline concentration (4 µg/m^3) was exceeded on November 14 (5.9 µg/m^3), December 1st (6.4 µg/m^3) and 19th (14.8 µg/m^3), 2022.

Table 6.7-1 outlines the action and response for the PM results. For a full complete Trigger Action Response please refer to Table 9.1-1 AQDMP, Appendix A.

Table 6.7-1 Particle Matter Action and Responses

		Level	Trigger	Management Response
Fine PM	Operations Camp	Low	The annual average PM_{10} and $PM_{2.5}$ concentration is: • Higher than the Baseline Case annual average concentration; <u>But</u> • Below the predicted concentrations and the Ambient Air Quality Objective	• Continue Monitoring • Develop Casual analysis and associated mitigations in addition to a schedule for implementation based on the exceedance level.

7.0 Summary and Conclusion

The dustfall samples and particulate matter samples were collected and analyzed to identify potential air quality concerns at the mine site. Based on the sampling and analytical program findings, the following conclusions are made:

- A total of eight dustfall samples were collected for 40 to 48 days, depending on installation and collection date. Station 027 had the highest total dustfall of 2.58 mg/dm^2-day.
- Of the eight dustfall samples, only five metals identified as a Contaminant of Potential Concern (COPCs) for human health (Entia 2021a, 2021b) were detectable in dust samples collected in both or one of the two areas (near-field or control): aluminum, cadmium, lead, manganese, and zinc.
- In total eleven particulate matter samples ($PM_{2.5}$ and PM_{10}) were collected between October and December 2022.

- No particulate matter samples exceeded any objective or standard. The highest concentration of both $PM_{2.5}$ and PM_{10} was observed on December 19th, 2022, with a concentration of 14.8 µg/m^3. The high concentrations could be attributed to the construction fire that occurred at site on December 17.
- Baseline PM_{10} concentration (9 µg/m^3) was exceeded on December 19th, 2022, and $PM_{2.5}$ baseline concentration (4 µg/m^3) was exceeded on November 14, December 1st, and 19th, 2022. The annual average $PM_{2.5}$ concentration was 4.55 µg/m^3. The trigger level for this exceedance is low.
- Nitrogen dioxide (NO_2) and Sulfur Dioxide ($SO_{2)}$ passive air samples were not collected as part of the air quality monitoring in 2022.
- Carbon monoxide monitoring and point source discharge monitoring were not completed in 2022.
- Meteorological data was collected between September and December 2022.

8.0 Recommendations

Based on the 2022 air quality and fugitive dust monitoring program results and conclusions, the following recommendations are provided:

- While the Partisol is set up near the maintenance building, the wood burning furnace should not be used on days the Partisol is sampling to prevent any bias high particulate results. Alternatively, the Partisol should be moved to another location.
- The Partisol sampling should continue in 2023, following the EPA Sampling Schedule.
- The results from the CFMP Dustfall monitoring program should be used in conjunction with visual dust monitoring.
- The PASS system should be operational before the start of construction and should be sampled and monitored as per the AQDMP.
- CO monitoring should be implemented in 2023.

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APPENDIX A

Air Quality and Fugitive Dust Management Plan (March 2022)



BW GOLD LTD
a subsidiary company of Artemis Gold Inc

Blackwater Gold Project

Air Quality and Fugitive Dust Management Plan

March 2022

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ACRONYMS AND ABBREVIATIONS

Aboriginal Groups or Indigenous nations	Aboriginal Groups include: Lhoosk'uz Dené Nation, Ulkatcho First Nation, Nadleh Whut'en First Nation, Stellat'en First Nation, Saik'uz First Nation, and Nazko First Nation (as defined in the Project's Environmental Assessment Certificate #M19-01)
AAQO	Ambient Air Quality Objective
AQDMP	Air Quality and Fugitive Dust Management Plan
AQO	Air Quality Objective
Artemis	Artemis Gold Inc.
BC	British Columbia
Blackwater	Blackwater Gold Project
BW Gold or Proponent	BW Gold LTD.
CAAQs	Canadian Ambient Air Quality Standards
CCME	Canadian Council of Ministers of the Environment
CEA Agency	Canadian Environmental Assessment Agency
CEO	Chief Executive Officer
CO	Carbon monoxide
COO	Chief Operating Officer
CFMP	Country Foods Monitoring Plan
CM	Construction Manager
COO	Chief Operating Officer
DS	Decision Statement
EAC or Certificate	Environmental Assessment Certificate
EC	Environment Canada
ECCC	Environment and Climate Change Canada
ECD	Environmental Control Dam
EM	Environmental Manager
EMC	Environmental Monitoring Committee
EMLI	Ministry of Energy, Mines and Low Carbon Innovation
EMP	Environmental Management Plan
EMPR	Ministry of Energy, Mines and Petroleum Resources

ENV	Ministry of Environment and Climate Change Strategy
EPCM	Engineering, Procurement and Construction Management
FLNRORD	Ministry of Forests, Lands, Natural Resource Operations and Rural Development
FSR	Forest Service Road
GM	General Manager
ha	Hectares
HHRA	Human Health Risk Assessment
HQ	Hazard quotient
HVAC	Heating, ventilation and air conditioning
Indigenous groups or Aboriginal Peoples	Lhoosk'uz Dené Nation, Ulkatcho First Nation, Nadleh Whut'en First Nation, Saik'uz First Nation, Stellat'en First Nation, Nazko First Nation, Skin Tyee Nation, Tŝilhqot'in Nation, Métis Nation British Columbia, and Nee-Tahi-Buhn Band (as defined in the Project's federal Decision Statement)
km	Kilometre
KP	Knight Piésold Ltd.
LGO	Low grade ore
MAR	Mine Access Road
MOE	Ministry of Environment
MOH	Ministry of Health
MP	Management plan
Mtpa	Million tonnes per annum
New Gold	New Gold Inc.
NO_x	Nitrogen oxides
OVB	Overburden
PASS	Passive Air Sampling System
PM	Particulate matter
POC	Parameter of concern
POPC	Parameter of potential concern
Project	Blackwater Gold Project
QA/QC	Quality control/quality assurance
SO_2	Sulphur dioxide

SOP	Standard operating procedure
t	Tonne
Tatelkus Lake 28	Tatelkus Lake Indian Reserve 28
TSF	Tailings Storage Facility
µm	Microns
WMMP	Wildlife Management and Monitoring Plan
VP	Vice President

1. PURPOSE AND SCOPE

The purpose of the Air Quality and Fugitive Dust Management Plan (AQDMP) is to identify measures to minimize the effects of the Project's air emissions on human health and the natural environment. The AQMP identifies the Project's fugitive dust-emitting sources and mitigation and contingency measures in the event that primary control measures are not effectively controlling dust emissions.

Pursuant to Part 2, Section 14 of the *Environmental Management Act*, BW Gold is seeking an authorization for air discharges during the Construction and Operation phases as follows:

- Discharge of fugitive dust generated at the mine site during the Construction and Operations phases; and
- Discharge of air emissions from the processing plant and assay lab during the Operations phase.

The AQDMP is being submitted with Blackwater's Joint Application for *Mines Act/Environmental Management Act* permits (Application). It addresses the requirements of EAC #M19-01 Condition 20 and federal Decision Statement (DS) Conditions 6.1, 6.3, 6.12 and 6.15. The AQDMP also includes the information requested in *Developing a Fugitive Dust Management Plan for Industrial Projects* (Guidance; EMPR & ENV 2018).

Concordance tables identifying where the requirements in EAC Condition 20 and DS conditions can be found in the AQDMP are provided in Appendix A and Appendix B respectively. A concordance table identifying where the requirements in the Guidance (EMPR & ENV 2018) can be found in the plan is provided in Appendix C.

The AQDMP will be implemented during construction, operations and closure.

1.1 Company Information

BW Gold LTD. (BW Gold) is a wholly-owned subsidiary of Artemis Gold Inc., a publicly-traded company listed on the TSX Venture Exchange (TSX-V: ARTG - https://www.artemisgoldinc.com/). Artemis and BW Gold are incorporated in BC (#71616 9511 and #73237 6876 respectively).

The BW Gold corporate office is in Vancouver, BC:

Physical Mailing Address:	Suite 3083 – 595 Burrard Street, Vancouver BC V7L 1L3
Telephone:	(604) 558-1107
General Email:	info@artemisgoldinc.com

The Blackwater community office is in Vanderhoof, BC:

Physical Mailing Address:	139 – 1st Street, P.O. Box 440
Mailing Address:	P.O. Box 440, Vanderhoof BC V0J 3A0
Telephone:	(250) 567-3276
General Email:	office.blackwater@artemisgoldinc.com

1.2 Existing Permits

BW Gold has a permitted diesel-fired putrescible waste incinerator (*Environmental Management Act* Authorization #106530, the Authorization), which is located near the exploration camp. The Authorization allows a maximum discharge rate of 110 m^3/minute and maximum waste feed of 1.1 tonnes/day. Authorized waste for incineration includes putrescible camp waste, paper, cardboard and lumber scraps that cannot be recycled. Condition 2.1.3 of the Authorization requires that every effort be made to minimize incineration of plastics.

1.3 Exclusions

Consistent with the Guidance (EMPR & ENV 2018), the AQDMP does not address occupational health and safety requirements pertaining to workplace exposures to dust. Worker health and safety at mine sites is regulated by the Health, Safety and Reclamation Code for Mines in British Columbia (EMLI 2021). The Project's Occupational Health and Safety Program is discussed in Chapter 8 of the Application (Blackwater Project Joint Application for a *Mines Act* and *Environmental Management Act* Permits).

1.4 Related Documents

Environmental Assessment Certificate Condition 20 requires the AQDMP to indicate how this plan informs the Country Foods Monitoring Plan (CFMP) and the Wildlife Mitigation and Monitoring Plan (WMMP). Fugitive dust deposition monitoring is not recommended by the Ministry of Environment and Climate Change Strategy (ENV) for the purposes of wildlife and human health protection (ENV 2020) and is not included in the AQDMP. However, as required by EAC Condition 41, analysis of dust for metal concentrations will be included in the CFMP and data collected under the CFMP can be used to inform the WMMP.

Monitoring of trace element (metals) uptake in vegetation and soils is considered in the Reclamation and Closure Plan (Chapter 4) and the CFMP. Plant tissue can be affected by the deposition of dust (particulate matter) containing metals generated by Project activities. Plants can also accumulate metals from the soil through uptake of metals through the root. Monitoring under the CFMP will determine whether concentrations of metals have changed in soil or in vegetation tissue because of Project activities. The results of trace metals monitoring and potential implications for wildlife based on results from monitoring under the CFMP will be addressed in the WMMP (Appendix 9-H of the Application).

Results of the AQDMP for monitoring of particulate matter (Section 8.3.3) and nitrogen dioxide and sulfur dioxide (Section 8.3.4) will inform the CFMP, as this monitoring is required by EAC Condition 41 for the CFMP.

2. PROJECT OVERVIEW

The Blackwater Gold Project (the Project) is a gold and silver open pit mine located in central British Columbia (BC), approximately 112 kilometres (km) southwest of Vanderhoof, 160 km southwest of Prince George, and 446 km northeast of Vancouver.

The Project is presently accessed via the Kluskus Forest Service Road (FSR), the Kluskus-Ootsa FSR and an exploration access road, which connects to the Kluskus-Ootsa FSR at km 142. The Kluskus FSR joins Highway 16 approximately 10 km west of Vanderhoof. A new, approximately 13.8 km road (Mine Access Road; MAR) will be built to replace the existing exploration access road, which will be decommissioned. The new planned access is at km 124.5. Driving time from Vanderhoof to the mine site is about 2.5 hours.

Major mine components include a tailings storage facility (TSF), ore processing facilities, waste rock, overburden and soil stockpiles, borrow areas and quarries, water management infrastructure, water treatment plants, accommodation camps and ancillary facilities. The gold and silver will be recovered into a gold-silver doré product and shipped by air and/or transported by road. Electrical power will be supplied by a new approximately 135 km, 230 kilovolt (kV) overland transmission line that will connect to the BC Hydro grid at the Glenannan substation located near the Endako mine, 65 km west of Vanderhoof.

The Blackwater mine site is located within the traditional territories of Lhoosk'uz Dené Nation (LDN), Ulkatcho First Nation (UFN), Skin Tyee Nation and Tsilhqot'in Nation. The Kluskus and Kluskus-Ootsa FSRs and Project transmission line cross the traditional territories of Nadleh Whut'en First Nation (NWFN), Saik'uz First Nation (SFN), and Stellat'en First Nation (StFN; collectively, the Carrier Sekani First Nations) as well as the traditional territories of the Nazko First Nation (NFN), Nee Tahi Buhn Band, Cheslatta Carrier Nation and Yekooche First Nation (BC EAO 2019a, 2019b).

Project construction is anticipated to take two years. Mine development will be phased with an initial milling capacity of 15,000 tonnes per day (t/d) or 5.5 million tonnes per annum (Mtpa) for the first five years of operation. After the first five years, the milling capacity will increase to 33,000 t/d or 12 Mtpa for the next five-years, and to 55,000 t/d or 20 Mtpa in Year 11 until the end of the 23-year mine life. The Closure phase is 24 years to approximately 45 years, ending when the Open Pit has filled and the TSF is allowed to passively discharge to Davidson Creek and the Post-closure phase is 46+ years.

New Gold Inc. (New Gold) received Environmental Assessment Certificate (EAC) #M19-01 on June 21, 2019 under the 2002 *Environmental Assessment Act* (BC EAO 2019c) and a Decision Statement (DS) on April 15, 2019 under the Canadian *Environmental Assessment Act*, 2012 (CEA Agency 2019). In August 2020, Artemis Gold Inc. (Artemis) acquired the mineral tenures, assets and rights in the Blackwater Project that were previously held by New Gold Inc. On August 7, 2020, the Certificate was transferred to BW Gold LTD. (BW Gold), a wholly-owned subsidiary of Artemis, under the 2018 *Environmental Assessment Act*. The Impact Assessment Agency of Canada notified BW Gold on September 25, 2020 to verify that written notice had been provided within 30 days of the change of proponent as required in Condition 2.16 of the DS, and that a process had been initiated to amend the DS.

3. ROLES AND RESPONSIBILITIES

BW Gold has the obligation of ensuring that all commitments are met and that all relevant obligations are made known to mine personnel and site contractors during all phases of the mine life. A clear understanding of the roles, responsibilities, and level of authority that employees and contractors have when working at the mine site is essential to meet Environmental Management System (EMS) objectives.

Table 3-1 provides an overview of general environmental management responsibilities during all phases of the mine life for key positions that will be involved in environmental management. Other positions not specifically listed in Table 3-1 but who will provide supporting roles include independent environmental monitors, an Engineer of Record (EOR) for each tailings storage facility and dam, an Independent Tailings Review Board (ITRB), TSF qualified person, geochemistry qualified professional, and other qualified persons and qualified professionals.

Table 3-1: Blackwater Gold Roles and Responsibilities

Position	Responsibility
Chief Executive Officer (CEO)	The CEO is responsible for overall Project governance. Reports to the Board.
Chief Operating Officer (COO)	The COO is responsible for engineering and Project development and coordinates with the Mine Manager to ensure overall Project objectives are being managed. Reports to CEO.
Vice President (VP) Environment & Social Responsibility	The VP is responsible for championing the Environmental Policy Statement and EMS, establishing environmental performance targets and overseeing permitting. Reports to COO.
General Manager (GM) Development	The GM Development is responsible for managing project permitting, the Project's administration services and external entities, and delivering systems and programs that ensure Artemis's values are embraced and supported: Putting People First, Outstanding Corporate Citizenship, High Performance Culture, Rigorous Project Management and Financial Discipline. Reports to COO.
Mine Manager	The Mine Manager, as defined in the *Mines Act*, has overall responsibility for mine operations, including the health and safety of workers and the public, EMS implementation, overall environmental performance and protection, and permit compliance. The Mine Manager may delegate some of their responsibilities to other qualified personnel. Reports to GM.
Construction Manager (CM)	The CM is accountable for ensuring environmental and regulatory commitments/ and obligations are being met during the construction phase. Reports to GM.
Environmental Manager (EM)	The EM is responsible for the day-to-day management of the Project's environmental programs and compliance with environmental permits, updating EMS and MPs. The EM or designate will be responsible for reporting non-compliance to the CM, and Engineering, Procurement and Construction Management (EPCM) contractor, other contractors, the Company and regulatory agencies, where required. Supports the CM and reports to Mine Manager.
Departmental Managers	Departmental Managers are responsible for implementation of the EMS relevant to their areas. Report to Mine Manager.
Indigenous Relations Manager	Indigenous Relations Manager is responsible for Indigenous engagement throughout the life of mine. Also responsible for day-to-day management and communications with Indigenous groups. Reports to VP Environment & Social Responsibility.

Position	Responsibility
Community Relations Advisor	Community Relations Advisor is responsible for managing the Community Liaison Committee and Community Feedback Mechanism. Reports to Indigenous Relations Manager.
Aboriginal Monitors	Aboriginal Monitors are required under EAC condition 17 and will be responsible for monitoring for potential effects from the Project on the Indigenous interests. Indigenous Monitors will be involved in the adaptive management and follow-up monitoring programs. Report to EM.
Employees and Contractors	Employees and contractors are responsible for being aware of permit requirements specific to their roles and responsibilities. Report to Departmental Managers.
Qualified Professionals or Qualified Persons	Qualified professionals and qualified persons will be retained to review objectives and conduct various aspects of the Project's environmental and social monitoring as specified in EMPs and social MPs.

BW Gold will employ a qualified person as an EM who will ensure that the EMS requirements are established, implemented and maintained, and that environmental performance is reported to management for review and action. The EM is responsible for retaining the services of qualified persons or qualified professionals with specific scientific or engineering expertise to provide direction and management advice in their areas of specialization. The EM will be supported by a staff of Environmental Monitors that will include Environmental Specialists and Technicians and by a consulting team of subject matter experts in the fields of environmental science and engineering.

During the Construction phase, BW Gold will be entering into multiple EPC contracts, likely for the Transmission Line, Process Plant, Tailings and Reclaim System, and 25kV Power Distribution. Each engineer/contractor will have their own CM and there will be a BW Gold responsible PM and/or Superintendent who ultimately reports to the GM Development. Some of the scope, such as the TSF and Water Management Structures will be self-performed by BW Gold, likely using hired equipment. Other smaller scope packages may be in the form of EPCM contracts. The EPCM contractors will report to the CMs who will ultimately be responsible for ensuring that impacts are minimized, and environmental obligations are met during the Construction phase. For non-EPCM contractors, who will perform some of the minor works on site, the same reporting structure, requirements, and responsibilities will be established as outlined above. BW Gold will maintain overall responsibility for management of the construction and operation of the mine site and will therefore be responsible for establishing employment and contract agreements, communicating environmental requirements, and conducting periodic reviews of performance against stated requirements.

The CM is accountable for ensuring that environmental and regulatory commitments/obligations are being met during the construction phase. The EM will be responsible for ensuring that construction activities are proceeding in accordance with the objectives of the EMS and associated MPs. The EM or designate will be responsible for reporting non-compliance to the CM and EPCM contractor, other contractors, and regulatory agencies, where required. The EM or designate will have the authority to stop any construction activity that is deemed to pose a risk to the environment; work will only proceed when the identified risk and concern have been addressed and rectified.

Environmental management during operation of the Project will be integrated under the direction of the EM, who will liaise closely with departmental managers and will report directly to the Mine Manager. The EM will be supported by the VP of Environment and Social Responsibility in order to provide an effective and integrated approach to environmental management and ensure adherence to corporate environmental standards. The EM will be accountable for implementing the approved MPs and reviewing them periodically for effectiveness. Departmental area managers (e.g., mining, milling, and plant/site services) will be directly

responsible for implementation of the EMS and EMPs relevant to their areas. All employees and contractors are responsible for daily implementation of the practices and policies contained in the EMS.

During closure and post-closure staffing levels will be reduced to align with the level of activity associated with these phases. Prior to initiating closure activities, BW Gold will revisit environmental and health and safety roles and responsibilities to ensure the site is adequately resourced to meet permit monitoring and reporting. The Mine Manager will maintain overall responsibility for management of Closure and Post-closure activities.

Pursuant to Condition 19 of the Project's EAC #M19-01, BW Gold has established an Environmental Monitoring Committee (EMC) to facilitate information sharing and provide advice on the development and operation of the Project, and the implementation of EAC conditions, in a coordinated and collaborative manner. Committee members include representatives of the Environmental Assessment Office (EAO), UFN, LDN, NWFN, StFN, SFN, NFN, Ministry of Energy, Mines and Low Carbon Innovation (EMLI), ENV and Ministry of Forests, Lands, Natural Resource Operations and Rural Development (FLNRORD).

Pursuant to Condition 17 of the EAC, Aboriginal Group Monitor and Monitoring Plan, BW Gold will retain or provide funding to retain a monitor for each Aboriginal Group prior to commencing construction and through all phases of the mine life. The general scope of the monitor's activities will be related to monitoring for potential effects from the Project on the Aboriginal Group's Aboriginal interests.

4. ADAPTIVE MANAGEMENT FRAMEWORK

The AQDMP is a living document that will evolve over time in response to monitoring results and regulatory changes. The AQDMP incorporates adaptive management as follows:

- Plan
  - Identify and characterize fugitive dust sources;
  - Identify composition and size distribution of particulate emissions;
  - Identify contributing factors to dust generation;
  - Describe fugitive dust control for each source; and
  - Prepare schedule for implementation and operation of control measures.
- Do
  - Implement mitigation measures;
  - Identify maintenance and record keeping procedures for control and monitoring equipment; and
  - Develop training procedures.
- Monitor
  - Conduct inspections and maintenance; and
  - Complete and maintain monitoring records.
- Adjust
  - Follow up on the evaluation of monitoring results;
  - Review of the monitoring program in terms of effectiveness in detecting effects;
  - Recommendations provided by a qualified professional for changes to the monitoring plan, objectives, frequency, methods, or timing;
  - Engagement tracking to record input from Indigenous groups and regulators such as the EAO, ENV and Impact Assessment Agency; and
  - Revise the AQDMP as new and/or altered measures introduced.

5. FACILITY DESCRIPTION AND SETTING

5.1 Physical Location and Access

The Project is an open pit gold and silver mine located approximately 112 kilometres (km) southwest of Vanderhoof and 160 km southwest of Prince George, BC. The Project falls within NTS map sheet 93F/02, centred at 5893000 N and 375400 E (UTM Zone 10 NAD83). The mine site is centred at 53°11'22.872" N and 124°52'0.437" W. The Project is accessed via the Kluskus Forest Service Road (FSR), the Kluskus-Ootsa FSR and an exploration access road, which connects to the Kluskus-Ootsa FSR at km 124.5.

Figure 5.1-1 and Figure 5.1-2 identifies the Project location and the access route from Vanderhoof in relation to nearby communities. The mine site is located within the traditional territories of LDN and UFN and downstream of the traditional territories of NWFN, SFN and StFN (collectively, the Carrier Sekani First Nations).

BW Gold holds a 100% recorded interest in 328 mineral claims covering an area of 148,688 hectares (ha) distributed among the Blackwater, Capoose, Auro, Key, Parlane, and RJK claim blocks (Artemis 2020). The Blackwater mine site is located within the Blackwater claim block. Figure 5.1-2 identifies the mineral tenures within the proposed *Mines Act* permit boundary.

5.2 Environmental Setting

The Project is located on the Nechako Plateau, a region of flat to gently rolling terrain on the northern slope of Mount Davidson. The mean annual wind speed at the Blackwater low elevation meteorological station (Blackwater Low) is approximately 2.2 m/s (7.9 km/h), with the wind direction being predominantly from the west and southwest. Strong southeast winds were also evident in the fall and winter at the Blackwater Low station (Figure 5.2-1). At the Blackwater high elevation station (Blackwater High) the wind direction is predominately from the west with strong southwest gusts during the fall and winter (Figure 5.2-2). The mean annual wind speed at the Blackwater High station is approximately 3.0 m/s (10.8 km/h). Meteorological baseline reports are provided in Appendix 2-A and 2-B of the Application.

5.3 Facility and Process Description

The Project includes an open pit, Plant Site and processing plant, waste and topsoil stockpiles, borrow areas and TSF. The general arrangement of the proposed mine site at Year +23 (full mine buildout) is shown in Figure 5.3-1.

5.3.1 Open Pit

Ore will be extracted using drilling and blasting from the Open Pit located in the southern portion of the proposed mine site. At its greatest extent, the Open Pit will be 228 ha, approximately 2.0 km long on the east to west axis and 1.8 km long on the north to south axis. When fully developed, the anticipated depth of the pit will range between 350 m to 550 m below the surrounding ground surface (masl). The initial production ramp up (Year +1 to Year +5) will be undertaken using 400 t class hydraulic shovels and 190 t payload class haul trucks. As production increases, the load and haul fleet will be expanded with 550 t class hydraulic shovels and 220 t payload class haul trucks. The initial drill and loading fleets are planned to be diesel drive, with expansion of the fleet to include electric drills and shovels after Year +5.

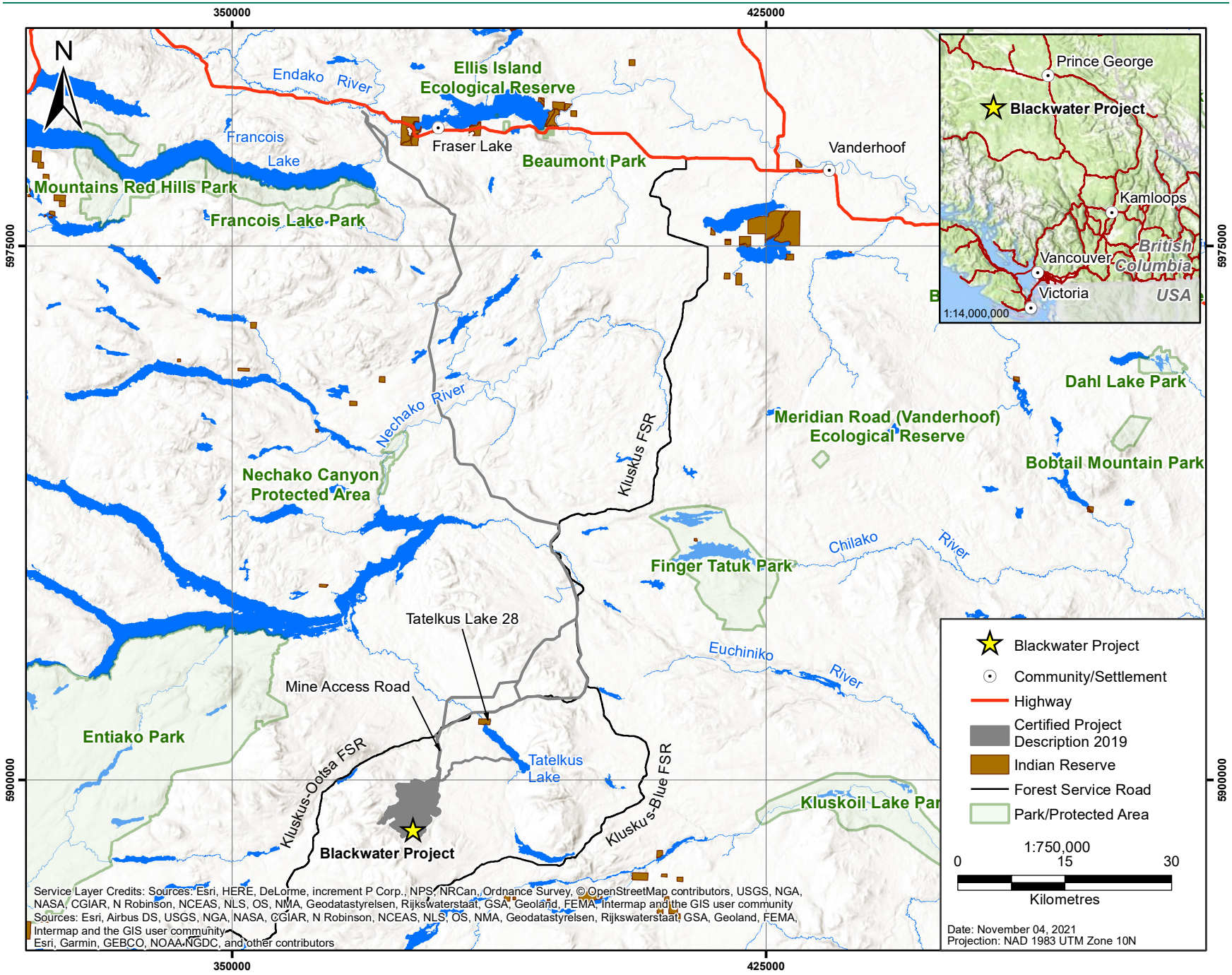


Figure 5.1-1: Blackwater Project Location

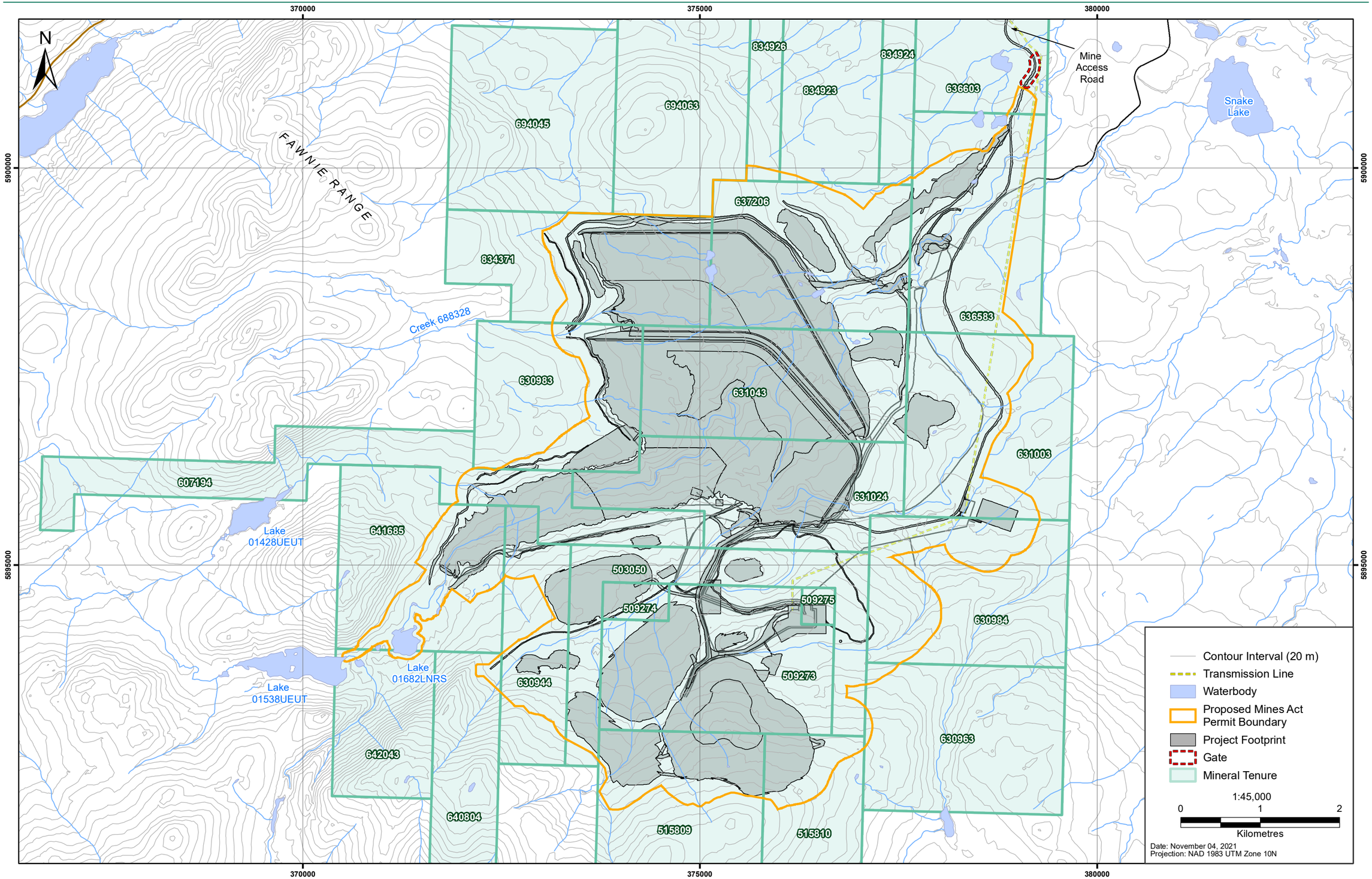
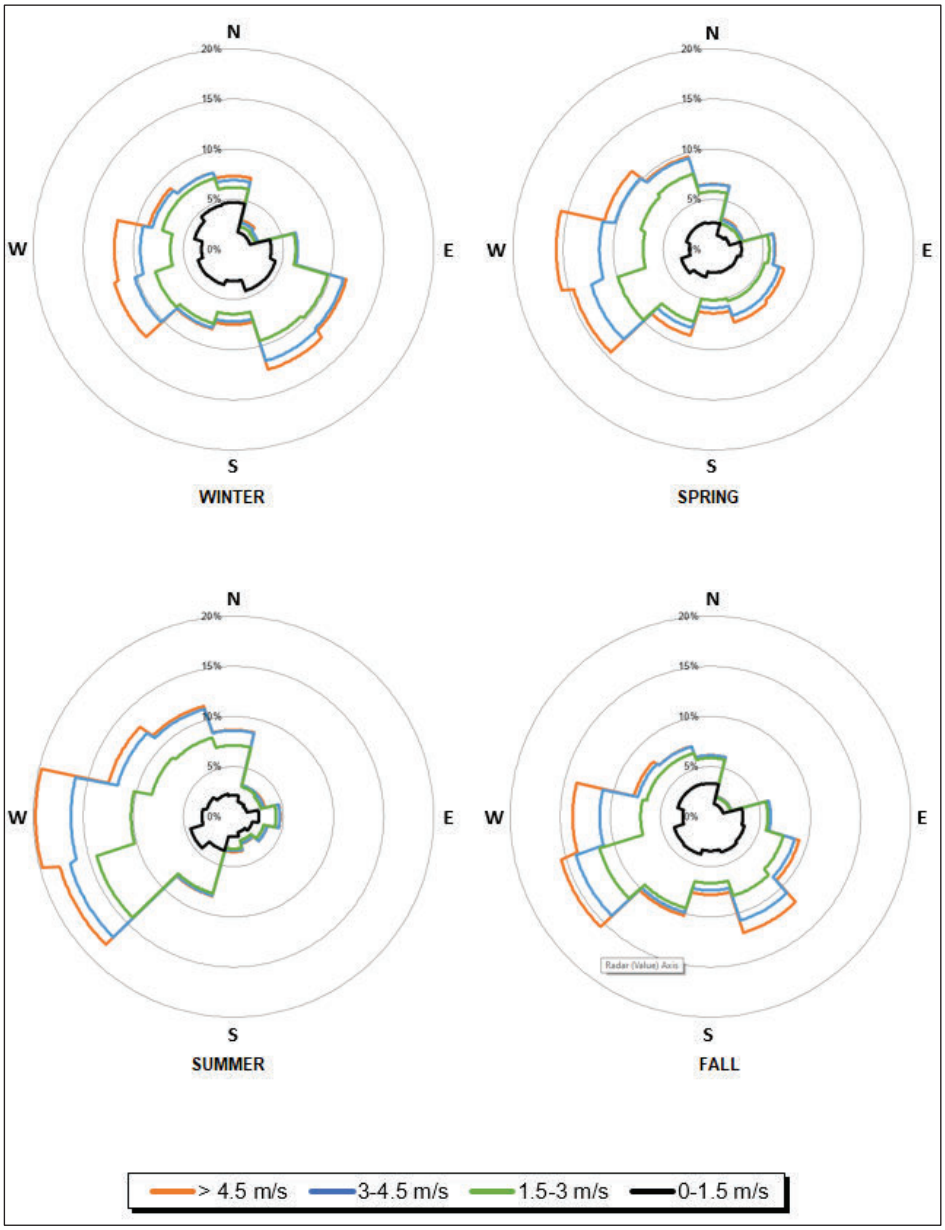


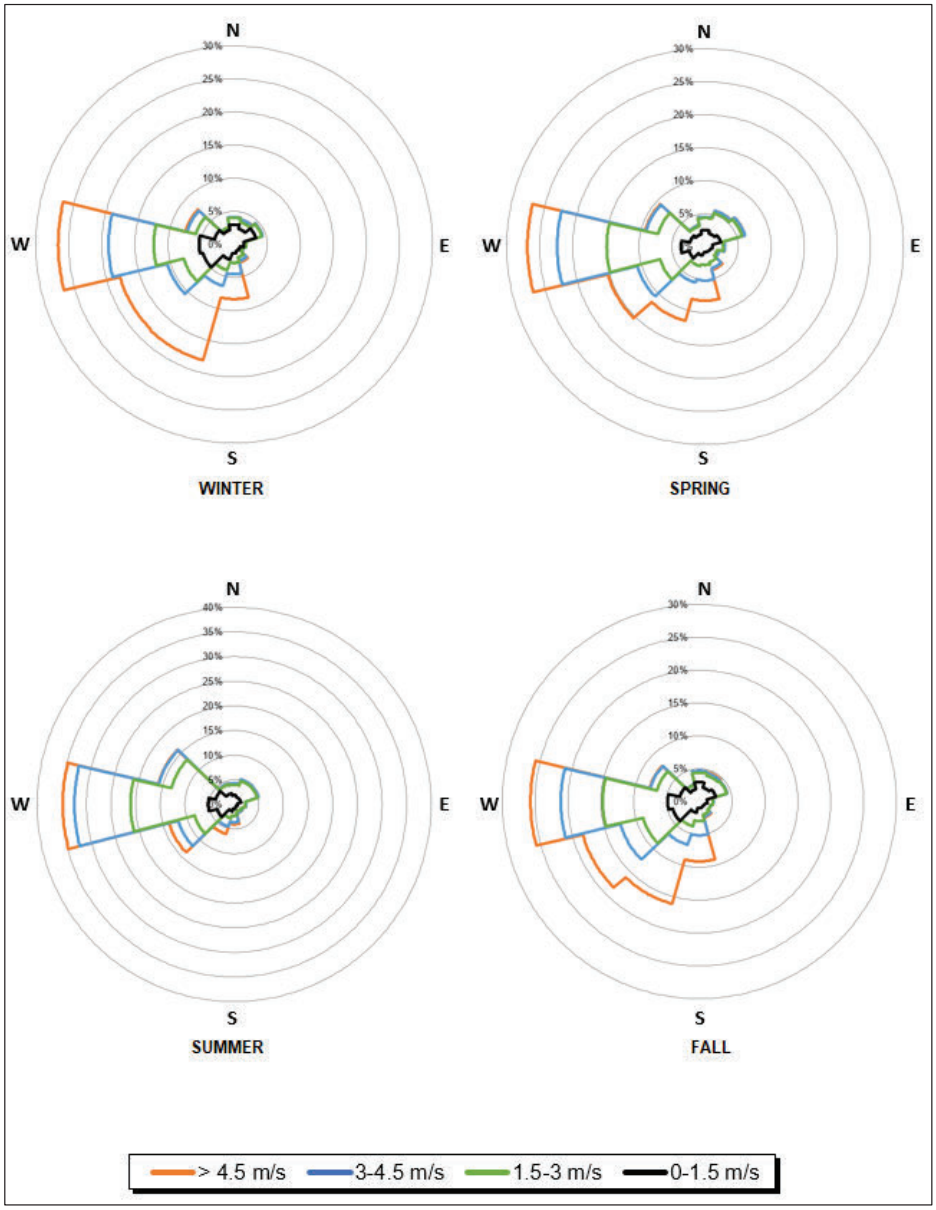
Figure 5.1-2: Blackwater Mineral Tenures within Proposed Mines Act Permit Boundary



NOTES:
1. WINTER CONSISTS OF DECEMBER TO FEBRUARY, SPRING CONSISTS OF MARCH TO MAY, SUMMER CONSISTS OF JUNE TO AUGUST, AND FALL CONSISTS OF SEPTEMBER TO NOVEMBER.
2. THE PREVAILING WIND DIRECTION IS THE ONE WITH THE LONGEST SPOKE (HIGHEST PERCENTAGE).

Figure 5.2-1: Blackwater Low Station Wind Roses

Source: Knight Piésold Consulting (2021).



NOTES:
1. WINTER CONSISTS OF DECEMBER TO FEBRUARY, SPRING CONSISTS OF MARCH TO MAY, SUMMER CONSISTS OF JUNE TO AUGUST, AND FALL CONSISTS OF SEPTEMBER TO NOVEMBER.
2. THE PREVAILING WIND DIRECTION IS THE ONE WITH THE LONGEST SPOKE (HIGHEST PERCENTAGE).

Figure 5.2-2: Blackwater High Station Wind Roses

Source: Knight Piésold Consulting (2021).

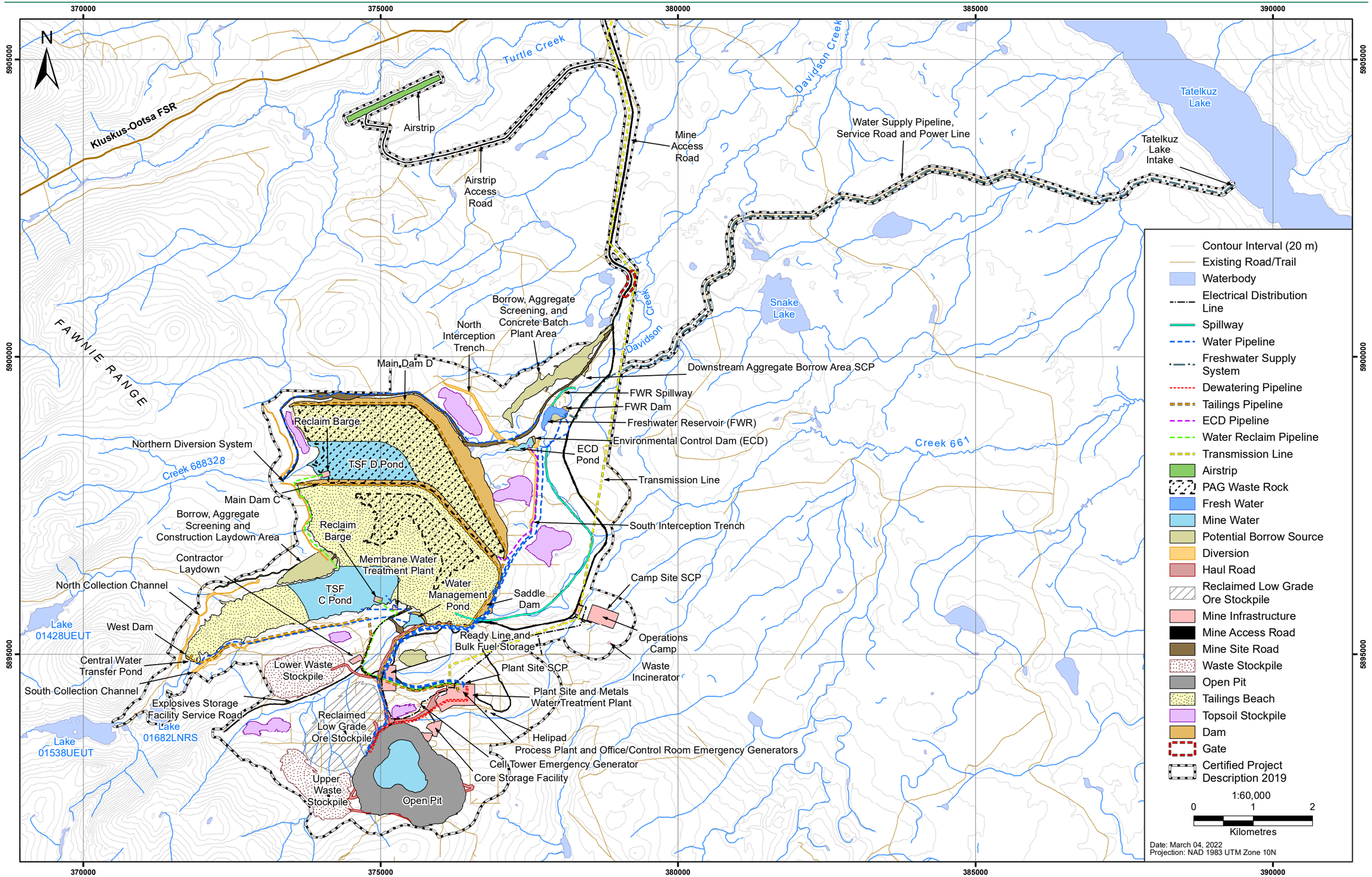


Figure 5.3-1: Mine Site General Arrangement (Year +23)

5.3.2 Processing Plant

The processing plant, located north of the Open Pit, will utilize a carbon in leach gold recovery process, with gold doré produced on-site. The plant will operate on a 5,500 kt per annum throughput from Year +1 to Year +5, 12,000 kt per annum throughput from Year +6 to Year +10, and a 20,000 kt per annum throughput from Year +11 to Year +23, the end of operations. The general arrangement for the processing plant at Year +1 is shown in Figure 5.3-2. An ore process flow diagram is presented in Figure 5.3-3.

BW Gold has integrated engineering controls to mitigate fugitive dust emissions from the processing plant, which includes active dust collection, wet grinding, enclosures, and stack emissions (Ausenco 2021). These controls are outlined below.

Active Dust Collection

Active dust collection systems will be installed in the following areas:

- Primary crusher – baghouse collector including blower and ducting with pickups at jaw crusher feeder and vibrating grizzly discharge;
- Secondary and tertiary crusher – baghouse collector including fan and ducting with pickups at screen feed and discharge chutes and cone crusher feeder head;
- Reclaim tunnel – cartridge style collector including fan and ducting with pickups at each reclaim feeder discharge;
- Fire Assay Main Lab – cartridge style dust collector – dust collection system services the electric cupellation and diesel-fired fusion furnace;
- Fire Assay Lab Sample Preparation – cartridge style sample preparation dust collector; and
- Lime Silo – cartridge style dust collector baghouse exhaust will contain lime dust and ambient air

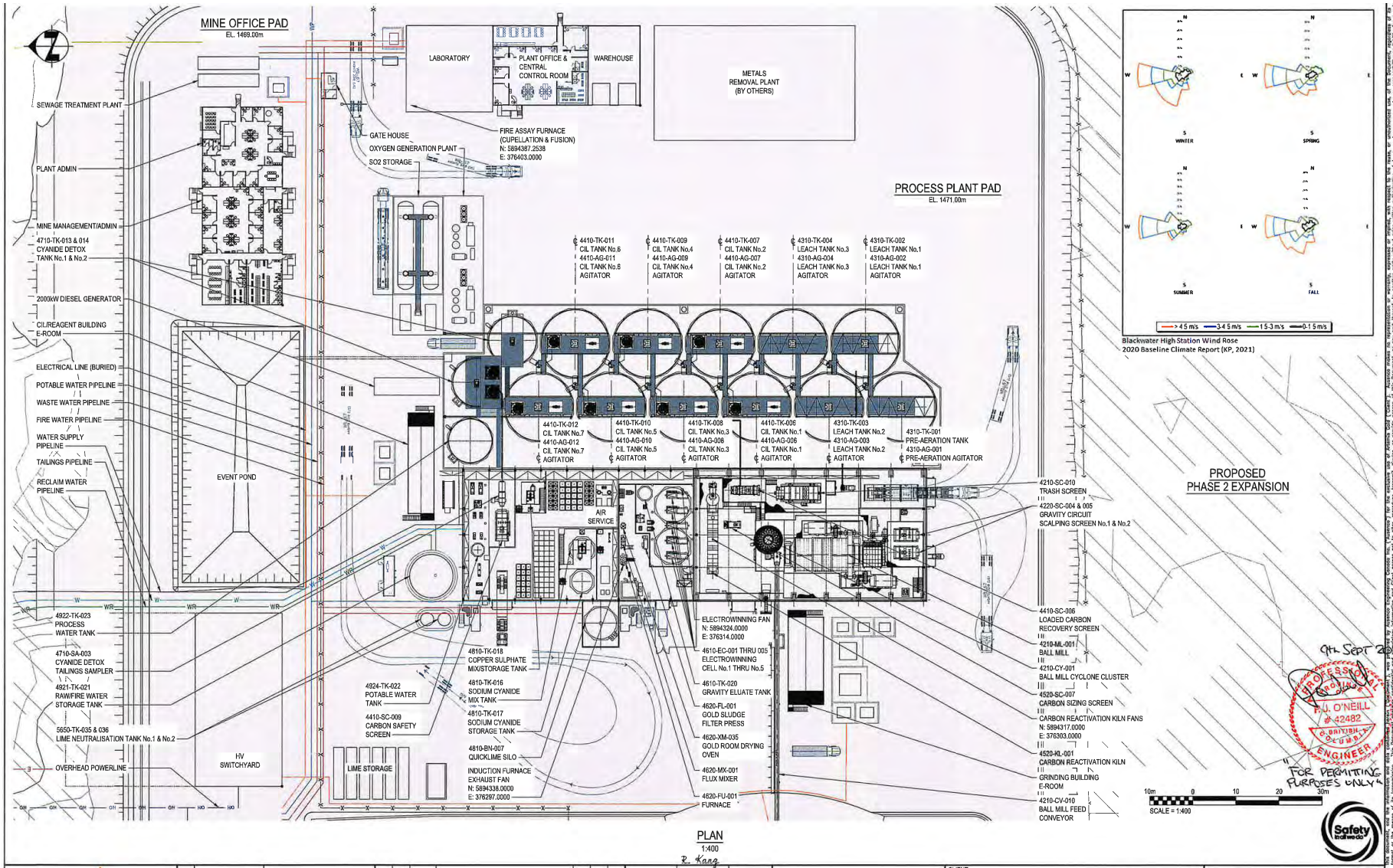
Wet Grinding

Wet grinding will be utilized for the grinding circuit. This medium is more energy efficient than dry grinding and eliminates dust associated with the ore grinding process.

Enclosures

Most handing and processing equipment at the Plant Site will be contained in enclosures to limit fugitive dust emissions. These enclosures and associated heating, ventilation and air conditioning (HVAC) considerations include:

- Primary crusher (building will be enclosed, cladded, insulated and heated);
- Secondary and tertiary crusher (building will be enclosed, cladded, insulated, and heated);
- Stockpile cover (will be enclosed, covered without insulation or HVAC;
- Reclaim tunnel (will be enclosed, without insulation or heating [HVAC – ventilation only]); and
- Mill building/ wet process plant (will be enclosed, cladded and insulated [HVAC – heated to 10 ºC minimum and ventilated]).



PLAN
1:400

P. Kang

ARTEMIS GOLD INC

REF.	DRAWING No.	REFERENCE DRAWING	No.	BY	DATE	REVISION DETAILS	CHKD	ENG	APPR
			D	RK	09SEP2021	RE-ISSUED FOR PERMITTING	IC	NW	PO
			C	RK	02SEP2021	ISSUED FOR CLIENT REVIEW	IC	NW	PO
			B	RK	19MAR2021	ISSUED FOR PERMITTING	IC	NW	PO
			A	RK	19MAR2021	ISSUED FOR INTERNAL REVIEW	IC		

DRAWN	R. KANG	16MAR2021
DWG. CHECKED	I. CORMIER	18MAR2021
DESIGNED	R. KANG	16MAR2021
DES. APPR.	N. MYERS	19MAR2021
PROJ. APPR.	P. ONEILL	19MAR2021

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CLIENT: ARTEMIS GOLD

TITLE: BLACKWATER PROJECT
PERMITTING
PROCESS PLANT AREA
PLAN

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PROJECT No. 105177-03 | SCALE 1:400 | SIZE A1

DRAWING No. 105177-0000-G-101 | REV D

Figure 5.3-2: Blackwater Process Plant Area Site Plan

Source: Ausenco (2021; Appendix 3-F)

Figure 5.3-3: Ore Process Flow Diagram

Source: Ausenco (2021).

Stack Emissions

Stack emissions will be generated by the following components (height in metres above ground):

- Rotary kiln (grinding building; 15 m);
- Propane smelting furnace (associated with electrowinning and refinery in gold room; 15 m); and
- Strip solution boiler (15 m).

5.3.3 Tailings Storage Facility

The TSF comprises two adjacent sites, TSF Site C and TSF Site D and four embankments (Site C Main Dam, Site D Main Dam, Site C Saddle Dam, and Site C West Main Dam). The TSF is designed to permanently store tailings and potentially acid generating waste rock, provide water for processing, and support mine site water balance management. During operations, tailings will be delivered by gravity via a pipeline from the processing plant to either TSF Site C or TSF Site D.

Tailings beaches will be developed and maintained throughout the life of mine for each dam. Tailings beaches prevent direct contact of the pond supernatant with dam embankments and limits the infiltration of seepage into the embankment. The particle size distribution of the tailings samples were approximately 44% fine sand, 46% silt, and 10% clay. The tailings are fairly coarse with good packing density and low rheology.

5.3.4 Stockpiles

Upper and Lower Waste Stockpiles

Two stockpiles will store NAG overburden (OVB) and NAG waste rock from stripping and open pit mining. The Upper Waste Stockpile will be located west of the Open Pit and has a planned maximum capacity of 31 Mt. The Lower Waste Stockpile will be located between the TSF and explosives storage road and has a planned maximum capacity of 29 Mt.

Low Grade Ore Stockpile

The Low Grade Ore (LGO) Stockpile will store ore prior to processing. The stockpile will be located northwest of the open pit with a planned maximum capacity of approximately 111 Mt. The LGO will be completely processed by Y +23.

Topsoil Stockpiles

During the mine life, reclamation materials (i.e., topsoil with subsoil, organic soil) will be salvaged and stored for use in progressive or final reclamation. The total estimated volume of potentially salvageable soil is 8.46 Mm^3. There will be seven soil stockpiles on the proposed mine site. Stockpiles will be seeded with non-propagating grass species, native grasses and forbs, and tree and shrub species to reduce erosion and invasive-species establishment and to control fugitive dust dispersal.

5.3.5 Borrow and Aggregate Crushing and Screening Areas

Eight borrow areas will be developed in Year -2 in order to produce aggregate to construct mine infrastructure and include:

- Mine site borrow area;
- Borrow, aggregate screening, and construction laydown area;

- TSF C additional borrow area;
- TSF C North borrow area;
- TSF C South borrow area;
- TSF D borrow areas;
- Freshwater reservoir borrow area; and
- Borrow, aggregate screening and concrete plant area.

Two aggregate crushing and screening plants will produce concrete aggregates, structural fills, road general fills, sub base and base coarse fills. The primary aggregate plant will be associated with the borrow area, aggregate screening and concrete batch plant area. The second plant will be located in a borrow and aggregate screening and construction laydown area.

5.3.6 Concrete Batch Plants

Two concrete batch plants will be mobilized in Year -2. A high volume plant (100m^3/hr) will operate during construction with the second plant available during peak pouring periods and as a backup to the 100 m^3/hr plant. Both dry mix concrete batch plants will be winterized and located adjacent to the crushed aggregate storage area in the mine access borrow area.

5.3.7 Refuse Incinerator

A putrescible refuse incinerator (CY-2050-FA) is located at 53.1923 N and 124.81354 W. The incinerator will be utilized during all Project phases. The incinerator is authorized to burn a maximum of 1.1 tonnes/day of the following:

- Putrescible camp waste;
- Paper;
- Cardboard, and
- Lumber scraps that cannot be recycled.

BW Gold plans to use the incinerator as permitted. Incinerator ash is disposed of in accordance with existing approval for the facility, *Environmental Management Act* Permit #106530. Ash is deposited in an off-site landfill. If operational conditions change such that an ash landfill is required, a landfill will be located, permitted and constructed. Any excess waste above and beyond what the permitted incinerator can process will be disposed of in an alternate manner, for example taken off-site for disposal. As the site develops and head count increases, consideration will be given to expanding site incineration capacity if the waste generated exceeds the permitted capacity of the existing incinerator.

6. IDENTIFICATION OF POTENTIAL AIR EMISSION SOURCES

Fugitive dust is the primary source of air emissions. Potential dust sources include material handling/ re-handling, construction and use of unpaved roads, blasting, compaction, drilling, grading, material (including ore) loading and unloading, and ore processing. Erodible surface areas such as stockpiles and the TSF beach) are also sources of fugitive dust.

Table 6-1 provides an overview of the Project activities anticipated to emit fugitive dust by Project phase. Table 6-2 provides further detail on dust emissions by Project component, further illustrated by Figure 6-1. Table 6-3 identifies emission sources and predicted emissions of total suspended particulate (TSP), particulate matter less than 10 µm (microns) in diameter (PM_{10}), particulate matter less than 2.5 µm in diameter ($PM_{2.5}$), carbon monoxide (CO), nitrogen oxides (NO_x); and sulphur dioxide (SO_2).

Non-dust air emission sources include mine fleet exhaust (multiple), backup diesel generators (x6), NO_x and SO_2 from blasting and the existing diesel-fired putrescible waste incinerator. Additional air emission sources include the processing plant and associated refinery system, which include: rotary kiln (15 m stack), propane smelting furnace (15 m stack), and strip solution boiler (15 m stack).

Table 6-1: Activities Resulting in Fugitive Dust by Project Phase

Construction	Operations	Closure	Post-closure
■ Land clearing and earthworks for all on-site and off-site Project components ■ Construction and use of unpaved access and mine site roads ■ Surface blasting, drilling, and material handling for starter pits ■ Construction of Project-owned roads ■ Construction of the transmission line ■ Construction of the freshwater supply system ■ Construction of TSF dams, and interim environmental control dam (ECD) ■ Material handling/re-handling at Lower and Upper Waste stockpiles, LGO and topsoil stockpiles, borrow areas, and laydown areas ■ Construction of water management structures (e.g., diversion channels) ■ Aggregate extraction from borrow pits ■ Borrow and aggregate screening areas ■ Concrete batch plants ■ Parking lot and road grading	■ Pit slopes ■ Surface blasting and mining activities during open pit operations ■ Ore extraction in the open pit ■ Ore transport to the processing plant ■ Ore processing ■ Construction of TSF Main Dam D and Final ECD ■ Wind erosion from exposed TSF beach and stockpiles ■ Land clearing and earthworks associated with production ramp ups ■ Use of unpaved surfaces including the mine site haul roads ■ Material handling/ re-handling at Lower and Upper Waste stockpiles, LGO and topsoil stockpiles, borrow areas, and laydown areas ■ Borrow and aggregate screening areas ■ Parking lot and road grading	■ Pit slopes ■ Earthworks, land forming and soil stockpile rehandling ■ Use of unpaved mine site roads ■ Wind erosion from exposed TSF beach ■ Parking lot and road grading	■ Pit slopes above inundation level ■ Use of unpaved mine site roads ■ Parking lot and road grading

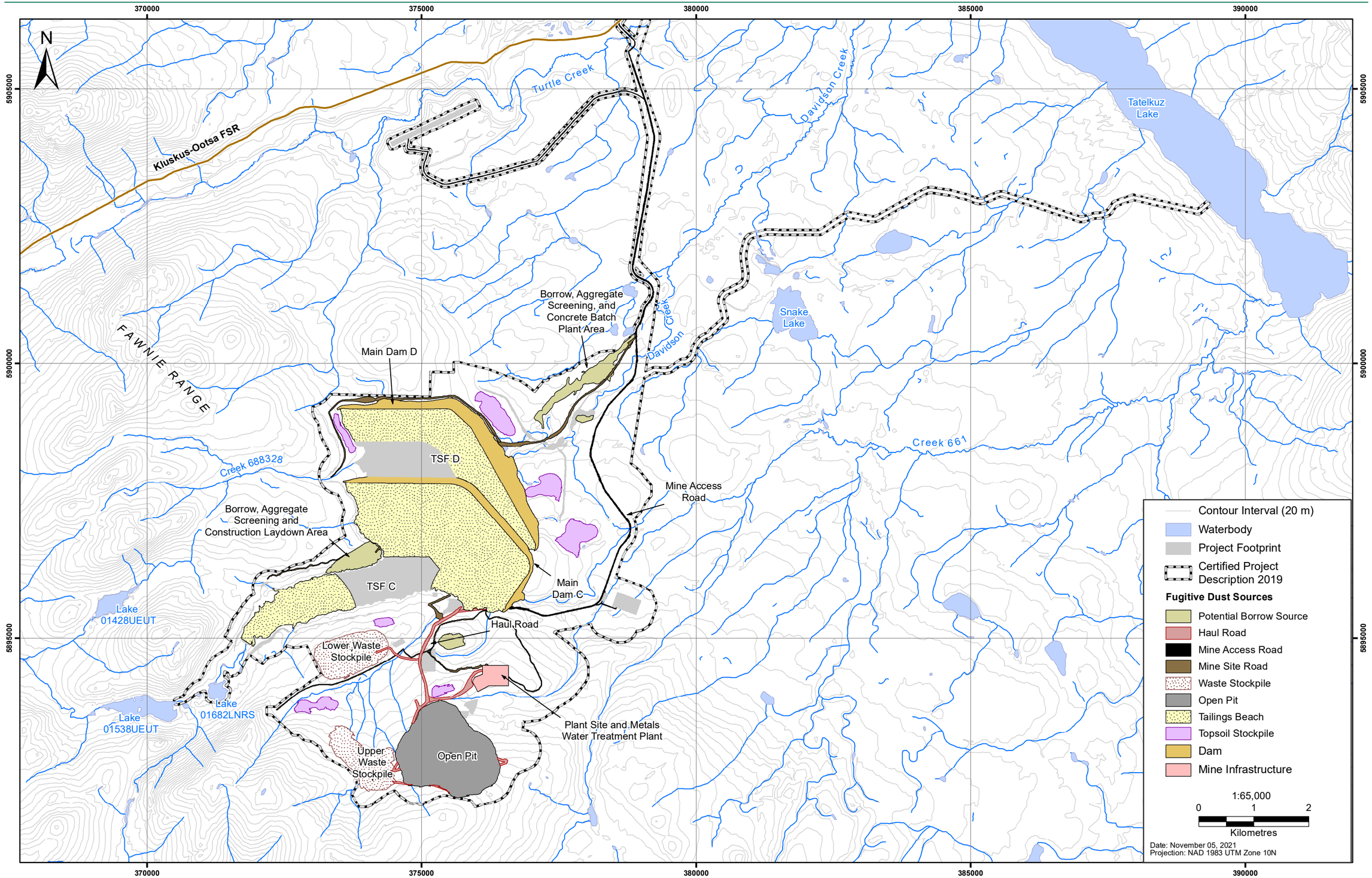


Figure 6-1: Project Components with Potential to Generate Fugitive Dust

Table 6-2: Fugitive Dust Emission Sources by Project Component

Component	Location	Potential Source	Dust-generating Material	Generating Conditions	Additional Comments
Open Pit	Figure 6-1	OVB and waste rock removal, blasting, drilling, material handling/ re-handling, vehicle traffic	OVB, waste rock, ore, aggregate, waste rock	Any conditions	Pit will become deeper and wetter as it is developed, mitigating fugitive dust
TSF, Site C and Site D Main dams, Site C Saddle and West dams	Figure 6-1	Excavation (drilling and blasting), compaction, material placement and handling, vehicle traffic	Waste rock, tailings	Windy, dry, hot days or extremely cold weather	TSF will expand and begin to inundate upstream dam faces as it is developed, mitigating dust
TSF beach	Figure 6-1	Wind erosion, blasting, drilling, vehicle traffic	OVB, waste rock, aggregate, tailings	Windy, dry, hot days or extremely cold weather	
Concrete batch plants	Figure 6-1	Material handling	Cement, aggregate	Any conditions	Active during Construction phase and intermittent use thereafter; Plants will conform to Code of Conduct for Concrete Batch plants (BC Reg. 329/2007)
Aggregate screening areas	Figure 6-1	Material handling/ re-handling, vehicle traffic	aggregate	Windy, dry, hot days or extremely cold weather	
Borrow areas	Figure 6-1	Material handling/ re-handling, vehicle traffic	OVB, waste rock and aggregate	Windy, dry, hot days or extremely cold weather	
Processing plant (located at Plant Site)	Figures 5.3-2; 5.3-3; 6-1	Conveyor drop, primary crusher building, Secondary and tertiary crusher building, reclaim tunnel, rotary kiln, propane smelting, fire assay furnace	Ore	Windy, dry, hot days or extremely cold weather	Covered conveyors; baghouse collector systems
Upper and Lower Waste stockpiles	Figure 6-1	Wind erosion, material handling, vehicle traffic	OVB and waste rock	Windy, dry, hot days or extremely cold weather	

Component	Location	Potential Source	Dust-generating Material	Generating Conditions	Additional Comments
LGO stockpile	Figure 6-1	Wind erosion, material handling/ re-handling, vehicle traffic	Ore	Windy, dry, hot days or extremely cold weather	Until stockpile is fully processed by Y+23
Topsoil stockpiles	Figure 6-1	Wind erosion, material handling, vehicle traffic	Topsoil	Wind, dry, hot days or extremely cold weather	Until stockpiles are vegetated
Freshwater Reservoir and dam	Figure 6-1	Excavation (drilling and blasting), compaction, material placement and handling, vehicle traffic	Cement, aggregate	Windy, dry, hot days or extremely cold weather	
Interim, and final Environmental Control dams	Figure 6-1	Excavation (drilling and blasting), compaction, material placement and handling, vehicle traffic	Cement, aggregate	Windy, dry, hot days or extremely cold weather	
TSF, mine site haul and service roads	Figure 6-1	Vehicle traffic, grading	Aggregate	Any conditions	
MAR	Figure 6-1	Vehicle traffic, grading	Aggregate	Windy, dry, hot days or extremely cold weather	

Table 6-3: Operations Emission Sources and Predicted Emissions

Emission Source	Maximum Emissions (tonnes/day)					
	TSP	PM_{10}	$PM_{2.5}$	SO_2	NO_X	CO
Material Handling	4.40	1.63	0.34	-	-	-
Unpaved Road (Haul Roads)	3.29	0.72	0.089	0.0015	2.17	0.091
Unpaved Roads (FSR+MAR)	0.57	0.14	0.014	1.1E-04	0.018	0.0056
Dump/Storage Areas	6.02	3.01	0.45	-	-	-
Incinerator	0.041	0.041	0.038	0.0022	0.0054	0.065
Processing Plant	0.0051	0.0022	6.0E-04	-	-	-
Refinery System	1.8E-04	1.8E-04	1.5E-04	3.7E-05	0.048	0.028
Fired Sources	0.049	0.049	0.047	0.026	0.38	0.12
Total Emissions	**14.38**	**5.59**	**0.98**	**0.03**	**2.62**	**0.31**

7. IDENTIFICATION OF POTENTIAL EFFECTS OF FUGITIVE DUST

7.1 Air Quality Objectives and Parameters of Concern

The *Canadian Environmental Protection Act, 1999* establishes National Ambient Air Quality Objectives (NAAQOs) and Canadian Ambient Air Quality Standards (CAAQS) to protect human health and the environment. BC has established Ambient Air Quality Objectives (AAQOs) pursuant to the *Environmental Management Act*. Federal and BC air quality objectives are provided in Table 7.1-1 and are non-legally binding limits. As even low levels of air pollution can affect some individuals, air quality objectives should not be viewed as levels that can be 'polluted up to', but levels to stay well below.

Table 7.1-1: Federal and BC Ambient Air Quality Objectives

Contaminant	Averaging Period	Objectives/Standards (µg/m^3)				
		Federal[a,b,c,d]			British Columbia[e]	
		Maximum Desirable	Maximum Acceptable	Maximum Tolerable	BCAAQO[f]	CAAQS[g]
TSP	24-hour	-	120	400	120	
	Annual	60	70	-	60[h]	
PM_{10}	24-hour	-			50	
$PM_{2.5}$	24-hour	27 to 28[i]			25[j]	28[k]
	Annual	8.8 to 10[l]			8[m]	10[n]
CO	1-hour	15,000	35,000	-	14,300	
	8-hour	6,000	15,000	20,000	5,500	
NO_2	1-hour	79 to 113[o]			188[p]	113[q]
	Annual	23 to 32[r]			60[s]	32
SO_2	1-hour	170 to 183[t]			196[u]	183[v]
	Annual	10 to 13[w]			13[x]	

Sources: [a] CCME 1999, [b] Government of Canada 2013, [c] Government of Canada 2017a, [d] Government of Canada 2017b, and [e] ENV 2020.

Notes:

µg/m^3 = micrograms per cubic metre; mg/dm^2/d = milligrams per square decimetre per day; TSP = total suspended particulate; PM_{10} = Particulate matter less than 10 µm (microns) in diameter; $PM_{2.5}$ = Particulate matter less than 2.5 µm (microns) in diameter; CO = carbon monoxide; NO_2 = nitrogen dioxide; SO_2 = sulphur dioxide

"-" signifies that no air quality objective is available.

[f] BC AAQO.

[g] CAAQS.

[h] Based on geometric mean.

[i] CAAQS is 28 µg/m^3 in 2015 and 27 µg/m^3 in 2020 (CCME 1999); compliance based on annual 98th percentile value, averaged over three consecutive years.

[j] Achievement based on annual 98th percentile of daily average, over one year.

[k] Achievement based on annual 98th percentile of daily average, averaged over three consecutive years.

[l] CAAQS is 10 µg/m^3 in 2015 and 8.8 µg/m^3 in 2020 (CCME 1999); compliance based on the average over three consecutive years.

[m] Achievement based on annual average, over one year. There is a planning goal of 6 µg/m^3.

[n] Achievement based on annual average, averaged over three consecutive years.

(o) CAAQS is 113 µg/m^3 from December 2017 through December 2024 and 79 µg/m^3 as of January 2025 (Government of Canada 2017a); compliance based on a three-year average of the annual 98th percentile of the daily 1-hour maximum concentration (D1HM).

(p) Interim provincial AAQO, currently under review. Achievement based on annual 98th percentile of D1HM, over 1 year.

(q) Achievement based on annual 98th percentile of D1HM, averaged over three consecutive years.

(r) CAAQS is 32 µg/m^3 from December 2017 through December 2024 and 23 µg/m^3 as of January 2025 (Government of Canada 2017a); compliance based on a one-calendar-year average of all the 1-hour average concentrations.

(s) Interim provincial AQO, currently under review.

(t) CAAQS is 183 µg/m^3 from October 2017 through December 2024 and 170 µg/m^3 as of January 2025 (Government of Canada 2017b); compliance based on a three-year average of the annual 99th percentile of the daily-maximum 1-hour average concentrations.

(u) Achievement based on annual 97th percentile of D1HM averaged over 2015-2017, annual 97.5th percentile of D1HM averaged over 2016-2018 and annual 98th percentile of D1HM averaged over 2017-2019, with one allowable excursion above 75 ppb to a maximum of 85 ppb over a three-year period prior to 2020. Superseded by CAAQS level and metric January 1, 2020.

(v) Achievement based on annual 99th percentile of D1HM, averaged over three consecutive years, effective January 1, 2020. Used to inform new air management decisions beginning January 1, 2017 and all air management decisions beginning January 1, 2020.

(w) CAQQS is 13 µg/m^3 from October 2017 through December 2024 and 10 µg/m^3 as of January 2025 (Government of Canada 2017b); compliance based on a one-calendar-year average of all the 1-hour average concentrations.

(x) Used to inform new air management decisions beginning January 1, 2017 and all air management decisions beginning January 1, 2020.

Particulate matter ($PM_{2.5}$ and PM_{10}) are the main parameters of concern for mining operations as they relate to human health. For the Project's human health risk assessment (HHRA), emissions of nitrogen oxides, SO_2, CO and PM ($PM_{2.5}$ and PM_{10}) were modelled to estimate concentrations at each human receptor location (including full-time residents, temporary land users and off-duty workers) for comparison with BC objectives (ERM 2021; Appendix 6-A). The HHRA considered estimated metal concentrations in dust that is predicted to be deposited at soils and vegetation sampling locations.

Figure 7.1-1 identifies sensitive receptors in relation to the Project. The closest on-site receptor is the operations camp which will house off-duty workers (Figure 7.1-1). The closest off-site receptor is Tatelkus Lake Indian Reserve 28 (Tatelkus Lake 28), located approximately 5.8 km northeast of the mine site (Figure 5.1-1).

Air dispersion modelling was conducted to predict concentrations of parameters of concern.

7.2 Air Dispersion Modelling Results and Effects

Modelling results represent a Level 3 assessment using the CALPUFF modelling system. The CALPUFF modeling system was used to prepare meteorological data, model concentrations and deposition, and to post-process results for specific pollutants and applicable averaging periods. CALPUFF was run using 2011 meteorology data. The results presented below represent predicted concentrations during the Phase 1 of the Project.

Table 7.2-1 summarizes the results of air dispersion modelling for all off-site human receptor locations, and Table 7.2-2 summarizes the results of air dispersion modelling for the operations camp. The results at all off-site receptor locations indicate there are no exceedances of applicable ambient air quality objectives, with all results being less than 80% of the objectives and hence are not considered parameters of potential concern (POPC).

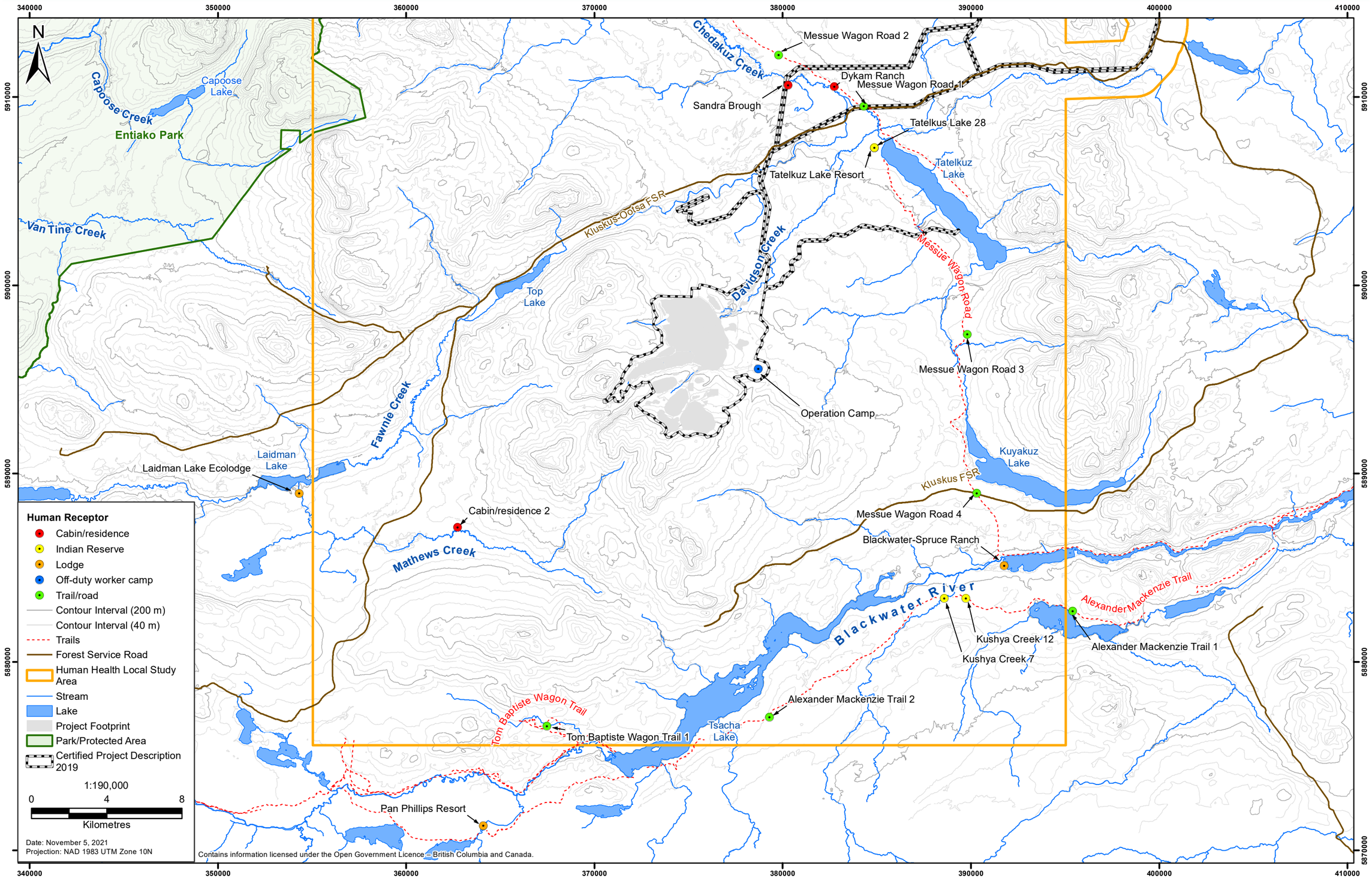


Figure 7.1-1: Air Quality Human Receptors

Table 7.2-1: Baseline Case and Project Case Concentrations for Criteria Air Contaminants for All Off-site Receptor Locations

Parameter	Averaging Period	Concentration (µg/m^3)			AAQO (µg/m^3)	POPC?	POC?
		Baseline Case	Project Only	Project Case			
$PM_{2.5}$	24-hour	4	0.4	4.4	25	No	No
	Annual		0.1	4.1	8	No	No
PM_{10}	24-hour	9	2	11	50	No	No
NO_2	1-hour	8	5	13	79	No	No
	Annual		0.3	8.3	23	No	No
SO_2	1-hour	2	1.0	3.0	170	No	No
	Annual		0.03	2.0	10	No	No
CO	1-hour	120	30	150	14,300	No	No
	8-hour		12	132	5,500	No	No

Table 7.2-2: Baseline Case and Project Case Concentrations for Criteria Air Contaminants at the Operations Camp

Parameter	Averaging Period	Concentration (µg/m^3)			AAQO (µg/m^3)	POPC?	POC?
		Baseline Case	Project Only	Project Case			
$PM_{2.5}$	24-hour	4	3.6	7.6	25	No	No
	Annual		1.0	5.0	8	No	No
PM_{10}	24-hour	9	17.9	26.9	50	No	No
NO_2	1-hour	8	29.1	37.1	79	No	No
	Annual		1.8	9.8	23	No	No
SO_2	1-hour	2	6.6	8.6	170	No	No
	Annual		0.2	2.2	10	No	No
CO	1-hour	120	197.5	317.5	14,300	No	No
	8-hour		85.0	205.0	5,500	No	No

Notes:

$PM_{2.5}$ = particulate matter less than 2.5 µm in diameter; PM_{10} = particulate matter less than 10 µm in diameter

NO_2 = nitrogen dioxide; SO_2 = sulfur dioxide; CO = carbon monoxide

AAQO = Ambient Air Quality Objective, based on the most conservative BC AAQO or CAAQS (including standards anticipated for 2025)

POPC = Parameter of Potential Concern, identified if the parameter concentration is higher than 80% of the AAQO.

POC = Parameter of Concern, identified if the parameter concentration is higher than the AAQO.

Baseline Case concentrations are from Table 2.2-4 in Chapter 2 of the Application.

Project Case concentrations include both background and Project contributions.

The HHRA (Appendix 6-A of the Application) found that predicted 24-hour ground-level $PM_{2.5}$ and PM_{10} concentrations do not result in any acute short-term exposure hazard quotient (HQ) values above 1.0 for any of the offsite sensitive receptor locations. The highest HQ values for 24-hour $PM_{2.5}$ and PM_{10} are 0.176 and 0.225 respectively, at Tatelkuz Lake Resort and Tatelkus Lake 28. The contributions of Project emissions to the total HQ for 24-hour $PM_{2.5}$ and PM_{10} are 0.016 and 0.045 respectively, based on the

effects assessment. At the operations camp, the highest HQ values for 24-hour $PM_{2.5}$ and PM_{10} are 0.304 and 0.539 respectively. The contributions of Project emissions to the total operations camp HQ for 24-hour $PM_{2.5}$ and PM_{10} are 0.144 and 0.359 respectively, based on the effects assessment. Adverse health effects for human receptors are unlikely to occur following acute short-term exposures to $PM_{2.5}$ and PM_{10}.

Predicted annual ground-level $PM_{2.5}$ concentrations do not result in any chronic HQ values above 1.0 for any of the receptor locations. The highest HQ value for annual chronic exposure to $PM_{2.5}$ at any offsite sensitive receptor is 0.512 at Tatelkuz Lake Resort and Tatelkus Lake 28. The contribution of Project emissions to the total HQ for annual chronic exposure is 0.012 based on the effects assessment. At the operations camp, the HQ value for annual chronic exposure to $PM_{2.5}$ is 0.629 with a contribution from Project emissions of 0.129. These values show that the contribution of Project emissions to the total HQ is small – maximum of 2% for offsite receptors, 21% at the operations camp, Since the total HQ values for the baseline condition and effects assessment remain less than 1.0, adverse health effects for human receptors are unlikely to occur following chronic exposure to $PM_{2.5}$.

Particulate emissions can have effects on aquatic resources and fish, vegetation, wildlife, and human health. Potential effects on the aquatic environment from dust include increase in turbidity levels which could affect habitat quality and organism health. Deposition of dust can lead to contamination of soils with metals, which may adversely affect vegetation abundance, composition, nutritional value, and toxicity. Fugitive dust can cause physical injuries to vegetation, including the alteration of photosynthetic receptors, respiration, and transpiration. Potential effects to wildlife and people include health effects from ingestion of plants and/or animals that have been exposed to chemicals contained with the dust. The amount of dust generated by haul trucks and mining equipment depend on a variety of factors including road material, waste rock moisture content, chemical composition, and the amounts of particulates ready to be emitted, known as silt content. The distance the particles will travel depends on particle size distribution (bigger particles are deposited to the ground closer to the source) and meteorological conditions. With higher winds, the higher mass concentration of larger size particles increases faster than smaller sized particles. (Haller et al. 1999).

Naturally occurring small particulates produced by forest fires can elevate $PM_{2.5}$ and PM_{10} levels above guidelines.

8. IMPLEMENTATION

The following sections present the mitigation measures, training, and monitoring that will be implemented to manage fugitive dust and confirm mitigation measures are working.

8.1 Training and Awareness

Employees and contractors will receive training in fugitive dust management and air quality awareness on their arrival on site through an environmental on-boarding training session and prior to the start of work as part of the Site Orientation. The purpose of this training is to provide all site personnel with a basic level of environmental awareness and an understanding of their obligations regarding compliance with regulatory requirements, commitments, and best practices.

Site supervisors will be provided with a copy of the AQDMP and will receive additional training with respect to the requirements that are outlined in the form of operational SOPs. Targeted training related to dust management will be provided to individuals and/or groups of workers assuming a specific authority or responsibility related to air quality. This training will be delivered by means of classroom instruction, toolbox/tailgate meetings or other means as appropriate.

BW Gold will regularly review and update the training and awareness plan based on changes in training needs and regulatory requirements.

8.2 Mitigation Measures

Site-specific mitigation measures, including best management practices, will be applied to all dust sources as listed in Table 8.2-1. In the event that measures are ineffective, contingency measures are also proposed, where relevant. Appendix D contains the Dust Emissions SOP that will be implemented during construction, operations and closure.

Table 8.2-1: Air Quality Mitigation Measures, Best Management Practices, and Contingency

Emission Source	Best Management Practices and Mitigation Measures	Contingency
Open Pit	■ Employees involved in material handling or management will receive training by a qualified person on the importance of minimizing material drop height (from excavator to truck, conveyor to stockpile, etc.) to reduce fugitive dust, noise, and vibration. ■ Ensure an available fleet of water trucks to be deployed, weather depending. ■ Use weather forecasts to inform blasting plan (e.g., wind forecast, lightning and thunder warnings).	n/a
Production drilling	■ Use wet drilling during very dry conditions (less than 0.25 mm/day of precipitation in the previous week)	n/a
Production blasting	■ Immediately prior to blasting, the “Drill and Blast Engineer / Blast Coordinator” must check weather conditions to determine if the blast is likely to cause any dust or fume impacts on the surrounding environment. ■ Where dust or fume impacts on employees and environment cannot be avoided, blasting must be postponed until weather conditions improve. The Mine Supervisor and Mine Superintendent will decide when to postpone blasting.	n/a

Emission Source	Best Management Practices and Mitigation Measures	Contingency
Concrete batch plants	■ When unloading material, piles should form low piles that extend horizontally, where practical. ■ Employees involved in material handling or management will receive training by a qualified person on the importance of minimizing material drop height (from excavator to truck, conveyor to stockpile, etc.) to reduce fugitive dust, noise, and vibration.	n/a
Aggregate crushing and screening areas	■ Equip the crusher and/or screener circuits with onboard water dosing during times of the year above freezing temperatures or other dust suppression measures (e.g., reagents) systems. ■ Apply water when temperatures are above freezing and there are very dry conditions (less than 0.25 mm/day of precipitation in the previous week). ■ Stockpiles should form low piles that extend horizontally as determined by the Construction Manager, where practical. ■ Use screener and crusher covers. ■ Check cover for tears, holes and cracks on a monthly basis. Repair as soon as possible.	n/a
TSF, Site C and Site D Main dams, Site C Saddle and West dams	■ Advance planning of weekly workload activities. ■ Apply water in non-freezing, very dry conditions (less than 0.25 mm/day of precipitation in the previous week).	■ Maintain higher water levels ■ Application of calcium chloride or magnesium chloride during freezing conditions
Freshwater Reservoir and dam	■ Advance planning of weekly workload activities. ■ Apply water in non-freezing, very dry conditions (less than 0.25 mm/day of precipitation in the previous week).	■ Application of calcium chloride or magnesium chloride during freezing conditions
Interim and Final ECD	■ Advance planning of weekly workload activities. ■ Apply water in non-freezing, very dry conditions (less than 0.25 mm/day of precipitation in the previous week).	■ Application of calcium chloride or magnesium chloride during freezing conditions
Borrow areas	■ Apply water when temperatures are above freezing and there are very dry conditions (less than 0.25 mm/day of precipitation in the previous week). ■ Employees involved in material handling or management will receive training by a qualified person on the importance of minimizing material drop height (from excavator to truck, conveyor to stockpile, etc.) to reduce fugitive dust, noise, and vibration. ■ Develop new borrow areas only when and as required (to be determined by the Mine Manager). ■ Once suitable materials have been salvaged, place topsoil on disturbed areas and seed using a native seed mix to re-establish vegetative cover as soon as reasonably possible. ■ When unloading material, piles should form low piles that extend horizontally. ■ Minimize drop height from loaders and excavators (shovels) to the truck.	n/a

Emission Source	Best Management Practices and Mitigation Measures	Contingency
Processing Plant	■ Apply water when temperatures are above freezing and there are very dry conditions (less than 0.25 mm/day of precipitation in the previous week). ■ Use screener and crusher covers. ■ Employees involved in material handling or management will receive training by a qualified person on the importance of minimizing material drop height (from excavator to truck, conveyor to stockpile, etc.) to reduce fugitive dust, noise, and vibration. ■ Baghouse, control emissions from fully enclosed conveyor. ■ Enclose conveyors. ■ Check cover for tears, holes and cracks on a monthly basis. Repair or replace as soon as possible.	n/a
Upper and Lower Waste stockpiles	■ Water stockpiles on dry windy (average wind speed above 10 m/s) days above freezing temperatures. ■ Apply calcium chloride or magnesium chloride during freezing conditions. ■ Minimize stockpile areas.	n/a
Low Grade Ore Stockpile	■ When unloading material, stockpiles should form low piles that extends horizontally. ■ Spray water on stockpiles during hot dry weather (a hot, dry day is defined as a day with less than 0.25 mm of rainfall for the preceding 24 hours and a temperature greater than 20 ºC).	n/a
Topsoil stockpiles	■ When unloading material, the piles should form low piles that extend horizontally. ■ Seed stockpiles to reduce erosion and establishment of invasive species.	n/a
MAR	■ Speed limits will be established based on road design class, with the maximum speed limit of 50 km/h on all Project roads. ■ Reduce speed limits on Project-owned roads if weather conditions cause fugitive dust emissions and dust cannot be controlled by watering. ■ Speed limits are clearly marked through signage and enforced by site security through periodic checks using a radar speed gun. Personnel caught speeding will face disciplinary measures, and if violators are encountered they will be provided with constructive instruction on the importance of adhering to speed limits to limit dust generation. ■ Manage dust emissions from roadways in accordance with the Fugitive Dust Management SOP. ■ Water roads in accordance with Section 5.1.1 (Watering) of the Fugitive Dust Management SOP. ■ Apply dust suppressant reagents after spring melt (e.g., calcium chloride, magnesium chloride or other equivalent) as approved by the Mine Manager. ■ Grader maintenance with road crush as required. ■ Regular compaction. ■ Use coarse aggregate on roads with low silt content to reduce silt loading on roads.	n/a

Emission Source	Best Management Practices and Mitigation Measures	Contingency
TSF and mine haulage and service roads	■ Speed limits will be established based on road design class, with the maximum speed limit of 50 km/h on all Project roads. ■ Reduce speed limits on Project-owned roads if weather conditions cause fugitive dust emissions and dust cannot be controlled by watering. ■ Speed limits are clearly marked through signage and enforced by site security through periodic checks using a radar speed gun. Personnel caught speeding will face disciplinary measures, and if violators are encountered they will be provided with constructive instruction on the importance of adhering to speed limits to limit dust generation. ■ Manage dust emissions from roadways in accordance with the Fugitive Dust Management SOP. ■ Water roads in accordance with Section 5.1.1 (Watering) of the Fugitive Dust Management SOP. ■ Visual inspection for dust emissions from roadways and active stockpiles – mine and Infrastructure supervisors, or designate, as well as the mine dispatch office who have a number of real-time stationary but rotating cameras with multiple angles of the open pit and haul roads will monitor for visible emissions from the trucks equipment, and active stockpiles on the site during moderate weather conditions. A hot, dry day is defined as a day with less than 0.25 mm of rainfall for the preceding 24 hours and a temperature greater than 20 ºC. ■ Ensure an available fleet of water trucks to be deployed, weather depending (non-freezing conditions). ■ Apply dust suppressant reagents after spring melt (e.g., calcium chloride, magnesium chloride or other equivalent) as approved by the Mine Manager. ■ Use coarse aggregate on roads with low silt content to reduce silt loading on roads. ■ Grader maintenance with road crush as required. ■ Regular compaction.	■ Trial installation of a fog/sprinkler system that releases small droplets of water on roadways to supress airborne dust and not cause water seepage on high traffic haul roads (e.g., primary crusher ramp, stockpile access roads).
Primary and secondary crusher circuits, conveyors and stockpile drop points	■ Install spray bar sprinklers at material transfer points to limit dust emissions. ■ During periods of air temperatures below 0 ºC, reagents can be used to limit the formation of frost balls.	n/a
Loads in transit in open beds.	■ Install removable tarps to cover truck loads of fine material. ■ Use tackifiers, if necessary, to limit fugitive dust from loads of fine material.	n/a
Vehicles	■ Maintain equipment in good working condition according to manufacturer's recommendations. ■ Restrict speeds and reducing idling. ■ Use Tier IV engines for mine fleet.	n/a

Note: n/a – not applicable.

8.3 Monitoring

The air quality monitoring program will be initiated prior to the start of construction and remain in place during all phases of the Project. Figure 8.3-1 illustrates the existing and planned monitoring sites, with further details provided in the following sections.

8.3.1 Meteorological Stations

There are two existing, automated meteorological stations (Figure 8.3-1). Table 8.3-1 provides information on the locations, parameters measured, and the available period of data. Prevailing winds have historically been observed to come from the west (see Section 5.2), which can cause fugitive dust events.

The parameters identified in Table 8.3-1 will be monitored over all phases of the Project. Data will be downloaded on a daily basis and reviewed by BW Gold employees overseen by the Environmental Manager at a minimum of a monthly basis. Data will be reviewed according to guidance in *Water and Air Baseline Guidance Document for Mine Proponents and Operators* (BC MOE 2016c).

Table 8.3-1: Blackwater Project Meteorological Stations

Station Name	Station Height	Latitude (deg N)	Longitude (deg W)	Elevation (masl)	Meteorological Parameters Monitored	Data Period Available
Low	10 m	53.29979	124.80025	1,050	Air temperature, relative humidity, precipitation, wind speed and direction, barometric pressure, snow depth, net radiation, solar radiation	August 2011 - present
High	10 m	53.18113	124.84620	1,470	Air temperature, relative humidity, precipitation, wind speed and direction, barometric pressure, snow depth, net radiation, solar radiation	July 2012 - present

8.3.2 Dustfall Monitoring

According to ENV 2020, dustfall monitoring and the dustfall Pollution Control Objectives have outdated methodology and criteria, and are no longer recommended by BC ENV. Visual monitoring of dust will be undertaken.

Mine personnel will be trained to be observant for dust related concerns which may arise. These observations, together with meteorological conditions and mitigation efforts taken to deal with a problem, will be recorded and included in monthly and annual reports. Visual monitoring will focus on areas where there are active surface earthworks, haul roads and overburden and soil stockpiles. Visual monitoring will occur on a daily basis at all locations where fugitive dust generation is occurring.

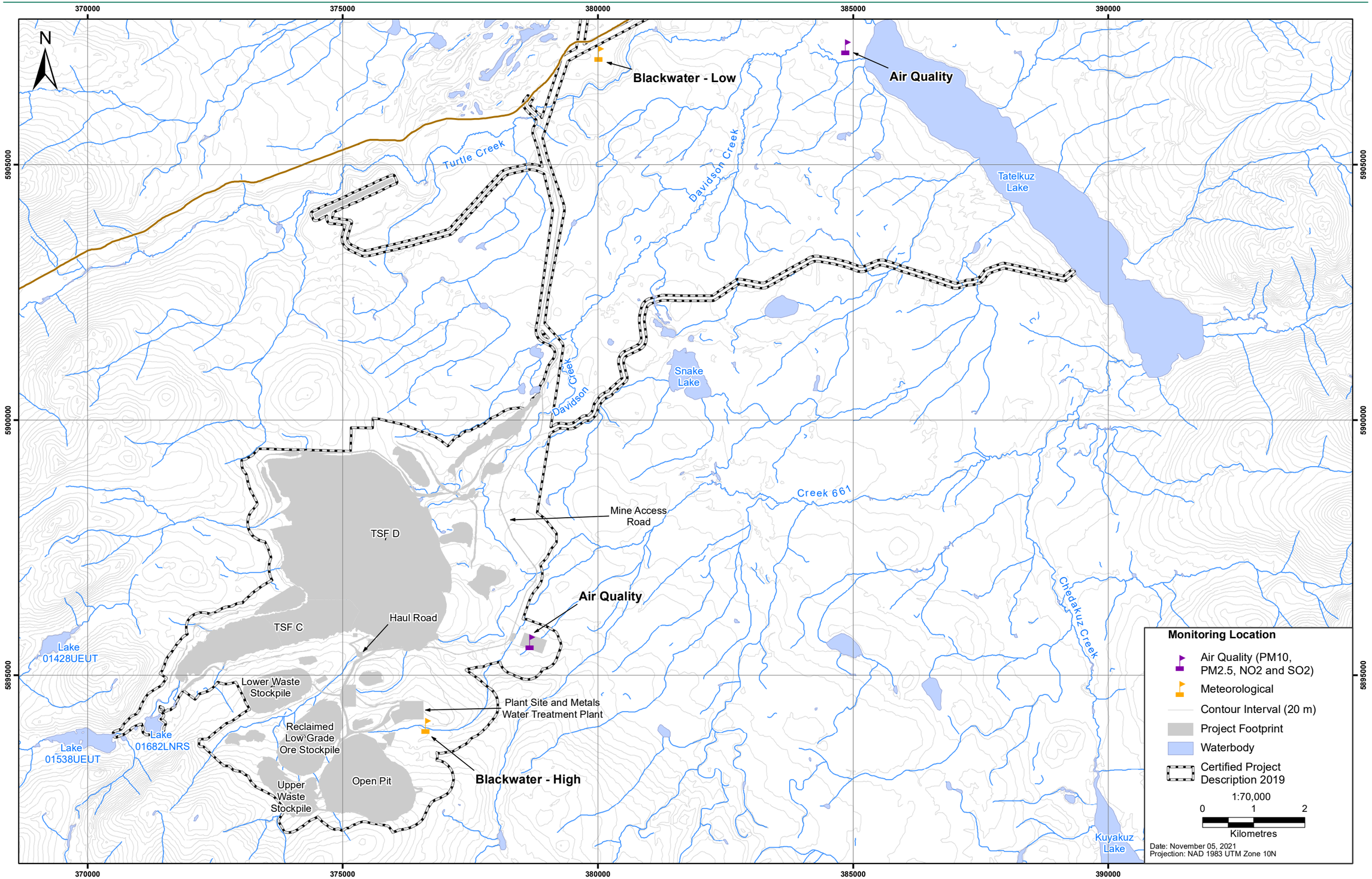


Figure 8.3-1: Air Quality Monitoring Locations

8.3.3 Particulate Matter Monitoring

A Thermo Scientific Partisol-FRM Model 2025i-D PM sampler will be installed on the mine site at the exploration camp before the start of major works construction, and moved to the operations camp at the start of operations. The camp is the nearest sensitive receptor to mine operations. The station will measure PM < 10 microns (PM_{10}) and PM < 2.5 microns ($PM_{2.5}$) mass concentrations on a 47 mm filter contained in a single-action filter change mechanism.

Samples will be collected over a 24-hour period at a target flow rate of 1 m^3/h. Sample volumes will be recorded and divided into the mass concentration to yield a 24-hour average concentration in units of µg/m^3. The Partisol sampler is suitable for a wide variety of climate conditions and meets the United States Environmental Protection Agency guidelines for manual air samplers.

Fine particulate sampling will occur every third day, alternating between $PM_{2.5}$ and PM_{10}, between May and October. During November to April, sampling will alternate between $PM_{2.5}$ and PM_{10} on a weekly basis.

8.3.4 Nitrogen Dioxide and Sulfur Dioxide Monitoring

Nitrogen dioxide (NO_2) and SO_2 will be sampled using a passive air sampling system (PASS) whereby gas pollutants are monitored by passive diffusion through a diffusive surface onto an adsorbent membrane or filter. PASS monitors will be installed at the exploration camp prior to the start of major works construction and at the operations camp at the start of operations.

Monitors will be under a protective rain shelter, attached to a supporting pole. Site personnel will collect and replace the PASS units approximately every 30 days, and submit the units to an accredited laboratory for analysis.

PASS laboratory results will be reviewed for sample integrity issues and erroneous data. Field notes, chains of custody, comments from the laboratory, and professional judgement will also be considered during the review process. Invalid data will be omitted from final analyzed datasets. Because PASS sampling is passive, hourly NO_2 and SO_2 concentrations cannot be sampled using this method and therefore will not be compared against the hourly CAAQS.

8.3.5 Carbon Monoxide

Based on the air dispersion modelling results, CO monitoring is not recommended as CO levels are below BC air quality objectives at the human receptor locations (i.e., less than 5% of the objective). The maximum 1-hr CO concentration at any human receptor is 317 ug/m^3 while the objective is 14,300 ug/m^3. The maximum 8-hr CO concentration is 205 ug/m^3 while the objective is 5,500 ug/m^3.

8.3.6 Point Source Discharge Monitoring

The following point source monitoring will be undertaken as per Table 8.3-2, and the results thereof submitted to ENV as part of annual reporting requirements. The sampling and analyses must be conducted once every five years.

The baghouses and dust suppression systems will be operated and maintained in accordance with the manufacturer’s specifications.

The operating pressure drop for the baghouses will be maintained within the design conditions specified by the manufacturer’s performance warranty. The baghouses will be equipped with a gauge or meter, which indicates the pressure drop across the control device. If the manufacturer's specifications are unavailable then the pressure drop will not be less than 1.0 inches of water column or more than 10.0 inches of water column.

Table 8.3-2: Blackwater Project Point Sources

Source	Parameter
Primary Crusher	Total Particulate Matter
Secondary and Tertiary Crusher	Total Particulate Matter
Reclaim Tunnel	Total Particulate Matter
Fire Assay Main Lab	Total Particulate Matter
Fire Assay Lab Sample Preparation	Total Particulate Matter
Lime Silo	Total Particulate Matter
Rotary kiln	Total Particulate Matter Methane Ammonia Carbon Dioxide Carbon Monoxide
Propane smelting furnace	Total Particulate Matter
Strip solution boiler	Total Particulate Matter Nitrogen Dioxide Carbon Monoxide

BW Gold will comply with the manufacturers recommended schedule for inspecting and maintaining control equipment. If the inspection frequency is not specified by the manufacturer, recommended inspection and maintenance activities will be conducted at least once per quarter.

8.3.7 Quality Assurance / Quality Control

The quality assurance/quality control (QA/QC) program for air quality will include:

- Use of standard field data sheets and SOPs (e.g., for calibration of the Partisol and PASS sampling equipment) for field sampling and data collection;
- Review of data once transferred to a database to minimize the potential for transcription errors;
- Appropriate training for field personnel responsible for collecting samples;
- Use of chain of custody (COC) forms and CALA-accredited laboratory for analysis of samples;
- Duplicate dustfall metals samples collected at each dustfall monitoring site; and
- Appropriate laboratory-based QA/QC programs, consistent with the requirements of the British Columbia Environmental Laboratory Manual (BC ENV 2020a).

8.4 Community Feedback Mechanism

Pursuant to DS Condition 6.3, BW Gold will establish a feedback mechanism to manage input and complaints related to exposure to dust from the Project during construction, operation and decommissioning. Complaints may arise from Project-related use of the FSRs between Vanderhoof and the Project site. Monitoring activities will include a review of any complaints received from the public related to fugitive dust and air quality and an initial response within 48 hours. Complaints will be carefully investigated, tracked and logged, contributing factors that may have resulted in the complaint, and any actions that were undertaken and follow-up to address the complaint. Complaints may require a more in-depth root cause analysis and result in modification of the Plan.

In the event that COPC limits and corresponding concentration triggers identified in Section 9 (Adaptive Management Trigger Action Response) of the AQDMP are exceeded, BW Gold will notify the EAO, ENV, EMLI, Northern Health and Aboriginal Groups and Independent Environmental Monitor. As required by EAC Condition 20, the notification will include both a technical report and a plain language summary of the technical report. The report will be public by posting it to the Blackwater Project website.

9. ADAPTIVE MANAGEMENT AND FOLLOW-UP PROGRAM

The AQDMP is a living document that will evolve over time in response to the results of the monitoring program, changing conditions or development at the Project, updates to scientific methods, and through consultation and discussions with Indigenous Nations, regulators, or other stakeholders. This process of continuous improvement with changing conditions is referred to as adaptive management.

Condition 6.12 of the DS requires BW Gold to develop an air quality follow-up program (AQFP) as follows:

> *The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, a follow-up program to verify the accuracy of the environmental pertains to adverse environmental effects of the Designated Project on the health of Indigenous Peoples as a result of changes to air quality and determine the effectiveness of mitigation measures. As part of the implementation of the follow-up program, the Proponent shall monitor nitrogen dioxide (NO_2), sulfur dioxide (SO_2), fine particulate matter ($PM_{2.5}$), particulate matter (PM_{10}), dust, and carbon monoxide (CO) in air. The Proponent shall implement the follow-up program during all phases of the Designated Project and shall apply conditions 2.9 and 2.10 when implementing the follow-up program.*

The federal DS requirements related to follow-up and adaptive management are:

> *"2.5 The Proponent shall, where a follow-up program is a requirement of a condition set out in this Decision Statement, have a Qualified Professional, where such a qualification exists for the subject matter of the follow-up program, determine, as part of the development of each follow-up program and in consultation with the party or parties being consulted during the development, the following information:*
>
> *2.5.1 the follow-up activities that must be undertaken by a qualified individual;*
>
> *2.5.2 the methodology, location, frequency, timing and duration of monitoring associated with the follow-up program;*
>
> *2.5.3 the scope, content, format and frequency of reporting of the results of the follow-up program;*
>
> *2.5.4 the levels of environmental change relative to baseline conditions that would require the Proponent to implement modified or additional mitigation measure(s), including instances where the Proponent may require Designated Project activities to be stopped; and*
>
> *2.5.5 the technically and economically feasible mitigation measures to be implemented by the Proponent if monitoring conducted as part of the follow-up program shows that the levels of environmental change referred to in condition 2.5.4 have been reached or exceeded.*
>
> *2.6 The Proponent shall update and maintain the follow-up and adaptive management information referred to in condition 2.5 during the implementation of each follow-up program in consultation with the party or parties being consulted during the development of each follow-up program."*

Condition 3 of the EAC requires an adaptive management plan to provide a framework for identifying triggers to determine effectiveness of mitigation and whether additional mitigation is required to address air quality effects. The adaptive management plan, as defined in Condition 3(d) to 3(l) of the EAC, must include at least the following:

> *"3(d) the monitoring program that will be used including methods, location, frequency, timing and duration of the monitoring;*
>
> *3(e) the baseline information that will be used, or collected where existing baseline information is insufficient, to support the monitoring program;*

3(f) the scope, content and frequency of reporting of the monitoring results;

3(g) the identification of qualitative and quantitative triggers, which, when observed through monitoring required under paragraph d), will require the Holder to alter existing, or develop new, mitigation measures to avoid, reduce, and/or remediate effects;

3(h) methods that will be applied to detect when a numeric trigger, or type or level of change referred to in paragraph g) occurs;

3(i) a description of the process for and timing to alter existing mitigation measures or develop new mitigation measures to reduce or avoid effects;

3(j) identification of the new and/or altered mitigation measures that will be applied when any of the changes identified in paragraphs a) to c) occur, or the process by which those will be established and updated over the relevant timeframe for the specific condition;

3(k) the monitoring program that will be used to determine if the altered or new mitigation measures and/or remediation activities are effectively mitigating or remediating the effects and or avoiding potential effects; and

3(l) The scope, content and frequency of reporting on the implementation of altered or new mitigation measures."

9.1 Air Quality Trigger Response Framework

Triggers are provided for the following action levels of the adaptive management framework: none, and low, medium; and high. The framework is intended to provide an early-warning system such that when defined action levels are triggered there is sufficient time to prevent irreversible adverse environmental effects to health of Indigenous Peoples.

The air quality adaptive management triggers and responses are provided in Table 9.1-1. The actions that will be taken are based on visual inspections of fugitive dust on the MAR and mine site roads, and fine PM (PM_{10} and $PM_{2.5}$) and SO_2 and NO_2 measurements at the operations camp. The following guideline has been used as triggers to identify the appropriate action level in the adaptive management framework: British Columbia Ambient Air Quality Objectives (BC ENV 2020c) for particulate matter and gases such as nitrogen dioxide and sulfur dioxide.

It is important to note that appropriate action responses resulting from dust observations are quite different than appropriate action responses resulting from fine PM measurements. When visible dust is observed, typically the source of the dust will be evident, and the mitigation measures are well-defined as shown in Table 9.1-1.

Fine PM concentrations will be measured on a 24-hour basis every three days during summer and weekly during winter and there will be a delay between the measurement date and reporting results after weighing the filter for the 24-hour period. Additionally, unlike a visible dust observation, the source of the elevated fine PM concentration may or may not be immediately apparent. Some analysis may be required to determine the cause and specify appropriate corrective action(s). This analysis will involve determining the operational and/or meteorological conditions that were present during the elevated PM event and determining if operational changes should be implements to limit emissions. For these reasons, the action/response associated with each level of alert is expressed in terms of how quickly the analysis and response is to be carried out. It is possible that fugitive dust will contribute to fine PM concentrations, and thus actions taken in response to visual observations may be part of the response for elevated fine PM. The actions/responses for fine PM listed in Table 9.1-1 are triggered based on 24-hour measurements since annual averages will only be known on an annual basis. As part of the adaptive management process the frequency of elevated 24-hour fine PM concentrations and the rolling average of fine PM concentrations will be tracked and evaluated to provide assurance that the standards and objectives are achieved.

Table 9.1-1: Trigger Action Response

Component	Location	Level	Trigger	Management Response
Fugitive Dust	Unpaved Roads	None	■ Dust plume less than half the height of a haul truck tire.	■ No action. Continue work in accordance with site management procedures.
		Low	■ Dust plume less than half the size of a haul truck for any period of time up to 30 minutes.	■ Limited watering of high traffic areas. ■ Repeat visual inspection every 2 hours depending on weather.
		Medium	■ Dust plume same size as a haul truck extending beyond local area for periods longer than half a day.	■ Continuous watering of high traffic areas until dust plume subsides. ■ Speed limit restrictions in high traffic areas.
		High	■ Dust plume greater than the size of a haul truck for periods longer than 1 day, or when dust plumes extend beyond the active mine area/infrastructure.	■ Increase frequency of watering and if not successful examine longer use of alternative dust suppressants (e.g., calcium or magnesium chloride, lignin compounds, environmentally friendly oils or clay additives). ■ Speed limit restrictions may be required if dust cannot be controlled by watering. ■ Closure of certain routes may be required if dust cannot be controlled by watering or speed restrictions.
	Surface Earthworks	None	■ Minor localized dust during construction and normal mine operations.	■ No action. Continue work in accordance with site management procedures.
		Low	■ Visible dust plumes rising over 2 m above the active construction area for longer than 30 minutes.	■ Minimize material movement in areas with active construction or operation and heavy equipment use.
		Medium	■ Triggers per level 1 but with dust plume extending beyond local area for periods longer than half a day.	■ Application of water to exposed construction area (if this is a source).
		High	■ Extensive areas of dust generation with large dust plumes for periods longer than 1 day or when dust plumes extend beyond the active mine area/ infrastructure.	■ Increase frequency of watering and if not successful apply gravel to exposed construction area (if this is a source). ■ Investigate long term solutions if dust plumes persist.
	Stockpiles	None	■ Minor localized dust during construction and normal mine operations.	■ No action. Continue work in accordance with site management procedures.
		Low	■ Visible dust plumes rising over 2 m above the ground for longer than 30 minutes.	■ Turn on spray bar sprinklers. ■ During periods where temperature are below freezing add reagents to control dust.

Component	Location	Level	Trigger	Management Response
Fugitive Dust *(cont'd)*	Stockpiles *(cont'd)*	Medium	■ Triggers per level 1 but with dust plume extending beyond local area for periods longer than half a day.	■ Increase the rate of water application using spray bar sprinklers. During periods where temperature are below freezing, add reagents to control dust.
		High	■ Extensive areas of dust generation with large dust plumes for periods longer than 1 day or when dust plumes extend beyond the active mine area/infrastructure.	■ Examine the possibility of re engineering the spray bar sprinklers to provide more effective water coverage of transfer points.
	Material handling transfer locations	None	■ Minor localized dust during construction and normal mine operations.	■ No action. Continue work in accordance with site management procedures.
		Low	■ Visible dust plumes rising over 2 m above the ground for longer than 30 minutes.	■ Turn on spray bar sprinklers. ■ During periods where temperature are below freezing add reagents to control dust.
		Medium	■ Triggers per level 1 but with dust plume extending beyond local area for periods longer than half a day.	■ Increase the rate of water application using spray bar sprinklers. ■ During periods where temperature are below freezing, add reagents to control dust.
		High	■ Extensive areas of dust generation with large dust plumes for periods longer than 1 day or when dust plumes extend beyond the active mine area/infrastructure.	■ Examine the possibility of re engineering the spray bar sprinklers to provide more effective water coverage of transfer points.
Fine PM	Operations Camp	None	The annual average PM_{10} and $PM_{2.5}$ concentration is: ■ at or below the Baseline Case annual average concentration; but ■ below the predicted concentrations and the Ambient Air Quality Objective.	■ No action. Continue monitoring.
		Low	The annual average PM_{10} and $PM_{2.5}$ concentration is: ■ higher than the Baseline Case annual average concentration; but ■ below the predicted concentrations and the Ambient Air Quality Objective.	■ Continue monitoring. ■ Develop causal analysis and associated mitigations in addition to a schedule for implementation based on the exceedance level.

Component	Location	Level	Trigger	Management Response
Fine PM *(cont'd)*	Operations Camp *(cont'd)*	Medium	The annual average PM_{10} and $PM_{2.5}$ concentration is: ■ higher than the Baseline Case annual average concentration; and ■ higher than the predicted annual average concentration plus 50%; but ■ below the Ambient Air Quality Objective.	■ Develop causal analysis and associated mitigations in addition to a schedule for implementation. ■ Increase sampling frequency to every other day.
		High	The annual average PM_{10} and $PM_{2.5}$ concentration is: ■ higher than the Baseline Case annual average concentration; and ■ higher than the predicted annual average concentration plus 50%; and ■ higher than the Ambient Air Quality Objective.	■ Implement mitigations developed at the medium action level. ■ Increase sampling frequency to daily.
SO_2 and NO_2	Operations Camp	None	The annual average SO_2 and/or NO_2 concentration is: ■ higher than 50% of the Baseline Case annual average concentration; but ■ below the predicted concentrations and the Ambient Air Quality Objective.	■ No action. Continue monitoring.
		Low	The annual average SO_2 and/or NO_2 concentration is: ■ higher the Baseline Case annual average concentration; but ■ below the Ambient Air Quality Objective.	■ Continue monitoring. ■ Develop causal analysis and associated mitigations in addition to a schedule for implementation based on the exceedance level.
		Medium	The annual average SO_2 and/or NO_2 concentration is: ■ higher than the Baseline Case annual average concentration; and ■ higher than the predicted annual average concentration plus 50%; but ■ below the Ambient Air Quality Objective.	■ Develop causal analysis and associated mitigations in addition to a schedule for implementation. ■ Increase sampling frequency to every other day.

Component	Location	Level	Trigger	Management Response
SO_2 and NO_2 *(cont'd)*	Operations Camp *(cont'd)*	High	The annual average SO_2 and/or NO_2 concentration is: ■ higher than the Baseline Case annual average concentration; and ■ higher than the predicted annual average concentration plus 50%; and ■ higher than the Ambient Air Quality Objective.	■ Implement mitigations developed at the medium action level. ■ Increase sampling frequency daily.

The EM or a qualified person will be responsible for calculating the 3-month rolling average $PM_{2.5}$ concentration and will evaluate the frequency of occurrence of elevated 24-hour fine PM concentrations. Based on the findings, the EM may propose modifications to emissions control equipment and/or to dust management monitoring and amend the AQDMP. In addition, the EM will compare measurements to predictions from the effects assessment and make recommendations regarding modifications to mitigation measures if warranted.

If there is an air quality advisory issued by ENV that affects the region where the mine is located, the EM will determine if an adjustment to a higher alert level described in Table 9.1-1 is required to further mitigate dust emissions.

9.2 Follow-up Program

To determine if modified or additional mitigation measures are required the results of the monitoring program will be compared to the predicted concentrations of criteria air contaminants shown in Tables 7.2-1 and 7.2-2. The predicted concentrations are considered to be baseline concentrations for the purposes of the FUP. None of the baseline concentrations reported in Tables 7.2-1 and 7.2-2 exceeded ambient air quality standards.

If the monitoring program shows exceedances of the criteria air contaminant standards shown in Table 7.1-1 then additional mitigation measures including contingency measures described in Table 8.2-1 will be considered and implemented where required. The final determination of which additional mitigation will be required will be based on an analysis of the causes of the exceedances. The FUP will, over time, inform the monitoring program and adaptive management to improve mitigations, and result in closer tracking of predicted results with monitored results:

- Low = exceed baseline – continue monitoring
- Medium = exceed baseline and predicted – continue monitoring, develop casual analysis (if observed concentrations are approaching the guidelines)
- High = exceed baseline, predicted, and guideline – implement mitigations plan, increase sampling frequency, etc.

10. REPORTING AND RECORD KEEPING

10.1 Reporting

10.1.1 Environmental Management Act *Annual Reporting*

Environmental Management Act permits for mine projects require annual reports be submitted to ENV. Annual reports are public documents and include a summary of environmental incidents, all monitoring under permits, an assessment of the data by a qualified professional, and recommendations as appropriate. The reporting must also conform to the requirements outlined in Developing a Fugitive Dust Management Plan for Industrial Projects (BC EMMPR & ENV, 2018) which require that adaptive management be used to evaluate the effectiveness and direct continual improvement of the AQDMP. Separate reports or sections of the annual report are expected for air, refuse and water/receiving environment (BC MOE 2016a).

BW Gold will follow reporting requirements in Technical Guidance 4 (BC MOE 2016b) and any amendments or updates thereto.

10.1.2 Decision Statement Annual Reporting

Annual reporting and information sharing requirements in the federal DS applicable to this plan are identified below. Conditions 2.11, 2.12, 2.13 and 2.14 identify annual reporting and information sharing requirements as follows:

- Condition 2.11 requires *"The proponent [BW Gold] shall, commencing in the reporting year during which the proponent begins the implementation of the conditions set out in the DS, prepare an annual report that describes the activities undertaken by the proponent [BW Gold] in the reporting year to comply with each condition in the DS"* as well as other matters identified in the Condition.
- Condition 2.12 requires "*The proponent [BW Gold] shall provide a draft annual report in condition 11 to Indigenous groups, no later than June 30 following the reporting year to which the annual report applies. BW Gold shall consult the Indigenous groups on the content and findings in the draft annual report"*.
- Condition 2.13 requires *"The proponent [BW Gold] in consideration of any comments received from Indigenous groups pursuant to condition 2.12, shall revise and submit to the Agency [Impact Assessment Agency of Canada] and Indigenous groups a final annual report, including an executive summary in both official languages, no later than September 30 following the reporting year to which the annual report applies"*.
- Conditions 2.14 requires:
  - *"The Proponent [BW Gold] shall publish on the Internet, or any medium which is publicly available, the annual reports and the executive summaries..."*. Names and contact information will be removed from the annual reports to protect confidentiality.
  - "*The Proponent [BW Gold] shall keep these documents publically available for 25 years following the decommissioning of the Designated Project"*.
  - *"The Proponent [BW Gold] shall notify the Agency and Indigenous groups of the availability of these documents within 48 hours of their publication".*

In addition, the DS Condition 6.15 requires that the results of the follow up program be communicated in plain language to Indigenous Groups and the relevant authorities as discussed in Section 10. This will be satisfied through the Annual Report.

10.1.3 Environmental Assessment Certificate #M19-01 Annual Reporting

Condition 5 of the EAC sets out reporting requirements. BW Gold will submit a report to the attention of the Environmental Assessment Office and Aboriginal Groups on the status of compliance with EAC #M19-01 at the following times:

a. at least 30 days prior to the start of Construction;

b. on or before March 31 in each year after the start of Construction;

c. at least 30 days prior to the start of Operations;

d. on or before March 31 in each year after the start of Operations;

e. at least 30 days prior to the start of Closure;

f. on or before March 31 in each year after the start of Closure until the end of Closure;

g. at least 30 days prior to the start of Post-Closure; and

h. on or before March 31 in each year after the start of Post-Closure until the end of Post-Closure.

10.2 Record Keeping

The EM will be responsible for ensuring dust events are logged, including details of the on-site activities, meteorological conditions, and the management actions taken. The EM will also be responsible for ensuring that analysis and mitigation for any fine PM event is completed in a timely manner. Records will be maintained for:

- Public complaints;
- Meteorological stations;
- Dust visual observations;
- Particulate matter monitoring; and
- Nitrogen dioxide and SO_2 monitoring.

Monitoring data will be entered into an electronic database and have quality control checks completed upon receipt of results. Data will be entered into a standard format that allows for data reporting and analyses. Data and data comparisons will be stored in a single file format for each type of survey or monitoring activity. Monitoring records will be maintained and retained in accordance with Conditions 12.1 and 12.2 of the federal DS respectively. The records will be made available upon request.

11. PLAN REVISIONS

The AQDMP will be reviewed annually to: review the monitoring program; confirm that the measures in the plan are being implemented; and identify any improvements to ensure effectiveness of fugitive dust best management practices. AQDMP revisions will be required:

- If the monitoring program shows that the effects of the Project are not mitigated to the extent contemplated or predicted in the Application/EIS (New Gold 2015) or exceed adaptive management triggers;
- There are new and /or changes to emission sources; and
- There are changes to other relevant management plans and regulatory requirements.

Proposed revisions to the AQDMP will be reviewed and discussed with the Blackwater Environment Committee and EMC (members include representatives from ENV, EMLI, FLNRORD and Aboriginal Groups) prior to adopting and implementing the changes to the AQDMP. As required by EAC #M19-01 Condition 20, the plan and any amendments thereto, will be implemented to the satisfaction of a qualified professional throughout construction, operations, and closure and to the satisfaction of the EAO. Revised draft and final versions of the AQDMP will be provided to EAO, EMC, and Northern Health.

12. QUALIFIED PROFESSIONALS

This management plan has been prepared and reviewed by the following qualified professionals:

Prepared by:	Reviewed by:
Andres Soux, M.Sc. Principal Consultant	Rolf Schmitt, P.Geo. Technical Director

13. REFERENCES

Definitions of the acronyms and abbreviations used in this reference list can be found in the Acronyms and Abbreviations section.

Legislation and Regulations

Canadian Environmental Protection Act, 1999, SC 1999, c. 33.

Code of Practice for the Concrete and Concrete Products Industry, BC Reg. 329/2007.

Declaration on the Rights of Indigenous Peoples Act, SBC 2019, c. 44.

Environmental Assessment Act, SBC 2018, c. 51.

Environmental Management Act, SBC 2003, c. 53.

Impact Assessment Act, RSC 2019, c. 28.

Mines Act, RSBC 1996, c. 293.

Open Burning Smoke Control Regulation, BC Reg. 145/93.

Sulphur in Diesel Fuel Regulation, SOR/2002-254.

United Nations Declaration on the Rights of Indigenous Peoples Act, SC 2021, c. 14.

Waste Discharge Regulation, BC Reg. 320/2004.

Secondary Sources

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BC EAO. 2019b. *Summary Assessment Report for Blackwater Gold Mine Project (Blackwater) With respect to the application by New Gold Inc. for an Environmental Assessment Certificate pursuant to the* Environmental Assessment Act, S.B.C. 2002, c. 43.

BC EAO. 2019c. *In the matter of the* ENVIRONMENTAL ASSESSMENT ACT *S.B.C. 2002, c. 43 (the Act) and in the matter of an Application for an Environmental Assessment Certificate (Application) by New Gold Inc. (Proponent) for the Blackwater Gold Project Environmental Assessment Certificate #M19-01.*

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BC MOH. 2017. *BC Guidelines for Industrial Camps Regulation*. Prepared by Health Protection Branch, Ministry of Health. https://www2.gov.bc.ca/assets/gov/health/keeping-bc-healthy-safe/industrial-camps/bc_guidelines_for_industrial_camps_regulation.pdf.

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CCME. 2020. *Guidance Document of Achievement Determination for Canadian Ambient Air Quality Standards for Nitrogen Dioxide* https://ccme.ca/en/res/gdadforcaaqsfornitrogendioxide_en1.0.pdf (Accessed April 2021).

CCME. 2020. *Guidance Document of Achievement Determination for Canadian Ambient Air Quality Standards for Sulphur Dioxide* https://ccme.ca/en/res/gdadforcaaqsforsulphurdioxide_en1.0.pdf (Accessed April 2021).

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APPENDIX A CONCORDANCE WITH ENVIRONMENTAL ASSESSMENT CERTIFICATE #M19-01 (JUNE 21, 2019)

Appendix A: Concordance with Environmental Assessment Certificate #M19-01 (June 2019)

Condition #	Description	Action/Location in the Plan
1.	**Document Review and Implementation** Where a condition of this Certificate requires the Holder to provide a plan, program or other document, the Holder must provide the plan, program or other document to the EAO and Aboriginal Groups in the timeframe referenced in such condition, unless otherwise approved by the EAO. The EAO may, within 60 days of receiving a copy of such plan, program or other document, advise that: 1. the Holder may proceed to implement the plan, program or other document with or without revisions; or 2. a revised plan, program, or other document must be provided for approval of the EAO prior to a specified activity or milestone. If the EAO advises pursuant to paragraphs (a) or (b) that changes are required to a plan, program, or other document, then the Holder must follow the instructions of the EAO in that regard. If the EAO does not advise on paragraphs (a) or (b) within 60 days of the EAO receiving a plan, program, or other document, the Holder may proceed to implement the plan, program or other document. The Holder may, or the EAO may require the Holder to, revise any plan, program or other document if the Holder or the EAO determines that the implementation of the plan, program or other document is not: 3. meeting one or more objectives of the plan, program or other document set out in the relevant condition of this Certificate; 4. having the effects contemplated or intended, as set out in the plan, program or other document itself; 5. consistent with the Certificate; or 6. consistent with changes in industry best practices or technology.	Draft AQDMP provided to Aboriginal Groups in August 2021 for review and comment.
2.	**Plan Development** Where a condition of this Certificate requires the Holder to develop a plan, program or other document, any such plan, program or other document must, at a minimum, include the following information:	
	a. purpose and objectives of the plan, program or other document;	Section 1
	b. roles and responsibilities of the Holder and Employees;	Section 3, Table 3-1
	c. names and, if applicable, professional certifications and professional stamps/seals, of those responsible for the preparation of the plan, program, or other document;	Signed by qualified professional
	d. schedule for implementing the plan, program or other document throughout the relevant Project phases;	Section 1 – the AQDMP will be implemented during construction, operations and closure
	e. means by which the effectiveness of the mitigation measures will be evaluated including the schedule for evaluating effectiveness;	Section 9.2

Condition #	Description	Action/Location in the Plan
2.	f. schedules and methods for the submission of reporting to specific agencies, Aboriginal Groups and the public and the required form and content of those reports; and	Section 10
	g. process and timing for updating and revising the plan, program or other document, including any consultation with agencies and Aboriginal Groups that would occur in connection with such updates and revisions.	Section 11
3.	**Adaptive Management** Where a condition of this Certificate requires the Holder to develop a plan, program or other document that includes monitoring, including monitoring of mitigation measures or monitoring to determine the effectiveness of the mitigation measures, the Holder must include adaptive management in that plan. The objective of the adaptive management is to address the circumstances that will require the Holder to implement alternate or additional mitigation measures to address effects of the Project if the monitoring shows that those effects: a. are not mitigated to the extent contemplated in the Application; b. are not predicted in the Application; or c. have exceeded the triggers identified in paragraph g) of this condition. The adaptive management in the plan must include at least the following: d. the monitoring program that will be used including methods, location, frequency, timing and duration of the monitoring;	Sections 4, 9
	e. the baseline information that will be used, or collected where existing baseline information is insufficient, to support the monitoring program;	n/a (the baseline information is sufficient and monitoring data will continue to be collected over the LoM)
	f. the scope, content and frequency of reporting of the monitoring results;	Section 10.1
	g. the identification of qualitative and quantitative triggers, which, when observed through monitoring required under paragraph d), will require the Holder to alter existing, or develop new, mitigation measures to avoid, reduce, and/or remediate effects;	Section 9.1, Table 9.1-1
	h. the methods that will be applied to detect when a numeric trigger, or type or level of change referred to in paragraph g), has occurred.	Section 9.1, Table 9.1-1
	i. a description of the process for and timing to alter existing mitigation measures or develop new mitigation measures to reduce or avoid effects;	Section 9.2
	j. identification of the new and/or altered mitigation measures that will be applied when any of the changes identified in paragraphs a) to c) occur, or the process by which those will be established and updated over the relevant timeframe for the specific condition;	Identification of new or altered mitigation measures will be determined based on monitoring results.

Condition #	Description	Action/Location in the Plan
3.	k. the monitoring program that will be used to determine if the altered or new mitigation measures and/or remediation activities are effectively mitigating or remediating the effects and or avoiding potential effects; and,	Monitoring results and will be used to determine if mitigation measures are effective or need to be modified. The monitoring program is described in Section 8.3.
	l. the scope, content and frequency of reporting on the implementation of altered or new mitigation measures.	Section 10.1
	If there are any requirements or mitigation measures required in the plan, program or other document for which adaptive management, or elements of adaptive management listed in paragraphs d) to l) are assessed to be not appropriate or applicable, the plan must include identification of those requirements and measures, and the rationale for that assessment.	This will be assessed in future plan updates.
4.	**Consultation** Where a condition of this Certificate requires the Holder consult a particular party or parties regarding the content of a plan, program or other document, the Holder must, to the satisfaction of the EAO: 1. provide written notice to each such party that: i) includes a copy of the plan, program or other document; ii) invites the party to provide its views on the content of such plan, program or other document; and iii) indicates: 1.1 if a timeframe for providing such views to the Holder is specified in the relevant condition of this Certificate, that the party may provide such views to the Holder within such time frame; or 1.2 if a timeframe for providing such views to the Holder is not specified in the relevant condition of this Certificate, specifies a reasonable period during which the party may submit such views to the Holder;	Draft AQDMP provided to Aboriginal Groups in August 2021 for review and comment. While BW Gold sets general timeframes for review and comments via written notice, BW Gold and Aboriginal Groups engage in ongoing communication to establish flexible timeframes agreed to by all parties.
	2. undertake a full and impartial consideration of any views and other information provided by a party in accordance with the timelines specified in a notice given pursuant to paragraph (a);	Comments from Aboriginal Groups and corresponding BW Gold responses are maintained in a tracking table. BW Gold comprehensively and impartially reviews received comments received within agreed upon timeframes on a regular basis.

Condition #	Description	Action/Location in the Plan
4.	3. provide a written explanation to each such party that provided comments in accordance with a notice given pursuant to paragraph (a) as to: 3.1 how the views and information provided by such party to the Holder have been considered and addressed in a revised version of the plan, program or other document; or 3.2 why such views and information have not been addressed in a revised version of the plan, program or other document;	Responses BW Gold provides in the tracking table include explanations on how comments from Aboriginal Groups have been addressed in a revised version of the AQMP. In cases where such comments have not been addressed in the revised version, BW Gold similarly explains its rationale for doing so.
	4. maintain a record of consultation with each such party regarding the plan, program or other document; and	BW Gold is maintaining consultation records
	5. provide a copy of such consultation record to the EAO, the relevant party, or both, promptly upon the written request of the EAO or such party. The copy of such consultation record must be provided to the EAO, relevant party, or both, no later than 15 days after the Holder receives the request for a copy of the consultation record, unless otherwise authorized by the EAO.	Potential future requirement.
20.	The Holder must retain a Qualified Professional to develop an Air Quality and Dust Management Plan. The plan must be developed in consultation with ENV, EMPR, NHA and Aboriginal Groups. The plan must include at least the following: a. the means by which the mitigation measures identified in the Mitigations Table required under Condition 43 for the valued component Air Quality will be implemented;	Section 12
	b. the means by which guidance contained in EMPR's and ENV's guidance: Developing a Fugitive Dust Management Plan for Industrial Projects (May 2018, or as updated or replaced from time to time) is addressed;	Appendix C
	c. the identification and detailed descriptions of dust-emitting sources from the Project;	Section 6
	d. the identification of environmental receptors to be monitored;	Section 8.3
	e. a compliance monitoring program, including the locations of monitoring stations and equipment that will be used to conduct the monitoring;	Section 8.3
	f. the contaminants of potential concern (COPC) and corresponding concentrations (triggers) that would cause the Holder to take corrective action to reduce contaminant concentrations to avoid adverse health effects to receptors identified in paragraph d);	Section 7.1
	g. how this plan will inform the Wildlife Management and Monitoring Plan (Condition 23), and Country Foods Monitoring Plan (Condition 41); and	Section 1.4

Condition #	Description	Action/Location in the Plan
20.	h. how the Holder will notify the EAO, ENV, EMPR, NHA, Aboriginal Groups, IEM, and the public in the event that contaminant concentration triggers identified in paragraph f) are exceeded. The notification must include both a technical report and a plain language summary of the technical report.	Section 8.4
	The Holder must provide the draft plan that was developed in consultation with ENV, EMPR, NHA, and Aboriginal Groups to ENV, EMPR, NHA, Aboriginal Groups and the EAO for review a minimum of 60 days prior to the planned commencement of Construction or as listed in the Document Submission Plan required by Condition 10 of this Certificate.	To be submitted 60 days prior to planned commencement.
	The plan and any amendments thereto, must be implemented to the satisfaction of a Qualified Professional throughout Construction, Operations, and Closure and to the satisfaction of the EAO.	Future requirement.

APPENDIX B CONCORDANCE WITH CANADIAN ENVIRONMENTAL ASSESSMENT AGENCY DECISION STATEMENT (APRIL 2019)

Appendix B: Concordance with Canadian Environmental Assessment Agency Decision Statement (April 2019)

Condition #	Description	Location in Plan
2.1 (General Conditions)	The Proponent shall ensure that its actions in meeting the conditions set out in this Decision Statement during all phases of the Designated Project are considered in a careful and precautionary manner, promote sustainable development, are informed by the best information and knowledge available at the time the Proponent takes action (including community and Indigenous traditional knowledge), are based on methods and models that are recognized by standard-setting bodies, are undertaken by qualified individuals, and have applied the best available economically and technically feasible technologies.	Section 5; Section 7; Section 8; Section 12
2.2 (General Conditions)	The Proponent shall, when mitigation is a requirement of a condition set out in this Decision Statement, give preference to avoiding the adverse environmental effect of the Designated Project over minimizing the adverse environmental effect of the Designated Project. If unable to avoid the adverse environmental effect, the Proponent shall give preference to minimizing the adverse environmental effect of the Designated Project over compensating for the adverse environmental effect of the Designated Project. If unable to minimize the adverse environmental effect, the Proponent shall compensate for the adverse environmental effect of the Designated Project.	Section 8.2; Section 8.3
2.3 (General Conditions)	The Proponent shall, where consultation is a requirement of a condition set out in this Decision Statement: 2.3.1 provide a written notice of the opportunity for the party or parties being consulted to present their views and information on the subject of the consultation; 2.3.2 provide all information available and relevant on the scope and the subject matter of the consultation and a period of time agreed upon with the party or parties being consulted, not less than 15 days, to prepare their views and information; 2.3.3 undertake a full and impartial consideration of all views and information presented by the party or parties being consulted on the subject matter of the consultation; 2.3.4 strive to reach consensus with Indigenous groups; and 2.3.5 advise the party or parties being consulted on how the views and information received have been considered by the Proponent including a rationale for why the views have, or have not, been integrated. The Proponent shall advise the party or parties in a time period that does not exceed the period of time taken in 2.3.2.	In Progress; Section 11
2.4 (Consultation)	The Proponent shall, where consultation with Indigenous groups is a requirement of a condition set out in this Decision Statement, determine and strive to reach consensus with each Indigenous group regarding the manner by which to satisfy the consultation requirements referred to in condition 2.3, including: 2.4.1 the methods of notification; 2.4.2 the type of information and the period of time to be provided when seeking input; 2.4.3 the process to be used by the Proponent to undertake impartial consideration of all views and information presented on the subject of the consultation; and	In Progress

Condition #	Description	Location in Plan
2.4 (Consultation)	2.4.4 the period of time and the means by which to advise Indigenous groups of how their views and information were considered by the Proponent.	In Progress
2.11 (Annual Reporting)	The Proponent shall, commencing in the reporting year during which the Proponent begins the implementation of the conditions set out in this Decision Statement, prepare an annual report that sets out: 2.11.1 the activities undertaken by the Proponent in the reporting year to comply with each of the conditions set out in this Decision Statement; 2.11.2 how the Proponent complied with condition 2.1; 2.11.3 for conditions set out in this Decision Statement for which consultation is a requirement, how the Proponent considered any views and information that the Proponent received during or as a result of the consultation, including a rationale for how the views have, or have not, been integrated; 2.11.4 the information referred to in conditions 2.5 and 2.6 for each follow-up program; 2.11.5 the results of the follow-up program requirements identified in conditions 3.14, 3.15, 3.16, 4.5, 5.5, 6.11, 6.12, 6.13, 6.14, 8.18.6, 8.20.5, 8.21, and 8.22 if required; 2.11.4 any update made to any follow-up program in the reporting year; 2.11.7 any modified or additional mitigation measures implemented or proposed to be implemented by the Proponent, as determined under condition 2.9 and rationale for why mitigation measures were selected pursuant to condition 2.5.4; and 2.11.8 any change(s) to the Designated Project in the reporting year.	Section 10.1.2
2.12 (Annual Reporting)	The Proponent shall provide a draft annual report referred to in condition 2.11 to Indigenous groups, no later than June 30 following the reporting year to which the annual report applies. The Proponent shall consult Indigenous groups on the content and findings in the draft annual report.	Section 10.1.2
2.13 (Annual Reporting)	The Proponent, in consideration of any comments received from Indigenous groups pursuant to condition, 2.12 shall revise and submit to the Agency and Indigenous groups a final annual report, including an executive summary in both official languages, no later than September 30 following the reporting year to which the annual report applies.	Section 10.1.2
2.15 (Information Sharing)	When the development of any plan is a requirement of a condition set out in this Decision Statement, the Proponent shall submit the plan to the Agency and to Indigenous groups prior to construction, unless otherwise required through the condition.	In Progress
6.1	The Proponent shall mitigate, during all phases of the Designated Project, emissions of fugitive dust from the Designated Project, including dust associated with vehicles on project roads.	Section 8.2, Table 8.2-1
6.3	The Proponent shall develop, prior to construction and in consultation with Indigenous groups, a protocol for receiving complaints related to the exposure to noise and dust from the Designated Project. The Proponent shall respond to any noise or dust complaint(s) within 48 hours of the complaint being received and shall implement corrective actions to reduce exposure to noise or dust in a timely manner. The Proponent shall implement the protocol during construction, operation and decommissioning.	Section 8.4

Condition #	Description	Location in Plan
6.12	The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, a follow-up program to verify the accuracy of the environmental assessment as it pertains to adverse environmental effects of the Designated Project on the health of Indigenous Peoples as a result of changes to air quality and determine the effectiveness of mitigation measures. As part of the implementation of the follow-up program, the Proponent shall monitor nitrogen dioxide (NO_2), sulfur dioxide (SO_2), fine particulate matter ($PM_{2.5}$), particulate matter (PM_{10}), dust, and carbon monoxide (CO) in air. The Proponent shall implement the follow-up program during all phases of the Designated Project and shall apply conditions 2.9 and 2.10 when implementing the follow-up program.	Section 9
6.15	The Proponent shall develop, prior to construction and in consultation with Indigenous groups and relevant authorities, and implement, during all phases of the Designated Project, a plan to communicate the results of the follow-up program referred to in conditions 6.11, 6.12, 6.13 and 6.14 in plain language to Indigenous groups and relevant authorities. The communication plan shall include the procedures to communicate, including the frequency of communication.	Section 10.1.2

APPENDIX C CONCORDANCE TABLE WITH DEVELOPING A FUGITIVE DUST MANAGEMENT PLAN FOR INDUSTRIAL PROJECTS (EMPR & ENV 2018)

Appendix C: Concordance Table with Developing a Fugitive Dust Management Plan for Industrial Projects (EMPR & ENV 2018)

Section	Description	Location in the Plan
1 Introduction	This section provides contextual background information on the project, project overview, and regulatory framework.	Section 1 Section 2
1.1 Company Information	Provide an overview including the name, organization and structure of the operating company.	Section 1.1
1.2 Permitting	Identify the permit for which this document is being developed and other relevant licences, authorizations and regulations which impact on this document.	Section 1
1.3 Purpose/Objectives and Scope	Describe the purpose and/or objectives that this plan will address.	Section 1
1.4 Authorship	A record of the development of the FDMP should be included.	Section 12
1.5 Submitted to	A record of the development and submission of the FDMP should be included.	n/a – The plan is being submitted with a Joint *Mines Act/Environmental Management Act* permit application. This application seeks authorizations for air discharges.
2 Roles and Responsibilities	Describe the roles and responsibilities for implementation of, and compliance with, the plan.	Section 3 (AQDMP)
3 Facility Description and Setting		
3.1 Site Ownership and Physical Location	Provide information on the site ownership, all relevant tenures/ permit boundaries, and the project location in relation to local communities and other sensitive receptors.	Section 5.1 and 5.2
3.2 Descriptive Overview of the Facility	Provide a brief overview of the site and activities that could result in fugitive dust.	Section 5.3
3.3 Process Flow Diagram or Description of the Facility	Provide a process flow diagram and/or use descriptions to indicate the process, operations and equipment that have the potential to emit fugitive dust.	Figure 5.3-3
3.4 Facility Site Map (Including Dust Sources)	The site map will clearly identify the locations of all fugitive dust emission sources and site features discussed in the facility description.	Figure 5.2-3
4 Identification of Potential Sources or Activities which Generate Fugitive Dust	The FDMP must contain a list of potential sources and/or activities which may generate fugitive dust.	Section 6
4.1 Source List Review	The FDMP must include a procedure to ensure the source list is reviewed on a regular schedule to reflect current conditions.	Section 11
4.2 Source List Update Procedure	Outline the procedure to take when updating or removing existing sources or adding new sources to the list established in Section 4.1	Section 11

Section	Description	Location in the Plan
4.3 Fugitive Dust Source List	The fugitive dust source list must include the following: ■ unique identification number or designation for each source; ■ location of the source within the facility (or reference id on the included site map); ■ potential source of fugitive dust; ■ factors influencing generation of dust (e.g. wind, operational activities); and ■ identification of the dust-generating material (e.g. aggregate, clean coal, road dust).	Table 6-2
5 Identification of Potential Effects of Fugitive Dust	The potential effects of dust both on and off the site should be identified.	Section 7
6 Fugitive Dust Management	The FDMP must contain a description of how fugitive dust will be managed onsite.	Section 8.2
6.1 Best Management Practices (BMP)	BMPs represent the current 'state of practice' approach to manage dust impacts and effects, and aim to produce outcomes consistent with social, economic and environmental expectations.	Table 8.2-1
6.2 Site Specific Mitigation Measures	The FDMP is most effective when it is developed to be a site-specific, operational plan.	Section 8.2
7 Plan Implementation		
7.1 Training	The plan should identify training and frequency of training of site personnel identified in the 'Roles and Responsibilities' section to ensure that they are aware of their responsibilities under the plan.	Section 8.1
7.2 Monitoring and Maintenance	Monitoring activities may include tracking of public complaints, visual inspection of facilities by site personnel, and quantitative monitoring of the environment, such as passive particulate deposition (dustfall) or active suspended particulate (TSP, PM_{10} or $PM_{2.5}$) sampling on and off site, to evaluate the effectiveness of dust control practices and to quantify levels of fugitive dust and its composition leaving the site.	Section 8.3
7.3 Trigger Action Response Plan (TARP)	The Response Plan should include specific triggers, actions to be taken, and reporting protocols.	Section 9
7.4 Record Keeping	The FDMP must include information on record keeping, including a complaint tracking tool and a record of dust events and responses.	Section 10.2
8 Adaptive Management	Adaptive management may be used to evaluate the effectiveness and direct continual improvement of the FDMP.	Section 9
9 Reporting	Outline the structure and timing of reporting, taking into account the annual reporting requirements of regulatory agencies, updates to First Nations and the public, and reporting related to the TARP (i.e., reporting out on dust events).	Section 10.1
10 References	References	Section 13.0

APPENDIX D DUST EMISSIONS STANDARD OPERATING PROCEDURE

Blackwater Gold Project

Fugitive Dust Management

STANDARD OPERATING PROCEDURE

November 2021 Version: C.1

Scope:	To define a standard operating procedure (SOP) for safe and efficient work practices to manage fugitive dust emissions from mining, including drilling, blasting, material handling and re-handling and use of the Mine Access Road, haul and service roads. The SOP provides guidance to personnel to assess working conditions to prevent excessive dust from equipment or processes.
Contacts:	Travis Desormeaux Environmental Manager tdesormeaux@artemisgoldinc.com 250.278.7788
Document Ownership:	Mine Manager

1. SCOPE

This standard operating procedure (SOP) applies to all employees, contractors, and subcontractors/vendors at the Blackwater Gold Mine (Blackwater) during construction, operation and closure.

2. RESPONSIBILITIES

Individuals with key roles and responsibilities with respect to fugitive dust management are presented in Table 2-1.

Table 2-1: Blackwater Roles and Responsibilities

Mine Manager	The Mine Manager, as defined in the Mines Act, has overall responsibility for mine operations, including the health and safety of workers and the public, Environmental Management System (EMS) implementation, overall environmental performance and protection, and permit compliance. The Mine Manager may delegate their responsibilities to qualified personnel. Reports to General Manager Development.
Construction Manager (CM)	The CM is accountable for ensuring environmental and regulatory commitments/ and obligations are being met during the construction phase. The CM is responsible for dust management during mine site construction. Reports to General Manager Development.
Environmental Manager (EM)	The EM is responsible for the day-to-day management of the Project's environmental programs and compliance with environmental permits, updating EMS and MPs. The EM or designate will be responsible for reporting non-compliance to the CM, and Engineering, Procurement and Construction Management (EPCM) contractor, other contractors, the Company and regulatory agencies, where required. Supports the CM and reports to Mine Manager.
Supervisors	Supervisors include the Construction Supervisor, Blasting Supervisor, and Production Supervisor and are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.
Departmental Managers	Departmental Managers are responsible for implementation of this SOP relevant to their areas. Report to the Mine Manager.
Employees and Contractors	Employees and contractors are responsible for being aware of the Air Quality and Fugitive Dust Management Plan, including monitoring requirements, mitigation measures, adaptive management trigger action response, and reporting and record keeping.

3. FUGITIVE DUST SOURCES

Fugitive dust is the primary air emission from the mine site. Table 3-1 lists potential fugitive dust sources by Project phase. These dust sources represent key facilities / activities that will be monitored for dust generation and receive active management, if required.

Broadly, the sources can be categorized as Construction, Road Use, Blasting, Material Handling, and Processing-related. Section 5 of this SOP provides management procedures based on these five categories.

Table 3-1: Potential Fugitive Dust Sources by Project Phase

Construction	Operations	Closure	Post-closure
■ Land clearing and earthworks for all on-site and off-site Project components ■ Construction and use of unpaved access and mine site roads ■ Surface blasting, drilling and handling for starter pits ■ Construction of Project-owned roads ■ Construction of the transmission line ■ Construction of the freshwater supply system ■ Construction of tailings storage facility (TSF) dams and interim environmental control dam ■ Material handling/re-handling at Lower and Upper Waste stockpiles, low grade ore (LGO) and topsoil stockpiles, borrow areas, and laydown areas ■ Construction of water management structures (e.g., diversion channels) ■ Aggregate extraction from borrow pits ■ Borrow and aggregate screening areas ■ Concrete batch plants ■ Parking lot and road grading	■ Pit slopes ■ Surface blasting and mining activities during open pit operations ■ Ore extraction in the open pit ■ Ore transport to the processing plant ■ Ore processing ■ Construction of TSF Main Dam D and final Environmental Control Dam ■ Wind erosion from exposed TSF beach and stockpiles ■ Construction of TSF dams ■ Land clearing and earthworks associated with production ramp ups ■ Use of unpaved surfaces including the mine site haul roads ■ Material handling/re-handling at Lower and Upper Waste stockpiles, LGO and topsoil stockpiles, borrow areas, and laydown areas ■ Borrow and aggregate screening areas ■ Parking lot and road grading	■ Pit slopes ■ Earthworks ■ Use of unpaved mine site roads ■ Wind erosion from exposed TSF beach ■ Parking lot and road grading	■ Pit slopes above inundation level ■ Use of unpaved mine site roads ■ Parking lot and road grading

4. INSPECTIONS

All Supervisors (or designates) are responsible for monitoring fugitive dust generation. They will conduct an inspection each day, at relevant sources listed in Table 3-1, during hot and dry weather. A hot and dry day is defined as having a daytime high greater than 20°C with less than 0.25 mm of precipitation in the preceding 24 hours.

5. RESPONSE PROCEDURES

5.1 Road Construction and Use

Dust mitigation associated with road construction and road use share similarities with respect to dust management. The relative size of dust plumes and the corresponding response action level are to be assessed using the guidance provided in Table 5.1-1. Further details on each response action is provided in Sections 5.1.1 to 5.1.3.

Table 5.1-1: Fugitive Dust Response Actions

Plume Size	Measure	Response Action Level
Large	Greater than the size of a haul truck	**Level 3 Alert** 1. Continuous watering of all Project roads and construction areas. 2. Speed limit restrictions may be required if dust cannot be controlled by watering. 3. Closure of certain routes or construction areas may be required if dust cannot be controlled by watering or speed restrictions.
Moderate	Same size as a haul truck	**Level 2 Alert** 1. Continuous watering of high traffic areas of Project roads. 2. Speed limit restrictions in high traffic areas if dust cannot be controlled by watering.
Small	Less than half the size of a haul truck	**Level 1 Alert** 1. Limited watering of high traffic areas of haul and service roads. 2. Repeat visual inspection every 12 hours depending on weather.
No Plume	Less than half the height of a haul truck tire	**Normal** 1. No action.

5.1.1 Watering

Watering is the primary control mechanism to manage fugitive dust on Project-owned roads and in active construction areas. Supervisors are responsible for determining which roads or specific construction areas require watering and dispatching a watering truck accordingly based on Table 5-1.

The following guidelines apply to watering:

- Watering in any area is to be carried out until the entire surface is wetted. Watering shall be controlled so there is no overland water flow. Watering must be stopped before notable surface run-off occurs. Water application is controlled by the use of a nozzle or spray application.
- Report unexpected runoff to the shift supervisor who will request maintenance or re-grading of the area.
- Use only clean water for dust suppression on roadways.
- Chemical dust suppressant (e.g., calcium chloride) shall only be used on roadways following approval from the Mine Manager.

5.1.2 Speed Limit Restrictions

Mobile equipment and light vehicles are restricted to designated routes and must abide by posted speed limits for normal activities. Speed limits are noted during site orientation and training, and are posted along roadways. Speed limits on Project-owned roads may be reduced based on weather conditions that cause higher fugitive dust emissions and dust cannot be controlled by watering.

Speed limit restrictions will be communicated by Supervisors at the start of each shift or via radio.

5.1.3 Road Maintenance

Roadways are to be maintained in good condition and inspected regularly by Supervisors. To reduce silt loading on roads, coarse aggregate is available and can be applied to areas of the roadway where significant dust generation has been noted during inspections.

5.2 Blasting

Blasting-related management measures are intended to limit fugitive dust migration. The Blasting Supervisor is responsible for the following pre-blast actions:

- Use weather forecasts to inform blasting plan (e.g., wind forecast, lightning and thunder storm warnings);
- Check weather conditions to determine if the blast is likely to cause dust or fume impacts on the surrounding environment; and
- Where dust or fume impacts on employees and environment cannot be avoided, blasting must be postponed until weather conditions improve. The Mine Manager will decide when to postpone blasting.

5.3 Material Handling

Material can include ore, overburden, topsoil or aggregates. Production Supervisors are responsible for ensuring employees and contractors implement procedures to limit fugitive dust generation from material handling as follows:

- Minimize drop height from loaders (or excavators) to trucks (or stockpiles);
- Apply water to materials when temperatures are above freezing and there are very dry conditions (less than 0.25 mm/day of precipitation in the previous week); and
- Only open new borrow areas when required.

Procedures to limit fugitive dust generation from stockpiles include:

- When unloading material, stockpiles should form low piles that extend horizontally;
- Water stockpiles on dry windy days (average wind speed above 10 m/s) above freezing temperatures, as necessary;
- Apply calcium chloride or magnesium chloride during freezing conditions;
- Minimize stockpile areas; and
- Seed topsoil stockpiles to reduce erosion and invasive-species establishment.

5.4 Processing

Production Supervisors are responsible for ensuring dust suppression and capture systems in the processing plant are functional and operating, as required. Systems include:

- Spray bar sprinklers at material transfer points; and
- Screener and crusher covers.

Screening and crusher covers should be checked for tears, holes and cracks on a monthly basis. Cover must be repaired as soon as possible or replaced.

6. REPORTING

Records of inspection, maintenance, and suppression activity will be kept onsite and available for government agency review for a period of two years. Records will include:

- Daily visual inspection log completed by Supervisors;
- Road maintenance completed (as detailed in the daily mine plan);
- Records of dust mitigation measures such as number of water trucks running (as detailed in the daily mine plan);
- Records of application of chemical dust suppressants;
- Complaint logs and follow-up actions; and
- Weather records from two on-site meteorological stations.

7. STANDARD OPERATING PROCEDURE REVIEW

Reviewed by:

Health and Safety Representative

_____	_____	_____
Print Name	Signature	Date

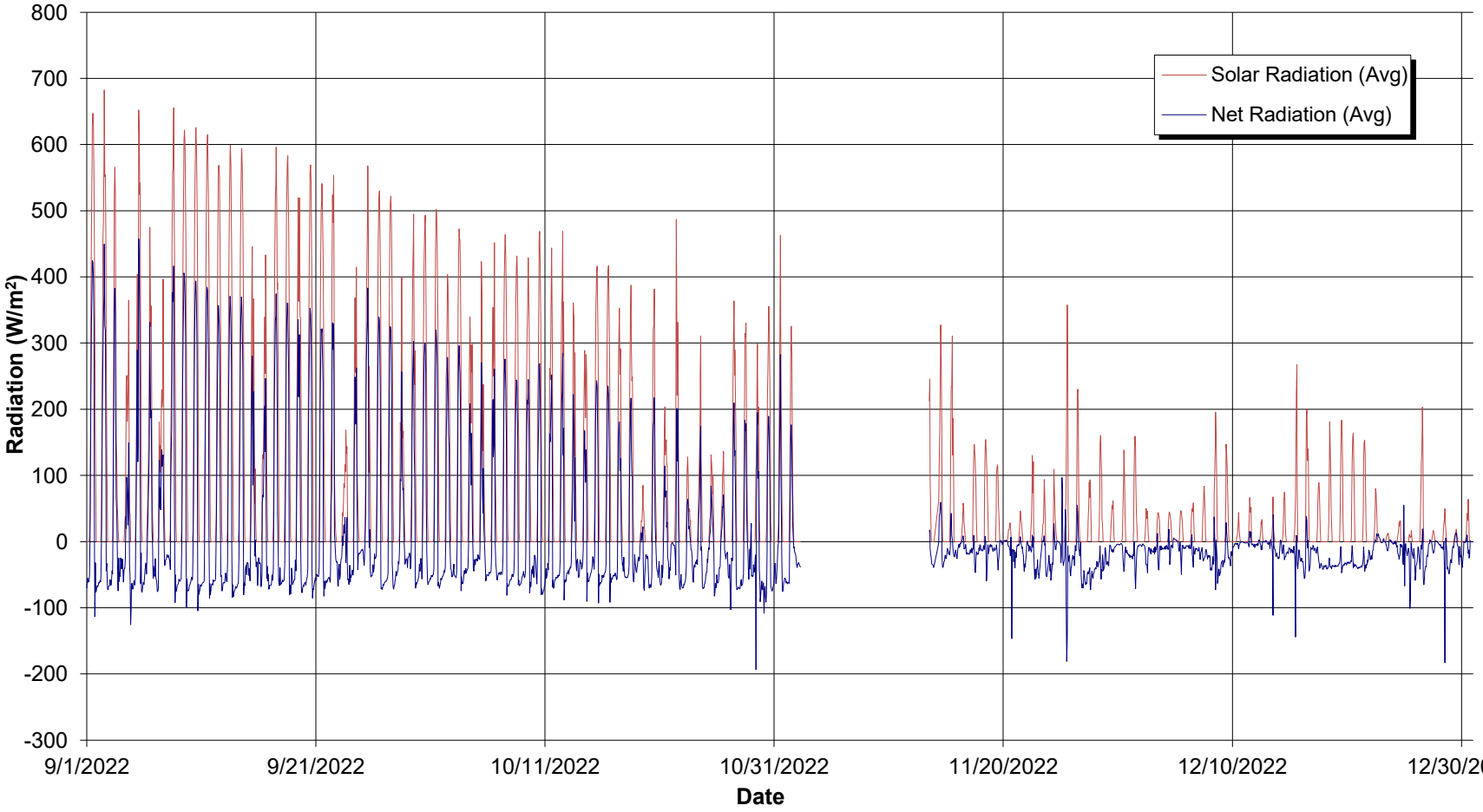
Approved by:

Mine Manager

_____	_____	_____
Print Name	Signature	Date

APPENDIX B

Meteorological Data



REV	DATE	DESCRIPTION	PREP'D	RVW'D
1	17MAR'23	ISSUED WITH TRANSMITTAL	BTN	MJB

BW GOLD LTD.

BLACKWATER GOLD PROJECT

BLACKWATER LOW METEOROLOGY STATION MEASURED RADIATION

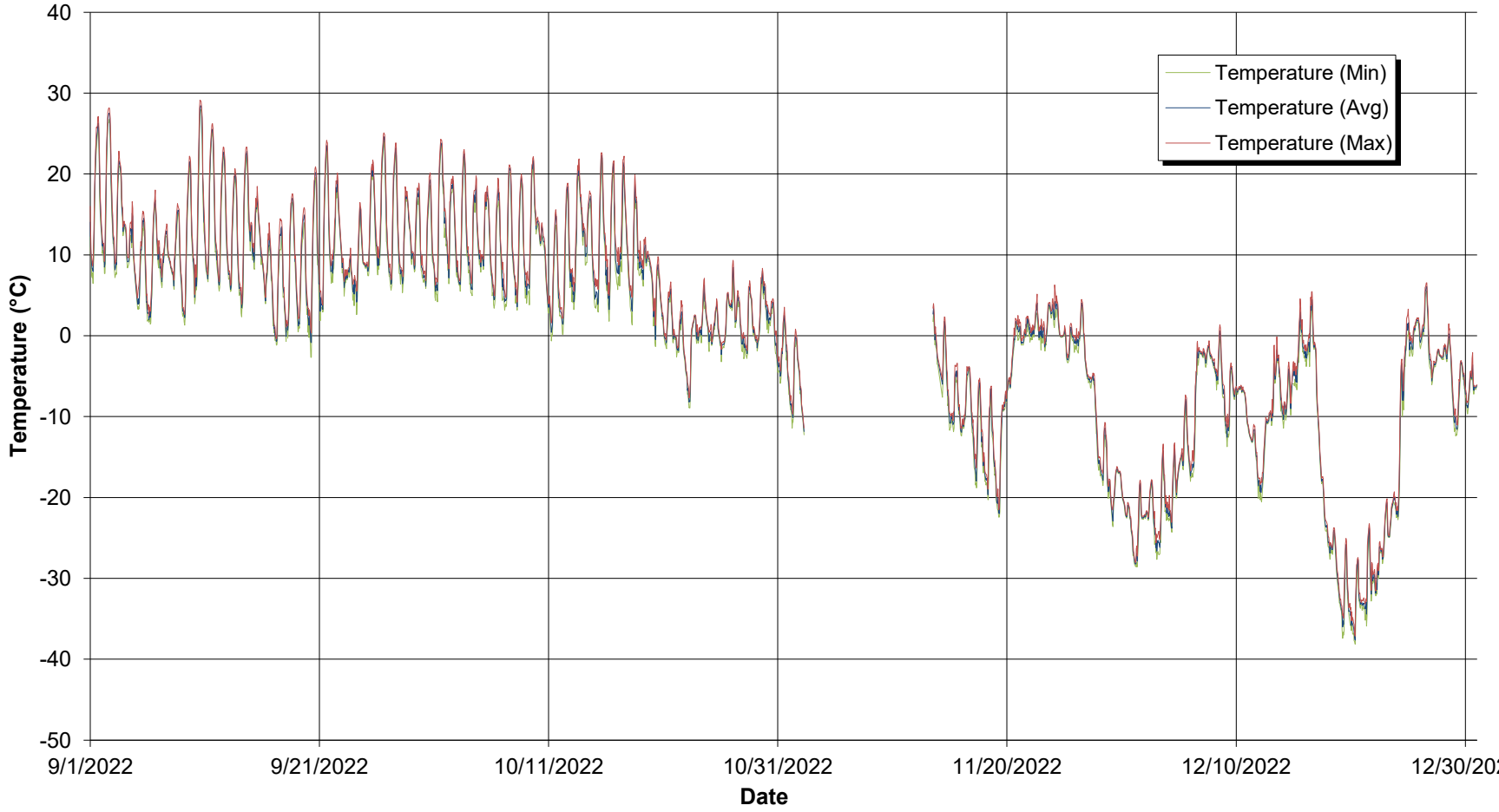
Knight Piésold CONSULTING

P/A NO. VA101-457/37

REF. NO. VA23-00437

FIGURE

REV 1



REV	DATE	DESCRIPTION	PREP'D	RVW'D
1	17MAR'23	ISSUED WITH TRANSMITTAL	BTN	MJB

BW GOLD LTD.

BLACKWATER GOLD PROJECT

BLACKWATER LOW METEOROLOGY STATION MEASURED TEMPERATURE

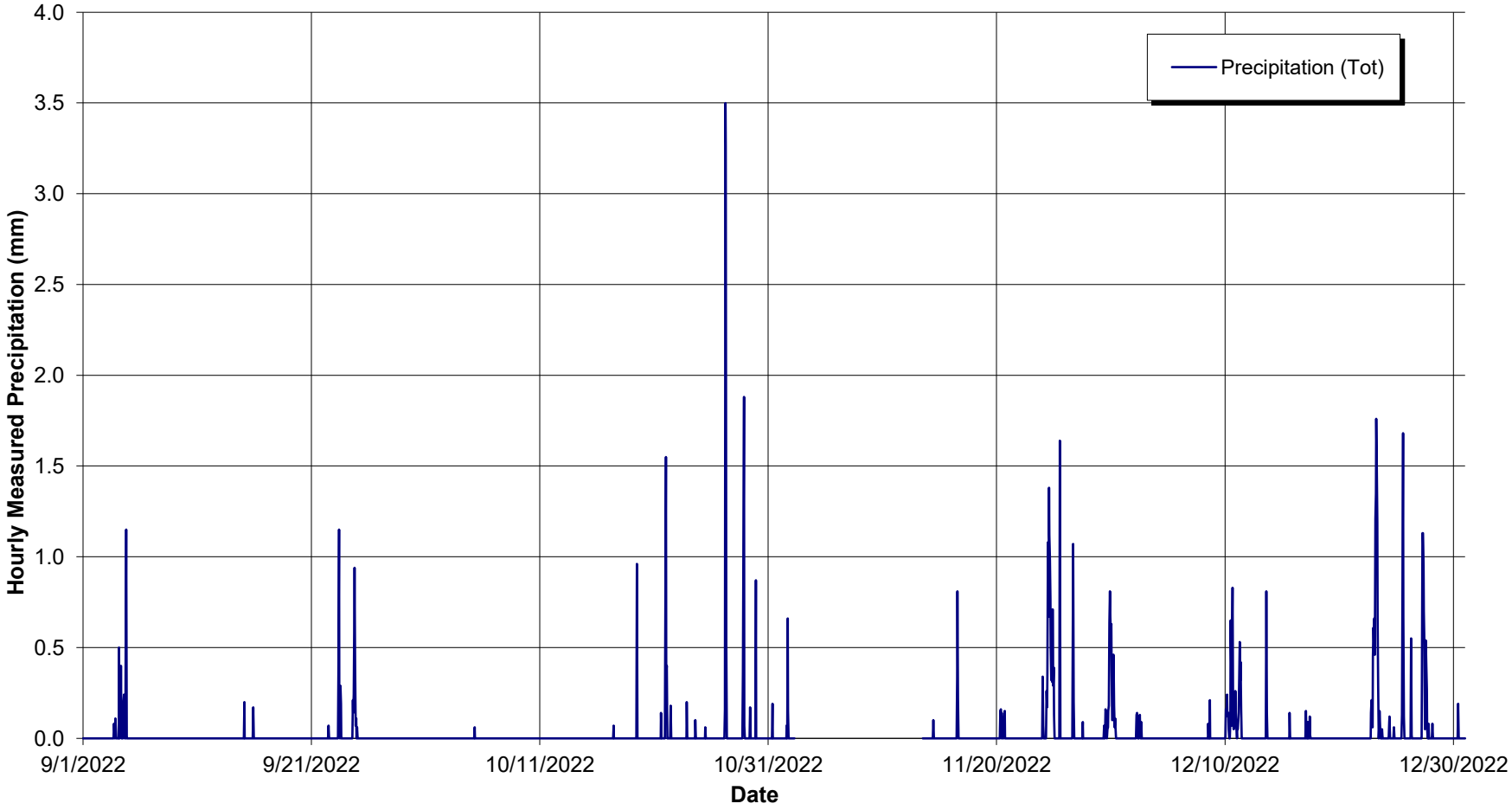
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P/A NO. VA101-457/37

REF. NO. VA23-00437

FIGURE

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REV	DATE	DESCRIPTION	PREP'D	RVW'D
1	17MAR'23	ISSUED WITH TRANSMITTAL	BTN	MJB

BW GOLD LTD.

BLACKWATER GOLD PROJECT

BLACKWATER LOW METEOROLOGY STATION MEASURED PRECIPITATION

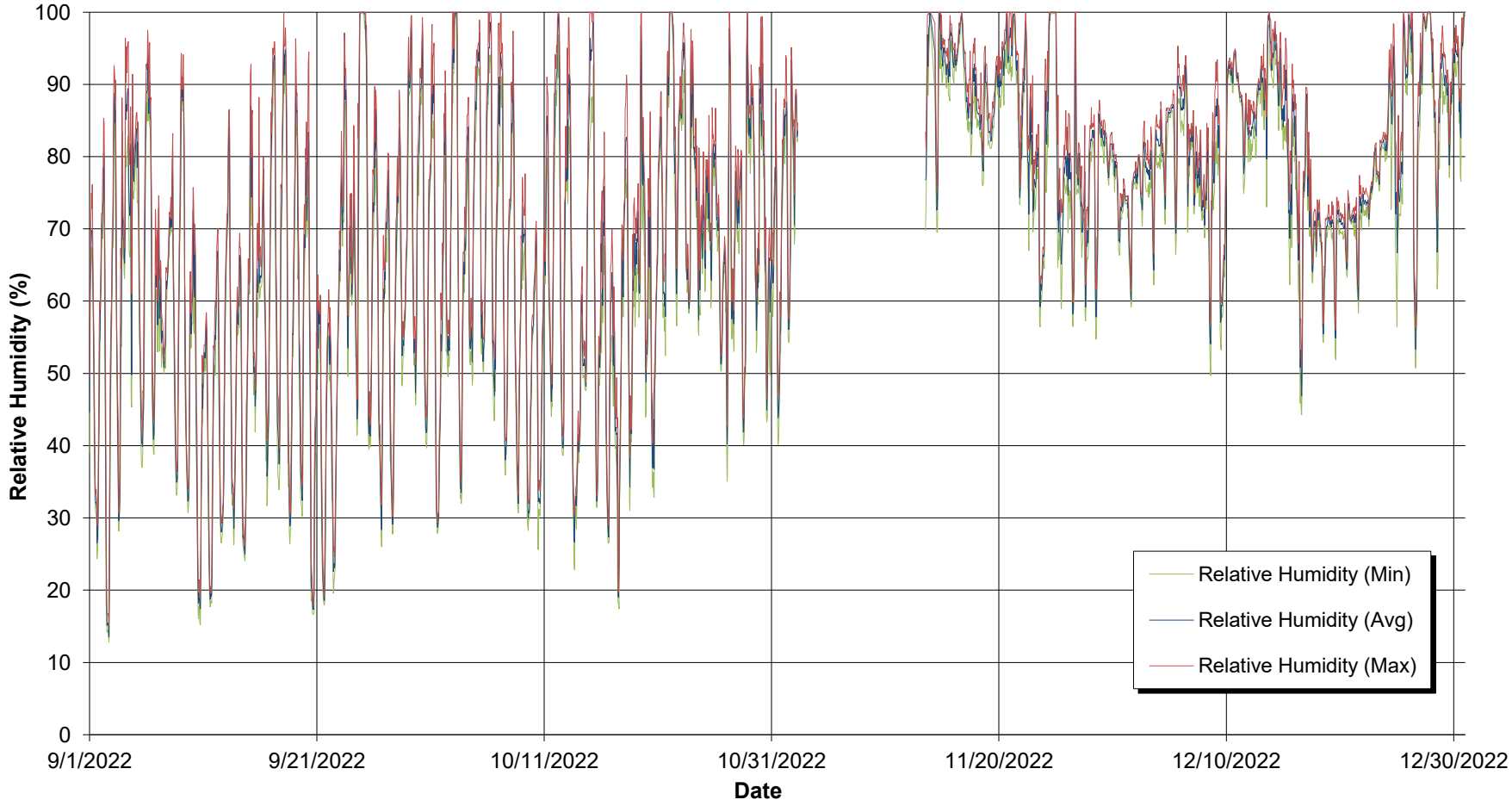
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P/A NO. VA101-457/37

REF. NO. VA23-00437

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REV	DATE	DESCRIPTION	PREP'D	RVW'D
1	17MAR'23	ISSUED WITH TRANSMITTAL	BTN	MJB

BW GOLD LTD.

BLACKWATER GOLD PROJECT

BLACKWATER LOW METEOROLOGY STATION MEASURED RELATIVE HUMIDITY

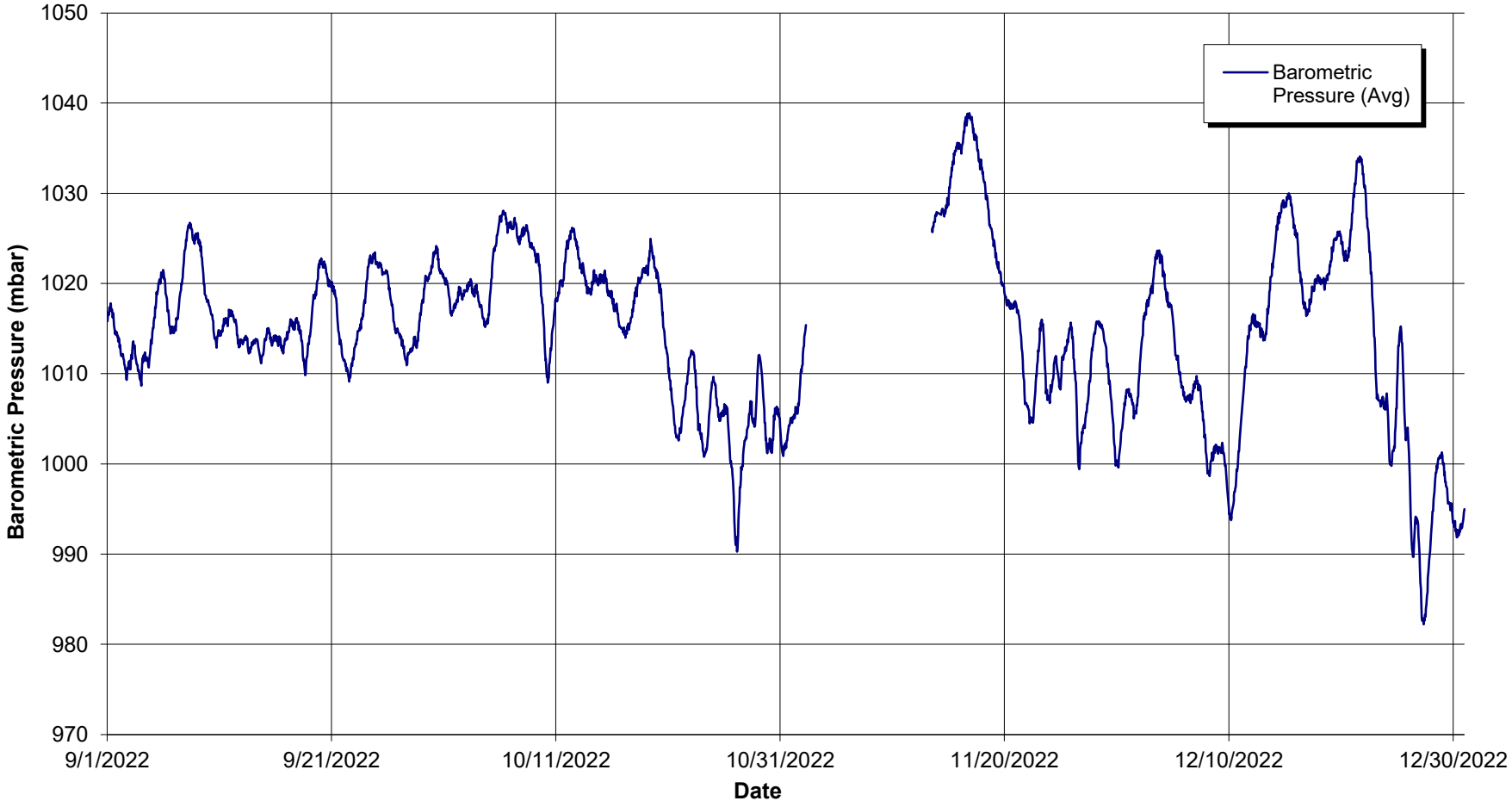
Knight Piésold CONSULTING

P/A NO. VA101-457/37

REF. NO. VA23-00437

FIGURE

REV 1



REV	DATE	DESCRIPTION	PREP'D	RVW'D
1	17MAR'23	ISSUED WITH TRANSMITTAL	BTN	MJB

BW GOLD LTD.

BLACKWATER GOLD PROJECT

BLACKWATER LOW METEOROLOGY STATION
MEASURED BAROMETRIC PRESSURE

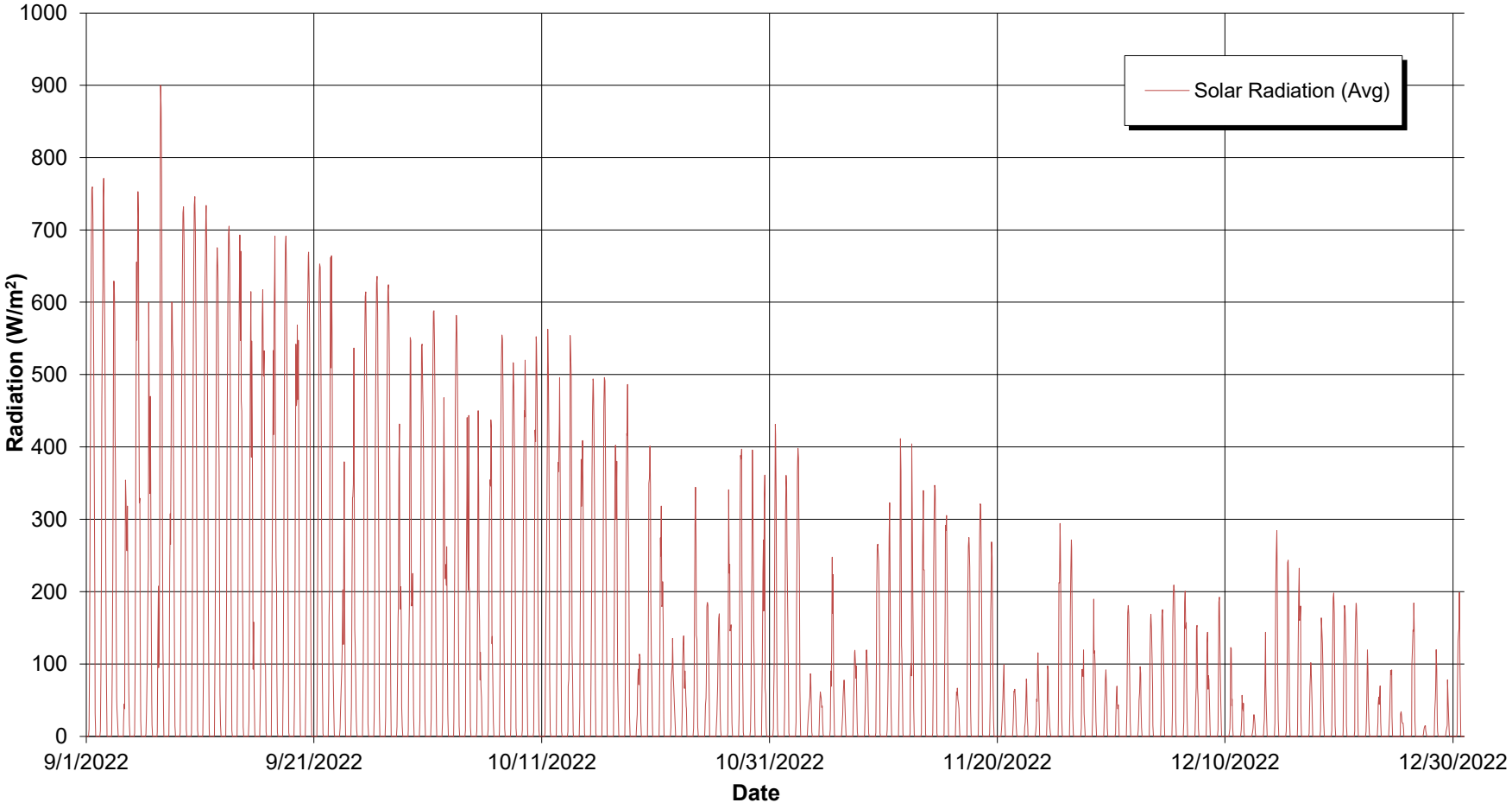
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P/A NO. VA101-457/37

REF. NO. VA23-00437

FIGURE

REV 1



REV	DATE	DESCRIPTION	PREP'D	RVW'D
1	17MAR'23	ISSUED WITH TRANSMITTAL	BTN	MJB

BW GOLD LTD.

BLACKWATER GOLD PROJECT

BLACKWATER HIGH METEOROLOGY STATION MEASURED RADIATION

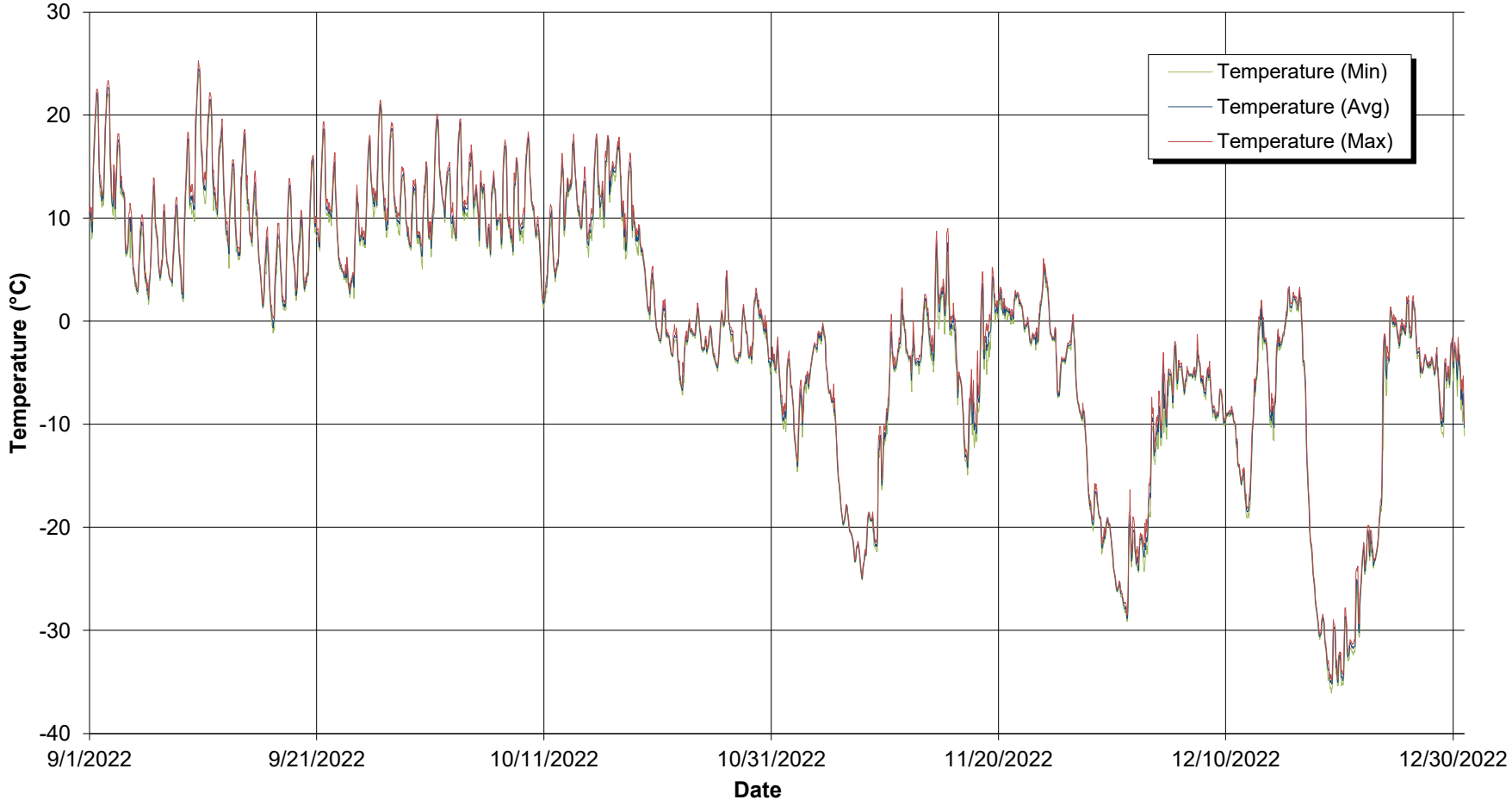
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FIGURE

REV 1



REV	DATE	DESCRIPTION	PREP'D	RVW'D
1	17MAR'23	ISSUED WITH TRANSMITTAL	BTN	MJB

BW GOLD LTD.

BLACKWATER GOLD PROJECT

BLACKWATER HIGH METEOROLOGY STATION MEASURED TEMPERATURE

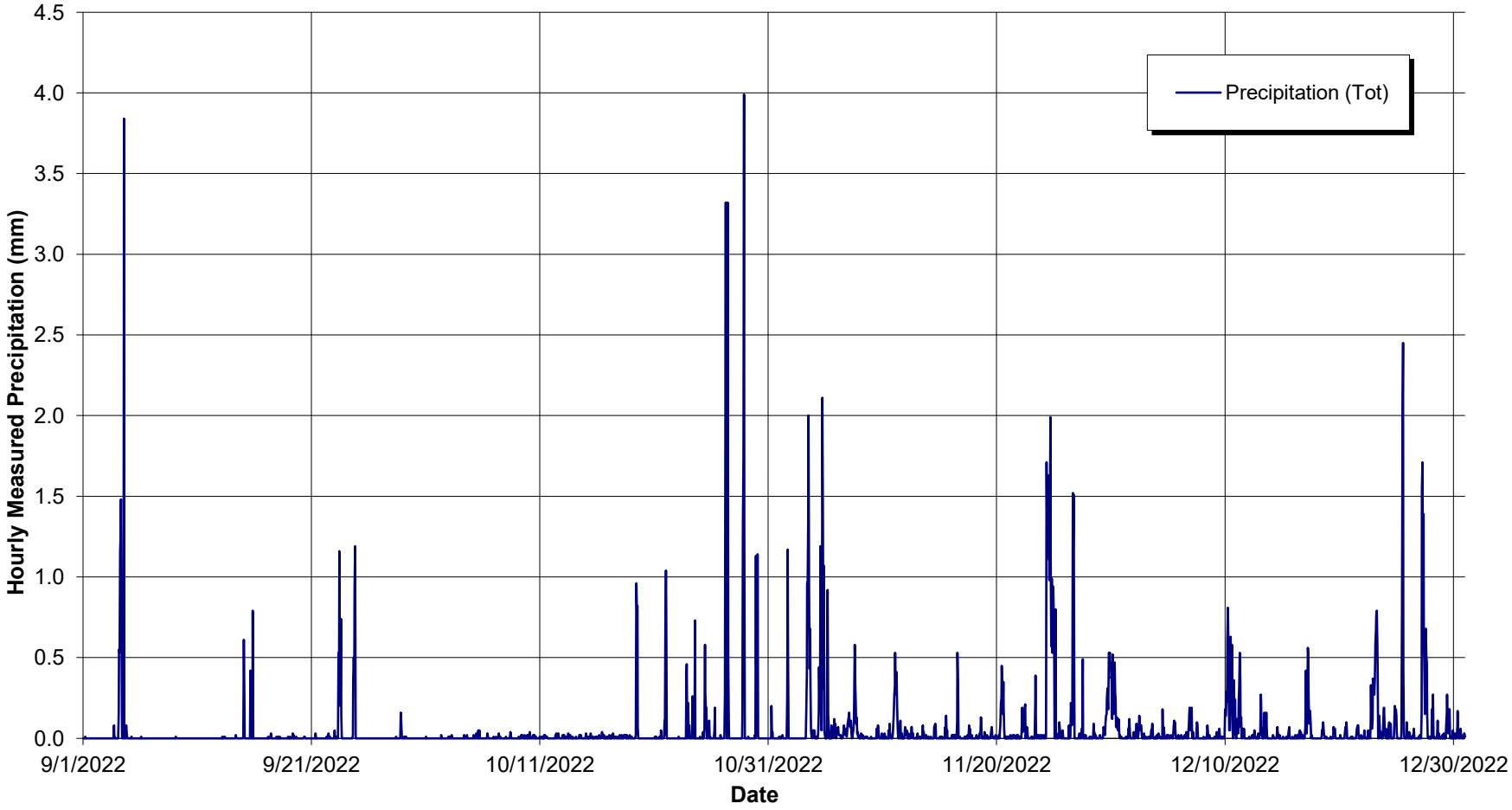
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REF. NO. VA23-00437

FIGURE

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REV	DATE	DESCRIPTION	PREP'D	RVW'D
1	17MAR'23	ISSUED WITH TRANSMITTAL	BTN	MJB

BW GOLD LTD.

BLACKWATER GOLD PROJECT

BLACKWATER HIGH METEOROLOGY STATION MEASURED PRECIPITATION

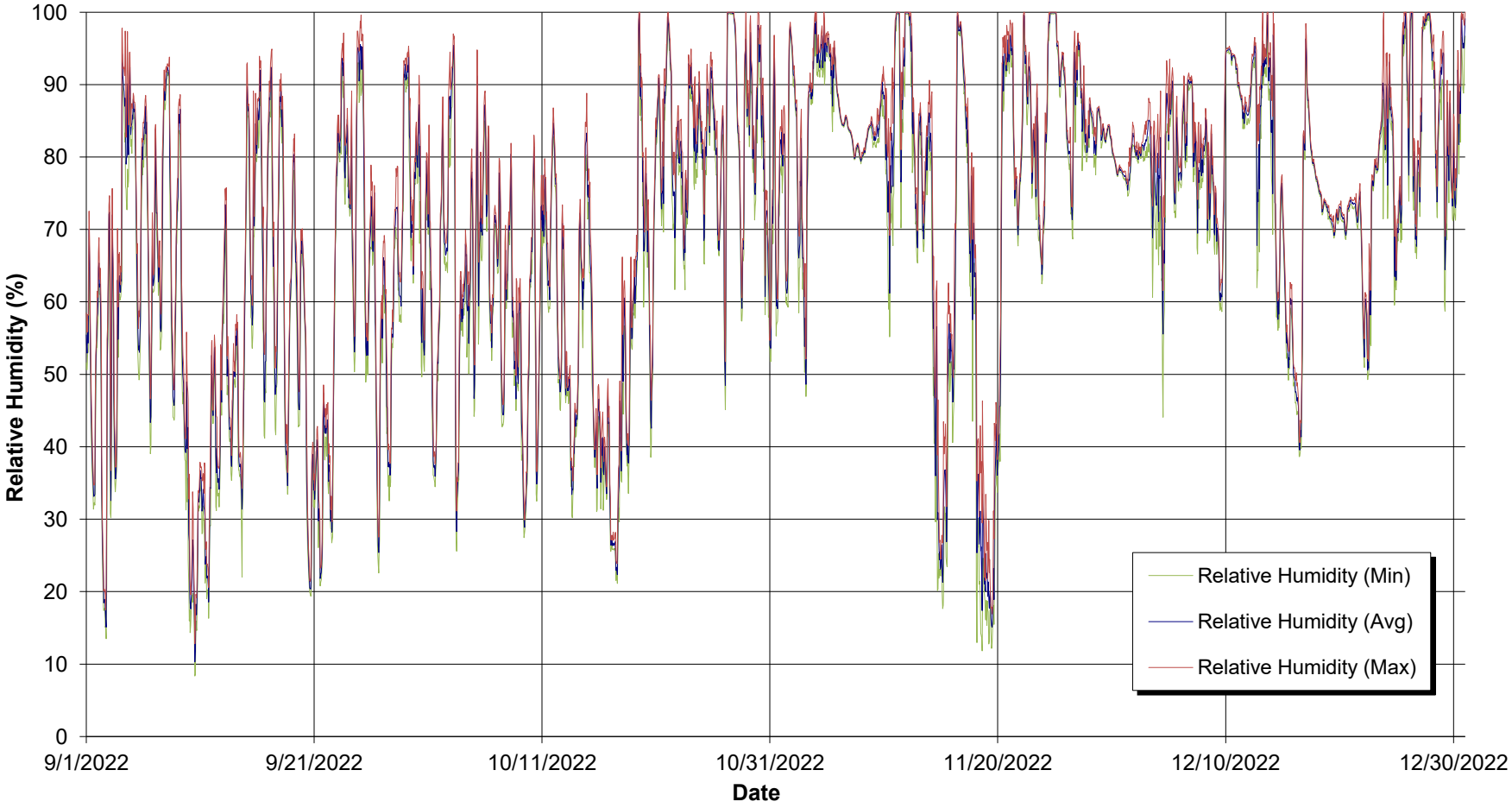
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P/A NO. VA101-457/37

REF. NO. VA23-00437

FIGURE

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REV	DATE	DESCRIPTION	PREP'D	RVW'D
1	17MAR'23	ISSUED WITH TRANSMITTAL	BTN	MJB

BW GOLD LTD.

BLACKWATER GOLD PROJECT

BLACKWATER HIGH METEOROLOGY STATION
MEASURED RELATIVE HUMIDITY

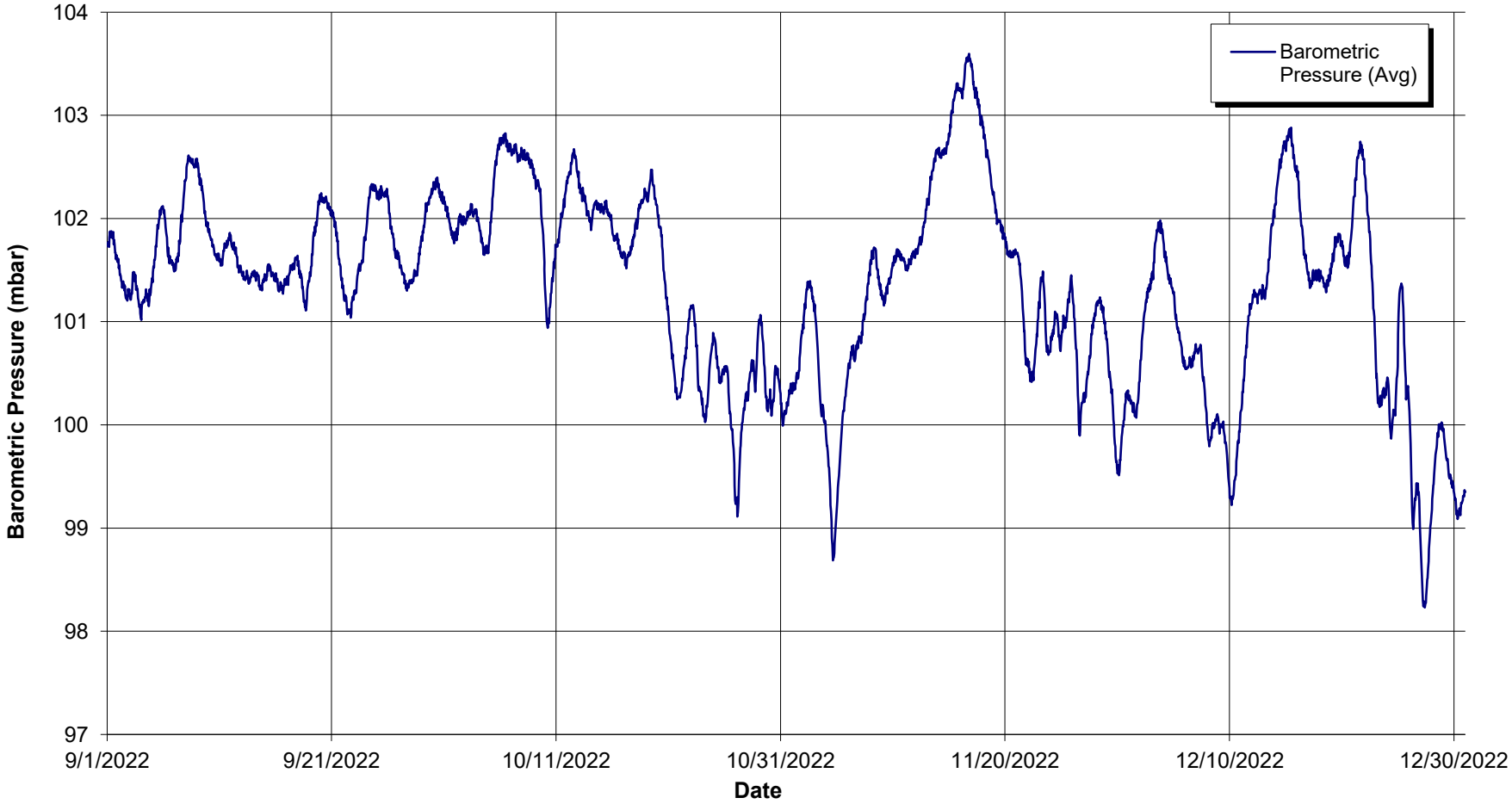
Knight Piésold CONSULTING

P/A NO. VA101-457/37

REF. NO. VA23-00437

FIGURE

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REV	DATE	DESCRIPTION	PREP'D	RVW'D
1	17MAR'23	ISSUED WITH TRANSMITTAL	BTN	MJB

BW GOLD LTD.

BLACKWATER GOLD PROJECT

BLACKWATER HIGH METEOROLOGY STATION
MEASURED BAROMETRIC PRESSURE

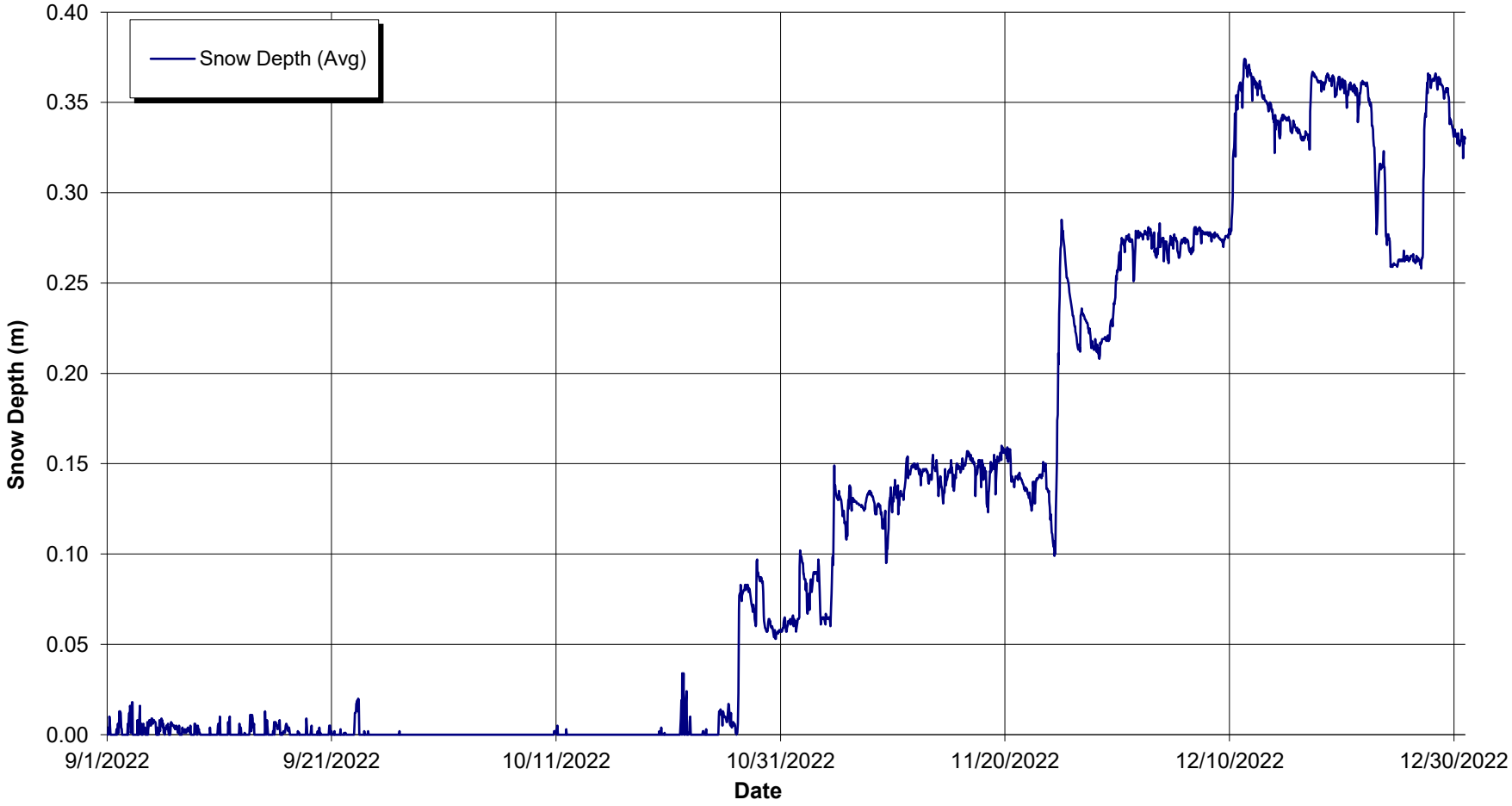
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REF. NO. VA23-00437

FIGURE

REV 1



REV	DATE	DESCRIPTION	PREP'D	RVW'D
1	17MAR'23	ISSUED WITH TRANSMITTAL	BTN	MJB

BW GOLD LTD.

BLACKWATER GOLD PROJECT

BLACKWATER HIGH METEOROLOGY STATION MEASURED SNOW DEPTH

Knight Piésold CONSULTING

P/A NO. VA101-457/37

REF. NO. VA23-00437

FIGURE

REV 1

APPENDIX C

Dustfall Certificate of Analysis

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA22C2246**	Page	: 1 of 8
Client	: **ERM Consultants Canada Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Daniel Casanova	Account Manager	: Amber Springer
Address	: 10th Floor, 1100 Melville St. Vancouver BC Canada V6E 4A6	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 0635833-0035 - Blackwater	Date Samples Received	: 16-Sep-2022 13:00
PO	: ----	Date Analysis Commenced	: 20-Sep-2022
C-O-C number	: ----	Issue Date	: 30-Sep-2022 09:33
Sampler	: ----		
Site	: ----		
Quote number	: VA22-ERMO100-009		
No. of samples received	: 8		
No. of samples analysed	: 8		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Metals, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Kinny Wu	Lab Analyst	Metals, Burnaby, British Columbia
Trace Chometsky	Account Manager Assistant	Administration, 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*
cm^2	square centimetres
days	days
mg	milligram
$mg/dm^2.day$	milligrams per square decimetre per day

<: 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*
DLB	*Detection Limit Raised. Analyte detected at comparable level in Method Blank.*

Analytical Results

Sub-Matrix: **Dustfall** (Matrix: **Air**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: Tatelkuz	6	14	19	24
					Client sampling date / time: 12-Sep-2022 07:40	12-Sep-2022 09:10	12-Sep-2022 08:45	12-Sep-2022 08:25	12-Sep-2022 08:10
					VA22C2246-001	VA22C2246-002	VA22C2246-003	VA22C2246-004	VA22C2246-005
					Result	Result	Result	Result	Result
Field Tests									
area sampled, field	----	EF001A	0.010	cm²	55.4	63.6	63.6	63.6	63.6
sampling time, field	----	EF001B	1.0	days	40.0	48.0	48.0	48.0	40.0
Particulates									
dustfall, total	----	EC880T.A	0.10	mg/dm².day	<0.17	<0.12	0.36	0.18	<0.15
dustfall, total insoluble	----	EC882.A	0.10	mg/dm².day	<0.10	<0.10	0.26	<0.10	<0.10
dustfall, total soluble	----	EC881.A	0.10	mg/dm².day	<0.10	<0.10	0.10	0.10	<0.10
dustfall, total insoluble	----	E882	1.9	mg	<1.9	<1.9	8.0	2.4	2.2
dustfall, total soluble	----	E881	1.9	mg	<1.9	2.0	3.1	3.2	<1.9
Anions and Nutrients									
ammonia, total (as N)	7664-41-7	EC301	0.0010	mg/dm².day	0.0016	<0.0010	<0.0010	0.0015	<0.0010
chloride	16887-00-6	EC244.Cl	0.18	mg/dm².day	<0.18	<0.18	<0.18	<0.18	<0.18
nitrate (as N)	14797-55-8	EC244.NO3	0.0010	mg/dm².day	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
sulfate	14808-79-8	EC244.SO4	0.013	mg/dm².day	<0.013	<0.013	<0.013	<0.013	<0.013
chloride	16887-00-6	E244.Cl	3.4	mg	<3.4	<3.4	<3.4	<3.4	<3.4
nitrate (as N)	14797-55-8	E244.NO3	0.019	mg	0.019	0.028	0.021	<0.019	0.019
sulfate	14808-79-8	E244.SO4	0.22	mg	<0.22	<0.22	<0.22	<0.22	<0.22
ammonia, total (as N)	7664-41-7	E301	0.019	mg	0.036	<0.019	<0.019	0.045	<0.019
Total Metals									
aluminum, total	7429-90-5	EC447	0.000160	mg/dm².day	0.000374	0.000213	0.000278	0.000249	0.000417
antimony, total	7440-36-0	EC447	0.0000026	mg/dm².day	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026
arsenic, total	7440-38-2	EC447	0.0000026	mg/dm².day	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026
barium, total	7440-39-3	EC447	0.0000026	mg/dm².day	0.0000063	0.0000051	0.0000131	0.0000035	0.0000146
beryllium, total	7440-41-7	EC447	0.000013	mg/dm².day	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
bismuth, total	7440-69-9	EC447	0.000013	mg/dm².day	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
boron, total	7440-42-8	EC447	0.00026	mg/dm².day	<0.00026	<0.00026	<0.00026	<0.00026	<0.00026
cadmium, total	7440-43-9	EC447	0.0000013	mg/dm².day	<0.0000013	<0.0000013	<0.0000013	<0.0000013	<0.0000013
calcium, total	7440-70-2	EC447	0.00052	mg/dm².day	0.00113	0.00059	0.00164	0.00059	0.00086
chromium, total	7440-47-3	EC447	0.000013	mg/dm².day	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
cobalt, total	7440-48-4	EC447	0.0000026	mg/dm².day	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026
copper, total	7440-50-8	EC447	0.000026	mg/dm².day	<0.000026	<0.000026	<0.000026	<0.000026	<0.000026

Analytical Results

Sub-Matrix: **Dustfall**
(Matrix: **Air**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID: Tatelkuz	6	14	19	24
					Client sampling date / time: 12-Sep-2022 07:40	12-Sep-2022 09:10	12-Sep-2022 08:45	12-Sep-2022 08:25	12-Sep-2022 08:10
					VA22C2246-001	VA22C2246-002	VA22C2246-003	VA22C2246-004	VA22C2246-005
					Result	Result	Result	Result	Result
Total Metals									
iron, total	7439-89-6	EC447	0.00079	mg/dm².day	<0.00135	<0.00079	<0.00079	<0.00079	<0.00079
lead, total	7439-92-1	EC447	0.0000013	mg/dm².day	<0.0000013	<0.0000013	<0.0000013	<0.0000013	<0.0000013
lithium, total	7439-93-2	EC447	0.00013	mg/dm².day	<0.00013	<0.00013	<0.00013	<0.00013	<0.00013
magnesium, total	7439-95-4	EC447	0.00013	mg/dm².day	0.00110	0.00028	0.00165	0.00070	0.00038
manganese, total	7439-96-5	EC447	0.0000052	mg/dm².day	<0.0000451	<0.0000295	0.000218	0.0000442	0.0000385
mercury, total	7439-97-6	EC516	0.0000013	mg/dm².day	<0.0000013	<0.0000013	<0.0000013	<0.0000013	<0.0000013
molybdenum, total	7439-98-7	EC447	0.0000013	mg/dm².day	<0.0000013	<0.0000013	<0.0000013	<0.0000013	<0.0000013
nickel, total	7440-02-0	EC447	0.000013	mg/dm².day	<0.000013	<0.000013	<0.000013	<0.000013	<0.000013
phosphorus, total	7723-14-0	EC447	0.0013	mg/dm².day	0.0047	<0.0013	0.0115	0.0060	<0.0013
potassium, total	7440-09-7	EC447	0.0013	mg/dm².day	0.0081	0.0036	0.0200	0.0103	<0.0013
selenium, total	7782-49-2	EC447	0.000026	mg/dm².day	<0.000026	<0.000026	<0.000026	<0.000026	<0.000026
silicon, total	7440-21-3	EC447	0.0013	mg/dm².day	<0.0013	<0.0013	<0.0013	<0.0013	<0.0013
silver, total	7440-22-4	EC447	0.00000026	mg/dm².day	<0.00000026	<0.00000026	<0.00000026	<0.00000026	<0.00000026
sodium, total	7440-23-5	EC447	0.0013	mg/dm².day	0.0019	<0.0013	0.0030	0.0023	<0.0013
strontium, total	7440-24-6	EC447	0.0000026	mg/dm².day	0.0000062	0.0000031	0.0000137	0.0000030	0.0000048
thallium, total	7440-28-0	EC447	0.0000026	mg/dm².day	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026
tin, total	7440-31-5	EC447	0.0000026	mg/dm².day	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026
titanium, total	7440-32-6	EC447	0.00026	mg/dm².day	<0.00026	<0.00026	<0.00026	<0.00026	<0.00026
uranium, total	7440-61-1	EC447	0.0000026	mg/dm².day	<0.0000026	<0.0000026	<0.0000026	<0.0000026	<0.0000026
vanadium, total	7440-62-2	EC447	0.000026	mg/dm².day	<0.000026	<0.000026	<0.000026	<0.000026	<0.000026
zinc, total	7440-66-6	EC447	0.000079	mg/dm².day	<0.000079	<0.000079	<0.000079	<0.000079	<0.000079
aluminum, total	7429-90-5	E447	0.0030	mg	0.0083	0.0065	0.0085	0.0076	0.0106
antimony, total	7440-36-0	E447	0.000050	mg	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
arsenic, total	7440-38-2	E447	0.000050	mg	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
barium, total	7440-39-3	E447	0.000050	mg	0.000140	0.000155	0.000399	0.000106	0.000372
beryllium, total	7440-41-7	E447	0.00025	mg	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
bismuth, total	7440-69-9	E447	0.00025	mg	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
boron, total	7440-42-8	E447	0.0050	mg	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
cadmium, total	7440-43-9	E447	0.000020	mg	<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
calcium, total	7440-70-2	E447	0.010	mg	0.025	0.018	0.050	0.018	0.022
chromium, total	7440-47-3	E447	0.00025	mg	<0.00025	<0.00025	<0.00025	<0.00025	<0.00025

Analytical Results

Sub-Matrix: **Dustfall**
(Matrix: **Air**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	Tatelkuz	6	14	19	24
					Client sampling date / time	12-Sep-2022 07:40	12-Sep-2022 09:10	12-Sep-2022 08:45	12-Sep-2022 08:25	12-Sep-2022 08:10
						VA22C2246-001	VA22C2246-002	VA22C2246-003	VA22C2246-004	VA22C2246-005
						Result	Result	Result	Result	Result
Total Metals										
cobalt, total	7440-48-4	E447	0.000050	mg		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
copper, total	7440-50-8	E447	0.00050	mg		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, total	7439-89-6	E447	0.015	mg		<0.030 DLB	<0.015	<0.015	<0.015	<0.015
lead, total	7439-92-1	E447	0.000025	mg		<0.000025	<0.000025	<0.000025	<0.000025	<0.000025
lithium, total	7439-93-2	E447	0.0025	mg		<0.0025	<0.0025	<0.0025	<0.0025	<0.0025
magnesium, total	7439-95-4	E447	0.0025	mg		0.0244	0.0084	0.0505	0.0213	0.0096
manganese, total	7439-96-5	E447	0.00010	mg		<0.00100 DLB	<0.00090 DLB	0.00667	0.00135	0.00098
mercury, total	7439-97-6	E516	0.000025	mg		<0.000025	<0.000025	<0.000025	<0.000025	<0.000025
molybdenum, total	7439-98-7	E447	0.000025	mg		<0.000025	<0.000025	<0.000025	<0.000025	<0.000025
nickel, total	7440-02-0	E447	0.00025	mg		<0.00025	<0.00025	<0.00025	<0.00025	<0.00025
phosphorus, total	7723-14-0	E447	0.025	mg		0.105	0.036	0.352	0.183	<0.025
potassium, total	7440-09-7	E447	0.025	mg		0.179	0.110	0.612	0.315	0.033
selenium, total	7782-49-2	E447	0.00050	mg		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
silicon, total	7440-21-3	E447	0.025	mg		<0.025	<0.025	<0.025	<0.025	<0.025
silver, total	7440-22-4	E447	0.0000050	mg		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
sodium, total	7440-23-5	E447	0.025	mg		0.042	<0.025	0.091	0.071	<0.025
strontium, total	7440-24-6	E447	0.000050	mg		0.000137	0.000095	0.000418	0.000091	0.000121
thallium, total	7440-28-0	E447	0.000050	mg		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
tin, total	7440-31-5	E447	0.000050	mg		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
titanium, total	7440-32-6	E447	0.0050	mg		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
uranium, total	7440-61-1	E447	0.0000050	mg		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
vanadium, total	7440-62-2	E447	0.00050	mg		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
zinc, total	7440-66-6	E447	0.0015	mg		<0.0015	<0.0015	0.0018	<0.0015	<0.0015

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

Analytical Results

Sub-Matrix: **Dustfall**
(Matrix: **Air**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	27	32	4	----	----
					Client sampling date / time	12-Sep-2022 07:55	12-Sep-2022 09:30	12-Sep-2022 11:50	----	----
						VA22C2246-006	VA22C2246-007	VA22C2246-008	--------	--------
						Result	Result	Result	----	----
Field Tests										
area sampled, field	----	EF001A	0.010	cm²		55.4	55.4	55.4	----	----
sampling time, field	----	EF001B	1.0	days		46.0	40.0	41.0	----	----
Particulates										
dustfall, total	----	EC880T.A	0.10	mg/dm².day		2.58	<0.17	0.25	----	----
dustfall, total insoluble	----	EC882.A	0.10	mg/dm².day		0.54	<0.10	0.10	----	----
dustfall, total soluble	----	EC881.A	0.10	mg/dm².day		2.03	<0.10	0.15	----	----
dustfall, total insoluble	----	E882	1.9	mg		13.9	1.9	2.3	----	----
dustfall, total soluble	----	E881	1.9	mg		51.8	<1.9	3.4	----	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	EC301	0.0010	mg/dm².day		0.0604	<0.0014	0.0026	----	----
chloride	16887-00-6	EC244.Cl	0.18	mg/dm².day		<0.18	<0.18	<0.18	----	----
nitrate (as N)	14797-55-8	EC244.NO3	0.0010	mg/dm².day		<0.0010	0.0013	<0.0010	----	----
sulfate	14808-79-8	EC244.SO4	0.013	mg/dm².day		<0.013	<0.013	<0.013	----	----
chloride	16887-00-6	E244.Cl	3.4	mg		<3.4	<3.4	<3.4	----	----
nitrate (as N)	14797-55-8	E244.NO3	0.019	mg		<0.019	0.028	<0.019	----	----
sulfate	14808-79-8	E244.SO4	0.22	mg		<0.22	<0.22	<0.22	----	----
ammonia, total (as N)	7664-41-7	E301	0.019	mg		1.54	<0.030	0.060	----	----
Total Metals										
aluminum, total	7429-90-5	EC447	0.000160	mg/dm².day		0.000416	0.000374	0.000229	----	----
antimony, total	7440-36-0	EC447	0.0000026	mg/dm².day		<0.0000026	<0.0000026	<0.0000026	----	----
arsenic, total	7440-38-2	EC447	0.0000026	mg/dm².day		<0.0000026	<0.0000026	<0.0000026	----	----
barium, total	7440-39-3	EC447	0.0000026	mg/dm².day		0.0000093	0.0000092	0.0000121	----	----
beryllium, total	7440-41-7	EC447	0.000013	mg/dm².day		<0.000013	<0.000013	<0.000013	----	----
bismuth, total	7440-69-9	EC447	0.000013	mg/dm².day		<0.000013	<0.000013	<0.000013	----	----
boron, total	7440-42-8	EC447	0.00026	mg/dm².day		<0.00026	<0.00026	<0.00026	----	----
cadmium, total	7440-43-9	EC447	0.0000013	mg/dm².day		<0.0000013	<0.0000013	<0.0000013	----	----
calcium, total	7440-70-2	EC447	0.00052	mg/dm².day		0.00106	0.00104	0.00101	----	----
chromium, total	7440-47-3	EC447	0.000013	mg/dm².day		<0.000013	<0.000013	<0.000013	----	----
cobalt, total	7440-48-4	EC447	0.0000026	mg/dm².day		<0.0000026	<0.0000026	<0.0000026	----	----
copper, total	7440-50-8	EC447	0.000026	mg/dm².day		<0.000026	<0.000026	<0.000026	----	----
iron, total	7439-89-6	EC447	0.00079	mg/dm².day		<0.00118	<0.00135	<0.00079	----	----

Analytical Results

Sub-Matrix: **Dustfall**
(Matrix: **Air**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	27	32	4	----	----
					Client sampling date / time	12-Sep-2022 07:55	12-Sep-2022 09:30	12-Sep-2022 11:50	----	----
						VA22C2246-006	VA22C2246-007	VA22C2246-008	--------	--------
						Result	Result	Result	----	----
Total Metals										
lead, total	7439-92-1	EC447	0.0000013	mg/dm².day		<0.0000013	<0.0000013	<0.0000013	----	----
lithium, total	7439-93-2	EC447	0.00013	mg/dm².day		<0.00013	<0.00013	<0.00013	----	----
magnesium, total	7439-95-4	EC447	0.00013	mg/dm².day		0.00220	0.00036	0.00039	----	----
manganese, total	7439-96-5	EC447	0.0000052	mg/dm².day		0.0000408	0.0000487	0.000167	----	----
mercury, total	7439-97-6	EC516	0.0000013	mg/dm².day		<0.0000013	<0.0000013	<0.0000013	----	----
molybdenum, total	7439-98-7	EC447	0.0000013	mg/dm².day		<0.0000013	<0.0000013	<0.0000013	----	----
nickel, total	7440-02-0	EC447	0.000013	mg/dm².day		<0.000013	<0.000013	<0.000013	----	----
phosphorus, total	7723-14-0	EC447	0.0013	mg/dm².day		0.0269	<0.0013	<0.0013	----	----
potassium, total	7440-09-7	EC447	0.0013	mg/dm².day		0.0379	0.0015	0.0018	----	----
selenium, total	7782-49-2	EC447	0.000026	mg/dm².day		<0.000026	<0.000026	<0.000026	----	----
silicon, total	7440-21-3	EC447	0.0013	mg/dm².day		<0.0013	<0.0013	<0.0013	----	----
silver, total	7440-22-4	EC447	0.00000026	mg/dm².day		<0.00000026	<0.00000026	<0.00000026	----	----
sodium, total	7440-23-5	EC447	0.0013	mg/dm².day		0.0098	0.0014	<0.0013	----	----
strontium, total	7440-24-6	EC447	0.0000026	mg/dm².day		0.0000059	0.0000058	0.0000058	----	----
thallium, total	7440-28-0	EC447	0.0000026	mg/dm².day		<0.0000026	<0.0000026	<0.0000026	----	----
tin, total	7440-31-5	EC447	0.0000026	mg/dm².day		<0.0000026	<0.0000026	<0.0000026	----	----
titanium, total	7440-32-6	EC447	0.00026	mg/dm².day		<0.00026	<0.00026	<0.00026	----	----
uranium, total	7440-61-1	EC447	0.0000026	mg/dm².day		<0.0000026	<0.0000026	<0.0000026	----	----
vanadium, total	7440-62-2	EC447	0.000026	mg/dm².day		<0.000026	<0.000026	<0.000026	----	----
zinc, total	7440-66-6	EC447	0.000079	mg/dm².day		<0.000079	<0.000079	<0.000079	----	----
aluminum, total	7429-90-5	E447	0.0030	mg		0.0106	0.0083	0.0052	----	----
antimony, total	7440-36-0	E447	0.000050	mg		<0.000050	<0.000050	<0.000050	----	----
arsenic, total	7440-38-2	E447	0.000050	mg		<0.000050	<0.000050	<0.000050	----	----
barium, total	7440-39-3	E447	0.000050	mg		0.000238	0.000203	0.000274	----	----
beryllium, total	7440-41-7	E447	0.00025	mg		<0.00025	<0.00025	<0.00025	----	----
bismuth, total	7440-69-9	E447	0.00025	mg		<0.00025	<0.00025	<0.00025	----	----
boron, total	7440-42-8	E447	0.0050	mg		<0.0050	<0.0050	<0.0050	----	----
cadmium, total	7440-43-9	E447	0.000020	mg		0.000021	<0.000020	<0.000020	----	----
calcium, total	7440-70-2	E447	0.010	mg		0.027	0.023	0.023	----	----
chromium, total	7440-47-3	E447	0.00025	mg		<0.00025	<0.00025	<0.00025	----	----
cobalt, total	7440-48-4	E447	0.000050	mg		<0.000050	<0.000050	<0.000050	----	----

Analytical Results

Sub-Matrix: **Dustfall**
(Matrix: **Air**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	27	32	4	----	----
					Client sampling date / time	12-Sep-2022 07:55	12-Sep-2022 09:30	12-Sep-2022 11:50	----	----
						VA22C2246-006	VA22C2246-007	VA22C2246-008	--------	--------
						Result	Result	Result	----	----
Total Metals										
copper, total	7440-50-8	E447	0.00050	mg		<0.00050	<0.00050	<0.00050	----	----
iron, total	7439-89-6	E447	0.015	mg		<0.030 DLB	<0.030 DLB	<0.015	----	----
lead, total	7439-92-1	E447	0.000025	mg		<0.000025	<0.000025	0.000028	----	----
lithium, total	7439-93-2	E447	0.0025	mg		<0.0025	<0.0025	<0.0025	----	----
magnesium, total	7439-95-4	E447	0.0025	mg		0.0562	0.0081	0.0089	----	----
manganese, total	7439-96-5	E447	0.00010	mg		0.00104	0.00108	0.00380	----	----
mercury, total	7439-97-6	E516	0.000025	mg		<0.000025	<0.000025	<0.000025	----	----
molybdenum, total	7439-98-7	E447	0.000025	mg		<0.000025	<0.000025	<0.000025	----	----
nickel, total	7440-02-0	E447	0.00025	mg		<0.00025	<0.00025	<0.00025	----	----
phosphorus, total	7723-14-0	E447	0.025	mg		0.685	<0.025	0.027	----	----
potassium, total	7440-09-7	E447	0.025	mg		0.967	0.034	0.041	----	----
selenium, total	7782-49-2	E447	0.00050	mg		<0.00050	<0.00050	<0.00050	----	----
silicon, total	7440-21-3	E447	0.025	mg		<0.025	<0.025	<0.025	----	----
silver, total	7440-22-4	E447	0.0000050	mg		<0.0000050	<0.0000050	<0.0000050	----	----
sodium, total	7440-23-5	E447	0.025	mg		0.250	0.030	<0.025	----	----
strontium, total	7440-24-6	E447	0.000050	mg		0.000151	0.000129	0.000131	----	----
thallium, total	7440-28-0	E447	0.000050	mg		<0.000050	<0.000050	<0.000050	----	----
tin, total	7440-31-5	E447	0.000050	mg		<0.000050	0.000056	<0.000050	----	----
titanium, total	7440-32-6	E447	0.0050	mg		<0.0050	<0.0050	<0.0050	----	----
uranium, total	7440-61-1	E447	0.0000050	mg		<0.0000050	<0.0000050	<0.0000050	----	----
vanadium, total	7440-62-2	E447	0.00050	mg		<0.00050	<0.00050	<0.00050	----	----
zinc, total	7440-66-6	E447	0.0015	mg		0.0016	<0.0015	0.0015	----	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA22C2246**	Page	: 1 of 17
Client	: **ERM Consultants Canada Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Daniel Casanova	Account Manager	: Amber Springer
Address	: 10th Floor, 1100 Melville St. Vancouver BC Canada V6E 4A6	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 0635833-0035 - Blackwater	Date Samples Received	: 16-Sep-2022 13:00
PO	: ----	Issue Date	: 30-Sep-2022 09:33
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: VA22-ERMO100-009		
No. of samples received	: 8		
No. of samples analysed	: 8		

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

Key

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

Workorder Comments

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

Summary of Outliers

Outliers : Quality Control Samples

- No 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)

- No Analysis Holding Time Outliers exist.

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: **Air**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Total Metals	QC-667178-001	----	iron, total	7439-89-6	E447	0.024 mg MB-LOR	0.015 mg	Blank result exceeds permitted value
Total Metals	QC-667178-001	----	manganese, total	7439-96-5	E447	0.00019 mg MB-LOR	0.0001 mg	Blank result exceeds permitted value

Result Qualifiers

Qualifier	*Description*
MB-LOR	*Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.*

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: **Air**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence (Dustfall, mg)										
HDPE dustfall canister (algecide) 14	E301	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Ammonia by Fluorescence (Dustfall, mg)										
HDPE dustfall canister (algecide) 19	E301	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Ammonia by Fluorescence (Dustfall, mg)										
HDPE dustfall canister (algecide) 24	E301	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Ammonia by Fluorescence (Dustfall, mg)										
HDPE dustfall canister (algecide) 27	E301	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Ammonia by Fluorescence (Dustfall, mg)										
HDPE dustfall canister (algecide) 32	E301	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Ammonia by Fluorescence (Dustfall, mg)										
HDPE dustfall canister (algecide) 4	E301	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Ammonia by Fluorescence (Dustfall, mg)										
HDPE dustfall canister (algecide) 6	E301	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	

Matrix: **Air**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence (Dustfall, mg)										
HDPE dustfall canister (algecide)										
Tatelkuz	E301	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Chloride by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
14	E244.Cl	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Chloride by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
19	E244.Cl	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Chloride by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
24	E244.Cl	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Chloride by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
27	E244.Cl	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Chloride by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
32	E244.Cl	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Chloride by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
4	E244.Cl	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Chloride by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
6	E244.Cl	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Chloride by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
Tatelkuz	E244.Cl	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	

Matrix: **Air**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
14	E244.NO3	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Nitrate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
19	E244.NO3	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Nitrate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
24	E244.NO3	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Nitrate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
27	E244.NO3	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Nitrate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
32	E244.NO3	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Nitrate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
4	E244.NO3	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Nitrate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
6	E244.NO3	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Nitrate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
Tatelkuz	E244.NO3	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Sulfate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
14	E244.SO4	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	

Matrix: **Air**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Sulfate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
19	E244.SO4	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Sulfate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
24	E244.SO4	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Sulfate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
27	E244.SO4	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Sulfate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
32	E244.SO4	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Sulfate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
4	E244.SO4	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Sulfate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
6	E244.SO4	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Anions and Nutrients : Sulfate by IC (Dustfall, mg)										
HDPE dustfall canister (algecide)										
Tatelkuz	E244.SO4	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Field Tests : Dustfall Canister Area (cm2)										
HDPE dustfall canister (algecide)										
14	EF001A	12-Sep-2022	----	----	----		29-Sep-2022	----	----	
Field Tests : Dustfall Canister Area (cm2)										
HDPE dustfall canister (algecide)										
19	EF001A	12-Sep-2022	----	----	----		29-Sep-2022	----	----	

Matrix: **Air**

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
Field Tests : Dustfall Canister Area (cm2)										
HDPE dustfall canister (algecide)										
24	EF001A	12-Sep-2022	----	----	----		29-Sep-2022	----	----	
Field Tests : Dustfall Canister Area (cm2)										
HDPE dustfall canister (algecide)										
27	EF001A	12-Sep-2022	----	----	----		29-Sep-2022	----	----	
Field Tests : Dustfall Canister Area (cm2)										
HDPE dustfall canister (algecide)										
32	EF001A	12-Sep-2022	----	----	----		29-Sep-2022	----	----	
Field Tests : Dustfall Canister Area (cm2)										
HDPE dustfall canister (algecide)										
4	EF001A	12-Sep-2022	----	----	----		29-Sep-2022	----	----	
Field Tests : Dustfall Canister Area (cm2)										
HDPE dustfall canister (algecide)										
6	EF001A	12-Sep-2022	----	----	----		29-Sep-2022	----	----	
Field Tests : Dustfall Canister Area (cm2)										
HDPE dustfall canister (algecide)										
Tatelkuz	EF001A	12-Sep-2022	----	----	----		29-Sep-2022	----	----	
Field Tests : Dustfall Canister Sampling Days										
HDPE dustfall canister (algecide)										
14	EF001B	12-Sep-2022	----	----	----		20-Sep-2022	----	----	
Field Tests : Dustfall Canister Sampling Days										
HDPE dustfall canister (algecide)										
19	EF001B	12-Sep-2022	----	----	----		20-Sep-2022	----	----	
Field Tests : Dustfall Canister Sampling Days										
HDPE dustfall canister (algecide)										
24	EF001B	12-Sep-2022	----	----	----		20-Sep-2022	----	----	

Matrix: **Air**

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
Field Tests : Dustfall Canister Sampling Days										
HDPE dustfall canister (algecide)										
27	EF001B	12-Sep-2022	----	----	----		20-Sep-2022	----	----	
Field Tests : Dustfall Canister Sampling Days										
HDPE dustfall canister (algecide)										
32	EF001B	12-Sep-2022	----	----	----		20-Sep-2022	----	----	
Field Tests : Dustfall Canister Sampling Days										
HDPE dustfall canister (algecide)										
4	EF001B	12-Sep-2022	----	----	----		20-Sep-2022	----	----	
Field Tests : Dustfall Canister Sampling Days										
HDPE dustfall canister (algecide)										
6	EF001B	12-Sep-2022	----	----	----		20-Sep-2022	----	----	
Field Tests : Dustfall Canister Sampling Days										
HDPE dustfall canister (algecide)										
Tatelkuz	EF001B	12-Sep-2022	----	----	----		20-Sep-2022	----	----	
Particulates : Total Insoluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide)										
14	E882	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Particulates : Total Insoluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide)										
19	E882	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Particulates : Total Insoluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide)										
24	E882	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Particulates : Total Insoluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide)										
27	E882	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	

Matrix: **Air**

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
Particulates : Total Insoluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide) 32	E882	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Particulates : Total Insoluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide) 4	E882	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Particulates : Total Insoluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide) 6	E882	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Particulates : Total Insoluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide) Tatelkuz	E882	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Particulates : Total Soluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide) 14	E881	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Particulates : Total Soluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide) 19	E881	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Particulates : Total Soluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide) 24	E881	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Particulates : Total Soluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide) 27	E881	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Particulates : Total Soluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide) 32	E881	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	

Matrix: **Air**

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
Particulates : Total Soluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide) 4	E881	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Particulates : Total Soluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide) 6	E881	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Particulates : Total Soluble Dustfalls by Gravimetry (mg)										
HDPE dustfall canister (algecide) Tatelkuz	E881	12-Sep-2022	27-Sep-2022	----	----		27-Sep-2022	----	0 days	
Total Metals : Total Mercury by CVAAS (Dustfall, mg)										
HDPE dustfall canister (algecide) 14	E516	12-Sep-2022	27-Sep-2022	180 days	15 days	✓	27-Sep-2022	180 days	0 days	✓
Total Metals : Total Mercury by CVAAS (Dustfall, mg)										
HDPE dustfall canister (algecide) 19	E516	12-Sep-2022	27-Sep-2022	180 days	15 days	✓	27-Sep-2022	180 days	0 days	✓
Total Metals : Total Mercury by CVAAS (Dustfall, mg)										
HDPE dustfall canister (algecide) 24	E516	12-Sep-2022	27-Sep-2022	180 days	15 days	✓	27-Sep-2022	180 days	0 days	✓
Total Metals : Total Mercury by CVAAS (Dustfall, mg)										
HDPE dustfall canister (algecide) 27	E516	12-Sep-2022	27-Sep-2022	180 days	15 days	✓	27-Sep-2022	180 days	0 days	✓
Total Metals : Total Mercury by CVAAS (Dustfall, mg)										
HDPE dustfall canister (algecide) 32	E516	12-Sep-2022	27-Sep-2022	180 days	15 days	✓	27-Sep-2022	180 days	0 days	✓
Total Metals : Total Mercury by CVAAS (Dustfall, mg)										
HDPE dustfall canister (algecide) 4	E516	12-Sep-2022	27-Sep-2022	180 days	15 days	✓	27-Sep-2022	180 days	0 days	✓

Matrix: **Air**

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 Mercury by CVAAS (Dustfall, mg)										
HDPE dustfall canister (algecide) 6	E516	12-Sep-2022	27-Sep-2022	180 days	15 days	✓	27-Sep-2022	180 days	0 days	✓
Total Metals : Total Mercury by CVAAS (Dustfall, mg)										
HDPE dustfall canister (algecide) Tatelkuz	E516	12-Sep-2022	27-Sep-2022	180 days	15 days	✓	27-Sep-2022	180 days	0 days	✓
Total Metals : Total Metals by CRC ICPMS (Dustfall, mg)										
HDPE dustfall canister (algecide) 4	E447	12-Sep-2022	27-Sep-2022	----	----		28-Sep-2022	180 days	16 days	✓
Total Metals : Total Metals by CRC ICPMS (Dustfall, mg)										
HDPE dustfall canister (algecide) 14	E447	12-Sep-2022	27-Sep-2022	----	----		28-Sep-2022	180 days	17 days	✓
Total Metals : Total Metals by CRC ICPMS (Dustfall, mg)										
HDPE dustfall canister (algecide) 19	E447	12-Sep-2022	27-Sep-2022	----	----		28-Sep-2022	180 days	17 days	✓
Total Metals : Total Metals by CRC ICPMS (Dustfall, mg)										
HDPE dustfall canister (algecide) 24	E447	12-Sep-2022	27-Sep-2022	----	----		28-Sep-2022	180 days	17 days	✓
Total Metals : Total Metals by CRC ICPMS (Dustfall, mg)										
HDPE dustfall canister (algecide) 27	E447	12-Sep-2022	27-Sep-2022	----	----		28-Sep-2022	180 days	17 days	✓
Total Metals : Total Metals by CRC ICPMS (Dustfall, mg)										
HDPE dustfall canister (algecide) 32	E447	12-Sep-2022	27-Sep-2022	----	----		28-Sep-2022	180 days	17 days	✓
Total Metals : Total Metals by CRC ICPMS (Dustfall, mg)										
HDPE dustfall canister (algecide) 6	E447	12-Sep-2022	27-Sep-2022	----	----		28-Sep-2022	180 days	17 days	✓

Matrix: **Air**

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 by CRC ICPMS (Dustfall, mg)										
HDPE dustfall canister (algecide) Tatelkuz	E447	12-Sep-2022	27-Sep-2022	----	----		28-Sep-2022	180 days	17 days	✓

Legend & Qualifier Definitions

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: **Air**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Laboratory Duplicates (DUP)							
Ammonia by Fluorescence (Dustfall, mg)	E301	666133	1	8	12.5	5.0	✓
Chloride by IC (Dustfall, mg)	E244.Cl	666132	1	8	12.5	5.0	✓
Nitrate by IC (Dustfall, mg)	E244.NO3	666135	1	8	12.5	5.0	✓
Sulfate by IC (Dustfall, mg)	E244.SO4	666134	1	8	12.5	5.0	✓
Total Mercury by CVAAS (Dustfall, mg)	E516	668664	1	13	7.6	5.0	✓
Total Metals by CRC ICPMS (Dustfall, mg)	E447	667178	1	13	7.6	5.0	✓
Laboratory Control Samples (LCS)							
Ammonia by Fluorescence (Dustfall, mg)	E301	666133	1	8	12.5	5.0	✓
Chloride by IC (Dustfall, mg)	E244.Cl	666132	1	8	12.5	5.0	✓
Nitrate by IC (Dustfall, mg)	E244.NO3	666135	1	8	12.5	5.0	✓
Sulfate by IC (Dustfall, mg)	E244.SO4	666134	1	8	12.5	5.0	✓
Total Insoluble Dustfalls by Gravimetry (mg)	E882	666127	1	13	7.6	5.0	✓
Total Mercury by CVAAS (Dustfall, mg)	E516	668664	1	13	7.6	5.0	✓
Total Metals by CRC ICPMS (Dustfall, mg)	E447	667178	1	13	7.6	5.0	✓
Total Soluble Dustfalls by Gravimetry (mg)	E881	666126	1	13	7.6	5.0	✓
Method Blanks (MB)							
Ammonia by Fluorescence (Dustfall, mg)	E301	666133	1	8	12.5	5.0	✓
Chloride by IC (Dustfall, mg)	E244.Cl	666132	1	8	12.5	5.0	✓
Nitrate by IC (Dustfall, mg)	E244.NO3	666135	1	8	12.5	5.0	✓
Sulfate by IC (Dustfall, mg)	E244.SO4	666134	1	8	12.5	5.0	✓
Total Insoluble Dustfalls by Gravimetry (mg)	E882	666127	1	13	7.6	5.0	✓
Total Mercury by CVAAS (Dustfall, mg)	E516	668664	1	13	7.6	5.0	✓
Total Metals by CRC ICPMS (Dustfall, mg)	E447	667178	1	13	7.6	5.0	✓
Total Soluble Dustfalls by Gravimetry (mg)	E881	666126	1	13	7.6	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence (Dustfall, mg)	E301	666133	1	8	12.5	5.0	✓
Chloride by IC (Dustfall, mg)	E244.Cl	666132	1	8	12.5	5.0	✓
Nitrate by IC (Dustfall, mg)	E244.NO3	666135	1	8	12.5	5.0	✓
Sulfate by IC (Dustfall, mg)	E244.SO4	666134	1	8	12.5	5.0	✓
Total Mercury by CVAAS (Dustfall, mg)	E516	668664	1	13	7.6	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
Chloride by IC (Dustfall, mg)	E244.Cl Vancouver - Environmental	Air	BC MOE Lab Manual (Particulate, Total and Particulate, Soluble)/EPA 300.1 (mod)	Inorganic anions in dustfall samples are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate by IC (Dustfall, mg)	E244.NO3 Vancouver - Environmental	Air	BC MOE Lab Manual (Particulate, Total and Particulate, Soluble)/EPA 300.1 (mod)	Inorganic anions in dustfall samples are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate by IC (Dustfall, mg)	E244.SO4 Vancouver - Environmental	Air	BC MOE Lab Manual (Particulate, Total and Particulate, Soluble)/EPA 300.1 (mod)	Inorganic anions in dustfall samples are analyzed by Ion Chromatography with conductivity and/or UV detection.
Ammonia by Fluorescence (Dustfall, mg)	E301 Vancouver - Environmental	Air	BC MOE Lab Manual (Particulate, Total and Particulate, Soluble)/EPA 300.1 (mod)	Ammonia in dustfall samples is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Total Metals by CRC ICPMS (Dustfall, mg)	E447 Vancouver - Environmental	Air	EPA 6020B (mod)	This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by Collision/Reaction Cell ICPMS.
Total Mercury by CVAAS (Dustfall, mg)	E516 Vancouver - Environmental	Air	EPA 245.7	This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).
Total Soluble Dustfalls by Gravimetry (mg)	E881 Vancouver - Environmental	Air	BC LAB MANUAL - PARTICULATE	A sample is filtered through a 0.45 um membrane filter and its filtrate is evaporated at 104□ to dryness. The residue, Total Soluble Dustfall, is measured gravimetrically.
Total Insoluble Dustfalls by Gravimetry (mg)	E882 Vancouver - Environmental	Air	BC LAB MANUAL - PARTICULATE	A sample is filtered through a 0.45 um membrane filter and its filtered is evaporated at 104□ to dryness. The residue, Total Insoluble Dustfall, is measured gravimetrically.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Chloride by IC (Dustfall) (mg/dm2.day)	EC244.Cl Vancouver - Environmental	Air	BC MOE Lab Manual (Particulate, Total and Particulate, Soluble)/EPA 300.1 (mod)	Inorganic anions in dustfall samples are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate by IC (Dustfall) (mg/dm2.day)	EC244.NO3 Vancouver - Environmental	Air	BC MOE Lab Manual (Particulate, Total and Particulate, Soluble)/EPA 300.1 (mod)	Inorganic anions in dustfall samples are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate by IC (Dustfall) (mg/dm2.day)	EC244.SO4 Vancouver - Environmental	Air	BC MOE Lab Manual (Particulate, Total and Particulate, Soluble)/EPA 300.1 (mod)	Inorganic anions in dustfall samples are analyzed by Ion Chromatography with conductivity and/or UV detection.
Ammonia by Fluorescence (Dustfall) (mg/dm2.day)	EC301 Vancouver - Environmental	Air	BC MOE Lab Manual (Particulate, Total and Particulate, Soluble)/J. Environ. Monit., 2005, 7, 37-42 (mod)	Ammonia in dustfall samples is analyzed by flow-injection analysis with fluorescence detection after reaction with orthophthaldialdehyde (OPA).
Total Metals by ICPMS (Dustfall, mg/dm2.day)	EC447 Vancouver - Environmental	Air	unit conversion	Convert mg/sample to mg/dm2.day by field information.
Total Mercury by CVAAS (Dustfall, mg/dm2.day)	EC516 Vancouver - Environmental	Air	unit conversion	Convert mg/sample to mg/dm2.day based on field information.
Total Dustfalls by Calculation (mg/dm2.day)	EC880T.A Vancouver - Environmental	Air	BC LAB MANUAL - PARTICULATE	Total Dustfall is sum of Total Soluble Dustall and Total Insoluble Dustall. The result is then calculated based on canister area and sampling time.
Total Soluble Dustfalls by Gravimetry (mg/dm2.day)	EC881.A Vancouver - Environmental	Air	BC LAB MANUAL - PARTICULATE	A sample is filtered through a 0.45 um membrane filter and its filtrate is evaporated at 104□ to dryness. The residue, Total Soluble Dustfall, is measured gravimetrically. The result is then calculated based on canister area and sampling time.
Total Insoluble Dustfalls by Gravimetry (mg/dm2.day)	EC882.A Vancouver - Environmental	Air	BC LAB MANUAL - PARTICULATE	A sample is filtered through a 0.45 um membrane filter and its filtered is evaporated at 104□ to dryness. The residue, Total Insoluble Dustfall, is measured gravimetrically. The result is then calculated based on canister area and sampling time.
Dustfall Canister Area (cm2)	EF001A Vancouver - Environmental	Air	Field data	Measurement of sampling area (cm²) of the opening of the dustfall canister is recorded.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Dustfall Canister Sampling Days	EF001B Vancouver - Environmental	Air	N/A	Field dustfall information recorded on ALS report may affect the validity of results.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Anions and Ammonia Dustfall Preparation	EP244 Vancouver - Environmental	Air	BC MOE Lab Manual (Particulate, Total and Particulate, Soluble)/J. Environ. Monit., 2005, 7, 37-42 (mod)	Preparation of anions in canister media for anions and ammonia analysis.
Total Metals Dustfall Screening and Digestion	EP447 Vancouver - Environmental	Air	EPA 6020A	This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA).
Mercury Dustfall Preparation	EP516 Vancouver - Environmental	Air	EPA 245.7	This analysis is carried out using procedures adapted from "Standard Methods for the Examination of Water and Wastewater" published by the American Public Health Association, and with procedures adapted from "Test Methods for Evaluating Solid Waste" SW-846 published by the United States Environmental Protection Agency (EPA). Instrumental analysis is by cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).
Solids Dustfall Preparaton	EP880 Vancouver - Environmental	Air	BC LAB MANUAL - PARTICULATE	Dustfall sample preparation.

QUALITY CONTROL REPORT

Work Order	: **VA22C2246**	Page	: 1 of 9
Client	: ERM Consultants Canada Ltd.	Laboratory	: Vancouver - Environmental
Contact	: Daniel Casanova	Account Manager	: Amber Springer
Address	: 10th Floor, 1100 Melville St. Vancouver BC Canada V6E 4A6	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 0635833-0035 - Blackwater	Date Samples Received	: 16-Sep-2022 13:00
PO	: ----	Date Analysis Commenced	: 20-Sep-2022
C-O-C number	: ----	Issue Date	: 30-Sep-2022 09:33
Sampler	: ----		
Site	: ----		
Quote number	: VA22-ERMO100-009		
No. of samples received	: 8		
No. of samples analysed	: 8		

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Angela Ren	Team Leader - Metals	Vancouver Metals, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Vancouver Metals, Burnaby, British Columbia
Kinny Wu	Lab Analyst	Vancouver Metals, Burnaby, British Columbia
Trace Chometsky	Account Manager Assistant	Vancouver Administration, Burnaby, British Columbia

General Comments

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

Key :

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

Workorder Comments

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Air**

					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: 666132)											
VA22C2246-001	Tatelkuz	chloride	16887-00-6	E244.Cl	3.4	mg	<3.4	<3.4	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 666133)											
VA22C2246-001	Tatelkuz	ammonia, total (as N)	7664-41-7	E301	0.019	mg	0.036	0.034	0.002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 666134)											
VA22C2246-001	Tatelkuz	sulfate	14808-79-8	E244.SO4	0.22	mg	<0.22	<0.22	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 666135)											
VA22C2246-001	Tatelkuz	nitrate (as N)	14797-55-8	E244.NO3	0.019	mg	0.019	0.020	0.0002	Diff <2x LOR	----
Total Metals (QC Lot: 667178)											
VA22C2246-001	Tatelkuz	aluminum, total	7429-90-5	E447	0.0030	mg	0.0083	0.0072	0.0010	Diff <2x LOR	----
		antimony, total	7440-36-0	E447	0.000050	mg	<0.000050	<0.000050	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E447	0.000050	mg	<0.000050	<0.000050	0	Diff <2x LOR	----
		barium, total	7440-39-3	E447	0.000050	mg	0.000140	0.000116	0.000024	Diff <2x LOR	----
		beryllium, total	7440-41-7	E447	0.00025	mg	<0.00025	<0.00025	0	Diff <2x LOR	----
		bismuth, total	7440-69-9	E447	0.00025	mg	<0.00025	<0.00025	0	Diff <2x LOR	----
		boron, total	7440-42-8	E447	0.0050	mg	<0.0050	<0.0050	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E447	0.000020	mg	<0.000020	<0.000020	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E447	0.010	mg	0.025	0.024	0.0008	Diff <2x LOR	----
		chromium, total	7440-47-3	E447	0.00025	mg	<0.00025	<0.00025	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E447	0.000050	mg	<0.000050	<0.000050	0	Diff <2x LOR	----
		copper, total	7440-50-8	E447	0.00050	mg	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E447	0.030	mg	<0.030	<0.030	0	Diff <2x LOR	----
		lead, total	7439-92-1	E447	0.000025	mg	<0.000025	<0.000025	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E447	0.0025	mg	<0.0025	<0.0025	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E447	0.0025	mg	0.0244	0.0222	0.0022	Diff <2x LOR	----
		manganese, total	7439-96-5	E447	0.00100	mg	<0.00100	<0.00100	0	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E447	0.000025	mg	<0.000025	<0.000025	0	Diff <2x LOR	----
		nickel, total	7440-02-0	E447	0.00025	mg	<0.00025	<0.00025	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E447	0.025	mg	0.105	0.100	0.004	Diff <2x LOR	----
		potassium, total	7440-09-7	E447	0.025	mg	0.179	0.182	0.002	Diff <2x LOR	----
		selenium, total	7782-49-2	E447	0.00050	mg	<0.00050	<0.00050	0	Diff <2x LOR	----
		silicon, total	7440-21-3	E447	0.025	mg	<0.025	<0.025	0	Diff <2x LOR	----

Sub-Matrix: **Air**

					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: 667178) - continued											
VA22C2246-001	Tatelkuz	silver, total	7440-22-4	E447	0.0000050	mg	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E447	0.025	mg	0.042	0.042	0.00009	Diff <2x LOR	----
		strontium, total	7440-24-6	E447	0.000050	mg	0.000137	0.000127	0.000010	Diff <2x LOR	----
		thallium, total	7440-28-0	E447	0.000050	mg	<0.000050	<0.000050	0	Diff <2x LOR	----
		tin, total	7440-31-5	E447	0.000050	mg	<0.000050	<0.000050	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E447	0.0050	mg	<0.0050	<0.0050	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E447	0.0000050	mg	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		vanadium, total	7440-62-2	E447	0.00050	mg	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E447	0.0015	mg	<0.0015	<0.0015	0	Diff <2x LOR	----
Total Metals (QC Lot: 668664)											
VA22C2246-001	Tatelkuz	mercury, total	7439-97-6	E516	0.000025	mg	<0.000025	<0.000025	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: **Air**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Particulates (QCLot: 666126)						
dustfall, total soluble	----	E881	1.9	mg	<1.9	----
Particulates (QCLot: 666127)						
dustfall, total insoluble	----	E882	1.9	mg	<1.9	----
Anions and Nutrients (QCLot: 666132)						
chloride	16887-00-6	E244.Cl	3.4	mg	<3.4	----
Anions and Nutrients (QCLot: 666133)						
ammonia, total (as N)	7664-41-7	E301	0.019	mg	<0.038	----
Anions and Nutrients (QCLot: 666134)						
sulfate	14808-79-8	E244.SO4	0.225	mg	<0.22	----
Anions and Nutrients (QCLot: 666135)						
nitrate (as N)	14797-55-8	E244.NO3	0.019	mg	<0.019	----
Total Metals (QCLot: 667178)						
aluminum, total	7429-90-5	E447	0.003	mg	<0.0030	----
antimony, total	7440-36-0	E447	0.00005	mg	<0.000050	----
arsenic, total	7440-38-2	E447	0.00005	mg	<0.000050	----
barium, total	7440-39-3	E447	0.00005	mg	<0.000050	----
beryllium, total	7440-41-7	E447	0.00025	mg	<0.00025	----
bismuth, total	7440-69-9	E447	0.00025	mg	<0.00025	----
boron, total	7440-42-8	E447	0.005	mg	<0.0050	----
cadmium, total	7440-43-9	E447	0.00002	mg	<0.000020	----
calcium, total	7440-70-2	E447	0.01	mg	<0.010	----
chromium, total	7440-47-3	E447	0.00025	mg	<0.00025	----
cobalt, total	7440-48-4	E447	0.00005	mg	<0.000050	----
copper, total	7440-50-8	E447	0.0005	mg	<0.00050	----
iron, total	7439-89-6	E447	0.015	mg	# 0.024	MB-LOR
lead, total	7439-92-1	E447	0.000025	mg	<0.000025	----
lithium, total	7439-93-2	E447	0.0025	mg	<0.0025	----
magnesium, total	7439-95-4	E447	0.0025	mg	<0.0025	----
manganese, total	7439-96-5	E447	0.0001	mg	# 0.00019	MB-LOR
molybdenum, total	7439-98-7	E447	0.000025	mg	0.000043	----
nickel, total	7440-02-0	E447	0.00025	mg	<0.00025	----
phosphorus, total	7723-14-0	E447	0.025	mg	<0.025	----
potassium, total	7440-09-7	E447	0.025	mg	<0.025	----

Sub-Matrix: **Air**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 667178) - continued						
selenium, total	7782-49-2	E447	0.0005	mg	<0.00050	----
silicon, total	7440-21-3	E447	0.025	mg	<0.025	----
silver, total	7440-22-4	E447	0.000005	mg	<0.0000050	----
sodium, total	7440-23-5	E447	0.025	mg	<0.025	----
strontium, total	7440-24-6	E447	0.00005	mg	<0.000050	----
thallium, total	7440-28-0	E447	0.00005	mg	<0.000050	----
tin, total	7440-31-5	E447	0.00005	mg	<0.000050	----
titanium, total	7440-32-6	E447	0.005	mg	<0.0050	----
uranium, total	7440-61-1	E447	0.000005	mg	<0.0000050	----
vanadium, total	7440-62-2	E447	0.0005	mg	<0.00050	----
zinc, total	7440-66-6	E447	0.0015	mg	<0.0015	----
Total Metals (QCLot: 668664)						
mercury, total	7439-97-6	E516	0.000025	mg	<0.000020	----

Qualifiers

Qualifier	Description
MB-LOR	*Method Blank exceeds ALS DQO. Limits of Reporting have been adjusted for samples with positive hits below 5x blank level.*

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: **Air**

					Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
Analyte	CAS Number	Method	LOR	Unit	Concentration	LCS	Low	High	Qualifier
Particulates (QCLot: 666126)									
dustfall, total soluble	----	E881	1.9	mg	200 mg	101	85.0	115	----
Particulates (QCLot: 666127)									
dustfall, total insoluble	----	E882	1.9	mg	30 mg	102	85.0	115	----
Anions and Nutrients (QCLot: 666132)									
chloride	16887-00-6	E244.Cl	3.4	mg	50 mg	102	90.0	110	----
Anions and Nutrients (QCLot: 666133)									
ammonia, total (as N)	7664-41-7	E301	0.019	mg	0.1 mg	97.8	85.0	115	----
Anions and Nutrients (QCLot: 666134)									
sulfate	14808-79-8	E244.SO4	0.225	mg	50 mg	104	90.0	110	----
Anions and Nutrients (QCLot: 666135)									
nitrate (as N)	14797-55-8	E244.NO3	0.019	mg	1.25 mg	102	90.0	110	----
Total Metals (QCLot: 667178)									
aluminum, total	7429-90-5	E447	0.003	mg	1 mg	100.0	80.0	120	----
antimony, total	7440-36-0	E447	0.00005	mg	0.5 mg	109	80.0	120	----
arsenic, total	7440-38-2	E447	0.00005	mg	0.5 mg	110	80.0	120	----
barium, total	7440-39-3	E447	0.00005	mg	0.125 mg	108	80.0	120	----
beryllium, total	7440-41-7	E447	0.00025	mg	0.05 mg	98.7	80.0	120	----
bismuth, total	7440-69-9	E447	0.00025	mg	0.5 mg	104	80.0	120	----
boron, total	7440-42-8	E447	0.005	mg	0.5 mg	94.6	80.0	120	----
cadmium, total	7440-43-9	E447	0.00002	mg	0.05 mg	103	80.0	120	----
calcium, total	7440-70-2	E447	0.01	mg	25 mg	101	80.0	120	----
chromium, total	7440-47-3	E447	0.00025	mg	0.125 mg	107	80.0	120	----
cobalt, total	7440-48-4	E447	0.00005	mg	0.125 mg	103	80.0	120	----
copper, total	7440-50-8	E447	0.0005	mg	0.125 mg	103	80.0	120	----
iron, total	7439-89-6	E447	0.015	mg	0.5 mg	112	80.0	120	----
lead, total	7439-92-1	E447	0.000025	mg	0.25 mg	107	80.0	120	----
lithium, total	7439-93-2	E447	0.0025	mg	0.125 mg	99.5	80.0	120	----
magnesium, total	7439-95-4	E447	0.0025	mg	25 mg	103	80.0	120	----
manganese, total	7439-96-5	E447	0.0001	mg	0.125 mg	104	80.0	120	----
molybdenum, total	7439-98-7	E447	0.000025	mg	0.125 mg	108	80.0	120	----
nickel, total	7440-02-0	E447	0.00025	mg	0.25 mg	104	80.0	120	----
phosphorus, total	7723-14-0	E447	0.025	mg	5 mg	115	80.0	120	----

Sub-Matrix: **Air**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 667178) - continued									
potassium, total	7440-09-7	E447	0.025	mg	25 mg	106	80.0	120	----
selenium, total	7782-49-2	E447	0.0005	mg	0.5 mg	105	80.0	120	----
silicon, total	7440-21-3	E447	0.025	mg	5 mg	101	80.0	120	----
silver, total	7440-22-4	E447	0.000005	mg	0.05 mg	96.7	80.0	120	----
sodium, total	7440-23-5	E447	0.025	mg	25 mg	101	80.0	120	----
strontium, total	7440-24-6	E447	0.00005	mg	0.125 mg	107	80.0	120	----
thallium, total	7440-28-0	E447	0.00005	mg	0.5 mg	97.8	80.0	120	----
tin, total	7440-31-5	E447	0.00005	mg	0.25 mg	104	80.0	120	----
titanium, total	7440-32-6	E447	0.005	mg	0.125 mg	100	80.0	120	----
uranium, total	7440-61-1	E447	0.000005	mg	0.0025 mg	110	80.0	120	----
vanadium, total	7440-62-2	E447	0.0005	mg	0.25 mg	103	80.0	120	----
zinc, total	7440-66-6	E447	0.0015	mg	0.25 mg	109	80.0	120	----
Total Metals (QCLot: 668664)									
mercury, total	7439-97-6	E516	0.000025	mg	0.00062 mg	74.2	70.0	130	----

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: **Air**

Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
					Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 666132)										
VA22C2246-002	6	chloride	16887-00-6	E244.Cl	21.1 mg	20 mg	106	75.0	125	----
Anions and Nutrients (QCLot: 666133)										
VA22C2246-002	6	ammonia, total (as N)	7664-41-7	E301	0.040 mg	0.04 mg	101	75.0	125	----
Anions and Nutrients (QCLot: 666134)										
VA22C2246-002	6	sulfate	14808-79-8	E244.SO4	22.1 mg	20 mg	110	75.0	125	----
Anions and Nutrients (QCLot: 666135)										
VA22C2246-002	6	nitrate (as N)	14797-55-8	E244.NO3	0.527 mg	0.5 mg	105	75.0	125	----
Total Metals (QCLot: 668664)										
VA22C2246-002	6	mercury, total	7439-97-6	E516	0.000273 mg	0.00031 mg	88.1	70.0	130	----

Environmental Division
Vancouver
Work Order Reference
VA22C2246

Telephone : +1 604 253 4188

dy (COC) / Analytical uest Form

ree: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number:

Page of

www.alsglobal.co

Report To	Contact and co	Report Format / Distribution	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	ERM	elect Report Format: ☑ PDF ☑ EXCEL ☐ EDD (DIGITAL)	Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Daniel Casanova	uality Control (QC) Report with Report ☐ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐ — EMERGENCY: 1 Business day [E - 100%] ☐ / Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
Phone:	250-877-7838	☐ Compare Results to Criteria on Report - provide details below if box checked	
	Company address bel	elect Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Street:	3790 Alfred Ave	mail 1 or Fax lshelley@entiaenviro.com	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
City/Province:	Smithers, BC	mail 2 nicole.bishop@erm.com, Kfond Kal@artemisgeo	For tests that can not be performed according to the service level selected, you will be contacted.
Postal Code:	V0J 2N0	Email 3 andres.soux@erm.com daniel.casanova@erm.com	

Invoice To	Same as Report To ☑ YES ☐ NO	Invoice Distribution
	Copy of Invoice with Report ☐ YES ☑ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Company:	ERM Consultants	Email 1 or Fax erm.canadapayables@erm.com
Contact:	erm.canadapayables@erm.com	Email 2

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:	0635833-0035-**** (Blackwater)	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only): 2246 — ALS Contact: Amber Springer — Sampler:

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Total Particulate	Soluble Particulate	Insoluble Particulate	Sulphate	Nitrate	NH3, NH4	Cl	Total Metals	Mg+	Ca+	K+	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	TatelKuz | START Date+Time: 03-Aug-22 14:00	12-Sept-22	07:40	Dustfall	2	R	R	R	R	R	R	R	R	R	R	R		
	6 | START Date+Time: 26-July-22 13:52	12-Sept-22	09:10	Dustfall	2	R	R	R	R	R	R	R	R	R	R	R		
	14 | START Date+Time: 26-July-22 12:05	12-Sept-22	08:45	Dustfall	2	R	R	R	R	R	R	R	R	R	R	R		
	19 | START Date+Time: 26-July-22 11:05	12-Sept-22	08:25	Dustfall	2	R	R	R	R	R	R	R	R	R	R	R		
	24 | START Date+Time: 03-Aug-22 14:40	12-Sept-22	08:10	Dustfall	2	R	R	R	R	R	R	R	R	R	R	R		
	27 | START Date+Time: 28-July-22 18:10	12-Sept-22	07:55	Dustfall	2	R	R	R	R	R	R	R	R	R	R	R		
	32 | START Date+Time: 02-Aug-22 10:30	12-Sept-22	09:30	Dustfall	2	R	R	R	R	R	R	R	R	R	R	R		
	4 | START Date+Time: 03-Aug-22 16:15	13-Sept-22	11:50	Dustfall	2	R	R	R	R	R	R	R	R	R	R	R		
	| START Date+Time:			Dustfall	2	R	R	R	R	R	R	R	R	R	R	R		
	| START Date+Time:			Dustfall	2	R	R	R	R	R	R	R	R	R	R	R		
	| START Date+Time:			Dustfall	2	R	R	R	R	R	R	R	R	R	R	R		
	| START Date+Time:			Dustfall	2	R	R	R	R	R	R	R	R	R	R	R		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☐ NO

Are samples for human consumption/ use? ☐ YES ☐ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

ALS dustfall bottles were pre-filled by ALS with algaecide. ALS template Date/time columns represent ENDING date/time. See custom start date/time column in the Sample ID section, for the start date/time.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐	No	☐
Ice Packs	☑	Ice Cubes ☐	Custody seal intact	Yes ☐	No ☐
Cooling Initiated	☐				

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
				10c			

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
<Original signed by>	Date: 14-Sept-22	Time: 10:00	Received by:	Date:	Time:	<Original signed by>	Date: 09/15/22	Time: 1pm

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION — WHITE - LABORATORY COPY — YELLOW - CLIENT

NOV 2018 FRONT

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

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

APPENDIX D

Particulate Matter Certificate of Analysis

CERTIFICATE OF ANALYSIS

Work Order	: **VA23A1589**	Page	: 1 of 5
Client	: **BW Gold Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Sarah Harrison	Account Manager	: Amber Springer
Address	: 3083-595 Burrard St Vancouver BC Canada V7X 1L3	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 20-Jan-2023 10:15
PO	: 10394	Date Analysis Commenced	: 26-Jan-2023
C-O-C number	: 17-001	Issue Date	: 30-Jan-2023 16:57
Sampler	: SH/RH		
Site	: ----		
Quote number	: VA22-BWGL100-001 - Partisol Filters		
No. of samples received	: 11		
No. of samples analysed	: 11		

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*
Cindy Tang	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Trace Chometsky	Account Manager Assistant	Administration, 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*
µg/m³	micrograms per cubic metre
L	litres
mg/sample	milligrams per sample

<: less than.

>: greater than.

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

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

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

Analytical Results

Sub-Matrix: **Filter**
(Matrix: **Air**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	78099/78152	78102/77706	78107/77710	77707/77715	78104/77716
					Client sampling date / time	21-Oct-2022 23:56	27-Oct-2022 23:29	02-Nov-2022 12:00	08-Nov-2022 23:11	14-Nov-2022 12:00
						VA23A1589-001	VA23A1589-002	VA23A1589-003	VA23A1589-004	VA23A1589-005
						Result	Result	Result	Result	Result
Field Tests										
Air volume, field, coarse particulate	----	EF005	0.010	L		2400	2350	2410	2400	2410
Air volume, field, fine particulate	----	EF005	0.010	L		21500	21100	21600	21500	21600
Particulates										
Particulate, coarse	----	EC886	2.0	µg/m³		<2.0	2.4	2.2	4.5	<2.0
Particulate, fine	----	EC886	2.0	µg/m³		<2.3	2.4	<2.3	<2.3	5.9
Particulate, PM10	----	EC886	3.0	µg/m³		<3.0	4.8	<3.0	4.5	5.9
Particulate, PM2.5	----	EC886	2.0	µg/m³		<2.3	2.4	<2.3	<2.3	5.9
Particulate, coarse	----	E886	0.050	mg/sample		<0.050	0.063	0.053	0.107	<0.050
Particulate, fine	----	E886	0.050	mg/sample		<0.050	0.050	<0.050	<0.050	0.127
Particulate, PM10	----	E886	0.075	mg/sample		<0.075	0.113	<0.075	0.107	0.127
Particulate, PM2.5	----	E886	0.050	mg/sample		<0.050	0.050	<0.050	<0.050	0.127

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

Analytical Results

Sub-Matrix: **Filter**
(Matrix: **Air**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	78151/77713	77718/77711	77714/78103	78106/78130	78101/77729
					Client sampling date / time	19-Nov-2022 12:00	25-Nov-2022 23:44	01-Dec-2022	07-Dec-2022 23:56	13-Dec-2022 23:48
						VA23A1589-006	VA23A1589-007	VA23A1589-008	VA23A1589-009	VA23A1589-010
						Result	Result	Result	Result	Result
Field Tests										
Air volume, field, coarse particulate	----	EF005	0.010	L		2200	2220	2370	2210	2220
Air volume, field, fine particulate	----	EF005	0.010	L		19800	19900	21300	19800	19900
Particulates										
Particulate, coarse	----	EC886	2.0	µg/m³		2.4	<2.0	<2.0	<2.0	2.0
Particulate, fine	----	EC886	2.0	µg/m³		2.9	3.9	6.4	3.4	3.5
Particulate, PM10	----	EC886	3.0	µg/m³		5.3	3.9	6.4	3.4	5.5
Particulate, PM2.5	----	EC886	2.0	µg/m³		2.9	3.9	6.4	3.4	3.5
Particulate, coarse	----	E886	0.050	mg/sample		0.060	0.050	<0.050	<0.050	0.053
Particulate, fine	----	E886	0.050	mg/sample		0.057	0.077	0.137	0.067	0.070
Particulate, PM10	----	E886	0.075	mg/sample		0.117	0.127	0.137	<0.075	0.123
Particulate, PM2.5	----	E886	0.050	mg/sample		0.057	0.077	0.137	0.067	0.070

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

Analytical Results

Sub-Matrix: **Filter**
(Matrix: **Air**)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	78147/77725	----	----	----	----
					Client sampling date / time	19-Dec-2022	----	----	----	----
						VA23A1589-011	--------	--------	--------	--------
						Result	----	----	----	----
Field Tests										
Air volume, field, coarse particulate	----	EF005	0.010	L		2510	----	----	----	----
Air volume, field, fine particulate	----	EF005	0.010	L		22500	----	----	----	----
Particulates										
Particulate, coarse	----	EC886	2.0	µg/m³		<2.0	----	----	----	----
Particulate, fine	----	EC886	2.0	µg/m³		14.8	----	----	----	----
Particulate, PM10	----	EC886	3.0	µg/m³		14.8	----	----	----	----
Particulate, PM2.5	----	EC886	2.0	µg/m³		14.8	----	----	----	----
Particulate, coarse	----	E886	0.050	mg/sample		0.073	----	----	----	----
Particulate, fine	----	E886	0.050	mg/sample		0.333	----	----	----	----
Particulate, PM10	----	E886	0.075	mg/sample		0.406	----	----	----	----
Particulate, PM2.5	----	E886	0.050	mg/sample		0.333	----	----	----	----

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

QUALITY CONTROL REPORT

Work Order	: **VA23A1589**	Page	: 1 of 3
Client	: BW Gold Ltd.	Laboratory	: Vancouver - Environmental
Contact	: Sarah Harrison	Account Manager	: Amber Springer
Address	: 3083-595 Burrard St Vancouver BC Canada V7X 1L3	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	:	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 20-Jan-2023 10:15
PO	: 10394	Date Analysis Commenced	: 26-Jan-2023
C-O-C number	: 17-001	Issue Date	: 30-Jan-2023 16:57
Sampler	: SH/RH ----		
Site	: ----		
Quote number	: VA22-BWGL100-001 - Partisol Filters		
No. of samples received	: 11		
No. of samples analysed	: 11		

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

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percent Difference (RPD) and Data Quality Objectives
- Method Blank (MB) Report; Recovery and Data Quality Objectives

Signatories

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

Signatories	*Position*	*Laboratory Department*
Cindy Tang	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Trace Chometsky	Account Manager Assistant	Vancouver Administration, Burnaby, British Columbia

General Comments

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

Key :

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

Workorder Comments

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Air**

					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*
Particulates (QC Lot: 816234)											
VA23A1589-001	78099/78152	Particulate, coarse	----	E886	0.050	mg/sample	<0.050	0.057	0.007	Diff <2x LOR	----
		Particulate, fine	----	E886	0.050	mg/sample	<0.050	<0.050	0	Diff <2x LOR	----
		Particulate, PM10	----	E886	0.075	mg/sample	<0.075	<0.075	0	Diff <2x LOR	----
Particulates (QC Lot: 818107)											
VA23A1589-006	78151/77713	Particulate, coarse	----	E886	0.050	mg/sample	0.060	0.070	0.010	Diff <2x LOR	----
		Particulate, fine	----	E886	0.050	mg/sample	0.057	<0.050	0.007	Diff <2x LOR	----
		Particulate, PM10	----	E886	0.075	mg/sample	0.117	<0.075	0.042	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: **Air**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Particulates (QCLot: 816234)						
Particulate, coarse	----	E886	0.05	mg/sample	<0.050	----
Particulate, fine	----	E886	0.05	mg/sample	<0.050	----
Particulate, PM10	----	E886	0.075	mg/sample	<0.075	----
Particulates (QCLot: 818107)						
Particulate, coarse	----	E886	0.05	mg/sample	<0.050	----
Particulate, fine	----	E886	0.05	mg/sample	<0.050	----
Particulate, PM10	----	E886	0.075	mg/sample	<0.075	----

ALS Canada Ltd.

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right partner.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA23A1589**	Page	: 1 of 7
Client	: **BW Gold Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Sarah Harrison	Account Manager	: Amber Springer
Address	: 3083-595 Burrard St Vancouver BC Canada V7X 1L3	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: ----	Date Samples Received	: 20-Jan-2023 10:15
PO	: 10394	Issue Date	: 30-Jan-2023 16:58
C-O-C number	: 17-001		
Sampler	: SH/RH		
Site	: ----		
Quote number	: VA22-BWGL100-001 - Partisol Filters		
No. of samples received	: 11		
No. of samples analysed	: 11		

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

Key

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

Workorder Comments

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

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

- No Analysis Holding Time Outliers exist.

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: **Air**

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
Field Tests : Air Sampling Volume for Particulate (Dichotomous)										
Filter 77707/77715	EF005	08-Nov-2022	----	----	----		26-Jan-2023	----	----	
Field Tests : Air Sampling Volume for Particulate (Dichotomous)										
Filter 77714/78103	EF005	01-Dec-2022	----	----	----		26-Jan-2023	----	----	
Field Tests : Air Sampling Volume for Particulate (Dichotomous)										
Filter 77718/77711	EF005	25-Nov-2022	----	----	----		26-Jan-2023	----	----	
Field Tests : Air Sampling Volume for Particulate (Dichotomous)										
Filter 78099/78152	EF005	21-Oct-2022	----	----	----		26-Jan-2023	----	----	
Field Tests : Air Sampling Volume for Particulate (Dichotomous)										
Filter 78101/77729	EF005	13-Dec-2022	----	----	----		26-Jan-2023	----	----	
Field Tests : Air Sampling Volume for Particulate (Dichotomous)										
Filter 78102/77706	EF005	27-Oct-2022	----	----	----		26-Jan-2023	----	----	
Field Tests : Air Sampling Volume for Particulate (Dichotomous)										
Filter 78104/77716	EF005	14-Nov-2022	----	----	----		26-Jan-2023	----	----	

Matrix: **Air**

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
Field Tests : Air Sampling Volume for Particulate (Dichotomous)										
Filter 78106/78130	EF005	07-Dec-2022	----	----	----		26-Jan-2023	----	----	
Field Tests : Air Sampling Volume for Particulate (Dichotomous)										
Filter 78107/77710	EF005	02-Nov-2022	----	----	----		26-Jan-2023	----	----	
Field Tests : Air Sampling Volume for Particulate (Dichotomous)										
Filter 78147/77725	EF005	19-Dec-2022	----	----	----		26-Jan-2023	----	----	
Field Tests : Air Sampling Volume for Particulate (Dichotomous)										
Filter 78151/77713	EF005	19-Nov-2022	----	----	----		26-Jan-2023	----	----	
Particulates : Particulates Dichotomous by Gravimetry (mg/sample)										
Filter 77707/77715	E886	08-Nov-2022	----	----	----		27-Jan-2023	----	----	
Particulates : Particulates Dichotomous by Gravimetry (mg/sample)										
Filter 77714/78103	E886	01-Dec-2022	----	----	----		30-Jan-2023	----	----	
Particulates : Particulates Dichotomous by Gravimetry (mg/sample)										
Filter 77718/77711	E886	25-Nov-2022	----	----	----		30-Jan-2023	----	----	
Particulates : Particulates Dichotomous by Gravimetry (mg/sample)										
Filter 78099/78152	E886	21-Oct-2022	----	----	----		27-Jan-2023	----	----	
Particulates : Particulates Dichotomous by Gravimetry (mg/sample)										
Filter 78101/77729	E886	13-Dec-2022	----	----	----		30-Jan-2023	----	----	

Matrix: **Air**

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
Particulates : Particulates Dichotomous by Gravimetry (mg/sample)										
Filter 78102/77706	E886	27-Oct-2022	----	----	----		27-Jan-2023	----	----	
Particulates : Particulates Dichotomous by Gravimetry (mg/sample)										
Filter 78104/77716	E886	14-Nov-2022	----	----	----		27-Jan-2023	----	----	
Particulates : Particulates Dichotomous by Gravimetry (mg/sample)										
Filter 78106/78130	E886	07-Dec-2022	----	----	----		30-Jan-2023	----	----	
Particulates : Particulates Dichotomous by Gravimetry (mg/sample)										
Filter 78107/77710	E886	02-Nov-2022	----	----	----		27-Jan-2023	----	----	
Particulates : Particulates Dichotomous by Gravimetry (mg/sample)										
Filter 78147/77725	E886	19-Dec-2022	----	----	----		30-Jan-2023	----	----	
Particulates : Particulates Dichotomous by Gravimetry (mg/sample)										
Filter 78151/77713	E886	19-Nov-2022	----	----	----		30-Jan-2023	----	----	

Legend & Qualifier Definitions

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: **Air**

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)							
Particulates Dichotomous by Gravimetry (mg/sample)	E886	816234	2	11	18.1	5.0	✓
Method Blanks (MB)							
Particulates Dichotomous by Gravimetry (mg/sample)	E886	816234	2	11	18.1	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
Particulates Dichotomous by Gravimetry (mg/sample)	E886 Vancouver - Environmental	Air	BC Lab Manual - Total Particulate	Total Particulate Matter (PM10) Method analysis is carried out in accordance with the BCMOE Lab Manual, Section G Air Constituents - Inorganics, "Total Particulate - PM10/PM02 - 47mm - HiVol" method. ALS provides pre-weighed filters (Pallflex TX40 HI20-WW 47mm) and clients typically sample using a "Dichotomus Partisol sequential Air Sampler" equivalent sample (EQPS-0509-179, EQPS-0509-180, EQPS-0311-198)as per U.S. EPA Reference Method RFPS-0694-098, fitted with a PM10 inlet. The particulate matter is determined gravimetrically. Three formulas are required for the mass concentration(um/M3)computation of fine PM(PM-2.5) Course PM (PM-10 minus PM2.5) and PM-10.
Particulates Dichotomous by Gravimetry (ug/m3)	EC886 Vancouver - Environmental	Air	BC Lab Manual - Total Particulate	Total Particulate Matter (PM10) Method analysis is carried out in accordance with the BCMOE Lab Manual, Section G Air Constituents - Inorganics, "Total Particulate - PM10/PM02 - 47mm - HiVol" method. ALS provides pre-weighed filters (Pallflex TX40 HI20-WW 47mm) and clients typically sample using a "Dichotomus Partisol sequential Air Sampler" equivalent sample (EQPS-0509-179, EQPS-0509-180, EQPS-0311-198)as per U.S. EPA Reference Method RFPS-0694-098, fitted with a PM10 inlet. The particulate matter is determined gravimetrically. Three formulas are required for the mass concentration(um/M3)computation of fine PM(PM-2.5) Course PM (PM-10 minus PM2.5) and PM-10.
Air Sampling Volume for Particulate (Dichotomous)	EF005 Vancouver - Environmental	Air	Field measurements supplied by client	Field measurement of sampling volume provided by client and recorded on ALS report may affect the validity of results

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 - 001

Page 2 of 2

Report To	Contact and company name below will appear on the final report
Company:	Blackwater Gold Mine
Contact:	Sarah Harrison
Phone:	2508183785
	Company address below will appear on the final report
Street:	101-139 1st Street East
City/Province:	Vanderhoof, BC
Postal Code:	V0J 3A0
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Atemis Gold Inc.
Contact:	Accounts Payable

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: Envirogeneral@artemisgoldinc.com
Email 2: dan.jarratt@stantec.com
Email 3: Ktanaka@artemisgoldinc.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax: accounts@artemisgoldinc.com
Email 2: Sharrison@artemisgoldinc.com

Project Information

ALS Account # / Quote #:
Job #:
PO / AFE: 10394
LSD:

Oil and Gas Required Fields (client use)

AFE/Cost Center: PO#
Major/Minor Code: Routing Code:
Requisitioner:
Location:

ALS Lab Work Order # (lab use only):

ALS Contact: Amber Springer **Sampler:** SH/RH

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

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

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

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

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

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

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	PM 2.5	PM 10	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	78151/ TV (M3) 19.8	19-Nov-22	0:00	particulate	1	X			
	77718/ TV (M3) 19.9	25-Nov-22	23:44	particulate	1	X			
	77714/ TV (M3) 21.3	1-Dec-22	0:00	particulate	1	X			
	~~78106/ TV (M3) 19.8~~	~~7-Dec-22~~	~~23:56~~	particulate	1	X			
	78101/ TV (M3) 19.9	13-Dec-22	23:48	particulate	1	X			
	78147/ TV (M3) 22.5	19-Dec-22	0:00	particulate	1	X			
	77713/ TV (M3) 2.20	19-Nov-22	0:00	particulate	1		X		
	77711/ TV (M3) 2.22	25-Nov-22	23:44	particulate	1		X		
	78103/ TV (M3) 2.37	1-Dec-22	0:00	particulate	1		X		
	78130/ TV (M3) 2.21	7-Dec-22	23:56	particulate	1		X		
	77729/ TV (M3) 2.22	13-Dec-22	23:48	particulate	1		X		
	77725/ TV (M3) 2.51	19-Dec-22	0:00	particulate	1		X		

Environmental Division
Vancouver
Work Order Reference
VA23A1589

Telephone : +1 604 253 4188

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human consumption/ use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
				8	

SHIPMENT RELEASE (client use)

Released by: <Original signed by> Date: 17 Jan 2023 Time: 0815

INITIAL SHIPMENT RECEPTION (lab use only)

Received by: Date: Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by: <Original signed by> Date: 20 Jan 23 Time: 10:15am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

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

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

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 - 001

Page ~~4 of~~ 1 of 2

Report To	Contact and company name below will appear on the final report
Company:	Blackwater Gold Mine
Contact:	Sarah Harrison
Phone:	2508183785
	Company address below will appear on the final report
Street:	101-139 1st Street East
City/Province:	Vanderhoof, BC
Postal Code:	V0J 3A0
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Atemis Gold Inc.
Contact:	Accounts Payable

Report Format / Distribution	
Select Report Format:	☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report	☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked	
Select Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	Envirogeneral@artemisgoldinc.com
Email 2	dan.jarratt@stantec.com
Email 3	Ktanaka@artemisgoldinc.com

Invoice Distribution	
Select Invoice Distribution:	☑ EMAIL ☐ MAIL ☐ FAX
Email 1 or Fax	accounts@artemisgoldinc.com
Email 2	Sharrison@artemisgoldinc.com

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

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

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

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

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

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

Project Information

ALS Account # / Quote #:	
Job #:	
PO / AFE:	10394
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#:
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only): 1589 **ALS Contact:** Amber Springer **Sampler:** SH/RH

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	PM 2.5	PM 10	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	78099/ TV (M3) 21.5	21-Oct-22	23:56	particulate	1	X			
	78102/ TV (M3) 21.1	27-Oct-22	23:29	particulate	1	X			
	78107/ TV (M3) 21.6	2-Nov-22	0:00	particulate	1	X			
	77707/ TV (M3) 21.5	8-Nov-22	23:11	particulate	1	X			
	78104/ TV (M3) 21.6	14-Nov-22	0:00	particulate	1	X			
	78152/ TV (M3) 2.40	21-Oct-22	23:56	particulate	1		X		
	77706/ TV (M3) 2.35	27-Oct-22	23:29	particulate	1		X		
	77710/ TV (M3) 2.41	2-Nov-22	0:00	particulate	1		X		
	77715/ TV (M3) 2.40	8-Nov-22	23:11	particulate	1		X		
	77716/ TV (M3) 2.41	14-Nov-22	0:00	particulate	1		X		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human consumption/ use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen	☐	SIF Observations	Yes ☐ No ☑
Ice Packs	☑ Ice Cubes ☐	Custody seal intact	Yes ☐ No ☐
Cooling Initiated	☐		

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			8		

SHIPMENT RELEASE (client use)

Released by:	Date:	Time:
<Original signed by>	17 Jan 2023	0815

INITIAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:

FINAL SHIPMENT RECEPTION (lab use only)

Received by:	Date:	Time:
<Original signed by>	20 Jan 23	10 15 am

REFER TO B... ...TIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

NOV 2018 FRONT

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

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

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 - 001

Page ~~1 of~~ 1 of 2

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Contact your AM to confirm all E&P TATs (surcharges may apply)
Company:	Blackwater Gold Mine	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Sarah Harrison	Quality Control (QC) Report with Report ☑ YES ☐ NO	PRIORITY (Business Days): 4 day [P4-20%] ☐ / 3 day [P3-25%] ☐ / 2 day [P2-50%] ☐
Phone:	2508183785	☐ Compare Results to Criteria on Report - provide details below if box checked	EMERGENCY: 1 Business day [E - 100%] ☐ / Same Day, Weekend or Statutory holiday [E2 -200% (Laboratory opening fees may apply)] ☐
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:	101-139 1st Street East	Email 1 or Fax: Envirogeneral@artemisgoldinc.com	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:	Vanderhoof, BC	Email 2: dan.jarratt@stantec.com	
Postal Code:	V0J 3A0	Email 3: Ktanaka@artemisgoldinc.com	
Invoice To	Same as Report To ☐ YES ☑ NO	**Invoice Distribution**	
	Copy of Invoice with Report ☐ YES ☑ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:	Atemis Gold Inc.	Email 1 or Fax: accounts@artemisgoldinc.com	
Contact:	Accounts Payable	Email 2: Sharrison@artemisgoldinc.com	
Project Information		**Oil and Gas Required Fields (client use)**	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	10394	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):	1589	ALS Contact: Amber Springer	Sampler: SH/RH

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	PM 2.5	PM 10	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	78099/ TV (M3) 21.5	21-Oct-22	23:56	particulate	1	X			
	78102/ TV (M3) 21.1	27-Oct-22	23:29	particulate	1	X			
	78107/ TV (M3) 21.6	2-Nov-22	0:00	particulate	1	X			
	77707/ TV (M3) 21.5	8-Nov-22	23:11	particulate	1	X			
	78104/ TV (M3) 21.6	14-Nov-22	0:00	particulate	1	X			
	78152/ TV (M3) 2.40	21-Oct-22	23:56	particulate	1		X		
	77706/ TV (M3) 2.35	27-Oct-22	23:29	particulate	1		X		
	77710/ TV (M3) 2.41	2-Nov-22	0:00	particulate	1		X		
	77715/ TV (M3) 2.40	8-Nov-22	23:11	particulate	1		X		
	77716/ TV (M3) 2.41	14-Nov-22	0:00	particulate	1		X		

Environmental Division
Vancouver
Work Order Reference
VA23A1589

Telephone : +1 604 253 4188

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human consumption/ use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

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

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C				FINAL COOLER TEMPERATURES °C			
					8		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released <Original signed by>	Date: 17 Jan 2023	Time: 0815	Received by:	Date:	Time:	Received by: <Original signed by>	Date: 20 Jan 23	Time: 10 15 am

REFER TO ...IONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

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

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

Chain of Custody (COC) / Analytical Request Form

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 17 - 001

Report To	Contact and company name below will appear on the final report
Company:	Blackwater Gold Mine
Contact:	Sarah Harrison
Phone:	2508183785
	Company address below will appear on the final report
Street:	101-139 1st Street East
City/Province:	Vanderhoof, BC
Postal Code:	V0J 3A0
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Atemis Gold Inc.
Contact:	Accounts Payable

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	Envirogeneral@artemisgoldinc.com
Email 2	dan.jarratt@stantec.com
Email 3	Ktanaka@artemisgoldinc.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	accounts@artemisgoldinc.com
Email 2	Sharrison@artemisgoldinc.com

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

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

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

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

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

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

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:	10394	Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only):		ALS Contact: Amber Springer	Sampler: SH/RH

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	PM 2.5	PM 10	SAMPLES ON HOLD	SUSPECTED HAZARD (see Special Instructions)
	78151/ TV (M3) 19.8	19-Nov-22	0:00	particulate	1	X			
	77718/ TV (M3) 19.9	25-Nov-22	23:44	particulate	1	X			
	77714/ TV (M3) 21.3	1-Dec-22	0:00	particulate	1	X			
	78106/ TV (M3) 19.8	7-Dec-22	23:56	particulate	1	X			
	78101/ TV (M3) 19.9	13-Dec-22	23:48	particulate	1	X			
	78147/ TV (M3) 22.5	19-Dec-22	0:00	particulate	1	X			
	77713/ TV (M3) 2.20	19-Nov-22	0:00	particulate	1		X		
	77711/ TV (M3) 2.22	25-Nov-22	23:44	particulate	1		X		
	78103/ TV (M3) 2.37	1-Dec-22	0:00	particulate	1		X		
	78130/ TV (M3) 2.21	7-Dec-22	23:56	particulate	1		X		
	77729/ TV (M3) 2.22	13-Dec-22	23:48	particulate	1		X		
	77725/ TV (M3) 2.51	19-Dec-22	0:00	particulate	1		X		

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human consumption/ use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ | SIF Observations Yes ☐ No ☐

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

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
				8	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: <Original signed by>	Date: 17 Jan 2023	Time: 0815	Received by:	Date:	Time:	Received by: <Original signed by>	Date: 20 Jan 23	Time: 10:15

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

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

Appendix 7: Country Food Monitoring Plan Annual Report 2022



ARTEMIS GOLD INC | Blackwater Mine

Blackwater Gold Project

Country Foods Monitoring Plan: Environmental Assessment Certificate Condition 41 Annual Report 2022

March 2023

Signature Page

March 2023

Blackwater Gold Project

Country Foods Monitoring Plan: Environmental Assessment Certificate Condition 41 Annual Report 2022

As required by the Blackwater Gold Mine Environmental Assessment Certificate Condition 41, the CFMP was prepared and implemented by qualified environmental professionals (QEPs), including those shown below. A QEP is a person who has training, experience, and expertise in a discipline relevant to the field of practice set out in the condition, is registered with a professional organization enabled under an Act who must follow a code of ethics issued by the professional organization, perform her or his duties in the public interest, and can be subject to disciplinary action by the organization.

Prepared by:

<Original signed by>

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ACKNOWLEDGEMENTS

This report was prepared by Entia Environmental Consultants Ltd (Entia), under a sub-contract with ERM Consultants Canada Ltd. (ERM), on behalf of BW Gold Ltd. This report was authored by Dr. Annette Muttray with senior technical review by Dr. Lesley Shelley. Statistical analyses were conducted by Dr. Arianne Albert of ERM. Review was provided by Patty Vadnais of ERM. ERM also provided GIS support services.

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ACRONYMS AND ABBREVIATIONS

Aboriginal Groups or Indigenous nations	Lhoosk'uz Dené Nation, Ulkatcho First Nation, Nadleh Whut'en First Nation, Saik'uz First Nation, Stellat'en First Nation and Nazko First Nation (as defined in the Project's Environmental Assessment Certificate #M19-01)
AEMP	Aquatic Effects Monitoring Plan
ANOVA	Analysis of variance
Application/EIS	Application for an Environmental Assessment Certificate/Environmental Impact Statement
AQDMP	Air Quality and Fugitive Dust Management Plan
BA	Before-after
BACI	Before-after-control-impact
BC	British Columbia
BC ENV	Ministry of Environment and Climate Change Strategy
BW Gold	BW Gold Ltd.
CAC	Criteria air contaminants
CALA	Canadian Association for Laboratory Accreditation
CFSN	Carrier Sekani First Nation
CFMP	Country Foods Monitoring Plan
CI	Control-impact
COPC	Contaminant of potential concern
CSM	Conceptual site model
CSR	Contaminated Sites Regulation
DL	Detection limit
DS	Decision Statement
DW	Drinking water
DWQG	Drinking water quality guideline
EAC	Environmental Assessment Certificate
EMB	Environmental Management Board
EPC	Exposure point concentration
FSR	Forest service road
ha	Hectares
HC	Health Canada

HHRA	Human health risk assessment
Indigenous groups or Aboriginal Peoples	Ulkatcho First Nation, Lhoosk'uz Dené Nation, Nadleh Whut'en First Nation, Stellat'en First Nation, Saik'uz First Nation, Nazko First Nation, Skin Tyee Nation, Tŝilhqot'in Nation, Métis Nation British Columbia, and Nee-Tahi-Buhn Band (as defined in the Project's federal Decision Statement)
km	Kilometre
LDN	Lhoosk'uz Dené Nation
LSA	Local Study Area
mg/L	milligrams per liter
Mtpa	Million tonnes per annum
NPM	numeric performance metrics
PASS	Passive air sampling system
PM	Particulate matter
Project, the	Blackwater Gold Project
Proponent	BW Gold LTD.
QA/QC	Quality assurance/quality control
RPD	Relative percent difference
SWQ	Surface water quality
t/d	Tonnes per day
TSF	Tailings storage facility
UCLM	Upper confidence limit of the mean
UFN	Ulkatcho First Nation
WMOP	Wetlands Management and Offsetting Plan

1. INTRODUCTION

1.1 Background

The Blackwater Gold Project (the Project) is located approximately 112 kilometres (km) southwest of Vanderhoof, 160 km southwest of Prince George, and 446 km northeast of Vancouver (Figure 1.1-1). The mine site is centered at latitude 53°11'22.872" N, and longitude 124°52' 0.437" W (375400 E, 5893000 N) on National Topographic System sheet 93F/02.

The Project is a greenfield gold and silver open-pit mine with associated ore processing facilities. The Project will have a life of mine of 23 years and will ramp up production in three phases: Year 1-5: 15,000 tonnes/day (t/d) (5.5 Million tonnes per annum [Mtpa]); Year 6-10: 33,000 t/d (12 Mtpa); and Year 11-23: 55,000 t/d (20 Mtpa). Ore will be processed in a plant by a combined gravity circuit and whole ore cyanide leach to recover gold and silver. The gold and silver will be recovered into a gold-silver doré product. Project layout at the end of the Operations phase is found on Figure 1.1-2.

The Project received Environmental Assessment Certificate #M19-01 (EAC) on June 21, 2019 under the 2002 *Environmental Assessment Act* and a Decision Statement (DS) on April 15, 2019 under the *Canadian Environmental Assessment Act, 2012* approving the Blackwater Project, with conditions.

The conditions include several environmental monitoring and management programs with the goal of protecting the environment and human health. The Country Foods Monitoring Program (CFMP; ERM 2022b) is one such program and addresses all or some aspects of the following provincial EAC and federal DS conditions:

- in the EAC:
  - Condition 41: Country Foods Monitoring Plan;
  - Condition 2: Plan Development;
  - Condition 3: Adaptive Management; and
  - Condition 4: Consultation.
- in the DS:
  - Conditions 6.5, 6.11, 6.12 and 6.15: Health and Socio-economic Conditions and Current Use of Lands and Resources for Traditional Purposes;
  - Conditions 2.3 and 2.4: Consultation;
  - Conditions 2.5, 2.6, 2.7, 2.8, 2.9, and 2.10: Follow-up and Adaptive Management; and
  - Conditions 2.11, 2.12, and 2.13: Annual Reporting.

This report is the first Annual Report under the CFMP and was triggered under Condition 5 of the EAC, which sets out timelines for reporting requirements. BW Gold must submit a report to the attention of the EAO and Indigenous groups on the status of compliance with EAC #M19-01 before March 31 in each year after the start of Construction. Since BW Gold began limited early works construction activities at the mine site in October 2022, the annual report under the CFMP for the period from October 1, 2022, to December 31, 2022 is required to be submitted prior to March 31, 2023. Of the sampling required under the CFMP (see Section 4 of the CFMP), surface water quality and air particulate matter sampling was conducted during the reporting period. Therefore, this CFMP Annual Report presents results of monitoring surface water quality and air particulate matter conducted between October 1 and December 31, 2022, only.

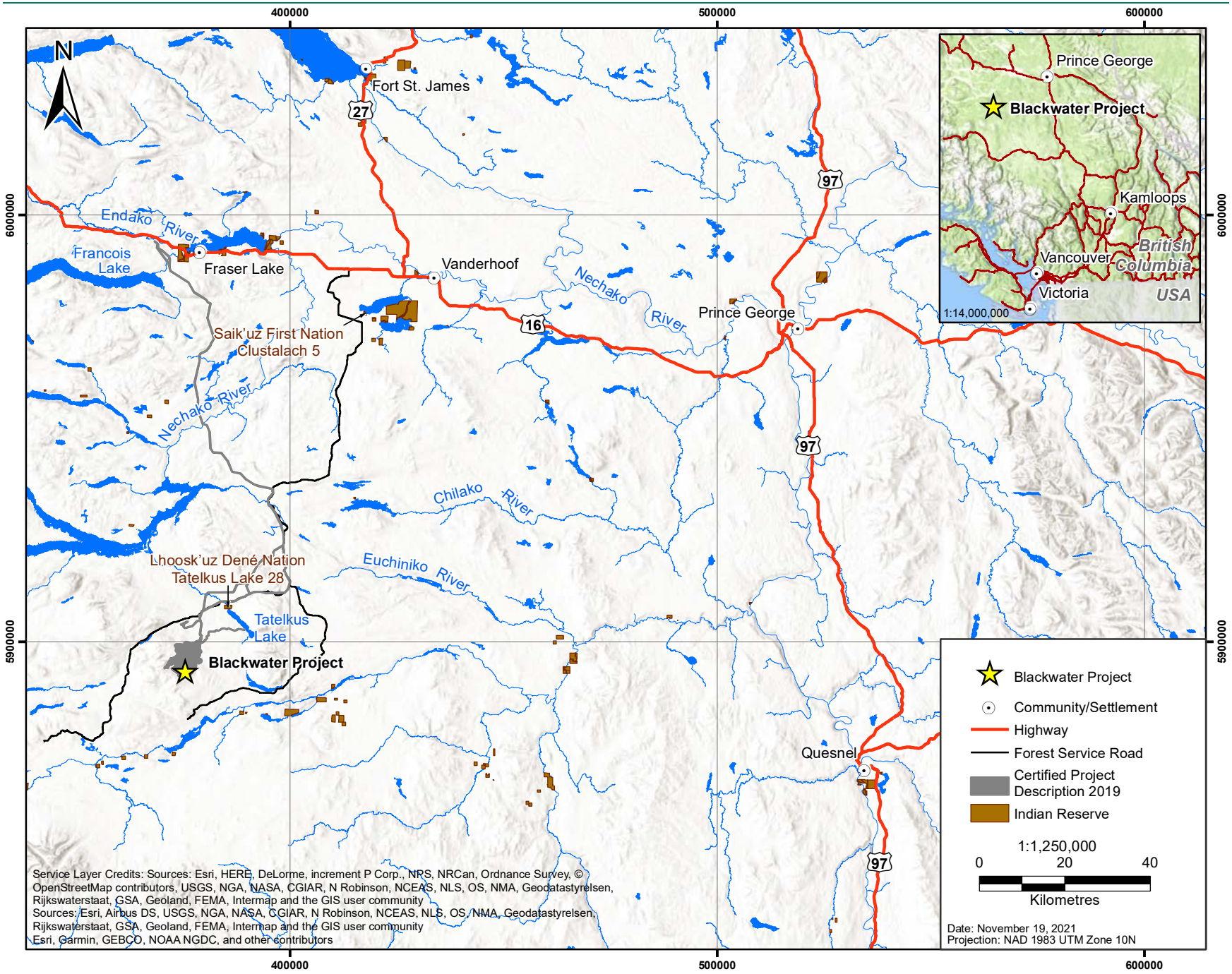


Figure 1.1-1: The Blackwater Gold Project Location

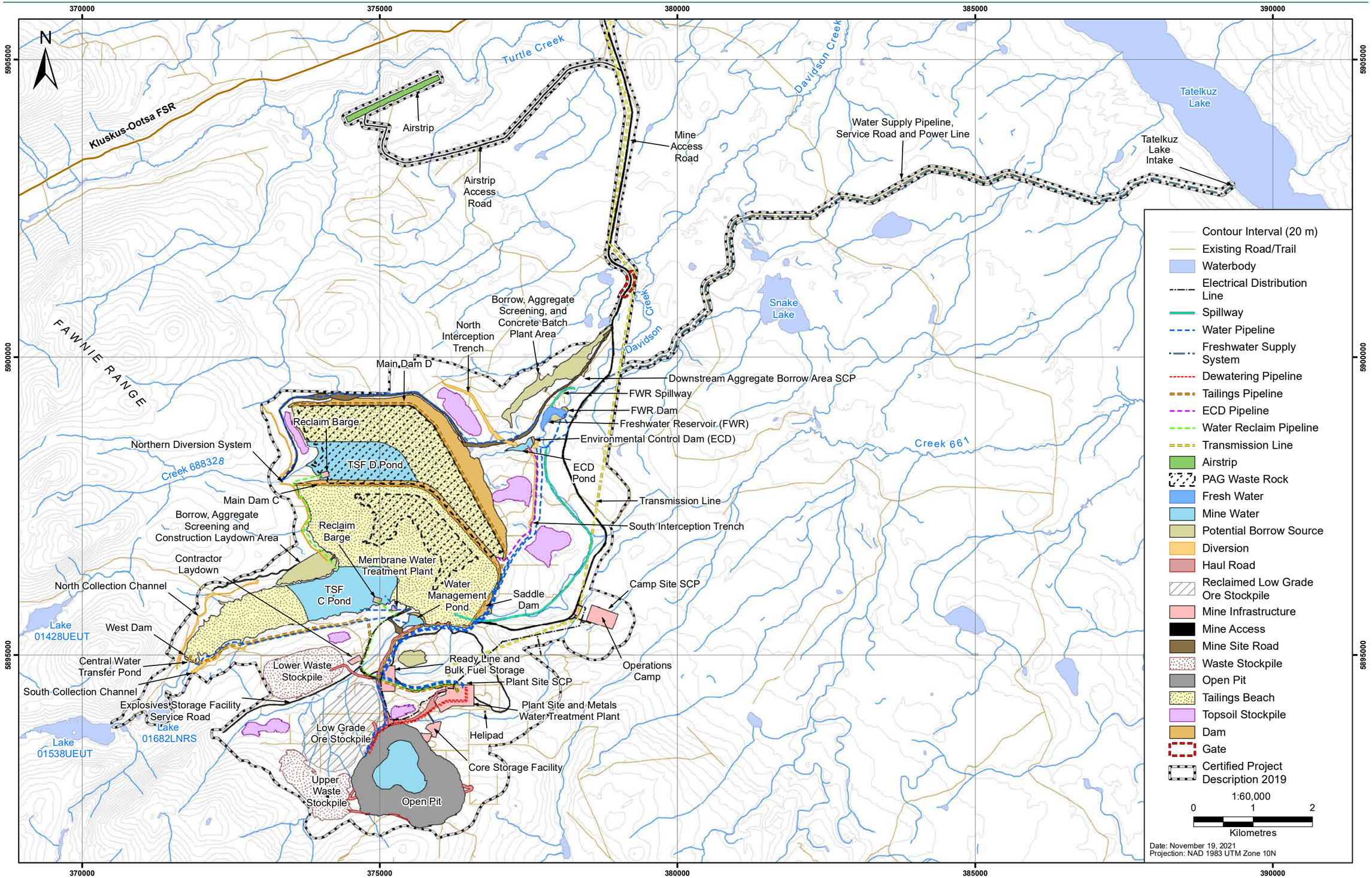


Figure 1.1-2: The Blackwater Gold Project Mine Plan

1.2 Project Activities Completed in 2022

From January to September of 2022, the Project was in the baseline (pre-construction) phase. Baseline data collection and monitoring programs were conducted in support of the CFMP, including baseline sampling of water quality, air quality (dustfall and dust metals), soil, plant and berry tissues, and fish tissues. Results of the baseline monitoring programs are provided in other reports including the following:

- 2021-2022 Cumulative Dustfall, Soil, and Plant Metal Concentration Baseline Report (ERM 2023a)
- 2022 Aquatic Effects Monitoring Program Cumulative Baseline (ERM *In prep.*)
- Chapter 2 of the Joint Application for *Mines Act/Environmental Management Act* permits (BW Gold 2022b) for Baseline air quality data for criteria air contaminants (CACs);
- 2022 Air Quality and Fugitive Dust Management Annual Report (BW Gold 2023)

The Project initiated limited early works construction activities at the mine site in October 2022. Table 1.2-1 provides an overview of early works construction activities that were carried out from early October to end of December 2022 at the Project. Figure 1.2-1 shows the location and extent of Project activities during this period. There were no effluent discharges to surface water from the Project during this time period.

Table 1.2-1: Overview of Early Works Components and Activities and Activities Completed Between October 1 and December 31, 2022

<table>
<tr><th>Component/Activity</th><th>Description</th><th>Activities Completed October 1 and December 31, 2022</th></tr>
<tr><td>Mine Access Road</td><td>■ Kluskus-Ootsa Forest Service Road (FSR) km 124.5 to plant site
■ Kluskus-Ootsa FSR to Mine Site boundary to be permitted under Special Use Permit
■ Mine Site boundary to mine site terminus to be permitted under Mines Act
■ 16 km single lane
■ Balanced cut and fill; no bedrock excavation/blasting
■ Located on mineral tenure held by BW Gold
■ Approximately 100 ha of disturbance; partially cleared</td><td>■ No works completed</td></tr>
<tr><td>Mine Access Road Bridges</td><td><table>
<tr><th>Bridge</th><th>Length (m)</th><th>Location (from the Kluskus-Ootsa FSR)</th><th>Description</th></tr>
<tr><td>Bridge 1 (off mine site)</td><td>18.3</td><td>0.490 km</td><td>Steel concrete composite on precast spread footing</td></tr>
<tr><td>Bridge 2 (off mine site)</td><td>13.0</td><td>5.190 km</td><td>Slab girder bridge on precast spread footing</td></tr>
<tr><td>Bridge 3 (on mine site)</td><td>18.3</td><td>6.7015 km</td><td>Skewed precast composite concrete deck panel. Steel Superstructure. Precast concrete spread footings.</td></tr>
<tr><td>Bridge 4 (on mine site)</td><td>14.0</td><td>10.320 km</td><td>Skewed precast concrete slab bridge. Precast concrete spread footings.</td></tr>
<tr><td>Bridge 5 (on mine site)</td><td>12.0</td><td>13.790 km</td><td>Skewed precast concrete slab bridge. Precast concrete spread footings.</td></tr>
</table></td><td>■ No works completed</td></tr>
<tr><td>Mine Site Roads (includes mine haul roads, mine site service roads, exploration road upgrade within mine site)</td><td>■ Clearing, grubbing and construction of roads to proposed Early Works on mine site
■ Approximately 178.9 ha of disturbance.
■ Estimated 7 clear-span bridges for fish-stream crossings
■ No bedrock excavation/blasting</td><td>■ No works completed</td></tr>
</table>

Component/Activity	Description	Activities Completed October 1 and December 31, 2022
Borrow Sources	■ Clearing of trees for two borrow sources: ○ Within footprint of the future Environmental Control Dam area – approximately 13.7 ha of disturbance ○ Southern borrow in TSF – approximately 7.5 ha of disturbance	■ No works completed
Tailings Storage Facility (TSF)	■ Clearing of trees in 3 areas: ○ TSF Site C starter dam footprint: 109.8 ha ○ Aggregate screening site: 9.3 ha	■ No works completed
Water Management Structures	■ Clearing of trees along water diversion channel route northeast of Site C starter dam: 47.1 ha of surface disturbance	■ No works completed
Ore Stockpile Sites	■ Adjacent to open pit and plant site ■ Clearing of trees ■ Future low grade ore stockpile base 4.5 ha of surface disturbance ■ Future high grade ore stockpile base 3.1 ha of surface disturbance	■ No works completed
Open Pit and Overburden Dump Site	■ Clearing of trees ■ Open pit stripping of overburden on 20.5 ha ■ Stockpile pit stripping overburden on 11.1 ha of surface disturbance	■ No works completed
Water Supply	■ Groundwater well east of camp provides sufficient water for portable water treatment plant for potable water ■ If necessary a second groundwater well will be drilled in this location ■ No additional site clearing required	■ Received Section 10 Short Term Use Approval under the *Water Sustainability Act*, for temporary use of TW-13-01 (File 7003004). Works began on piping in 2022.
Ancillary Building Sites	■ Clearing at multiple sites: ○ Explosives magazine site: 3.1 ha of surface disturbance ○ Truck shop and mine offices: 18.6 ha of surface disturbance ○ Operational camp area: 33.9 ha of surface disturbance ○ Existing 250 person camp: 0 ha	■ No works completed
Plant Site	■ Clearing, grubbing, site levelling, soil, overburden salvage. No bedrock excavation/blasting: ■ Plant site: 24.4 ha of surface disturbance	■ Clearing, grubbing, cut to fill. The full 24.4 ha was cleared, excluding the wetland, which was buffered and flagged.

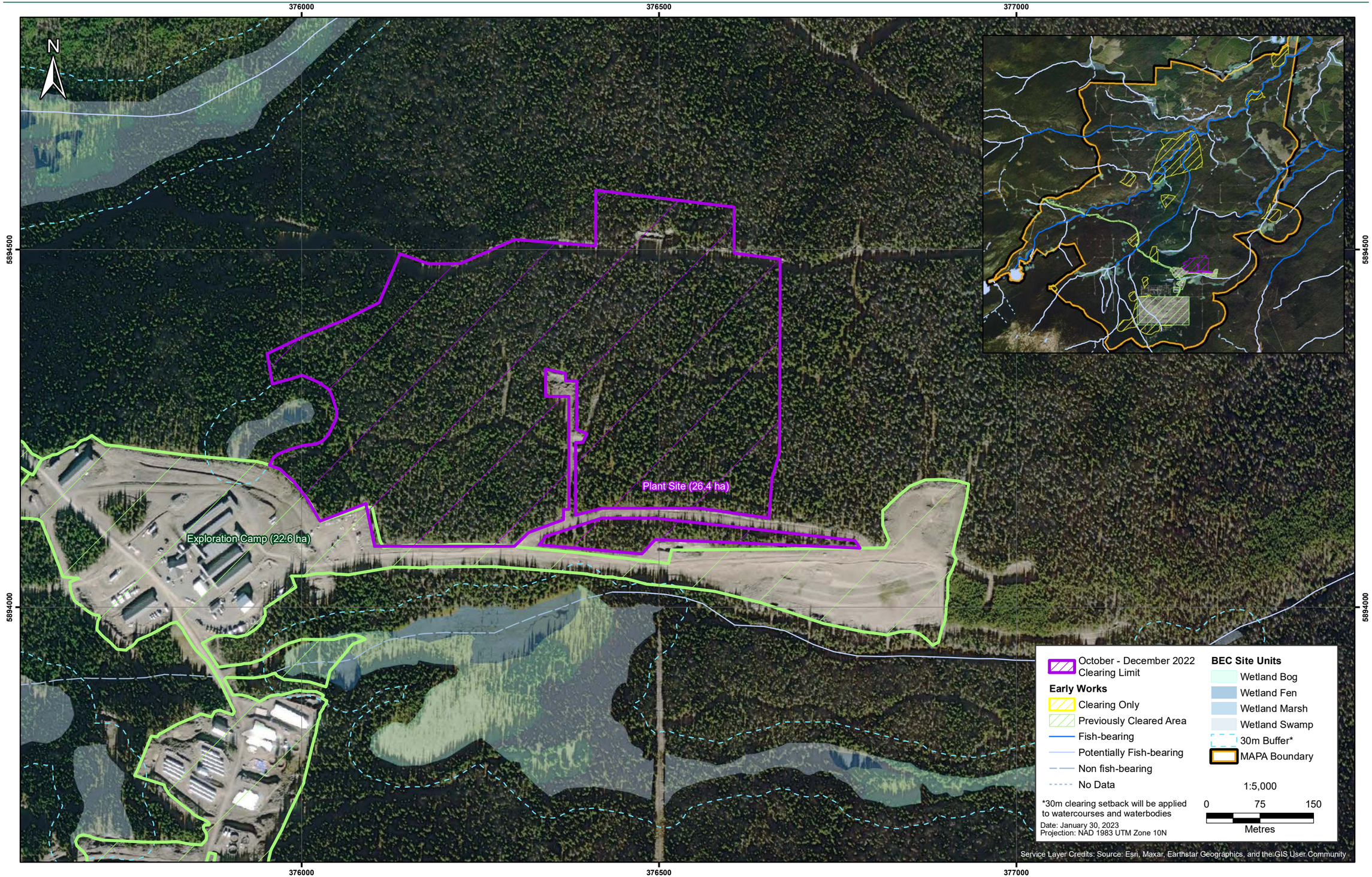


Figure 1.2-1: Project Activities in 2022

2. OVERVIEW OF THE CFMP

2.1 Objectives and Structure of the Annual Report

People may be exposed to contaminants of potential concern (COPCs) through inhalation of gases or particulates in air or ingestion of surface water, soil (incidental), or country foods such as plants and berries, fish, mammals, or birds. As a result of mining, mineral processing, or related activities, changes in concentrations of COPCs in environmental media, like surface water or soil, can influence the concentrations of the COPCs in plants, berries, fish, mammals, or birds (from uptake of COPCs through ingestion of environmental media or food) that may then be eaten by people as country foods. If concentrations or exposures are high enough, there is the potential for human health to be affected by exposure to the COPCs in environmental media or country foods.

Contaminants of potential concern were identified in the Conceptual Site Model (CSM; Entia 2022a) and the Human Health Risk Assessment (HHRA; Entia 2022b) and are metals, as defined in Section 3, Table 3-1, of the CFMP (ERM 2022b). Criteria air contaminants (including particulate matter PM_{10} and $PM_{2.5}$, SO_2, NO_2) are not COPCs based on the results of the CSM (Entia 2022a) and the HHRA (Entia 2022b) and thus will not be included in the reporting under the CFMP, but are reported under the Air Quality and Fugitive Dust Management Plan (AQDMP; ERM 2022a).

The purpose of the CFMP Annual Report is to identify whether there have been changes in COPC concentrations in air, surface water, soil, and country foods as a result of the Project and whether these changes pose potential risk to people. As stated in the federal DS, objectives of the CFMP over the life of the mine are:

- *"to verify the accuracy of the environmental assessment as it pertains to adverse environmental effects of the Designated Project on the health of Indigenous Peoples caused by changes in concentrations of contaminants of potential concern in water, soil, vegetation and wildlife, including fish"* (Condition 6.11 of the Decision Statement). No adverse effects to Indigenous or non-Indigenous health were identified in the environmental assessment, so the CFMP is intended to confirm that assessment.
- *to identify "levels of environmental change relative to baseline conditions that would require the Proponent to implement modified or additional mitigation measure(s)" (Condition 2.5.4 of the Decision Statement).*

As such, annual reports will be submitted under the CFMP with the objectives:

- to determine the short- and long-term effects of the Project on the aquatic and terrestrial environments with respect to the quality of country foods;
- to confirm the quantitative predictions made in the HHRA submitted as part of the Application for an Environmental Assessment Certificate/Environmental Impact Statement (Application/EIS; New Gold 2015) and since updated for the optimized Project (Entia 2022b), submitted as part of the provincial Joint Mines Act/Environmental Management Act permits application;
- to assess the efficacy of mitigation measures that are used to minimize the effects of Project-related activities on the aquatic and terrestrial environments and country foods; and
- to identify the need for additional mitigation measures to reduce or eliminate mine-related effects.

This first CFMP annual report consists of the following sections:

- Section 1 – Introduction: includes background information and Project activities during the reporting year.
- Section 2 – Overview of the CFMP: a description of the CFMP objectives, monitoring framework, and linkages to other management and monitoring plans.

- Section 3 – Sampling under the CFMP: summary of environmental or biological media sampled in the reporting year and any deviations or modification to the sampling methods or frequencies identified in the CFMP.
- Section 4 – Data analysis and interpretation: presentation of results of monitoring conducted in the CFMP study area during the reporting year, including statistical summaries and comparison to benchmarks, with interpretation of the results.
- Section 5 – Adaptive management and action level: an overview of the CFMP trigger response framework and identification of the action levels based on monitoring results for the reporting year, including identification of any recommended changes to monitoring or mitigation measures.
- Section 6 – Planned CFMP sampling program for 2023.
- Section 7 - Summary and recommendations: summary of results, recommendations, and any follow up actions.

Additional supporting information is included in the following appendices:

- Appendix A: Raw data for 2022 surface water quality;
- Appendix B: Box plots showing results of monitoring; and
- Appendix C: Results for relative percent difference calculations.

2.2 Framework for the CFMP

The CFMP is one of numerous monitoring and management plans and programs for the Project that use an adaptive approach to identifying, understanding, and reducing the magnitude, frequency, and extent of potential effects of Project-related activities on the environment and human health.

The overall framework for monitoring, evaluating, and adaptively managing potential effects from the Project to human health is presented in Figure 2.2-1. This adaptive management framework has been incorporated into the CFMP and serves as an early warning system for identifying and addressing potential effects before they reach levels of concern for human health.



Figure 2.2-1: Adaptive Management Framework

The components of the adaptive management framework are:

Plan: The CFMP study design considered the requirements for the CFMP to meet EAC Conditions 3 and 41 and DS requirements 2.5 to 2.10. BW Gold has engaged and will continue to engage with Indigenous groups and relevant federal and provincial authorities on these measures and programs.

Do: Implement the mitigation measures as described in the mitigation and management plans for the Project.

Monitor: The CFMP includes monitoring programs to determine if, after mitigations and management has been applied, Project-related effects to the aquatic or terrestrial environments occur.

Adjust: Quantitative human health-specific trigger (also called numeric performance metric; NPM) concentrations (ERM 2023c) are used to identify the level of Project-related change relative to predicted conditions, baseline conditions, and other benchmarks such as environmental quality guidelines to determine the appropriate action level and management responses. Management responses may include additional monitoring or studies, adjustment of existing mitigation measures, or identification and implementation of new mitigation measures.

Additional information about the monitoring program design can be found in Section 4 of the CFMP and more details about the adaptive management framework can be found in Section 6 of the CFMP.

2.3 CFMP Study Area

The CFMP study area is the same as the study area used in the updated HHRA (Entia 2022b). The CFMP study area is based on an overlay of the air quality modelling domain, the surface water quality local study area (LSA), and the terrestrial LSA used in the Application/EIS and in the Joint Application. The air quality, surface water quality and terrestrial study areas were used as the foundation for the CFMP study area because they represent key transport or exposure pathways between COPCs in environmental media and human receptors. The LSAs or modelling domains were used (rather than the larger, regional study areas) because any effects due to the Project are likely to be highest in the areas closest to Project sources of COPCs at the mine site. Since the air quality modelling domain is larger than the other two LSAs, the human health LSA is effectively equivalent to the air quality modelling domain (Figure 2.3-1).

Some water quality baseline and monitoring sites (e.g., CC-30, CC-40) were located outside of the CFMP study area but were included in the CFMP reporting as they are of interest to the Carrier Sekani First Nation (CFSN) and are located downstream of the mine site (far field locations).

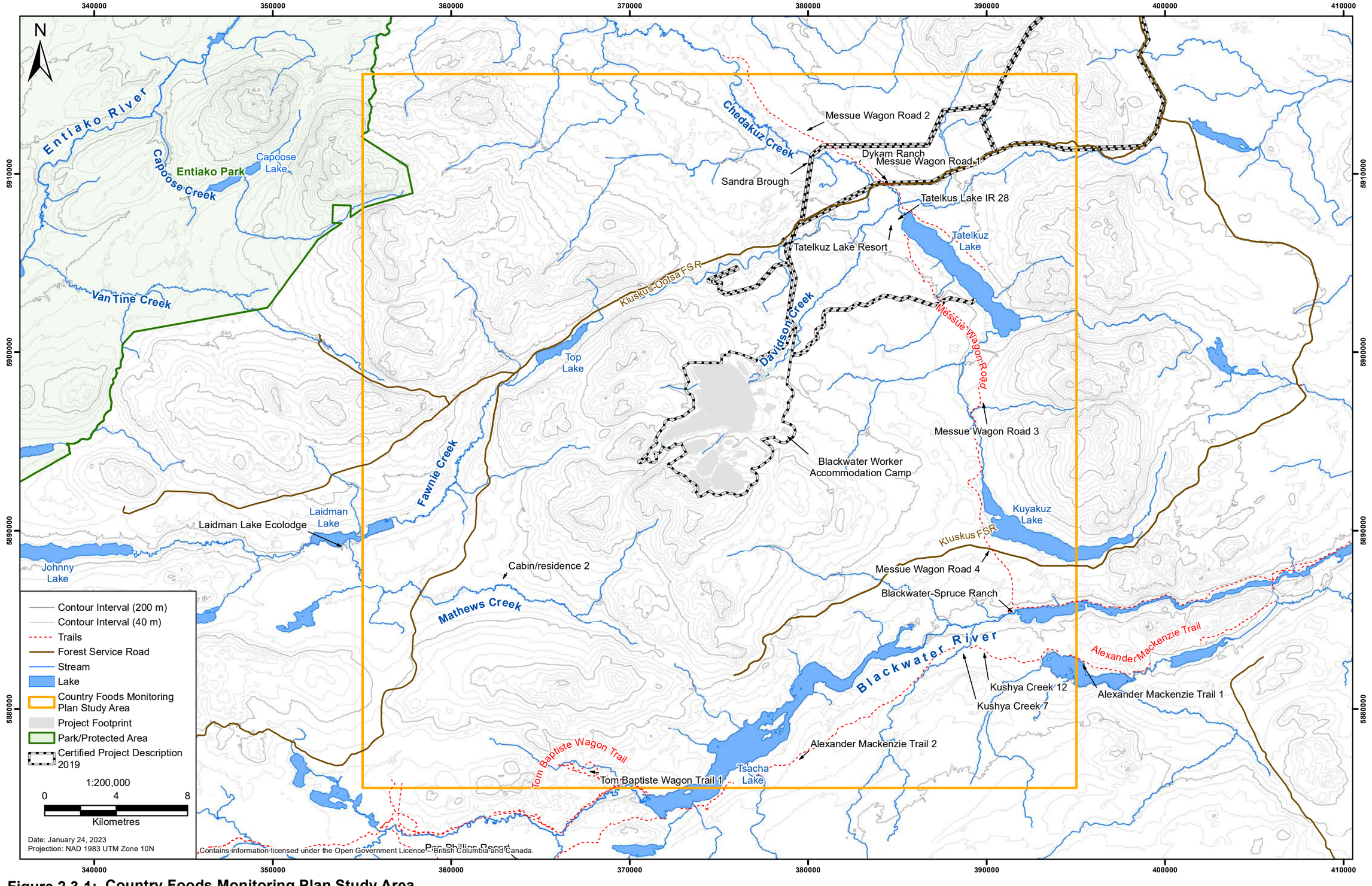


Figure 2.3-1: Country Foods Monitoring Plan Study Area

2.4 Linkages to Other Management and Monitoring Plans

A series of management and monitoring plans have been developed for the Project. Many of these plans outline monitoring commitments relevant to the CFMP objectives and, where possible, the sampling requirements under other plans align with the sampling requirements for the CFMP. The CFMP relies on the monitoring and associated results from several of the plans, as follows:

- Aquatic Effects Monitoring Plan (AEMP; BW Gold 2022a):
  - Data collected under the AEMP will be used to fulfill requirements for CFMP sampling of water and fish tissue (EAC Condition 41(d)(vi) and 41(d)(vii), federal Decision Statement condition 6.11).
  - The AEMP outlines requirements for monitoring of water and fish tissue at various locations in the downstream aquatic receiving environment and at control sites.
  - Water and fish (juvenile Rainbow Trout) tissue samples will be co-collected at stream sites including near-field impact sites in Davidson Creek (DC-05 and DC-15) and Creek 661 (661-05 and 661-10), and reference sites in Creek 705 (705-05, 705-10) and a Fawnie Creek tributary (FC-01). Sampling will also be done in Turtle Creek (TC-01, TC-05, and TC-10) once the airstrip is constructed for the Project.
  - Water and fish (adult Kokanee, Rainbow Trout, and Mountain Whitefish) tissue samples will be co-collected at lake sites including Tatelkuz Lake (potential impact site) and Kuyakuz Lake (control site).
- Air Quality and Fugitive Dust Management Plan (AQDMP; ERM 2022a):
  - Data collected under the AQDMP will be used to fulfill requirements for CFMP sampling of meteorological conditions and CACs (EAC Condition 41(d)(iii), federal Decision Statement condition 6.12).
  - The AQDMP outlines requirements for monitoring of meteorological conditions (e.g., air temperature, relative humidity, precipitation, wind speed and direction, barometric pressure, snow depth, net radiation, and solar radiation) in two locations.
  - The AQDMP also includes monitoring of CACs including particulate matter (PM) of less than 10 microns in diameter (PM_{10}) and less than 2.5 microns in diameter ($PM_{2.5}$), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2).

3. SAMPLING UNDER THE CFMP IN 2022

Early works construction activity began in late September of 2022. Of the sampling required under the CFMP (see Section 4 of the CFMP), only surface water quality and air quality (particulates) sampling was conducted between October and December 2022. Sampling of other environmental media or biota tissues was not conducted during this time period. Therefore, this CFMP Annual Report presents results of surface water quality monitoring conducted between October 1 and December 31, 2022 only. Results for air particulate monitoring are presented in the AQDMP Annual Report (BW Gold 2023).

3.1 Surface Water Quality

The purpose of monitoring surface water for COPC (metal) concentrations is to identify whether there are Project-related changes in the quality of water. The primary transport pathway for COPCs from the Project to the aquatic environment is from discharges and seepage from mine infrastructure to water, where COPCs can either be consumed by people in drinking water or taken up by fish (which can then be consumed by people). Terrestrial animals may also drink surface water, but uptake of COPCs by terrestrial biota through drinking water is negligible relative to other exposure pathways.

From January to September 2022 baseline water quality sampling was completed, including sampling at all sites described in Section 4.4.2.1 of the CFMP and summarized in Table 3.1-1. Results of baseline water quality sampling are provided in the AEMP cumulative baseline report (ERM *In prep.*).

Surface water quality was monitored between October and December 2022 at the sites shown in Table 3.1-1 during the period of early works construction activities that is covered by this CFMP Annual Report. Sampling locations for surface water quality in 2022 for the CFMP are shown on Figure 3.1-1 and are a subset of the sampling sites described in Section 4.2 of the AEMP. The sites were included in the CFMP because:

- fish tissue sampling was done in baseline studies or will be done in the future at the sites;
- water quality predictions were made for the sites and the predictions were used in the HHRA; or
- they are control sites located either upstream of Project influence or in an adjacent watershed (water quality at these sites is not predicted to be affected by the Project).

Table 3.1-1: 2022 CFMP Surface Water Sampling Locations

Watershed or Lake	Site ID	Easting	Northing	Type of Site
Davidson Creek	DC-05	378205	5899299	near-field impact site
	DC-10	378845	5900157	near-field impact site
	DC-15	381880	5904054	near-field impact site
	DC-20	384234	5907722	mid-field impact site
Creek 661	661-01	378620	5894431	control site (upstream reference site)
	661-03	380803	5897193	near-field impact site on Creek 543585
	661-04	378714	5896389	near-field impact site on Creek 146920
	661-05	378843	5897007	near-field impact site on Creek 505659
	661-10	381179	5897915	near-field impact site
	661-20	388662	5899439	mid-field impact site

Watershed or Lake	Site ID	Easting	Northing	Type of Site
Turtle Creek	TC-01	369772	5902753	control site (upstream reference site)
	TC-05	376375	5904723	near-field impact site
	TC-10	379129	5906160	mid-field impact site
	TC-15	383300	5908691	mid-field impact site
Chedakuz Creek	CC-03	388645	5899175	control site (upstream reference site)
	CC-05	389737	5900563	mid-field impact site
	CC-10	385418	5907732	mid-field impact site
	CC-15	383924	5909393	mid-field impact site
	CC-20	383097	5910077	far-field impact site
	CC-30	375187	5916462	far-field impact site
	CC-40	368695	5918685	far-field impact site
Creek 705	705-05	365887	5894321	control site (regional reference site)
	705-10	362169	5892943	control site (regional reference site)
Fawnie Creek	FC-01	363860	5899323	control site (regional reference site)
Tatelkuz Lake	TL-01	386010	5906768	mid field impact site
Kuyakuz Lake	KL-01	395187	5888710	control site (upstream reference site)

Parameters analyzed in surface water quality samples included the 18 COPCs identified in Section 4.4.1 of the CFMP as well as additional physical parameters, general chemistry parameters (e.g., hardness), ions, and a full suite of total and dissolved metals that is required by Section 4.4.2.2 of the AEMP.

The sampling frequency and methods used in sampling surface water were as described in Section 4.4.2 of the CFMP, with the following exceptions:

- The fifth sample of the fall 5-in-30 sampling (conducted in October 2022) at site 661-04 was not collected because, despite multiple attempts at access, the site was not accessible at the time of sampling due to construction activities occurring along the access route. Water quality sampling during the other four weeks of the fall 5-in-30 sampling event were successfully completed for this site.
- Tatelkuz Lake was not sampled in quarter 4 (November 2022) because of unsafe ice conditions.

The quality assurance/quality control (QA/QC) program for surface water quality sampling described in Section 4.4.3 of the CFMP was followed, including the collection of field duplicate samples and the use of trip and equipment blanks, as described in Section 4.2.2 of the AEMP and 4.4.3 of the CFMP. Laboratory-based QA/QC programs, consistent with the requirements of the British Columbia Environmental Laboratory Manual (BC ENV 2020a) were used. No exceptions in the QA/QC program were noted.

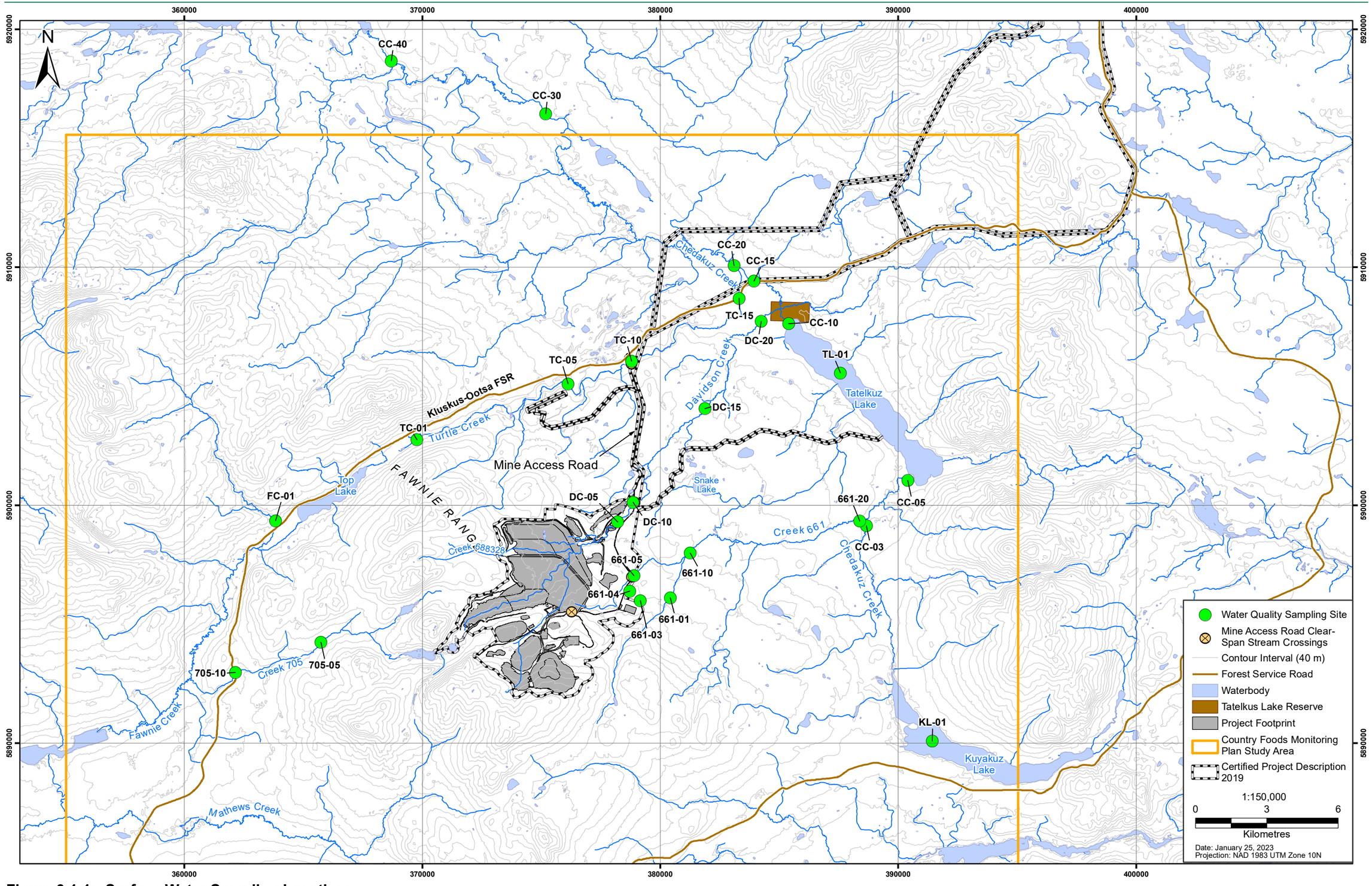


Figure 3.1-1: Surface Water Sampling Locations

3.2 Air Quality

Monitoring methodology for air quality is described in detail in Section 9.3 of the AQDMP (ERM 2022a) and in the AQDMP Annual Report (BW Gold 2023). As described in Section 2, CACs (including particulate matter PM_{10} and $PM_{2.5}$, SO_2, NO_2) are not COPCs based on the results of the CSM (Entia 2022a) and the HHRA (Entia 2022b), but are covered under the AQDMP (ERM 2022a). However, inhalable metals (i.e., metals attached to PM_{10}) were included as COPCs in the HHRA (Entia 2022b) and are covered under the CFMP (ERM 2022b).

In September 2022, Stantec provided training to three Blackwater Gold (BWG) employees from the Environmental department on the operation of the Thermo Scientific Partisol-FRM Model 2025i-D PM sampler (Partisol) and particulate matter sampling. Details on the training is provided in the AQDMP Annual Report (BW Gold 2023). The Partisol sampler was installed adjacent to the current exploration camp. Eleven (11) coarse and fine particulate matter, PM_{10}, and $PM_{2.5}$, samples were obtained at an approximately weekly intervals from the Partisol sampler during the early works construction period from October 1 to December 31, 2022. Samples were sent to ALS Laboratories in Burnaby, BC for analysis. Results for coarse and fine particulate matter, PM_{10}, and $PM_{2.5}$ are presented in the AQDMP Annual Report (BW Gold 2023).

A Passive Air Sampling System (PASS) for the collection of NO_2 and SO_2 concentrations has not been set up yet. BWG's construction crew is currently in the process of making the structure for the sampling system for collection of data in 2023.

As 2022 was a transitional period between baseline (January to September 2022) and Construction phase (October to December 2022) during which some early works construction activities were conducted (see Section 1.2), soil or dustfall metal data were not obtained during the early works construction period to derive estimates for inhalable PM_{10}-associated metals. Soil and dustfall metal data were only obtained during baseline studies (August and September 2022), prior to initiation of early works construction activities. Soil and dustfall metal data are planned to be collected in 2023 and future CFMP annual reports will include analysis and reporting of inhalable PM_{10}-associated metals.

4. DATA ANALYSIS AND INTERPRETATION

4.1 Measurement Endpoints, Assessment Endpoints, and Questions for Data Analysis

As described in the CFMP, the assessment endpoints are based on comparisons of COPC concentrations measured during the monitoring period to predicted COPC concentrations (predicted NPMs), baseline COPC concentrations (baseline NPMs), and to water quality guidelines or standards (DWQG NPMs; Table 4.1-1) within a trigger response framework under the CFMP (Table 6.3-4 of the CFMP).

Table 4.1-1: Measurement and Assessment Endpoints

Measurement Endpoint	Assessment Endpoint
COPC concentrations in water	■ Comparison of measured concentrations to predicted concentrations (predicted WQ NPMs) ■ Comparison of measured concentrations to baseline concentrations (baseline WQ NPMs) ■ Comparison of measured concentrations to applicable water quality guidelines or standards (DWQG NPMs) ■ Before-after-control-impact (BACI) analysis

Evaluation of results for surface water quality for the period from October 1 to December 31, 2022, was performed as described in Section 5 of the CFMP. The evaluation intends to answer the following questions (see Section 5.1 of the CFMP for additional details):

- **Question 1:** Are COPC concentrations in water different than were predicted in the predictive model and used in the HHRA?
- **Question 2**: Are COPC concentrations in water changing relative to baseline conditions due to Project-related discharges or emissions?
- **Question 3**: If concentrations are different than baseline and different than predicted, are the changes statistically significant or exceeding levels of concern? What is the extent of Project-related influence on COPC concentrations in water?

The derivation of trigger concentrations (referred to as NPMs) for answering Questions 1 to 3 and for defining action levels in the adaptive management framework is presented in the *Human Health Triggers for Adaptive Management* report (ERM 2023c). Briefly, the NPMs are:

- The predicted COPC concentration in surface water (predicted WQ NPM) based on the surface water quality (SWQ) model's 95th percentile concentration (Base Case) for the Construction and Operation phases of the Project.
    - The maximum 95% UCLM concentration (i.e., the year with the highest concentration in Construction and Operation phase) was chosen for each site (modelling node) that was included in the SWQ model and an LSA-wide average was calculated to represent the predicted LSA-wide exposure point concentration (EPC) to which people could be exposed.
    - To calculate the predicted WQ NPM, a value of 20% was added to the predicted EPC to account for inherent variability in measured data. This percentage is based on the recommended value for relative percent difference (RPD) for duplicate surface water samples from BC ENV (2013)
    - To answer **Question 1**, the predicted WQ NPM was compared to the mean of water concentrations measured at the subset of impact sites that were included in the SWQ model as assessment nodes

(i.e., the same sites were used in calculating the predicted WQ NPM and in compiling the summary statistics of the monitoring data to ensure an "apples to apples" comparison).

- The baseline COPC concentration (baseline WQ NPM) based on the 95% UCLM concentration calculated from data obtained between 2016 and 2022 at impact sites listed in Table 3.1-1.
  - To calculate the baseline WQ NPM, a value of 20% was added to account for variability in the data.
  - To answer **Question 2**, the baseline WQ NPM for each parameter was compared to the mean parameter concentration measured at the same impact sites that were used to calculate the baseline WQ NPM.
- The drinking water (DW) quality guideline or standard (DWQG NPM) based on the lower of the BC Source Drinking Water Quality Guidelines (BC DWQG; BC ENV 2020b), Health Canada Drinking Water Quality Guidelines (HC DWQG; Health Canada 2022), and BC Contaminated Sites Regulation (BC CSR; B.C. Reg 375/96) Schedule 3.2 generic numerical water standards for drinking water (CSR DWS).
  - The DWQG NPMs were used to define the "level of concern" concentration referred to in **Question 3**.

A BACI analysis was used to identify if there were statistically significant Project-related impacts to water quality between October and December 2022 to address **Question 3**.

4.2 Surface Water Quality Monitoring Results in 2022

4.2.1 Comparison of Contaminants of Potential Concern Concentrations to Drinking Water Guidelines or Standards

Table 4.2-1 provides summary statistics for COPC concentrations for all monitoring sites (both control and impact sites) within the LSA listed in Table 3.1-1. Table 4.2-1 also includes a comparison to the DWQG NPM. Raw water quality data are located in Appendix A. Box plots illustrating summary statistics (mean, percentile ranges, and potential outliers) for control and for impact sites for baseline and monitoring periods are located in Appendix B.

As shown in Table 4.2-1, mean concentrations of all COPCs were below the DWQG NPMs.

The maximum concentration of total manganese, considering all monitoring sites across the LSA, was higher than the DWQG NPM (Table 4.2-1). Total manganese concentrations were higher than the DWQG NPM of 0.12 mg/L in one sample each from 661-01 (control site, 0.247 mg/L) in October 2022, 661-03 (impact site, 0.146 mg/L) in November 2022, and Kuyakuz Lake (KL-01 surface sample, control site, 0.942 mg/L) in November 2022. For both 661-01 and 661-03, the single samples with total manganese concentrations higher than the DWQG NPM were collected as part of the fall 5-in-30 sampling event. When the average concentration across the 5 samples in 30 days is calculated for each site, the average concentration is lower than the total manganese DWQG NPM at both sites (0.089 mg/L at 661-01 and 0.076 mg/L at 661-03).

Concentrations of total manganese exceeded the DWQG NPM at the KL-01 site during baseline studies between 2016 and September 2022 in 11 of 23 samples (including two field duplicate samples; ERM *In prep.*). As this is a control site located in Kuyakuz Lake upstream of the Project and the baseline dataset indicates total manganese concentrations were regularly higher than the DWQG NPM, the elevated total manganese concentrations are naturally occurring and not due to Project activities.

Table 4.2-1: Summary Statistics of Surface Water Quality Monitoring Results, LSA-wide, October 1 to December 31, 2022

Contaminant of Potential Concern	Minimum DL (mg/L)	Number of Samples	Number of Samples >DL	Concentration Summary Statistic (mg/L)[a]						DWQG NPM [b] (mg/L)
				Minimum	Mean	Median	95% UCLM	95th Percentile	Maximum	
Aluminum	0.0030	120	119	0.0015	0.042	0.021	0.060	0.081	1.0	2.9
Antimony	0.00010	120	2	0.000050	0.000052	0.000050	0.000054	0.000050	0.00017	0.006
Arsenic	0.00010	120	120	0.00016	0.00067	0.00064	0.00072	0.0012	0.0015	0.01
Beryllium	0.000020	120	2	0.000010	0.000010	0.000010	0.000011	0.000010	0.000053	0.008
Cadmium	0.0000050	120	21	0.0000025	0.0000041	0.0000025	0.0000048	0.000013	0.000019	0.005
Chromium	0.00050	120	9	0.00025	0.00029	0.00025	0.00033	0.00058	0.0016	0.05
Cobalt	0.00010	120	7	0.000050	0.000059	0.000050	0.000066	0.00011	0.00041	0.001
Copper	0.00050	120	8	0.00025	0.00031	0.00025	0.00035	0.00070	0.0018	1.5
Iron	0.010	121	118	0.0050	0.20	0.16	0.23	0.43	1.3	6.5
Lead	0.000050	120	7	0.000025	0.000033	0.000025	0.000041	0.000054	0.00050	0.005
Lithium	0.0010	120	0	0.00050	0.00050	0.00050	-	0.00050	0.00050	0.008
Manganese	0.00010	121	120	0.000050	0.033	0.019	0.049	0.061	**0.94**	0.12
Mercury	0.0000050	120	1	0.0000025	0.0000025	0.0000025	0.0000026	0.0000025	0.0000058	0.001
Molybdenum	0.000050	123	123	0.00010	0.00074	0.00076	0.00078	0.0010	0.0011	0.088
Nickel	0.00050	120	5	0.00025	0.00027	0.00025	0.00030	0.00025	0.0017	0.08
Selenium	0.000050	126	61	0.000025	0.000046	0.000038	0.000050	0.000080	0.00015	0.01
Thallium	0.0030	120	0	0.0000050	0.0000050	0.0000050	-	0.0000050	0.0000050	ng
Zinc	0.000010	120	11	0.0015	0.0018	0.0015	0.0020	0.0043	0.0062	3.0

Notes:

DL = detection limit; 95% UCLM = 95% upper confidence limit of the mean; ng = no drinking water quality guideline or standard is available.

"-" means that the 95% UCLM could not be calculated because all concentrations were equal.

Concentrations measured to be less than the DL were replaced with concentrations of 0.5 x DL for the purpose of calculating summary statistics.

The 95% UCLM was calculated using bootstrapping methods, which are free of parametric assumptions.

[a] Sites: DC-05, DC-10, DC-15, DC-20, 661-01, 661-03, 661-04, 661-05, 661-10, 661-20, CC-03, CC-05, CC-10, CC-15, CC-20, CC-30, CC-40, 705-05, 705-10, TC-01, TC-05, TC-10, TC-15, and FC-01, and KL-01.

[b] DWQG NPM = drinking water quality guideline or standard numeric performance objective which is the lowest (most conservative) of the BC Contaminated Sites Regulation (B.C. Reg. 375/96) Schedule 3.2 Drinking Water Standards, the BC Source Drinking Water Guideline (BC ENV 2020b), and the Health Canada Drinking Water Quality Guideline (Health Canada 2022).

***Bold font and grey highlight** denote values greater than the DWQG NPM.*

Sites 661-01 and 661-03 are new sites where baseline sampling was first initiated in July or August 2022, so there are currently limited baseline data for these locations. Site 661-01 (control site) is on the mainstem of Creek 661, upstream of potential Project influences. Site 661-03 (impact site) is located on a tributary of Creek 661 (Creek 543585), which could be influenced in the future by contact water infiltration into the ground from the Camp Site. However, the Camp Site (future location of the operating camp) has not been constructed yet and there are currently no Project related discharges or emissions to this tributary. Therefore, the manganese concentrations measured in surface water samples are considered to be naturally occurring and are not associated with potential Project effects.

4.2.2 Summary of Contaminants of Potential Concern Concentrations at Control Sites

The following water quality sampling sites are control sites as they are located either upstream of the Project or in a watershed that is separate from the Project (Table 3.1-1): KL-01, CC-03, 661-01, 705-05, 705-10, TC-01, and FC-01. Table 4.2-2 provides summary statistics for COPC concentrations at these control sites for the monitoring period.

Mean concentrations of all COPCs were below the DWQG NPMs. The maximum and 95th percentile concentration of total manganese exceeded the DWQG NPM at control sites, specifically at KL-01 and 661-01 (see Section 4.2.1). As these are control sites, concentrations of total manganese higher than the DWQG NPM are naturally elevated and are not elevated due to the Project.

4.2.3 Summary of Contaminants of Potential Concern Concentration at Potential Impact Sites

The following sites are potential impact sites as they are located downstream of the Project (Table 3.1-1): DC-05, DC-10, DC-15, DC-20, 661-03, 661-04, 661-05, 661-10, 661-20, TL-01, CC-05, CC-10, CC-15, CC-20, CC-30, CC-40, TC-05, TC-10- and TC-15. Table 4.2-3 provides summary statistics for COPC concentrations for these impact sites for the monitoring period, with a comparison to the DWQG NPM and the baseline WQ NPM.

The baseline 2016 to 2022 stream water quality data was evaluated for outliers and outlier exclusion from the baseline dataset to be used for comparison in AEMP and CFMP annual reports. Statistical metrics was used to identify potential outliers (e.g., data points outside of the 99th percentile along with graphical analysis (Gilbert 1987)). Professional judgement was used to determine whether the data are likely to be outliers due to sampling or analysis issues (e.g., unit errors in lab report, sample contamination), or whether the data represent the true extreme of natural or expected conditions (e.g., very high concentrations of total suspended solids and metals that may occur during a natural 1 in 100 storm event). The AEMP annual report provides the list of outliers that was removed from the baseline dataset (ERM 2023b).

Mean concentrations of all COPC at impact sites were lower than the DWQG NPM during the monitoring period. Similar to statistics calculated for control sites during the monitoring period (Table 4.2-2), the maximum concentration of total manganese was higher than the DWQG NPM, which occurred in a single sample at a single site (661-03, see Section 4.2.1). As there was no discharge from the Project to Creek 543585 during the monitoring period, the elevated total manganese concentrations are naturally occurring.

Table 4.2-2: Summary Statistics of Surface Water Quality Monitoring Results, Control Sites, October 1 to December 31, 2022

Contaminant of Potential Concern	Minimum DL (mg/L)	Number of Samples	Number of Samples > DL	Concentration Summary Statistic (mg/L)[a]						DWQG NPM [b] (mg/L)
				Minimum	Mean	Median	95% UCLM	95th Percentile	Maximum	
Aluminum	0.0030	29	28	0.0015	0.029	0.021	0.041	0.072	0.16	2.9
Antimony	0.00010	29	0	0.000050	0.000050	0.000050	-	0.000050	0.000050	0.006
Arsenic	0.00010	29	29	0.00016	0.00053	0.00054	0.00061	0.0008	0.0010	0.01
Beryllium	0.000020	29	0	0.000010	0.000010	0.000010	-	0.000010	0.000010	0.008
Cadmium	0.0000050	29	4	0.0000025	0.0000032	0.0000025	0.0000040	0.0000068	0.000013	0.005
Chromium	0.00050	29	1	0.00025	0.00026	0.00025	0.00028	0.00025	0.00058	0.05
Cobalt	0.00010	29	2	0.000050	0.000060	0.000050	0.000076	0.000086	0.00028	0.001
Copper	0.00050	29	1	0.00025	0.00027	0.00025	0.00031	0.00025	0.00083	1.5
Iron	0.010	30	27	0.0050	0.16	0.12	0.23	0.45	1.0	6.5
Lead	0.000050	29	0	0.000025	0.000025	0.000025	-	0.000025	0.000025	0.005
Lithium	0.0010	29	0	0.00050	0.00050	0.00050	-	0.00050	0.00050	0.008
Manganese	0.00010	30	29	0.000050	0.058	0.018	0.12	**0.17**	**0.94**	0.12
Mercury	0.0000050	29	0	0.0000025	0.0000025	0.0000025	-	0.0000025	0.0000025	0.001
Molybdenum	0.000050	30	30	0.00010	0.00064	0.00061	0.00074	0.0011	0.0011	0.088
Nickel	0.00050	29	0	0.00025	0.00025	0.00025	-	0.00025	0.00025	0.08
Selenium	0.000050	31	9	0.000025	0.000039	0.000025	0.000047	0.000090	0.00010	0.01
Thallium	0.0030	29	0	0.0000050	0.0000050	0.0000050	-	0.0000050	0.0000050	ng
Zinc	0.000010	29	0	0.0015	0.0016	0.0015	0.0017	0.0015	0.0030	3.0

Notes:

DL = detection limit; 95% UCLM = 95% upper confidence limit of the mean; ng = no drinking water quality guideline or standard is available.

"-" means that the 95% UCLM could not be calculated because all concentrations were equal.

Concentrations measured to be less than the DL were replaced with concentrations of 0.5 x DL for the purpose of calculating summary statistics.

The 95% UCLM was calculated using bootstrapping methods, which are free of parametric assumptions.

[a] Sites: 661-01, CC-03, 705-05, 705-10, TC-01, FC-01, and KL-01.

[b] DWQG NPM = drinking water quality guideline or standard numeric performance objective which is the lowest (most conservative) of the BC Contaminated Sites Regulation (B.C. Reg. 375/96) Schedule 3.2 Drinking Water Standards, the BC Source Drinking Water Guideline (BC ENV 2020b), and the Health Canada Drinking Water Quality Guideline (Health Canada 2022).

***Bold font and grey highlight** denote values greater than the DWQG NPM.*

Table 4.2-3: Summary Statistics of Surface Water Quality Monitoring Results at Impact Sites, October 1 to December 31, 2022

Contaminant of Potential Concern	Minimum DL (mg/L)	Number of Samples	Number of Samples > DL	Concentration Summary Statistic (mg/L)[a]						Baseline WQ NPM [b] (mg/L)	DWQG NPM [c] (mg/L)
				Minimum	Mean	Median	95% UCLM	95th Percentile	Maximum		
Aluminum	0.0030	91	91	0.0042	0.046	0.021	0.072	0.091	1.0	0.11	2.9
Antimony	0.00010	91	2	0.000050	0.000052	0.000050	0.000055	0.000050	0.00017	0.000062	0.006
Arsenic	0.00010	91	91	0.00031	0.00072	0.00065	0.00078	0.0012	0.0015	0.00081	0.01
Beryllium	0.000020	91	2	0.000010	0.000011	0.000010	0.000012	0.000010	0.000053	0.000036	0.008
Cadmium	0.0000050	91	17	0.0000025	0.0000044	0.0000025	0.0000052	0.000015	0.000019	0.000006	0.005
Chromium	0.00050	91	8	0.00025	0.00030	0.00025	0.00034	0.00070	0.0016	0.00038	0.05
Cobalt	0.00010	91	5	0.000050	0.000058	0.000050	0.000067	0.000080	0.00041	0.000072	0.001
Copper	0.00050	91	7	0.00025	0.00032	0.00025	0.00037	0.00072	0.0018	0.00063	1.5
Iron	0.010	91	91	0.024	0.21	0.16	0.25	0.39	1.3	0.22	6.5
Lead	0.000050	91	7	0.000025	0.000035	0.000025	0.000047	0.000087	0.00050	0.000050	0.005
Lithium	0.0010	91	0	0.00050	0.00050	0.00050	-	0.00050	0.00050	0.00062	0.008
Manganese	0.00010	91	91	0.0033	0.024	0.020	0.029	0.059	**0.15**	0.026	0.12
Mercury	0.0000050	91	1	0.0000025	0.0000025	0.0000025	0.0000026	0.0000025	0.0000058	0.0000044	0.001
Molybdenum	0.000050	93	93	0.00028	***0.00078***	0.00082	0.00081	0.0010	0.0011	0.00074	0.088
Nickel	0.00050	91	5	0.00025	0.00028	0.00025	0.00031	0.00039	0.0017	0.00038	0.08
Selenium	0.000050	95	52	0.000025	0.000048	0.000053	0.000053	0.000078	0.00015	0.000068	0.01
Thallium	0.0030	91	0	0.0000050	0.0000050	0.0000050	-	0.0000050	0.0000050	0.0000064	ng
Zinc	0.000010	91	11	0.0015	0.0019	0.0015	0.0021	0.0045	0.0062	0.0023	3.0

Notes:

DL = detection limit; 95% UCLM = 95% upper confidence limit of the mean; WQ = water quality; NPM = numeric performance objective; ng = no drinking water quality guideline or standard is available.

"-" means that the 95% UCLM could not be calculated because all concentrations were equal.

Concentrations measured to be less than the DL were replaced with concentrations of 0.5 x DL for the purpose of calculating summary statistics.

The 95% UCLM was calculated using bootstrapping methods, which are free of parametric assumptions.

[a] Sites: CC-05, DC-05, DC-10, DC-15, DC-20, 661-03, 661-04, 661-05, 661-10, 661-20, CC-10, CC-15, CC-20, CC-30, CC-40, TC-05, TC-10, and TC-15.

[b] Baseline data are for the period of April 27, 2016 to Sept 24, 2022, and include the following impact sites: DC-05, DC-10, DC-15, DC-20, 661-03, 661-04, 661-05, 661-10, 661-20, CC-05, CC-10, CC-15, CC-20, CC-30, CC-40, TC-05, TC-10, TC-15, and TL-01. The 95% UCLM was used to calculate the numeric performance metric (ERM 2023c). Outliers exceeding threshold based on professional judgement were removed while values exceeding the 99th percentile were flagged but retained in the dataset.

[c] DWQG NPM = drinking water quality guideline numeric performance objective which is the lowest (most conservative) of the BC Contaminated Sites Regulation (B.C. Reg. 375/96) Schedule 3.2 Drinking Water Standards, the BC Source Drinking Water Guideline (BC ENV 2020b), and the Health Canada Drinking Water Quality Guideline(Health Canada 2022).

***Bold italicized** denotes a mean concentration greater than the baseline WQ NPM.*

***Bold font and grey highlight** denote concentrations greater than the DWQG NPM.*

The mean concentration of total molybdenum (0.00078 mg/L) marginally exceeded (by 5%) the baseline WQ NPM (0.00074 mg/L) at impact sites during the monitoring period. One potential reason for this apparent increase from baseline concentrations of total molybdenum is that Tatelkuz Lake was not sampled during the monitoring period due to unsafe ice conditions. Mean and upper end COPC concentrations (mean, median, 95% UCLM, 95th percentile and maximum) have generally been lower in Tatelkuz Lake than in impact site creeks during baseline studies. The missing sample from Tatelkuz Lake means that Tatelkuz Lake water quality was excluded from the calculation of the mean total molybdenum concentration for the monitoring period. This may have artificially increased the mean molybdenum concentration for potential impact sites during the monitoring period. Another potential reason for the apparent increase of total molybdenum concentrations relative to baseline is that the baseline NPM is calculated based on a whole year of data (i.e., all twelve months), whereas the data for the monitoring period only include October to December. This may also have artificially increased mean total molybdenum concentrations. Monitoring data in future years will be based on a whole year of data and may resolve this artificial difference in concentration.

4.2.4 Comparison of Contaminants of Potential Concern Concentrations at Sites included in the Surface Water Quality Model to Predicted Concentrations

The following sites were included in the SWQ model (Lorax 2022) as assessment nodes and are impact sites for monitoring water quality: DC-05, DC-10, DC-15, DC-20, 661-05, 661-10, 661-20, CC-10, CC-15, CC-20, CC-30, and CC-40. As the SWQ model used different assessment node names than the CFMP program, Table 4.2-4 provides an overview of assessment nodes and corresponding CFMP monitoring sites.

Table 4.2-4: Water Quality Model Assessment Nodes and Country Foods Monitoring Program Sampling Locations

Watershed	Water Quality Model Assessment Node (Lorax 2022)	CFMP Monitoring Site Name
Davidson Creek	WQ28	DC-05
	WQ27	DC-10
	WQ26	DC-15
	WQ7	DC-20
Creek 661	WQ3	661-05
	WQ5	661-10
	WQCk661	661-20
Chedakuz Creek	WQ8	CC-10
	WQ9	CC-15
	WQ13	CC-20
	Chedakuz Midway	CC-30
	Chedakuz Outlet	CC-40

Data collected from these sites during the monitoring period was used to confirm that measured concentrations of COPCs in water were within the range predicted by the SWQ model v.13e (Lorax 2022) and that the predicted surface water concentrations used in the Project Case HHRA (Entia 2022b) represented a conservative exposure scenario. Table 4.2-5 provides summary statistics for water quality during the monitoring period at the impact sites that were included as assessment nodes in the SWQ model.

Table 4.2-5: Summary Statistics of Surface Water Quality Monitoring Results for Surface Water Quality Model Assessment Node Sites, October 1 to December 31, 2022

Contaminant of Potential Concern	Minimum DL (mg/L)	Number of Samples	Number of Samples > DL	Concentration Summary Statistic [a] (mg/L)						Predicted WQ NPM (mg/L)	DWQG NPM [b] (mg/L)
				Minimum	Mean	Median	95% UCLM	95th Percentile	Maximum		
Aluminum	0.0030	64	64	0.0042	0.042	0.020	0.072	0.057	1.0	0.15	2.9
Antimony	0.00010	64	0	0.000050	0.000050	0.000050	-	0.000050	0.000050	0.0025	0.006
Arsenic	0.00010	64	64	0.00042	0.00074	0.00065	0.00079	0.0012	0.0015	0.0012	0.01
Beryllium	0.000020	64	1	0.000010	0.000011	0.000010	0.000012	0.000010	0.000053	0.000075	0.008
Cadmium	0.0000050	64	7	0.0000025	0.0000035	0.0000025	0.0000043	0.0000092	0.000019	0.000033	0.005
Chromium	0.00050	64	6	0.00025	0.00031	0.00025	0.00036	0.00071	0.0016	0.00046	0.05
Cobalt	0.00010	64	3	0.000050	0.000058	0.000050	0.000069	0.000050	0.00041	0.00030	0.001
Copper	0.00050	64	3	0.00025	0.00029	0.00025	0.00034	0.00025	0.0018	0.00053	1.5
Iron	0.010	64	64	0.024	0.19	0.17	0.24	0.37	1.3	0.19	6.5
Lead	0.000050	64	3	0.000025	0.000036	0.000025	0.000050	0.000025	0.00050	0.00014	0.005
Lithium	0.0010	64	0	0.00050	0.00050	0.00050	-	0.00050	0.00050	0.011	0.008
Manganese	0.00010	64	64	0.0033	0.021	0.019	0.025	0.044	0.11	0.064	0.12
Mercury	0.0000050	64	1	0.0000025	0.0000026	0.0000025	0.0000027	0.0000025	0.0000058	0.0000080	0.001
Molybdenum	0.000050	64	64	0.00059	0.00082	0.00086	0.00086	0.00099	0.0011	0.0013	0.088
Nickel	0.00050	64	3	0.00025	0.00028	0.00025	0.00033	0.00025	0.0017	0.00056	0.08
Selenium	0.000050	66	43	0.000025	0.000053	0.000056	0.000059	0.000080	0.00015	0.00018	0.01
Thallium	0.0030	64	0	0.0000050	0.0000050	0.0000050	-	0.0000050	0.0000050	0.000037	ng
Zinc	0.000010	64	2	0.0015	0.0016	0.0015	0.0017	0.0015	0.0047	0.0051	3.0

Notes:

DL = detection limit; 95% UCLM = 95% upper confidence limit of the mean; WQ = water quality; NPM = numeric performance objective; ng = no drinking water quality guideline or standard is available.

"-" means that the 95% UCLM could not be calculated because all concentrations were equal.

Concentrations measured to be less than the DL were replaced with concentrations of 0.5 x DL for the purpose of calculating summary statistics.

The 95% UCLM was calculated using bootstrapping methods, which are free of parametric assumptions.

Outliers exceeding threshold based on professional judgement were removed while values exceeding the 99th percentile were flagged but retained in the dataset.

[a] Sites: DC-05, DC-10, DC-15, DC-20, 661-05, 661-10, 661-20, CC-15, CC-20, CC-30, and CC-40.

[b] DWQG NPM = drinking water quality guideline numeric performance objective which is the lowest (most conservative) of the BC Contaminated Sites Regulation (B.C. Reg. 375/96) Schedule 3.2 Drinking Water Standards, the BC Source Drinking Water Guideline (BC ENV 2020b), and the Health Canada Drinking Water Quality Guideline (Health Canada 2022).

In all cases, the mean concentration of each COPC was lower than the predicted WQ NPM concentration (Table 4.2-5). This indicates that the concentrations of COPCs in surface water were within the range predicted by the SWQ model and that concentrations used to represent surface water EPCs in the HHRA were reasonably conservative.

Concentrations of all COPCs from impact sites where water quality modelling was completed were also lower than the DWQG NPMs (Table 4.2-5).

4.2.5 BACI Analysis

4.2.5.1 Methodology

BACI analysis was carried out on COPCs in surface water that had greater than 70% detectable results. Highly censored parameters (i.e., more than 70% of data were above the DL) were considered unreliable and were not subjected to BACI analysis. The percent detection for each parameter during baseline and monitoring is illustrated in Appendix B, Figure 1. As a result, BACI analysis under the CFMP included the following COPCs:

- Total aluminum;
- Total arsenic;
- Total chromium;
- Total iron;
- Total manganese;
- Total molybdenum; and
- Total selenium.

Duplicates were averaged and field and travel blanks were removed prior to analysis.

The standard approach to BACI was used to assess potential impacts to water quality, where the mean of baseline data collected prior to the start of construction on October 1, 2022 (before) is compared to the mean of monitoring data (after) at both control and impact sites. Water quality data were grouped into control sites (as per Section 4.1.3) and potential impact sites (as per Section 4.1.4). The main statistic of interest in a BACI analysis is an ANOVA interaction term (Before-After × Control-Impact, or BA × CI), which would be significant when a change occurs at the impact site but not at the control site (Smokorowski and Randall 2016).

4.2.5.2 Results

Box plots illustrating parameter concentrations in baseline and during monitoring at control and impact sites are located in Appendix B. Table 4.2-6 to Table 4.2-12 show the results of the BACI analysis for the COPCs listed in Section 4.2.5.1. The threshold for significance was assumed to be $p = 0.001$.

Table 4.2-6: BACI Analysis Results for Aluminum

Term	Estimate	Standard Error	p-value
Intercept	-1.384	0.155	<0.001
BA	-0.475	0.062	<0.001
CI	0.052	0.173	0.765
BA x CI	0.147	0.069	0.033

Table 4.2-7: BACI Analysis Results for Arsenic

Term	Estimate	Standard Error	p-value
Intercept	-3.367	0.063	<0.001
BA	0.022	0.016	0.169
CI	0.129	0.071	0.069
BA x CI	-0.006	0.017	0.735

Table 4.2-8: BACI Analysis Results for Chromium

Term	Estimate	Standard Error	p-value
Intercept	-3.605	0.046	<0.001
BA	0.031	0.040	0.434
CI	-0.015	0.052	0.776
BA x CI	0.046	0.044	0.295

Table 4.2-9: BACI Analysis Results for Iron

Term	Estimate	Standard Error	p-value
Intercept	-0.983	0.179	<0.001
BA	-0.274	0.051	<0.001
CI	0.088	0.200	0.658
BA x CI	0.191	0.056	**0.0006**

Table 4.2-10: BACI Analysis Results for Manganese

Term	Estimate	Standard Error	p-value
Intercept	-1.846	0.150	<0.001
BA	-0.293	0.056	<0.001
CI	0.065	0.168	0.698
BA x CI	0.269	0.062	**<0.001**

Table 4.2-11: BACI Analysis Results for Molybdenum

Term	Estimate	Standard Error	p-value
Intercept	-3.358	0.072	<0.001
BA	0.121	0.025	<0.001
CI	0.032	0.081	0.69
BA x CI	0.015	0.028	0.95

Table 4.2-12: BACI Analysis Results for Selenium

Term	Estimate	Standard Error	p-value
Intercept	-4.453	0.064	<0.001
BA	-0.006	0.039	0.889
CI	0.116	0.072	0.109
BA x CI	-0.048	0.043	0.265

To interpret the BACI results, the results for total aluminum are presented first as an example (Table 4.2-6). The BA term representing the potential change in aluminum concentration from baseline (before) to after start of early works construction at the control sites is significant ($p < 0.001$), meaning that there was a shift (decrease) in the concentrations at the control sites following start of early works construction. This is also reflected in the Figure 2 boxplot of Appendix B. The difference in aluminum concentrations between the control and impact sites (the CI term) in the before period is not significant. However, these terms on their own are not of much interest. The change in aluminum concentrations from before to after start of early works construction between control and impact sites is not significant (BA x CI term). This means that the change in aluminum concentrations from before to after at the impact sites was not different than the change in aluminum concentrations from before to after at the control sites (both decreased). Similar results of the BACI analysis were found for molybdenum (Table 4.2-11), with the BA term showing significance but the BA x CI term not being significant indicating changes in molybdenum concentrations were not Project-related.

For three of the metals in the BACI analysis (arsenic in Table 4.2-7, chromium in Table 4.2-8, and selenium in Table 4.2-12), the BA, CI, and BC x CI terms were not significant. This means that there were no differences in concentrations for these parameters from before to after start of early works construction between control and impact sites.

For iron (Table 4.2-9) and manganese (Table 4.2-10), the BA term is significant ($p < 0.001$), which means that there was a shift in concentration from baseline (before) at the control sites following the start of early works construction; however, the CI terms were not significant for either parameter. Iron and manganese both had significant interactions between the BA and CI terms (both $p < 0.001$). For iron concentrations relative to baseline conditions, there was a significant decrease in concentration in the control sites after start of early works construction, while the impact sites had a small increase. For manganese concentrations relative to baseline conditions, there was an increase in concentration in the control sites, and no change in the impact sites after start of early works construction.

Since there was no effluent discharge to surface water from the Project during the monitoring period, statistically significant Project related changes to water quality would not be expected. It is possible that the apparent statistically significant changes in water quality for iron (decrease at control sites, slight increase at impact sites) and manganese (increase at control sites, no change at impact sites) may be a result of seasonal differences. The monitoring period in 2022 (the “after” period) included October to December only, while the baseline datasets (the “before” period) included all months of the year. This issue may be resolved in 2023, when the “after” monitoring period includes all calendar months rather than just the last quarter of the year.

4.2.6 Quality Assurance / Quality Control

4.2.6.1 Sample Integrity, Storage, and Transport

During field sampling, standard sampling procedures were followed to preserve sample integrity and mitigate the chances of cross-contamination. The field trips were completed safely with no environmental or safety incidents, and there were no additional concerns that would suggest the integrity of the samples would have been affected.

After delivery of the samples to the CALA-certified laboratory (ALS Laboratories), a review of the sample receipt confirmation was completed to identify any issues that may have occurred during transport to the lab. The sample receipt confirmation indicated that the samples had been successfully delivered with no issues pertaining to sample and container integrity and all samples were analyzed within recommended holding times.

While the laboratory noted a few instances of method blank values, internal duplicate, matrix spikes, control sample recovery, and parameter frequency laboratory targets not being met, these checks overall met ALS Laboratories data quality objectives for internal QA/QC, and the report was issued and distributed without further comment. Certificates of Analysis, including complete results from laboratory QA/QC checks, are provided in Appendix A.

During the 2022 monitoring period, some water quality samples could not be collected due to conditions found in the field during sampling:

- The fifth sample of the October 5-in-30 sampling at station 661-04 was not collected because, despite multiple attempts, the site could not be accessed safely at the time of sampling.
- Tatelkuz Lake was not sampled in Quarter 4 (November) because of unsafe ice conditions.

4.2.6.2 Relative Percent Difference (RPD)

The RPD values were calculated to evaluate variability among duplicate samples. Calculation of the RPD was performed for all parameters with measured values greater than five times the MDL as part of the AEMP Interpretive Report (ERM 2023b). The results of RPD calculations are provided in Appendix C for all duplicates collected.

A total of 361 RPD calculations were performed. The BC provincial government recommends that any field duplicates with RPD values exceeding 20% indicate a possible problem and RPD values above 50% suggest a definite problem, most likely either contamination or lack of sample representativeness (ENV 2013). Of the total calculations, 3% percent (n = 10) of RPD calculations were in the range of 20 to 50%, and 0.3% (n = 1) of calculations were greater than 50%. This result indicates that for the majority of parameters with values greater than five times the DL in Project streams, sample replication was overall successful, within the typical margin of natural variability.

The RPD calculations greater than 20% were restricted to seven parameters: TDS, turbidity, orthophosphate, total and dissolved aluminum, total manganese, and dissolved barium. Turbidity is a naturally variable parameter, and total aluminum occurs at relatively high concentrations at many Project sites (see Section 3.1 of the AEMP). Manganese and barium concentrations are also typically variable in Project streams. Therefore, these parameters likely reflect natural heterogeneity in Project streams, rather than analytical error or sample contamination.

Overall, sample replication did not indicate any systematic issues with sampling or analytical methods.

5. ADAPTIVE MANAGEMENT AND ACTION LEVELS

An adaptive management framework is provided in Section 6 of the CFMP and was briefly described in Section 2 of this CFMP Annual Report.

The following subsections describe the country foods trigger response framework (Section 5.1) and identify the action level under the CFMP adaptive management framework based on the monitoring data collected for surface water quality between October and December 2022 (Section 5.2).

5.1 Country Foods Trigger Response Framework

Triggers (or NPMs) are provided at the following action levels of the adaptive management framework: none, low, medium, and high. The framework is intended to provide an early-warning system such that there is sufficient time to prevent adverse effects to human health when defined action levels are triggered. An overview of the trigger response framework and action levels is provided in Figure 5.1-1. Note that Figure 5.1-1 has been modified slightly from the version in the CFMP so that statistical significance is secondary to whether concentrations are higher than guidelines (i.e., a high action level is triggered if there are exceedances of guidelines, regardless of whether changes are identified to be statistically significant or not).

Additional details about the trigger response framework can be found in Section 6 of the CFMP. The human health trigger concentrations or NPMs used in the trigger response framework based on predicted COPC concentrations, baseline COPC concentrations, and guidelines or standards are briefly described in Section 4.1 and their derivation is described in ERM (2023c).

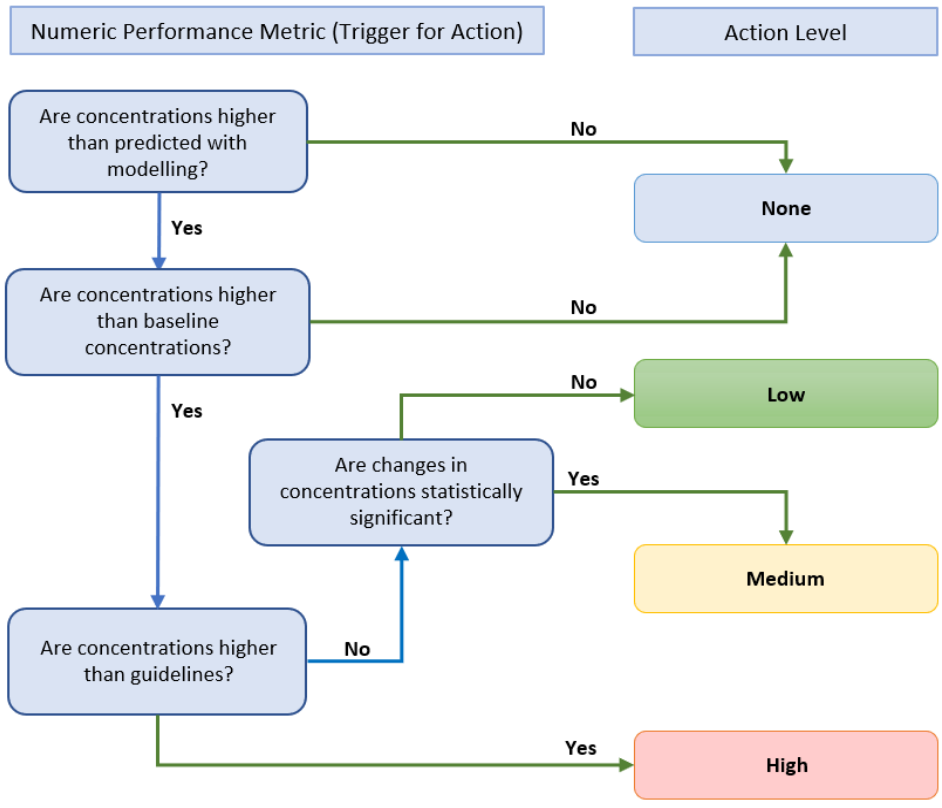


Figure 5.1-1: Overview of Action Levels and Triggers (Numeric Performance Metrics)

5.2 Action Level Based on Surface Water Quality Monitoring in 2022

Based on the comparison of surface water quality monitoring data from October 1 to December 31, 2022 to NPM concentrations (Sections 4.2.3 and 4.2.4, and Table 4.2-3 and Table 4.2-5), the action level for surface water quality under the CFMP is “none” (Table 5.2-1). With the exception of molybdenum, mean concentrations of COPCs in surface water quality at impact sites were lower than baseline WQ NPMs (Section 4.2.3). Mean concentrations of all parameters were lower than the predicted WQ NPMs (Section 4.2.4) and, with the exception of total manganese concentrations, all COPC concentrations were lower than DWQG NPMs (Section 4.2.1).

Total manganese concentrations are naturally elevated above the DWQG NPM at two control sites and one impact site (Section 4.2.1), but mean concentrations were lower than the baseline WQ NPM (Section 4.2.3) and predicted WQ NPM (Section 4.2.4), placing this parameter in the “none” action level.

Although mean molybdenum concentrations at impact sites exceeded the baseline WQ NPM by approximately 5% (Table 4.2-3), this exceedance may have been caused by a missing sample from Tatelkuz Lake during the monitoring period or by including baseline data from all months of the year in the baseline WQ NPM, whereas the monitoring period included October to December only. In addition, mean molybdenum concentrations were less than the predicted WQ NPM, placing this parameter in the “none” action level.

Since average (mean) COPC concentrations are less than baseline or predicted NPM concentrations, no change to mitigation is necessary. As there were no discharges to surface water from the Project during the monitoring period in 2022, the results of this year’s monitoring program are in line with expectations (i.e., no Project effects).

Table 5.2-1: Triggers and Management Responses Based on Metals in Surface Water

Level	Trigger	Management Response
None	Average measured parameter concentrations in water are: ■ Less than or equal to the predicted exposure point concentration (EPC) plus 20%[1]; and ■ Less than or equal to the baseline trigger concentration plus 20%; or ■ Less than the BC Source Drinking Water Quality Guidelines (BC DWQG), Health Canada Drinking Water Quality Guidelines (HC DWQG), and BC CSR Schedule 3.2 generic numerical water standards for drinking water (CSR DW).	No change to mitigation as mitigation measures are performing as expected, water concentrations are below levels of concern (drinking water guidelines or standards) or within baseline ranges, and water quality is in the range predicted by the surface water quality model.

[1] This percentage is based on the recommended value for acceptable relative percent difference for duplicate surface water samples from BC ENV (2013).

6. PLANNED CFMP SAMPLING PROGRAM FOR 2023

The following construction activities are planned by BWG for Q1 and Q2 of 2023, prior to sampling under the CFMP:

- Installation of temporary camp on existing disturbed ground;
- Clearing of priority early works areas outside of riparian corridors (pending approval of the revised Wetlands Management and Offsetting Plan (WMOP)); and
- Clearing of priority areas including riparian corridors (pending receipt of the *Fisheries Act* Authorization and completion of fish salvage activities).

Sampling under the CFMP and linked monitoring plans (AQDMP, AEMP, see Section 2.4) in 2023 is planned to include:

- Monitoring of air quality for CACs (PASS, Partisol);
- Baseline air quality sampling for dustfall;
- Baseline soil and vegetation (berries and plants) sampling in conjunction with small mammal (rodent) sampling;
- Baseline fish tissue sampling; and
- Monitoring of surface water quality.

While details of sampling plans (sampling frequencies, locations) for human health for these media are provided in the CFMP, the following paragraphs provide rationale for sampling in 2023.

Monitoring of particulates using the Partisol sampler at the exploration camp was initiated in Q4 of 2022 (BW Gold 2023) and is expected to continue in 2023. A PASS sampler was deployed on March 25, 2023. Sampling of CACs is required under EAC Condition 20 (the AQDMP), Condition 41 (the CFMP), and under the federal DS Section 6.12.

A second year of baseline dustfall metal sampling will be conducted in the summer of 2023, together with additional co-collected baseline soil and vegetation sampling, to support baseline rodent sampling as described in the *Framework for the Collection Program for Rodents* (ERM 2023f). This framework was provided to Indigenous nations and government for review and input, discussed during the EMB meeting on December 14, 2022, and updates made in January 2023. Sampling of dustfall and small mammals will be conducted at the existing eight dustfall sampling sites (four potential impact and four control sites), as described in the CFMP. It is expected that the construction activities planned to be conducted by summer of 2023 will not affect the results of this baseline sampling, as described in ERM (2023f). Baseline soil and vegetation metal concentrations collected concurrently with small mammals and dustfall in 2023 will become part of a cumulative three-year baseline dataset for these media to facilitate future BACI analyses, as recommended by the *2021-2022 Cumulative Dustfall, Soil, and Plant Metal Concentration Baseline Report* (ERM 2023f).

Monitoring of surface water quality will continue throughout all phases of the Project at locations and frequencies consistent with the AEMP, as required by EAC Condition 30 (the AEMP). Sites targeted for sampling under the CFMP in 2022 are listed in Table 3.1-1, which will be targeted again for sampling throughout 2023.

Although water quality sampling is now considered ‘monitoring’ for early-works construction activities, given that effluent discharge to surface water is not anticipated to occur prior to fish tissue sampling in 2023, an additional year of baseline sampling is proposed for 2023 for fish tissues. Fish tissues were sampled during baseline studies in 2021 and in 2022 (ERM *In prep.*). However, it was discovered that

some of the dissected fish tissues and whole fish samples were shipped to the analytical laboratory wrapped in aluminum foil, which may have inadvertently resulted in elevated metal concentrations, especially aluminum, in the tissues. This uncertainty can only be resolved with additional baseline sampling during the summer of 2023. It is anticipated that construction activities in Q4 2022 and Q1 to Q3 2023 will have no effect on fish tissue metal concentrations as these activities are unlikely to affect metal concentrations in water courses and fish will be salvaged prior to clearing of riparian corridors. The following sites will be targeted for sampling:

- Co-collection of water and fish (juvenile Rainbow Trout) tissue samples at stream sites including near-field impact sites in Davidson Creek (DC-05 and DC-15) and Creek 661 (661-05 and 661-10), and control sites in Creek 661 (661-01), Creek 705 (705-05, 705-10), and a Fawnie Creek tributary (FC-01), as well as in Turtle Creek (TC-01, TC-05, and TC-10).
- Co-collection of water and fish (adult Kokanee, Rainbow Trout, and Mountain Whitefish) tissue samples at lake sites including Tatelkuz Lake (potential impact site) and Kuyakuz Lake (control lake).

7. SUMMARY AND RECOMMENDATIONS

The Project initiated limited early works construction activities at the mine site in late September of 2022, which included preparing the plant site for construction and permitting and piping for TW-13-01 as a drinking water supply. There were no Project discharges to watercourses between late September and December 31, 2022. However, as surface water quality sampling was conducted during the reporting period after early works construction activities began (October 1 to December 31, 2022), this CFMP Annual Report presents the results of surface water quality monitoring. Other media covered under the CFMP (COPC concentrations in air, soil, plants, berries, and fish) were not sampled during the reporting period.

The LSA-wide surface water quality for the monitoring period was compared to DWQG NPMs, baseline NPMs, and predicted NPMs, as described under the trigger framework in the CFMP. A BACI analysis was also completed to identify if there were any statistically significant changes in water quality.

Mean concentrations of all COPCs were below the DWQG NPM, i.e., the lowest DW guideline or standard.

Based on the results of the comparisons to NPM concentrations and BACI analysis, the action level within the adaptive management framework of the CFMP is “none”. No adjustments to current mitigation measures for surface water quality to protect human health are required at this time. The results of the 2022 monitoring program are in line with expectations, given the limited early works construction activities in 2022 during which there were no Project discharges of effluent to surface water.

Sampling under the CFMP or linked monitoring programs is proposed for 2023, including the following:

- Air quality for CACs (PASS, Partisol) and for dustfall metals;
- Soil and vegetation (berries and plants) sampling in conjunction with small mammal (rodent) sampling;
- Fish tissue sampling; and
- Surface water quality.

8. REFERENCES

Definitions of the acronyms and abbreviations used in this reference list can be found in the Acronyms and Abbreviations section.

Legislation and Regulations

Contaminated Sites Regulation, B.C. Reg. 375/96.

Environmental Assessment Act, SBC 2018, c 51.

Environmental Management Act, SBC 2003, c. 53.

Secondary Sources

BC ENV. 2020a. *British Columbia Environmental Laboratory Manual*. British Columbia Ministry of Environment and Climate Change Strategy. https://www2.gov.bc.ca/gov/content/environment/research-monitoring-reporting/monitoring/laboratory-standards-quality-assurance/bc-environmental-laboratory-manual (accessed February 2023).

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BW Gold. 2023. *Air Quality and Fugitive Dust Management Annual Report 2022*. BW Gold Inc. Vancouver, BC.

Entia. 2022a. *Blackwater Gold Project: Conceptual Site Model*. Prepared by Entia Environmental Consultants Ltd. for BW Gold Inc.: Campbell River, BC.

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Gilbert, R. O. 1987. *Statistical methods for environmental pollution monitoring*. New York, NY: Van Nostrand Reinhold Company Inc.

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Lorax. 2022. *Surface Water Quality Model Base Case v13e. November 2022*.

New Gold. 2015. *Blackwater Gold Project: Environmental Assessment Application/Environmental Impact Statement*. Prepared by AMEC Environment & Infrastructure for New Gold Inc.: Vancouver, BC.

Smokorowski, K. E. and R. G. Randall. 2016. Cautions on Using the Before-After-Control-Impact Design in Environmental Effects Monitoring Programs. *Facets*, 2: 212-32.

APPENDIX A RAW WATER QUALITY DATA FOR OCTOBER TO DECEMBER, 2022

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA22C3937**	Page	: 1 of 6
Client	: **ERM Consultants Canada Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Tonia Robb	Account Manager	: Amber Springer
Address	: 10th Floor, 1100 Melville St. Vancouver BC Canada V6E 4A6	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: 604 689 9460	Telephone	: +1 604 253 4188
Project	: 0332945-0102-0001	Date Samples Received	: 05-Oct-2022 09:00
PO	: 10857	Date Analysis Commenced	: 06-Oct-2022
C-O-C number	: ----	Issue Date	: 17-Oct-2022 14:32
Sampler	:		
Site	: ----		
Quote number	: ERM/BW Gold SW (VA22-BWGL100-002/Q56205)		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Ann Joby	Lab Assistant	Metals, Burnaby, British Columbia
Anthony Calero	Supervisor - Inorganic	Inorganics, Calgary, Alberta
Caitlin Macey	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Elke Tabora		Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Owen Cheng		Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Qammar Almas	Lab Assistant	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

General Comments

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

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

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

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

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

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

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	CC-03	CC-05	661-03	661-10	----
					Client sampling date / time	03-Oct-2022	03-Oct-2022	03-Oct-2022	03-Oct-2022	----
						VA22C3937-001	VA22C3937-002	VA22C3937-003	VA22C3937-004	--------
						Result	Result	Result	Result	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	<2.0	<2.0	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		116	99.3	78.6	49.6	----
conductivity	----	E100	2.0	µS/cm		223	192	141	83.9	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		105	87.9	62.4	34.8	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		106	88.8	63.0	36.8	----
pH	----	E108	0.10	pH units		8.16	8.12	7.99	7.72	----
solids, total dissolved [TDS]	----	E162	10	mg/L		135	112	86	61	----
solids, total suspended [TSS]	----	E160	3.0	mg/L		<3.0	3.4	11.8	3.6	----
turbidity	----	E121	0.10	NTU		0.66	0.69	2.38	1.11	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0065	<0.0050	<0.0050	<0.0050	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
chloride	16887-00-6	E235.Cl	0.50	mg/L		<0.50	<0.50	<0.50	<0.50	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.059	0.055	0.052	0.042	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.208	0.156	0.108	0.134	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0481	0.0196	<0.0050	<0.0050	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		0.0011	<0.0010	<0.0010	<0.0010	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		0.0121	0.0133	0.0046	0.0124	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0170	0.0169	0.0110	0.0205	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		5.85	3.76	1.11	0.83	----
Cyanides										
cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L		<0.0050	0.0118	<0.0050	<0.0050	----
cyanide, weak acid dissociable	----	E336	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	----
thiocyanate	302-04-5	E344	0.50	mg/L		<0.50	<0.50	<0.50	<0.50	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		7.36	6.55	3.30	3.09	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		6.49	7.45	3.55	4.64	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0153	0.0197	0.0275	0.0517	----
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00078	0.00091	0.00033	0.00114	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	CC-03	CC-05	661-03	661-10	----
					Client sampling date / time	03-Oct-2022	03-Oct-2022	03-Oct-2022	03-Oct-2022	----
Analyte	CAS Number	Method	LOR	Unit		VA22C3937-001	VA22C3937-002	VA22C3937-003	VA22C3937-004	--------
						Result	Result	Result	Result	----
Total Metals										
barium, total	7440-39-3	E420	0.00010	mg/L		0.00753	0.00734	0.00846	0.00498	----
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	0.0000093	----
calcium, total	7440-70-2	E420	0.050	mg/L		29.4	24.6	16.7	10.6	----
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
iron, total	7439-89-6	E420	0.010	mg/L		0.185	0.158	0.159	0.272	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	----
magnesium, total	7439-95-4	E420	0.100	mg/L		7.87	6.66	5.18	2.50	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0317	0.0202	0.0382	0.0149	----
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.00100	0.00104	0.000371	0.000762	----
nickel, total	7440-02-0	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
potassium, total	7440-09-7	E420	0.100	mg/L		1.10	0.960	0.747	0.547	----
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000054	0.000063	<0.000050	<0.000050	----
silicon, total	7440-21-3	E420	0.10	mg/L		6.39	6.71	8.76	7.14	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, total	7440-23-5	E420	0.050	mg/L		4.58	4.54	4.27	3.40	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.120	0.115	0.0970	0.0718	----
sulfur, total	7704-34-9	E420	0.50	mg/L		2.24	1.48	0.54	<0.50	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<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	----
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00068	<0.00060 DLM	0.00041	0.00123	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000184	0.000229	0.000095	0.000099	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00072	0.00086	0.00067	0.00109	----
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	----
chromium, total	7440-47-3	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
Dissolved Metals										

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	CC-03	CC-05	661-03	661-10	----
					Client sampling date / time	03-Oct-2022	03-Oct-2022	03-Oct-2022	03-Oct-2022	----
						VA22C3937-001	VA22C3937-002	VA22C3937-003	VA22C3937-004	--------
						Result	Result	Result	Result	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0042	0.0066	0.0094	0.0178	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00071	0.00085	0.00023	0.00101	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.00746	0.00689	0.00822	0.00457	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	0.0000088	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		29.2	24.2	16.4	9.83	----
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00022	<0.00020	<0.00020	0.00023	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.116	0.100	0.067	0.149	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		7.77	6.68	5.21	2.48	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0188	0.00790	0.0323	0.00506	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000954	0.000932	0.000338	0.000594	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		1.10	0.943	0.732	0.549	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		6.82	7.05	9.22	7.17	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		4.69	4.73	4.44	3.65	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.120	0.109	0.0958	0.0673	----
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		1.88	1.18	<0.50	<0.50	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<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	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	0.00043	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000176	0.000223	0.000088	0.000087	----

Analytical Results

Sub-Matrix: **Water** (Matrix: **Water**)					Client sample ID	**CC-03**	**CC-05**	**661-03**	**661-10**	**----**
					Client sampling date / time	03-Oct-2022	03-Oct-2022	03-Oct-2022	03-Oct-2022	----
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*		**VA22C3937-001**	**VA22C3937-002**	**VA22C3937-003**	**VA22C3937-004**	**--------**
						Result	Result	Result	Result	----
Dissolved Metals										
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	0.00081	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	0.0015	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	Field	----

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

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA22C3937**	Page	: 1 of 22
Client	: **ERM Consultants Canada Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Tonia Robb	Account Manager	: Amber Springer
Address	: 10th Floor, 1100 Melville St. Vancouver BC Canada V6E 4A6	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 0332945-0102-0001	Date Samples Received	: 05-Oct-2022 09:00
PO	: 10857	Issue Date	: 17-Oct-2022 14:33
C-O-C number	: ----		
Sampler	:		
Site	: ----		
Quote number	: ERM/BW Gold SW (VA22-BWGL100-002/Q56205)		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

Key

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

Workorder Comments

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

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Laboratory Control Sample (LCS) Recoveries								
Total Metals	QC-686121-002	----	iron, total	7439-89-6	E420	121 % MES	80.0-120%	Recovery greater than upper control limit

Result Qualifiers

Qualifier	Description
MES	*Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).*

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) 661-03	E298	03-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) 661-10	E298	03-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) CC-03	E298	03-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) CC-05	E298	03-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE 661-03	E235.Br-L	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE 661-10	E235.Br-L	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE CC-03	E235.Br-L	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE CC-05	E235.Br-L	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE 661-03	E235.Cl	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE 661-10	E235.Cl	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE CC-03	E235.Cl	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE CC-05	E235.Cl	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE 661-03	E378-U	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE 661-10	E378-U	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE CC-03	E378-U	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE CC-05	E378-U	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
661-03	E235.F	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
661-10	E235.F	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
CC-03	E235.F	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
CC-05	E235.F	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
661-03	E235.NO3-L	03-Oct-2022	06-Oct-2022	3 days	3 days	✓	06-Oct-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
661-10	E235.NO3-L	03-Oct-2022	06-Oct-2022	3 days	3 days	✓	06-Oct-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
CC-03	E235.NO3-L	03-Oct-2022	06-Oct-2022	3 days	3 days	✓	06-Oct-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
CC-05	E235.NO3-L	03-Oct-2022	06-Oct-2022	3 days	3 days	✓	06-Oct-2022	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
661-03	E235.NO2-L	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
661-10	E235.NO2-L	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
CC-03	E235.NO2-L	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
CC-05	E235.NO2-L	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
661-03	E235.SO4	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
661-10	E235.SO4	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
CC-03	E235.SO4	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
CC-05	E235.SO4	03-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
661-03	E318	03-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	28 days	12 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
661-10	E318	03-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	28 days	12 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
CC-03	E318	03-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	28 days	12 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
CC-05	E318	03-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	28 days	12 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid)										
661-03	E372-U	03-Oct-2022	13-Oct-2022	----	----		15-Oct-2022	28 days	12 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid)										
661-10	E372-U	03-Oct-2022	13-Oct-2022	----	----		15-Oct-2022	28 days	12 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid)										
CC-03	E372-U	03-Oct-2022	13-Oct-2022	----	----		15-Oct-2022	28 days	12 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid)										
CC-05	E372-U	03-Oct-2022	13-Oct-2022	----	----		15-Oct-2022	28 days	12 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid)										
661-03	E344	03-Oct-2022	----	----	----		06-Oct-2022	14 days	4 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid)										
661-10	E344	03-Oct-2022	----	----	----		06-Oct-2022	14 days	4 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid)										
CC-03	E344	03-Oct-2022	----	----	----		06-Oct-2022	14 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid)										
CC-05	E344	03-Oct-2022	----	----	----		06-Oct-2022	14 days	4 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
661-03	E333	03-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	11 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
661-10	E333	03-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	11 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
CC-03	E333	03-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	11 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
CC-05	E333	03-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	11 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
661-03	E336	03-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	11 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
661-10	E336	03-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	11 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
CC-03	E336	03-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	11 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
CC-05	E336	03-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	11 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved) 661-03	E509	03-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	5 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved) 661-10	E509	03-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	5 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved) CC-03	E509	03-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	5 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved) CC-05	E509	03-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 661-03	E421	03-Oct-2022	06-Oct-2022	----	----		07-Oct-2022	180 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) 661-10	E421	03-Oct-2022	06-Oct-2022	----	----		07-Oct-2022	180 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) CC-03	E421	03-Oct-2022	06-Oct-2022	----	----		07-Oct-2022	180 days	5 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) CC-05	E421	03-Oct-2022	06-Oct-2022	----	----		07-Oct-2022	180 days	5 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) 661-03	E358-L	03-Oct-2022	09-Oct-2022	----	----		11-Oct-2022	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
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) 661-10	E358-L	03-Oct-2022	09-Oct-2022	----	----		11-Oct-2022	28 days	9 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) CC-03	E358-L	03-Oct-2022	09-Oct-2022	----	----		11-Oct-2022	28 days	9 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) CC-05	E358-L	03-Oct-2022	09-Oct-2022	----	----		11-Oct-2022	28 days	9 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) 661-03	E355-L	03-Oct-2022	11-Oct-2022	----	----		11-Oct-2022	28 days	9 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) 661-10	E355-L	03-Oct-2022	11-Oct-2022	----	----		11-Oct-2022	28 days	9 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) CC-03	E355-L	03-Oct-2022	11-Oct-2022	----	----		11-Oct-2022	28 days	9 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) CC-05	E355-L	03-Oct-2022	11-Oct-2022	----	----		11-Oct-2022	28 days	9 days	✓
Physical Tests : Acidity by Titration										
HDPE 661-03	E283	03-Oct-2022	06-Oct-2022	----	----		07-Oct-2022	14 days	4 days	✓
Physical Tests : Acidity by Titration										
HDPE 661-10	E283	03-Oct-2022	06-Oct-2022	----	----		07-Oct-2022	14 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Acidity by Titration										
HDPE										
CC-03	E283	03-Oct-2022	06-Oct-2022	----	----		07-Oct-2022	14 days	4 days	✓
Physical Tests : Acidity by Titration										
HDPE										
CC-05	E283	03-Oct-2022	06-Oct-2022	----	----		07-Oct-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
661-03	E290	03-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	14 days	8 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
661-10	E290	03-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	14 days	8 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
CC-03	E290	03-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	14 days	8 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE										
CC-05	E290	03-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	14 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE										
661-03	E100	03-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	28 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE										
661-10	E100	03-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	28 days	8 days	✓
Physical Tests : Conductivity in Water										
HDPE										
CC-03	E100	03-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	28 days	8 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE CC-05	E100	03-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	28 days	8 days	✓
Physical Tests : pH by Meter										
HDPE 661-03	E108	03-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	0.25 hrs	108.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE 661-10	E108	03-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	0.25 hrs	108.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE CC-03	E108	03-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	0.25 hrs	108.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE CC-05	E108	03-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	0.25 hrs	108.25 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE 661-03	E162	03-Oct-2022	----	----	----		07-Oct-2022	7 days	4 days	✓
Physical Tests : TDS by Gravimetry										
HDPE 661-10	E162	03-Oct-2022	----	----	----		07-Oct-2022	7 days	4 days	✓
Physical Tests : TDS by Gravimetry										
HDPE CC-03	E162	03-Oct-2022	----	----	----		07-Oct-2022	7 days	4 days	✓
Physical Tests : TDS by Gravimetry										
HDPE CC-05	E162	03-Oct-2022	----	----	----		07-Oct-2022	7 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE 661-03	E160	03-Oct-2022	----	----	----		07-Oct-2022	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE 661-10	E160	03-Oct-2022	----	----	----		07-Oct-2022	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE CC-03	E160	03-Oct-2022	----	----	----		07-Oct-2022	7 days	4 days	✓
Physical Tests : TSS by Gravimetry										
HDPE CC-05	E160	03-Oct-2022	----	----	----		07-Oct-2022	7 days	4 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE 661-03	E121	03-Oct-2022	----	----	----		06-Oct-2022	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE 661-10	E121	03-Oct-2022	----	----	----		06-Oct-2022	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE CC-03	E121	03-Oct-2022	----	----	----		06-Oct-2022	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE CC-05	E121	03-Oct-2022	----	----	----		06-Oct-2022	3 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) 661-03	E508	03-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	28 days	11 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 Mercury in Water by CVAAS										
Glass vial - total (lab preserved) 661-10	E508	03-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	28 days	11 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) CC-03	E508	03-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	28 days	11 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) CC-05	E508	03-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	28 days	11 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved) 661-03	E420	03-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	180 days	6 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved) 661-10	E420	03-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	180 days	6 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved) CC-03	E420	03-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	180 days	6 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved) CC-05	E420	03-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	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	682677	1	17	5.8	5.0	✓
Alkalinity Species by Titration	E290	682676	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	686036	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	682683	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	682682	1	19	5.2	5.0	✓
Conductivity in Water	E100	682674	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	686558	1	9	11.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	684844	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	688728	1	18	5.5	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	682684	1	19	5.2	5.0	✓
Fluoride in Water by IC	E235.F	682681	1	19	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	682679	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	682680	1	19	5.2	5.0	✓
pH by Meter	E108	682675	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	682678	1	19	5.2	5.0	✓
TDS by Gravimetry	E162	686029	1	13	7.6	5.0	✓
Thiocyanate by Colourimetry	E344	684228	1	20	5.0	5.0	✓
Total Cyanide	E333	694714	1	10	10.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	693497	1	20	5.0	5.0	✓
Total Mercury in Water by CVAAS	E508	695559	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	686121	1	19	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	690194	1	18	5.5	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	693899	1	20	5.0	5.0	✓
TSS by Gravimetry	E160	686027	1	13	7.6	5.0	✓
Turbidity by Nephelometry	E121	683112	1	20	5.0	5.0	✓
WAD Cyanide	E336	694715	1	7	14.2	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	682677	1	17	5.8	5.0	✓
Alkalinity Species by Titration	E290	682676	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	686036	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	682683	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	682682	1	19	5.2	5.0	✓
Conductivity in Water	E100	682674	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	686558	1	9	11.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	684844	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	688728	1	18	5.5	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	682684	1	19	5.2	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	682681	1	19	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	682679	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	682680	1	19	5.2	5.0	✓
pH by Meter	E108	682675	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	682678	1	19	5.2	5.0	✓
TDS by Gravimetry	E162	686029	1	13	7.6	5.0	✓
Thiocyanate by Colourimetry	E344	684228	1	20	5.0	5.0	✓
Total Cyanide	E333	694714	1	10	10.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	693497	1	20	5.0	5.0	✓
Total Mercury in Water by CVAAS	E508	695559	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	686121	1	19	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	690194	1	18	5.5	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	693899	1	20	5.0	5.0	✓
TSS by Gravimetry	E160	686027	1	13	7.6	5.0	✓
Turbidity by Nephelometry	E121	683112	1	20	5.0	5.0	✓
WAD Cyanide	E336	694715	1	7	14.2	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	682677	1	17	5.8	5.0	✓
Alkalinity Species by Titration	E290	682676	1	19	5.2	5.0	✓
Ammonia by Fluorescence	E298	686036	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	682683	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	682682	1	19	5.2	5.0	✓
Conductivity in Water	E100	682674	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	686558	1	9	11.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	684844	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	688728	1	18	5.5	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	682684	1	19	5.2	5.0	✓
Fluoride in Water by IC	E235.F	682681	1	19	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	682679	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	682680	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	682678	1	19	5.2	5.0	✓
TDS by Gravimetry	E162	686029	1	13	7.6	5.0	✓
Thiocyanate by Colourimetry	E344	684228	1	20	5.0	5.0	✓
Total Cyanide	E333	694714	1	10	10.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	693497	1	20	5.0	5.0	✓
Total Mercury in Water by CVAAS	E508	695559	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	686121	1	19	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	690194	1	18	5.5	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	693899	1	20	5.0	5.0	✓
TSS by Gravimetry	E160	686027	1	13	7.6	5.0	✓
Turbidity by Nephelometry	E121	683112	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*
Method Blanks (MB) - Continued							
WAD Cyanide	E336	694715	1	7	14.2	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	686036	1	20	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	682683	1	19	5.2	5.0	✓
Chloride in Water by IC	E235.Cl	682682	1	19	5.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	686558	1	9	11.1	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	684844	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	688728	1	18	5.5	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	682684	1	19	5.2	5.0	✓
Fluoride in Water by IC	E235.F	682681	1	19	5.2	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	682679	1	19	5.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	682680	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	682678	1	19	5.2	5.0	✓
Thiocyanate by Colourimetry	E344	684228	1	20	5.0	5.0	✓
Total Cyanide	E333	694714	1	10	10.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	693497	1	20	5.0	5.0	✓
Total Mercury in Water by CVAAS	E508	695559	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	686121	1	19	5.2	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	690194	1	18	5.5	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	693899	1	20	5.0	5.0	✓
WAD Cyanide	E336	694715	1	7	14.2	5.0	✓

Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Vancouver - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TSS by Gravimetry	E160 Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Vancouver - 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 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC	E235.Cl Vancouver - 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 Vancouver - 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 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Vancouver - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH endpoint of 8.3
Alkalinity Species by Titration	E290 Vancouver - 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	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Calgary - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Cyanide	E333 Vancouver - Environmental	Water	ISO 14403 (mod)	Total or Strong Acid Dissociable (SAD) Cyanide is determined by Continuous Flow Analyzer (CFA) with in-line UV digestion followed by colourmetric analysis. Method Limitation: High levels of thiocyanate (SCN) may cause positive interference (up to 0.5% of SCN concentration).
WAD Cyanide	E336 Vancouver - Environmental	Water	APHA 4500-CN I (mod)	Weak Acid Dissociable (WAD) cyanide is determined by Continuous Flow Analyzer (CFA) with in-line distillation followed by colourmetric analysis.
Thiocyanate by Colourimetry	E344 Vancouver - Environmental	Water	APHA 4500-CN M (mod)	Thiocyanate is determined by the ferric nitrate colourimetric method. Water samples containing high levels of hexavalent chromium, cyanide (together with sulfide), reducing agents, or hydrocarbons may cause negative or positive interferences with this method.
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L Calgary - Environmental	Water	APHA 5310 B (mod)	Total Organic Carbon (Non-Purgeable), also known as NPOC (total), is a direct measurement of TOC after an acidified sample has been purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of total carbon (TC) is comprised of IC (which is common), this method is more accurate and more reliable than the TOC by subtraction method (i.e. TC minus TIC).
Dissolved Organic Carbon by Combustion (Low Level)	E358-L Calgary - Environmental	Water	APHA 5310 B (mod)	Dissolved Organic Carbon (Non-Purgeable), also known as NPOC (dissolved), is a direct measurement of DOC after a filtered (0.45 micron) sample has been acidified and purged to remove inorganic carbon (IC). Analysis is by high temperature combustion with infrared detection of CO_2. NPOC does not include volatile organic species that are purged off with IC. For samples where the majority of DC (dissolved carbon) is comprised of IC (which is common), this method is more accurate and more reliable than the DOC by subtraction method (i.e. DC minus DIC).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Total Phosphorus by Colourimetry (0.002 mg/L)	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 0.001 mg/L)	E378-U Vancouver - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically 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.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508 Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), dissolved” is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), from total Ca/Mg” is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.

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

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Digestion for TKN in water	EP318 Calgary - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
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 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	: **VA22C3937**	Page	: 1 of 18
Client	: ERM Consultants Canada Ltd.	Laboratory	: Vancouver - Environmental
Contact	: Tonia Robb	Account Manager	: Amber Springer
Address	: 3083-595 Burrard St Vancouver BC Canada V7X 1L3	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 0332945-0102-0001	Date Samples Received	: 05-Oct-2022 09:00
PO	: 10857	Date Analysis Commenced	: 06-Oct-2022
C-O-C number	: ----	Issue Date	: 17-Oct-2022 14:32
Sampler	:		
Site	: ----		
Quote number	: ERM/BW Gold SW (VA22-BWGL100-002/Q56205)		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Ann Joby	Lab Assistant	Vancouver Metals, Burnaby, British Columbia
Anthony Calero	Supervisor - Inorganic	Calgary Inorganics, Calgary, Alberta
Caitlin Macey	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Elke Tabora		Calgary Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Vancouver Metals, Burnaby, British Columbia
Owen Cheng		Vancouver Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Calgary Inorganics, Calgary, Alberta
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Tracy Harley	Supervisor - Water Quality Instrumentation	Vancouver Inorganics, Burnaby, British Columbia

General Comments

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

Key :

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

Workorder Comments

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Physical Tests (QC Lot: 682674)											
VA22C3893-001	Anonymous	conductivity	----	E100	2.0	µS/cm	416	416	0.00%	10%	----
Physical Tests (QC Lot: 682675)											
VA22C3893-001	Anonymous	pH	----	E108	0.10	pH units	8.14	8.14	0.00%	4%	----
Physical Tests (QC Lot: 682676)											
VA22C3893-001	Anonymous	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	109	108	0.368%	20%	----
Physical Tests (QC Lot: 682677)											
VA22C3893-002	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 683112)											
VA22C3886-006	Anonymous	turbidity	----	E121	0.10	NTU	4.49	4.68	4.23%	15%	----
Physical Tests (QC Lot: 686027)											
VA22C3886-003	Anonymous	solids, total suspended [TSS]	----	E160	5.0	mg/L	117	111	5.28%	20%	----
Physical Tests (QC Lot: 686029)											
VA22C3886-003	Anonymous	solids, total dissolved [TDS]	----	E162	13	mg/L	110	110	0.3	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 682678)											
VA22C3893-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	68.6	68.6	0.0394%	20%	----
Anions and Nutrients (QC Lot: 682679)											
VA22C3893-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.414	0.414	0.0246%	20%	----
Anions and Nutrients (QC Lot: 682680)											
VA22C3893-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 682681)											
VA22C3893-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.038	0.039	0.0005	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 682682)											
VA22C3893-001	Anonymous	chloride	16887-00-6	E235.Cl	0.50	mg/L	24.9	24.9	0.0382%	20%	----
Anions and Nutrients (QC Lot: 682683)											
VA22C3893-001	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: 682684)											
VA22C3893-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0043	0.0042	0.00005	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 686036)											
CG2213887-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 693497)											
VA22C3936-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.500	mg/L	27.7	27.0	2.63%	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*
Cyanides (QC Lot: 684228)											
VA22C3896-001	Anonymous	thiocyanate	302-04-5	E344	0.50	mg/L	0.51	<0.50	0.006	Diff <2x LOR	----
Cyanides (QC Lot: 694714)											
KS2203727-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Cyanides (QC Lot: 694715)											
VA22C3925-001	Anonymous	cyanide, weak acid dissociable	----	E336	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 688728)											
VA22C3937-001	CC-03	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	7.36	7.39	0.414%	20%	----
Organic / Inorganic Carbon (QC Lot: 690194)											
VA22C3937-001	CC-03	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	6.49	7.50	14.4%	20%	----
Total Metals (QC Lot: 686121)											
VA22C3731-001	Anonymous	aluminum, total	7429-90-5	E420	0.0100	mg/L	<0.0100	<0.0100	0	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00024	0.00024	0.000003	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.0200	mg/L	<0.0200	<0.0200	0	Diff <2x LOR	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<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	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
		cadmium, total	7440-43-9	E420	0.000200	mg/L	<0.000200	<0.000200	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.100	mg/L	9.51	9.74	2.40%	20%	----
		chromium, total	7440-47-3	E420	0.00200	mg/L	<0.00200	<0.00200	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00100	mg/L	0.0102	0.0105	3.12%	20%	----
		iron, total	7439-89-6	E420	0.030	mg/L	0.277	0.285	0.008	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000500	mg/L	0.000971	0.00102	0.000048	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0013	0.0013	0.00002	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.100	mg/L	4.17	4.38	4.97%	20%	----
		manganese, total	7439-96-5	E420	0.00200	mg/L	0.0135	0.0137	0.00025	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00116	0.00119	2.34%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00189	0.00188	0.000008	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	0.075	0.025	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.100	mg/L	2.49	2.55	2.53%	20%	----
		selenium, total	7782-49-2	E420	0.00100	mg/L	<0.00100	<0.00100	0	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	9.27	9.53	2.72%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	2.00	mg/L	26.2	26.8	1.91%	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: 686121) - continued											
VA22C3731-001	Anonymous	strontium, total	7440-24-6	E420	0.00020	mg/L	0.0648	0.0656	1.29%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	2.43	2.52	0.09	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000100	mg/L	0.000196	0.000204	0.000007	Diff <2x LOR	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00230	0.00229	0.000007	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0500	mg/L	0.0877	0.0906	0.0029	Diff <2x LOR	----
Total Metals (QC Lot: 695559)											
KS2203830-002	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 684844)											
VA22C3901-006	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0022	0.0016	0.0006	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00026	0.00026	0.000004	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00110	0.00109	1.79%	20%	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0717	0.0757	5.43%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.040	0.040	0.0004	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000200	mg/L	<0.0000200	<0.0000200	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	140	141	0.552%	20%	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	0.00057	0.00057	0.000008	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00110	0.00113	0.00003	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.038	0.038	0.0009	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	0.0162	0.0167	2.66%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	53.1	53.8	1.19%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0648	0.0666	2.70%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.0530	0.0542	2.14%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00142	0.00144	0.00002	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	18.8	19.4	3.29%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000496	0.000432	0.000064	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	8.21	8.14	0.838%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Dissolved Metals (QC Lot: 684844) - continued											
VA22C3901-006	Anonymous	sodium, dissolved	7440-23-5	E421	0.050	mg/L	97.3	99.2	1.94%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	1.44	1.49	2.89%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	207	211	2.08%	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	0.00172	0.00170	1.33%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00108	0.00109	0.00002	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: 686558)											
VA22C3920-004	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----

Method Blank (MB) Report

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

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Physical Tests (QCLot: 682674)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 682676)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 682677)						
acidity (as CaCO3)	----	E283	2	mg/L	2.1	----
Physical Tests (QCLot: 683112)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 686027)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 686029)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 682678)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 682679)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 682680)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 682681)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 682682)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 682683)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 682684)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 686036)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 693497)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 693899)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Cyanides (QCLot: 684228)						
thiocyanate	302-04-5	E344	0.5	mg/L	<0.50	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Cyanides (QCLot: 694714)						
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	<0.0020	----
Cyanides (QCLot: 694715)						
cyanide, weak acid dissociable	----	E336	0.002	mg/L	<0.0020	----
Organic / Inorganic Carbon (QCLot: 688728)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 690194)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 686121)						
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	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 686121) - continued						
tin, total	7440-31-5	E420	0.0001	mg/L	<0.00010	----
titanium, total	7440-32-6	E420	0.0003	mg/L	<0.00030	----
uranium, total	7440-61-1	E420	0.00001	mg/L	<0.000010	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	<0.00050	----
zinc, total	7440-66-6	E420	0.003	mg/L	<0.0030	----
Total Metals (QCLot: 695559)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 684844)						
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	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 684844) - continued						
tin, dissolved	7440-31-5	E421	0.0001	mg/L	<0.00010	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	<0.000010	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	<0.0010	----
Dissolved Metals (QCLot: 686558)						
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: 682674)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	100	90.0	110	----
Physical Tests (QCLot: 682675)									
pH	----	E108	----	pH units	7 pH units	99.7	98.0	102	----
Physical Tests (QCLot: 682676)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	112	85.0	115	----
Physical Tests (QCLot: 682677)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	100	85.0	115	----
Physical Tests (QCLot: 683112)									
turbidity	----	E121	0.1	NTU	200 NTU	101	85.0	115	----
Physical Tests (QCLot: 686027)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	93.3	85.0	115	----
Physical Tests (QCLot: 686029)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	98.2	85.0	115	----
Anions and Nutrients (QCLot: 682678)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 682679)									
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: 682680)									
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: 682681)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	100	90.0	110	----
Anions and Nutrients (QCLot: 682682)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	103	90.0	110	----
Anions and Nutrients (QCLot: 682683)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	107	85.0	115	----
Anions and Nutrients (QCLot: 682684)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	94.9	80.0	120	----
Anions and Nutrients (QCLot: 686036)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	99.2	85.0	115	----
Anions and Nutrients (QCLot: 693497)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	99.1	75.0	125	----
Anions and Nutrients (QCLot: 693899)									

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: 693899) - continued									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.03 mg/L	99.1	80.0	120	----
Cyanides (QCLot: 684228)									
thiocyanate	302-04-5	E344	0.5	mg/L	10 mg/L	96.6	85.0	115	----
Cyanides (QCLot: 694714)									
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	0.25 mg/L	95.5	80.0	120	----
Cyanides (QCLot: 694715)									
cyanide, weak acid dissociable	----	E336	0.002	mg/L	0.125 mg/L	103	80.0	120	----
Organic / Inorganic Carbon (QCLot: 688728)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	93.0	80.0	120	----
Organic / Inorganic Carbon (QCLot: 690194)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	91.4	80.0	120	----
Total Metals (QCLot: 686121)									
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	112	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	104	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	99.8	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	105	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	99.1	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	93.8	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	101	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	102	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	99.2	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	# 121	80.0	120	MES
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	102	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	104	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	105	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	102	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	107	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	98.9	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	103	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	104	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 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
Total Metals (QCLot: 686121) - continued									
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	97.5	80.0	120	----
sodium, total	7440-23-5	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	105	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	100	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	104	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	99.9	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	97.8	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	100	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	103	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	97.8	80.0	120	----
Total Metals (QCLot: 695559)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	99.9	80.0	120	----
Dissolved Metals (QCLot: 684844)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	97.3	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	101	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	99.0	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	99.0	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	91.3	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	98.0	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	99.3	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	95.3	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	95.5	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	96.2	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	99.5	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	101	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	97.6	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	99.7	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	95.6	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	102	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	99.7	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	100.0	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 684844) - continued									
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	105	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	91.7	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	106	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	108	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	96.6	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	99.6	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	98.9	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	93.2	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	101	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	98.8	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	97.8	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	94.4	80.0	120	----

Qualifiers

Qualifier	Description
MES	*Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).*

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 682678)										
VA22C3893-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	106 mg/L	100 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 682679)										
VA22C3893-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	2.62 mg/L	2.5 mg/L	105	75.0	125	----
Anions and Nutrients (QCLot: 682680)										
VA22C3893-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.519 mg/L	0.5 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 682681)										
VA22C3893-002	Anonymous	fluoride	16984-48-8	E235.F	1.02 mg/L	1 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 682682)										
VA22C3893-002	Anonymous	chloride	16887-00-6	E235.Cl	104 mg/L	100 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 682683)										
VA22C3893-002	Anonymous	bromide	24959-67-9	E235.Br-L	0.530 mg/L	0.5 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 682684)										
VA22C3893-002	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0250 mg/L	0.03 mg/L	83.3	70.0	130	----
Anions and Nutrients (QCLot: 686036)										
CG2213887-003	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.104 mg/L	0.1 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 693497)										
VA22C3937-001	CC-03	Kjeldahl nitrogen, total [TKN]	----	E318	2.60 mg/L	2.5 mg/L	104	70.0	130	----
Anions and Nutrients (QCLot: 693899)										
VA22C3936-001	Anonymous	phosphorus, total	7723-14-0	E372-U	ND mg/L	0.05 mg/L	ND	70.0	130	----
Cyanides (QCLot: 684228)										
VA22C3896-002	Anonymous	thiocyanate	302-04-5	E344	8.92 mg/L	10 mg/L	89.2	75.0	125	----
Cyanides (QCLot: 694714)										
KS2203731-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	11.2 mg/L	12.5 mg/L	89.3	75.0	125	----
Cyanides (QCLot: 694715)										
VA22C3937-001	CC-03	cyanide, weak acid dissociable	----	E336	0.127 mg/L	0.125 mg/L	102	75.0	125	----
Organic / Inorganic Carbon (QCLot: 688728)										
VA22C3937-001	CC-03	carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	5 mg/L	ND	70.0	130	----
Organic / Inorganic Carbon (QCLot: 690194)										

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
Organic / Inorganic Carbon (QCLot: 690194) - continued										
VA22C3937-001	CC-03	carbon, total organic [TOC]	----	E355-L	ND mg/L	5 mg/L	ND	70.0	130	----
Total Metals (QCLot: 686121)										
VA22C3922-001	Anonymous	aluminum, total	7429-90-5	E420	0.188 mg/L	0.2 mg/L	93.8	70.0	130	----
		antimony, total	7440-36-0	E420	0.0192 mg/L	0.02 mg/L	96.2	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0189 mg/L	0.02 mg/L	94.3	70.0	130	----
		barium, total	7440-39-3	E420	0.0178 mg/L	0.02 mg/L	89.3	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0368 mg/L	0.04 mg/L	92.1	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00936 mg/L	0.01 mg/L	93.6	70.0	130	----
		boron, total	7440-42-8	E420	0.081 mg/L	0.1 mg/L	81.1	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00381 mg/L	0.004 mg/L	95.2	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		chromium, total	7440-47-3	E420	0.0386 mg/L	0.04 mg/L	96.5	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0189 mg/L	0.02 mg/L	94.7	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	1.84 mg/L	2 mg/L	92.1	70.0	130	----
		lead, total	7439-92-1	E420	0.0182 mg/L	0.02 mg/L	91.0	70.0	130	----
		lithium, total	7439-93-2	E420	0.0914 mg/L	0.1 mg/L	91.4	70.0	130	----
		magnesium, total	7439-95-4	E420	0.937 mg/L	1 mg/L	93.7	70.0	130	----
		manganese, total	7439-96-5	E420	0.0187 mg/L	0.02 mg/L	93.7	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0194 mg/L	0.02 mg/L	96.8	70.0	130	----
		nickel, total	7440-02-0	E420	0.0381 mg/L	0.04 mg/L	95.2	70.0	130	----
		phosphorus, total	7723-14-0	E420	9.49 mg/L	10 mg/L	94.9	70.0	130	----
		potassium, total	7440-09-7	E420	3.73 mg/L	4 mg/L	93.2	70.0	130	----
		selenium, total	7782-49-2	E420	0.0383 mg/L	0.04 mg/L	95.7	70.0	130	----
		silicon, total	7440-21-3	E420	9.01 mg/L	10 mg/L	90.1	70.0	130	----
		silver, total	7440-22-4	E420	0.00397 mg/L	0.004 mg/L	99.3	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	18.1 mg/L	20 mg/L	90.7	70.0	130	----
		thallium, total	7440-28-0	E420	0.00373 mg/L	0.004 mg/L	93.2	70.0	130	----
		tin, total	7440-31-5	E420	0.0182 mg/L	0.02 mg/L	90.8	70.0	130	----
		titanium, total	7440-32-6	E420	0.0377 mg/L	0.04 mg/L	94.2	70.0	130	----
		uranium, total	7440-61-1	E420	0.00379 mg/L	0.004 mg/L	94.7	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0949 mg/L	0.1 mg/L	94.9	70.0	130	----
		zinc, total	7440-66-6	E420	0.386 mg/L	0.4 mg/L	96.5	70.0	130	----
Total Metals (QCLot: 695559)										

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: 695559) - continued										
KS2203830-003	Anonymous	mercury, total	7439-97-6	E508	0.0000933 mg/L	0.0001 mg/L	93.3	70.0	130	----
Dissolved Metals (QCLot: 684844)										
VA22C3901-007	Anonymous	aluminum, dissolved	7429-90-5	E421	0.188 mg/L	0.2 mg/L	93.9	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0184 mg/L	0.02 mg/L	91.8	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0198 mg/L	0.02 mg/L	99.0	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	0.0366 mg/L	0.04 mg/L	91.6	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00805 mg/L	0.01 mg/L	80.5	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.081 mg/L	0.1 mg/L	80.8	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00364 mg/L	0.004 mg/L	91.0	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0376 mg/L	0.04 mg/L	93.9	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0181 mg/L	0.02 mg/L	90.3	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0175 mg/L	0.02 mg/L	87.7	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.82 mg/L	2 mg/L	90.8	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0176 mg/L	0.02 mg/L	88.2	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0921 mg/L	0.1 mg/L	92.1	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0352 mg/L	0.04 mg/L	88.0	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.1 mg/L	10 mg/L	101	70.0	130	----
		potassium, dissolved	7440-09-7	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0416 mg/L	0.04 mg/L	104	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.36 mg/L	10 mg/L	93.6	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00285 mg/L	0.004 mg/L	71.3	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00350 mg/L	0.004 mg/L	87.5	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0182 mg/L	0.02 mg/L	91.1	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0363 mg/L	0.04 mg/L	90.8	70.0	130	----
		uranium, dissolved	7440-61-1	E421	ND mg/L	0.004 mg/L	ND	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0977 mg/L	0.1 mg/L	97.7	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.363 mg/L	0.4 mg/L	90.8	70.0	130	----
Dissolved Metals (QCLot: 686558)										

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: 686558) - continued										
VA22C3937-001	CC-03	mercury, dissolved	7439-97-6	E509	0.0000934 mg/L	0.0001 mg/L	93.4	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental
www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here
(lab use only)

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	ERM
Contact:	Tonia Robb
Phone:	604-689-9460
	Company address below will appear on the final report
Street:	15th Floor, 1111 West Hastings St
City/Province:	Vancouver, BC
Postal Code:	V6E 2J3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Artemis Gold Ltd, Blackwater
Contact:	Travis Desormeaux

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)
Quality Control (QC) Report with Report ☑ YES ☐ NO
☐ Compare Results to Criteria on Report - provide details below if box checked
Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	Tonia.Robb@erm.com
Email 2	tdesormeaux@artemisgoldinc.com
Email 3	ktanaka@artemisgoldinc.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	tdesormeaux@artemisgoldinc.com
Email 2	accounts@artemisgoldinc.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
4 day [P4]	☐	1 Business day [E1]	☐
3 day [P3]	☐	Same Day, Weekend or Statutory holiday [E0]	☐
2 day [P2]	☐		

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

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

Project Information

ALS Account # / Quote #:	Q56205
Job #:	VA22-BWGL100-002
PO / AFE:	
LSD:	

Oil and Gas Required Fields (client use)

AFE/Cost Center:	PO#
Major/Minor Code:	Routing Code:
Requisitioner:	
Location:	

ALS Lab Work Order # (lab use only) 3937

ALS Contact: A. Springer **Sampler:**

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	General Parameters/Anions	Ammonia/Nutrients/TOC	DOC	T-CN, WAD-CN	Total Metals	Dissolved Metals	Total Mercury	Dissolved Mercury	Thiocyanate	Number of Containers
						P	F/P	P		F		F	P	
1	CC-03	3-Oct-22		Water	R	R	R	R	R	R	R	R	R	9
2	CC-05	3-Oct-22		Water	R	R	R	R	R	R	R	R	R	9
3	661-03	3-Oct-22		Water	R	R	R	R	R	R	R	R	R	9
4	~~661-10~~	3-Oct-22		Water	R	R	R	R	R	R	R	R	R	9
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										

Environmental Division
Vancouver
Work Order Reference
VA22C3937

Telephone : +1 604 253 4188

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System?
☐ YES ☑ NO

Are samples for human drinking water use?
☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please also email reports to Envirogeneral@artemisgoldinc.com
Dissolved parameters field-filtered. Metals and mercury not preserved.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐
Ice Packs ☑ Ice Cubes ☐ Custody seal intact Yes ☐ No ☐
Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			7	7	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
<Original signed by>	Date: Oct 4, 2022	Time: 1100	Received by:	Date:	Time:	Received by: <Original signed by>	Date: 5 Oct 22	Time: 9 am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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

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

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **VA22C4122**	Page	: 1 of 6
Client	: **ERM Consultants Canada Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Tonia Robb	Account Manager	: Amber Springer
Address	: 10th Floor, 1100 Melville St. Vancouver BC Canada V6E 4A6	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: 604 689 9460	Telephone	: +1 604 253 4188
Project	: 0332945-0102-0001	Date Samples Received	: 06-Oct-2022 09:15
PO	: 10857	Date Analysis Commenced	: 06-Oct-2022
C-O-C number	: ----	Issue Date	: 14-Oct-2022 17:02
Sampler	: AVISON		
Site	: ----		
Quote number	: ERM/BW Gold SW (VA22-BWGL100-002/Q56205)		
No. of samples received	: 5		
No. of samples analysed	: 5		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Caitlin Macey	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Parnian Sane	Analyst	Metals, Burnaby, British Columbia
Qammar Almas	Lab Assistant	Metals, Burnaby, British Columbia

General Comments

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

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

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

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

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

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

<: less than.

>: greater than.

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

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

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

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	CC-30	CC-40	CC-10	CC-15	DC-20
					Client sampling date / time	04-Oct-2022	04-Oct-2022	04-Oct-2022	04-Oct-2022	04-Oct-2022
						VA22C4122-001	VA22C4122-002	VA22C4122-003	VA22C4122-004	VA22C4122-005
						Result	Result	Result	Result	Result
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	<2.0	<2.0	<2.0
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		75.3	81.9	66.4	68.6	64.6
conductivity	----	E100	2.0	µS/cm		151	163	133	135	123
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		75.3	82.3	68.3	69.7	59.5
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		74.6	80.3	66.0	63.9	57.4
pH	----	E108	0.10	pH units		8.11	8.15	8.06	8.06	8.06
solids, total dissolved [TDS]	----	E162	10	mg/L		98	116	95	99	81
solids, total suspended [TSS]	----	E160	3.0	mg/L		<3.0	3.6	3.0	<3.0	<3.0
turbidity	----	E121	0.10	NTU		1.04	1.46	0.56	1.05	0.56
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	0.0125	0.0107	<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	0.50	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50
fluoride	16984-48-8	E235.F	0.020	mg/L		0.061	0.067	0.055	0.054	0.048
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.248	0.235	0.404	0.278	0.081
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		<0.0010	0.0021	0.0051	0.0019	0.0051
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0138	0.0154	0.0132	0.0120	0.0094
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		2.72	3.20	2.98	2.87	1.88
Cyanides										
cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
cyanide, weak acid dissociable	----	E336	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
thiocyanate	302-04-5	E344	0.50	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		7.45	7.33	9.00	7.79	3.64
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		6.78	7.08	9.48	8.21	3.34
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0228	0.0211	0.0077	0.0272	0.0218
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00071	0.00087	0.00053	0.00066	0.00070

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	CC-30	CC-40	CC-10	CC-15	DC-20
					Client sampling date / time	04-Oct-2022	04-Oct-2022	04-Oct-2022	04-Oct-2022	04-Oct-2022
						VA22C4122-001	VA22C4122-002	VA22C4122-003	VA22C4122-004	VA22C4122-005
						Result	Result	Result	Result	Result
Total Metals										
barium, total	7440-39-3	E420	0.00010	mg/L		0.00810	0.00828	0.00591	0.00750	0.00961
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	<0.010
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
calcium, total	7440-70-2	E420	0.050	mg/L		21.4	22.7	18.9	18.2	16.2
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
iron, total	7439-89-6	E420	0.010	mg/L		0.251	0.258	0.025	0.145	0.234
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
magnesium, total	7439-95-4	E420	0.100	mg/L		5.15	5.74	4.57	4.48	4.11
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0324	0.0290	0.00873	0.0178	0.0174
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000973	0.00103	0.000591	0.000651	0.000847
nickel, total	7440-02-0	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, total	7440-09-7	E420	0.100	mg/L		0.912	0.985	0.772	0.768	0.665
selenium, total	7782-49-2	E420	0.000050	mg/L		0.000052	0.000056	0.000050	0.000067	<0.000050
silicon, total	7440-21-3	E420	0.10	mg/L		4.10	4.15	2.80	4.02	6.47
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, total	7440-23-5	E420	0.050	mg/L		4.42	4.78	3.35	3.47	3.93
strontium, total	7440-24-6	E420	0.00020	mg/L		0.112	0.119	0.0949	0.0995	0.108
sulfur, total	7704-34-9	E420	0.50	mg/L		0.94	1.12	1.04	1.08	0.64
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		0.00094	0.00078	0.00031	0.00112	0.00050
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000151	0.000194	0.000090	0.000114	0.000211
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00065	0.00065	0.00056	0.00064	0.00066
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	<0.0030
chromium, total	7440-47-3	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Dissolved Metals										

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	CC-30	CC-40	CC-10	CC-15	DC-20
					Client sampling date / time	04-Oct-2022	04-Oct-2022	04-Oct-2022	04-Oct-2022	04-Oct-2022
						VA22C4122-001	VA22C4122-002	VA22C4122-003	VA22C4122-004	VA22C4122-005
						Result	Result	Result	Result	Result
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0040	0.0027	0.0023	0.0022	0.0095
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		0.00012	<0.00010	<0.00010	<0.00010	<0.00010
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00069	0.00082	0.00054	0.00054	0.00062
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.00791	0.00822	0.00595	0.00620	0.00957
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	<0.000020
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	<0.010	<0.010
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	<0.0000050
calcium, dissolved	7440-70-2	E421	0.050	mg/L		21.6	22.9	19.8	20.2	17.2
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00040	0.00035	0.00037	0.00038	0.00023
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.212	0.180	0.020	0.020	0.233
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		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		5.18	6.11	4.58	4.67	4.02
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0267	0.0200	0.00625	0.00636	0.0150
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		0.00107	0.00107	0.000635	0.000605	0.000883
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	<0.050
potassium, dissolved	7440-09-7	E421	0.100	mg/L		0.948	0.993	0.789	0.815	0.691
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	0.000062	0.000055
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.38	4.40	2.93	2.96	6.60
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	<0.000010
sodium, dissolved	7440-23-5	E421	0.050	mg/L		4.50	5.02	3.29	3.33	3.89
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.114	0.130	0.0984	0.0993	0.111
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		1.21	1.39	1.06	1.15	0.63
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		0.000157	0.000192	0.000088	0.000088	0.000198

Analytical Results

Sub-Matrix: **Water** (Matrix: **Water**)					Client sample ID	CC-30	CC-40	CC-10	CC-15	DC-20
					Client sampling date / time	04-Oct-2022	04-Oct-2022	04-Oct-2022	04-Oct-2022	04-Oct-2022
Analyte	*CAS Number*	*Method*	*LOR*	*Unit*		**VA22C4122-001**	**VA22C4122-002**	**VA22C4122-003**	**VA22C4122-004**	**VA22C4122-005**
						Result	Result	Result	Result	Result
Dissolved Metals										
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		0.00060	<0.00050	<0.00050	<0.00050	0.00056
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<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.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA22C4122**	Page	: 1 of 24
Client	: **ERM Consultants Canada Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Tonia Robb	Account Manager	: Amber Springer
Address	: 10th Floor, 1100 Melville St. Vancouver BC Canada V6E 4A6	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 0332945-0102-0001	Date Samples Received	: 06-Oct-2022 09:15
PO	: 10857	Issue Date	: 14-Oct-2022 17:02
C-O-C number	: ----		
Sampler	: AVISON		
Site	: ----		
Quote number	: ERM/BW Gold SW (VA22-BWGL100-002/Q56205)		
No. of samples received	: 5		
No. of samples analysed	: 5		

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

Key

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

Workorder Comments

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

Summary of Outliers

Outliers : Quality Control Samples

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

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) CC-10	E298	04-Oct-2022	07-Oct-2022	----	----		13-Oct-2022	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) CC-15	E298	04-Oct-2022	07-Oct-2022	----	----		13-Oct-2022	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) CC-30	E298	04-Oct-2022	07-Oct-2022	----	----		13-Oct-2022	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) CC-40	E298	04-Oct-2022	07-Oct-2022	----	----		13-Oct-2022	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) DC-20	E298	04-Oct-2022	07-Oct-2022	----	----		13-Oct-2022	28 days	9 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE CC-10	E235.Br-L	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE CC-15	E235.Br-L	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE CC-30	E235.Br-L	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE CC-40	E235.Br-L	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE DC-20	E235.Br-L	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE CC-10	E235.Cl	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE CC-15	E235.Cl	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE CC-30	E235.Cl	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE CC-40	E235.Cl	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE DC-20	E235.Cl	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE CC-10	E378-U	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE CC-15	E378-U	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE CC-30	E378-U	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE CC-40	E378-U	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE DC-20	E378-U	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE CC-10	E235.F	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE CC-15	E235.F	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE CC-30	E235.F	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE CC-40	E235.F	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE DC-20	E235.F	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE CC-10	E235.NO3-L	04-Oct-2022	06-Oct-2022	3 days	3 days	✓	06-Oct-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE CC-15	E235.NO3-L	04-Oct-2022	06-Oct-2022	3 days	3 days	✓	06-Oct-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE CC-30	E235.NO3-L	04-Oct-2022	06-Oct-2022	3 days	3 days	✓	06-Oct-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE CC-40	E235.NO3-L	04-Oct-2022	06-Oct-2022	3 days	3 days	✓	06-Oct-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DC-20	E235.NO3-L	04-Oct-2022	06-Oct-2022	3 days	3 days	✓	06-Oct-2022	3 days	0 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE CC-10	E235.NO2-L	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE CC-15	E235.NO2-L	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE CC-30	E235.NO2-L	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE CC-40	E235.NO2-L	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
DC-20	E235.NO2-L	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
CC-10	E235.SO4	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
CC-15	E235.SO4	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
CC-30	E235.SO4	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
CC-40	E235.SO4	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
DC-20	E235.SO4	04-Oct-2022	06-Oct-2022	----	----		06-Oct-2022	28 days	3 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
CC-10	E318	04-Oct-2022	07-Oct-2022	----	----		09-Oct-2022	28 days	5 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
CC-15	E318	04-Oct-2022	07-Oct-2022	----	----		09-Oct-2022	28 days	5 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
CC-30	E318	04-Oct-2022	07-Oct-2022	----	----		09-Oct-2022	28 days	5 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
CC-40	E318	04-Oct-2022	07-Oct-2022	----	----		09-Oct-2022	28 days	5 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
DC-20	E318	04-Oct-2022	07-Oct-2022	----	----		09-Oct-2022	28 days	5 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid)										
CC-10	E372-U	04-Oct-2022	07-Oct-2022	----	----		09-Oct-2022	28 days	5 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid)										
CC-15	E372-U	04-Oct-2022	07-Oct-2022	----	----		09-Oct-2022	28 days	5 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid)										
CC-30	E372-U	04-Oct-2022	07-Oct-2022	----	----		09-Oct-2022	28 days	5 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid)										
CC-40	E372-U	04-Oct-2022	07-Oct-2022	----	----		09-Oct-2022	28 days	5 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid)										
DC-20	E372-U	04-Oct-2022	07-Oct-2022	----	----		09-Oct-2022	28 days	5 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid)										
CC-10	E344	04-Oct-2022	----	----	----		09-Oct-2022	14 days	6 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid)										
CC-15	E344	04-Oct-2022	----	----	----		09-Oct-2022	14 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
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid) CC-30	E344	04-Oct-2022	----	----	----		09-Oct-2022	14 days	6 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid) CC-40	E344	04-Oct-2022	----	----	----		09-Oct-2022	14 days	6 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid) DC-20	E344	04-Oct-2022	----	----	----		09-Oct-2022	14 days	6 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) CC-10	E333	04-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	10 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) CC-15	E333	04-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	10 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) CC-30	E333	04-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	10 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) CC-40	E333	04-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	10 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) DC-20	E333	04-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	10 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) CC-10	E336	04-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	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
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
CC-15	E336	04-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	10 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
CC-30	E336	04-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	10 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
CC-40	E336	04-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	10 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
DC-20	E336	04-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	14 days	10 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved)										
CC-10	E509	04-Oct-2022	10-Oct-2022	----	----		10-Oct-2022	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved)										
CC-15	E509	04-Oct-2022	10-Oct-2022	----	----		10-Oct-2022	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved)										
CC-30	E509	04-Oct-2022	10-Oct-2022	----	----		10-Oct-2022	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved)										
CC-40	E509	04-Oct-2022	10-Oct-2022	----	----		10-Oct-2022	28 days	6 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved)										
DC-20	E509	04-Oct-2022	10-Oct-2022	----	----		10-Oct-2022	28 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) CC-10	E421	04-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	180 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) CC-15	E421	04-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	180 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) CC-30	E421	04-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	180 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) CC-40	E421	04-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	180 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved) DC-20	E421	04-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	180 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) CC-10	E358-L	04-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	3 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) CC-15	E358-L	04-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	3 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) CC-30	E358-L	04-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	3 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) CC-40	E358-L	04-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) DC-20	E358-L	04-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	3 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) CC-10	E355-L	04-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	3 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) CC-15	E355-L	04-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	3 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) CC-30	E355-L	04-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	3 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) CC-40	E355-L	04-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	3 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) DC-20	E355-L	04-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	3 days	✓
Physical Tests : Acidity by Titration										
HDPE CC-10	E283	04-Oct-2022	06-Oct-2022	----	----		08-Oct-2022	14 days	4 days	✓
Physical Tests : Acidity by Titration										
HDPE CC-15	E283	04-Oct-2022	06-Oct-2022	----	----		08-Oct-2022	14 days	4 days	✓
Physical Tests : Acidity by Titration										
HDPE CC-30	E283	04-Oct-2022	06-Oct-2022	----	----		08-Oct-2022	14 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Acidity by Titration										
HDPE CC-40	E283	04-Oct-2022	06-Oct-2022	----	----		08-Oct-2022	14 days	4 days	✓
Physical Tests : Acidity by Titration										
HDPE DC-20	E283	04-Oct-2022	06-Oct-2022	----	----		08-Oct-2022	14 days	4 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE CC-10	E290	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	14 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE CC-15	E290	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	14 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE CC-30	E290	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	14 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE CC-40	E290	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	14 days	7 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DC-20	E290	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	14 days	7 days	✓
Physical Tests : Conductivity in Water										
HDPE CC-10	E100	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	28 days	7 days	✓
Physical Tests : Conductivity in Water										
HDPE CC-15	E100	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	28 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE CC-30	E100	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	28 days	7 days	✓
Physical Tests : Conductivity in Water										
HDPE CC-40	E100	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	28 days	7 days	✓
Physical Tests : Conductivity in Water										
HDPE DC-20	E100	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	28 days	7 days	✓
Physical Tests : pH by Meter										
HDPE CC-10	E108	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	0.25 hrs	86.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE CC-15	E108	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	0.25 hrs	86.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE CC-30	E108	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	0.25 hrs	86.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE CC-40	E108	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	0.25 hrs	86.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DC-20	E108	04-Oct-2022	06-Oct-2022	----	----		10-Oct-2022	0.25 hrs	86.25 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE CC-10	E162	04-Oct-2022	----	----	----		09-Oct-2022	7 days	5 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TDS by Gravimetry										
HDPE CC-15	E162	04-Oct-2022	----	----	----		09-Oct-2022	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE CC-30	E162	04-Oct-2022	----	----	----		09-Oct-2022	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE CC-40	E162	04-Oct-2022	----	----	----		09-Oct-2022	7 days	5 days	✓
Physical Tests : TDS by Gravimetry										
HDPE DC-20	E162	04-Oct-2022	----	----	----		09-Oct-2022	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE CC-10	E160	04-Oct-2022	----	----	----		09-Oct-2022	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE CC-15	E160	04-Oct-2022	----	----	----		09-Oct-2022	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE CC-30	E160	04-Oct-2022	----	----	----		09-Oct-2022	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE CC-40	E160	04-Oct-2022	----	----	----		09-Oct-2022	7 days	5 days	✓
Physical Tests : TSS by Gravimetry										
HDPE DC-20	E160	04-Oct-2022	----	----	----		09-Oct-2022	7 days	5 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Turbidity by Nephelometry										
HDPE										
CC-10	E121	04-Oct-2022	----	----	----		07-Oct-2022	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
CC-15	E121	04-Oct-2022	----	----	----		07-Oct-2022	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
CC-30	E121	04-Oct-2022	----	----	----		07-Oct-2022	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
CC-40	E121	04-Oct-2022	----	----	----		07-Oct-2022	3 days	3 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE										
DC-20	E121	04-Oct-2022	----	----	----		07-Oct-2022	3 days	3 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved)										
CC-10	E508	04-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved)										
CC-15	E508	04-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved)										
CC-30	E508	04-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	6 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved)										
CC-40	E508	04-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	6 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved)										
DC-20	E508	04-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	6 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved)										
CC-10	E420	04-Oct-2022	09-Oct-2022	----	----		10-Oct-2022	180 days	7 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved)										
CC-15	E420	04-Oct-2022	09-Oct-2022	----	----		10-Oct-2022	180 days	7 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved)										
CC-30	E420	04-Oct-2022	09-Oct-2022	----	----		10-Oct-2022	180 days	7 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved)										
CC-40	E420	04-Oct-2022	09-Oct-2022	----	----		10-Oct-2022	180 days	7 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved)										
DC-20	E420	04-Oct-2022	09-Oct-2022	----	----		10-Oct-2022	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	684876	1	15	6.6	5.0	✓
Alkalinity Species by Titration	E290	684866	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	685374	1	17	5.8	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	684870	1	18	5.5	5.0	✓
Chloride in Water by IC	E235.Cl	684869	1	18	5.5	5.0	✓
Conductivity in Water	E100	684864	1	16	6.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	688908	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	687092	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	685371	1	16	6.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	684875	1	16	6.2	5.0	✓
Fluoride in Water by IC	E235.F	684868	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	684871	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	684872	1	18	5.5	5.0	✓
pH by Meter	E108	684865	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	684867	1	18	5.5	5.0	✓
TDS by Gravimetry	E162	688167	2	24	8.3	5.0	✓
Thiocyanate by Colourimetry	E344	688614	1	20	5.0	5.0	✓
Total Cyanide	E333	695183	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	685370	1	17	5.8	5.0	✓
Total Mercury in Water by CVAAS	E508	688434	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	687090	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	685372	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	685373	1	17	5.8	5.0	✓
TSS by Gravimetry	E160	688165	2	24	8.3	5.0	✓
Turbidity by Nephelometry	E121	685394	1	20	5.0	5.0	✓
WAD Cyanide	E336	695181	1	20	5.0	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	684876	1	15	6.6	5.0	✓
Alkalinity Species by Titration	E290	684866	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	685374	1	17	5.8	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	684870	1	18	5.5	5.0	✓
Chloride in Water by IC	E235.Cl	684869	1	18	5.5	5.0	✓
Conductivity in Water	E100	684864	1	16	6.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	688908	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	687092	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	685371	1	16	6.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	684875	1	16	6.2	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	684868	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	684871	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	684872	1	18	5.5	5.0	✓
pH by Meter	E108	684865	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	684867	1	18	5.5	5.0	✓
TDS by Gravimetry	E162	688167	2	24	8.3	5.0	✓
Thiocyanate by Colourimetry	E344	688614	1	20	5.0	5.0	✓
Total Cyanide	E333	695183	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	685370	1	17	5.8	5.0	✓
Total Mercury in Water by CVAAS	E508	688434	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	687090	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	685372	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	685373	1	17	5.8	5.0	✓
TSS by Gravimetry	E160	688165	2	24	8.3	5.0	✓
Turbidity by Nephelometry	E121	685394	1	20	5.0	5.0	✓
WAD Cyanide	E336	695181	1	20	5.0	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	684876	1	15	6.6	5.0	✓
Alkalinity Species by Titration	E290	684866	1	18	5.5	5.0	✓
Ammonia by Fluorescence	E298	685374	1	17	5.8	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	684870	1	18	5.5	5.0	✓
Chloride in Water by IC	E235.Cl	684869	1	18	5.5	5.0	✓
Conductivity in Water	E100	684864	1	16	6.2	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	688908	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	687092	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	685371	1	16	6.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	684875	1	16	6.2	5.0	✓
Fluoride in Water by IC	E235.F	684868	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	684871	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	684872	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	684867	1	18	5.5	5.0	✓
TDS by Gravimetry	E162	688167	2	24	8.3	5.0	✓
Thiocyanate by Colourimetry	E344	688614	1	20	5.0	5.0	✓
Total Cyanide	E333	695183	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	685370	1	17	5.8	5.0	✓
Total Mercury in Water by CVAAS	E508	688434	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	687090	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	685372	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	685373	1	17	5.8	5.0	✓
TSS by Gravimetry	E160	688165	2	24	8.3	5.0	✓
Turbidity by Nephelometry	E121	685394	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*
Method Blanks (MB) - Continued							
WAD Cyanide	E336	695181	1	20	5.0	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	685374	1	17	5.8	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	684870	1	18	5.5	5.0	✓
Chloride in Water by IC	E235.Cl	684869	1	18	5.5	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	688908	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	687092	1	19	5.2	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	685371	1	16	6.2	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	684875	1	16	6.2	5.0	✓
Fluoride in Water by IC	E235.F	684868	1	18	5.5	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	684871	1	16	6.2	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	684872	1	18	5.5	5.0	✓
Sulfate in Water by IC	E235.SO4	684867	1	18	5.5	5.0	✓
Thiocyanate by Colourimetry	E344	688614	1	20	5.0	5.0	✓
Total Cyanide	E333	695183	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	685370	1	17	5.8	5.0	✓
Total Mercury in Water by CVAAS	E508	688434	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	687090	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	685372	1	17	5.8	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	685373	1	17	5.8	5.0	✓
WAD Cyanide	E336	695181	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 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Vancouver - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TSS by Gravimetry	E160 Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Vancouver - 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 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC	E235.Cl Vancouver - 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 Vancouver - 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 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Vancouver - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH endpoint of 8.3
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Vancouver - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Cyanide	E333 Vancouver - Environmental	Water	ISO 14403 (mod)	Total or Strong Acid Dissociable (SAD) Cyanide is determined by Continuous Flow Analyzer (CFA) with in-line UV digestion followed by colourmetric analysis. Method Limitation: High levels of thiocyanate (SCN) may cause positive interference (up to 0.5% of SCN concentration).
WAD Cyanide	E336 Vancouver - Environmental	Water	APHA 4500-CN I (mod)	Weak Acid Dissociable (WAD) cyanide is determined by Continuous Flow Analyzer (CFA) with in-line distillation followed by colourmetric analysis.
Thiocyanate by Colourimetry	E344 Vancouver - Environmental	Water	APHA 4500-CN M (mod)	Thiocyanate is determined by the ferric nitrate colourimetric method. Water samples containing high levels of hexavalent chromium, cyanide (together with sulfide), reducing agents, or hydrocarbons may cause negative or positive interferences with this method.
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 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).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
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 (0.002 mg/L)	E372-U Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U Vancouver - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically 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.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508 Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), dissolved” is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), from total Ca/Mg” is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
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 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

QUALITY CONTROL REPORT

Work Order	: **VA22C4122**	Page	: 1 of 18
Client	: ERM Consultants Canada Ltd.	Laboratory	: Vancouver - Environmental
Contact	: Tonia Robb	Account Manager	: Amber Springer
Address	: 3083-595 Burrard St Vancouver BC Canada V7X 1L3	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 0332945-0102-0001	Date Samples Received	: 06-Oct-2022 09:15
PO	: 10857	Date Analysis Commenced	: 06-Oct-2022
C-O-C number	: ----	Issue Date	: 14-Oct-2022 17:02
Sampler	: AVISON		
Site	: ----		
Quote number	: ERM/BW Gold SW (VA22-BWGL100-002/Q56205)		
No. of samples received	: 5		
No. of samples analysed	: 5		

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Caitlin Macey	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Vancouver Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Vancouver Metals, Burnaby, British Columbia
Parnian Sane	Analyst	Vancouver Metals, Burnaby, British Columbia
Qammar Almas	Lab Assistant	Vancouver Metals, Burnaby, British Columbia

General Comments

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

Key :

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

Workorder Comments

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 684864)											
FJ2202822-001	Anonymous	conductivity	----	E100	2.0	µS/cm	235	236	0.425%	10%	----
Physical Tests (QC Lot: 684865)											
FJ2202822-001	Anonymous	pH	----	E108	0.10	pH units	8.14	8.15	0.123%	4%	----
Physical Tests (QC Lot: 684866)											
FJ2202822-001	Anonymous	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	89.3	87.0	2.61%	20%	----
Physical Tests (QC Lot: 684876)											
VA22C4043-002	Anonymous	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 685394)											
VA22C4029-001	Anonymous	turbidity	----	E121	0.10	NTU	0.24	0.23	0.003	Diff <2x LOR	----
Physical Tests (QC Lot: 688165)											
FJ2202847-001	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 688166)											
VA22C4122-002	CC-40	solids, total suspended [TSS]	----	E160	3.0	mg/L	3.6	3.0	0.6	Diff <2x LOR	----
Physical Tests (QC Lot: 688167)											
FJ2202847-001	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	223	228	2.22%	20%	----
Physical Tests (QC Lot: 688168)											
VA22C4122-002	CC-40	solids, total dissolved [TDS]	----	E162	13	mg/L	116	100	15	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 684867)											
FJ2202822-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	36.4	36.5	0.294%	20%	----
Anions and Nutrients (QC Lot: 684868)											
FJ2202822-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.096	0.093	0.003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 684869)											
FJ2202822-001	Anonymous	chloride	16887-00-6	E235.Cl	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 684870)											
FJ2202822-001	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: 684871)											
FJ2202822-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L	0.0775	0.0756	2.38%	20%	----
Anions and Nutrients (QC Lot: 684872)											
FJ2202822-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 684875)											
FJ2202822-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0037	0.0037	0.00001	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: 685370)											
VA22C4071-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.129	0.128	0.002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 685373)											
VA22C4071-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0060	0.0060	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 685374)											
VA22C4071-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.0056	0.0062	0.0006	Diff <2x LOR	----
Cyanides (QC Lot: 688614)											
VA22C4071-003	Anonymous	thiocyanate	302-04-5	E344	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
Cyanides (QC Lot: 695181)											
VA22C3886-001	Anonymous	cyanide, weak acid dissociable	----	E336	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Cyanides (QC Lot: 695183)											
VA22C3886-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 685371)											
VA22C4071-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	3.21	3.26	0.05	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 685372)											
VA22C4071-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	3.53	3.60	0.07	Diff <2x LOR	----
Total Metals (QC Lot: 687090)											
VA22C4063-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.0230	0.0226	0.0004	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.00028	0.00027	0.00001	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.00610	0.00596	2.33%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<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	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	7.29	7.28	0.126%	20%	----
		chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00053	<0.00050	0.00003	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.016	0.016	0.0002	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	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.0050	mg/L	1.38	1.39	0.269%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.00274	0.00277	1.04%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.000453	0.000482	0.000029	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 687090) - continued											
VA22C4063-001	Anonymous	phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	0.357	0.354	0.003	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	1.81	1.82	0.558%	20%	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	1.60	1.60	0.298%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	0.0365	0.0369	1.05%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	0.79	0.68	0.11	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00046	<0.00030	0.00016	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.000029	0.000026	0.000002	Diff <2x LOR	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
Total Metals (QC Lot: 688434)											
FJ2202867-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 687092)											
VA22C4122-001	CC-30	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0040	0.0038	0.0002	Diff <2x LOR	----
		antimony, dissolved	7440-36-0	E421	0.00010	mg/L	0.00012	<0.00010	0.00002	Diff <2x LOR	----
		arsenic, dissolved	7440-38-2	E421	0.00010	mg/L	0.00069	0.00068	0.00001	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.00791	0.00796	0.531%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	21.6	21.4	0.970%	20%	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00040	0.00039	0.00001	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.212	0.217	2.43%	20%	----
		lead, dissolved	7439-92-1	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, dissolved	7439-93-2	E421	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, dissolved	7439-95-4	E421	0.100	mg/L	5.18	5.39	3.94%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0267	0.0273	2.19%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.00107	0.00102	4.61%	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: 687092) - continued											
VA22C4122-001	CC-30	nickel, dissolved	7440-02-0	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.100	mg/L	0.948	0.979	0.032	Diff <2x LOR	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	4.38	4.34	1.02%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	4.50	4.50	0.0593%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	0.114	0.116	1.96%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	1.21	1.18	0.03	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	0.000157	0.000160	1.94%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00060	0.00064	0.00003	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: 688908)											
VA22C4071-003	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: 684864)						
conductivity	----	E100	1	µS/cm	1.9	----
Physical Tests (QCLot: 684866)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 684876)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Physical Tests (QCLot: 685394)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 688165)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 688166)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 688167)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 688168)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 684867)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 684868)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 684869)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 684870)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 684871)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 684872)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 684875)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 685370)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 685373)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 685374)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Cyanides (QCLot: 688614)						
thiocyanate	302-04-5	E344	0.5	mg/L	<0.50	----
Cyanides (QCLot: 695181)						
cyanide, weak acid dissociable	----	E336	0.002	mg/L	<0.0020	----
Cyanides (QCLot: 695183)						
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	<0.0020	----
Organic / Inorganic Carbon (QCLot: 685371)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 685372)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 687090)						
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	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 687090) - continued						
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
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: 688434)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 687092)						
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	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
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	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 687092) - continued						
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
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: 688908)						
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: 684864)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	96.5	90.0	110	----
Physical Tests (QCLot: 684865)									
pH	----	E108	----	pH units	7 pH units	99.7	98.0	102	----
Physical Tests (QCLot: 684866)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	107	85.0	115	----
Physical Tests (QCLot: 684876)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	91.7	85.0	115	----
Physical Tests (QCLot: 685394)									
turbidity	----	E121	0.1	NTU	200 NTU	99.5	85.0	115	----
Physical Tests (QCLot: 688165)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	91.7	85.0	115	----
Physical Tests (QCLot: 688166)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	93.7	85.0	115	----
Physical Tests (QCLot: 688167)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	102	85.0	115	----
Physical Tests (QCLot: 688168)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	97.1	85.0	115	----
Anions and Nutrients (QCLot: 684867)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	107	90.0	110	----
Anions and Nutrients (QCLot: 684868)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	99.0	90.0	110	----
Anions and Nutrients (QCLot: 684869)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 684870)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	100	85.0	115	----
Anions and Nutrients (QCLot: 684871)									
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: 684872)									
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: 684875)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	102	80.0	120	----
Anions and Nutrients (QCLot: 685370)									

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: 685370) - continued									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	94.4	75.0	125	----
Anions and Nutrients (QCLot: 685373)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.05 mg/L	91.2	80.0	120	----
Anions and Nutrients (QCLot: 685374)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	100	85.0	115	----
Cyanides (QCLot: 688614)									
thiocyanate	302-04-5	E344	0.5	mg/L	10 mg/L	96.6	85.0	115	----
Cyanides (QCLot: 695181)									
cyanide, weak acid dissociable	----	E336	0.002	mg/L	0.125 mg/L	103	80.0	120	----
Cyanides (QCLot: 695183)									
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	0.25 mg/L	95.2	80.0	120	----
Organic / Inorganic Carbon (QCLot: 685371)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	101	80.0	120	----
Organic / Inorganic Carbon (QCLot: 685372)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	103	80.0	120	----
Total Metals (QCLot: 687090)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	111	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	112	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	109	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	108	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	108	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	113	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	98.9	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	106	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	105	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	109	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	106	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	107	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	101	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	109	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	109	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	108	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	110	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	110	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: 687090) - continued									
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	105	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	109	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	110	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	107	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	106	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	102	80.0	120	----
sodium, total	7440-23-5	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	111	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	89.6	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	108	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	104	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	111	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	109	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	104	80.0	120	----
Total Metals (QCLot: 688434)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	103	80.0	120	----
Dissolved Metals (QCLot: 687092)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	107	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	105	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	99.6	80.0	120	----
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	109	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	103	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	91.2	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	99.7	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	103	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	100	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	120	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	102	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	106	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	105	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	101	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	109	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: 687092) - continued									
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	100	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	114	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	104	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	103	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	98.1	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	102	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	106	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	98.4	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	104	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	100	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	100	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	102	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	101	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	103	80.0	120	----

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 684867)										
VA22C4043-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	5090 mg/L	5000 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 684868)										
VA22C4043-001	Anonymous	fluoride	16984-48-8	E235.F	49.7 mg/L	50 mg/L	99.4	75.0	125	----
Anions and Nutrients (QCLot: 684869)										
VA22C4043-001	Anonymous	chloride	16887-00-6	E235.Cl	5170 mg/L	5000 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 684870)										
VA22C4043-001	Anonymous	bromide	24959-67-9	E235.Br-L	24.6 mg/L	25 mg/L	98.3	75.0	125	----
Anions and Nutrients (QCLot: 684871)										
VA22C4043-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	130 mg/L	125 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 684872)										
VA22C4043-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	25.5 mg/L	25 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 684875)										
VA22C4043-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0381 mg/L	0.03 mg/L	127	70.0	130	----
Anions and Nutrients (QCLot: 685370)										
VA22C4071-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.56 mg/L	2.5 mg/L	102	70.0	130	----
Anions and Nutrients (QCLot: 685373)										
VA22C4071-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0491 mg/L	0.05 mg/L	98.2	70.0	130	----
Anions and Nutrients (QCLot: 685374)										
VA22C4071-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.102 mg/L	0.1 mg/L	102	75.0	125	----
Cyanides (QCLot: 688614)										
VA22C4071-009	Anonymous	thiocyanate	302-04-5	E344	9.32 mg/L	10 mg/L	93.2	75.0	125	----
Cyanides (QCLot: 695181)										
VA22C3886-002	Anonymous	cyanide, weak acid dissociable	----	E336	0.126 mg/L	0.125 mg/L	101	75.0	125	----
Cyanides (QCLot: 695183)										
VA22C3886-002	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.223 mg/L	0.25 mg/L	89.1	75.0	125	----
Organic / Inorganic Carbon (QCLot: 685371)										
VA22C4071-002	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	4.44 mg/L	5 mg/L	88.8	70.0	130	----
Organic / Inorganic Carbon (QCLot: 685372)										

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
Organic / Inorganic Carbon (QCLot: 685372) - continued										
VA22C4071-002	Anonymous	carbon, total organic [TOC]	----	E355-L	4.43 mg/L	5 mg/L	88.6	70.0	130	----
Total Metals (QCLot: 687090)										
VA22C4063-002	Anonymous	aluminum, total	7429-90-5	E420	0.200 mg/L	0.2 mg/L	100	70.0	130	----
		antimony, total	7440-36-0	E420	0.0198 mg/L	0.02 mg/L	99.3	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0189 mg/L	0.02 mg/L	94.7	70.0	130	----
		barium, total	7440-39-3	E420	0.0195 mg/L	0.02 mg/L	97.3	70.0	130	----
		beryllium, total	7440-41-7	E420	0.0388 mg/L	0.04 mg/L	97.0	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00986 mg/L	0.01 mg/L	98.6	70.0	130	----
		boron, total	7440-42-8	E420	0.090 mg/L	0.1 mg/L	89.9	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00398 mg/L	0.004 mg/L	99.4	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		chromium, total	7440-47-3	E420	0.0397 mg/L	0.04 mg/L	99.2	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0200 mg/L	0.02 mg/L	100	70.0	130	----
		copper, total	7440-50-8	E420	0.0198 mg/L	0.02 mg/L	99.3	70.0	130	----
		iron, total	7439-89-6	E420	1.96 mg/L	2 mg/L	98.0	70.0	130	----
		lead, total	7439-92-1	E420	0.0193 mg/L	0.02 mg/L	96.4	70.0	130	----
		lithium, total	7439-93-2	E420	0.0976 mg/L	0.1 mg/L	97.6	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	0.0197 mg/L	0.02 mg/L	98.7	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0200 mg/L	0.02 mg/L	99.8	70.0	130	----
		nickel, total	7440-02-0	E420	0.0399 mg/L	0.04 mg/L	99.7	70.0	130	----
		phosphorus, total	7723-14-0	E420	9.81 mg/L	10 mg/L	98.1	70.0	130	----
		potassium, total	7440-09-7	E420	4.04 mg/L	4 mg/L	101	70.0	130	----
		selenium, total	7782-49-2	E420	0.0391 mg/L	0.04 mg/L	97.8	70.0	130	----
		silicon, total	7440-21-3	E420	9.57 mg/L	10 mg/L	95.7	70.0	130	----
		silver, total	7440-22-4	E420	0.00415 mg/L	0.004 mg/L	104	70.0	130	----
		sodium, total	7440-23-5	E420	2.01 mg/L	2 mg/L	101	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	19.4 mg/L	20 mg/L	97.0	70.0	130	----
		thallium, total	7440-28-0	E420	0.00381 mg/L	0.004 mg/L	95.3	70.0	130	----
		tin, total	7440-31-5	E420	0.0195 mg/L	0.02 mg/L	97.3	70.0	130	----
		titanium, total	7440-32-6	E420	0.0380 mg/L	0.04 mg/L	95.1	70.0	130	----
		uranium, total	7440-61-1	E420	0.00385 mg/L	0.004 mg/L	96.2	70.0	130	----
		vanadium, total	7440-62-2	E420	0.102 mg/L	0.1 mg/L	102	70.0	130	----
		zinc, total	7440-66-6	E420	0.380 mg/L	0.4 mg/L	95.1	70.0	130	----
Total Metals (QCLot: 688434)										

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: 688434) - continued										
FJ2202867-002	Anonymous	mercury, total	7439-97-6	E508	0.0000976 mg/L	0.0001 mg/L	97.6	70.0	130	----
Dissolved Metals (QCLot: 687092)										
VA22C4122-002	CC-40	aluminum, dissolved	7429-90-5	E421	0.184 mg/L	0.2 mg/L	91.9	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0198 mg/L	0.02 mg/L	98.8	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0185 mg/L	0.02 mg/L	92.4	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0188 mg/L	0.02 mg/L	94.2	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0373 mg/L	0.04 mg/L	93.3	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00908 mg/L	0.01 mg/L	90.8	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.083 mg/L	0.1 mg/L	82.8	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00392 mg/L	0.004 mg/L	97.9	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0373 mg/L	0.04 mg/L	93.2	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0186 mg/L	0.02 mg/L	93.0	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0185 mg/L	0.02 mg/L	92.7	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.89 mg/L	2 mg/L	94.4	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0187 mg/L	0.02 mg/L	93.6	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0974 mg/L	0.1 mg/L	97.4	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0198 mg/L	0.02 mg/L	98.9	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0368 mg/L	0.04 mg/L	92.0	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	9.05 mg/L	10 mg/L	90.5	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.76 mg/L	4 mg/L	94.0	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0382 mg/L	0.04 mg/L	95.6	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.06 mg/L	10 mg/L	90.6	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00412 mg/L	0.004 mg/L	103	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	19.3 mg/L	20 mg/L	96.3	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00379 mg/L	0.004 mg/L	94.8	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0191 mg/L	0.02 mg/L	95.3	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0366 mg/L	0.04 mg/L	91.6	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00386 mg/L	0.004 mg/L	96.5	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0973 mg/L	0.1 mg/L	97.3	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: 688908)										

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: 688908) - continued										
VA22C4071-009	Anonymous	mercury, dissolved	7439-97-6	E509	0.000106 mg/L	0.0001 mg/L	106	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report
Company:	ERM
Contact:	Tonia Robb
Phone:	604-689-9460
	Company address below will appear on the final report
Street:	15th Floor, 1111 West Hastings St
City/Province:	Vancouver, BC
Postal Code:	V6E 2J3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Artemis Gold Ltd, Blackwater
Contact:	Travis Desormeaux

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	Tonia.Robb@erm.com
Email 2	tdesormeaux@artemisgoldinc.com
Email 3	ktanaka@artemisgoldinc.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax	tdesormeaux@artemisgoldinc.com
Email 2	accounts@artemisgoldinc.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
	4 day [P4] ☐		1 Business day [E1] ☐
	3 day [P3] ☐		Same Day, Weekend or Statutory holiday [E0] ☐
	2 day [P2] ☐		

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

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

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q56205	AFE/Cost Center:	PO#
Job #:	VA22-BWGL100-002	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	

ALS Lab Work Order # (lab use only)

ALS Contact: A. Springer Sampler: Avison

Environmental Division Vancouver

Work Order Reference

VA22C4122

Telephone : +1 604 253 4188

Analysis Request

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

ALS Sample # (lab use only)	Sample (This de	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	General Parameters/Anions	Ammonia/Nutrients/TOC	DOC	T-CN, WAD-CN	Total Metals	Dissolved Metals	Total Mercury	Dissolved Mercury	Thiocyanate					Number of Containers
					P	F/P	P		F		F	P						
1	CC-30	4-Oct-22		Water	R	R	R	R	R	R	R	R	R					9
2	CC-40	4-Oct-22		Water	R	R	R	R	R	R	R	R	R					9
3	CC-10	4-Oct-22		Water	R	R	R	R	R	R	R	R	R					9
4	CC-15	4-Oct-22		Water	R	R	R	R	R	R	R	R	R					9
5	DC-20	4-Oct-22		Water	R	R	R	R	R	R	R	R	R					9
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														

Drinking Water (DW) Samples[1] (client use)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)

Please also email reports to Envirogeneral@artemisgoldinc.com
Dissolved parameters field-filtered. Metals and mercury not preserved.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

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

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			3	3	

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)			
<Original signed by>	Date: Oct 5/2022	Time: 0800	Received by:	Date:	Time:	Received by: <Original signed by>	Date: 6 Oct 22	Time: 9 15am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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

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

CERTIFICATE OF ANALYSIS

Work Order	: **VA22C4200**	Page	: 1 of 6
Client	: **ERM Consultants Canada Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Tonia Robb	Account Manager	: Amber Springer
Address	: 10th Floor, 1100 Melville St. Vancouver BC Canada V6E 4A6	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: 604 689 9460	Telephone	: +1 604 253 4188
Project	: 0332945-0102-0001	Date Samples Received	: 07-Oct-2022 09:00
PO	: 10857	Date Analysis Commenced	: 07-Oct-2022
C-O-C number	: ----	Issue Date	: 19-Oct-2022 15:27
Sampler	: AVISON		
Site	: ----		
Quote number	: ERM/BW Gold SW (VA22-BWGL100-002/Q56205)		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Supervisor - Inorganic	Inorganics, Calgary, Alberta
Caitlin Macey	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Elke Tabora		Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Inorganics, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Qammar Almas	Lab Assistant	Metals, Burnaby, British Columbia

General Comments

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

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

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

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

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances

LOR: Limit of Reporting (detection limit).

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

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	CC-20	DC-05	Field Blank	Duplicate	----
					Client sampling date / time	05-Oct-2022	05-Oct-2022	05-Oct-2022	05-Oct-2022	----
						VA22C4200-001	VA22C4200-002	VA22C4200-003	VA22C4200-004	--------
						Result	Result	Result	Result	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	<2.0	<2.0	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		72.3	56.0	<1.0	72.7	----
conductivity	----	E100	2.0	µS/cm		141	111	<2.0	139	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		68.7	49.8	<0.60	68.4	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		67.0	49.0	<0.60	67.6	----
pH	----	E108	0.10	pH units		7.93	7.72	5.21	7.75	----
solids, total dissolved [TDS]	----	E162	10	mg/L		96	61	<10	118	----
solids, total suspended [TSS]	----	E160	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	----
turbidity	----	E121	0.10	NTU		0.84	0.28	<0.10	0.86	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		0.0059	<0.0050	<0.0050	<0.0050	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
chloride	16887-00-6	E235.Cl	0.50	mg/L		<0.50	<0.50	<0.50	<0.50	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.056	0.047	<0.020	0.059	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.310	0.085	<0.050	0.299	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		0.0024	0.0042	<0.0010	0.0023	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0109	0.0060	<0.0020	0.0097	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		3.32	2.92	<0.30	3.36	----
Cyanides										
cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	----
cyanide, weak acid dissociable	----	E336	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	----
thiocyanate	302-04-5	E344	0.50	mg/L		<0.50	<0.50	<0.50	<0.50	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		7.38	2.56	<0.50	7.84	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		8.03	2.14	<0.50	7.21	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0132	0.0158	<0.0030	0.0165	----
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	CC-20	DC-05	Field Blank	Duplicate	----
					Client sampling date / time	05-Oct-2022	05-Oct-2022	05-Oct-2022	05-Oct-2022	----
Analyte	CAS Number	Method	LOR	Unit		VA22C4200-001	VA22C4200-002	VA22C4200-003	VA22C4200-004	--------
						Result	Result	Result	Result	----
Total Metals										
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00062	0.00065	<0.00010	0.00070	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.00734	0.00843	<0.00010	0.00724	----
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
calcium, total	7440-70-2	E420	0.050	mg/L		19.7	15.0	<0.050	19.9	----
cobalt, total	7440-48-4	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
iron, total	7439-89-6	E420	0.010	mg/L		0.164	0.052	<0.010	0.176	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	----
magnesium, total	7439-95-4	E420	0.100	mg/L		4.33	2.80	<0.100	4.36	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0216	0.00393	<0.00010	0.0234	----
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000725	0.000962	0.000052	0.000746	----
nickel, total	7440-02-0	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
potassium, total	7440-09-7	E420	0.100	mg/L		0.756	0.518	<0.100	0.766	----
selenium, total	7782-49-2	E420	0.000050	mg/L		<0.000050	0.000072	<0.000050	0.000065	----
silicon, total	7440-21-3	E420	0.10	mg/L		4.09	6.29	<0.10	4.03	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, total	7440-23-5	E420	0.050	mg/L		3.33	3.33	<0.050	3.48	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.106	0.104	<0.00020	0.104	----
sulfur, total	7704-34-9	E420	0.50	mg/L		1.08	0.81	<0.50	1.08	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<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	----
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00054	<0.00030	<0.00030	<0.00090 DLM	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000108	0.000281	<0.000010	0.000110	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		0.00065	0.00064	<0.00050	0.00068	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	CC-20	DC-05	Field Blank	Duplicate	----
					Client sampling date / time	05-Oct-2022	05-Oct-2022	05-Oct-2022	05-Oct-2022	----
Analyte	CAS Number	Method	LOR	Unit		VA22C4200-001	VA22C4200-002	VA22C4200-003	VA22C4200-004	--------
						Result	Result	Result	Result	----
Total Metals										
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	<0.0030	<0.0030	<0.0030	----
chromium, total	7440-47-3	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0052	0.0141	<0.0010	0.0046	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00059	0.00065	<0.00010	0.00060	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.00749	0.00906	<0.00010	0.00748	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		19.7	15.0	<0.050	19.6	----
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		0.00048	<0.00020	<0.00020	0.00046	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.115	0.038	<0.010	0.112	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		4.73	2.99	<0.100	4.73	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0192	0.00326	<0.00010	0.0186	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000747	0.00104	<0.000050	0.000731	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		0.826	0.562	<0.100	0.829	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		0.000064	0.000059	<0.000050	0.000052	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		4.20	6.44	<0.050	4.27	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		3.80	3.90	<0.050	3.81	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.102	0.102	<0.00020	0.103	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)				Client sample ID	CC-20	DC-05	Field Blank	Duplicate	----
				Client sampling date / time	05-Oct-2022	05-Oct-2022	05-Oct-2022	05-Oct-2022	----
Analyte	CAS Number	Method	LOR	Unit	VA22C4200-001	VA22C4200-002	VA22C4200-003	VA22C4200-004	--------
					Result	Result	Result	Result	----
Dissolved Metals									
sulfur, dissolved	7704-34-9	E421	0.50	mg/L	1.11	0.83	<0.50	1.03	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L	<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	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L	<0.00030	<0.00030	<0.00030	<0.00030	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.000106	0.000268	<0.000010	0.000102	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	----
dissolved mercury filtration location	----	EP509	-	-	Field	Field	Field	Field	----
dissolved metals filtration location	----	EP421	-	-	Field	Field	Field	Field	----

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

ALS Canada Ltd.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA22C4200**	Page	: 1 of 22
Client	: **ERM Consultants Canada Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Tonia Robb	Account Manager	: Amber Springer
Address	: 10th Floor, 1100 Melville St. Vancouver BC Canada V6E 4A6	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 0332945-0102-0001	Date Samples Received	: 07-Oct-2022 09:00
PO	: 10857	Issue Date	: 19-Oct-2022 15:27
C-O-C number	: ----		
Sampler	: AVISON		
Site	: ----		
Quote number	: ERM/BW Gold SW (VA22-BWGL100-002/Q56205)		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

Key

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

Workorder Comments

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

Summary of Outliers

Outliers : Quality Control Samples

- No Method Blank value outliers occur.
- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Laboratory Control Sample (LCS) Recoveries								
Dissolved Metals	QC-688292-002	----	barium, dissolved	7440-39-3	E421	122 % MES	80.0-120%	Recovery greater than upper control limit

Result Qualifiers

Qualifier	Description
MES	*Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).*

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) CC-20	E298	05-Oct-2022	11-Oct-2022	----	----		11-Oct-2022	28 days	6 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) DC-05	E298	05-Oct-2022	11-Oct-2022	----	----		11-Oct-2022	28 days	6 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) Duplicate	E298	05-Oct-2022	11-Oct-2022	----	----		11-Oct-2022	28 days	6 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid) Field Blank	E298	05-Oct-2022	11-Oct-2022	----	----		11-Oct-2022	28 days	6 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE CC-20	E235.Br-L	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE DC-05	E235.Br-L	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE Duplicate	E235.Br-L	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
Field Blank	E235.Br-L	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
CC-20	E235.Cl	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
DC-05	E235.Cl	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
Duplicate	E235.Cl	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
Field Blank	E235.Cl	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE										
CC-20	E378-U	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	3 days	2 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE										
DC-05	E378-U	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	3 days	2 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE										
Duplicate	E378-U	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	3 days	2 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE Field Blank	E378-U	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	3 days	2 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE CC-20	E235.F	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE DC-05	E235.F	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE Duplicate	E235.F	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE Field Blank	E235.F	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE CC-20	E235.NO3-L	05-Oct-2022	07-Oct-2022	3 days	2 days	✓	07-Oct-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE DC-05	E235.NO3-L	05-Oct-2022	07-Oct-2022	3 days	2 days	✓	07-Oct-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE Duplicate	E235.NO3-L	05-Oct-2022	07-Oct-2022	3 days	2 days	✓	07-Oct-2022	3 days	0 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE Field Blank	E235.NO3-L	05-Oct-2022	07-Oct-2022	3 days	2 days	✓	07-Oct-2022	3 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 Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE CC-20	E235.NO2-L	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE DC-05	E235.NO2-L	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE Duplicate	E235.NO2-L	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	3 days	2 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE Field Blank	E235.NO2-L	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	3 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE CC-20	E235.SO4	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE DC-05	E235.SO4	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE Duplicate	E235.SO4	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE Field Blank	E235.SO4	05-Oct-2022	07-Oct-2022	----	----		07-Oct-2022	28 days	2 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) CC-20	E318	05-Oct-2022	16-Oct-2022	----	----		16-Oct-2022	28 days	11 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) DC-05	E318	05-Oct-2022	16-Oct-2022	----	----		16-Oct-2022	28 days	11 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) Duplicate	E318	05-Oct-2022	16-Oct-2022	----	----		16-Oct-2022	28 days	11 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) Field Blank	E318	05-Oct-2022	16-Oct-2022	----	----		16-Oct-2022	28 days	11 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) CC-20	E372-U	05-Oct-2022	14-Oct-2022	----	----		18-Oct-2022	28 days	13 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) DC-05	E372-U	05-Oct-2022	14-Oct-2022	----	----		18-Oct-2022	28 days	13 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) Duplicate	E372-U	05-Oct-2022	14-Oct-2022	----	----		18-Oct-2022	28 days	13 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) Field Blank	E372-U	05-Oct-2022	14-Oct-2022	----	----		18-Oct-2022	28 days	13 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid) CC-20	E344	05-Oct-2022	----	----	----		16-Oct-2022	14 days	11 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid) DC-05	E344	05-Oct-2022	----	----	----		16-Oct-2022	14 days	11 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
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid) Duplicate	E344	05-Oct-2022	----	----	----		16-Oct-2022	14 days	11 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid) Field Blank	E344	05-Oct-2022	----	----	----		16-Oct-2022	14 days	11 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) CC-20	E333	05-Oct-2022	17-Oct-2022	----	----		17-Oct-2022	14 days	12 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) DC-05	E333	05-Oct-2022	17-Oct-2022	----	----		17-Oct-2022	14 days	12 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) Duplicate	E333	05-Oct-2022	17-Oct-2022	----	----		17-Oct-2022	14 days	12 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) Field Blank	E333	05-Oct-2022	17-Oct-2022	----	----		17-Oct-2022	14 days	12 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) CC-20	E336	05-Oct-2022	17-Oct-2022	----	----		17-Oct-2022	14 days	12 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) DC-05	E336	05-Oct-2022	17-Oct-2022	----	----		17-Oct-2022	14 days	12 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) Duplicate	E336	05-Oct-2022	17-Oct-2022	----	----		17-Oct-2022	14 days	12 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
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
Field Blank	E336	05-Oct-2022	17-Oct-2022	----	----		17-Oct-2022	14 days	12 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved)										
CC-20	E509	05-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	28 days	8 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved)										
DC-05	E509	05-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	28 days	8 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved)										
Duplicate	E509	05-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	28 days	8 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved)										
Field Blank	E509	05-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	28 days	8 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
CC-20	E421	05-Oct-2022	10-Oct-2022	----	----		11-Oct-2022	180 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
DC-05	E421	05-Oct-2022	10-Oct-2022	----	----		11-Oct-2022	180 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
Duplicate	E421	05-Oct-2022	10-Oct-2022	----	----		11-Oct-2022	180 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
Field Blank	E421	05-Oct-2022	10-Oct-2022	----	----		11-Oct-2022	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
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) CC-20	E358-L	05-Oct-2022	11-Oct-2022	----	----		13-Oct-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) DC-05	E358-L	05-Oct-2022	11-Oct-2022	----	----		13-Oct-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) Duplicate	E358-L	05-Oct-2022	11-Oct-2022	----	----		13-Oct-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) Field Blank	E358-L	05-Oct-2022	11-Oct-2022	----	----		13-Oct-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) CC-20	E355-L	05-Oct-2022	11-Oct-2022	----	----		13-Oct-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) DC-05	E355-L	05-Oct-2022	11-Oct-2022	----	----		13-Oct-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) Duplicate	E355-L	05-Oct-2022	11-Oct-2022	----	----		13-Oct-2022	28 days	8 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) Field Blank	E355-L	05-Oct-2022	11-Oct-2022	----	----		13-Oct-2022	28 days	8 days	✓
Physical Tests : Acidity by Titration										
HDPE CC-20	E283	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	14 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 : Acidity by Titration										
HDPE DC-05	E283	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	14 days	3 days	✓
Physical Tests : Acidity by Titration										
HDPE Duplicate	E283	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	14 days	3 days	✓
Physical Tests : Acidity by Titration										
HDPE Field Blank	E283	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE CC-20	E290	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE DC-05	E290	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE Duplicate	E290	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	14 days	3 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE Field Blank	E290	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	14 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE CC-20	E100	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE DC-05	E100	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	28 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Conductivity in Water										
HDPE Duplicate	E100	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	28 days	3 days	✓
Physical Tests : Conductivity in Water										
HDPE Field Blank	E100	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	28 days	3 days	✓
Physical Tests : pH by Meter										
HDPE CC-20	E108	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	0.25 hrs	24.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE DC-05	E108	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	0.25 hrs	24.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE Duplicate	E108	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	0.25 hrs	24.25 hrs	× EHTR-FM
Physical Tests : pH by Meter										
HDPE Field Blank	E108	05-Oct-2022	07-Oct-2022	----	----		08-Oct-2022	0.25 hrs	24.25 hrs	× EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE CC-20	E162	05-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE DC-05	E162	05-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE Duplicate	E162	05-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TDS by Gravimetry										
HDPE Field Blank	E162	05-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE CC-20	E160	05-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE DC-05	E160	05-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE Duplicate	E160	05-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE Field Blank	E160	05-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE CC-20	E121	05-Oct-2022	----	----	----		07-Oct-2022	3 days	2 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE DC-05	E121	05-Oct-2022	----	----	----		07-Oct-2022	3 days	2 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE Duplicate	E121	05-Oct-2022	----	----	----		07-Oct-2022	3 days	2 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE Field Blank	E121	05-Oct-2022	----	----	----		07-Oct-2022	3 days	2 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) CC-20	E508	05-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) DC-05	E508	05-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) Duplicate	E508	05-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) Field Blank	E508	05-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved) CC-20	E420	05-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	180 days	4 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved) DC-05	E420	05-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	180 days	4 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved) Duplicate	E420	05-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	180 days	4 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved) Field Blank	E420	05-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	180 days	4 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	686152	1	4	25.0	5.0	✓
Alkalinity Species by Titration	E290	686151	1	10	10.0	5.0	✓
Ammonia by Fluorescence	E298	690013	1	19	5.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	686158	1	4	25.0	5.0	✓
Chloride in Water by IC	E235.Cl	686153	1	11	9.0	5.0	✓
Conductivity in Water	E100	686150	1	12	8.3	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	695029	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	688292	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	690716	1	11	9.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	686159	1	4	25.0	5.0	✓
Fluoride in Water by IC	E235.F	686157	1	4	25.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	686155	1	4	25.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	686156	1	4	25.0	5.0	✓
pH by Meter	E108	686149	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	686154	1	9	11.1	5.0	✓
TDS by Gravimetry	E162	691323	2	26	7.6	5.0	✓
Thiocyanate by Colourimetry	E344	698712	1	20	5.0	5.0	✓
Total Cyanide	E333	700060	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	696559	1	9	11.1	5.0	✓
Total Mercury in Water by CVAAS	E508	688436	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	687096	1	17	5.8	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	690717	1	11	9.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	696080	1	9	11.1	5.0	✓
TSS by Gravimetry	E160	691303	2	26	7.6	5.0	✓
Turbidity by Nephelometry	E121	686274	1	20	5.0	5.0	✓
WAD Cyanide	E336	700061	1	14	7.1	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	686152	1	4	25.0	5.0	✓
Alkalinity Species by Titration	E290	686151	1	10	10.0	5.0	✓
Ammonia by Fluorescence	E298	690013	1	19	5.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	686158	1	4	25.0	5.0	✓
Chloride in Water by IC	E235.Cl	686153	1	11	9.0	5.0	✓
Conductivity in Water	E100	686150	1	12	8.3	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	695029	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	688292	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	690716	1	11	9.0	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							
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	686159	1	4	25.0	5.0	✓
Fluoride in Water by IC	E235.F	686157	1	4	25.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	686155	1	4	25.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	686156	1	4	25.0	5.0	✓
pH by Meter	E108	686149	1	19	5.2	5.0	✓
Sulfate in Water by IC	E235.SO4	686154	1	9	11.1	5.0	✓
TDS by Gravimetry	E162	691323	2	26	7.6	5.0	✓
Thiocyanate by Colourimetry	E344	698712	1	20	5.0	5.0	✓
Total Cyanide	E333	700060	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	696559	1	9	11.1	5.0	✓
Total Mercury in Water by CVAAS	E508	688436	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	687096	1	17	5.8	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	690717	1	11	9.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	696080	1	9	11.1	5.0	✓
TSS by Gravimetry	E160	691303	2	26	7.6	5.0	✓
Turbidity by Nephelometry	E121	686274	1	20	5.0	5.0	✓
WAD Cyanide	E336	700061	1	14	7.1	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	686152	1	4	25.0	5.0	✓
Alkalinity Species by Titration	E290	686151	1	10	10.0	5.0	✓
Ammonia by Fluorescence	E298	690013	1	19	5.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	686158	1	4	25.0	5.0	✓
Chloride in Water by IC	E235.Cl	686153	1	11	9.0	5.0	✓
Conductivity in Water	E100	686150	1	12	8.3	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	695029	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	688292	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	690716	1	11	9.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	686159	1	4	25.0	5.0	✓
Fluoride in Water by IC	E235.F	686157	1	4	25.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	686155	1	4	25.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	686156	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	686154	1	9	11.1	5.0	✓
TDS by Gravimetry	E162	691323	2	26	7.6	5.0	✓
Thiocyanate by Colourimetry	E344	698712	1	20	5.0	5.0	✓
Total Cyanide	E333	700060	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	696559	1	9	11.1	5.0	✓
Total Mercury in Water by CVAAS	E508	688436	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	687096	1	17	5.8	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	690717	1	11	9.0	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*
Method Blanks (MB) - Continued							
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	696080	1	9	11.1	5.0	✓
TSS by Gravimetry	E160	691303	2	26	7.6	5.0	✓
Turbidity by Nephelometry	E121	686274	1	20	5.0	5.0	✓
WAD Cyanide	E336	700061	1	14	7.1	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	690013	1	19	5.2	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	686158	1	4	25.0	5.0	✓
Chloride in Water by IC	E235.Cl	686153	1	11	9.0	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	695029	1	20	5.0	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	688292	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	690716	1	11	9.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	686159	1	4	25.0	5.0	✓
Fluoride in Water by IC	E235.F	686157	1	4	25.0	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	686155	1	4	25.0	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	686156	1	4	25.0	5.0	✓
Sulfate in Water by IC	E235.SO4	686154	1	9	11.1	5.0	✓
Thiocyanate by Colourimetry	E344	698712	1	20	5.0	5.0	✓
Total Cyanide	E333	700060	1	18	5.5	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	696559	1	9	11.1	5.0	✓
Total Mercury in Water by CVAAS	E508	688436	1	20	5.0	5.0	✓
Total metals in Water by CRC ICPMS	E420	687096	1	17	5.8	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	690717	1	11	9.0	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	696080	1	9	11.1	5.0	✓
WAD Cyanide	E336	700061	1	14	7.1	5.0	✓

Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Vancouver - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TSS by Gravimetry	E160 Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Vancouver - 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 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC	E235.Cl Vancouver - 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 Vancouver - 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 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Vancouver - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH endpoint of 8.3
Alkalinity Species by Titration	E290 Vancouver - 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	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Calgary - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Cyanide	E333 Vancouver - Environmental	Water	ISO 14403 (mod)	Total or Strong Acid Dissociable (SAD) Cyanide is determined by Continuous Flow Analyzer (CFA) with in-line UV digestion followed by colourmetric analysis. Method Limitation: High levels of thiocyanate (SCN) may cause positive interference (up to 0.5% of SCN concentration).
WAD Cyanide	E336 Vancouver - Environmental	Water	APHA 4500-CN I (mod)	Weak Acid Dissociable (WAD) cyanide is determined by Continuous Flow Analyzer (CFA) with in-line distillation followed by colourmetric analysis.
Thiocyanate by Colourimetry	E344 Vancouver - Environmental	Water	APHA 4500-CN M (mod)	Thiocyanate is determined by the ferric nitrate colourimetric method. Water samples containing high levels of hexavalent chromium, cyanide (together with sulfide), reducing agents, or hydrocarbons may cause negative or positive interferences with this method.
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).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
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 (0.002 mg/L)	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 0.001 mg/L)	E378-U Vancouver - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically 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.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508 Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
Dissolved Hardness (Calculated)	EC100 Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), dissolved” is calculated from the sum of dissolved Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations.
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	“Hardness (as CaCO3), from total Ca/Mg” is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. “Total Hardness” refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca/Mg is normally comparable to Dissolved Hardness in non-turbid waters.

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 at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
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 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

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QUALITY CONTROL REPORT

Work Order	: **VA22C4200**	Page	: 1 of 18
Client	: ERM Consultants Canada Ltd.	Laboratory	: Vancouver - Environmental
Contact	: Tonia Robb	Account Manager	: Amber Springer
Address	: 3083-595 Burrard St Vancouver BC Canada V7X 1L3	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	:	Telephone	: +1 604 253 4188
Project	: 0332945-0102-0001	Date Samples Received	: 07-Oct-2022 09:00
PO	: 10857	Date Analysis Commenced	: 07-Oct-2022
C-O-C number	: ----	Issue Date	: 19-Oct-2022 15:27
Sampler	: AVISON ----		
Site	: ----		
Quote number	: ERM/BW Gold SW (VA22-BWGL100-002/Q56205)		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Supervisor - Inorganic	Calgary Inorganics, Calgary, Alberta
Caitlin Macey	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Elke Tabora		Calgary Inorganics, Calgary, Alberta
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Vancouver Metals, Burnaby, British Columbia
Miles Gropen	Department Manager - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Calgary Inorganics, Calgary, Alberta
Qammar Almas	Lab Assistant	Vancouver Metals, Burnaby, British Columbia

General Comments

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

Key :

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

Workorder Comments

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 686149)											
VA22C4024-001	Anonymous	pH	----	E108	0.10	pH units	7.90	7.96	0.668%	4%	----
Physical Tests (QC Lot: 686150)											
VA22C4024-001	Anonymous	conductivity	----	E100	2.0	µS/cm	480	477	0.627%	10%	----
Physical Tests (QC Lot: 686151)											
VA22C4024-001	Anonymous	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	132	131	0.910%	20%	----
Physical Tests (QC Lot: 686152)											
VA22C4200-002	DC-05	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 686274)											
FJ2202848-001	Anonymous	turbidity	----	E121	0.10	NTU	0.23	0.25	0.02	Diff <2x LOR	----
Physical Tests (QC Lot: 691303)											
VA22C4200-001	CC-20	solids, total suspended [TSS]	----	E160	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 691323)											
VA22C4200-001	CC-20	solids, total dissolved [TDS]	----	E162	13	mg/L	96	90	5	Diff <2x LOR	----
Physical Tests (QC Lot: 691916)											
VA22C4193-001	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	<3.0	<3.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 691921)											
VA22C4193-001	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	2900	2920	0.601%	20%	----
Anions and Nutrients (QC Lot: 686153)											
VA22C4200-001	CC-20	chloride	16887-00-6	E235.Cl	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 686154)											
VA22C4200-001	CC-20	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	3.32	3.32	0.0706%	20%	----
Anions and Nutrients (QC Lot: 686155)											
VA22C4200-001	CC-20	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: 686156)											
VA22C4200-001	CC-20	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: 686157)											
VA22C4200-001	CC-20	fluoride	16984-48-8	E235.F	0.020	mg/L	0.056	0.058	0.002	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 686158)											
VA22C4200-001	CC-20	bromide	24959-67-9	E235.Br-L	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 686159)											

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: 686159) - continued											
VA22C4200-001	CC-20	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L	0.0024	0.0022	0.0003	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 690013)											
VA22C4197-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.250	mg/L	10.5	10.5	0.372%	20%	----
Anions and Nutrients (QC Lot: 696080)											
CG2214216-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0037	0.0033	0.0005	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 696559)											
VA22C4197-005	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
Cyanides (QC Lot: 698712)											
VA22C4160-001	Anonymous	thiocyanate	302-04-5	E344	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
Cyanides (QC Lot: 700060)											
FJ2202881-001	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Cyanides (QC Lot: 700061)											
VA22C4200-001	CC-20	cyanide, weak acid dissociable	----	E336	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 690716)											
VA22C4200-001	CC-20	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	7.38	7.64	3.48%	20%	----
Organic / Inorganic Carbon (QC Lot: 690717)											
VA22C4200-001	CC-20	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	8.03	7.66	4.71%	20%	----
Total Metals (QC Lot: 687096)											
YL2201696-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	0.164	0.181	10.1%	20%	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	0.110	0.110	0.0485%	20%	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	0.131	0.130	1.08%	20%	----
		barium, total	7440-39-3	E420	0.00010	mg/L	0.0371	0.0369	0.594%	20%	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<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	0.131	0.134	2.39%	20%	----
		cadmium, total	7440-43-9	E420	0.0000050	mg/L	0.0000273	0.0000246	0.0000028	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	224	227	1.26%	20%	----
		chromium, total	7440-47-3	E420	0.00050	mg/L	0.00060	<0.00050	0.00010	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	0.00178	0.00176	1.25%	20%	----
		copper, total	7440-50-8	E420	0.00050	mg/L	0.00619	0.00602	2.72%	20%	----
		iron, total	7439-89-6	E420	0.010	mg/L	0.322	0.312	3.11%	20%	----
		lead, total	7439-92-1	E420	0.000050	mg/L	0.000949	0.000943	0.617%	20%	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	0.0183	0.0185	1.01%	20%	----

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	*Client sample ID*	*Analyte*	*CAS Number*	*Method*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD(%) or Difference*	*Duplicate Limits*	*Qualifier*
Total Metals (QC Lot: 687096) - continued											
YL2201696-001	Anonymous	magnesium, total	7439-95-4	E420	0.0050	mg/L	52.0	51.3	1.38%	20%	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	0.0679	0.0667	1.70%	20%	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	0.00553	0.00567	2.52%	20%	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	0.00563	0.00556	1.15%	20%	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.050	mg/L	6.82	6.69	1.93%	20%	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	0.000185	0.000166	0.000019	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	0.68	0.71	0.03	Diff <2x LOR	----
		silver, total	7440-22-4	E420	0.000010	mg/L	0.000018	0.000020	0.000003	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	84.6	83.0	1.86%	20%	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	1.87	1.90	1.44%	20%	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	217	217	0.264%	20%	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	0.00613	0.00638	4.03%	20%	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	0.00195	0.00196	0.417%	20%	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	0.00067	0.00073	0.00006	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	0.0066	0.0068	0.0002	Diff <2x LOR	----
Total Metals (QC Lot: 688436)											
VA22C4197-001	Anonymous	mercury, total	7439-97-6	E508	0.00500	mg/L	0.00753	0.00858	0.00105	Diff <2x LOR	----
Dissolved Metals (QC Lot: 688292)											
KS2203808-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0049	0.0058	0.0009	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	0.00094	0.00094	0.000002	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0973	0.0991	1.89%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.091	0.095	0.004	Diff <2x LOR	----
		cadmium, dissolved	7440-43-9	E421	0.0000100	mg/L	<0.0000100	<0.0000100	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	110	112	2.27%	20%	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00052	0.00048	0.00004	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.022	0.021	0.0004	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: 688292) - continued											
KS2203808-001	Anonymous	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	0.0202	0.0209	3.61%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	225	222	1.05%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0117	0.0116	0.380%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.0108	0.0111	1.97%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00226	0.00219	0.00006	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	0.078	0.082	0.004	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	26.6	26.7	0.343%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000187	0.000229	0.000042	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	20.0	19.7	1.52%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	57.3	56.7	1.01%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	1.23	1.24	0.188%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	109	107	1.86%	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	0.00041	0.00040	0.00001	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.0184	0.0178	3.14%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00092	0.00091	0.00001	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0039	0.0039	0.00004	Diff <2x LOR	----
Dissolved Metals (QC Lot: 695029)											
FJ2202867-013	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: 686150)						
conductivity	----	E100	1	µS/cm	1.0	----
Physical Tests (QCLot: 686151)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	1.0	----
Physical Tests (QCLot: 686152)						
acidity (as CaCO3)	----	E283	2	mg/L	<2.0	----
Physical Tests (QCLot: 686274)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 691303)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 691323)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Physical Tests (QCLot: 691916)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 691921)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 686153)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 686154)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 686155)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 686156)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 686157)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 686158)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 686159)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 690013)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 696080)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 696080) - continued						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 696559)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Cyanides (QCLot: 698712)						
thiocyanate	302-04-5	E344	0.5	mg/L	<0.50	----
Cyanides (QCLot: 700060)						
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	<0.0020	----
Cyanides (QCLot: 700061)						
cyanide, weak acid dissociable	----	E336	0.002	mg/L	<0.0020	----
Organic / Inorganic Carbon (QCLot: 690716)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 690717)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 687096)						
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	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	<0.000050	----
nickel, total	7440-02-0	E420	0.0005	mg/L	<0.00050	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 687096) - continued						
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
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: 688436)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 688292)						
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	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 688292) - 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	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
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: 695029)						
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: 686149)									
pH	----	E108	----	pH units	7 pH units	99.7	98.0	102	----
Physical Tests (QCLot: 686150)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	96.9	90.0	110	----
Physical Tests (QCLot: 686151)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	109	85.0	115	----
Physical Tests (QCLot: 686152)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	91.2	85.0	115	----
Physical Tests (QCLot: 686274)									
turbidity	----	E121	0.1	NTU	200 NTU	99.5	85.0	115	----
Physical Tests (QCLot: 691303)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	98.7	85.0	115	----
Physical Tests (QCLot: 691323)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	91.9	85.0	115	----
Physical Tests (QCLot: 691916)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	98.8	85.0	115	----
Physical Tests (QCLot: 691921)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	109	85.0	115	----
Anions and Nutrients (QCLot: 686153)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	107	90.0	110	----
Anions and Nutrients (QCLot: 686154)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	109	90.0	110	----
Anions and Nutrients (QCLot: 686155)									
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	2.5 mg/L	108	90.0	110	----
Anions and Nutrients (QCLot: 686156)									
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: 686157)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	105	90.0	110	----
Anions and Nutrients (QCLot: 686158)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	111	85.0	115	----
Anions and Nutrients (QCLot: 686159)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 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
Anions and Nutrients (QCLot: 690013)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	99.7	85.0	115	----
Anions and Nutrients (QCLot: 696080)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.03 mg/L	111	80.0	120	----
Anions and Nutrients (QCLot: 696559)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	112	75.0	125	----
Cyanides (QCLot: 698712)									
thiocyanate	302-04-5	E344	0.5	mg/L	10 mg/L	96.4	85.0	115	----
Cyanides (QCLot: 700060)									
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	0.25 mg/L	90.0	80.0	120	----
Cyanides (QCLot: 700061)									
cyanide, weak acid dissociable	----	E336	0.002	mg/L	0.125 mg/L	93.8	80.0	120	----
Organic / Inorganic Carbon (QCLot: 690716)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	85.1	80.0	120	----
Organic / Inorganic Carbon (QCLot: 690717)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	94.9	80.0	120	----
Total Metals (QCLot: 687096)									
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	105	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	104	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	100	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	106	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	89.1	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	98.0	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	105	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	101	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	99.2	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	98.6	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	120	80.0	120	----
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	101	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	106	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	100	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	100.0	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Total Metals (QCLot: 687096) - continued									
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	106	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	97.8	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	96.7	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	97.7	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	95.4	80.0	120	----
sodium, total	7440-23-5	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	103	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	103	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	104	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	98.9	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	101	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	99.9	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	98.3	80.0	120	----
Total Metals (QCLot: 688436)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	102	80.0	120	----
Dissolved Metals (QCLot: 688292)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	98.8	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	108	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	103	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	# 122	80.0	120	MES
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	106	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	106	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	97.8	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	101	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	97.5	80.0	120	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	99.0	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	97.9	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	106	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	105	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	109	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	102	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Dissolved Metals (QCLot: 688292) - continued									
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	98.1	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	106	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	99.2	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	105	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	99.8	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	116	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	101	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	96.7	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	96.6	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	108	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	115	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	107	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	101	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	98.0	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	104	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	100	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	95.2	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	98.4	80.0	120	----

Qualifiers

Qualifier	Description
MES	*Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).*

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 686153)										
VA22C4200-002	DC-05	chloride	16887-00-6	E235.Cl	111 mg/L	100 mg/L	111	75.0	125	----
Anions and Nutrients (QCLot: 686154)										
VA22C4200-002	DC-05	sulfate (as SO4)	14808-79-8	E235.SO4	112 mg/L	100 mg/L	112	75.0	125	----
Anions and Nutrients (QCLot: 686155)										
VA22C4200-002	DC-05	nitrate (as N)	14797-55-8	E235.NO3-L	2.80 mg/L	2.5 mg/L	112	75.0	125	----
Anions and Nutrients (QCLot: 686156)										
VA22C4200-002	DC-05	nitrite (as N)	14797-65-0	E235.NO2-L	0.535 mg/L	0.5 mg/L	107	75.0	125	----
Anions and Nutrients (QCLot: 686157)										
VA22C4200-002	DC-05	fluoride	16984-48-8	E235.F	1.08 mg/L	1 mg/L	108	75.0	125	----
Anions and Nutrients (QCLot: 686158)										
VA22C4200-002	DC-05	bromide	24959-67-9	E235.Br-L	0.579 mg/L	0.5 mg/L	116	75.0	125	----
Anions and Nutrients (QCLot: 686159)										
VA22C4200-002	DC-05	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0294 mg/L	0.03 mg/L	98.2	70.0	130	----
Anions and Nutrients (QCLot: 690013)										
VA22C4197-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.104 mg/L	0.1 mg/L	104	75.0	125	----
Anions and Nutrients (QCLot: 696080)										
SK2205748-001	Anonymous	phosphorus, total	7723-14-0	E372-U	ND mg/L	0.05 mg/L	ND	70.0	130	----
Anions and Nutrients (QCLot: 696559)										
VA22C4197-006	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.60 mg/L	2.5 mg/L	104	70.0	130	----
Cyanides (QCLot: 698712)										
VA22C4160-002	Anonymous	thiocyanate	302-04-5	E344	9.26 mg/L	10 mg/L	92.6	75.0	125	----
Cyanides (QCLot: 700060)										
VA22C4200-001	CC-20	cyanide, strong acid dissociable (total)	----	E333	0.220 mg/L	0.25 mg/L	87.8	75.0	125	----
Cyanides (QCLot: 700061)										
VA22C4200-002	DC-05	cyanide, weak acid dissociable	----	E336	0.116 mg/L	0.125 mg/L	92.8	75.0	125	----
Organic / Inorganic Carbon (QCLot: 690716)										
VA22C4200-001	CC-20	carbon, dissolved organic [DOC]	----	E358-L	ND mg/L	5 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
Organic / Inorganic Carbon (QCLot: 690717)										
VA22C4200-001	CC-20	carbon, total organic [TOC]	----	E355-L	ND mg/L	5 mg/L	ND	70.0	130	----
Total Metals (QCLot: 687096)										
YL2201696-002	Anonymous	aluminum, total	7429-90-5	E420	4.05 mg/L	4 mg/L	101	70.0	130	----
		antimony, total	7440-36-0	E420	ND mg/L	0.4 mg/L	ND	70.0	130	----
		arsenic, total	7440-38-2	E420	ND mg/L	0.4 mg/L	ND	70.0	130	----
		barium, total	7440-39-3	E420	0.397 mg/L	0.4 mg/L	99.3	70.0	130	----
		beryllium, total	7440-41-7	E420	0.844 mg/L	0.8 mg/L	105	70.0	130	----
		bismuth, total	7440-69-9	E420	0.201 mg/L	0.2 mg/L	100	70.0	130	----
		boron, total	7440-42-8	E420	1.70 mg/L	2 mg/L	85.0	70.0	130	----
		cadmium, total	7440-43-9	E420	0.0814 mg/L	0.08 mg/L	102	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	80 mg/L	ND	70.0	130	----
		chromium, total	7440-47-3	E420	0.820 mg/L	0.8 mg/L	102	70.0	130	----
		cobalt, total	7440-48-4	E420	0.408 mg/L	0.4 mg/L	102	70.0	130	----
		copper, total	7440-50-8	E420	0.407 mg/L	0.4 mg/L	102	70.0	130	----
		iron, total	7439-89-6	E420	40.8 mg/L	40 mg/L	102	70.0	130	----
		lead, total	7439-92-1	E420	0.416 mg/L	0.4 mg/L	104	70.0	130	----
		lithium, total	7439-93-2	E420	2.12 mg/L	2 mg/L	106	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	ND mg/L	0.4 mg/L	ND	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.428 mg/L	0.4 mg/L	107	70.0	130	----
		nickel, total	7440-02-0	E420	0.803 mg/L	0.8 mg/L	100	70.0	130	----
		phosphorus, total	7723-14-0	E420	203 mg/L	200 mg/L	102	70.0	130	----
		potassium, total	7440-09-7	E420	80.4 mg/L	80 mg/L	100	70.0	130	----
		selenium, total	7782-49-2	E420	0.806 mg/L	0.8 mg/L	101	70.0	130	----
		silicon, total	7440-21-3	E420	190 mg/L	200 mg/L	95.1	70.0	130	----
		silver, total	7440-22-4	E420	0.0876 mg/L	0.08 mg/L	109	70.0	130	----
		sodium, total	7440-23-5	E420	ND mg/L	40 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.4 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	397 mg/L	400 mg/L	99.4	70.0	130	----
		thallium, total	7440-28-0	E420	0.0798 mg/L	0.08 mg/L	99.7	70.0	130	----
		tin, total	7440-31-5	E420	0.402 mg/L	0.4 mg/L	100	70.0	130	----
		titanium, total	7440-32-6	E420	0.810 mg/L	0.8 mg/L	101	70.0	130	----
		uranium, total	7440-61-1	E420	0.0826 mg/L	0.08 mg/L	103	70.0	130	----
		vanadium, total	7440-62-2	E420	2.04 mg/L	2 mg/L	102	70.0	130	----
		zinc, total	7440-66-6	E420	8.20 mg/L	8 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: 688436)										
VA22C4197-002	Anonymous	mercury, total	7439-97-6	E508	0.000101 mg/L	0.0001 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 688292)										
KS2203809-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.186 mg/L	0.2 mg/L	93.3	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0193 mg/L	0.02 mg/L	96.7	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0193 mg/L	0.02 mg/L	96.6	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0182 mg/L	0.02 mg/L	91.0	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0392 mg/L	0.04 mg/L	98.0	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00930 mg/L	0.01 mg/L	93.0	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.092 mg/L	0.1 mg/L	91.9	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00384 mg/L	0.004 mg/L	95.9	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0366 mg/L	0.04 mg/L	91.4	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0188 mg/L	0.02 mg/L	93.9	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0183 mg/L	0.02 mg/L	91.5	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.87 mg/L	2 mg/L	93.4	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0192 mg/L	0.02 mg/L	96.1	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0952 mg/L	0.1 mg/L	95.2	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0188 mg/L	0.02 mg/L	93.9	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0197 mg/L	0.02 mg/L	98.6	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0367 mg/L	0.04 mg/L	91.9	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.0 mg/L	10 mg/L	100	70.0	130	----
		potassium, dissolved	7440-09-7	E421	3.59 mg/L	4 mg/L	89.8	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0380 mg/L	0.04 mg/L	95.0	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.04 mg/L	10 mg/L	90.4	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00406 mg/L	0.004 mg/L	101	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	18.5 mg/L	20 mg/L	92.6	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00375 mg/L	0.004 mg/L	93.7	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0187 mg/L	0.02 mg/L	93.6	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0370 mg/L	0.04 mg/L	92.6	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00375 mg/L	0.004 mg/L	93.8	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0936 mg/L	0.1 mg/L	93.6	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.370 mg/L	0.4 mg/L	92.6	70.0	130	----

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Dissolved Metals (QCLot: 695029)										
FJ2202867-014	Anonymous	mercury, dissolved	7439-97-6	E509	0.0000920 mg/L	0.0001 mg/L	92.0	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 15 -

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Report To	Contact and company name below will appear on the final report
Company:	ERM
Contact:	Tonia Robb
Phone:	604-689-9460
	Company address below will appear on the final report
Street:	15th Floor, 1111 West Hastings St
City/Province:	Vancouver, BC
Postal Code:	V6E 2J3
Invoice To	Same as Report To ☐ YES ☑ NO
	Copy of Invoice with Report ☐ YES ☑ NO
Company:	Artemis Gold Ltd, Blackwater
Contact:	Travis Desormeaux

Report Format / Distribution

Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)

Quality Control (QC) Report with Report ☑ YES ☐ NO

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: Tonia.Robb@erm.com

Email 2: tdesormeaux@artemisgoldinc.com

Email 3: ktanaka@artemisgoldinc.com

Invoice Distribution

Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax: tdesormeaux@artemisgoldinc.com

Email 2: accounts@artemisgoldinc.com

Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply

Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply

PRIORITY (Business Days)		EMERGENCY	
	4 day [P4] ☐		1 Business day [E1] ☐
	3 day [P3] ☐		Same Day, Weekend or Statutory holiday [E0] ☐
	2 day [P2] ☐		

Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm

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

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q56205	AFE/Cost Center:	PO#
Job #:	VA22-BWGL100-002	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)	4200	ALS Contact: A. Springer	Sampler: Avison

Analysis Request

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	General Parameters/Anions	Ammonia/Nutrients/TOC	DOC	T-CN, WAD-CN	Total Metals	Dissolved Metals	Total Mercury	Dissolved Mercury	Thiocyanate	Number of Containers
						P	F/P	P		F		F	P	
	CC-20	5-Oct-22		Water	R	R	R	R	R	R	R	R	R	9
	DC-05	5-Oct-22		Water	R	R	R	R	R	R	R	R	R	9
	Field Blank	5-Oct-22		Water	R	R	R	R	R	R	R	R	R	9
	Duplicate	5-Oct-22		Water	R	R	R	R	R	R	R	R	R	9
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										
				Water										

Environmental Division Vancouver
Work Order Reference
VA22C4200

Telephone : +1 604 253 4188

Drinking Water (DW) Samples[1] (client us... add on report by clicking on the drop-down list below ...ctronic COC only)

Are samples taken from a Regulated DW System? ☐ YES ☑ NO

Are samples for human drinking water use? ☐ YES ☑ NO

Please also email reports to Envirogeneral@artemisgoldinc.com
Dissolved parameters field-filtered. Metals and mercury not preserved.

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

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

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			3.9		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
Released by: <Original signed by>	Date: Oct 6, 2022	Time: 0900	Received by:	Date:	Time:	Received by: <Original signed by>	Date: Oct 7/22	Time: 9am

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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

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

CERTIFICATE OF ANALYSIS

Work Order	: **VA22C4353**	Page	: 1 of 6
Client	: **ERM Consultants Canada Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Tonia Robb	Account Manager	: Amber Springer
Address	: 10th Floor, 1100 Melville St. Vancouver BC Canada V6E 4A6	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: 604 689 9460	Telephone	: +1 604 253 4188
Project	: 0332945-0102-0001	Date Samples Received	: 08-Oct-2022 10:50
PO	: 10857	Date Analysis Commenced	: 08-Oct-2022
C-O-C number	: ----	Issue Date	: 18-Oct-2022 15:21
Sampler	: ----		
Site	: ----		
Quote number	: ERM/BW Gold SW (VA22-BWGL100-002/Q56205)		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Benjamin Oke	Lab Assistant	Metals, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Hamideh Moradi	Analyst	Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Qammar Almas	Lab Assistant	Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Inorganics, Burnaby, British Columbia

General Comments

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

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

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

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

Key : CAS Number: Chemical Abstracts Services number is a unique identifier assigned to discrete substances

LOR: Limit of Reporting (detection limit).

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

<: less than.

>: greater than.

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

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

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

Qualifiers

Qualifier	*Description*
DLM	*Detection Limit Adjusted due to sample matrix effects (e.g. chemical interference, colour, turbidity).*
RRV	*Reported result verified by repeat analysis.*

Analytical Results

Sub-Matrix: Water
(Matrix: Water)

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	661-01	661-04	705-10	Travel Blank	----
					Client sampling date / time	06-Oct-2022	06-Oct-2022	06-Oct-2022	06-Oct-2022	----
						VA22C4353-001	VA22C4353-002	VA22C4353-003	VA22C4353-004	--------
						Result	Result	Result	Result	----
Physical Tests										
acidity (as CaCO3)	----	E283	2.0	mg/L		<2.0	<2.0	<2.0	<2.0	----
alkalinity, total (as CaCO3)	----	E290	1.0	mg/L		22.5	40.9	45.1	<1.0	----
conductivity	----	E100	2.0	µS/cm		41.1	75.6	85.8	<2.0	----
hardness (as CaCO3), dissolved	----	EC100	0.60	mg/L		17.2	33.5	41.6	----	----
hardness (as CaCO3), from total Ca/Mg	----	EC100A	0.60	mg/L		16.3	31.4	37.3	<0.60	----
pH	----	E108	0.10	pH units		7.41	7.70	7.75	5.23	----
solids, total dissolved [TDS]	----	E162	10	mg/L		56	64	62	<10	----
solids, total suspended [TSS]	----	E160	3.0	mg/L		<3.0	<3.0	<3.0	<3.0	----
turbidity	----	E121	0.10	NTU		0.51	0.31	0.22	<0.10	----
Anions and Nutrients										
ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L		<0.0050	<0.0050	<0.0050	0.0059 RRV	----
bromide	24959-67-9	E235.Br-L	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
chloride	16887-00-6	E235.Cl	0.50	mg/L		<0.50	<0.50	<0.50	<0.50	----
fluoride	16984-48-8	E235.F	0.020	mg/L		0.029	0.044	0.028	<0.020	----
Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L		0.106	0.076	0.107	<0.050	----
nitrate (as N)	14797-55-8	E235.NO3-L	0.0050	mg/L		0.0281	<0.0050	0.0391	<0.0050	----
nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	----
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0010	mg/L		<0.0010	0.0101	<0.0010	<0.0010	----
phosphorus, total	7723-14-0	E372-U	0.0020	mg/L		0.0077	0.0159	0.0036	<0.0020	----
sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L		<0.30	0.89	1.35	<0.30	----
Cyanides										
cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	----
cyanide, weak acid dissociable	----	E336	0.0050	mg/L		<0.0050	<0.0050	<0.0050	<0.0050	----
thiocyanate	302-04-5	E344	0.50	mg/L		<0.50	<0.50	<0.50	<0.50	----
Organic / Inorganic Carbon										
carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L		3.89	3.62	4.67	----	----
carbon, total organic [TOC]	----	E355-L	0.50	mg/L		3.74	3.10	4.78	<0.50	----
Total Metals										
aluminum, total	7429-90-5	E420	0.0030	mg/L		0.0600	0.0300	0.0206	<0.0030	----
antimony, total	7440-36-0	E420	0.00010	mg/L		<0.00010	<0.00010	<0.00010	<0.00010	----

Analytical Results

Sub-Matrix: Water (Matrix: Water)					Client sample ID	661-01	661-04	705-10	Travel Blank	----
					Client sampling date / time	06-Oct-2022	06-Oct-2022	06-Oct-2022	06-Oct-2022	----
Analyte	CAS Number	Method	LOR	Unit		VA22C4353-001	VA22C4353-002	VA22C4353-003	VA22C4353-004	--------
						Result	Result	Result	Result	----
Total Metals										
arsenic, total	7440-38-2	E420	0.00010	mg/L		0.00065	0.00111	0.00017	<0.00010	----
barium, total	7440-39-3	E420	0.00010	mg/L		0.00356	0.00422	0.0108	<0.00010	----
beryllium, total	7440-41-7	E420	0.000020	mg/L		<0.000020	<0.000020	<0.000020	<0.000020	----
bismuth, total	7440-69-9	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
boron, total	7440-42-8	E420	0.010	mg/L		<0.010	<0.010	<0.010	<0.010	----
cadmium, total	7440-43-9	E420	0.0000050	mg/L		<0.0000050	0.0000115	<0.0000050	<0.0000050	----
calcium, total	7440-70-2	E420	0.050	mg/L		4.58	8.94	11.2	<0.050	----
cobalt, total	7440-48-4	E420	0.00010	mg/L		0.00011	<0.00010	<0.00010	<0.00010	----
copper, total	7440-50-8	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
iron, total	7439-89-6	E420	0.010	mg/L		0.197	0.061	0.027	<0.010	----
lead, total	7439-92-1	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
lithium, total	7439-93-2	E420	0.0010	mg/L		<0.0010	<0.0010	<0.0010	<0.0010	----
magnesium, total	7439-95-4	E420	0.100	mg/L		1.18	2.20	2.26	<0.100	----
manganese, total	7439-96-5	E420	0.00010	mg/L		0.0744	0.00587	0.00190	<0.00010	----
mercury, total	7439-97-6	E508	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	<0.0000050	----
molybdenum, total	7439-98-7	E420	0.000050	mg/L		0.000249	0.000652	0.000508	<0.000050	----
nickel, total	7440-02-0	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
phosphorus, total	7723-14-0	E420	0.050	mg/L		<0.050	<0.050	<0.050	<0.050	----
potassium, total	7440-09-7	E420	0.100	mg/L		0.345	0.546	0.366	<0.100	----
selenium, total	7782-49-2	E420	0.000050	mg/L		<0.000050	<0.000050	<0.000050	<0.000050	----
silicon, total	7440-21-3	E420	0.10	mg/L		4.97	7.55	4.59	<0.10	----
silver, total	7440-22-4	E420	0.000010	mg/L		<0.000010	<0.000010	<0.000010	<0.000010	----
sodium, total	7440-23-5	E420	0.050	mg/L		2.06	3.28	2.61	<0.050	----
strontium, total	7440-24-6	E420	0.00020	mg/L		0.0344	0.0582	0.0709	<0.00020	----
sulfur, total	7704-34-9	E420	0.50	mg/L		<0.50	<0.50	0.71	<0.50	----
thallium, total	7440-28-0	E420	0.000010	mg/L		<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	----
titanium, total	7440-32-6	E420	0.00030	mg/L		0.00069	<0.00060 DLM	<0.00030	<0.00030	----
uranium, total	7440-61-1	E420	0.000010	mg/L		0.000032	0.000065	0.000110	<0.000010	----
vanadium, total	7440-62-2	E420	0.00050	mg/L		<0.00050	0.00051	<0.00050	<0.00050	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	661-01	661-04	705-10	Travel Blank	----
					Client sampling date / time	06-Oct-2022	06-Oct-2022	06-Oct-2022	06-Oct-2022	----
						VA22C4353-001	VA22C4353-002	VA22C4353-003	VA22C4353-004	--------
						Result	Result	Result	Result	----
Total Metals										
zinc, total	7440-66-6	E420	0.0030	mg/L		<0.0030	0.0041	<0.0030	<0.0030	----
chromium, total	7440-47-3	E420	0.00050	mg/L		<0.00050	<0.00050	<0.00050	<0.00050	----
Dissolved Metals										
aluminum, dissolved	7429-90-5	E421	0.0010	mg/L		0.0291	0.0240	0.0193	----	----
antimony, dissolved	7440-36-0	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
arsenic, dissolved	7440-38-2	E421	0.00010	mg/L		0.00048	0.00120	0.00019	----	----
barium, dissolved	7440-39-3	E421	0.00010	mg/L		0.00316	0.00454	0.0119	----	----
beryllium, dissolved	7440-41-7	E421	0.000020	mg/L		<0.000020	<0.000020	<0.000020	----	----
bismuth, dissolved	7440-69-9	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
boron, dissolved	7440-42-8	E421	0.010	mg/L		<0.010	<0.010	<0.010	----	----
cadmium, dissolved	7440-43-9	E421	0.0000050	mg/L		0.0000091	0.0000165	<0.0000050	----	----
calcium, dissolved	7440-70-2	E421	0.050	mg/L		4.82	9.54	12.7	----	----
chromium, dissolved	7440-47-3	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
cobalt, dissolved	7440-48-4	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
copper, dissolved	7440-50-8	E421	0.00020	mg/L		<0.00020	<0.00020	0.00036	----	----
iron, dissolved	7439-89-6	E421	0.010	mg/L		0.060	0.047	0.022	----	----
lead, dissolved	7439-92-1	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
lithium, dissolved	7439-93-2	E421	0.0010	mg/L		<0.0010	<0.0010	<0.0010	----	----
magnesium, dissolved	7439-95-4	E421	0.100	mg/L		1.26	2.36	2.41	----	----
manganese, dissolved	7439-96-5	E421	0.00010	mg/L		0.0247	0.00506	0.00181	----	----
mercury, dissolved	7439-97-6	E509	0.0000050	mg/L		<0.0000050	<0.0000050	<0.0000050	----	----
molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L		0.000268	0.000710	0.000566	----	----
nickel, dissolved	7440-02-0	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
phosphorus, dissolved	7723-14-0	E421	0.050	mg/L		<0.050	<0.050	<0.050	----	----
potassium, dissolved	7440-09-7	E421	0.100	mg/L		0.396	0.624	0.413	----	----
selenium, dissolved	7782-49-2	E421	0.000050	mg/L		<0.000050	<0.000050	<0.000050	----	----
silicon, dissolved	7440-21-3	E421	0.050	mg/L		5.33	8.06	4.95	----	----
silver, dissolved	7440-22-4	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
sodium, dissolved	7440-23-5	E421	0.050	mg/L		2.32	3.67	2.88	----	----
strontium, dissolved	7440-24-6	E421	0.00020	mg/L		0.0379	0.0634	0.0785	----	----

Analytical Results

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

Analyte	CAS Number	Method	LOR	Unit	Client sample ID	661-01	661-04	705-10	Travel Blank	----
					Client sampling date / time	06-Oct-2022	06-Oct-2022	06-Oct-2022	06-Oct-2022	----
						VA22C4353-001	VA22C4353-002	VA22C4353-003	VA22C4353-004	--------
						Result	Result	Result	Result	----
Dissolved Metals										
sulfur, dissolved	7704-34-9	E421	0.50	mg/L		<0.50	<0.50	<0.50	----	----
thallium, dissolved	7440-28-0	E421	0.000010	mg/L		<0.000010	<0.000010	<0.000010	----	----
tin, dissolved	7440-31-5	E421	0.00010	mg/L		<0.00010	<0.00010	<0.00010	----	----
titanium, dissolved	7440-32-6	E421	0.00030	mg/L		<0.00030	<0.00030	<0.00030	----	----
uranium, dissolved	7440-61-1	E421	0.000010	mg/L		0.000024	0.000061	0.000114	----	----
vanadium, dissolved	7440-62-2	E421	0.00050	mg/L		<0.00050	<0.00050	<0.00050	----	----
zinc, dissolved	7440-66-6	E421	0.0010	mg/L		<0.0010	0.0043	<0.0010	----	----
dissolved mercury filtration location	----	EP509	-	-		Field	Field	Field	----	----
dissolved metals filtration location	----	EP421	-	-		Field	Field	Field	----	----

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

ALS Canada Ltd.

QUALITY CONTROL INTERPRETIVE REPORT

Work Order	: **VA22C4353**	Page	: 1 of 22
Client	: **ERM Consultants Canada Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Tonia Robb	Account Manager	: Amber Springer
Address	: 10th Floor, 1100 Melville St. Vancouver BC Canada V6E 4A6	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	: ----	Telephone	: +1 604 253 4188
Project	: 0332945-0102-0001	Date Samples Received	: 08-Oct-2022 10:50
PO	: 10857	Issue Date	: 18-Oct-2022 15:22
C-O-C number	: ----		
Sampler	: ----		
Site	: ----		
Quote number	: ERM/BW Gold SW (VA22-BWGL100-002/Q56205)		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

Key

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

Workorder Comments

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

Summary of Outliers

Outliers : Quality Control Samples

- No Duplicate outliers occur.
- No Matrix Spike outliers occur.
- Method Blank value outliers occur - please see following pages for full details.
- Laboratory Control Sample (LCS) outliers occur - please see following pages for full details.
- No Test sample Surrogate recovery outliers exist.

Outliers: Reference Material (RM) Samples

- No Reference Material (RM) Sample outliers occur.

Outliers : Analysis Holding Time Compliance (Breaches)

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

Outliers : Frequency of Quality Control Samples

- No Quality Control Sample Frequency Outliers occur.

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **Water**

Analyte Group	Laboratory sample ID	Client/Ref Sample ID	Analyte	CAS Number	Method	Result	Limits	Comment
Method Blank (MB) Values								
Anions and Nutrients	QC-MRG7-6877780 01	----	nitrite (as N)	14797-65-0	E235.NO2-L	0.0015 B mg/L	0.001 mg/L	Blank result exceeds permitted value

Result Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

Laboratory Control Sample (LCS) Recoveries								
Dissolved Metals	QC-688292-002	----	barium, dissolved	7440-39-3	E421	122 % MES	80.0-120%	Recovery greater than upper control limit

Result Qualifiers

Qualifier	Description
MES	*Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).*

Analysis Holding Time Compliance

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

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

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

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

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
Travel Blank	E298	06-Oct-2022	12-Oct-2022	----	----		16-Oct-2022	28 days	10 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
661-01	E298	06-Oct-2022	09-Oct-2022	----	----		14-Oct-2022	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
661-04	E298	06-Oct-2022	09-Oct-2022	----	----		14-Oct-2022	28 days	9 days	✓
Anions and Nutrients : Ammonia by Fluorescence										
Amber glass total (sulfuric acid)										
705-10	E298	06-Oct-2022	09-Oct-2022	----	----		14-Oct-2022	28 days	9 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
661-01	E235.Br-L	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
661-04	E235.Br-L	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
705-10	E235.Br-L	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Bromide in Water by IC (Low Level)										
HDPE										
Travel Blank	E235.Br-L	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
661-01	E235.Cl	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
661-04	E235.Cl	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
705-10	E235.Cl	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Chloride in Water by IC										
HDPE										
Travel Blank	E235.Cl	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE										
661-01	E378-U	06-Oct-2022	08-Oct-2022	----	----		08-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE										
661-04	E378-U	06-Oct-2022	08-Oct-2022	----	----		08-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE										
705-10	E378-U	06-Oct-2022	08-Oct-2022	----	----		08-Oct-2022	3 days	3 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001										
HDPE										
Travel Blank	E378-U	06-Oct-2022	08-Oct-2022	----	----		08-Oct-2022	3 days	3 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
661-01	E235.F	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
661-04	E235.F	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
705-10	E235.F	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Fluoride in Water by IC										
HDPE										
Travel Blank	E235.F	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
661-01	E235.NO3-L	06-Oct-2022	08-Oct-2022	3 days	3 days	✓	09-Oct-2022	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
661-04	E235.NO3-L	06-Oct-2022	08-Oct-2022	3 days	3 days	✓	09-Oct-2022	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
705-10	E235.NO3-L	06-Oct-2022	08-Oct-2022	3 days	3 days	✓	09-Oct-2022	3 days	1 days	✓
Anions and Nutrients : Nitrate in Water by IC (Low Level)										
HDPE										
Travel Blank	E235.NO3-L	06-Oct-2022	08-Oct-2022	3 days	3 days	✓	09-Oct-2022	3 days	1 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
661-01	E235.NO2-L	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	3 days	4 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
661-04	E235.NO2-L	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	3 days	4 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
705-10	E235.NO2-L	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	3 days	4 days	✓
Anions and Nutrients : Nitrite in Water by IC (Low Level)										
HDPE										
Travel Blank	E235.NO2-L	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	3 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
661-01	E235.SO4	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
661-04	E235.SO4	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
705-10	E235.SO4	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Sulfate in Water by IC										
HDPE										
Travel Blank	E235.SO4	06-Oct-2022	08-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid)										
661-01	E318	06-Oct-2022	09-Oct-2022	----	----		10-Oct-2022	28 days	5 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) 661-04	E318	06-Oct-2022	09-Oct-2022	----	----		10-Oct-2022	28 days	5 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) 705-10	E318	06-Oct-2022	09-Oct-2022	----	----		10-Oct-2022	28 days	5 days	✓
Anions and Nutrients : Total Kjeldahl Nitrogen by Fluorescence (Low Level)										
Amber glass total (sulfuric acid) Travel Blank	E318	06-Oct-2022	12-Oct-2022	----	----		13-Oct-2022	28 days	7 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) 661-01	E372-U	06-Oct-2022	09-Oct-2022	----	----		11-Oct-2022	28 days	6 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) 661-04	E372-U	06-Oct-2022	09-Oct-2022	----	----		11-Oct-2022	28 days	6 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) 705-10	E372-U	06-Oct-2022	09-Oct-2022	----	----		11-Oct-2022	28 days	6 days	✓
Anions and Nutrients : Total Phosphorus by Colourimetry (0.002 mg/L)										
Amber glass total (sulfuric acid) Travel Blank	E372-U	06-Oct-2022	12-Oct-2022	----	----		13-Oct-2022	28 days	7 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid) 661-01	E344	06-Oct-2022	----	----	----		16-Oct-2022	14 days	11 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid) 661-04	E344	06-Oct-2022	----	----	----		16-Oct-2022	14 days	11 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
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid) 705-10	E344	06-Oct-2022	----	----	----		16-Oct-2022	14 days	11 days	✓
Cyanides : Thiocyanate by Colourimetry										
HDPE (nitric acid) Travel Blank	E344	06-Oct-2022	----	----	----		16-Oct-2022	14 days	11 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) 661-01	E333	06-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	14 days	9 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) 661-04	E333	06-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	14 days	9 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) 705-10	E333	06-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	14 days	9 days	✓
Cyanides : Total Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) Travel Blank	E333	06-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	14 days	9 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) 661-01	E336	06-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	14 days	9 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) 661-04	E336	06-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	14 days	9 days	✓
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide) 705-10	E336	06-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	14 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
Cyanides : WAD Cyanide										
UV-inhibited HDPE - total (sodium hydroxide)										
Travel Blank	E336	06-Oct-2022	14-Oct-2022	----	----		14-Oct-2022	14 days	9 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved)										
661-01	E509	06-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved)										
661-04	E509	06-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	28 days	7 days	✓
Dissolved Metals : Dissolved Mercury in Water by CVAAS										
Glass vial - dissolved (lab preserved)										
705-10	E509	06-Oct-2022	13-Oct-2022	----	----		13-Oct-2022	28 days	7 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
661-04	E421	06-Oct-2022	10-Oct-2022	----	----		11-Oct-2022	180 days	12 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
661-01	E421	06-Oct-2022	10-Oct-2022	----	----		11-Oct-2022	180 days	6 days	✓
Dissolved Metals : Dissolved Metals in Water by CRC ICPMS										
HDPE - dissolved (lab preserved)										
705-10	E421	06-Oct-2022	10-Oct-2022	----	----		11-Oct-2022	180 days	6 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
661-01	E358-L	06-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid)										
661-04	E358-L	06-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Organic / Inorganic Carbon : Dissolved Organic Carbon by Combustion (Low Level)										
Amber glass dissolved (sulfuric acid) 705-10	E358-L	06-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) 661-01	E355-L	06-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) 661-04	E355-L	06-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) 705-10	E355-L	06-Oct-2022	09-Oct-2022	----	----		09-Oct-2022	28 days	4 days	✓
Organic / Inorganic Carbon : Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)										
Amber glass total (sulfuric acid) Travel Blank	E355-L	06-Oct-2022	12-Oct-2022	----	----		12-Oct-2022	28 days	6 days	✓
Physical Tests : Acidity by Titration										
HDPE 661-01	E283	06-Oct-2022	08-Oct-2022	----	----		10-Oct-2022	14 days	5 days	✓
Physical Tests : Acidity by Titration										
HDPE 661-04	E283	06-Oct-2022	08-Oct-2022	----	----		10-Oct-2022	14 days	5 days	✓
Physical Tests : Acidity by Titration										
HDPE 705-10	E283	06-Oct-2022	08-Oct-2022	----	----		10-Oct-2022	14 days	5 days	✓
Physical Tests : Acidity by Titration										
HDPE Travel Blank	E283	06-Oct-2022	08-Oct-2022	----	----		10-Oct-2022	14 days	5 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : Alkalinity Species by Titration										
HDPE 661-01	E290	06-Oct-2022	08-Oct-2022	----	----		11-Oct-2022	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE 661-04	E290	06-Oct-2022	08-Oct-2022	----	----		11-Oct-2022	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE 705-10	E290	06-Oct-2022	08-Oct-2022	----	----		11-Oct-2022	14 days	6 days	✓
Physical Tests : Alkalinity Species by Titration										
HDPE Travel Blank	E290	06-Oct-2022	08-Oct-2022	----	----		11-Oct-2022	14 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE 661-01	E100	06-Oct-2022	08-Oct-2022	----	----		11-Oct-2022	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE 661-04	E100	06-Oct-2022	08-Oct-2022	----	----		11-Oct-2022	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE 705-10	E100	06-Oct-2022	08-Oct-2022	----	----		11-Oct-2022	28 days	6 days	✓
Physical Tests : Conductivity in Water										
HDPE Travel Blank	E100	06-Oct-2022	08-Oct-2022	----	----		11-Oct-2022	28 days	6 days	✓
Physical Tests : pH by Meter										
HDPE 661-01	E108	06-Oct-2022	08-Oct-2022	----	----		11-Oct-2022	0.25 hrs	69.25 hrs	× EHTR-FM

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : pH by Meter										
HDPE 661-04	E108	06-Oct-2022	08-Oct-2022	----	----		11-Oct-2022	0.25 hrs	69.25 hrs	✖ EHTR-FM
Physical Tests : pH by Meter										
HDPE 705-10	E108	06-Oct-2022	08-Oct-2022	----	----		11-Oct-2022	0.25 hrs	69.25 hrs	✖ EHTR-FM
Physical Tests : pH by Meter										
HDPE Travel Blank	E108	06-Oct-2022	08-Oct-2022	----	----		11-Oct-2022	0.25 hrs	69.25 hrs	✖ EHTR-FM
Physical Tests : TDS by Gravimetry										
HDPE 661-01	E162	06-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE 661-04	E162	06-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE 705-10	E162	06-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓
Physical Tests : TDS by Gravimetry										
HDPE Travel Blank	E162	06-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE 661-01	E160	06-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE 661-04	E160	06-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Physical Tests : TSS by Gravimetry										
HDPE 705-10	E160	06-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓
Physical Tests : TSS by Gravimetry										
HDPE Travel Blank	E160	06-Oct-2022	----	----	----		12-Oct-2022	7 days	7 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE 661-01	E121	06-Oct-2022	----	----	----		09-Oct-2022	3 days	4 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE 661-04	E121	06-Oct-2022	----	----	----		09-Oct-2022	3 days	4 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE 705-10	E121	06-Oct-2022	----	----	----		09-Oct-2022	3 days	4 days	✓
Physical Tests : Turbidity by Nephelometry										
HDPE Travel Blank	E121	06-Oct-2022	----	----	----		09-Oct-2022	3 days	4 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) 661-01	E508	06-Oct-2022	12-Oct-2022	----	----		12-Oct-2022	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) 661-04	E508	06-Oct-2022	12-Oct-2022	----	----		12-Oct-2022	28 days	7 days	✓
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) Travel Blank	E508	06-Oct-2022	12-Oct-2022	----	----		12-Oct-2022	28 days	7 days	✓

Matrix: **Water**

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

Analyte Group / Container / Client Sample ID(s)	Method	Sampling Date	Extraction / Preparation				Analysis			
			Preparation Date	Holding Times Rec	Holding Times Actual	Eval	Analysis Date	Holding Times Rec	Holding Times Actual	Eval
Total Metals : Total Mercury in Water by CVAAS										
Glass vial - total (lab preserved) 705-10	E508	06-Oct-2022	15-Oct-2022	----	----		15-Oct-2022	28 days	9 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved) 661-01	E420	06-Oct-2022	10-Oct-2022	----	----		11-Oct-2022	180 days	6 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved) 661-04	E420	06-Oct-2022	10-Oct-2022	----	----		11-Oct-2022	180 days	6 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved) 705-10	E420	06-Oct-2022	10-Oct-2022	----	----		11-Oct-2022	180 days	6 days	✓
Total Metals : Total metals in Water by CRC ICPMS										
HDPE - total (lab preserved) Travel Blank	E420	06-Oct-2022	10-Oct-2022	----	----		11-Oct-2022	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	687787	1	4	25.0	5.0	✓
Alkalinity Species by Titration	E290	687777	1	9	11.1	5.0	✓
Ammonia by Fluorescence	E298	688538	2	40	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	687784	1	8	12.5	5.0	✓
Chloride in Water by IC	E235.Cl	687779	1	9	11.1	5.0	✓
Conductivity in Water	E100	687776	1	9	11.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	693740	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	688292	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	688539	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	687786	1	8	12.5	5.0	✓
Fluoride in Water by IC	E235.F	687782	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	687783	1	13	7.6	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	687780	1	13	7.6	5.0	✓
pH by Meter	E108	687775	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	687778	1	13	7.6	5.0	✓
TDS by Gravimetry	E162	693258	1	20	5.0	5.0	✓
Thiocyanate by Colourimetry	E344	698712	1	20	5.0	5.0	✓
Total Cyanide	E333	697069	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	688536	2	33	6.0	5.0	✓
Total Mercury in Water by CVAAS	E508	692692	2	39	5.1	5.0	✓
Total metals in Water by CRC ICPMS	E420	688178	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	688540	2	34	5.8	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	688537	2	40	5.0	5.0	✓
TSS by Gravimetry	E160	693255	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	688497	1	13	7.6	5.0	✓
WAD Cyanide	E336	697070	1	13	7.6	5.0	✓
Laboratory Control Samples (LCS)							
Acidity by Titration	E283	687787	1	4	25.0	5.0	✓
Alkalinity Species by Titration	E290	687777	1	9	11.1	5.0	✓
Ammonia by Fluorescence	E298	688538	2	40	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	687784	1	8	12.5	5.0	✓
Chloride in Water by IC	E235.Cl	687779	1	9	11.1	5.0	✓
Conductivity in Water	E100	687776	1	9	11.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	693740	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	688292	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	688539	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							
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	687786	1	8	12.5	5.0	✓
Fluoride in Water by IC	E235.F	687782	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	687783	1	13	7.6	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	687780	1	13	7.6	5.0	✓
pH by Meter	E108	687775	1	10	10.0	5.0	✓
Sulfate in Water by IC	E235.SO4	687778	1	13	7.6	5.0	✓
TDS by Gravimetry	E162	693258	1	20	5.0	5.0	✓
Thiocyanate by Colourimetry	E344	698712	1	20	5.0	5.0	✓
Total Cyanide	E333	697069	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	688536	2	33	6.0	5.0	✓
Total Mercury in Water by CVAAS	E508	692692	2	39	5.1	5.0	✓
Total metals in Water by CRC ICPMS	E420	688178	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	688540	2	34	5.8	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	688537	2	40	5.0	5.0	✓
TSS by Gravimetry	E160	693255	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	688497	1	13	7.6	5.0	✓
WAD Cyanide	E336	697070	1	13	7.6	5.0	✓
Method Blanks (MB)							
Acidity by Titration	E283	687787	1	4	25.0	5.0	✓
Alkalinity Species by Titration	E290	687777	1	9	11.1	5.0	✓
Ammonia by Fluorescence	E298	688538	2	40	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	687784	1	8	12.5	5.0	✓
Chloride in Water by IC	E235.Cl	687779	1	9	11.1	5.0	✓
Conductivity in Water	E100	687776	1	9	11.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	693740	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	688292	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	688539	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	687786	1	8	12.5	5.0	✓
Fluoride in Water by IC	E235.F	687782	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	687783	1	13	7.6	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	687780	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	687778	1	13	7.6	5.0	✓
TDS by Gravimetry	E162	693258	1	20	5.0	5.0	✓
Thiocyanate by Colourimetry	E344	698712	1	20	5.0	5.0	✓
Total Cyanide	E333	697069	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	688536	2	33	6.0	5.0	✓
Total Mercury in Water by CVAAS	E508	692692	2	39	5.1	5.0	✓
Total metals in Water by CRC ICPMS	E420	688178	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	688540	2	34	5.8	5.0	✓

Matrix: **Water**

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

Quality Control Sample Type			Count		Frequency (%)		
Analytical Methods	*Method*	*QC Lot #*	*QC*	*Regular*	*Actual*	*Expected*	*Evaluation*
Method Blanks (MB) - Continued							
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	688537	2	40	5.0	5.0	✓
TSS by Gravimetry	E160	693255	1	20	5.0	5.0	✓
Turbidity by Nephelometry	E121	688497	1	13	7.6	5.0	✓
WAD Cyanide	E336	697070	1	13	7.6	5.0	✓
Matrix Spikes (MS)							
Ammonia by Fluorescence	E298	688538	2	40	5.0	5.0	✓
Bromide in Water by IC (Low Level)	E235.Br-L	687784	1	8	12.5	5.0	✓
Chloride in Water by IC	E235.Cl	687779	1	9	11.1	5.0	✓
Dissolved Mercury in Water by CVAAS	E509	693740	1	17	5.8	5.0	✓
Dissolved Metals in Water by CRC ICPMS	E421	688292	1	20	5.0	5.0	✓
Dissolved Organic Carbon by Combustion (Low Level)	E358-L	688539	1	20	5.0	5.0	✓
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U	687786	1	8	12.5	5.0	✓
Fluoride in Water by IC	E235.F	687782	1	9	11.1	5.0	✓
Nitrate in Water by IC (Low Level)	E235.NO3-L	687783	1	13	7.6	5.0	✓
Nitrite in Water by IC (Low Level)	E235.NO2-L	687780	1	13	7.6	5.0	✓
Sulfate in Water by IC	E235.SO4	687778	1	13	7.6	5.0	✓
Thiocyanate by Colourimetry	E344	698712	1	20	5.0	5.0	✓
Total Cyanide	E333	697069	1	20	5.0	5.0	✓
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318	688536	2	33	6.0	5.0	✓
Total Mercury in Water by CVAAS	E508	692692	2	39	5.1	5.0	✓
Total metals in Water by CRC ICPMS	E420	688178	1	20	5.0	5.0	✓
Total Organic Carbon (Non-Purgeable) by Combustion (Low Level)	E355-L	688540	2	34	5.8	5.0	✓
Total Phosphorus by Colourimetry (0.002 mg/L)	E372-U	688537	2	40	5.0	5.0	✓
WAD Cyanide	E336	697070	1	13	7.6	5.0	✓

Methodology References and Summaries

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

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Conductivity in Water	E100 Vancouver - Environmental	Water	APHA 2510 (mod)	Conductivity, also known as Electrical Conductivity (EC) or Specific Conductance, is measured by immersion of a conductivity cell with platinum electrodes into a water sample. Conductivity measurements are temperature-compensated to 25°C.
pH by Meter	E108 Vancouver - Environmental	Water	APHA 4500-H (mod)	pH is determined by potentiometric measurement with a pH electrode, and is conducted at ambient laboratory temperature (normally 20 ± 5°C). For high accuracy test results, pH should be measured in the field within the recommended 15 minute hold time.
Turbidity by Nephelometry	E121 Vancouver - Environmental	Water	APHA 2130 B (mod)	Turbidity is measured by the nephelometric method, by measuring the intensity of light scatter under defined conditions.
TSS by Gravimetry	E160 Vancouver - Environmental	Water	APHA 2540 D (mod)	Total Suspended Solids (TSS) are determined by filtering a sample through a glass fibre filter, following by drying of the filter at 104 ± 1°C, with gravimetric measurement of the filtered solids. Samples containing very high dissolved solid content (i.e. seawaters, brackish waters) may produce a positive bias by this method. Alternate analysis methods are available for these types of samples.
TDS by Gravimetry	E162 Vancouver - 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 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Chloride in Water by IC	E235.Cl Vancouver - 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 Vancouver - 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 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Nitrate in Water by IC (Low Level)	E235.NO3-L Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Sulfate in Water by IC	E235.SO4 Vancouver - Environmental	Water	EPA 300.1 (mod)	Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.
Acidity by Titration	E283 Vancouver - Environmental	Water	APHA 2310 B (mod)	Acidity is determined by potentiometric titration to pH endpoint of 8.3
Alkalinity Species by Titration	E290 Vancouver - Environmental	Water	APHA 2320 B (mod)	Total alkalinity is determined by potentiometric titration to a pH 4.5 endpoint. Bicarbonate, carbonate and hydroxide alkalinity are calculated from phenolphthalein alkalinity and total alkalinity values.
Ammonia by Fluorescence	E298 Vancouver - Environmental	Water	Method Fialab 100, 2018	Ammonia in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021)
Total Kjeldahl Nitrogen by Fluorescence (Low Level)	E318 Vancouver - Environmental	Water	Method Fialab 100, 2018	TKN in water is determined by automated continuous flow analysis with membrane diffusion and fluorescence detection, after reaction with OPA (ortho-phthalaldehyde). This method is approved under US EPA 40 CFR Part 136 (May 2021).
Total Cyanide	E333 Vancouver - Environmental	Water	ISO 14403 (mod)	Total or Strong Acid Dissociable (SAD) Cyanide is determined by Continuous Flow Analyzer (CFA) with in-line UV digestion followed by colourmetric analysis. Method Limitation: High levels of thiocyanate (SCN) may cause positive interference (up to 0.5% of SCN concentration).
WAD Cyanide	E336 Vancouver - Environmental	Water	APHA 4500-CN I (mod)	Weak Acid Dissociable (WAD) cyanide is determined by Continuous Flow Analyzer (CFA) with in-line distillation followed by colourmetric analysis.
Thiocyanate by Colourimetry	E344 Vancouver - Environmental	Water	APHA 4500-CN M (mod)	Thiocyanate is determined by the ferric nitrate colourimetric method. Water samples containing high levels of hexavalent chromium, cyanide (together with sulfide), reducing agents, or hydrocarbons may cause negative or positive interferences with this method.
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 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).

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
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 (0.002 mg/L)	E372-U Vancouver - Environmental	Water	APHA 4500-P E (mod).	Total Phosphorus is determined colourimetrically using a discrete analyzer after heated persulfate digestion of the sample.
Dissolved Orthophosphate by Colourimetry (Ultra Trace Level 0.001 mg/L)	E378-U Vancouver - Environmental	Water	APHA 4500-P F (mod)	Dissolved Orthophosphate is determined colourimetrically 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.
Dissolved Metals in Water by CRC ICPMS	E421 Vancouver - Environmental	Water	APHA 3030B/EPA 6020B (mod)	Water samples are filtered (0.45 um), preserved with nitric acid, and analyzed by Collision/Reaction Cell ICPMS. Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.
Total Mercury in Water by CVAAS	E508 Vancouver - Environmental	Water	EPA 1631E (mod)	Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS
Dissolved Mercury in Water by CVAAS	E509 Vancouver - Environmental	Water	APHA 3030B/EPA 1631E (mod)	Water samples are filtered (0.45 um), preserved with HCl, then undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.
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.

Analytical Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Hardness (Calculated) from Total Ca/Mg	EC100A Vancouver - Environmental	Water	APHA 2340B	"Hardness (as CaCO3), from total Ca/Mg" is calculated from the sum of total Calcium and Magnesium concentrations, expressed in CaCO3 equivalents. "Total Hardness" refers to the sum of Calcium and Magnesium Hardness. Hardness is normally or preferentially calculated from dissolved Calcium and Magnesium concentrations, because it is a property of water due to dissolved divalent cations. Hardness from total Ca /Mg is normally comparable to Dissolved Hardness in non-turbid waters.

Preparation Methods	Method / Lab	Matrix	Method Reference	Method Descriptions
Preparation for Ammonia	EP298 Vancouver - Environmental	Water		Sample preparation for Preserved Nutrients Water Quality Analysis.
Digestion for TKN in water	EP318 Vancouver - Environmental	Water	APHA 4500-Norg D (mod)	Samples are digested at high temperature using Sulfuric Acid with Copper catalyst, which converts organic nitrogen sources to Ammonia, which is then quantified by the analytical method as TKN. This method is unsuitable for samples containing high levels of nitrate. If nitrate exceeds TKN concentration by ten times or more, results may be biased low.
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 Vancouver - Environmental	Water	APHA 4500-P E (mod).	Samples are heated with a persulfate digestion reagent.
Dissolved Metals Water Filtration	EP421 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HNO3.
Dissolved Mercury Water Filtration	EP509 Vancouver - Environmental	Water	APHA 3030B	Water samples are filtered (0.45 um), and preserved with HCl.

ALS Canada Ltd.

QUALITY CONTROL REPORT

Work Order	: **VA22C4353**	Page	: 1 of 18
Client	: ERM Consultants Canada Ltd.	Laboratory	: Vancouver - Environmental
Contact	: Tonia Robb	Account Manager	: Amber Springer
Address	: 3083-595 Burrard St Vancouver BC Canada V7X 1L3	Address	: 8081 Lougheed Highway Burnaby, British Columbia Canada V5A 1W9
Telephone	:	Telephone	: +1 604 253 4188
Project	: 0332945-0102-0001	Date Samples Received	: 08-Oct-2022 10:50
PO	: 10857	Date Analysis Commenced	: 08-Oct-2022
C-O-C number	: ----	Issue Date	: 18-Oct-2022 15:21
Sampler	: ---- ----		
Site	: ----		
Quote number	: ERM/BW Gold SW (VA22-BWGL100-002/Q56205)		
No. of samples received	: 4		
No. of samples analysed	: 4		

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

This Quality Control Report contains the following information:

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Benjamin Oke	Lab Assistant	Vancouver Metals, Burnaby, British Columbia
Caitlin Macey	Team Leader - Inorganics	Vancouver Inorganics, Burnaby, British Columbia
Hamideh Moradi	Analyst	Vancouver Metals, Burnaby, British Columbia
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Vancouver Metals, Burnaby, British Columbia
Qammar Almas	Lab Assistant	Vancouver Metals, Burnaby, British Columbia
Tracy Harley	Supervisor - Water Quality Instrumentation	Vancouver Inorganics, Burnaby, British Columbia

General Comments

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

Key :

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

Workorder Comments

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

Laboratory Duplicate (DUP) Report

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

Sub-Matrix: **Water**

					Laboratory Duplicate (DUP) Report						
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	LOR	Unit	Original Result	Duplicate Result	RPD(%) or Difference	Duplicate Limits	Qualifier
Physical Tests (QC Lot: 687775)											
VA22C4320-001	Anonymous	pH	----	E108	0.10	pH units	6.88	6.88	0.0727%	4%	----
Physical Tests (QC Lot: 687776)											
VA22C4320-001	Anonymous	conductivity	----	E100	2.0	µS/cm	23.5	23.4	0.1	Diff <2x LOR	----
Physical Tests (QC Lot: 687777)											
VA22C4320-001	Anonymous	alkalinity, total (as CaCO3)	----	E290	1.0	mg/L	7.5	7.1	0.4	Diff <2x LOR	----
Physical Tests (QC Lot: 687787)											
VA22C4353-001	661-01	acidity (as CaCO3)	----	E283	2.0	mg/L	<2.0	<2.0	0	Diff <2x LOR	----
Physical Tests (QC Lot: 688497)											
VA22C4321-007	Anonymous	turbidity	----	E121	0.10	NTU	4.10	3.81	7.33%	15%	----
Physical Tests (QC Lot: 693255)											
VA22C4197-005	Anonymous	solids, total suspended [TSS]	----	E160	3.0	mg/L	10.9	12.1	1.2	Diff <2x LOR	----
Physical Tests (QC Lot: 693258)											
VA22C4197-005	Anonymous	solids, total dissolved [TDS]	----	E162	20	mg/L	156	149	8	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 687778)											
VA22C4225-001	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	0.30	mg/L	6.48	6.54	0.816%	20%	----
Anions and Nutrients (QC Lot: 687779)											
VA22C4225-001	Anonymous	chloride	16887-00-6	E235.Cl	0.50	mg/L	0.85	0.83	0.02	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 687780)											
VA22C4225-001	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 687782)											
VA22C4225-001	Anonymous	fluoride	16984-48-8	E235.F	0.020	mg/L	0.043	0.043	0.00010	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 687783)											
VA22C4270-001	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	0.0250	mg/L	<0.0250	<0.0250	0	Diff <2x LOR	----
Anions and Nutrients (QC Lot: 687784)											
VA22C4270-001	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: 687786)											
VA22C4271-001	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: 688536)											
KS2203826-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	0.050	mg/L	0.867	0.824	5.14%	20%	----
Anions and Nutrients (QC Lot: 688537)											

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: 688537) - continued											
KS2203826-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0020	mg/L	0.0958	0.0944	1.37%	20%	----
Anions and Nutrients (QC Lot: 688538)											
KS2203826-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0050	mg/L	0.588	0.574	2.45%	20%	----
Anions and Nutrients (QC Lot: 691395)											
VA22C4269-001	Anonymous	phosphorus, total	7723-14-0	E372-U	0.200	mg/L	3.93	4.06	3.40%	20%	----
Anions and Nutrients (QC Lot: 691397)											
VA22C4269-001	Anonymous	ammonia, total (as N)	7664-41-7	E298	2.50	mg/L	354	352	0.467%	20%	----
Anions and Nutrients (QC Lot: 691398)											
VA22C4269-001	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	5.00	mg/L	365	351	3.95%	20%	----
Cyanides (QC Lot: 697069)											
VA22C4282-002	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Cyanides (QC Lot: 697070)											
VA22C4282-002	Anonymous	cyanide, weak acid dissociable	----	E336	0.0050	mg/L	<0.0050	<0.0050	0	Diff <2x LOR	----
Cyanides (QC Lot: 698712)											
VA22C4160-001	Anonymous	thiocyanate	302-04-5	E344	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 688539)											
KS2203826-001	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	0.50	mg/L	1.80	1.86	0.06	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 688540)											
KS2203826-001	Anonymous	carbon, total organic [TOC]	----	E355-L	0.50	mg/L	1.71	1.84	0.13	Diff <2x LOR	----
Organic / Inorganic Carbon (QC Lot: 691400)											
VA22C4269-001	Anonymous	carbon, total organic [TOC]	----	E355-L	1.50	mg/L	186	199	6.93%	20%	----
Total Metals (QC Lot: 688178)											
VA22C4066-001	Anonymous	aluminum, total	7429-90-5	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
		antimony, total	7440-36-0	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		arsenic, total	7440-38-2	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		barium, total	7440-39-3	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		beryllium, total	7440-41-7	E420	0.000020	mg/L	<0.000020	<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	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
		calcium, total	7440-70-2	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		chromium, total	7440-47-3	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, total	7440-48-4	E420	0.00010	mg/L	<0.00010	<0.00010	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: 688178) - continued											
VA22C4066-001	Anonymous	copper, total	7440-50-8	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		iron, total	7439-89-6	E420	0.010	mg/L	<0.010	<0.010	0	Diff <2x LOR	----
		lead, total	7439-92-1	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		lithium, total	7439-93-2	E420	0.0010	mg/L	<0.0010	<0.0010	0	Diff <2x LOR	----
		magnesium, total	7439-95-4	E420	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
		manganese, total	7439-96-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		molybdenum, total	7439-98-7	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		nickel, total	7440-02-0	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		phosphorus, total	7723-14-0	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		potassium, total	7440-09-7	E420	0.100	mg/L	<0.100	<0.100	0	Diff <2x LOR	----
		selenium, total	7782-49-2	E420	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		silicon, total	7440-21-3	E420	0.10	mg/L	<0.10	<0.10	0	Diff <2x LOR	----
		silver, total	7440-22-4	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, total	7440-23-5	E420	0.050	mg/L	<0.050	<0.050	0	Diff <2x LOR	----
		strontium, total	7440-24-6	E420	0.00020	mg/L	<0.00020	<0.00020	0	Diff <2x LOR	----
		sulfur, total	7704-34-9	E420	0.50	mg/L	<0.50	<0.50	0	Diff <2x LOR	----
		thallium, total	7440-28-0	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		tin, total	7440-31-5	E420	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		titanium, total	7440-32-6	E420	0.00030	mg/L	<0.00030	<0.00030	0	Diff <2x LOR	----
		uranium, total	7440-61-1	E420	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		vanadium, total	7440-62-2	E420	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		zinc, total	7440-66-6	E420	0.0030	mg/L	<0.0030	<0.0030	0	Diff <2x LOR	----
Total Metals (QC Lot: 692692)											
FJ2202867-014	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	0.000113	0.000102	9.67%	20%	----
Total Metals (QC Lot: 697520)											
VA22C4152-001	Anonymous	mercury, total	7439-97-6	E508	0.0000050	mg/L	<0.0000050	<0.0000050	0	Diff <2x LOR	----
Dissolved Metals (QC Lot: 688292)											
KS2203808-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.0010	mg/L	0.0049	0.0058	0.0009	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	0.00094	0.00094	0.000002	Diff <2x LOR	----
		barium, dissolved	7440-39-3	E421	0.00010	mg/L	0.0973	0.0991	1.89%	20%	----
		beryllium, dissolved	7440-41-7	E421	0.000020	mg/L	<0.000020	<0.000020	0	Diff <2x LOR	----
		bismuth, dissolved	7440-69-9	E421	0.000050	mg/L	<0.000050	<0.000050	0	Diff <2x LOR	----
		boron, dissolved	7440-42-8	E421	0.010	mg/L	0.091	0.095	0.004	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: 688292) - continued											
KS2203808-001	Anonymous	cadmium, dissolved	7440-43-9	E421	0.0000100	mg/L	<0.0000100	<0.0000100	0	Diff <2x LOR	----
		calcium, dissolved	7440-70-2	E421	0.050	mg/L	110	112	2.27%	20%	----
		chromium, dissolved	7440-47-3	E421	0.00050	mg/L	<0.00050	<0.00050	0	Diff <2x LOR	----
		cobalt, dissolved	7440-48-4	E421	0.00010	mg/L	<0.00010	<0.00010	0	Diff <2x LOR	----
		copper, dissolved	7440-50-8	E421	0.00020	mg/L	0.00052	0.00048	0.00004	Diff <2x LOR	----
		iron, dissolved	7439-89-6	E421	0.010	mg/L	0.022	0.021	0.0004	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	0.0202	0.0209	3.61%	20%	----
		magnesium, dissolved	7439-95-4	E421	0.0050	mg/L	225	222	1.05%	20%	----
		manganese, dissolved	7439-96-5	E421	0.00010	mg/L	0.0117	0.0116	0.380%	20%	----
		molybdenum, dissolved	7439-98-7	E421	0.000050	mg/L	0.0108	0.0111	1.97%	20%	----
		nickel, dissolved	7440-02-0	E421	0.00050	mg/L	0.00226	0.00219	0.00006	Diff <2x LOR	----
		phosphorus, dissolved	7723-14-0	E421	0.050	mg/L	0.078	0.082	0.004	Diff <2x LOR	----
		potassium, dissolved	7440-09-7	E421	0.050	mg/L	26.6	26.7	0.343%	20%	----
		selenium, dissolved	7782-49-2	E421	0.000050	mg/L	0.000187	0.000229	0.000042	Diff <2x LOR	----
		silicon, dissolved	7440-21-3	E421	0.050	mg/L	20.0	19.7	1.52%	20%	----
		silver, dissolved	7440-22-4	E421	0.000010	mg/L	<0.000010	<0.000010	0	Diff <2x LOR	----
		sodium, dissolved	7440-23-5	E421	0.050	mg/L	57.3	56.7	1.01%	20%	----
		strontium, dissolved	7440-24-6	E421	0.00020	mg/L	1.23	1.24	0.188%	20%	----
		sulfur, dissolved	7704-34-9	E421	0.50	mg/L	109	107	1.86%	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	0.00041	0.00040	0.00001	Diff <2x LOR	----
		uranium, dissolved	7440-61-1	E421	0.000010	mg/L	0.0184	0.0178	3.14%	20%	----
		vanadium, dissolved	7440-62-2	E421	0.00050	mg/L	0.00092	0.00091	0.00001	Diff <2x LOR	----
		zinc, dissolved	7440-66-6	E421	0.0010	mg/L	0.0039	0.0039	0.00004	Diff <2x LOR	----
Dissolved Metals (QC Lot: 693740)											
VA22C4318-001	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: 687776)						
conductivity	----	E100	1	µS/cm	<1.0	----
Physical Tests (QCLot: 687777)						
alkalinity, total (as CaCO3)	----	E290	1	mg/L	<1.0	----
Physical Tests (QCLot: 687787)						
acidity (as CaCO3)	----	E283	2	mg/L	2.1	----
Physical Tests (QCLot: 688497)						
turbidity	----	E121	0.1	NTU	<0.10	----
Physical Tests (QCLot: 693255)						
solids, total suspended [TSS]	----	E160	3	mg/L	<3.0	----
Physical Tests (QCLot: 693258)						
solids, total dissolved [TDS]	----	E162	10	mg/L	<10	----
Anions and Nutrients (QCLot: 687778)						
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	<0.30	----
Anions and Nutrients (QCLot: 687779)						
chloride	16887-00-6	E235.Cl	0.5	mg/L	<0.50	----
Anions and Nutrients (QCLot: 687780)						
nitrite (as N)	14797-65-0	E235.NO2-L	0.001	mg/L	# 0.0015	B
Anions and Nutrients (QCLot: 687782)						
fluoride	16984-48-8	E235.F	0.02	mg/L	<0.020	----
Anions and Nutrients (QCLot: 687783)						
nitrate (as N)	14797-55-8	E235.NO3-L	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 687784)						
bromide	24959-67-9	E235.Br-L	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 687786)						
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	<0.0010	----
Anions and Nutrients (QCLot: 688536)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Anions and Nutrients (QCLot: 688537)						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 688538)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 691395)						

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Anions and Nutrients (QCLot: 691395) - continued						
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	<0.0020	----
Anions and Nutrients (QCLot: 691397)						
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	<0.0050	----
Anions and Nutrients (QCLot: 691398)						
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	<0.050	----
Cyanides (QCLot: 697069)						
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	<0.0020	----
Cyanides (QCLot: 697070)						
cyanide, weak acid dissociable	----	E336	0.002	mg/L	<0.0020	----
Cyanides (QCLot: 698712)						
thiocyanate	302-04-5	E344	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 688539)						
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 688540)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Organic / Inorganic Carbon (QCLot: 691400)						
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	<0.50	----
Total Metals (QCLot: 688178)						
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	----
chromium, total	7440-47-3	E420	0.0005	mg/L	<0.00050	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	<0.00010	----
copper, total	7440-50-8	E420	0.0005	mg/L	<0.00050	----
iron, total	7439-89-6	E420	0.01	mg/L	<0.010	----
lead, total	7439-92-1	E420	0.00005	mg/L	<0.000050	----
lithium, total	7439-93-2	E420	0.001	mg/L	<0.0010	----
magnesium, total	7439-95-4	E420	0.005	mg/L	<0.0050	----
manganese, total	7439-96-5	E420	0.0001	mg/L	<0.00010	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Total Metals (QCLot: 688178) - 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	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	<0.050	----
potassium, total	7440-09-7	E420	0.05	mg/L	<0.050	----
selenium, total	7782-49-2	E420	0.00005	mg/L	<0.000050	----
silicon, total	7440-21-3	E420	0.1	mg/L	<0.10	----
silver, total	7440-22-4	E420	0.00001	mg/L	<0.000010	----
sodium, total	7440-23-5	E420	0.05	mg/L	<0.050	----
strontium, total	7440-24-6	E420	0.0002	mg/L	<0.00020	----
sulfur, total	7704-34-9	E420	0.5	mg/L	<0.50	----
thallium, total	7440-28-0	E420	0.00001	mg/L	<0.000010	----
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: 692692)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Total Metals (QCLot: 697520)						
mercury, total	7439-97-6	E508	0.000005	mg/L	<0.0000050	----
Dissolved Metals (QCLot: 688292)						
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	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	<0.00050	----
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	<0.00010	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	<0.00020	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	<0.010	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	<0.000050	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Result	Qualifier
Dissolved Metals (QCLot: 688292) - continued						
lithium, dissolved	7439-93-2	E421	0.001	mg/L	<0.0010	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	<0.0050	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	<0.00010	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	<0.000050	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	<0.00050	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	<0.050	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	<0.050	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	<0.000050	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	<0.050	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	<0.000010	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	<0.050	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	<0.00020	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	<0.50	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	<0.000010	----
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: 693740)						
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	<0.0000050	----

Qualifiers

Qualifier	Description
B	*Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.*

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: 687775)									
pH	----	E108	----	pH units	7 pH units	99.7	98.0	102	----
Physical Tests (QCLot: 687776)									
conductivity	----	E100	1	µS/cm	146.9 µS/cm	95.6	90.0	110	----
Physical Tests (QCLot: 687777)									
alkalinity, total (as CaCO3)	----	E290	1	mg/L	500 mg/L	108	85.0	115	----
Physical Tests (QCLot: 687787)									
acidity (as CaCO3)	----	E283	2	mg/L	50 mg/L	99.0	85.0	115	----
Physical Tests (QCLot: 688497)									
turbidity	----	E121	0.1	NTU	200 NTU	101	85.0	115	----
Physical Tests (QCLot: 693255)									
solids, total suspended [TSS]	----	E160	3	mg/L	150 mg/L	96.2	85.0	115	----
Physical Tests (QCLot: 693258)									
solids, total dissolved [TDS]	----	E162	10	mg/L	1000 mg/L	103	85.0	115	----
Anions and Nutrients (QCLot: 687778)									
sulfate (as SO4)	14808-79-8	E235.SO4	0.3	mg/L	100 mg/L	106	90.0	110	----
Anions and Nutrients (QCLot: 687779)									
chloride	16887-00-6	E235.Cl	0.5	mg/L	100 mg/L	104	90.0	110	----
Anions and Nutrients (QCLot: 687780)									
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: 687782)									
fluoride	16984-48-8	E235.F	0.02	mg/L	1 mg/L	99.3	90.0	110	----
Anions and Nutrients (QCLot: 687783)									
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: 687784)									
bromide	24959-67-9	E235.Br-L	0.05	mg/L	0.5 mg/L	101	85.0	115	----
Anions and Nutrients (QCLot: 687786)									
phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.001	mg/L	0.03 mg/L	106	80.0	120	----
Anions and Nutrients (QCLot: 688536)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	93.2	75.0	125	----
Anions and Nutrients (QCLot: 688537)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.05 mg/L	90.6	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report				
					Spike	Recovery (%)	Recovery Limits (%)		
					Concentration	LCS	Low	High	Qualifier
Anions and Nutrients (QCLot: 688538)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	105	85.0	115	----
Anions and Nutrients (QCLot: 691395)									
phosphorus, total	7723-14-0	E372-U	0.002	mg/L	0.05 mg/L	89.1	80.0	120	----
Anions and Nutrients (QCLot: 691397)									
ammonia, total (as N)	7664-41-7	E298	0.005	mg/L	0.2 mg/L	97.9	85.0	115	----
Anions and Nutrients (QCLot: 691398)									
Kjeldahl nitrogen, total [TKN]	----	E318	0.05	mg/L	4 mg/L	93.3	75.0	125	----
Cyanides (QCLot: 697069)									
cyanide, strong acid dissociable (total)	----	E333	0.002	mg/L	0.25 mg/L	98.0	80.0	120	----
Cyanides (QCLot: 697070)									
cyanide, weak acid dissociable	----	E336	0.002	mg/L	0.125 mg/L	101	80.0	120	----
Cyanides (QCLot: 698712)									
thiocyanate	302-04-5	E344	0.5	mg/L	10 mg/L	96.4	85.0	115	----
Organic / Inorganic Carbon (QCLot: 688539)									
carbon, dissolved organic [DOC]	----	E358-L	0.5	mg/L	8.57 mg/L	98.3	80.0	120	----
Organic / Inorganic Carbon (QCLot: 688540)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	103	80.0	120	----
Organic / Inorganic Carbon (QCLot: 691400)									
carbon, total organic [TOC]	----	E355-L	0.5	mg/L	8.57 mg/L	92.6	80.0	120	----
Total Metals (QCLot: 688178)									
aluminum, total	7429-90-5	E420	0.003	mg/L	2 mg/L	95.3	80.0	120	----
antimony, total	7440-36-0	E420	0.0001	mg/L	1 mg/L	96.3	80.0	120	----
arsenic, total	7440-38-2	E420	0.0001	mg/L	1 mg/L	101	80.0	120	----
barium, total	7440-39-3	E420	0.0001	mg/L	0.25 mg/L	96.4	80.0	120	----
beryllium, total	7440-41-7	E420	0.00002	mg/L	0.1 mg/L	95.8	80.0	120	----
bismuth, total	7440-69-9	E420	0.00005	mg/L	1 mg/L	94.8	80.0	120	----
boron, total	7440-42-8	E420	0.01	mg/L	1 mg/L	81.6	80.0	120	----
cadmium, total	7440-43-9	E420	0.000005	mg/L	0.1 mg/L	96.7	80.0	120	----
calcium, total	7440-70-2	E420	0.05	mg/L	50 mg/L	96.0	80.0	120	----
chromium, total	7440-47-3	E420	0.0005	mg/L	0.25 mg/L	95.3	80.0	120	----
cobalt, total	7440-48-4	E420	0.0001	mg/L	0.25 mg/L	96.1	80.0	120	----
copper, total	7440-50-8	E420	0.0005	mg/L	0.25 mg/L	95.5	80.0	120	----
iron, total	7439-89-6	E420	0.01	mg/L	1 mg/L	114	80.0	120	----

Sub-Matrix: **Water**

Analyte	CAS Number	Method	LOR	Unit	Laboratory Control Sample (LCS) Report: Spike Concentration	Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High	Qualifier
Total Metals (QCLot: 688178) - continued									
lead, total	7439-92-1	E420	0.00005	mg/L	0.5 mg/L	93.5	80.0	120	----
lithium, total	7439-93-2	E420	0.001	mg/L	0.25 mg/L	95.5	80.0	120	----
magnesium, total	7439-95-4	E420	0.005	mg/L	50 mg/L	95.5	80.0	120	----
manganese, total	7439-96-5	E420	0.0001	mg/L	0.25 mg/L	93.5	80.0	120	----
molybdenum, total	7439-98-7	E420	0.00005	mg/L	0.25 mg/L	94.0	80.0	120	----
nickel, total	7440-02-0	E420	0.0005	mg/L	0.5 mg/L	94.2	80.0	120	----
phosphorus, total	7723-14-0	E420	0.05	mg/L	10 mg/L	102	80.0	120	----
potassium, total	7440-09-7	E420	0.05	mg/L	50 mg/L	98.2	80.0	120	----
selenium, total	7782-49-2	E420	0.00005	mg/L	1 mg/L	100	80.0	120	----
silicon, total	7440-21-3	E420	0.1	mg/L	10 mg/L	98.1	80.0	120	----
silver, total	7440-22-4	E420	0.00001	mg/L	0.1 mg/L	85.5	80.0	120	----
sodium, total	7440-23-5	E420	0.05	mg/L	50 mg/L	98.7	80.0	120	----
strontium, total	7440-24-6	E420	0.0002	mg/L	0.25 mg/L	91.8	80.0	120	----
sulfur, total	7704-34-9	E420	0.5	mg/L	50 mg/L	101	80.0	120	----
thallium, total	7440-28-0	E420	0.00001	mg/L	1 mg/L	95.4	80.0	120	----
tin, total	7440-31-5	E420	0.0001	mg/L	0.5 mg/L	90.9	80.0	120	----
titanium, total	7440-32-6	E420	0.0003	mg/L	0.25 mg/L	90.5	80.0	120	----
uranium, total	7440-61-1	E420	0.00001	mg/L	0.005 mg/L	99.1	80.0	120	----
vanadium, total	7440-62-2	E420	0.0005	mg/L	0.5 mg/L	95.9	80.0	120	----
zinc, total	7440-66-6	E420	0.003	mg/L	0.5 mg/L	94.3	80.0	120	----
Total Metals (QCLot: 692692)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	100	80.0	120	----
Total Metals (QCLot: 697520)									
mercury, total	7439-97-6	E508	0.000005	mg/L	0.0001 mg/L	96.6	80.0	120	----
Dissolved Metals (QCLot: 688292)									
aluminum, dissolved	7429-90-5	E421	0.001	mg/L	2 mg/L	98.8	80.0	120	----
antimony, dissolved	7440-36-0	E421	0.0001	mg/L	1 mg/L	108	80.0	120	----
arsenic, dissolved	7440-38-2	E421	0.0001	mg/L	1 mg/L	103	80.0	120	----
barium, dissolved	7440-39-3	E421	0.0001	mg/L	0.25 mg/L	# 122	80.0	120	MES
beryllium, dissolved	7440-41-7	E421	0.00002	mg/L	0.1 mg/L	106	80.0	120	----
bismuth, dissolved	7440-69-9	E421	0.00005	mg/L	1 mg/L	106	80.0	120	----
boron, dissolved	7440-42-8	E421	0.01	mg/L	1 mg/L	97.8	80.0	120	----
cadmium, dissolved	7440-43-9	E421	0.000005	mg/L	0.1 mg/L	101	80.0	120	----
calcium, dissolved	7440-70-2	E421	0.05	mg/L	50 mg/L	104	80.0	120	----
chromium, dissolved	7440-47-3	E421	0.0005	mg/L	0.25 mg/L	97.5	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: 688292) - continued									
cobalt, dissolved	7440-48-4	E421	0.0001	mg/L	0.25 mg/L	99.0	80.0	120	----
copper, dissolved	7440-50-8	E421	0.0002	mg/L	0.25 mg/L	97.9	80.0	120	----
iron, dissolved	7439-89-6	E421	0.01	mg/L	1 mg/L	106	80.0	120	----
lead, dissolved	7439-92-1	E421	0.00005	mg/L	0.5 mg/L	105	80.0	120	----
lithium, dissolved	7439-93-2	E421	0.001	mg/L	0.25 mg/L	109	80.0	120	----
magnesium, dissolved	7439-95-4	E421	0.005	mg/L	50 mg/L	102	80.0	120	----
manganese, dissolved	7439-96-5	E421	0.0001	mg/L	0.25 mg/L	98.1	80.0	120	----
molybdenum, dissolved	7439-98-7	E421	0.00005	mg/L	0.25 mg/L	106	80.0	120	----
nickel, dissolved	7440-02-0	E421	0.0005	mg/L	0.5 mg/L	99.2	80.0	120	----
phosphorus, dissolved	7723-14-0	E421	0.05	mg/L	10 mg/L	105	80.0	120	----
potassium, dissolved	7440-09-7	E421	0.05	mg/L	50 mg/L	99.8	80.0	120	----
selenium, dissolved	7782-49-2	E421	0.00005	mg/L	1 mg/L	116	80.0	120	----
silicon, dissolved	7440-21-3	E421	0.05	mg/L	10 mg/L	101	80.0	120	----
silver, dissolved	7440-22-4	E421	0.00001	mg/L	0.1 mg/L	96.7	80.0	120	----
sodium, dissolved	7440-23-5	E421	0.05	mg/L	50 mg/L	96.6	80.0	120	----
strontium, dissolved	7440-24-6	E421	0.0002	mg/L	0.25 mg/L	108	80.0	120	----
sulfur, dissolved	7704-34-9	E421	0.5	mg/L	50 mg/L	115	80.0	120	----
thallium, dissolved	7440-28-0	E421	0.00001	mg/L	1 mg/L	107	80.0	120	----
tin, dissolved	7440-31-5	E421	0.0001	mg/L	0.5 mg/L	101	80.0	120	----
titanium, dissolved	7440-32-6	E421	0.0003	mg/L	0.25 mg/L	98.0	80.0	120	----
uranium, dissolved	7440-61-1	E421	0.00001	mg/L	0.005 mg/L	104	80.0	120	----
vanadium, dissolved	7440-62-2	E421	0.0005	mg/L	0.5 mg/L	100	80.0	120	----
zinc, dissolved	7440-66-6	E421	0.001	mg/L	0.5 mg/L	95.2	80.0	120	----
mercury, dissolved	7439-97-6	E509	0.000005	mg/L	0.0001 mg/L	101	80.0	120	----

Qualifiers

Qualifier	Description
MES	*Data Quality Objective was marginally exceeded (by < 10% absolute) for < 10% of analytes in a Multi-Element Scan / Multi-Parameter Scan (considered acceptable as per OMOE & CCME).*

Matrix Spike (MS) Report

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

Sub-Matrix: **Water**

					Matrix Spike (MS) Report					
					Spike		Recovery (%)	Recovery Limits (%)		
Laboratory sample ID	Client sample ID	Analyte	CAS Number	Method	Concentration	Target	MS	Low	High	Qualifier
Anions and Nutrients (QCLot: 687778)										
VA22C4270-002	Anonymous	sulfate (as SO4)	14808-79-8	E235.SO4	1080 mg/L	1000 mg/L	108	75.0	125	----
Anions and Nutrients (QCLot: 687779)										
VA22C4270-002	Anonymous	chloride	16887-00-6	E235.Cl	1060 mg/L	1000 mg/L	106	75.0	125	----
Anions and Nutrients (QCLot: 687780)										
VA22C4270-002	Anonymous	nitrite (as N)	14797-65-0	E235.NO2-L	5.16 mg/L	5 mg/L	103	75.0	125	----
Anions and Nutrients (QCLot: 687782)										
VA22C4270-002	Anonymous	fluoride	16984-48-8	E235.F	11.4 mg/L	10 mg/L	114	75.0	125	----
Anions and Nutrients (QCLot: 687783)										
VA22C4270-002	Anonymous	nitrate (as N)	14797-55-8	E235.NO3-L	26.8 mg/L	25 mg/L	107	75.0	125	----
Anions and Nutrients (QCLot: 687784)										
VA22C4270-002	Anonymous	bromide	24959-67-9	E235.Br-L	5.10 mg/L	5 mg/L	102	75.0	125	----
Anions and Nutrients (QCLot: 687786)										
VA22C4320-001	Anonymous	phosphate, ortho-, dissolved (as P)	14265-44-2	E378-U	0.0300 mg/L	0.03 mg/L	100	70.0	130	----
Anions and Nutrients (QCLot: 688536)										
KS2203826-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	2.74 mg/L	2.5 mg/L	109	70.0	130	----
Anions and Nutrients (QCLot: 688537)										
KS2203826-002	Anonymous	phosphorus, total	7723-14-0	E372-U	ND mg/L	0.05 mg/L	ND	70.0	130	----
Anions and Nutrients (QCLot: 688538)										
KS2203826-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	ND mg/L	0.1 mg/L	ND	75.0	125	----
Anions and Nutrients (QCLot: 691395)										
VA22C4271-002	Anonymous	phosphorus, total	7723-14-0	E372-U	0.0493 mg/L	0.05 mg/L	98.7	70.0	130	----
Anions and Nutrients (QCLot: 691397)										
VA22C4271-002	Anonymous	ammonia, total (as N)	7664-41-7	E298	0.0956 mg/L	0.1 mg/L	95.6	75.0	125	----
Anions and Nutrients (QCLot: 691398)										
VA22C4271-002	Anonymous	Kjeldahl nitrogen, total [TKN]	----	E318	1.94 mg/L	2.5 mg/L	77.7	70.0	130	----
Cyanides (QCLot: 697069)										
VA22C4282-003	Anonymous	cyanide, strong acid dissociable (total)	----	E333	0.236 mg/L	0.25 mg/L	94.6	75.0	125	----

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
Cyanides (QCLot: 697070)										
VA22C4282-003	Anonymous	cyanide, weak acid dissociable	----	E336	0.127 mg/L	0.125 mg/L	102	75.0	125	----
Cyanides (QCLot: 698712)										
VA22C4160-002	Anonymous	thiocyanate	302-04-5	E344	9.26 mg/L	10 mg/L	92.6	75.0	125	----
Organic / Inorganic Carbon (QCLot: 688539)										
KS2203826-002	Anonymous	carbon, dissolved organic [DOC]	----	E358-L	4.95 mg/L	5 mg/L	98.9	70.0	130	----
Organic / Inorganic Carbon (QCLot: 688540)										
KS2203826-002	Anonymous	carbon, total organic [TOC]	----	E355-L	4.56 mg/L	5 mg/L	91.1	70.0	130	----
Organic / Inorganic Carbon (QCLot: 691400)										
VA22C4271-002	Anonymous	carbon, total organic [TOC]	----	E355-L	4.82 mg/L	5 mg/L	96.5	70.0	130	----
Total Metals (QCLot: 688178)										
VA22C4066-002	Anonymous	aluminum, total	7429-90-5	E420	0.174 mg/L	0.2 mg/L	87.3	70.0	130	----
		antimony, total	7440-36-0	E420	0.0183 mg/L	0.02 mg/L	91.5	70.0	130	----
		arsenic, total	7440-38-2	E420	0.0188 mg/L	0.02 mg/L	93.9	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	91.3	70.0	130	----
		bismuth, total	7440-69-9	E420	0.00887 mg/L	0.01 mg/L	88.7	70.0	130	----
		boron, total	7440-42-8	E420	0.081 mg/L	0.1 mg/L	80.9	70.0	130	----
		cadmium, total	7440-43-9	E420	0.00366 mg/L	0.004 mg/L	91.5	70.0	130	----
		calcium, total	7440-70-2	E420	ND mg/L	4 mg/L	ND	70.0	130	----
		chromium, total	7440-47-3	E420	0.0362 mg/L	0.04 mg/L	90.6	70.0	130	----
		cobalt, total	7440-48-4	E420	0.0180 mg/L	0.02 mg/L	90.0	70.0	130	----
		copper, total	7440-50-8	E420	0.0177 mg/L	0.02 mg/L	88.4	70.0	130	----
		iron, total	7439-89-6	E420	1.77 mg/L	2 mg/L	88.7	70.0	130	----
		lead, total	7439-92-1	E420	0.0174 mg/L	0.02 mg/L	87.1	70.0	130	----
		lithium, total	7439-93-2	E420	0.0884 mg/L	0.1 mg/L	88.4	70.0	130	----
		magnesium, total	7439-95-4	E420	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, total	7439-96-5	E420	0.0165 mg/L	0.02 mg/L	82.5	70.0	130	----
		molybdenum, total	7439-98-7	E420	0.0190 mg/L	0.02 mg/L	94.8	70.0	130	----
		nickel, total	7440-02-0	E420	0.0350 mg/L	0.04 mg/L	87.4	70.0	130	----
		phosphorus, total	7723-14-0	E420	8.89 mg/L	10 mg/L	88.9	70.0	130	----
		potassium, total	7440-09-7	E420	3.66 mg/L	4 mg/L	91.4	70.0	130	----
		selenium, total	7782-49-2	E420	0.0390 mg/L	0.04 mg/L	97.5	70.0	130	----
		silicon, total	7440-21-3	E420	8.31 mg/L	10 mg/L	83.1	70.0	130	----
		silver, total	7440-22-4	E420	0.00380 mg/L	0.004 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: 688178) - continued										
VA22C4066-002	Anonymous	sodium, total	7440-23-5	E420	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, total	7440-24-6	E420	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, total	7704-34-9	E420	ND mg/L	20 mg/L	ND	70.0	130	----
		thallium, total	7440-28-0	E420	0.00350 mg/L	0.004 mg/L	87.5	70.0	130	----
		tin, total	7440-31-5	E420	0.0181 mg/L	0.02 mg/L	90.4	70.0	130	----
		titanium, total	7440-32-6	E420	0.0346 mg/L	0.04 mg/L	86.6	70.0	130	----
		uranium, total	7440-61-1	E420	0.00385 mg/L	0.004 mg/L	96.3	70.0	130	----
		vanadium, total	7440-62-2	E420	0.0914 mg/L	0.1 mg/L	91.4	70.0	130	----
		zinc, total	7440-66-6	E420	0.351 mg/L	0.4 mg/L	87.8	70.0	130	----
Total Metals (QCLot: 692692)										
VA22C4237-005	Anonymous	mercury, total	7439-97-6	E508	0.0000992 mg/L	0.0001 mg/L	99.2	70.0	130	----
Total Metals (QCLot: 697520)										
VA22C4152-002	Anonymous	mercury, total	7439-97-6	E508	0.000101 mg/L	0.0001 mg/L	101	70.0	130	----
Dissolved Metals (QCLot: 688292)										
KS2203809-001	Anonymous	aluminum, dissolved	7429-90-5	E421	0.186 mg/L	0.2 mg/L	93.3	70.0	130	----
		antimony, dissolved	7440-36-0	E421	0.0193 mg/L	0.02 mg/L	96.7	70.0	130	----
		arsenic, dissolved	7440-38-2	E421	0.0193 mg/L	0.02 mg/L	96.6	70.0	130	----
		barium, dissolved	7440-39-3	E421	0.0182 mg/L	0.02 mg/L	91.0	70.0	130	----
		beryllium, dissolved	7440-41-7	E421	0.0392 mg/L	0.04 mg/L	98.0	70.0	130	----
		bismuth, dissolved	7440-69-9	E421	0.00930 mg/L	0.01 mg/L	93.0	70.0	130	----
		boron, dissolved	7440-42-8	E421	0.092 mg/L	0.1 mg/L	91.9	70.0	130	----
		cadmium, dissolved	7440-43-9	E421	0.00384 mg/L	0.004 mg/L	95.9	70.0	130	----
		calcium, dissolved	7440-70-2	E421	ND mg/L	4 mg/L	ND	70.0	130	----
		chromium, dissolved	7440-47-3	E421	0.0366 mg/L	0.04 mg/L	91.4	70.0	130	----
		cobalt, dissolved	7440-48-4	E421	0.0188 mg/L	0.02 mg/L	93.9	70.0	130	----
		copper, dissolved	7440-50-8	E421	0.0183 mg/L	0.02 mg/L	91.5	70.0	130	----
		iron, dissolved	7439-89-6	E421	1.87 mg/L	2 mg/L	93.4	70.0	130	----
		lead, dissolved	7439-92-1	E421	0.0192 mg/L	0.02 mg/L	96.1	70.0	130	----
		lithium, dissolved	7439-93-2	E421	0.0952 mg/L	0.1 mg/L	95.2	70.0	130	----
		magnesium, dissolved	7439-95-4	E421	ND mg/L	1 mg/L	ND	70.0	130	----
		manganese, dissolved	7439-96-5	E421	0.0188 mg/L	0.02 mg/L	93.9	70.0	130	----
		molybdenum, dissolved	7439-98-7	E421	0.0197 mg/L	0.02 mg/L	98.6	70.0	130	----
		nickel, dissolved	7440-02-0	E421	0.0367 mg/L	0.04 mg/L	91.9	70.0	130	----
		phosphorus, dissolved	7723-14-0	E421	10.0 mg/L	10 mg/L	100	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: 688292) - continued										
KS2203809-001	Anonymous	potassium, dissolved	7440-09-7	E421	3.59 mg/L	4 mg/L	89.8	70.0	130	----
		selenium, dissolved	7782-49-2	E421	0.0380 mg/L	0.04 mg/L	95.0	70.0	130	----
		silicon, dissolved	7440-21-3	E421	9.04 mg/L	10 mg/L	90.4	70.0	130	----
		silver, dissolved	7440-22-4	E421	0.00406 mg/L	0.004 mg/L	101	70.0	130	----
		sodium, dissolved	7440-23-5	E421	ND mg/L	2 mg/L	ND	70.0	130	----
		strontium, dissolved	7440-24-6	E421	ND mg/L	0.02 mg/L	ND	70.0	130	----
		sulfur, dissolved	7704-34-9	E421	18.5 mg/L	20 mg/L	92.6	70.0	130	----
		thallium, dissolved	7440-28-0	E421	0.00375 mg/L	0.004 mg/L	93.7	70.0	130	----
		tin, dissolved	7440-31-5	E421	0.0187 mg/L	0.02 mg/L	93.6	70.0	130	----
		titanium, dissolved	7440-32-6	E421	0.0370 mg/L	0.04 mg/L	92.6	70.0	130	----
		uranium, dissolved	7440-61-1	E421	0.00375 mg/L	0.004 mg/L	93.8	70.0	130	----
		vanadium, dissolved	7440-62-2	E421	0.0936 mg/L	0.1 mg/L	93.6	70.0	130	----
		zinc, dissolved	7440-66-6	E421	0.370 mg/L	0.4 mg/L	92.6	70.0	130	----
Dissolved Metals (QCLot: 693740)										
VA22C4318-002	Anonymous	mercury, dissolved	7439-97-6	E509	0.000102 mg/L	0.0001 mg/L	102	70.0	130	----

Chain of Custody (COC) / Analytical Request Form

ALS Environmental

www.alsglobal.com

Canada Toll Free: 1 800 668 9878

Affix ALS barcode label here (lab use only)

COC Number: 15 -

Page of

Report To	Contact and company name below will appear on the final report	Report Format / Distribution	Select Service Level Below - Please confirm all E&P TATs with your AM - surcharges will apply
Company:	ERM	Select Report Format: ☑ PDF ☑ EXCEL ☑ EDD (DIGITAL)	Regular [R] ☑ Standard TAT if received by 3 pm - business days - no surcharges apply
Contact:	Tonia Robb	Quality Control (QC) Report with Report ☑ YES ☐ NO	PRIORITY (Business Days): 4 day [P4] ☐ / 3 day [P3] ☐ / 2 day [P2] ☐ — EMERGENCY: 1 Business day [E1] ☐ / Same Day, Weekend or Statutory holiday [E0] ☐
Phone:	604-689-9460	☐ Compare Results to Criteria on Report - provide details below if box checked	
	Company address below will appear on the final report	Select Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	Date and Time Required for all E&P TATs: dd-mmm-yy hh:mm
Street:	15th Floor, 1111 West Hastings St	Email 1 or Fax: Tonia.Robb@erm.com	For tests that can not be performed according to the service level selected, you will be contacted.
City/Province:	Vancouver, BC	Email 2: tdesormeaux@artemisgoldinc.com	
Postal Code:	V6E 2J3	Email 3: ktanaka@artemisgoldinc.com	
Invoice To	Same as Report To ☐ YES ☑ NO	Invoice Distribution	
	Copy of Invoice with Report ☐ YES ☑ NO	Select Invoice Distribution: ☑ EMAIL ☐ MAIL ☐ FAX	
Company:	Artemis Gold Ltd, Blackwater	Email 1 or Fax: tdesormeaux@artemisgoldinc.com	
Contact:	Travis Desormeaux	Email 2: accounts@artemisgoldinc.com	

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:	Q56205	AFE/Cost Center:	PO#
Job #:	VA22-BWGL100-002	Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (lab use only)		ALS Contact: A. Springer	Sampler:

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

ALS Sample # (lab use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	General Parameters/Anions	Ammonia/Nutrients/TOC	DOC	T-CN, WAD-CN	Total Metals	Dissolved Metals	Total Mercury	Dissolved Mercury	Thiocyanate					Number of Containers
						P	F/P	P		F		F	P					
	661-01	6-Oct-22		Water	R	R	R	R	R	R	R	R	R					9
	661-04	6-Oct-22		Water	R	R	R	R	R	R	R	R	R					9
	705-10	6-Oct-22		Water	R	R	R	R	R	R	R	R	R					9
	Travel Blank	6-Oct-22		Water	R	R		R	R		R		R					6
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														
				Water														

Environmental Division Vancouver
Work Order Reference
VA22C4353

Telephone : +1 604 253 4188

Drinking Water (DW) Samples[1] (client use)	Special Instructions / Specify Criteria to add on report by clicking on the drop-down list below (electronic COC only)
Are samples taken from a Regulated DW System? ☐ YES ☑ NO	Please also email reports to Envirogeneral@artemisgoldinc.com Dissolved parameters field-filtered. Metals and mercury not preserved.
Are samples for human drinking water use? ☐ YES ☑ NO	

SAMPLE CONDITION AS RECEIVED (lab use only)

Frozen ☐ SIF Observations Yes ☐ No ☐

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

Cooling Initiated ☐

INITIAL COOLER TEMPERATURES °C			FINAL COOLER TEMPERATURES °C		
			5		

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (lab use only)			FINAL SHIPMENT RECEPTION (lab use only)		
<Original signed by>	Date: Oct 7, 2022	Time: 0900	Received by:	Date:	Time:	Received by: <Original signed by>	Date: 80 Oct 22	Time: 1050A

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

OCTOBER 2015 FRONT

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

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

ALS Canada Ltd.

right solutions. right partner.

CERTIFICATE OF ANALYSIS

Work Order	: **VA22C4666**	Page	: 1 of 10
Client	: **ERM Consultants Canada Ltd.**	Laboratory	: Vancouver - Environmental
Contact	: Tonia Robb	Account Manager	: Amber Springer
Address	: 10th Floor, 1100 Melville St. Vancouver BC Canada V6E 4A6	Address	: 8081 Lougheed Highway Burnaby BC Canada V5A 1W9
Telephone	: 604 689 9460	Telephone	: +1 604 253 4188
Project	: 0332945-0102-0001	Date Samples Received	: 13-Oct-2022 08:50
PO	: 10857	Date Analysis Commenced	: 13-Oct-2022
C-O-C number	: ----	Issue Date	: 21-Oct-2022 13:52
Sampler	: Avison		
Site	: ----		
Quote number	: ERM/BW Gold SW (VA22-BWGL100-002/Q56205)		
No. of samples received	: 7		
No. of samples analysed	: 7		

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

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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

Signatories

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

Signatories	*Position*	*Laboratory Department*
Anthony Calero	Supervisor - Inorganic	Inorganics, Calgary, Alberta
Caitlin Macey	Team Leader - Inorganics	Inorganics, Burnaby, British Columbia
Dan Gebert	Laboratory Analyst	Metals, Burnaby, British Columbia
Elke Tabora		Inorganics, Calgary, Alberta
Erin Sanchez		Metals, Burnaby, British Columbia
Greg Pokocky	Supervisor - Inorganic	Inorganics, Waterloo, Ontario
Kevin Duarte	Supervisor - Metals ICP Instrumentation	Metals, Burnaby, British Columbia
Parker Sgarbossa	Laboratory Analyst	Inorganics, Calgary, Alberta
Qammar Almas	Lab Assistant	Metals, Burnaby, British Columbia
Ruifang Zheng	Analyst	Inorganics, Calgary, Alberta